Proceedings

Symposium on Land Consolidation and Land Readjustment for Sustainable Development

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A vocabulary for building landscapes

Henk VAN BLERCK, The Netherlands

Key words: : landscape architecture, land consolidation, scenery, participatory planning, narrative design approach

SUMMARY

In the post-war period (1944-1970) land consolidation programmes drastically transformed the Dutch historical landscape. Landscape architects contributed to this by re-designing the landscapes in such a way that they would express the "essence of the landscape" (Blerck, 1998), addressing their main characteristics, scenery and land uses. These post-war landscape plans resulted in distinctive - often even iconic – landscapes in vast parts of the Netherlands. Half a century later the designed landscapes have fully grown and turned into a new layer in the cultural biography of the landscape (Hidding et al, 2001). Politicians, policy makers, officials and designers are confronted with the question how to preserve the characteristics and values of these designed landscapes.
The objective of this paper is to identify the design elements that determine the characteristics of these post-war land consolidation landscapes. Twenty different designed landscapes were analysed using field observations, map studies, studies of the original designs and their textual explanations, literature study, and interviews with landscape architects who knew and worked with the landscape designers of the post-war land consolidation period.
The study resulted in a typology of spatial-visual elements that can be considered as the building blocks of the post-war landscape designs. The design elements were used to enhance the characteristics of the historical landscape and its scenic qualities. It appears that the generic types of design elements were adjusted to the specifics of different landscapes and the personal style of different landscape architects.
The typology of design elements with their specific local application offers a valuable contribution to the preservation of the post-war designed landscapes.

A vocabulary for building landscapes

Henk VAN BLERCK, The Netherlands

1. TRACING THE BASIS OF LANDSCAPE PLANS IN DUTCH LAND CONSOLIDATION PROJECTS

Already in he decennium before WWII the State Forestry Department had a special unit called 'Landschapsverzorging'. That could be translated into English as 'Landscape care'. That unit made designs and plans for the plantings along main roads and canals.
The designers in this unit were also asked to contribute to the plans for the first polders in the former Zuiderzee: Wieringermeerpolder and the Noordoostpolder. As external advisor J.T.P. Bijhouwer was consulted for a general landscape plan for the 'new land' of the polders as a whole, but also for designs of the new farmyards in the polder (Andela, 2008).
Bijhouwer invented a new form of landscape architecture. He matched a functional and methodical approach with a great knowledge and love for the variation in the Dutch landscape. Andela (2008) describes how his ideas were formed in interaction with a series of formal and informal discussions with designers like Granpré Molière, Verhagen and Van Eesteren.
In the first years of WW II Bijhouwer not only worked on designs for the new polders, but also made landscape designs for regions at the 'old land', like the Land of Vollenhove. But these plans were not implemented. Bijhouwer's ideas however must have been very influential on the designers and planners working for Landschapsverzorging. He showed that a landscape design appoints different scales. For instance a farmyard is a functional entity on a local scale. But it is also as an element that plays a vast role in the spatial-visual composition of the scenery in a landscape on the scale of a polder (Andela, 2008).
Since 1944 a small team of designers working for Landschapsverzorging had started to make landscape plans for 'ruilverkavelingen', land consolidation projects, in parts of the old land. For a few decades such land consolidation plans had been implemented but only aiming at the interests of agricultural development. The designers of Landschapsverzorging were keen on interlinking the consolidation plans also to the historical landscape with its natural values and cultural heritage (Andela, 2000; van Blerck, 1987; Steenhuis, 2014; de Visser, 1997).

A special collection

The original drawings of the landscape plans of Landschapsverzorging are being preserved at the Special Collections Department of the Wageningen University Library. There we can study the almost complete set of drawings for land consolidations from the period 1944 until the late seventies.
These maps were made at the drawing office of Landschapsverzorging. The maps are numbered starting with R1 (for a small project in the Province of Groningen, Balmahuizen) up to R654 (for peatlands near Amsterdam, Waterland). The R probably stands for the first character of the word 'ruilverkaveling'.
This collection provides an overview of the development of Landschapsverzorging. De Visser (1997) describes this development in two periods. Dividing point is the adoption by the government in 1954 of a new legislation to structure the many land consolidation projects. One of the important changes in this law compared to the earlier legislation was the obligation

to make a landscape plan. Before the installation of this law there was hardly any legal basis for implementing a landscape plan in the plan process. Nevertheless the collection of landscape plans in Wageningen does point out that in the period 1944-1954 landscape plans have been made for circa 200 land consolidation projects.
Do these pioneering 200 already reflect one overriding mode of operation for making landscape plans in land consolidation projects in the Netherlands as a whole? And if so, how can it be characterised? And was it successful?

200 pioneering plans
An inventory of these first 200 landscape plans points out that they have been made for areas all over the country. Some provinces like Zuid Holland and Utrecht are represented with just a few plans, others like Brabant, Overijssel and Drenthe had dozens of plans.
The plans are sometimes for just small sites, like a tiny old polder, or the meadows along a stream. But a lot of the plans incorporate 1000's of hectares of cultivated land. It is also notable that the villages are often part of the plan.
The plans are drawn on a map which showed the patterns of roads and ditches, the allotment patterns and the farms and houses. Some of the landscape plans use the situation that reflects the situation before the consolidation, but often the plans are drawn on a map of the new situation or a concept plan for the reallotment. In these first years the landscape plan was often only made after the land consolidation works with a new allotment pattern, new roads and ditches had already been carried out. The designers of the landscape plan could only ad trees and hedgerows after the plan of the civil engineers was already implemented. But there were also projects where Landschapsverzorging could interfere in earlier stages of the plan process (Andela, 2000; van Blerck, 1987; Steenhuis, 2014; de Visser, 1997).
On their maps existing rows of trees, small forests, shrubberies or hedgerows were marked in black and white. Colour pencils were used to point out the designed elements. Different colours were used for different types of trees, shrubberies or hedgerows.
If the map showed a concept for the projected reallotment, the designers of the landscape plan mark spots on the planned roads where in their opinion this road was projected too much in a straight line to relate to the landscape.
The legend on the maps often also refers to parts of the landscape where extra plantings along land borders were desirable in the vision of the designers. In this way they wanted to express that these parts of the landscape were different from other zones. For instance they indicated valleys along a stream or zones along the edges of dunes.
From actual excursions in the field but also virtual visits using Google Streetview to over half of these 200 areas it turns out that in a vast part of the country these landscape designs have been really carried out and are still largely recognisable. So although there was hardly any legal ground for a landscape plan in land consolidations, these early landscape plans were often very successful. Half a century later the designed landscapes have fully grown and turned into a new layer in the cultural biography of the landscape.

Narrative design approach as overarching mode of operation
Can an overarching approach be recognised in the series of 200 early landscape plans and what are the main elements of this approach? R.J. Benthem, who was head of the team of landscape plan designers, did give his vision in several articles and books. He stressed that in making landscape plans one should never use a template, but always make a design fit to the specific landscape (Benthem, 1950). The variety in the Dutch landscape was in his vision unrivalled. It was essential to build on that diversity.

This was not an easy task because the interferences that were made in the process of land consolidation were often radical. A mode of operation that would just defend the most valuable parts of the landscape as nature or heritage reserves would not suffice. A landscape plan should point at the future landscape as one renewed spatial-visual composition that expresses this essence of the landscape (Benthem, 1950).
People in the landscape should be able to experience the narrative of the landscape, its history, its present, its development over the ages. In this way they wanted to keep, as Benthem said, 'the essence of the landscape' (van Blerck, 1997). In their landscape plans the designers wanted to express the stories of the landscape in the shape of the land. Therefore this can be indicated as a narrative design approach: making a composition of the scenery was a way of storytelling, not with words but with old and new elements of the landscape.
After a first analysis of the collection of 200 early landscape plans the thesis is that this collection reflects this narrative design approach as overarching. In the series of plans many elements of a 'vocabulary' for this narrative designs can be recognised.
This vocabulary comprises three levels. First there is a 'sense of time' on the scale of the Dutch landscape as a whole. Second a 'sense of space' on the scale of landscape ensemble, like a village historically situated between a valley and fields, or like a large polder.
The third level is a 'sense of place' on the scale of a person experiencing the landscape walking through it.

Sense of time: sand, sea and rivers
Sense of time is about landscape as an ever developing interaction of natural and anthropogenic processes. Geological processes in the earth's crust and at the surface of the earth by ice, wind and water resulted in a great variety of geomorphological phenomena. This has been starting point for landscape development in the Dutch delta. In the east the basic shape of the landscape has been formed by glaciers and sandstorms, in the west the force of the sea was predominant. The rivers Maas and Rhine have run through the middle of the country for ages flooding and eroding the land and depositing gravel, sand and clay.
Natural processes react on this variety with a development of ecosystems with different specific flora and fauna. The pioneers of 'landschapsverzorging' had a vast amount of knowledge of nature. They knew about phytosociologic studies of vegetation, including the organisation interdependency, development, geographical distribution and classification of plant communities. Knowledge of the way soil and groundwater influences the development of natural processes was important for the choice of trees to plant in a specific region. They knew about which tree has its natural habitat in different areas in the landscape.
Furthermore they were very aware of the cultural history of the landscape and of how people over the centuries coped with the effects of natural processes.
These insights in the interacting processes that steer the development of a landscape formed the basis of their design (van Blerck, 1987). They reflected on a land consolidation as a next step in the development of these landscapes. This is what is meant with 'sense of time'.

Sense of space: seclusion of the wood versus openness of the sea
In the 200 early landscape plans one can recognise a series of spatial-visual modules. Together they can be analysed as a vocabulary for the designers to make their compositions of the scenery in a landscape. This vocabulary was used to express the sense of space of that particular landscape. Archetypal images of 'wood' and 'sea' stand for two extremes in the sense of space. In the Dutch landscape these extremes are distinct in the delta: the woods in the east and the sea in the west.

In literature such a vocabulary was never systematically described. But the contrast between open and secluded zones in the landscape is a main theme in the landscape plans. Like scientists in chemistry invented the ‘periodic table’ of chemical elements the Dutch landscape designers maybe did make up a sceneric table. On the far left in this sceneric table they would have placed the varied forms of the absolute openness: sea, a huge field, or uncultivated land with peat or heather, a wide polder. There the human eye can see the horizon in all directions.

On the right in this system they would have located modules that resemble the opposite: forests, woods, maybe cities. From the left to the middle modules would have had more and more elements in the openness. They would resemble little isles in the open sea, for instance small forests in a wide heath, or farmyards spread over a polder. More to the middle the open space would be more filled with elements like dikes, dunes, or rows of trees, ribbons of villages. From the right to the middle the forest would have had more and bigger open spaces surrounded by woodlands. In the middle the landscape modules are divided in subspaces of different shapes. This sceneric system of spatial-visual modules was never really systematically recorded in a book or article but they can be recognised in the landscape plans. The aforementioned designation of specific areas where extra plantings were desirable, in contrast to areas that should be left as open space, is an example of how a ‘sense of space’ was expressed in the composition of the scenery of the landscape.
The early 200 point out that from the beginning in designs for the sand landscapes modules in the right side of the sceneric table were used: the wood and clearings in the wood. In contrast modules of the left side of the sceneric table were used for the different polders that make op the sea landscapes. The river landscape is a mixture of both but the spaces and seclusions reflected the long and winding rivers.

Sense of place: individual experience, inside or outside
On the scale of a person walking through the landscape the composition of the scenery can offer a variety of experiences. In many of the landscape plans the experience of entering a village for instance is indicated by making ‘green portals’. Coming from a road with no trees along it, the designer made sure that just before you reach the first house of the village hedgerows are planted: the first 25 meters only on the right side of the road and just past the first house on both sides. It is like a gesture of welcome. In villages often a field with trees makes up a common green hall. The trees form a roof over the public space.
The designed scenery can give a person the feeling that he or she is inside a village, or outside in the middle of an open field. You may feel like walking outside along the edge of a space, or inside a lane of trees and hedgerows along this space. One can ‘enter’ a farmyard which is surrounded by plantings.
These are all examples of how a designer of a landscape plan can steer the experience of being inside or outside in parts of the landscape by composing the scenery. The early 200 are mostly designed in this great detail. They were made to suit perfectly which is probably one of the reasons that the designs are still present in the current landscape, more then 70 years later.

2. ELEMENTS OF THE VOCABULARY

2.1 Examples in designs for Dutch sand-landscapes

2.1.1 Sense of time

Many of the 'early 200' are plans made for land consolidations in southern and eastern parts of the Netherlands. The natural structure of these higher sections of the country was formed by the moraine of gigantic glaciers and by ridges of sand left behind by the sandstorms of the tundra climate during the last Ice Age. The water drains off these moraines and ridges and forms meandering systems of brooks and rivulets.
Since the Middle Ages, people have settled at the transition from high to low ground, at the spot where they could dig a well. They used the lower ground for grazing, and cultivated the higher land for arable crops. High lying dry ground and often marshy grounds farther away from villages and streams were used as large grazing fields for sheep, whose dung was mixed with heather sods. This mixture was used to fertilise the arable plots near the village.
This method of settling the sandy areas depended on the area of land that could be used for cultivation of crops. Some plots on small sand ridges were cultivated by just one or two farms, while in other places the cultivable area was so large that it could support whole villages. The most common Dutch name for these arable grounds is 'es', but also the words 'enk' and 'akker' are used.
After the introduction of industrial fertilisers in the 19th century the large uncultivated grounds lost their role in the method of settling. In the 20th century the cultivation of these grounds became an important part of the land consolidation projects. In the 50s large land consolidation projects were carried out for areas including the villages, valleys, arable plots and the former uncultivated grounds. For the designers it was important that the historic components of the landscape: village, es, valley along the stream and heath would still be recognisable as separate zones in the landscape, each with their own characteristics.
However before these 'overall sand landscape consolidation' projects were set about, dozens of smaller consolidation projects had been carried out in the 40's and early 50's. These projects aimed at modernising farming on the old arable plots, the es, near the villages. The allotment of many long and narrow parcels was from a time when farmers ploughed their land using harrow and ox. The modern agricultural machinery needed wider and shorter parcels.

2.1.2 Es- consolidations like 'R039 Hooghaler en Laaghaler Essen'

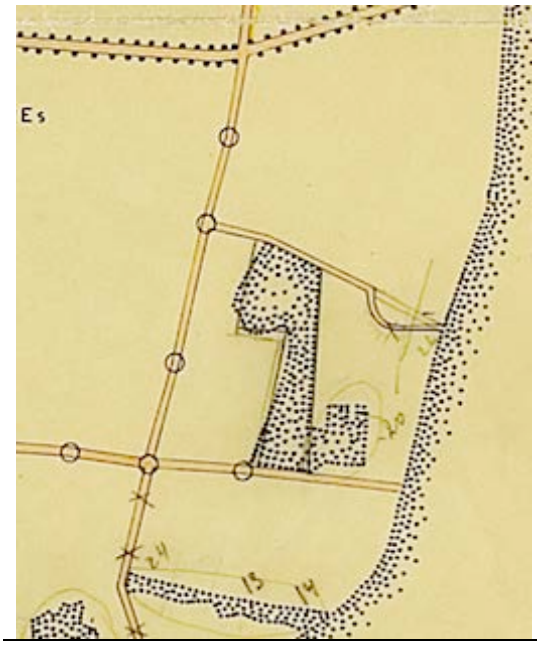
After joining Benthem's team in 1948 the designer, Harry de Vroome, used an identical approach for a series of es-consolidations in the provinces Gelderland, Overijssel and Drenthe. The historic relation between the people in the village and their 'es' was essential (van Blerck, 1987). Therefore public space in the villages is an integral part of the landscape plans. Of the 'early 200' some 40 were 'es'-consolidations and often included more then one village and es. In total this means that as a result of the land consolidations in the early years for nearly a hundred villages a design is made for the green structure. And most of these designs are still recognisable in these villages, iconic even.

Sense of space

One of the first es-consolidations comprised two villages, Hooghalen and Laaghalen, each with their own es. Just outside the villages the es was accentuated as one open space

surrounded by existing forests and new hedgerows and trees along the borders of the es. In this way the es was made one rather large space surrounded by a green ‘enclosure’. This gave all these esses the atmosphere of a clearing in a large forest. On the landscape plan trees were projected in the villages to strengthen them as secluded spaces, in contrast with this openness on the es.

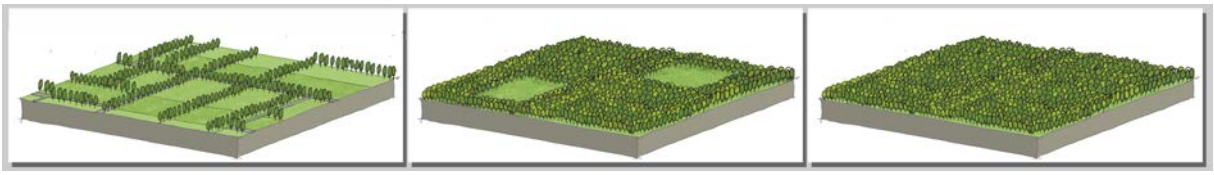
Sense of place
Like in most of the es-consolidations part of the landscape plan is a design for the public space in the villages. Green entrances with trees and hedgerows along the roads make sure that after you have entered the village you move through a range of smaller spaces where ‘trees in grass’ determine the atmosphere.
Often the roads along the edge of the es have hedgerows and trees on the roadside, partially on both roadsides, partially only on the left or only on the right side of the road. You can experience walking ‘on’ the es when the roadside along the es is kept free of plantings. But a little further, often when the road makes a slight curve, in this roadside a hedgerow is designed. Then you have the feeling that you walk outside the es-space because the es is behind the hedgerow. At every curve in the road the hedgerows can switch from the left to the right roadside or hedgerows can be designed on both roadsides. This offers a concatenation of experiences of being in or outside the space of the es, or of being in a lane along the es.



Another example is the way in which a new road over the es of Hooghalen was designed. Landschaps-verzorging wanted to avoid that new roads would look like ‘fremdkörper’ in the landscape. Therefore they indicated with small circles where this road should get a slight curve to make it feel as a natural part of the historic landscape. Often, after discussing this with the civil engineers the projected roadline was adapted. In the case of Hooghalen eventually the road has been given two extra curves and the forest was extended a bit. Now the road crosses the little forest and ‘feels’ like having been there for ages. It’s like park design!

2.1.3 Overall sand landscape consolidations like ‘R043 Rossumerveld en Lemseler Esch’

Sense of time
In Noord Brabant (R050 Spoordonk), Gelderland (R080 Beltrum) and Overijssel (R043 Rossumerveld en Lemseler Esch) the land consolidation not only comprised the es and villages, but also the valleys of streams and the former heathlands. In fact these land consolidations were cultivations of large marshy, peaty or very poor grounds. This could – and in some areas did - lead to a landscape that had the appearance of a cultural tundra. The cultural and natural identity of these historic landscapes would be erased on the civil engineers’ drawing table. To avoid this the designers accentuated the differences in atmosphere of the essential historic components of the landscape: the secluded village, the es with a green enclusure, the former heathland and the valley along the stream.



Sense of space
The es and village were designed in the same way as in the es-consolidations (2.1.2). For the valleys and the former heathland something new had to invented. In the sixties De Vroome made landscape plans for Drenthe in which he designed the former heath lands as large open spaces as a reference to the extensive heath of former ages. In the ‘early 200’ the cultivated heathlands however were cut up into geometric patterns of new roads with a sequence of hedgerows and trees left, right, or on both sides along the new roads.

The streams in the valleys were straightened and canalised. The designers of the landscape plans tried to preserve the seclusion of the range of meadows surrounded by hedgerows and shrubberies. In these early plans a yellow line was drawn along the edges of the valleys - and along the borders of the es – to indicate that these hedgerows and shrubberies should be preserved as much as possible. The legend on the plan also indicates that in these zones outlined in yellow it was recommended to plant new hedgerows and shrubberies.

Sense of place
All these elements of the landscape plan together make up a mosaic landscape that people nowadays call typical for Twenthe and Brabant. A person moving through this landscape experiences along his route entering and leaving hundreds of green rooms in this small-scaled chequered seemingly old landscape. On the landscape plan one can see however how many of all these hedgerows, lanes and forests are newly planted as part of the land consolidation.

2.2 Sea

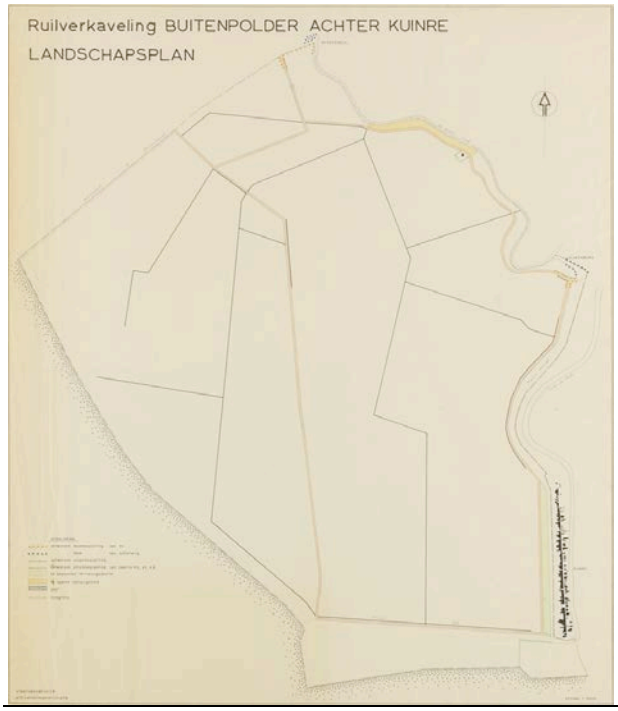
2.2.1 Sense of time

In the western and northern parts of the country, the rise and fall of the sea level determined settlement patterns. Ocean currents formed large sandbanks on the seafloor in an arc roughly parallel with the present-day coastline. Over the centuries, as the sea level dropped, the leeside of these sandbanks provided sheltered areas where the sea could no longer penetrate, and turf started to grow there. As the sea level gradually rose again, tidal seawater flowed into creeks and inlets through the dune landscape. At other times, the sea swept away large areas of the dunes, including turf and peat, with devastating power. This formed an area that was left dry at low tide. The Romans were amazed that people could survive in this tidal habitat, settling around self constructed mounds to which they retreated with their livestock at high tide. You can still see these mounds, known as ‘terpen’ in Dutch, in the far north of the country. The people in the north and west of the Netherlands protected their land from the sea by constructing dikes and creating the polder landscape.
The dikes withstood the force of the sea with varying degrees of success. Sheltered in these early polders, the settlers would wait until the sea inlets and estuaries silted up with a fertile layer of clay and sediment before surrounding them by another defence line of dikes. This resulted in a concatenation of polders of various ages and soil types, with sea inlets running between them. Peat was cut in some of these polders, resulting in new waterlands. As soon as the technology became available, some of these were pumped dry, along with other sea inlets. These were the primitive predecessors of the polders of the man-made province of Flevoland in the former Zuiderzee.
Halfway the 20th century the allotment and water system of the old polders in Groningen, Friesland and the north of Holland had to be adapted to the demand of modern agriculture. A few dozen land consolidations for one single polder were carried out. For Landschaps-verzorging the essence of these polder landscapes was their ‘sea’ of openness. The plots where people are living appear as little ‘isles’ in this openness.
There were also some real islands in this landscape, most of them surrounded by sea, but a few of them surrounded by new polder land after the Zuiderzee had been drained. On these former islands the contrast between the seclusion and intimacy of the villages and arable lands

on the one hand and the wide open lower parts overlooking the former sea on the other hand, was strengthened. There you can feel the wind blow.

2.2.2 Polder consolidations ‘R001 Balmahuizen’ and ‘R165 Buitenpolder achter Kuinre’

Sense op space
In many of the single polder landscape plans hardly any new plantings were proposed. It is the vast openness of the polder with curving dikes and a wide open sky above the horizon dominating the spatial composition of the landscape. One should not think that these landscape plans are so ‘minimal’ because of a lack of possibilities to plant more trees. This was a deliberate artistic choice. The openness and the horizon are essential in the narrative the designers wanted to express in these landscapes.



Sense of place
But moving through this wide open landscapes - ‘high’ on the dike – the sparse plantings of farmyards, bridges or sluices are like isles silhouetted against the horizon. And coming nearer

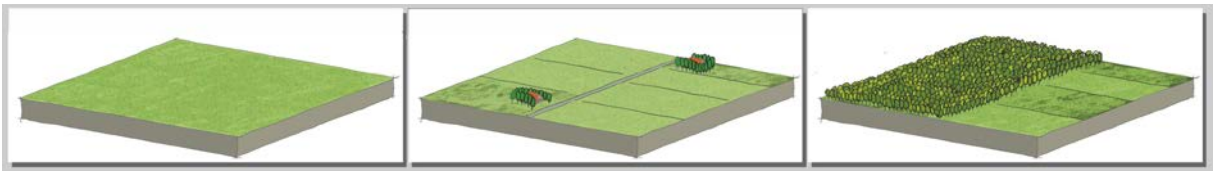
to this farmyard or sluice one enters a little world, secluded but with belvederes from ‘inside’ on the landscape outside.

2.2.3 Overall sea landscape consolidations like ‘R053 Wieringen’

Sense of time
Wieringen had been an island until the Afsluitdijk and the Wieringermeerpolder were realised in the 30’s of the 20th century. Like more of the isles around the Waddensea there was a pattern of embankments made of sod to keep the cattle. This pattern of embankments had already been erased in 1948 when Nico de Jonge and Harry de Vroome made the landscape design together, so after the plan for land consolidation was executed. What they found was an island with a range of hamlets and two small villages with strokes of arable land on some higher slopes, surrounded by open and lower fields. The embankments were gone and so were most of the plantings on the former island. The most important thing for the designers was probably to keep the feeling of being on an island: comfortable out of the wind and rain in a village, but when going out the feeling of walking in the open, watching the sea.

Sense op space
The designers decided to leave the lower parts of the island open, with a few duck decoys as the only beacons. In contrast the roads on the higher grounds were designed more secluded. Trees were placed in the public space of the villages. Green portals and gateways are designed along the last sloping parts of roads that come from the lower grounds to the hamlets. Hedgerows on both sides of roads along the borders of the higher grounds form lanes of

hedgerows. On the plan these higher grounds are outlined with a yellow line. The legend indicates that within these outlined zones placement of extra hedgerows should be stimulated.



Sense of place
Moving through these hedgerow lanes from time to time an opening to one side of the road. On one side they give view on a village. The embankments must have been inbetween these lanes and the villages. And there are views on the other side of the road - over the open lower grounds - at the sea or the polder. The contrast of the secluded hedgerow lanes with these views in the wide open strengthen the experience of being on an island.

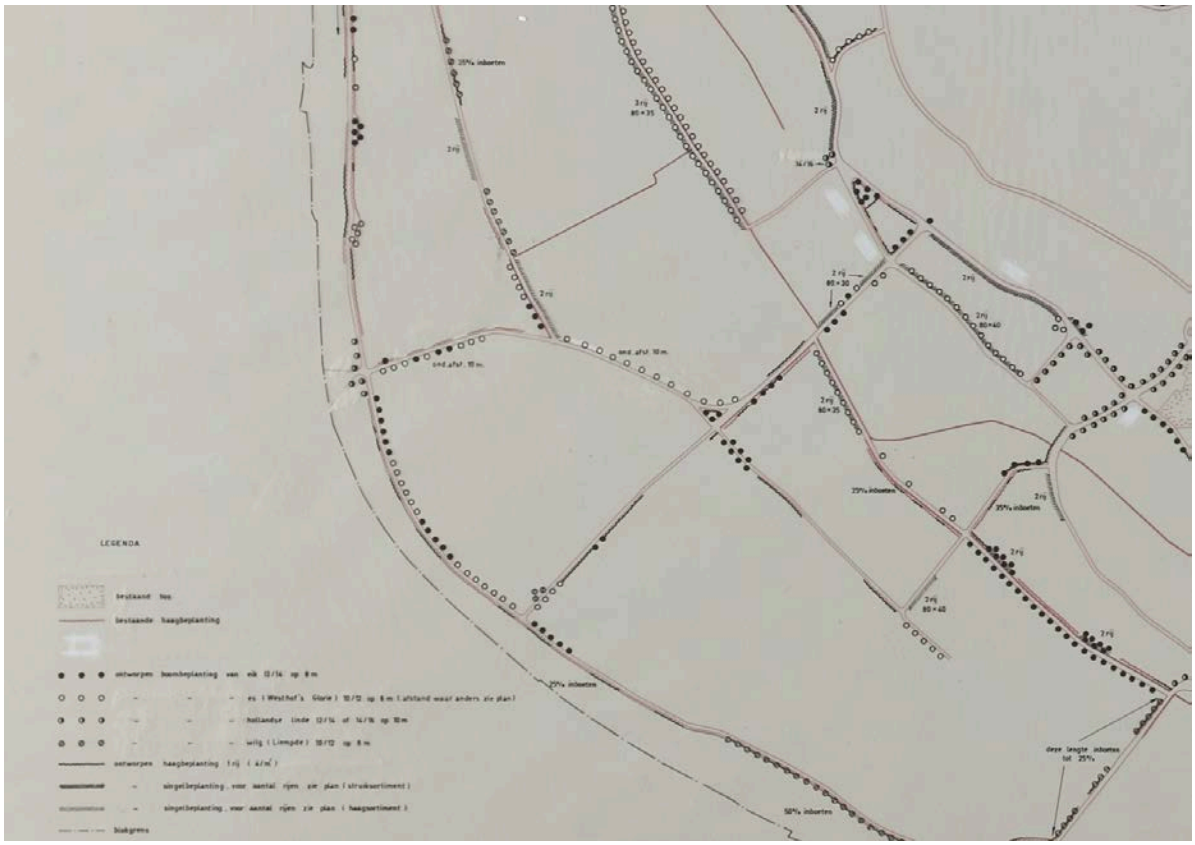
2.3 River

2.3.1 Sense of time

The great rivers cut a swathe from east to west across the Netherlands, eventually discharging into the sea in the westernmost lowlands. These rivers would break their banks when there was high water, flooding the land along their usual channels and leaving behind debris that the floodwaters had swept along. Coarser sandy material was deposited close to the riverbanks, while lighter material was deposited further from the river, where the floodwaters calmed down. This resulted in a characteristic pattern of flood plains and wetlands through which the rivers flowed, with sandy embankments on both sides and an extensive hinterland with heavy clay soil. Over the course of time the rivers gradually altered their courses, creating a river landscape that is an interwoven network of flood plains, riverbanks and basins.
People settled along the riverbanks, cultivating plots of land atop the embankments and grazing their livestock on the riverbanks. The basins were still untamed marshy areas until seventy years ago. The rivers, on the other hand, were the most important transport routes for many centuries, and some of the little settlements on the riverbanks developed into important mercantile towns and cities.

Outside these cities this central part of the country was one of the more backward areas. Poverty was a reality for most of the people. Therefore programs were carried out to uplift these areas with education of the people. Hand in hand with these programs land consolidation projects for the entire river landscape were undertaken. Most of the change in the landscape was in the hinterland. They were transformed from just extensively cultivated marshy areas into prosperous modern agricultural land with new farms, new land, new farmyards along a lane, just like in the flevopolders.
Alongside with these large overall land consolidations in the center of the country some smaller consolidations were undertaken along the river Maas in Limburg. In the Maas valley gravel sand and clay was extracted resulting in large pools. A few smaller land consolidations were undertaken in such parts of the valley.

2.3.2 Stream valley consolidations like ‘R006 Mook-Middelaar’



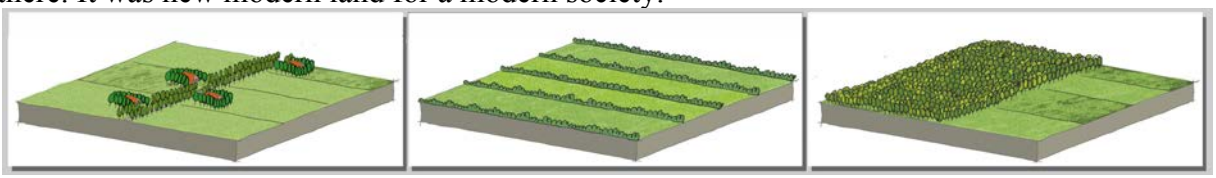
Sense of time
One of these was ‘Mook-Middelaar’ in the North of Limburg in between the Maas and the slopes of the Nijmegen-Kleve ridge. The pool would be transformed into a recreational lake. The rest of the valley along the Maas historically had a an allotment curving with the curves along the river and these bends were traditionally planted with hedges of hawthorns.
In the design this pattern of hedges was strengthened and enriched with some recreational roads along these curves with a composition of hedgerows in the roadsides that give spectacular views on the Nijmegen hills and over the valley of the Maas with the pittoresque silhouette of village Cuijk across the river. The landscape plan makes the lake play a very subordinate role in this ensemble.

Sense of space
The curving spaces in between the hedges and hedgerows highlight the influence of the river in the zone between the Maas and hills. The rows of trees along the curving roads do so too.

Sense of place
Ensembles of trees are situated in the landscape plan at special places in the valley, for instance at the mooring point of the ferry to Cuijk. Most of the trees are oaks, willows and poplars but here a few lime trees were planted. As we saw in projects described earlier in this article the recreational routes also have a concatenation of views to parts of the surrounding landscape.

2.3.3 Overall river landscape consolidations like ‘R087 Maaskant-West’

Sense of time
In the 40’s and 50’s there was a range of land consolidations to uplift the central part of the Netherlands situated in between the rivers Rhine, Waal and Maas. In all of them the subdivision of the landscape in: flood plains, historically inhabited riverbanks with the arable lands and basins, which -up until the land consolidation were marshy and hardly cultivated. It meant a great deal when these basins were cultivated. And it meant even when in later land consolidations also new farms were built in these parts of the landscape. People never lived there. It was new modern land for a modern society.



Sense op space and sense of place
The flood plains were left open in contrast with the riverbanks behind the river dike. There the villages and orchards made the atmosphere: secluded behind the dike but wide and grand when climbing the dike and watching the rivers flow through the flood plains.
Only in later consolidations the roadsides in the basins were planted. Then dozens of new farmyards were built in the middle of this new land, with long straight rows of poplars as a string binding the new farmyards. But only on one roadside otherwise these poplars would give too much shadow on the crops. Every square meter productive land counted.

3. CONCLUSION

The objective of this research was to identify the design elements that determine the characteristics of a narrative design approach in the ‘early 200’ landscape plans for Dutch land consolidation projects from 1944 until 1954.
The study resulted in a deduction of spatial-visual elements that can be considered as building blocks of the post-war landscape designs. The design elements were used to enhance the characteristics of the historical landscape and its scenic qualities. It appears that the generic types of design elements were adjusted to the specifics of different landscapes.

It is recommended to do more research: can this narrative design approach with its arrangement of design elements work as a tool kit for future landscape design - specifically in participate planning?

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The (fragments of) landscape plans presented in this article are part of the Special Collections at the Library of Wageningen University and Research.
Photographs and illustrations are by Hanneke Baltjes, Schokland en water BV, Rhenen

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BIOGRAPHICAL NOTES

Henk van Blerck studied Landscape Architecture at the Agricultural University of Wageningen in The Netherlands. After graduating in 1985 he worked as a self employed landscape architect and curator of exhibitions and manifestations.
In his work the stories and tales that people experience in the landscape and the story and message of designers in their plans for the landscape are crucial. Since april 2016 he is external PhD at Groningen University.

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Practice about Definitions of three boundaries in Chinese spatial planning

Yuntai Zhao and Rosy Liao, China

Key words: Spatial planning, Definitions of three boundaries, Development strategy, China

Summary: This paper reviews the spatial development of, as well as, spatial planning and development of, China's national territory and, based on which, puts forward the development strategy of China's spatial planning in the new period. This paper also, by a combination of the exploration of spatial planning carried out in China's city and county levels, makes an analysis in the practical applications of permanent basic farmland, the red line of ecological protection and the boundary of urban development in the spatial planning, and in the technical methods. Meanwhile, this paper sums up the main consensuses about the spatial planning and puts forward policy suggestions about further development and perfection.

摘要：在回顾中国国土空间开发和空间规划发展的基础上，提出了新时期中国空间规划的发展战略。结合中国市县层面开展的空间规划的探索，分析了永久基本农田、生态保护红线和城市开发边界在空间规划中的实践应用和技术方法，总结了空间规划的主要共识，并对进一步的发展完善提出政策建议。

Practice about Definitions of three boundaries in Chinese spatial planning

Yuntai Zhao and Rosy Liao, China

1. Basics of Spatial Planning

1.1 Spatial Development Features and Problems

China has a vast territory, but with huge regional differences. From the southeast coasts to the west inland, prominent differences in the water and thermal conditions in different spaces are seen. China also owns abundant resources of all kinds in total, but insufficient per capita. Meanwhile, there are diverse ecological types in China, however, due to complex factors, a large area of ecology is fragile. Since the reform and opening-up, China's spatial development has shown a series of prominent features:

1.1.1 Populations are moving towards eastern costs and large cities, but there is a lack of overall planning in spatial development.

Since the reform and opening-up, China has entered into a rapid urbanization development stage, the urbanization ratio increased rapidly to 53.73% in 2013 from 29.04 in 1995, and there have been a prominent trend of the populations being moving to the coastal areas, areas along rivers and areas near the traffic lines and boundary lines. However, there are no changes in the basic features of the spatial distribution of populations fundamentally. Overall, a spatial feature is still maintained that there are dense populations along the southeast side of Hu Line and sparse populations in its northwest[1]. Rapid industrialization and large-scale spatial development brings a huge pressure to China's resource environments. There still are many issues existing in the construction of China's spatial development, planning and coordination, spatial control, and etc..

1.1.2 The development of regional economy is featured with multi polarity while there are prominent imbalanced spatial development issues.

China's economy keeps growing rapidly, with an annual average growth rate of 10%. With the in-depth advancement of overall regional development strategy, the pace of development in central and western regions is accelerated significantly, while the national economy growth pattern tends to be multi-polaritized. Although the relative gaps between regional development are narrowed, the absolute gaps remain enlarging. Moreover, as to public capital investment, basic education, medical and health investment, social security and etc., there are significant differences between urban and rural areas of different provinces and cities.

1.1.3 The development workloads keep increasing, while the spatial utilization efficiency is low.

The rapid economy growth has led to rapid consumption of resources and energy, ecological environment destruction, causing increasing prominent contradictions between economy development and resource guarantee. The high quality cultivated

land area is decreasing year by year while the wetland area is shrinking, having significant negative impacts on the ecological environments.

1.1.4 In some areas, the resource environments are overloaded thus, the spatial development is restricted.

Due to the extensive development mode, in some areas, there are prominent security issues as to water resource. Meanwhile, the main pollutant emissions exceed the environmental capacity. Moreover, in the whole country, the geological, seismic, meteorological and marine disasters occur frequently. Thus disaster prevention and mitigation capacity and emergency response capacity need to be improved.

1.2 Spatial Planning Features and Issues

China's basic national conditions and institutional features decide the diversification of internal composition of the spatial planning system[7]. There are at least 83 kinds of planning prepared by authorization of laws. The spatial planning system has the features in the following three aspects. First, there are many parallel plannings. The subjects of all of the existing kinds of spatial plannings are mainly the governments at all levels or the functional departments. Of which, there are 6 kinds of planning - economic and social development planning, main function zone planning, territorial planning, land use planning, urban and rural planning, environmental protection planning - which play a leading role in China's social and economic development, resource distribution optimization and resource protection, and many other aspects. Second, clear hierarchy. Each kind of spatial planning is basically carried out by the administration departments at the corresponding levels. For example, a five-level planning system has been constructed for the overall land use planning. They are respectively overall land use planning at national level, provincial level, municipal level, county level and township level. Thirdly, a combination of guidance and restriction. In all kinds of planning, for different control indicators, anticipatory guidance measures and restrictive control means are developed respectively.

Being impacted by the value orientation, department interests, professional restrictions, poor communication and many other factors, as to China's spatial planning, unclear planning functions, contradictions in planning contents, waste of planning resources and other phenomenons emerge, affecting the planning efficiency. There are two reasons. First, the spatial control thinking, which needs to be reformed, is restricted to by the customary thoughts of planned economy for a long time[8]. Second, there are insufficient basic researches on the spatial planning systems. The monitoring and early warning of resources and environment carrying capacity needs to be further strengthened as to researches on it for its popularization and application. Third, the administrative systems are not coordinate. The division by all departments of planning restricts the implementation effect of spatial planning[9]. Fourth, the law systems about the spatial planning are to be perfected. And there is a lack of support by special laws[10]. Thus, there is an urgent need to make a definition of the production, living and ecology spatial boundaries centered on the construction of spatial planning systems in accordance with the requirements of greatly advancing the ecological civilization construction by the central government.

2. Strategic Orientation of the Spatial Planning

2.1 We need to adhere to both the governments regulation and market regulations.

Give full play to the role of the government in guidance and control as to the spatial development and utilization, and comprehensively apply planning, policy and law and other means to scientifically guide the population mobility, urban and rural construction and industrial layout, control the development strength, adjust the spatial structure and promote focused development and balanced development. Based on this, we need to actively perfect the market economy system to give play to the basic role of the market in the resource allocation, to a greater degree and in a wider range, to improve the efficiency of resource allocation and spatial development.

2.2 We need to adhere to the national territory development matching with the carrying capacity.

We need to build up an ecological civilization concept to respect the nature, comply with the nature and protect the nature to scientifically develop and utilize the national territory in the premise of not exceeding the resource environment carrying capacity. We need to, according the nature of the resource, ecological conditions and environmental capacity, make clear the limitation and suitability of the spatial development, guide the mobility of the populations and the industries towards the regions with a relative high resource environment carrying capacity, optimize the production, living and ecology spatial structures and promote the coordination between the populations and the resource environments.

2.3 We need to adhere to the coordination between the agglomeration development development and the balanced development.

We also need to focus on the spatial agglomeration development, encourage to let the regions with the conditions develop first, give a maximum play to the agglomeration benefits of all kinds of the factors, and improve the ability to drive the surrounded regions to develop. Moreover, we need to take into account the efficiency and fairness, make overall allocation of public resources, promote the equal exchange of elements and advance the coordinated urban and rural development in all regions. Also, we need to make great efforts to give support to the old revolutionary base areas, minority concentrated areas, border areas, poor areas and resource - exhausted cities, and improve self-development abilities. In addition, construction of public welfare infrastructure and environmental protection infrastructure should be advanced for the priority guarantee for the spatial construction of public education, medical and health, employment service, social security, the aged service and other many livelihood facilities to advance the equalization of the basic public services.

2.4 We need to adhere to the dependent promotion between the development and the protection of the development in a wider range.

We also need to adhere to the development and protection of the development for further development. In the regions with a relative high resource environment carrying capacity, we need to implement centralized layout and stronghold development, and fully improve the utilization efficiency of the limited space for development, to create more space and to be much more stronger for national territory

protection in a greater range and at a higher level. The protection themes should be cleared according to the spatial development features of different areas to implement classified protection.

3. Key Contents of Spatial Planning

Based on the references to the international spatial planning experiences and summaries of China's spatial planning practices at city and county levels, the spatial planning that is being carried out in China is mainly to definite the red line of ecological protection, the red line of permanent basic farmland, and the boundary of urban development to form ecological spaces, agricultural spaces and urban spaces so as to implement spatial guidance and control.

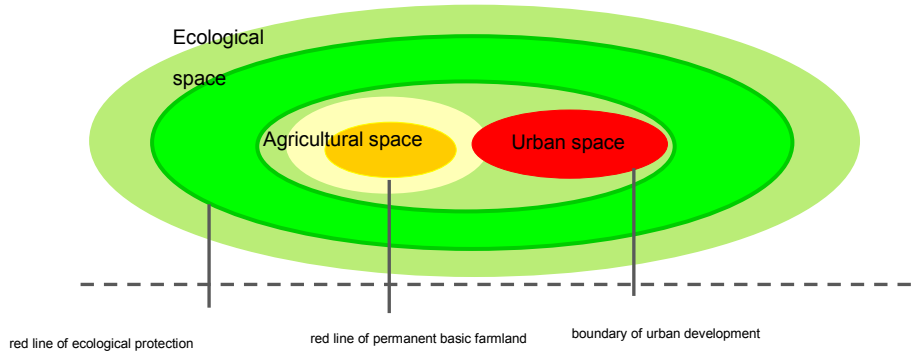

Figure 1 Spatial Planning Figure

3.1 Red Line of Permanent Basic Farmland

3.1.1 Definition method based on the quantity and spatial layout.

In most researchers, based on the grading of the agricultural land, indicators which have impacts on the farm land to a high degree, were selected to predict the grain demand quantity[3], based on the basic farmland's slope, evenness, soil texture, soil fertility, connectivity, irrigation facility and many other natural conditions of the cultivated land[1-2] and by population size, grain demand per capita, multi-cropping index, proportion of sown area of grain crops and other basic parameters, and to predict the available supply quantity of the cultivated land by productivity calculation of agricultural land[4], to conduct supply-demand equilibrium analysis to determine the final basic farmland quantity. Based on this, some scholars introduced landscape fragmentation index and modified K mean spatial clustering method to obtain the spatial layout of the basic farmland[5]. This method lacks a consideration of the spatial location of the plots, often causing the basic farmlands located at the regions with highest potential land use conflict risk and biggest conflicts between land use purposes (such as, suburbs and areas along the transaction lines), thus, resulting in high protection costs of the basic farmlands in some areas but with poor effect achieved[6].

3.1.2 Definition method based on the quality and spatial layout.

This method is mainly used to definite the basic farmlands respectively based on the agricultural land's quality grade, utilization grade and economy grade. Then, an analysis is made on distance from the so defined basic farmland to the cities, residential areas and roads, as well as on the adaptability of the so defined basic

farmland to the adjacent land, so as to select the more suitable cultivated land to be the basic farmlands and thus, determine the spatial layout[8-9]. As to the basic farmlands defined by the natural quality grade and utilization grade of the agricultural land, more rational spatial distribution of the plots is got.

3.1.3 The method based on the spatial technologies.

As to the basic farmlands at county level, information construction and dynamic monitoring is conducted based on the quantity of the basic farmland, the soil quality and the ecological environment quality, and used to the definition of the permanent basic farmland and refined monitoring management[11-12]. With the development and extensive application of "3S" technologies, a big breakthrough and innovation is achieved as to the researches on basic farmland protection both in theory and technical method, which researches on the basic farmlands are conducted via a combination of traditional theory evaluation methods and modern scientific technologies.

3.1.4 Statistical measurement and analysis method.

It is more common to use statistical analysis methods and measurement analysis means to describe the land use status, carry out comprehensive evaluation of the cultivated land quality, build up the evaluation indicator system of selecting the cultivated lands to be the basic farmlands, explore the factors that hinder the definition of the basic farmlands. Of which, the mean, median, mode, variance, skewness, frequency and many other descriptive analyses are usually used to get the property data of the basic farmland for preliminary statistical analysis.

In summary, as to the basic farmland definition, the basic farmland quantity determination is mainly conducted from the perspectives of the agricultural land grade and cultivated land evaluation. As to the theory researches on spatial layout definition methods and practice attempts, a big breakthrough and innovation in theory and technology has been achieved, which gradually spurs the basic farmlands to be protected in both the quantity and the quality simultaneously, not only in the quantity as before. In the actual definition of the basic farmland, it is very hard to achieve the definition by a single method. To achieve a rational and scientific definition, a combination of using two or more methods is needed. Based on the analysis of the property data of the basic farmland via the statistical measurement analysis method, a definition task can be completed by applying computer software via 3S technology. When using the mode method, a definition task of the basic farmlands also can be completed based on the agricultural land's grading principles and by building up an evaluation indicator system via GIS software.

3.2 Boundary of Urban Development

3.2.1 Definition based on the natural geographically limited elements.

There are three kinds of technologies. The first kind is the land use adaptability evaluation technology, which is applied to conduct researches on whether the land is adaptable to the intended use, the adaptability degree and the limitation situations in accordance with the natural, social and economic properties of the land. The second kind is the urban growth resistance analysis technology, which is applied to quantify the indicators and ranges of all kinds of natural and geographical elements on the

basis of the comprehensive evaluation and development analysis of the natural and geographical elements, thus, forming a range to be avoided for the needs for urban development. The third kind is the urban carrying capacity evaluation technology, which is applied for grading the carrying capacity of all plots evaluated, and selecting the regions with a relatively high carrying capacity to be the regions for urban limited development and thus defining the UGB.

3.2.2 Definition based on the relevant protection requirements.

There are three methods. The first method is relevant protection range superposition method, which is applied for comprehensive superposition of the urban landscape protection area, forest protection area, water source protection area, basic farmland protection area and other elements to form UGB. The second method is four-zone definition method, which is applied as per its defined requirements by China's law and regulation system to define UGB. The third method is the ecological safety pattern method, which is used to first determine the urban resource control range during the urban planning process as guided by the ecology thoughts to define the major natural systems on which the urban sustainable development relies, as the land not for construction purpose, thus, define UGB.

3.2.3 Definition based on the spatial development forecast.

There are two methods. The first method is urban spatial expansion modeling method, which is, based on the historical development laws, applied to establish the urban spatial expansion models in all directions, to define UGB ranges in all directions by combining the basic judgments about its future development, to form a UGB within a certain period. The second method is the urban spatial development simulation method, which is applied to develop UGB methods based on the constrained cellular automata (CA model).

3.3 Red Line of Ecological Protection

3.3.1 Definition based on the natural and geographical limited elements.

There are two methods. The first method is the environmental carrying capacity evaluation method, which is applied for grading the carrying capacity of all plots evaluated, and selecting the regions with a relatively low carrying capacity to be the regions limited for development and thus defining the red line of ecological protection. The second method is the natural boundary method, which is applied for getting the boundary points by using Jenk optimization method in the statistics based on GIS[13].

3.3.2 Definition based on relevant protection requirements.

There are two methods. The first method is relevant protection range superposition method, which is applied for comprehensive superposition of the importance of the ecological functions, ecological environment sensitivity, ecological protection diversity and many other elements to form the red line area of the ecological protection. The second method is adaptability of ecological factors evaluation method, which is applied for quantitative calculation of all factors that have an impact on the stability of the regional ecological functions and making an intuitive analysis on the impact degree of all factors, as well as, making an comprehensive assessment of the service functions of the ecological systems by using weighted method.

4 Experiences from Practices

Chinese governments have carried out “multi-planning united” plots work at national level in 28 cities and counties in the whole China. Some provinces also chose typical regions to carry out relevant practical work. For more than two years, multi-planning united work has flourished and consensuses have been reached in many aspects.

4.1 Unified Targets and Indicators

The core indicators of the economic and social development planning include GDP per capita, proportion of productive service industry’s added values in the service industry, R&D cost proportion in GDP, private investment proportion in the fixed asset investment of the whole society, the number of the pension beds for each one thousand aged people, hospitalization reimbursement percentage of urban and rural residents cooperative medical insurance, the average annual new urban jobs, and etc.. The core indicators of urban and rural planning include the urbanization rate, the resident population of in urban areas, the scale of urban construction land, greenbelt proportion in urban construction land, and etc.. The core indicators of ecological environment protection planning include total emissions of chemical oxygen demand, total emissions of carbon dioxide, proportion of four or above waters from the major rivers sections, urban sewage treatment rate. The core indicators of the overall land use planning include: the retaining amount of cultivated land, basic farmland protection area, new construction land scale, the total amount of construction land, urban and rural construction land scale, urban industrial and mining land area per capita, and etc.

4.2 About Unified Spatial Layout

As to the comprehensive spatial planning of national territory at county level, urban space, industrial space, comprehensive transportation, ecological space and other national territory use strategies and targets shall be integrated to construct an spatial pattern of overall national territory use and protection at county level. Under the guidance of the overall national territory use layout framework at county level, such contents as urban system structure, industrial spatial layout, comprehensive transportation layout and ecological spatial layout have been proposed at county level.

4.3 About Unified Zoning Control

As to the comprehensive spatial planning of national territory at county level, the economy, resource and environmental elements at county level shall, as guided by the overall spatial layout of national territory at county level, be combined to propose a preliminary program of definition of the boundary of urban development, the red line of ecological protection, and the red line of permanent basic farmland protection. Based on so proposed program, the administrative jurisdiction areas at county level shall be further defined into spatial use zoning of national territory, such as, central city optimization zone, construction zone for major towns, central towns and general towns construction zones, basic farmland protection zone, general agricultural use land zone, ecological protection zone, ecological coordination zone, ecological tourism zone, and etc. and corresponding use zoning control measures and requirements shall be developed.

4.4 About Unified Short Term and Long Term

At present, the “multi-planning united” pilot planning at city level and county level is ended at 2030 in the long term and at 2020 in the short term. In consideration of the existing overall land use planning, and the thirteenth five-year planning for national economic and social development are ended at 2020, all project arrangement and land use indicators shall be practically carried out till 2020 for an outlook till 2030. Here is an specific example at county level below:

(1)The overall spatial targets of national territory shall include 2020 target and 2030 target, of which, the 2020 target of land use shall be linked to the existing overall land use planning, with no breakthrough in total quantity indicators, and with a focus on the structure adjustment. The 2020 urban construction, resource and energy utilization, ecological environment protection and many other targets shall be respectively linked to the existing urban and rural planning (the planing period end at 2020), and the thirteenth five-year planning for national economic and social development.

(2) The 2030 overall spatial layout of national territory at county level shall be determined as per the 2030 comprehensive strategies and overall targets of national territory spaces at county level. On this basis, a preliminary program of definition of the 2030 “three lines” shall be proposed to form the spatial use zoning of national territory.

(3) Under the guidance of 2030 spatial use zoning of national territory at county level, a comparison of “multi-planning” land use layout (2020 year) differences shall be conducted at township level to further define 2020 “three lines” and 2030 “three lines” to respectively form 2020 and 2030 national territory use control zoning.

(4) Under the guidance of the overall targets, overall spatial layout of national territory, and the national territory use control zoning as determined by the comprehensive spatial planning of national territory, sub-planning programs of land use, urban and rural construction, comprehensive transportation, industrial space, ecological environment and etc. Shall be formed respectively, including 2020 short term planning program and 2030 long term planning program. Of which, the short term land use planning program shall mainly be a program for giving suggestions to adjust and perfect the existing overall land use planning.

5 Discussion and Thinking

5.1 Suggestions on Planning Preparation System Reforms

5.1.1 Rationalizing the planning preparation system framework.

The comprehensive spatial planning of national territory shall be the unified overall spatial planning centered on by other spatial planning types. The two major systems of economic and social development planning and spatial planning shall be conducted in short term in parallel and integrated in long term. In the urban and rural planning system, the contents of the urban system planning can be included into the comprehensive spatial national territory planning. Also the contents of the overall city and township planning can be included into the comprehensive spatial national territory planning. Under the guidance of the comprehensive spatial national territory planning and comprehensive special planning (including ecological environment protection planning), controlled and detailed planning, constructive detailed planning and etc shall be prepared. In the short-term planning field, the thirteenth five-year

planing for national economic and social development shall be used to be a basis for unified preparation of short time national territory use planning, short-term construction planning and short-term industrial (undertaking) special planning and also for rolling preparation of annual implementation plans and all land use plans.

5.1.2 Carrying out the preparation work of pilots of comprehensive spatial planning of national territory.

At the national and provincial levels, the comprehensive spatial planning of national territory integrates with the overall land use planning, main function zone planning and etc. based on the national territory planning. It is necessary to make further innovations as to the existing national territory planning in the planning positioning, core contents, preparation methods, control means, and many other aspects, and to explore the integration with the national and provincial overall land use planning step by step. At the city, county and country levels, the comprehensive spatial planning of national territory integrates with the overall planning at city, county and township levels based on the overall land use planning. Thus, it is necessary to as soon as possible carry out the preparation work of the pilots of the comprehensive spatial planning of national territory at all levels, via which such pilots, the contents of the planning results, the technical standards and specifications, the planning result approval and application shall be further specified, so as to improve the position of the comprehensive spatial planning of national territory and enhance its effect.

5.1.3. Strengthening the planning at country level.

The country is the most grass-root social unit and the most basic spatial unit. It is also an extension and perfection of the planning at the township level. Especially, “The mountains and waters need to be seen to help us to remember the nostalgia” was proposed at the central urbanization work meeting. And nostalgia needs a spatial carrier. However, what is mainly carried out at country level is the rural planning. Moreover, as to the pilots of the land use planning at country level, there are many problems, such as, it is hard to determine the locations for pilots, country construction offer involves occupation of the basic farmlands, rural planning standards are not perfect, country design means are lacked, key hands are lacked for construction and implementation of rural planning, the farmer housing management responsibilities are not clear. Compared with the planning at township level, the rural planning has more conditions for integrating with all kinds of spatial planning, increasing the economic and social development contents and trying to prepare a comprehensive development planning.

5.2 Suggestions on Planning Management System Reforms

5.2.1 Gradually carrying out planning management agency reforms.

During the planning coordination period, it is suggested to set up “planning affair coordination leadership group” and office. The office can be set up under the function department leading the planning coordination work, mainly responsible for the daily planning organization and coordination work. During the spatial planning integration period, the national territory resource department can be integrated with the urban and rural planning department to set up “national territory resource and urban and rural

planning department" or "spatial planning preparation committee" to be responsible for unifying all spatial planning. During the integration period of the spatial planning with the economic and social development planning, "planning preparation committee" can be set up to be responsible for unifying all planning. And separation of planning preparation and management from supervision can be implemented.

5.2.2 Rationally defining the superior and the equal governments' routine powers in the planning.

Take the comprehensive spatial planning of national territory as an example. The statutory contents to be defined to the routine powers of the superior governments include: (1) mandatory requirements of preliminary planning; (2) cross-jurisdiction land use functions, facility configuration and resource environment coordination; (3) the nature of the cities; (4) the planning targets; (5) the urban growth boundary, red line of ecological protection, red line of the permanent basic farmland protection; (6) major regional facility layout, major resource environment element protection, public security maintenance, facility supply standards.

In addition to the statutory contents of the superior governments' routine powers, the equal governments' routine powers shall also include: (1) urban development strategies; (2) urban functions and layout structures; (3) urban construction land use balance among all regions; (4) spatial function zoning of national territory at municipal level; (5) the overall planning contents that must be implemented by the subordinate governments.

The other non statutory contents to be defined to the equal governments include: (1) urban population policies; (2) urban industrial policies and industrial layout policies; (3) urban spatial policies; (4) urban construction land use policies; (5) other relevant policies: housing, transportation, urban supporting facilities, urban environment, development policies for major sections; (6) short term spatial planning of national territory, etc.

5.2.3 Enriching the planning implementation mechanisms and measures.

On one hand, it is necessary to continue to improve the administrative review and approval, planning permission and many other basic administrative management means, specify the "three lines" management requirements and the control requirements of the national territory use control zoning, and set up "multi-planning united" planning management and administrative review and approval processes to form "multi-planning united" coordination mechanisms for co-research, co-preparation and co-management to improve the administrative management efficiency. On the other hand, it is necessary to greatly enhance the economic, social and technical means for planning implementation, and increase the ability for guarantee for planning implementation. As to the economic means, it is essential to increase the government's public spending for planning implementation and to promote the planning implementation via public welfare projects, major engineering, financial transfer, taxation tools and many other measures. As to the social means, it is necessary to enhance the planning publicity and consultation services to create a good social atmosphere to act according to the rules and punish all violation acts to reduce the social cost for planning implementation. As to the technical means, it is essential

to enhance the monitoring on any changes in the use of the national territory resources, compare the planning programs, enhance the rolling assessment of the planning implementation progress and efficiency, and adjust the planning at appropriate time for different situations to ensure the planning to be adaptable to the situations and continue to be effective.

5.3 Suggestions on Planning Law System Reforms

5.3.1 Accelerating the development of the principal planning laws.

It is suggested to, based on the existing Several Opinions of the State Council on Strengthening the Preparation Work of the National Economic and Social Development Planning, Urban and Rural Planning Law, and Land Management Law, accelerate the development of Spatial Planning of National Territory Law to be the unified law in respect of the spatial planning so as to rationalize the relationships among all kinds of spatial planning and guide the unifying and integration of the spatial planning. Meanwhile, it is required to, based on the practices as to the integration of the spatial planning with the economic and social development planning, develop Planning Law appropriately to specify the construction of the national planning system framework.

5.3.2 Organizing modifications of relevant laws and regulations.

It is required to, based on the principal planning laws, organize modifications of the Urban and Rural Planning Law, Land Management Law, and Environmental Protection Law, develop Ecological Environmental Protection Planning Law, Forest Land Protection and Use Planning Law, Water Resource Protection and Use Planning Law, Mineral Resource Protection and Use Planning Law and many other industrial laws, as well as Rules for Public Participation in Planning and many other administrative rules.

5.3.3 Strengthening basic research and technical support.

For doing this, there are four ways. Firstly, to set up “multi-planning united” basic data platform, coordinate system, land use classification standards, data sorting and library building standards and etc. Secondly, to carry out “multi-planning united” planning coordination technology researches, including “three lines” and other spatial boundary coordination, construction land use scale, layout and timing coordination; Thirdly, to set up technical method sharing and exchange system, ecology system technologies, low carbon planning method, participation-style planning method that can be co-used in different kinds of planning and can promote cross connection, resource exchange and sharing among multi disciplines. Fourthly, to strengthen the information platform support, on the “multi-planning united” and “one piece of drawing” basis, construct an unified planning information management cooperative platform to achieve data sharing, exchange, update among national territory, planning, development and reform, environmental protection and other departments to provide guarantees for implementation of “three lines” management and national territory use control zoning and effectively dock with the project review and approval processes to improve the scientific and refined levels of administrative management.

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Land Consolidation in North Rhine-Westphalia
Modern Challenges and European cooperation –
From FARLAND to Tripartite

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Key words: land consolidation, land-use planning, balance of interests, FARLAND, Tripartite Cooperation

SUMMARY:

The EU-FARLAND project compared the strategy and instruments of 7 European countries for facing the challenges to protect nature and environment in densely populated areas with the interaction of modern agricultural and forestal use of land. The collaboration lead to results: several countries revised their approach, laws and procedures in the following years.

NRW did not revise the legal tool box : a wide range of land consolidation procedures - from integrated to very focused targets - are available. A cost-benefit analysis is developed and used as a guideline in the preparation of a specific procedure for large infrastructure.

New tasks emerge in the wake of European initiatives as the European ecological network (Natura 2000) or the Water framework directive. The self-evident modern participatory approach, the evolution of modern farming, diminishing land mobility and rising prices challenge the existing tools. Long-lasting, expensive procedures with a wide range of topics are refused, whereas the acquisition of exchange land needs time. Development plans with planar target areas often miss the urgency of linear plans.

Considering the resemblance of spatial, geographical and socio-economic contexts, the public administrations of land consolidation of the Netherlands, Flanders (Belgium) and North Rhine-Westphalia stayed in contact until now. The Tripartite Cooperation is to be continued even after dissolution of the Dutch DLG in 2015, as the now responsible Dutch provinces and the Wallonian part of Belgium show interest and commitment.

The paper will give a short description of the history and the valid German tool box of land consolidation. It will reflect on the demands, the changes in EU-funding and the organizational situation since 2000. It will tackle the actual challenges and topics and give some answers.

After all, there is a demand and a role for land consolidation carried out by state organizations in the years after 2016. The celebration of 100 years of land consolidation in the Netherlands shows the relevance of land consolidation to steer land use in a way as it is needed and seems a good opportunity to identify future topics of cooperation.

ZUSAMMENFASSUNG

Das EU-Projekt FARLAND verglich Strategien und Instrumente von 7 europäischen Ländern zum Schutz von Umwelt und Natur in dicht besiedelten Räumen. In der Folge modifizierten einige Länder Herangehensweise, Gesetze und Methoden.

Aufgrund des gut ausgestatteten Instrumentenkoffers waren Gesetzesänderungen in NRW nicht angezeigt. Am Beispiel der Unternehmensflurbereinigung wurde eine Wertschöpfungsanalyse konzipiert und gibt Hilfestellung in der Verfahrensvorbereitung.

Aufgrund der Dynamik moderner Landwirtschaft und abnehmender Bodenmobilität bei steigenden Preisen stellen die Europäischen Richtlinien bzgl. NATURA 2000 und Wasserrahmenrichtlinie große Herausforderungen an die vorhandenen Instrumente und die Vorgehensweise. Langwierige, aufwändige Verfahren mit breiter Ausrichtung werden abgelehnt, Bevorratung von Tauschland erfordert einen langen Vorlauf, flächenhafte „weiche Zielkulissen“ entfalten häufig nicht den notwendigen Umsetzungsdruck linienhafter Planungen.

Aufgrund vergleichbarer räumlicher, geographischer und sozio-ökonomischer Verhältnisse bildeten Flandern, die Niederlande und NRW die Tripartite Cooperation. Die Zusammenarbeit soll auch nach Auflösung der niederländischen DLG 2015 fortgesetzt werden, weil die nun zuständigen holländischen Provinzen sowie die wallonische Verwaltung Belgiens entsprechendes Interesse und Engagement bekundet haben.

Der Artikel gibt einen kurzen Überblick über Ausrichtung und Verfahren der Flurbereinigung in NRW, benennt aktuelle Herausforderungen und artikuliert Vorschläge aus Sicht der Verwaltung. Das 100-jährige Jubiläum in den Niederlanden zeigt die Bedeutung der Flurbereinigung als Instrument für eine ausgewogene Landnutzung und gibt einen Rahmen zum Austausch über die künftige Zusammenarbeit.

1. The network

By the EU-INTERREG III C-Project “Future approaches to Land Development” (FARLAND, 200 - 2007) professionals from seven European countries were brought together to stimulate exchange of knowledge and experience and to contribute to the upgrading of instruments for integrated land development. The partnership was oriented as a mix of policy and implementation as well as research and development.

Figure 1: Title of the FARLAND book

Partners came from Germany, the Netherlands, Flanders, Galicia, Portugal, Lithuania and Hungary. Land development in this context was defined as public task for adapting the nature and the location of land use and land ownership for the sake of public as well as of private objectives. To achieve this, a set of legal and informal land related instruments are used. The mainly used instrument was land consolidation for various objectives, with priority for agriculture. As a result of

the cooperation some countries revised their approach, laws and procedures in the following years in order to come to more integrated, decentralized and flexible procedures. In 2007 the FARLAND-project was finished.

Considering the clear resemblance of spatial, geographic and socio-economic preconditions and common challenges in their rural and peri-urban areas, i.e. the implementation of European initiatives as the European ecological network NATURA 2000 or the Water Framework directive, the Netherlands, Flanders and North Rhine-Westphalia decided to keep the network alive and to continue the fruitful cooperation between the organizations responsible for land consolidation.

In 2009 the North Rhine-Westphalian Land Consolidation Authorities, the Dutch Government Service for Land and Water Management (Dienst Landelijk Gebied, DLG) and the Flemish Land Agency (Vlaamse Landmaatschappij, VLM) started the cross-border Tripartite Cooperation on rural development as the common cooperation topic. Because of similar challenges, especially conflicts in land use between private/ agricultural and public interests, and preconditions (density of population, proper land administration systems, property rights or good farming conditions), there are similar questions, how to deal with and react on them, but there are different answers, depending on different legal bases, organizational structures or national policies. The knowledge exchange looks for reasons and identifies possibilities to integrate other point of views in one's own actions and to reflect own standards and procedures.

After dissolution ofDLG in 2015 the responsibility for land consolidation is given to the Dutch Provinces, so that the cooperation has to regroup. Since 2015 the Wallonia (Direction of Rural Development, DAFOR) is interested in being part of the cooperation.

2. Land consolidation in North Rhine-Westphalia

2.1 Organizational structures

Land consolidation in North Rhine-Westphalia is a governmental task. Responsible authorities are the Ministry for Climate Protection, Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MKULNV) as supreme and upper land consolidation authority and five Regional District Governments as the executing land consolidation authorities.

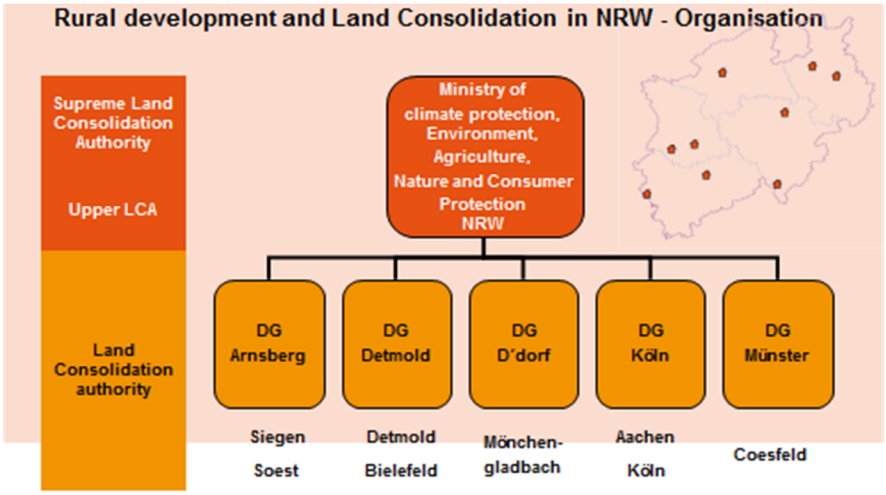

Figure 2: Organization in NRW

2.2 Legal base

Legal base for German land consolidation procedures is the Land Consolidation Act. The legislation was enacted in 1953 and several times revised by the Federal Republic of Germany. 1994 the opportunity to start a land consolidation to solve conflicts in land use between private and public interests has been opened by a change of law. 2006 the responsibility for the legislation was given to the federal states. The federal law remains in effect, until the states enact their own land consolidation acts. Up to now no federal state has an own land consolidation act.

Land consolidation - in the sense of the German Land Consolidation Act (LCA) - is a flexible instrument to cope with the modern tasks of rural development. It is a mean with view to improve the production and working conditions in agriculture and forestry as well as promoting the general use and development of land and rural areas by re-arrangement of agricultural land. Land consolidation is a mix of agrarian special planning and land re-adjustment.

The German land consolidation act offers with five kinds of land consolidation procedures an instrument with a wide range of applications. The different measures are chosen with view to the comprehensiveness especially of the public interests. Beside the land consolidation act North Rhine-Westphalia has a special law, which uses the regulations of the land consolidation act in order to improve common forest management.

As the legislative basis provides a well-assorted tool box it did need a significant revision except for some additions in 1994 to allow the pragmatic changes to be implemented in the last decades. The terms are wide enough to address all kind of objectives that society sets for a healthy and appealing rural landscape. The different measures are chosen with view to the comprehensiveness especially of the public interests.

2.3 Facts about North Rhine-Westphalian land consolidation procedures (LCP)

Kind of procedure	Number of Procedures	Land consolidation area in ha	Number of Participants
§ 1,37 LCA	9	15.632	7.110
§ 86 LCA (Simplified LCP)	115	68.897	16.866
§ 87 LCPCA (LCP in the Case of Permissible Compulsory Acquisition)	49	25.626	9.761
§ 91 LCA (Accelerated LCP)	17	5.367	1.021
§ 103 a LCA (Voluntary Land Exchange	49	754	138
Law for Common Forest Management	*9*	*3.445*	*1.544*
Sums	**248**	**119.721**	**36.440**

Table 1: NRW Land Consolidation Procedures (30.09.2016)

Land consolidation areas cover ca. 3,5% of the North Rhine-Westphalian area.

2.4 Different Measures of North Rhine-Westphalian land consolidation procedures

The so-called Comprehensive Land Consolidation (CLC, on the base of §§ 1,37 LCA) has a far-reaching planning approach and will be implemented for an integrated rural development. In order to improve the production and working conditions in agriculture and forestry land parcels will be reshaped and consolidated with due regard for respective structure of the landscape to serve the interests of the parties concerned as weighted against each other, to further general use and development of land and to benefit the general public health. Ways, roads, water bodies and other common facilities can be provided, soil-conservation, soil-improving and landscaping measures can be taken as well as any other measures improving enterprises, reducing the amount of work and facilitating farm management. Village renewal measures can be taken. The legal situation and relationships will be clarified

The Simplified Land Consolidation (SLC, on the base of § 86 LCA) can be implemented to eliminate or to minimize the detrimental impacts on the agricultural structure caused by public request to land use. Classic examples are planning concerning nature protection and landscape, communal land use planning, water management planning or transport planning. The SLC is not solely carried out in support of public purposes – private benefit must be evident. At least all participants shall be entitled to receive land of equal value.

If, for special reason, it is permissible to acquire agricultural land on a large scale by compulsory purchase, then a Land Consolidation in Case of Permissible Compulsory Acquisition (LCPCA, on the base of §§ 87, 88 LCA) may be carried out to apportion the loss of land among a large number of owners and to avoid the disadvantages the project may bring for the general use of the land. Although the LCPCA strives that each participant receives land of equal value, it is not in every case possible to avoid the expropriation. Classic examples are projects for public transport (construction of highways, federal roads, railway lines) including accompanying environmental compensation for the intrusion into the nature and assault upon the landscape or flood protection measures.

The aforementioned three measures are the most powerful of the LCA, as they can be applied for multi-purpose development aims. Besides that the legal provisions do not determine the measures to be executed with total voluntariness, although the agreement of all participants is strived for.

Voluntary Land Exchange (§103 a LCA) and Accelerated Land Consolidation (§91 LCA) go for fast and favorable re-arrangement of land parcels, as all parties concerned have to agree respectively the physical rural infrastructure does not need improvement. The measures aim at the improvement of agricultural farming conditions and/or may be used to enable necessary measures of the protection of nature and landscape.

The five different measures can be put in an order with view to the administration´s ability to assert the objectives especially of the public interests.

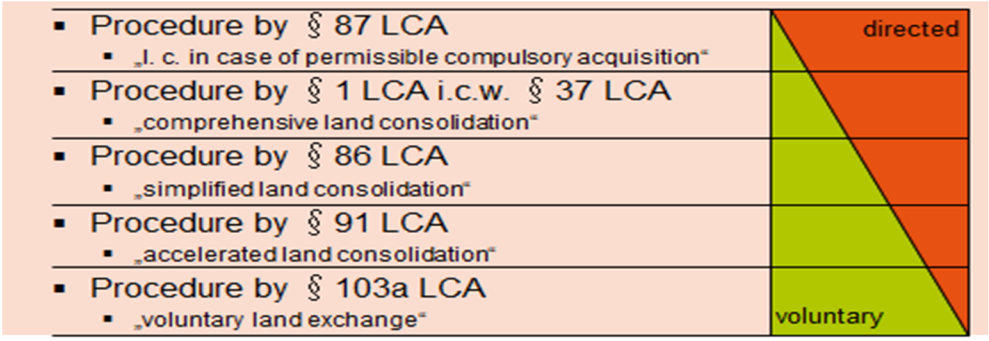

Figure 3: Kind of procedures depending on sovereign action or voluntariness

3. Changing demands on land consolidation

3.1 Land consolidation in adaption to changing agricultural and societal demands 1950 - 2000

The historic procedures after World War II focused on the guarantee of sufficient food and the adaption of farmwork to modern machinery. They provided new ways and roads, waterbodies fitted for drainage water and cultivated fallow land, moor and wetlands. Scattered parcels were allocated to bigger plots. Big efforts were undertaken to build new settlement of refugees from the eastern parts of Germany.

In the 1970/80´s the ecological impact of the induced change of land use became obvious: from now on the procedures were accompanied by a strong and ever expanding harmonization of economic and ecological needs: the standard procedures were accompanied by extensive compensation methods to balance the conflicting interest.

Now agricultural areas became objectives of societal development: infrastructure projects for roads and train lines demanded land on a large scale for projects of public interest. Apportioning the loss of land and avoiding disadvantages in the general use of land became a major task of the land consolidation authorities. In many cases the main task of minimizing land use conflicts could be complemented with improvements towards sound agricultural conditions. In 1994 area wide landscape-planning got obligatory in NRW.

3.2 Land consolidation and the Common Agricultural Policy (CAP) 2000 – 2015

Agricultural politics and funding played always an important role since the founding of the European Union. The turn of the century saw a CAP that intended to strengthen the rural areas via the second pillar, as the regions apparently needed more assistance than the benefits granted to the agricultural companies. New programmatic steps were taken: Measures of village and touristic development were facilitated by land consolidation, even though the financial budgets and the staff resources constrained the quantity thereof.

The large, costly land consolidation procedures were replaced by well-prepared, target-oriented smaller operations. The comprehensive integration of interests was somewhat narrowed to the topics of prime importance. As the land consolidation act was not changed, there was always (and still is today) the possibility and necessity to respond to the actual regional demand: as integrated as necessary, as focussed as possible.

That conforms to one of the FARLAND results, that land development in the future will be an important approach, facilitated by governments to restructure land use (both public and

private) and property and that it will be most effective when done in an integrated way in which different interests of sectors and organizations are balanced during project preparation and procedure.

With increasing public demands on the use of agricultural areas - at least in the range of urban concentrations – mono-dimensional improvements of agrarian structures are a matter of the distant past. Instead land consolidation has been increasingly integrated into the means of implementing conservation programs, projects to improve transport infrastructure and water management. In correspondence the number and area underlying the Comprehensive Land Consolidation has been constantly decreasing. That comes along with a steady incline of the Simplified Land Consolidation. The Land Consolidation in Case of Permissible Compulsory Acquisition and the Accelerated Land Consolidation keep a pretty constant level.

Whereas the statutory rules of German land consolidation offers excellent opportunities to integrate private and (different) public interests, the majority of the procedures focus on only some (2 – 3) public interests. Time-consuming lawsuits can be avoided by means of mutual agreements in the most cases.

In 2005 a tool was developed with external experts of consulting and research to link the costs of organization and implementation of the procedure with its economic impact on private and public goods. The cost-benefit-analysis of the value added was executed on the procedures in case of permissible compulsory acquisition (LCPCA) and led to a positive balance. In the following years it was developed further. It proofed positive results for other kinds of procedures and is used in several federal states as a prediction tool.

3.3 Modern societal demands on land consolidation

The guidelines on the European network of NATURA 2000 (including Important Bird Areas – IBA) and the European Water Framework Directive (WFD) show the directions to counterbalance the ongoing loss of species and biodiversity: allocation of land for nature conservancy and for dynamic and ecological development of riverbeds and their bottom land is an invaluable precondition to change and develop the present land use. The adaption to the approaching climate change asks for solutions even more voluminous, as lateral flood detention basins have to supplement the floodplain retention areas allowing river dynamics.

The challenging requirements clash with an evolving competitive agricultural business competing with the world market. A lot of farmers in highly productive agricultural and horticultural areas of NRW are mostly businessmen, have invested in new machinery, stables, livestock and try to expand their business. This evolution is not likely to stop in our countries due to the advantageous conditions for agriculture and farming concerning climate, water and soil in comparison to other areas of the world.

As the number of farms in NRW decreases about 3% per year, agricultural land decreased 8% in 20 years and currently with about 17 ha per day (NRW 9,3 ha per day). As the land is taken for other purposes as settlement, industry, infrastructure or the specific function of nature, forest or water retention, the political intention to come to a “near zero consumption” of 5 ha per day in NRW in 2020 will be hard to achieve.

The ongoing structural change to lesser and bigger farms can be noticed with a look to the rental rates: the NRW leasehold proportion rose 8% in 15 years and the average is around 60% of the farmland. In some very competitive areas in NRW the relation is already up to

75%. The current situation will not ease in the foreseeable future. The NRW tenants´ laws are weak compared to the regulations in Belgium and the Netherlands.

4 Challenges to NRW land consolidation in the 2020´s

Some of the new challenges can be met with the instruments of land consolidation, if specific limitations will be overcome. While the overall agricultural situation is quite similar in the regions or countries of the Tripartite cooperation, the legal, political and administrative reactions differ to some extent. The exchange of knowledge and ideas with the partner organizations leads to the following considerations - eventually to a modified approach.

- Agricultural land is scarce and will further diminish. Non-farmers try to buy land, even if there is a possibility for active farmers for preemption. The mobility of land slows down to unequalled low rates – especially in the highly productive regions!
  Resigning farmers feel obliged to sell their land not to a public or nature organization, but to keep farmland in farmer´s hands. The "normal" structural change in agriculture is somewhat hindered.
  So far the acquisition of land to be used in a land consolidation procedure in NRW may only begin when the underlying measure will start.

  - *The problem has to be tackled in the public: resigning farmers should be addressed proactively to sell their land. Selling of parcels is no defeat, but helps to manage a sustainable mix of land use.*

  - *The rising prices exceed the project budgets of private and public organisations. Nevertheless, the efforts to land banking should be intensified, as a further increase of prices is expected. The NRW instrument of project-based land banking might be adapted.*

  - *In times of steadily rising prices of agricultural land and increasing lease rates potential sellers will retain their plot until the latest moment. Early acquisition might be possible via an agreement to compensate the following increase of prices during a defined number of years.*

- The fierce competition between well educated, middle-aged farmers leads to rising prices. Few of the farmers support the ecological purpose actively, some fear the predictable loss of (intensly usable) land as a strike on their competitiveness. Public institutions are recognized mostly as competitors, seldom as a persevering partner to reorganize intensive farming to come to a diversified portfolio.

  - *The model of farming as a business to administer a certain use of land for purposes of nature, flood prevention is to be strengthened. Cooperation and the moderation of different interests and organizations are necessary. „Facilitators" will be of importance in the early state of the implementation process.*

- The farmers fear losing their land for measures derived from the overall planning schemes of NATURA 2000, the general road map to implement the Water Framework Directive action plan or the Biodiversity Strategy of NRW. In response to this fear and to increase the acceptance of ecological measures the ministry (MKULNV) decides for a cooperative and consensual way of action with the farmers as land owners and land users. In ministerial agreements with the farmers' associations framework and conditions for

action were laid down. The public authority should seek of prime importance for mutual contracts with the land users.
The agreements however regard land consolidation procedures as an uncommon instrument rarely used in land consuming projects – not easy to understand when looking at the achievements of the preceding years and neither easy to understand when looking on the much more competitive environment and the widely spread distrust of farmers towards politics, bureaucracy and regional activists for nature in some of the agricultural strongholds of NRW.

- *Nowadays the agricultural competition is stronger than in 2000 and the number of farmers has diminished. The agricultural lobby concentrates their power. A promise to come to mutual agreements with everybody (owner and user) in a large project area cannot be given and should be modified: the solution of the underlying land use conflict might come by a simplified land consolidation procedure. Land of equal value is guaranteed for every owner. Long lasting experience shows possibilities to serve not only the owner´s, but also the user´s interests, even if the legal safe-guards to this effect are not strong in Germany.*

- Project areas of European network of NATURA 2000 and WFRD are of big scale: the important bird area of the lower Rhine f.e. covers an area of 26.000 ha, the WFRD deals with 14.000 km of riverbeds and an enormous number of hectars of corridors for natural river development in NRW alone. Concerning NATURA 2000 areas NRW follows the approach to safeguard and develop core areas, whereas the remaining ecological hot spots of floodplains shall be linked by a line of stepping stones.
  This approach of "soft, light green" (or "soft, light blue") diffuse target areas offers different alternatives to achieve the expected results, if the actors and farmers concerned cooperate. If they don´t cooperate, success is endangered.

  - *If the offer on cooperative implementation is refused, appropriate target areas might be covered by well defined "hard, dark green" (or hard, dark blue") planning schemes, that should be executed to show the time-consuming, but effective alternative to fulfil the European obligations.*

  - *After all cooperative efforts are more efficient than specifications by administrative decisions: land consolidation procedures to solve the named land use conflicts might broaden the target and offer possibilities and subsidies to the farmers. The German LCA allows the allocation of the land needed as long as every owner gets land of equal value: anticipatory acquisition of exchange land is of great importance.*

- Regional institutions of water associations are responsible to carry planning into execution as part of their legal obligation to care and develop the water bodies. There are financed by contributions of the members and get support by public funding. Whereas big institutions with professional staff are qualified to deal with the necessary works, small institutions with close linkage to the farmers are confronted with a difficult task.

  - *The small institutions might be assisted by hired professionals or by employees of the public administrative bodies for raising awareness on the regional level of politics and with farmers´ associations, for coordination with other organizations, financing and funding, acquisition of exchange land, planning.*

  - *Funding decisions might pick up competitive elements: institutions willing to come to good and quick results might get a better funding or more assistance.*

- The acquisition of land for market participants other than farmers is difficult due to a preemption right for active farmers if they express to need the land for their business.
  - *A newly revised NRW law on water management offers for the first time a preemption possibility for state authorities on parcels situated at the river banks. Likewise the draft of a new legislation on nature conservation also stipulates the right of preemption in nature protection areas.*
  - *Time will tell whether acquisition of land on the spot leads to good results or whether the range of application should be extended in other areas, because usable exchange land might be purchased in areas unaffected by ecological developments! Land banking on a wider scale would be a logical advancement, even if farmers´ associations oppose the idea.*
- The multifunctionality of agricultural areas in ways of ecology, recreation and balancing the impact of urban areas in general is neglected by some of the farmers. In some areas the owners of agricultural parcels articulate via their leaseholders. The standstill will not reduce the conflicts.
  - *The defensive attitude has to be tackled. Land consolidation may safeguard the rights of the owner and might offer possibilities to satisfy the needs of the users and the society in the same procedure by land management. Good examples of land consolidation to overcome the standstill are to be disseminated.*
  - *The German experience of land consolidation shows the benefit of an increasing tendency towards consensus in the planning and decision-making. At least the outcome of a realization measure is partly predetermined by integrating the parties concerned in the decision-making. Therefore land consolidation should strive for the agreement of the participants to the greatest possible extent even when not stipulated by law. As no guarantee might (and should) be given in the beginning of the procedure, an extensive preparation and communication is necessary to build up the confidence needed.*
  - *Specific attention is to be given to the active farmers´ needs, as their rights in Germany rely predominantly on the particular lease contracts with the owners, not on specific legal provisions. In the consequence there might be relevant contractual differences that might provoke opposition. An early survey of the actual leasehold situation and map exercises with farmers before start of the consolidation procedure should build up the confidence of the farmers, uncover unrecognized obstacles and show possibilities to solve conventional as well as current problems of land use.*
- After all, modern farmers, water associations, nature conservancy organizations and public administrations in general face similar problems, as they are obliged to follow a lot of rules and regulations with decreasing money and time.
  - *They need fast, low-cost and effective measures to improve their situation. The NRW land consolidation administration strives to be a reliable partner, keep contacts and facilitate changes in land use as occasion demands.*

5 Prospects of future cooperation

The celebration of 100 years of land consolidation in the Netherlands shows in retrospect the relevance of land consolidation to steer land use in a way as it was (and is) needed at the time.

Conflicting interests on land use persist and even intensify in consideration of the climate-change, loss of biodiversity and growing population altogether. Thus NRW politics see a demand and a role for land consolidation carried out by state organizations in the years after 2015.

The administration of land consolidation in NRW will continue the business. It will keep well-proven instruments and modify them only when and to the extent it is appropriate. New problems ask for new solutions – the exchange of knowledge, experience and good ideas in a network of international partners may work as passing lane. After the dissolution of the Dutch Dienst Landelijk Gebied (DLG) NRW looks forward to welcome the Dutch provinces in the cooperation and let the Wallonian colleagues (DAFOR) take their role.

NRW will memorize the bicentennial anniversary of its land consolidation administration in 2020 – this should be a good opportunity to reflect on the progress to fulfill European obligations.

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Land readjustment suitable solution for retail vacancy?

Sanne HOLTSLAG-BROEKHOF, The Netherlands

Key words: land readjustment, retail vacancy, Apeldoorn, the Netherlands

Cadastre

SUMMARY

The role and function of urban retail areas is changing due to the increasing market share of internet shopping. As a result, the number of vacant shops in the Netherlands has been growing in the last years. Municipalities search within a broad range of possible activities for effective strategies to reduce their vacancy rate. One of the strategies that is considered by various municipalities to reduce vacancy rates is land readjustment. The aim of this paper is to evaluate under what conditions land readjustment can help to sustainably (re)develop inner-urban shopping areas that cope with high rates of vacancy. This is achieved by evaluating one retail area that copes with high rates of shopping vacancy (Apeldoorn). The municipalities aim is to revitalize the shopping and center area, including a reduction of the vacancy rate. In this context, the use of land readjustment is explored. The Netherlands' Cadastre, Land registry and Mapping agency facilitates and advises both municipalities on how to use the instrument of land readjustment. In the Netherlands, land readjustment is currently used in a broad variety of spatial planning tasks, including retail vacancy. Within this broad variety of tasks, retail vacancy is one of the most complex and challenging tasks. This paper describes the planning tasks of Apeldoorn, and discusses under what conditions land readjustment can offer a solution for the tasks in this area. Lessons for the effectiveness of land readjustment in the situation of retail vacancy are drawn from the practical experience in this case, compared to practices with land readjustment and land consolidation in other Dutch cases.

Land readjustment suitable solution for retail vacancy?

Sanne HOLTSLAG-BROEKHOF, The Netherlands

1. INTRODUCTION

The role and function of urban retail areas is changing due to a variety of factors including the increasing market share of internet shopping, reduced consumption behavior economic due to economic downfall, and long-term changes in urban policies and demographic composition that shops have not been able to keep up with (Carlyle, 2012). The number of vacant shops in the Netherlands has been growing in the last years from 6% in 2004 to more than 10% today[1]. Vacancy is often associated with a number of negative aspects such as neglect, inefficient use of space, unattractiveness of the area and decrease of property values (Popova, 2015). Consequently, municipalities search within a broad range of possible activities for effective strategies to reduce their vacancy rate and to increase the viability of their city centers. these strategies include renewed street lighting, renewing public spaces, or rezoning buildings from retail towards an alternative land use (often residential use). Another strategy that is considered and explored by various municipalities to deal with complex ownership structures is the use of land readjustment. According to the Netherlands' Cadastre, Land registry and Mapping Agency, land readjustment can enable area development by bringing owners who are willing to develop, into position for development . Land readjustment is the urban counterpart of land consolidation, which has been used for hundred years (since 1916) to improve the agrarian parcel structure, and to realize planning tasks in the Dutch rural area. In the latest years, the effective use of land consolidation and number of planning tasks in urban areas led to exploring the possibilities to use land readjustment. The number and variety of cases in which the use of land readjustment is considered, is growing and includes a substantial number of cases that deal with retail vacancy. The first experiences in these cases however learn, that especially the case of retail vacancy often appears promising in the beginning, but turns out very challenging in practice. This is not surprising, as the reduction of retail vacancy in general is a very complex and challenging task (Popova, 2015). Therefore, the aim of this paper is to evaluate under what conditions land readjustment can help to sustainably (re)develop inner-urban shopping areas that copes with high rates of vacancy. This is achieved by evaluating a retail area (Apeldoorn) that copes with high rates of shopping vacancy. The municipalities aim is to revitalize the shopping and center area, including a reduction of the vacancy rate. In this context, the use of land readjustment is explored. The Netherlands' Cadastre, Land registry and Mapping agency facilitates and advises both municipalities on how to use land readjustment. This paper describes the planning tasks of Apeldoorn, and discusses under what conditions land readjustment can offer a solution for the tasks in this area. Lessons for conditions under which land readjustment in the situation of retail vacancy can be used effectively are drawn from the practical experiences in Apeldoorn. In the analysis, knowledge of and experience with land consolidation is used to analyze the central tasks and challenges of Apeldoorn. This leads to a list of conditions that are expected to be preconditioned to effective land readjustment to reduce retail vacancy.

[1] Source: http://nos.nl/artikel/2136070-winkelleegstand-aangepakt-hoe-leeg-staat-jouw-gemeente.html

2. DUTCH CONTEXT, TOWARDS AN INSTRUMENT FOR LAND READJUSTMENT

Dutch municipalities have five instruments to actively conduct land policy: voluntary land purchase, expropriation, pre-emption rights, public cost recovery and land consolidation. Using these instruments, municipalities have been capable to steer land use developments in both rural and urban areas into the desired directions in the past century (Needham, 1997; Van der Krabben and Jacobs, 2013). Despite the available land policy instruments, the necessity for a new act that enables land readjustment in an urban context has been discussed several times in the past decades. Since the economic crisis of 2008, the debate on an act on land readjustment has again been put into new life and has been explored in several research reports (Van den Hazel et al., 2007; Bregman and De Wolff, 2011). In 2015, the political decision has been made to implement a new act for land re-adjustment in 2018. It is assumed that land readjustment leads to more democracy trough the involvement of local landowners in the process (Yau, 2012). Land readjustment has been described as a successful method to initiate urban development with several advantages compared to other land policy instruments. First, land readjustment facilitates increased community involvement (Muñoz-Gielen, 2012; Needham and Krabben; Turk and Korthals Altes, 2010; Van der Krabben and Needham, 2009) and enables a facilitative role of public parties (Van der Putten et. al, 2004). Second, land readjustment helps to share risks amongst all parties, rather than leaving the risk to the government alone (Van der Putten et. al, 2004; Bregman and De Wolff, 2011). Third, land readjustment enables development in areas with fragmented property structures (Van der Putten et. al., 2004).

Traditionally, Dutch planning urban planning developments have been implemented by acquiring all property by a public party (often the municipality), or a cooperation between public and private parties, that service and develop the acquired land into buildable plots. This approach is known as active land policy (Needham, 1997; Buitelaar, 2010). The acquirement of all land brings all land in the area in hands of owner, which enables the smooth readjustment of the parcels (De Wolf and Bregman, 2012). Active land policy was used by Dutch public parties to maintain control on spatial developments and ensure the quality of the physical environment. Moreover, it was used for its financial profits (Buitelaar, 2010). For example in 2005, twelve percent of the municipal income resulted from value capturing in land development revenues (Korthals Altes, 2008).

The debate on land readjustment started after the Second World War, after land readjustment had been used to renew urban areas that were destroyed or damaged during the Second World War (Van Schilfgaarde, 1987; Van der Krabben, 2011). In the seventies, the debate on land readjustment regained attention and the usefulness of land readjustment was studied by action-planning in a shopping street in Groningen[2] (Botman, 1984). The land readjustment process in Groningen was challenging and complex, and did not lead to the recommendation to implement an act for land readjustment. In 2001, the instrument was again proposed in a national report on land policy (Groot Nibbelink, 2001). However, the research that was conducted as a result of this proposal did again not lead to a new act for land readjustment (Van der Stoep et al., 2013).

[2] Groningen is a city in the north of the Netherlands. The land readjustment experiment was executed in the Folkingestraat.

Since the economic crisis in 2008, decreasing financial means for urban renewal, a political desire to take a more facilitative role in urban developments, and the increasing number of planning tasks in urban areas all add to the current demand for new legislation on land readjustment (Holtslag-Broekhof, 2016). On February 17th, the Dutch minister Schultz-van Haegen-Maas Geesteranus declared to implement a new act for land readjustment in 2018. The design of the act is currently being executed by a small group of officials at the National Ministry of Infrastructure and Environment. In 2015, the Ministry organised three sessions for expert consultation in which the outline and features of the new act were debated. The results of these consultations were taken into account during the further development of the new act.

During land readjustment the original landowners form the basis of the renewal process. Several countries have their own conception of a legal instrument for land readjustment (Larsson, 1997; Muñoz-Gielen, 2012; Turk and Korthals Altes, 2010). Common characteristics of these legislations are the share of costs and benefits amongst all landowners and the absence of acquisition costs (Turk and Korthals Altes, 2010). Generally, the land readjustment exists of the transfer of all ownership rights to one party (this can for example be the municipality or an association of owners), the redistribution of the parcels and ownership rights, and the return of equivalent new rights to the original landowners (Turk and Korthals Altes, 2010).

3. TOWARDS A VITAL CENTRE OF APELDOORN

3.1 Description of the planning task

The municipality of Apeldoorn has almost 160.000 inhabitants and consists of the city of Apeldoorn (ca. 140.000 inhabitants) and 9 small villages. The city of Apeldoorn can be categorized as a medium-sized Dutch city. In Apeldoorn, just as in many Dutch municipalities retail vacancy has been increased since the economic crisis of 2008. The municipality of Apeldoorn had ambitious plans and wanted to revitalize their city center. In 2009, the municipality published a structure vision on the redevelopment of the city center. In this vision three strategic ambitions are mentioned: 1) a compact and complete city center, 2) city center is well accessible, 3) a characteristic and green-blue center. In order to achieve these ambitions, the municipality wants to develop, amongst others, a maximum of 15.000 m2 retail, two parking-lots, an indicative program of 7500-10.000 m2 extra leisure and cafés, and 250-400 houses (Gemeente Apeldoorn, 2009). Throughout the years, these ambitious plans of the municipality have been tempered. The municipality now aims for the redevelopment of three large redevelopment areas that cope with vacancy and decay (figure 1) .

3.2 Description of the property and retail structure

The municipality of Apeldoorn decided to take an active role in the urban renewal plans for the city center. Pre-emption rights were used to buy 7000 m2 of real estate in the shopping center of Apeldoorn. Therewith, the municipality generated a strategic position on the local land market (figure 2). Insight on the risk of such an active position have however changed in the past decade, due to huge financial losses on land in the economic crisis.
In 2015, due to a different vision on the municipalities role and financial problems, the municipality decided to start selling their earlier bought real estate under the condition that the new owner would invest in the regeneration of the building. Public spaces (such as roads and parks) are not sold.

The city center of Apeldoorn is visited by 234.000 people per week. At prime time, every hour 7400 people pass the main shopping street. However, the municipality deals with structural vacancy. Currently, 12% of the retail surface in Apeldoorn is vacant[3]. Therewith, the municipality ranks slightly under the average rate of 10%.

3.2.1 KPN location

The first redevelopment location is owned by KPN; a large telecom company in the Netherlands. The building of KPN is currently underused and this is expected to increase in the comping years. KPN stated that it wants to sell the building around 2022. In 2010, the possible destruction of the building in order to realize one of the two new parking-lots, led to political unrest in the city council. In 2012, the coming of a new regional supermarket in Apeldoorn (Landmarkt), just outside the city center, led to critics and was said to be a missed chance. Criticists stated that if Landmarkt could have been located in the KPN building, it would have added to the municipal ambition to create a compact city and attract new consumers to the city center.

3.2.2 V&D location

The V&D was a large franchise retailer in the Netherlands. In 2015, the company went bankrupt and the building of V&D became vacant. The owner of the V&D building is a regional real estate business (Elizen Vastgoed Groep). Elizen also owns the empty V&D building in neighboring city Deventer. Currently the location is rented to temporal tenants.

3.2.3 CBB location

The CBB location is owned by three locale real estate developers, amongst which CBB (Elizen Vastgoed and Frank Van Berlo). The location is therefore also known as ‘Van-Berlo location’. The site is a brownfield that is currently in use as parking plot. The owners already wanted to start the development of this location in 2011, but they dealt with a retailer that was unwilling to leave the building that they were planning to demolish.

3.3 Towards a vital center?

The property structure of the three development sites is clearly interrelated. Moreover, for the new plans, not only the property owners, but also the tenants, seem to have a vital role. The municipality is wrestling with their role in this 'play’ between the parties. This is not surprising, given the complexity of the task with each it’s political, financial and esthetical aspects, combined with the diverse interests and power positions that all players have.

[3] Source: http://nos.nl/artikel/2136070-winkelleegstand-aangepakt-hoe-leeg-staat-jouw-gemeente.html

Figure 1. Areas that the municipality wants to redevelop

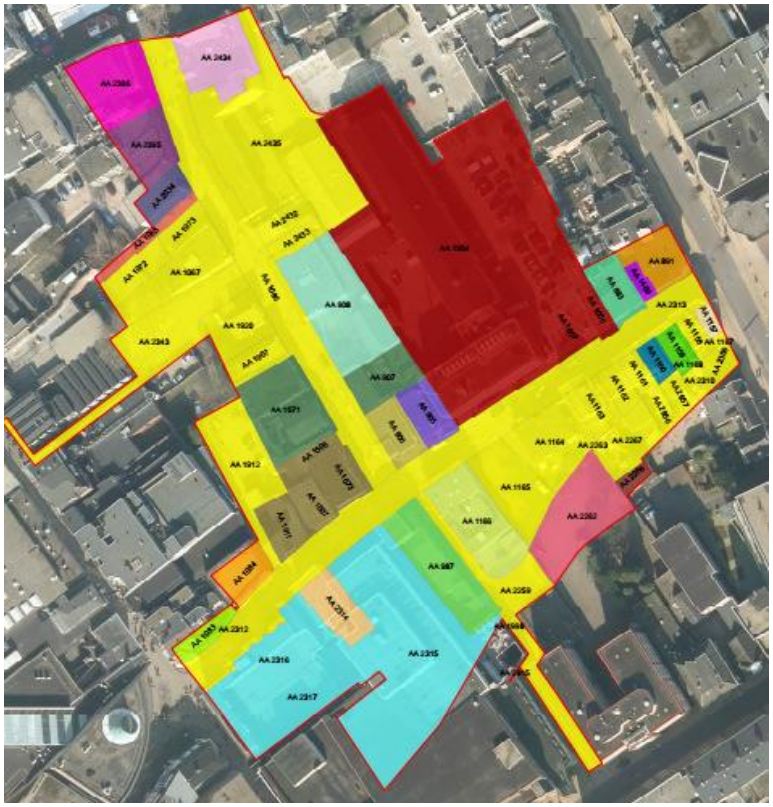
Figure 2. Most important owners in center Apeldoorn. Yellow is municipality

4. EFFECTIVENESS OF LAND READJUSTMENT FOR RETAIL VACANCY

4.1 Defining Effectiveness

Land readjustment has been named a 'sleeping beauty' as it is potentially a very interesting instrument, but rarely used in practise (Alterman, 2012, p.9). The rare use of land readjustment is certainly not evident in all countries, as it has been extensively used in for example Germany and Spain (Muñoz-Gielen, 2016). Muñoz-Gielen defines land readjustment as effective 'when it provides serviced building plots with proper public infrastructure within a reasonable period of time with no or almost no need of public subsidization' (Muñoz-Gielen, 2016, p. 78). In other words, effectiveness is related to the speed of the process, the extent of need for public subsidisation and the outcome of the process. Hartmann and Spit (2015) define effectiveness as the extent to which the outcome of the planning process relates to the planning goals. For our analysis this definition will be difficult to use, as currently only one of the cases has led to a finished planning process. Munoz-Gielen (2016) distinguishes four aspects of effectiveness based on his own experience with land readjustment: 1) organisational bodies that are allowed to initiate land readjustment, 2) the difference between a voluntary or compulsory regulation 3) the extent to which the land owners contribute to the total costs of land readjustment 4) 'open, transparent and accountable public decision making'. These four aspects are used as guiding principles of effective land readjustment in this article.

4.2 Reflecting upon Case Apeldoorn

The aspects of effective land readjustment that are distinguished by Munoz-Gielen (2016) help to reflect upon the possible use of land readjustment in the case of Apeldoorn.

The first aspect that Munoz-Gielen distinguished is the ability of the municipality to initiate land readjustment. In the Netherlands, municipalities have the ability to initiate planning processes and have the power to adapt land use plans. Moreover, they have the ability develop subsidies, and to facilitate planning processes that are initiated by local inhabitants or stakeholders themselves. More central in the Netherlands may be the question of willingness to involve local property owners in a redevelopment process and to leave traditional methods for the exploration of a new method that is essentially different from the methods municipalities are used to. Apeldoorn, seems still on two thoughts concerning this point. Just as many other Dutch municipalities they state to be very willing to use new ('facilitative') methods, but in practice the traditional starting points seem to be still at stake within these new methods.

The second aspect that is mentioned by Munoz-Gielen is the difference between a voluntary or compulsory regulation. He states that a compulsory regulation is more effective, due to difficulties to deal with unwilling property owners. Sagalyn (2007, p 176) makes a comparable statement: 'No scheme that upsets the status quo in property relations is going to be immune to resistance from unwilling property owners. Apart from those who object to redevelopment for ideological reasons, opposing property interests might include owners who overpaid during market swells, owners with building densities greater than what current zoning would allow, owners with land uses that might not be permitted in a redevelopment program, owners of environmentally contaminated sites, and others with preferences for the status quo. Eminent domain challenges might also be brought by unwilling sellers because the end use does not necessarily provide a quantifiable or visible public good, especially if no significant public use is created as a result of the readjustment and redevelopment.'

In the Netherlands, currently municipalities do not have a legal instrument that allows them to use compulsory land readjustment. This means that unwilling property owners need to be dealt with during voluntary negotiations, or – if this would not work – the municipality could use the instrument of compulsory purchase to buy the property from these unwilling owners. The case of Apeldoorn shows however that the reality is often not black or white. Property owners are not willing or unwilling, but have their own interest and plans, that often partly conforms to the municipalities plans, and partly differs from it. The three property owners in Apeldoorn are not unwilling to cooperate, but do have a strong position in the negotiations with the municipality. Some bring jobs to the area, own a substantial number of other property and they often have powerful relations with strategic people. The option of compulsory purchase is for this (and several other) reasons not at stake, which makes them powerful players in their negotiations with the municipality. The municipality moreover depends on the owners' willingness and ability to start developing in important locations within the city.
The third aspect is the extent to which the land owners contribute to the total costs of land readjustment. This is related to their willingness to invest in the improvements for the area as a whole. Once owners pay a larger part of the general costs, they are literally more involved in the project and will be less likely to drop out at a later stage. This can increase the effectiveness of the land readjustment instrument. In Apeldoorn, the owners have not been asked to pay general costs of any planning process to the municipality.
The fourth aspect comprises the transparency of public decision making. The more open this is, the better private owners can understand and follow the process and the more they will feel as a part of the process itself. Although Apeldoorn used many informative documentation towards citizens and property owners on their vision and ideas for the area, transparency on the actual decision making seems to lack. All information that is publicly available reflects the outcome of decisions, rather than an explanation of the deliberation that was made to come to this decision.

4.3 Conditions for effective use of land readjustment for retail vacancy

The studied case cannot provide a definitive answer on its own upon the question if land readjustment can decrease retail vacancy in city centers. The case does however provide several conditions that seem to be viable for the effective use of land readjustment to deal with retail vacancy. Based on the reflection upon this case, the conditions of Munoz-Gielen were translated and four key conditions are distinguished.
The first aspect is the public vision on retail vacancy. More specifically, the question whether retail vacancy is seen as a problem of solely (or primarily) the retail owners, as mainly a societal problem, or as a intertwined combination of both in which not one or the other is more important. Only the last vision seems to be viable to enable an effective land readjustment. After all, only with a vision of a common task, the municipality will be willing to initiate a land readjustment in which all parties are involved and treated as equal parties.
The second aspect is a complete and correct insight in the current situation of the area that is available for all parties in the area. If the insight in the local parties, characteristics, strengths, and weaknesses of the area is lacking it is impossible to be transparent on decisions, to involve all parties and to have a process in which all parties have the same information position.
The third aspect that is important is a legal framework that is in order to facilitate land readjustment. Currently, there is no legislation in the Netherlands to enable compulsory land readjustment. Legislation that enables this, would improve the municipalities power positions

towards the private property owners in the area and make room for real negotiations between the parties.
The fourth condition that is essential for an effective land readjustment process is a sense of urgency amongst at least the majority of the involved property owners in the area. If they are not willing to invest time and money in the improvement of the area in which they are located it is useless to approach the task as a common assignment and the municipality may just as well use traditional methods to develop the area.

4.4 Concluding remarks

This paper evaluated the conditions under which land readjustment can help to sustainably (re)develop inner-urban shopping areas that cope with high rates of vacancy. This was done by reflecting upon the case of retail vacancy in the medium-sized Dutch city of Apeldoorn. Four conditions for the effective application of land readjustment in city centers were described. These conditions can be seen as preconditions; without these conditions aiming for an effective land readjustment process seems to be useless Apart for these aspects, there are other preconditions for the successful use of land readjustment, such as sufficient finances. These conditions were not taken into account as this paper aims specifically to those conditions that contribute to *effective* land readjustment.

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BIOGRAPHICAL NOTES

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Land Readjustment as a tool for Urban Development in Greece: the implementation gap between Laws, Policies and Practice.

Evangelia BALLA, Greece

Keywords: Land Readjustment, Urban Development, Land Policy, Spatial Planning, Greece

SUMMARY

Land Readjustment (LR), as a tool for urban development, was implemented initially in Greece, at the beginning of the 20th century, indicating thus a rapid response of the planning community to the quest for a more efficient land acquisition tool, quite at the same period as in other European countries. A few years later, specific legal provisions for the use of LR to the implementation of town plans (Ktimatikes Omades) were incorporated in the Law Decree of July 17, 1923. However, the implementation of LR was very limited compared to other traditional tools, such as expropriation, and was restricted to a few cases, mainly when there was an urgent need for the implementation of town plans after extensive disasters i.e. bombings, fires and earthquakes.

A new form of Land Readjustment, apparently influenced from the relevant French institution of "Remembrement Urbaine" and the German "Baulandumlegung", was legislated in the late '70s, in the context of the Planning Reform that took place following the Greek Constitution in 1975 (Article 24). However, its application has been once again limited to a few cases. In view of the above, a fundamental research question apparently arises: which are the predominant factors that determined the limited implementation of Land Readjustment in Greece? How LR is related to other innovative ideas, tools and practices which have been transposed in the domestic planning system fundamentally influenced by foreign experience?

The paper aspires to present into the international fora the Greek experience in Land Readjustment, providing an analytical overview of its basic characteristics (legal framework, related policies and applications). It seeks further to shed light into the implementation gap between laws, policies and practice of LR, to discuss how the application of LR is related to the basic features of the land administration and spatial planning system in Greece and to investigate its prospects, with regard to the current challenges of Spatial and Land policies in the country.

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Introduction

One of the main problems that usually arise in the urban development process stems from the existing plot boundaries which are considered as a serious impediment to the optimum urban planning of an area. In addition, the cost for the equipment of the area with the basic urban infrastructure and public facilities is one of the key issues that often public and local authorities have to overcome during the urban or redevelopment process. Land Readjustment (LR) is an urban development technique which addresses sufficiently the aforementioned issues, compared to other conventional land policy mechanisms such as the land acquisition by agreement, compulsory purchase, eminent domain, land banking etc. Among its benefits are the fair distribution of the capital gains from the development process and the maintaining of the existing social structure in the development area, since proprietors are not forced to separate from their land. In the readjustment process, the parcels of land are notionally assembled in one plot, where joint owners have a share according to the acreage of the property owned by each or according to the value of the land owned before the procedure began (FIG, 2009). Following, the boundaries of the irregular and fragmented initial land plots are rearranged into regular building plots, according to the provisions of a Detailed Local Plan (Town Plan or Statutory Plan) and are redistributed back to the initial proprietors. A percentage of each landowner's property is given as land for public facilities *(e.g. roads, parks, schools or other community uses)* while the infrastructure's costs are covered either by the sale of land or by monetary contributions from the proprietors.

Land Readjustment draws its origin from the land consolidation in rural areas, though its first implementation in urban areas is referred in Frankfurt in 1902 with Lex Adickes (Dieterich, 1985). In several countries (e.g. Germany, Japan, and Southeast Asian countries) Land Readjustment has been extensively used for the reconstruction of cities after the Second World War and during the period of rapid urbanization in the '60s and '70s, while in some of these countries it is still used successfully for urban renewal, as an alternative option to the eminent domain. The topic of Land Readjustment has been investigated efficiently in the international literature (Doebele, 1982, Hong, Needam, 2007, Larsson, 1993, Minerbi, 1986). However, the current paper aspires to enrich the relevant literature with the Greek experience on Land Readjustment, providing an analytical overview of the corresponding legal framework, the related policies and its respective application.

1. The context: Land and Spatial Planning Policies in Greece

Greek Land Policy has undergone significant changes throughout the country's history; however, one of its important features, which goes back to the formation of the contemporary Greek State, is argued to be the systematic promotion of measures which favored the land fragmentation and the small proprietorship (Vergopoulos, 1975, Mantouvalou et.al., 1994). On the other hand, urban planning and its associated legislation has been viewed as a means for the modernization and Europeanization of the country, strongly influenced by western urban doctrines, though without necessarily being compatible with the domestic

socioeconomic conditions, whereas their most innovative elements have been impeded by multiple interests around small landownership (Mantouvalou 1988, Prevelakis, 2016). In addition, it is argued that the land policy mechanisms to support the implementation of town planning are inefficient, due to inadequacies pertaining to the philosophy and conception of the domestic Land Policy, to the absence of specific mechanisms and to technical deficiencies of the existing mechanisms and institutional framework (Economou, 1999).

In particular, the importance of the creation of *"a people of proprietors"* as a prerequisite for the constitution of the Modern Greek State was supported by the first governor of Greece Ioannis Kapodistrias, after the War of Independence, in 1828[1]. The formation of land ownership was considered as the *"only healthy basis of the national economic policy which could contribute to the creation of a population of happy people by allowing them to exchange the status of the tenant-farmer with the dignified title of the proprietor"*[2]. Indeed, in 1830 the Greek State was the main landholder in the territory possessing approximately 35-50% of the croplands of the new established Hellenic Kingdom. (Patronis, 2010). From 1834 until 1938, a total of 1.374.971 ha were distributed to Greek peasants (Sakellaropoulos, 1991), initially as a reward for their participation in the War of Independence. Later, the distribution of land by the Greek State was used as a means to boost the farming sector with the agrarian reform that took place in 1917 and to cover the urgent housing needs arisen by the rehabilitation of 1.5 million refugees who had evacuated the Minor Asia after the catastrophe of the Greek-Turkish War in 1922. The land tenure conditions of the agrarian land were inevitably conveyed to urban land during the urbanization wave in Greece at the beginning of the 20th century and the consequent gradual expansion of the cities. In addition, a secondary land market and mode of housing production made its appearance to satisfy the newly-emerged housing needs of the rapidly urbanized population based on "semi-squatting[3]" of the urban fringe and on illegal development. However, formal planning policies not only tolerated the illegal subdivision of land and semi-squatting, but, at almost regular intervals, entire areas of unauthorized settlements were incorporated in the Town Plan (the so-called 'extensions of Town Plans'), which resulted in property values increasing manifold. Illegal development covered a considerable part of the housing needs of people who were near the poverty threshold, substituting for a social policy for housing. Lack of adequate social policy also in the domains of education, health and welfare led popular strata to acquire more than one urban piece of property, as a hedge for the future (Mantouvalou et al., 1994).

In the same period Greek planning policy was dominated by issues of physical planning focusing mainly on the interface between private ownership and public space and landowners' development rights as well (Giannakourou, 2011, EC,2000). The main legislative framework was the Law Decree of July, 17 1923 for the planning of cities, towns and communes which introduced the fundamental distinction of public and private lands into areas either 'within-the plan[4]' (*entos sxediou*) or 'out of plan' (*ektos sxediou*) areas. However, whereas the Statutory

[1] *"The Greek people, who today are a mass of landless (Prolétaires), should be "upgraded" to a people of proprietors. And when that objective would be achieved, then the constitutional organization of Greece would be not only possible, but easy as well"*, "Treatise on the situation of Greece", addressed by Ioannis Kapodistrias in November 1830 to Michael Soutsos, diplomatic representative of Greece abroad.

[2] Minister responsible for the Economic Affairs (Government Gazette 20, 16th December 1835, Appendix), History of the Greek Nation, Volume IC, pg.59

[3] Land was acquired and held legally but was illegally used for residential purposes, hence "semi-squatted".

[4] The plan in this context, is the official town plan or detailed local plan ('schedio poleos', scale 1:500 or 1:1000) which determines the street alignments (rymotomikes grammes), building lines (oikodomikes grammes), land use designations and is accompanied by a statement of building conditions (oroi domisis). These conditions

Plan was the planning instrument for the determination of land uses in "within the plan' areas from 1923 to 1983, there wasn't any appropriate planning tool for the development control and the designation of land uses in the *'out of plan'* areas.

In 1975 the restoration of Democracy in the country led to a new Constitution which signaled a major reform in the Greek Planning Policy towards to the adoption of new planning instruments. Specifically, the new Constitution provided for the protection of the natural, cultural and built environment and urban renewal (Article 24), the strengthening of the social role of landownership (Article 17) and social housing (Article 21 par.4). Nonetheless, the reforming endeavor that the new constitutional rules triggered towards a more active and interventionist role of the State to housing market and to land ownership remained meteor due to various political, economic and corporatist interests which were shielding various aspects of the traditional land development model. In addition, the reforming spirit was somehow obsoleted since it was fundamentally influenced by western European urban paradigms evolved in different socioeconomic context and historical periods, while yet there was inadequate understanding of the needs to be addressed. In 1981, the first socialist government elected in Greece brought various reforms in several fields of state policies, among which was the planning system too (ISOCARP, 2002). Indeed, in 1983 a new planning law was legislated which gave priority to the provision of basic urban infrastructure to unauthorized settlements located in the urban fringe. In the 1990s and 2000s a shift occurred towards a more strategic and development-oriented spatial approach that could ameliorate the country's attractiveness and competitiveness in the context of European integration and globalization (Giannakourou, 2011). Even though new elements emerged in this period, the dominant post-war land development model in Greece remained stable and coherent since its fundamental features had not been drastically threatened. Old and new domestic actors (i.e. small-landowners and large size construction and real estate companies) remained in a noticeable balance profiting from the gains produced in the period of credit expansion and public spending (Mantouvalou, Balla, 2004). Since 2010, the most serious financial and economic crisis the country has been facing in its modern history was the catalyst to accelerate a significant number of structural reforms for the country's economic recovery. The Land Administration and the Spatial Planning system are at the core of legislative initiatives that have been taken to facilitate private investments and to create a business friendly environment. The planning system underwent a new reform in 2014[5] aiming at reducing planning barriers for business development and creating more scope for private initiatives, whereas the pace for the completion of the National Cadastre has been accelerated with the imposition of a specific deadline for its completion, i.e. 2020. In addition, several new planning instruments have been lately introduced with the aim of enabling development on public and private land[6] in view of facilitation of the privatization programme and private investments. Overall, the Greek Land and Spatial Planning System, which has functioned as a kind of 'exception' compared to the dominant post-war European model, and remained extremely stable and coherent in the past, currently receives significant pressures and it seems to be in a transformation process.

include minimum plot size and plot dimensions, maximum plot ratios, and the crucial floor-area ratio (syntelestis domisis) (EC, 2000:51).

[5] Law 4269/2014 "Spatial Planning Reform"

[6] Law 3894/2010 for the Strategic Investments and Law 3986/2011 for the privatization and exploitation of public property.

2. The early implementation of Land Readjustment in Greece

An early form of Land Readjustment was attempted initially in Greece in 1914 with Law 455/1914 for the reconstruction of the Serres town center in Northern Greece after a devastating fire occurred by the Bulgarians on 28.6.1913. However, this law was never implemented, though its contribution to the evolution of the planning system in Greece is regarded as extremely important to the enrichment of the planning toolbox with the idea of land contribution from properties, as a reward to the benefits of the urban development process. Indeed, the idea of Land Readjustment was successfully implemented a few years later for the reconstruction of the Thessaloniki town center after the devastating fire of 1917 (Karadimou-Gerolympou, 1995). Law 1394/1918 for the implementation of the Town Plan as amended later with Law 2633/1921 provided for the creation of a land pool, i.e.'Properties Group' (*Ktimatiki Omada)*, the appraisal of properties' values before and after the readjustment process, and the transfer of the new building plots to the landowners.

The successful implementation of Land Readjustment in the case of Thessaloniki[7] facilitated the inclusion of the tool a few years later in the Law Decree of 1923, as an alternative option for the implementation of Town Plans, aiming either at fairly distributing the financial surplus of the development process (Article 50) or at accelerating the implementation of the town plan in case of emergency like after natural or other cause disasters (Article 51). However, the dominant mechanism for the implementation of the Town Plans, according to the 1923 Decree was the boundaries' adjustment of plots to street layout through specific Administrative Acts *(Praxeis Analogismou-Apozimiosis*) which were drawn up for a single or a few building blocks, but not for the whole plan area. Furthermore, the necessary land for the creation of public spaces and facilities was acquired mainly through a mixed system of land contribution and expropriations[8]. This system of gradual implementation of town plan to the ground remained dominant for several decades in Greece and is still valid in the "urban core" of the existing cities, even though it proved to be insufficient and problematic[9]. The LR mechanism on the other hand, was argued to be more socially fair and therefore more suitable to efficiently cope with landowners' reactions to town planning implementation. Albeit, it was criticized as being, in most of the cases, arduous, demanding long lasting and cumbersome procedures and huge technical resources, while it had been considered as most appropriate for green fields without buildings (Grammatikopoulos, 1949). Therefore, LR according to the 1923 Decree was applied into only a few areas (e.g. Lixouri, Sami, Argostoli, Kalavrita, Zakinthos) specifically after extensive disasters i.e. earthquakes and bombings. However, the legal provisions of Land Readjustment according to the 1923 Decree i.e. articles 50-51 though obsoleted and not in use, are still in force and theoretically could be applied to town plans which were drawn before 1983.

[7] Overall, in the specific case "*the concepts of land readjustment, expropriation and landowners' association, were merged into a single rationale that attempted to address the issues of distribution of socially produced surplus value, the private and public interest, the rearrangement of properties, the control of speculation and the acceleration of private urban development process"* (Karadimou-Gerolympou, 1995).

[8] This mixed system of expropriations and land contribution is known as "self-compensation" (*autoapozimiosi*)

[9] In reality, there have been many instances where significant parts of approved statutory town plans have not been implemented on the ground.

3. The regulatory framework of Land Readjustment after 1975

Article 24 of the Greek Constitution lays out the legal basis[10] of the Land Readjustment in Greece (StE[11] 2149/1986, Skouris, 1991, Christofilopoulos, 1990). In particular Article 24 par.3 provides for landowners to contribute to the securing of land for public facilities and amenities without compensation. Article 24 par.4 provides for the participation of property owners to the development and general accommodation of an area, on the basis of an approved town plan, in exchange for properties or apartments of equal value in the building plots or buildings of such area. According to Article 24 par.5 the preceding paragraphs are also applicable in the rehabilitation of existing residential areas. In case free spaces remain free after rehabilitation, these shall be allotted to the creation of common utility areas or shall be sold to cover expenses incurred by the rehabilitation, as specified by law.

Following the above constitutional provisions, the Land Readjustment had been legislated with articles 35 to 50 of the Law 947/1979 for "Residential Areas"[12]. In particular, the specific law provided for the urban development or the rehabilitation of an existing area according to three mechanisms i.e. a) Operational Planning[13], b) Urban Land Readjustment and c) enactment of general land plot and building provisions i.e. Regulatory Building Provisions. The development of an area under the first two mechanisms would require the designation of respective Zone of Operational Planning (Zoni Energou Poleodomias/ZEP) or Zone of Land Readjustment (Zoni Astikou Anadasmou/ZAA) whereas the latter i.e. Zone of Regulatory Building Conditions (Zoni Kanonistikon Oron Domisis/ZKOD) does not essentially differ from that of a normal Town Plan under the provisions of the 1923 Decree.

Law 947/1979 was actually never implemented, due to a strong resistance by land owners and the opposite political parties as well, because of the high, as perceived, ratios for land and money contribution that it introduced[14]. However, articles 35 up to 50 of L. 947/79, as amended and partially supplemented later by subsequent laws[15] still constitute the main institutional framework of Land Readjustment in Greece. The execution of a Land

[10] As regards the 'legal nature' of Land Readjustment, part of the Greek literature describes it as a form of expropriation, in which the land owner receives a compensation in kind i.e. a new land plot with at least the same value (Choromidis, 1994) while other sources (Dagtoglou, 1991) argue that Land Readjustment cannot be regarded as a form of expropriation, at least for those landowners which voluntarily participate in the process. In that case, the land readjustment process is not aiming to deprive the property in favor of a third person, but only to readjust it and in some cases to reallocate it, in view of the private and public interest. Dagtoglou argues as well (1991), that Land Readjustment can be viewed as a "partial expropriation" in case that the proprietor receives not only a property, but a monetary compensation as well, so as to supplement the equal value criterion before the readjustment process.

[11] Council of State i.e. Simvoulio tis Epikratias (StE) in Greek

[12] The specific Law introduced the notion of the "residential area" as the land which, due to its location and natural terrain, is appropriate for development and for the service of the living, the organized social life and the productive activities of people (Article 2par.1 Law 947/1979).

[13] Operational Planning was an innovative approach of housing production according to which a total renewal or redevelopment of an area is undertaken by a special operational planning company. Original real estate owners receive property of the same value after reconstruction has taken place (EC, 2000).

[14] The landowners in these areas had the obligation to contribute part of their land (30% in ZEP and ZAA and 40% in ZKOD) and an additional money payment (10% in ZEP and ZAA and 15% in ZKOD of their plot's value) so that the necessary public space and land for social benefit uses is secured.

[15] Article 10 of Law 1337/1983, Article 23 of Law 2508/1997, Presidential Decree 422/1994, Presidential Decree 66/1995

Readjustment project can be undertaken and implemented by the public authorities or a compulsory landowners association[16]. The latter can be established as well in order to support the implementation of the project, in case this is to be executed by the public authorities. The declaration of an area as a Land Readjustment Zone (ZAA) can start with a decision from the Minister of Environment, after a proposal from the local authorities or a request by a legal entity of private or public law accompanied by a written consent of the majority of the property owners of the area[17]. The designation of an area as a ZAA can start simultaneously with the process of the elaboration of a General Urban Plan i.e. a Local Spatial Plan (TXS)[18] according to the new terminology, or after the approval of the TXS. In the latter case, the boundaries of the ZAA are depicted in the TXS and a Presidential Decree (PD) is issued to designate the geographic boundaries of the Zone and to define the executing body of the project. If the Presidential Decree provides for the creation of a compulsory association to execute the LR project, then all the property owners of the land plots located in the Land Readjustment Zone obligatorily participate in the association. The LR process, according to Article 38 of Law 947/1979, includes the following stages:

1. Creation of a compulsory landowners association
2. Cadastral Survey and Land Registration of the Land Readjustment Zone
3. Elaboration and Approval of the Detailed Local Plan (Town Plan)
4. Appraisal of the Values of the contributed plots
5. Implementation of the Detailed Local Plan and allotment of the redistributed land plots
6. Dissolution of the landowners association.

If the executing body of a LR project is a public authority, then the whole process is limited into stages 2 to 5. The cadastral map and the inventory of the plots contained in the area for reallocation shall be placed on public display for one month in the municipality[19]. Appeals against the cadastral map and the cadastral tables can be made in the local court of first instance from anyone with a legitimate interest. The elaboration and approval of the Detailed Local Plan follows the completion of the cadastral survey and land registration of the ZAA. It is legally binding and it defines the land uses, the public facilities and amenities, the building conditions like plot ratios, floor-area ratio, building materials etc., as well as, any other additional limitations and prohibitions.

Each property within the boundaries of the ZAA is subject to a land contribution (*eisfora gis*) for the creation of public spaces which depends on the original plot's size (i.e. before the urban development process) and it is calculated according to specific rates provided for by the

[16] Initially the law provided for the execution of a LR project by the Public Housing Corporation (DEPOS), though the recent government downsizing, due to the economic crisis, resulted in the abolition of DEPOS with the Law 3985/2010. However the Law does not provide for the execution of LR by local authorities.

[17] In this case the land owners should hold at least ¾ of the total acreage of the area

[18] The recent planning reform i.e. Law 4269/2014 substituted the General Urban Plans with the Local Spatial Plans. These plans define the general land uses, the building conditions and the general guidelines for the comprehensive spatial organization and development of an area. They are covering the administrative borders of one or more municipal units of a municipality i.e. the first tier local authority in Greece.

[19] At the time that Law 947/1979 was legislated, the land administration system was based exclusively on the system of Registrations and Mortgages. Therefore any urban development process should involve a kind of cadastral survey and land registration in the area to be developed. In the course of the years, the Hellenic Cadastre project is expanding to cover the Greek territory, therefore all recent provisions on planning law provide for the use and exploitation of the cadastral data in areas where a Cadastral Office is in operation. However the existing legal provisions of the Land Readjustment haven't been amended yet. Nevertheless, in areas where the Hellenic Cadastre hasn't been completed yet, the cadastral survey process should follow the declaration of an area as a ZAA.

law. In the same philosophy, the finance for the construction of the public facilities is obtained through a mechanism of a tiered contribution in money (*eisfora se xrima*) that each property is subject to[20]. In this case, it is the property area after the development process i.e. after the deduction of the land contribution that defines the amount of contribution in money. The appraisal of the values of the land plots before and after the reallocation procedure is carried out by a committee[21] and takes into account the general conditions of the local real estate market and the specific characteristics of each plot i.e. shape, size and orientation. Any objections to the committee's decisions regarding the plots' values can be settled in court, after the completion of the LR procedure and the distribution of the new plots. After the reallocation procedure each landowner in the Land Readjustment Zone receives a new plot with a value, at least equal to the value of the original plot. In cases where it's not possible to redistribute a building plot due to the size or to the value of the original plot, a landowner can receive a shared ownership, or a condominium in an existing or a new building in the Zone. Small plots or shared ownerships existing in the Zone, which cannot reallocated according to the new plan, can be purchased or expropriated by the executing body of the project. The reallocation process is completed with the issuance of the Deeds for the transfer of the new building plots to the landowners[22]. Last, the compulsory association of landowners is resolved, in case the project has been implemented by such a body.

The Land Readjustment was legislated in 1979 as one of the three development mechanisms in the Greek planning law, and classified, along with Operational Planning, as a planning tool which requires a strong intervention in land tenure (Chatzopoulou, 2003). Albeit, up to date, almost four decades after the enactment of Land Readjustment, the respective provisions are incomplete, since the anticipated Presidential Decrees for the compulsory associations have not been issued yet, obsoleted since not streamlined with the successive amendments of the planning law, and ultimately still dormant and underused.

4. The contemporary implementation of Land Readjustment at the sidelines of the urban development of the country.

The implementation of Land Readjustment in Greece in its current form was extremely limited even though there were a lot of areas that had been declared as Land Readjustment Zones in relevant General Urban Plans[23] in the early '80s. In particular, there are only three

[20] As being said (See footnote 14) when LR was legislated in 1979, the land and money contribution rates were 30% and 10% respectively for each plot inside the ZAA. This provision amended later, with the planning law of 1983 which provided for land and money contribution rates calculated on a tiered scale with regard to the plot's size and not on a uniform percentage as established by Law 947/1979. In addition the new law abolished the distinction of land and money contribution rates for plots to be developed with Land Readjustment (ZAA) or Regulatory Building Conditions (ZKOD) whereas the previous law provided for lower rates in case of ZAA (See footnote 14). However these rates had been amended a few times since then, as not sufficient to ensure the spaces for public facilities, due to the graduated scale and the small size of land plots. Recently, the Law 4315/2014 established new rates for land contribution which range from 10% for the plot's part, up to 500sq.m. to 50% for the plot's part above 10.000sq.m. In case that, public spaces cannot be secured with these rates, the new law provides for a proportional increase of land contribution. The land and money contribution rates are differentiated in specific cases such as in small settlements, in industrial areas or redevelopment areas.

[21] The committee consists of a judge from the local administrative court, an executive officer from the planning authority and the director of the tax authority (Article 1 PD 422/1994).

[22] Article 49 Law 947/79, PD 66/1995

[23] e.g. P.D. 24.4.1980 "About the residential area of the Municipality of Heraclion Attica", General Urban Plan of Peiraius (Government Gazette 79D/1988), General Urban Plan of Tavros Municipality (Government Gazette 834D/1987).

urban development projects in which the LR tool had been selected, whilst only one of the projects was completed successfully. These projects, concern a total of ca.654 ha of areas which used to be or currently belong to Landowners Associations[24]. Therefore the Land Readjustment legal framework was implemented in conjunction with the specific legal context of the Landowners Associations[25].

The only implemented Land Readjustment project in Greece, under the provisions of Law 947/1979, concerns an area of ca.32 ha which had been acquired in the '60s by the Landowners Association "Saint George" in the foot of Ymittos Mountain at Glyfada suburb southeast of Athens. At the time of land acquisition no land use plan existed, designating the area as appropriate for residential development. Despite that, the Association elaborated a subdivision plan for the distribution of land plots to its members, on which some unauthorized buildings were developed. Following, the area was designated as residential in 1989 and declared as Land Readjustment Zone in 1993. The approval of the Detailed Local Plan and of the Reallocation Map followed in 1993 and 1994 respectively. The next year i.e.1995 the real estate appraisal stage was attained due to the issuance of a Presidential Decree which determined the composition of the appraising committee and the details of the procedure. The same year the new land plots were redistributed[26] to the original landowners (~ 600) and the infrastructure works begun, to be completed after three years. The first LR project in Greece gave rise to the issuance of some Presidential Decrees, anticipated in the 947/79 Law. However, a number of problems regarding the proper implementation of the institutional framework were encountered, but surpassed with disputable solutions, mainly due to the strong will of all involved parties (landowners, public and local authorities) to provide a statutory plan and the necessary public facilities to the area.

Apart from the above case, there were two more endeavors to implement the legal framework of LR according to Law 947/79 in Greece, though without success so far, yet indicative of the structural deficiencies of the Land and Spatial Planning Policies in Greece. The first one concerns an area of ca. 600 ha at the foot of Penteli Mountain (Pikermi suburb), in Attica, in which the process lasts for more than two decades. The absence of Land Cadastre and Land Use plan at the time of land acquisition, led to encompassing not only agricultural but forest land, archaeological sites, river-beds, streams and natural protection zones as well, in the area that had been bought in the early '70s for residential purposes from six Landowners' Associations (Aravantinos, 2007). The whole area was declared as a LR Zone in 1988 and a statutory town plan was elaborated the same year. However, the Council of State didn't uphold the ratification of the statutory plan, founding the area as not appropriate for residential development due to its proximity to the protection zone of the

[24]The Landowners Associations were founded, mainly by civil servants, military personnel or other professionals, during the 60's and 70's in Greece, with the exclusive goal to provide building plots to their members, by acquiring land in the urban fringe, usually encompassing public land or forest areas. The initial share of each member of an Association was converted to a building plot after the subdivision of land, according to an unauthorized private plan. Besides, the Association was usually dissolved after the subdivision of the plots, sometimes without having constructed the necessary public facilities. This mechanism, which was developed as a substitute to the inadequacy of official planning to provide urban land in due time, was much criticized in the Greek planning literature, and is considered as one of the major problems that have to be settled currently, since there are still a lot of areas which belong to Landowners' Associations, though are considered as inappropriate for housing.

[25] Presidential Decree 93/1987 for the urban development of areas belonging to the Associations of Landowners.

[26] The average land contribution rate per plot was ~6,58% due to the application of the provisions of the P.D. 93/1987 instead of the ones provided in the specific LR legal framework i.e. Article 18 of Law 947/197 as being revised with Article 10 of L.1337/83 Law.

Penteli Mountain[27]. Despite that, the Ministry of Environment proposed two improved versions of the statutory town plan which were rejected as well by the Council of State in 2000[28] and 2006[29] respectively. The incorporation of forest land, archaeological sites, streams and natural protection zones to the boundaries of the LR Zone and the provision of the Attica's Master Plan for the control of the urban sprawl were the main reasons for the latest decisions of the Council of State. Lately, the Ministry of Environment attempted once more to overcome the obstacles encountered in the previous period with Law 4280/2014. Nevertheless, almost three decades after the designation of the area as a LR Zone the project is still in progress while it still remains to be seen whether the new provisions will prove more effective.. However, the specific case reveals in the most dramatic way, the socioeconomic impacts of the delay of the National Cadastre, of the overlapping and often conflicting planning regimes and public law restrictions as well, which increase uncertainty and investment costs and are ranked among the highest impediments for the creation of a business friendly environment (OECD, 2011). Last, the third attempt to implement the idea of LR concerned an area of ca.22ha in Thessaloniki[30] which later was abandoned due to problems stemming from the obsoleted legal framework of LR according to the provisions of L.947/79 and the administrative capacity of the local planning authorities (Balla, 2009).

Overall, the experience from the contemporary implementation of LR demonstrates that the tool of Land Readjustment was selected as an exception for the urban development in the country, motivated by opportunistic criteria to overcome obstacles originating from existing land patterns and delayed official planning to provide residential land in due time.

5. Land Readjustment in the context of Law 1337/1983

A hybrid form of Land Readjustment is taking place in the context of the urban development process according to Law 1337/1983 which inaugurated an extensive programme to provide land use plans and town plans in almost 380 cities and communities in the country. The specific programme gave priority to the extension of existing town plans in areas that were on the urban fringe, had unauthorized development and lacked basic urban infrastructure, through the enactment of Regulatory Building Provisions i.e. one of the three mechanisms that Law 947/1979 introduced. The new legal regime targeted a smooth and gradual reform of the planning system appeasing those social groups that had been opposed to the previous Law 947/1979.

In particular Law 1337/1983 kept the rationale of land and money contributions under Law 947/1979, but introduced a tiered scale related to the size of the properties, favoring though small size against large size plots[31]. Furthermore, it provided for the implementation of town plans through "Implementation Acts" (*Praxeis Efarmogis*) which are usually elaborated for the whole area of the Town plan, to avoid problems stemming from the gradual implementation of town plans such as those of the previous regime of 1923 Law Decree. The "Implementation Act" consists of a land registration map, which depicts property adjustments,

[27] PE StE 89/1998
[28] PE StE 246/2000
[29] PE StE 104/2006
[30] Efkarpia community in Thessaloniki
[31] The land contribution is related to the total amount of land owned by a particular owner in the area under integration into the town plan (Article 8 Law 1337/1983) whereas the calculation of money contribution is based on the value of the property as formed after the implementation of the town plan (Article 9 Law 1337/1983). See also footnote 20.

and is accompanied by tables of land and money contributions assigned to each property to ensure that the land needed for public open spaces and public-service uses is secured. However, it does not induce major property modifications but rather adjusts the Town Plan to the existing land structure by taking into account the realities of land properties on the ground (EC, 2000). In the course of years[32], several amendments have been brought in the legal provisions of the "Implementation Acts", which targeted the expansion of readjustment procedures so as to facilitate the implementation of the statutory plan to the ground. Therefore, in the context of the law, land readjustment is considered currently the unification of the parts forming the land contributions, the reallocation of land plots and any other change that may be needed for the implementation of the plan that affects their size, shape or dimensions[33]. The "Implementation Acts" are considered as definite and immutable after the ratification by the Regional Governor and are registered in the local Cadastral or Mortgage office. However, in case a land owner disagrees with the equivalent of the old to the new building plot, which is attributed by the "Implementation Act", they can lodge an appeal to the courts within six months after the ratification of the Act requesting a judicial determination of the property's value. The law does not provide for the appraisal of the land values before the "Implementation Act" but only after its ratification with a view to calculate the money contributions.

The provisions of Law 1337 prevailed after 1983 in the vast majority of the planning processes in the country and raised a lot of debates in the planning literature as not being more efficient than those of the 1923 Decree. In actual practice of both cases, there are serious delays in the implementation of the plans and the payment of the necessary compensation to affected landowners[34]. According to empirical data presented by the Central Union of Municipalities and Communes of Greece in November 2005 (KEDKE, 2005), the average time for the approval of the Implementation Acts is between four to six years. Additionally, the tiered scale for the calculation of money and land contributions to provide the necessary land for public facilities and to meet the infrastructure's costs, proved inefficient and problematic (Economou, 1999), while disputes over the legal nature of the "Implementation Acts" and their impact on property rights have arisen as well (Choromidis,1995).

6. Overall assessment

Land Readjustment implementation in Greece, either with the provisions of the 1923 Decree or with those of Law 947/1979 is poor, in spite of the fact that the tool was initially transposed to the domestic planning system timely, compared to other countries. The ultimate cause for this implementation gap is a sum of several underlying factors in political, economic, social and cultural level (CIPE, 2012).

[32] Initially the Law 1337/83 was considered to be a temporary and transitional law, aiming to address the urgent needs that had been accumulated in the previous period i.e. unauthorized settlements, serious delays in the implementation of town plans and absence of land use plans in the "out of plan" areas. Despite the initial anticipations, the specific legal regime remains valid until today with successive amendments which aimed to improve some of its initial deficiencies.

[33] Article 12 par.3 of L.1337/1983 as being amended by L.1512/1985. In fact, the "Implementation Acts" have been enriched with the potential of the reallocation of land plots, since readjustment actions have been predicted and are taking place in the context of the "Administrative Acts" (Praxeis Analogismou Apozimiosis) of the 1923 Law Decree as well.

[34] For cases that involve the system of the Law Decree of 1923, the delays sometime exceed forty, sixty, seventy, or even ninety years (StE 2673/1999, StE, 1451/1998, StE 385/1997) (Giannakourou, Balla, 2006).

At a **political level,** *divergent political agendas* were a determinant factor for the limited use of LR. Law 947/1979 was actually never implemented due to a strong resistance by several interest groups and the opposite political parties which led to its suspension and the enactment of Law 1337/1983 a few years later. The *state bureaucracy* is another factor which caused the failure of LR in Greece. The planning process evolved to a bureaucratic one, lacking to inspire trust to the involved landowners (Gartzos, 1990) while, though the planning authorities having an excessive degree of discretion to implement the law, they demonstrated inertia to apply the more innovative mechanisms i.e. Land Readjustment and Operational Planning. Aside from the above, the *quality of the legal framework* and specifically those provisions for the compulsory landowners associations were perceived as overly complicated and unclear, along with the *limited legitimacy of Law 947/1979* due to inadequate public consultation, were crucial for the lack of LR implementation.

The aggregate *lack of resources* of the planning authorities is placed among the **economic factors** behind the limited use of LR. Indeed, the Greek planning system, apparently impacted by the limited resources of the planning authorities, is considered as a formally plan- led system which does not lead developments, but rather responds to change, often with a considerable time lag and thus usually strives to accommodate unauthorized settlements by legalizing them after the event (EC, 2000). The application of LR is commonly agreed that is hindered by the existence of buildings and is mostly appropriate for green fields (FIG, 2009). Therefore the high density of illegal buildings in the *'out of plan'* areas led to the intense use of regulatory provisions i.e. "Implementation Acts", according to which the Town Plans are adjusted to the existing plot boundaries without major modifications. However, in the course of years, the need for applying reallocation procedures during the implementation of the Town Plans was addressed by amending the respective legal framework of 1337/1983, therefore, reducing some of its original deficiencies and increasing respectively the similarities with the Land Readjustment mechanism which lacked of strong economic incentives as a counterbalance.

Related research on public governance (CIPE, 2012) argues that the implementation gap occurs and persists due to a variety of **social and cultural conditions**. Indeed, the *dominant socio cultural pattern around land ownership* in Greece affected the implementation of Law 947/79. The latter, with the institution of Land Readjustment and Operational planning envisioned a more interventionist role of the State to land development. However, the persistent cultural stereotypes and practices of all the actors in the planning system in Greece for minimum intervention in landownership, led profoundly to the abandonment of these instruments. Indeed, the contemporary form of Land Readjustment was legislated with a considerable time lag[35] in Greece in the late '70s, without necessarily corresponding to the domestic socioeconomic context and respective planning needs. In fact, the reforming planning endeavor of the '70s to inaugurate a new urban paradigm failed and was replaced by a new policy which compromised social resistance and was regarded as more pragmatic. In this direction, the implementation gap was fueled as well by the *influence of local elites* i.e. professional associations and planning experts that were opposite to the most innovative features of Law 947/1979.

Aside the factors which caused the implementation gap, the problems that have been encountered in the cases where LR was applied, are related to the basic structural weaknesses,

[35] The modernization of the tool on Greece had a considerable time delay, compared to other countries such Germany or Japan where it was implemented extensively as the main urban development process after World War II.

deficiencies and general pathogens of the Greek Land Administration and Spatial planning system in Greece such as (Balla, 2012):

- Costly, cumbersome and lengthy procedures for the elaboration, approval and implementation of plans
- Conflicting and scattered legal provisions in planning law
- Overlapping and often contradicting land-use regulations, permits and consents[36]
- Absence of a complete Cadaster and lack of delineation of protected areas and public land
- Complicated, fragmented and strongly centralized planning responsibilities.

Overall, the enactment of LR in Greece demonstrates the fragmented and mechanistic manner in which other innovative ideas, tools and practices have been transposed to the domestic legal system from abroad, and caused them to remain inactive and become obsolete in the course of years (ESC, 2007). In addition, the implementation gap reveals the contradiction among the explicit public policies for environmental protection and rational planning on one hand, and the systematic tolerance of the Greek State to practices which were considered as part of the so called "tacit social contract" (Lygeros, 2011). The latter has promoted and expanded the post war land development model, as a substitute of the inadequate social welfare state (Giannakourou, Kafkalas, 2014), while it has been used to ensure consent by broad popular strata towards the state itself and the status quo (Mantouvalou, 1988).

The looming paradigm shift of the Greek Land and Spatial Planning System towards a "pro-growth" planning model, the concurrent collapse of the domestic real estate market along with governmental downsizing and shrinking public spending, inevitably influence the use of Land Readjustment in its current form. However, since the fragmented landownership patterns and oddly-shaped parcels are still part of the Greek reality and hinder the redevelopment of urban land, the "spirit of land readjustment" should be exploited in new forms to address the needs of urban renewal, which in medium-term are expected to rise in the older parts of the Greek cities.

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[36] e.g. forest legislation, archaeological legislation, seashore legislation etc.

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BIOGRAPHICAL NOTES

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She participates in experts' committees, scientific forums, and research groups in Greece and abroad, and has authored several papers in the field of Property Rights, Spatial Planning, Land Policy and Sustainable Development.

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Urban Land readjustment with The Netherlands' Cadastre, Land registry and Mapping agency

Maartje LOF, The Netherlands

Key words: urban land readjustment, sense of urgency, role of Cadastre, legislation, organizational development

SUMMARY

In time of crisis governments have great interest in finding solutions for spatial challenges. In Dutch urban areas, vacancy of real estate is an upcoming challenge. Both in retail areas and in business areas vacancy is growing as an undesirable development. Urban readjustment can play a role as alternative to expropriation of real estate.

The Ministry of Infrastructure and Environment prepared a law on voluntary reallotment in urban areas. The proposal for this law will be in Dutch parliament next year. However the proposal lacks a legal "big stick" for public bodies to work on vacancy problems in urban development.

The Netherlands' Cadastre, Land registry and Mapping agency (The Dutch Cadastre) is acknowledged as an expert in the field of urban readjustment, because of its knowledge and experience in land reallotment in rural areas. The situation before reallotment, the situation after reallotment and the transition are all in one hand. That is cost effective.

The Dutch Cadastre implemented a strategy to become a partner in urban readjustment. An internal program on urban readjustment coordinates the activities that contribute to this aim. To become a partner in urban land readjustment the Dutch Cadastre has some best practices for a successful strategy.

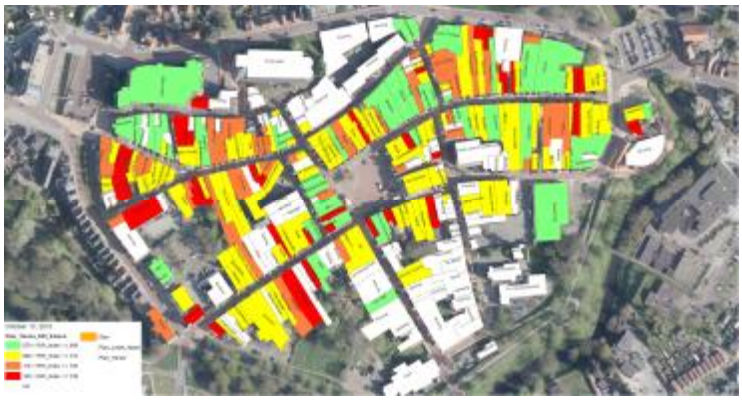
Urban Land readjustment with The Netherlands' Cadastre, Land registry and Mapping agency

Maartje LOF, The Netherlands

1. WHY A LEGAL LAW FOR URBAN READJUSTMENT IS IMPORTANT

1.1 What is urban readjustment?

The Netherlands is a small country with a high density of built-up area. Urbanisation is in general a concentric development. Cities are build up in a well ordered way. Vacancies, however, will arise in random places. Vacancy in retail areas makes shopping streets unattractive and will discourage entrepreneurs to start new shops. Eventually this will lead to more vacancy and therefore loss of facilities in these areas.



Retail Risk index for vacancy in retail property in Steenwijk

Vacancy in retail areas, as well as business areas, housing and office buildings are an impulse for urban redevelopments. If spatial development with readjustment of legal rights is desired, but the voluntary way is not succesful, the government needs an legal instrument.

Urban readjustment is a facilitating instrument that aims to redivide and readjust legal rights in an urban area. The instrument brings parties in a certain area in position to develop within the legal framework.

1.2 What is sence of urgency for urban readjustment?

Previously, municipalities had the strategy of buying land, preparing a site for building, and selling the site to a real estate developer. This resulted in an overproduction of real estate for retail and office buildings.

Since the financial crisis, governments are reluctant to take risks on investments in real estate and property of land. Next to that the focus changed to readjustment in favor of new locations of building sites. Previously municipalities used expropriation as an ultimate remedy to break a deadlock in urban redevelopment. Nowadays lack of budget is keeping municipalities from applying this instrument. Therefore a need for a new instrument arises: an instrument that on

the one hand minimizes the financial risks of buying land and on the other hand solves the problems of obstructing property rights that hamper implementation of a strategy.

Land consolidation in rural areas is an instrument that is applicable if voluntary reallotment isn't possible, because the owners don't all agree. In land consolidation government intervenes in property against owners' wish. Therefore it is only feasible if a vast majority is committed to the urban readjustment. The legitimacy is the interest of this majority and the need for spatial development for society. Both in land consolidation and urban land readjustment the rights and interests of the minority should be protected.

1.3 Who takes the initiative?

Urban readjustment can play a role in a wide variety of situations. There are two categories, depending on who takes the initiative.

1) The initiative comes from property owners: all owners (or a majority) requests the government to decide on urban readjustment. Both the plan and the clearance are established by government and the government accommodates changes in policy if needed.
2) The initiative comes from government: The government is hampered in implementation of its strategy, by obstructing property rights. Expropriation is not a desirable approach. Instead the governmental body facilitates urban readjustment. Again commitment of the majority of owners is important. Public information, legal costs and adjustment of strategies are the possible actions.

The Dutch Cadastre mentioned over a 100 initiatives in the Netherlands. Most involved parties are municipalities. Ministry of Infrastructure and Environment did a study on possible legislation. Private parties have confidence in this instrument. The Dutch Cadastre works together with many and has cooperation agreements with some. Several universities have been cooperating on pilots in urban readjustment.

1.4 What is current legislation on urban readjustment?

The government is perparing legislation for voluntary urban readjustment. The political climate is not ready for urban readjustment yet. The Minister of Infrastructure and Environment does identify the urgency and the need for legislation. But the current legislative proposal holds voluntary reallotment only and will not be voted for till the next cabinet period. The elections in March 2017 will create a new political landscape that give new possibilities for legislation.

2. WHAT IS THE ROLE OF THE DUTCH CADASTRE

2.1 The experience of the Dutch Cadastre

The Dutch Cadastre has a legal role in rural land consolidation and reallotment. This year we celebrate 100 years of practice in Land consolidation and reallotment in rural areas. The principles and procedures as well as the legal law in rural reallotment can be helpful in working on urban readjustment.

That was one of the reasons why the Ministry of Infrastructure and Environment invited the Dutch Cadastre to work on a consultation for legislation on urban readjustment. The Dutch Cadastre is seen as an innovator on this topic, by working on pilots and organizing a couple of expert meetings. Especially municipalities seek contact for expertise and advice.

The Dutch Cadastre aims to play a role in areas that are important to society. Urban readjustment will help urban areas in economic recovery and development and therefore is an incentive for urban development in the Netherlands.

2.2 Taking care of legal certainty in urban readjustment projects

In urban areas owners of real estate and property often differ much in power. One can think of differentiation in knowledge, time and financial means. This could give inequality in the process that needs to be taken care of. As an independent party the Dutch Cadastre can make sure that in the urban readjustment process all rights of individuals and legal persons are taken care of.

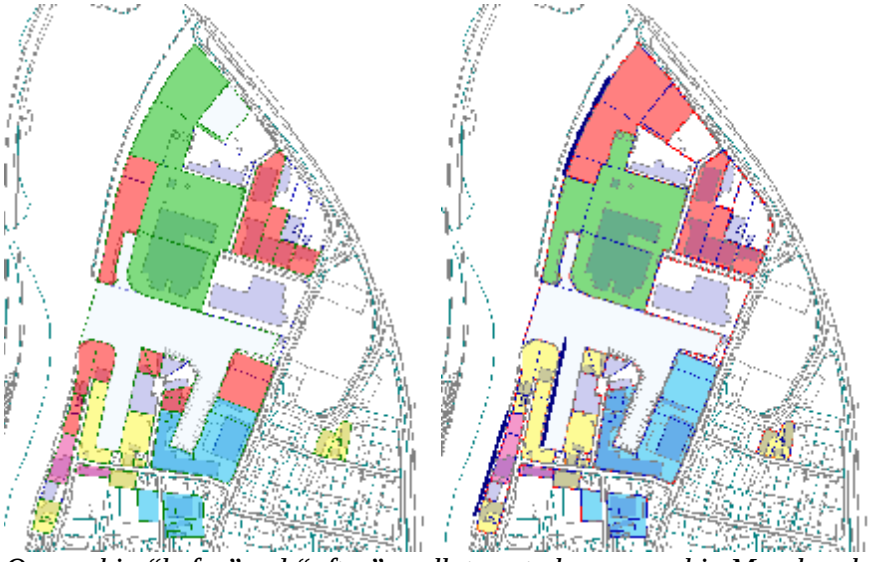
Urban readjustment can have radical impact on the property owners and title holders. Legal certainty in property rights should always be guaranteed. The Dutch Cadastre has the experience and the knowledge about taking care of legal certainty in reallotment processes.

The Dutch Cadastre administers all data on the legal situation of real estate and property of the participants in a project. This information is essential to the preparation and implementation of an urban readjustment project.

Registering rights and wishes of individuals and legal persons in urban rejustment

2.3 Cost saving in the process

Passing of titles of properties that are the result of land readjustments should be registered correctly. Both the administrative as well as the cartographic data is made available throughout the process by the Dutch Cadastre. This information is the input for the deed. Both the old and the new situation as well as the passing of the titles itself are in one hand. The Dutch Cadastre has developed ICT tooling to facilitate the process of reallotment with cadastral data and geographic information. Since the data, the tooling and the knowledge are combined at the Dutch Cadastre, the work can be done in a cost effective way.



Ownership "befor"and "after" reallotment plan propsal in Maasbracht

2.4 Open governance

The government of the Netherlands presented a vision on transparency and open governance in 2013[1]. The core elements in open governance are facilitation of initiatives and cooperation with partners that address social issues. Governmental organisations should empower citizens and make participation in society and policy making possible. This enhances the effectivity and the accountability of the government. Citizens not only participate in policy making, but also make plans themselves that are supported and made possible by the government. When doing so in an urban readjustment project, the Dutch Cadastre can contribute to an open governance, by playing a supporting role.

2.5 The role of the Dutch Cadastre in urban readjustment projects

In rural land consolidation the Dutch Cadastre formaly assists Provincial Executives in implementing the project. The legal role of the Dutch Cadastre is to support property owners in the procedures. In urban readjustment this could be the same. In general the Ducth Cadastre's roles could be described as follows:

1. Consultant:
   The consultant has vast knowledge and experience about the urban readjustment. He has the ability to bring the instrument in posistion to solve the problem. The consultant defines the methodological approach befor starting implementation of the project. He gives advise about the feasibility of the project.
2. Proces executer
   The role of the proces executer is to conduct the participants through all stages of the urban readjustment project. This stages include building an administrative database, set up of a list of holders, collecting wishes of participants, make and share reallotment plans etc.
3. Messenger

[1] http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2013/09/26/aanbiedingsbrief-bij-visie-en-actieplan-open-government-partnership-ogp.html

Urban readjustment is a new instrument that is rather unknown. Now the ministry is preparing a law on urban readjustment, a lot of questions are raised. There is a need among governmental organisations and commercial parties of education and sharing of knowledge. The messenger actively raises awareness about what urban readjustment is, how it can be executed, what can be the results etc. The messenger builds up a network and keeps contacts with other partners that play a role in the field of urban readjustment.

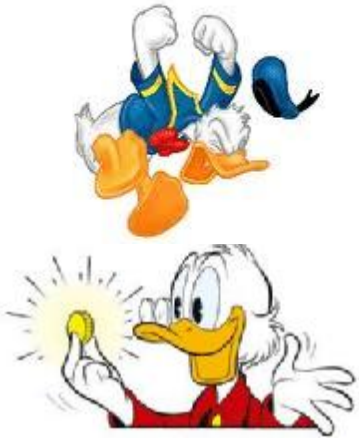
3. FIND THE STRATEGY TO BECOME A PARTNER

3.1 What can we do?

The first step in the endeavour of this new field was to find out if readjustment in urban area is possible. Together with both Radboud University, students and Ministry of Infrastructure and Environment the Dutch Cadastre explored the possibilities of urban readjustment. Important is to pitch the ideas in a way that they are not put as sollutions, but as concepts. Partners are invited to cooperate and support development of the concept. These concepts were new, but closely related to the core business of the Dutch Cadastre.

3.2 Elaborate the concept

The concept was tested with a case study called Duckcity. In Duckcity 17 owners would participate in an urban readjustment project. This case study reveiled the bottlenecks and the possibilities in the concept of urban readjustment. This study was shared with many stakeholders that operate in the field of urban development during an expert meeting. The knowledge and experience of new partners was to the concept. In a short time a new network of knowledge carriers was created.



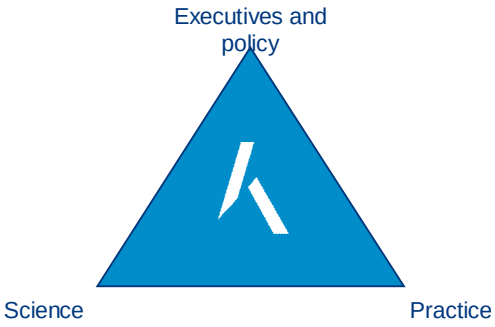
Casestudy Duckstad

3.3 Show your share in the debate

The ideas and concept that are developed are sharpened and elaborated together with partners. Commitment and acknowledgment are needed to come to a settled legislation. Scientists as well as policy makers and executives and practicioners are adding their share to the debate. The Dutch Cadastre contributed by showing the case studies, taking part in pilots and sharing their knowledge.

3.4 Create a network

Whereas a strong external network in the field of science, policy and executive is important, the internal organisation is a prerequisite to get your logistics right. Good cooperation with the department of Communications and Marketing advance internal commitment. Innovators inside and outside the organisation are needed to bring forward the idea to a concept and finally to an acknowledged sollution. Therefore a strong network of cooperating partners in different fields is important.



Network of the Dutch Cadastre in urban readjustment

3.5 Prepare your institution

The Dutch Cadastre started a program on urban readjustment in 2012. The program coordinates all actions that are aiming at making the Dutch Cadastre a partner in urban readjustment. It makes sure that sufficient capacitiy is available and devoted collegues work together to build up an organisation that is ready for work. The program coordinates expertmeetings, contributions to masterclasses, publications on LinkedIN and other media. Businesscases for projects, ICT tooling etc are developed within the program.

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Technical Session C1

Measuring the impact of land consolidation

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The Effectivity of Land Consolidation in Finland

Kalle KONTTINEN, Finland

Key words: Land Consolidation, Rural Development, Land Banking, Parcel size

SUMMARY

In the last two decades land consolidations in Finland have been concentrated in agricultural areas. The main goal of the projects has been reduction of the agricultural cost. Key figures when assessing the impact of a land consolidation project are parcel size and distance to the farmhouse. In winter 2015–2016 NLS Finland director Timo Potka did a comprehensive study about the development of land consolidations in Finland. The study was commissioned by the Ministry of Agriculture and Forestry. The study included a detailed survey of the 17 areas in which land consolidation was carried out between 10 and 20 years ago, four areas where land consolidation was done roughly 100 years ago and four areas where land consolidation was not implemented although the possibility was surveyed 15 years ago. The study found out that the structure of the parcels in these areas did not deteriorate. The average parcel size increased slightly in the years following land consolidation. A similar development was observed in areas where land consolidation was not implemented. Therefore the doubling of the average parcel size in land consolidations could be seen as a long term effect. The distance between farmhouse and parcel was observed to have increased slightly through the years. The main reason for this is the enlargement of the average Finnish farm.

In his report Timo Potka proposed several improvements to land consolidation activity in Finland. Many of these proposals are now being implemented.

SUMMARY IN FINNISH

Viime vuosina suomalainen tilusjärjestely on keskittynyt peltoalueille. Päätavoitteena on ollut viljelykustannusten alentaminen. Keskeiset tunnusluvut tilusjärjestelyiden vaikuttavuuden mittauksessa ovat lohkokoko ja viljelyetäisyys. Talvella 2015–2016 Maanmittauslaitoksen johtaja Timo Potka teki kattavan selvityksen tilusjärjestelyiden kehittämisestä Suomessa. Selvityksen tilasi Maa- ja metsätalousministeriö. Selvitys sisälsi tutkimuksen 17 alueesta joilla tilusjärjestely oli tehty 10–20 vuotta sitten, neljästä alueesta joilla tilusjärjestely oli tehty noin 100 vuotta sitten ja neljä aluetta joilla tilusjärjestelyä ei toteutettu, vaikka mahdollisuutta niihin selvitettiin 15 vuotta sitten. Selvityksessä havaittiin, ettei tilusrakenne näillä alueilla heikentynyt vuosien kuluessa. Keskimääräinen lohkokoko useimmiten hiukan kasvoi. Tästä johtuen tilusjärjestelyllä saavutettua lohkokokoon kaksinkertaistumista voidaan pitää pitkäkestoisena parannuksena. Sen sijaan viljelyetäisyyden havaittiin hiukan kasvaneen vuosien kuluessa. Pääsyy tähän on keskimääräisen suomalaisen maatilan kasvaminen.

Selvitysraportissaan Timo Potka esitti useita erilaisia parannuksia tilusjärjestelytoimintaan Suomessa. Monia näistä ehdotuksista ollaan nyt toteuttamassa.

The Effectivity of the Finnish Land Consolidation

Kalle KONTTINEN, Finland

1. BACKGROUND

In the last two centuries, land consolidation procedures in Finland have evolved from large scale Basic Land Consolidations aimed at the consolidation of all land in a rural village to restricted land consolidation procedures aimed at the consolidation of agricultural land only in a somewhat modestly sized area. As in old times, the reduction of agricultural costs remains the first goal of land consolidations and it has become even more important in recent years. Due to the rough and moist climate of Finland, drainage works have been a crucial part of land consolidations in this country.

The Last two decades have seen the fastest developments and modernisation of land consolidations in Finland. A semi-automated survey planning platform called Jako2 was introduced in the year 2003. Unified cost-benefit tools came in 2009. National Surveys concerning the need of land consolidations in Finland were done to agricultural, forestry and to water parcels respectively in 2012, 2006 and 2013. Also several smaller improvements increased the efficiency of land consolidations. For example, an automatic letter mailing system was introduced to all cadastral surveys in 2008 and small improvements to the process of land consolidation are done almost yearly.

Land consolidations in Finland have been subsidised by government since the 1970s. Payments by land owners have covered only a part of the total expenses of the project. Earlier cadastral fee, agricultural roads and drainage works have all received government money from 40 to 80 percent of the total cost. Demands for reduction of government spending in Finland have reached land consolidations in recent years. For example, in 2016, the total government funding of drainage works and building of agricultural roads in land consolidations was 3 million euros, when only few years earlier it was 7.5 million euros. This kind of decrease in funding poses a threat to the survival of land consolidation activities in Finland. How could ongoing projects be completed? How could new projects be implemented effectively when funding for them would be uncertain?

In Finland there is a tradition to appoint an official government investigator (in Finnish: selvitysmies) to solve or gather information about difficult questions. For example, the last two years have seen government appointed investigators concerning healthcare organisation, medical cost savings and student allowances. In October 2015, the Ministry of Agriculture and Forestry (MAF) appointed Timo Potka, the director of Land Consolidations at the National Land Survey (NLS), to investigate the development of land consolidations in Finland. In its appointing letter MAF raised some questions and arguments about land consolidations. Key arguments and questions were:

1) Difficulties of synchronisation on national legislation and EU-legislation in state subsidies to Land Consolidations.
2) Increase of crofting of fields in Finland and difficulties that this presents to land consolidations.
3) Argument that land consolidations do not provide a long term solution to parcel fragmentation.
4) Need to cut costs and bureaucracy in all government activities.
5) How to improve parcel structure more with less government spending?

In October 2015 at the National Land Survey assembled several work groups to survey background information to investigators report. The survey included 120 personal and email interviews of land owners, municipal chiefs of agriculture, cadastral surveyors, and officials of other agencies and representatives of land owners associations. Also several foreign land consolidation specialist from the EUregion were interviewed via email. The parcel structure of 21 areas which had experienced land consolidation and four that had not were surveyed and compared.

Director Timo Potka handed in the investigation report to the Ministry of Agriculture and Forestry on 31 March 2016. This article includes some of the findings of that report.

2. CROFTING AND LAND CONSOLIDATIONS

2.1 Crofting in Finland

In Finland there is a long tradition of crofting of agricultural land. During the 1600s and 1700s the king of Sweden would often grant ownerships of vast areas of Finland to noblemen distinguished in war or in the administrative duties of the kingdom. Noblemen seldom worked in the fields themselves. Their lands were cultivated by crofters or hired hands. Although free peasantry survived in Finland, there were large areas in southern Finland where crofting was major way to cultivate fields. During the 1800s there were several restrictions to the partitioning of estates. With an improvement in living conditions and a population increase, this led to an increase of crofting.

One of the reasons for the bloody Finnish Civil war of 1918 was the so called crofter problem. Although crofters were liberated in the years between 1918 and 1945 and they could purchase land they had leased with cheap government loans, the memory of 1918 has affected the Finnish crofting legislation. For example, the Finnish Crofter's Act of 1966 (259/1966) restricted crofting time of agricultural land to 10 years. Crofting was seen as socially dangerous and there was a wish to avoid a reoccurrence of the events of 1918. Legislation was mitigated in 2010 and the restriction limit was increased to 20 years. After 1918, crofting decreased steadily in Finland and during the 1980s there was a low point when only 12 percent of cultivated land was leased (Potka page 39).

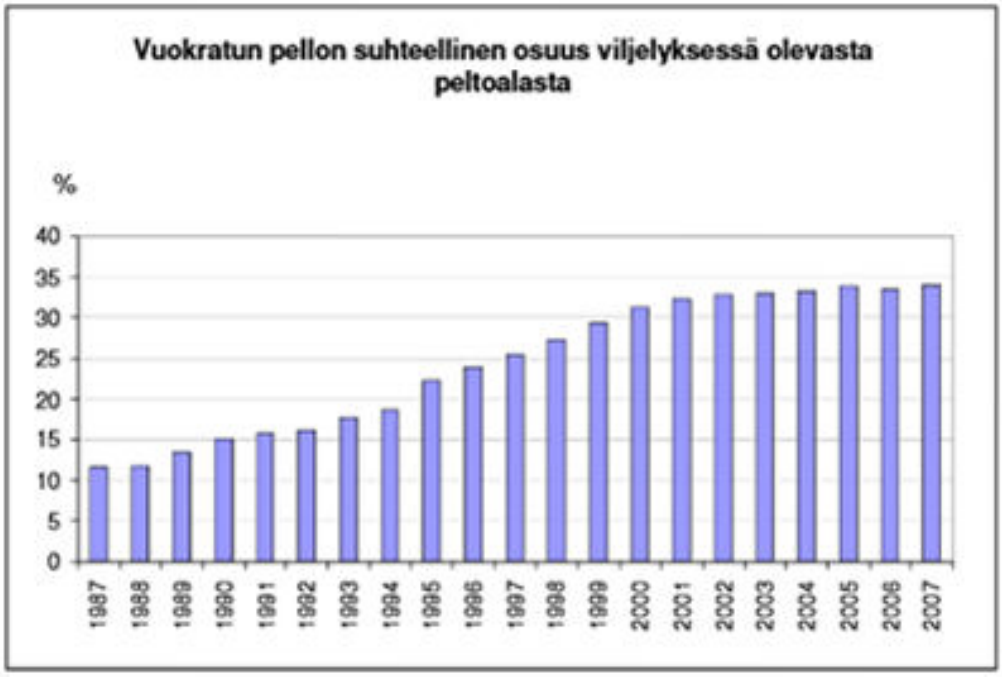

Chart 1. Percentage share of leased land from total of agricultural land in Finland (Potka, page 39)

In the late 1980s the lease of agricultural land increased and after Finland joined to EU in 1995 it continued to increase until 2005. One major reason for increased area of leased cultivated land was the structural development of Finnish agriculture. The average farm size in Finland has grown by approx. one hectare each year since 1995, reaching 45 hectares in 2015. During the 2010s the amount of leased agricultural land has remained roughly at the same level of 34% of cultivated land (Pässi, p. 12, Potka, p. 39).

2.2 Crofting and Land Consolidations

One problem with leased cultivated field parcels is their size. Leased parcels tend to be smaller than average (Sulonen, p.14). Parcel size explains the economical result of agricultural production (Myyrä, p. 42) and main goal of land consolidations in Finland is to decrease agricultural costs and so to improve the profitability of agriculture. An important way to do this is to increase the size of parcels. Because leased parcels are small, the biggest economical gains through land consolidations could be reached with leased parcels.

Often the start of land consolidation proceedings also starts the sale of cultivated land to active farmers. Landowners that participated in land consolidation were asked did they sell their leased land during the project. Depending on province 23–40 % answered that they did sell (Sulonen p.31).

Interviews of landowners showed that the merging of earlier leased parcels and leaseholders' own parcels is very rare event in land consolidation. Reasons for this were difficulties of exchanging a leased parcel next to leaseholder's own parcel in land consolidation plan, short durations of lease contracts, missing approval of landlord and costs of a merger. One

interviewed municipal agricultural chief told that: “Merging of cultivated parcels is very difficult with contracts and voluntary means. We have been doing crofting and contracts a long time and they haven’t impacted positively on the parcel structure.” Also, it seems that in areas were parcel structure is good crofting and contract work do not deteriorate it. (Potka, p. 39-40)

In practice, the management of leases by verdict in a land consolidation project is not common event. Finnish land consolidation legislation organises leases automatically. Old leases follow the exchanged parcels. Normally the benefits of farmers and landlords both are tended to in land consolidation. (Potka, p.40)

3. EFFECTIVITY OF THE FINNISH LAND CONSOLIDATIONS

3.1 Development of Land Consolidations

Production volume of land consolidations in Finland have remained roughly the same in recent years. Between 2002 and 2014 production has varied from 6,700 hectares in 2002 to 10,800 in 2009. In same time number of people working with Land Consolidation have declined. When in 2003 land consolidations took 64 man-years, in year 2015 they took only 36. (Potka, p. 45)

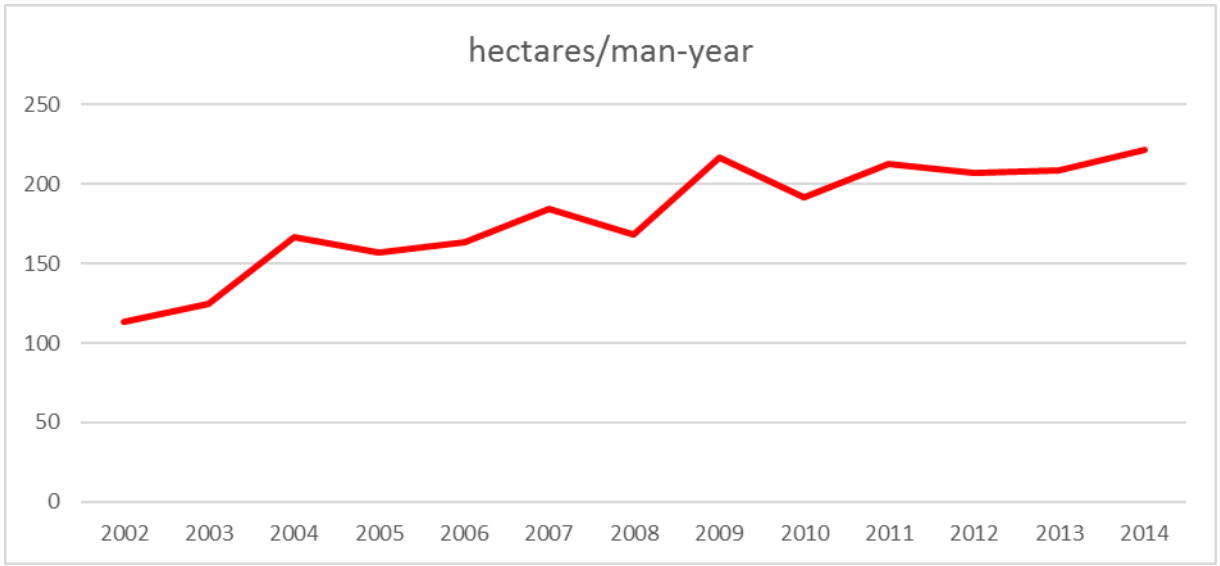

Chart 2. Production of Land Consolidations in hectares per man-years put to Land Consolidations between years 2002 to 2014 (Potka, p.45).

There are several reasons for this increase in productivity. Legislation was reshaped in 1997 when Real Estate Formation Act came into force. Development of the semi-automated land consolidation planning program Jako2 in year 2003 reduced planning work to less than half of what it had been earlier. All these played a part, but the most important reason of the production increase was the development and reshaping of the land consolidation process. Earlier land consolidations were more oriented towards the completion of cadastral map and cadastral information than parcel readjustment. In the first decade of the new millennium

emphasis was put on essential improvements and on work that had real impact on the outcome of the project. Mapping, new boundary markers, drainage and road works were concentrated in areas, which were important to the achievement of a better parcel structure.

Before the year 2007 in Finland, all land owners in the project area of a land consolidation procedure were eligible for funding for drainage and road works through land consolidation. This way, large areas where exchanges of parcels did not occur received funding if the area was fortunate enough to be included in a project area. This changed in 2007, when strict criteria for funding of drainage and road works were introduced. Now only parcels that were newly formed in a land consolidation procedure could get funding for subterranean drainage. The size of tubing of main drainage was limited to 25 mm and other drainage and road works were limited to only those areas on which land exchanges occurred and where the works were important for achieving land consolidations goals. As you can see from Chart 3, the costs of drainage and road works decreased rapidly.

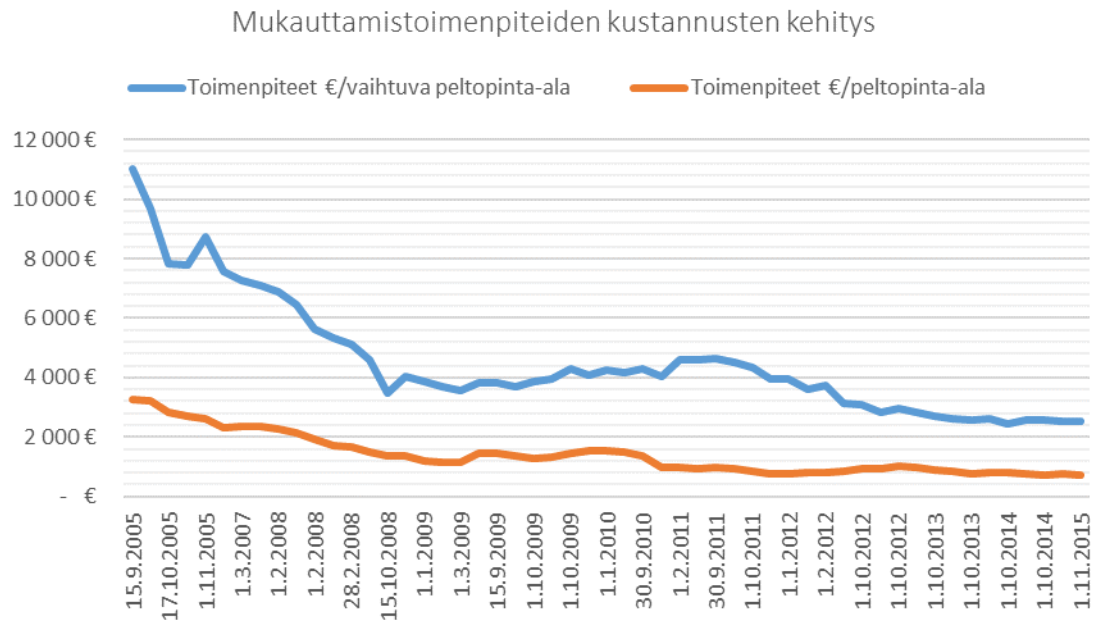

Chart 3. Costs of drainage and road works per hectare of exchanged land (blue) and per hectare of cultivated area in land consolidations project area (red) by land consolidations finalisation date. (Potka, p.55)

3.2 Effects to Parcel Structure

Long term studies about the effects of land consolidation on parcel structure are hard to find. MAF raised the question that effects might be short term and not so long lasting as was supposed earlier. Because of this, NLS surveyed long term effects of land consolidations on parcel structure in 25 areas. Of these, 17 areas were such that land consolidation was completed between 1996 and 2003. Four areas were such that land consolidation was never implemented, although possibility was studied 15 years ago, and four areas were such that land consolidation was completed 100 to 120 years ago. Information was gathered from old

survey maps, aerial photographs and the agricultural administrations information system (IACS). Number of farms, cultivated area, leased area, number of parcels and average parcel size was surveyed. The effects of farming distance from farmhouse to parcel by road was also surveyed. In older areas this proved too difficult, because the information available on older survey maps was incomplete.

From Chart 4 you can see that parcel structure has not deteriorated in areas where land consolidation was completed roughly 15 years ago. In only one area, Sievi Jokikylä, the average parcel size has decreased slightly in recent years. In all other areas, average parcel size has increased and in all areas combined the average parcel size has grown by 6%. (Potka p.51-52)

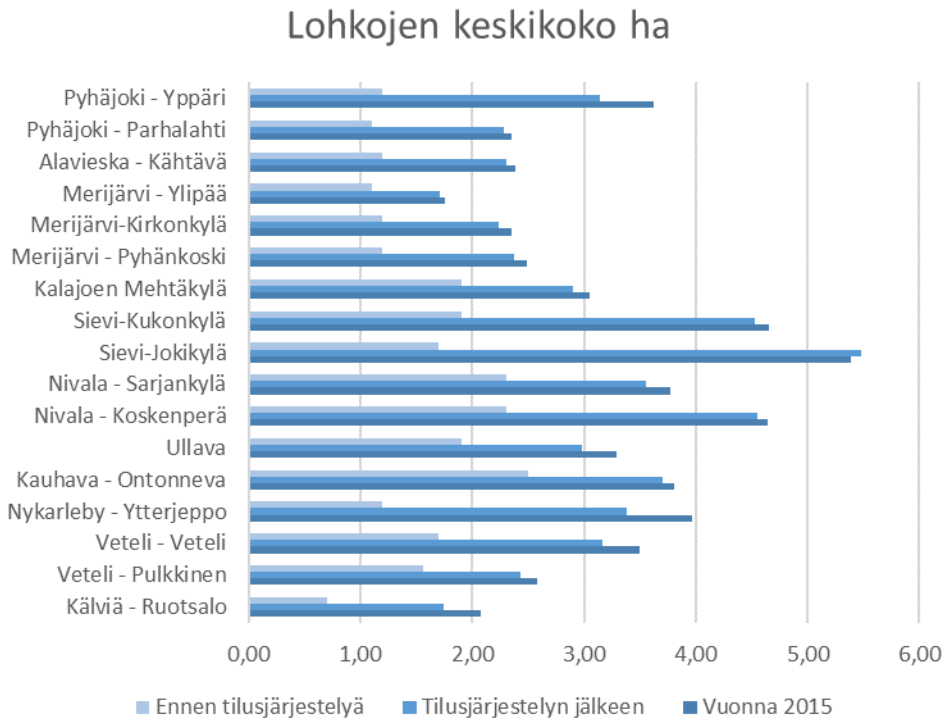

Chart 4. Development of average parcel size before land consolidation, right after and in the year 2015 in areas where land consolidations were completed between years 1996 and 2003. (Potka, p.51)

Investigation of older land consolidations showed that over 100 years have not much changed how cultivated parcels lay in the Finnish countryside (Chart 5). The First World War, Civil War, the Second World War, the collapse of the Soviet Union and Finland's EU membership have not much changed average parcel size, which has remained almost the same in Laihia and Vöyri and has grown only a little in Vaasa and Kaustinen after land consolidation was completed over 100 years ago.

In 2012 NLS Finland surveyed parcel structure and opportunities for land consolidation in all cultivated areas in Finland. One factor of study was the average size of natural parcels, ergo average parcel size that could be reached if only nature would limit the size of a parcel. The survey was done by municipalities. It was found that the natural parcel size in Vöyri was 13.9,

Vaasa 10.1, Kaustinen 9.3 and in Laihia 15.7 hectares (Hiironen, p. 70, 75). Although the old land consolidations areas surveyed in 2015 did not include all cultivated area in those municipalities as the survey in 2012 did, you could argue that possibilities for a much faster increase of the average parcel size were present in the last 100 years by nature, but not in Finnish society.

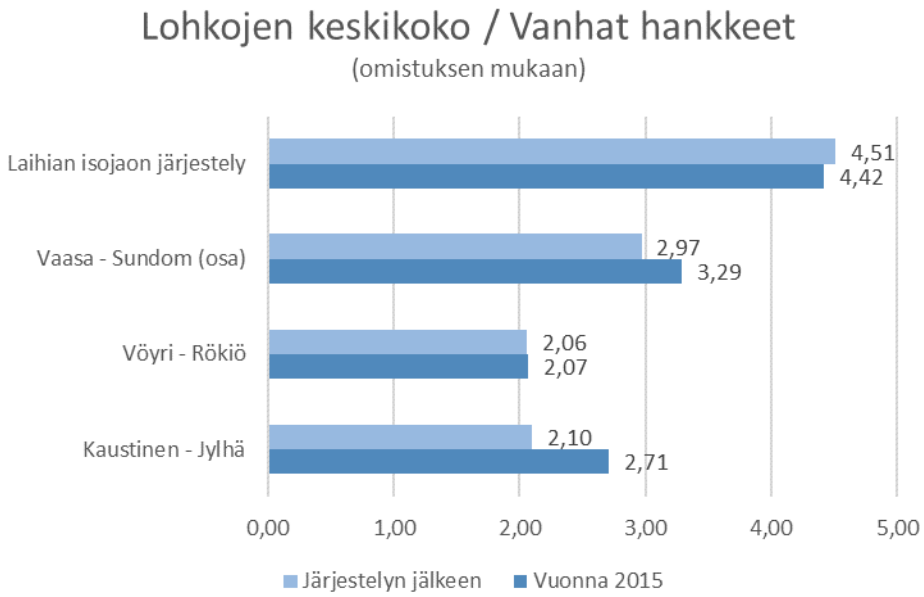

Chart 5. Average parcel size right after land consolidation and in year 2015 in four areas which land consolidation was completed 100 to 120 years ago. (Potka, p. 52)

In four surveyed areas that no land consolidation was implemented, the average parcel size had slightly increased from 2.22 hectares to 2.38 hectares. In light of NLS surveys you could say that land consolidation doubles the parcel size of a cultivated area. In recent history free markets have not managed to reach such performance as land consolidations in the structural development of cultivated land in Finland. You could say that it takes free markets at least 150–200 years to make similar improvement to parcel structure as land consolidation. (Potka p. 53–54)

From Chart 6 you can see the effect of land consolidation compared to areas where it was not done. Last 15 years increase of parcel size is very similar regardless of areas current situation. Average parcel size have increased 6–7%. The survey proved that MAF's belief that the effect of land consolidations on parcel structure might be short term was groundless. At least in surveyed areas the parcel structure remained the same on even improved from the situation right after land consolidation.

While the average parcel size has remained the same or increased after land consolidations, the average distance from farmhouse to parcel has increased in all surveyed areas (Potka p. 53). Therefore you could say that distance is not as stable a variable as parcel size. Undoubtedly the enlargement of the average Finnish farm has played major part causing farming distance to grow.

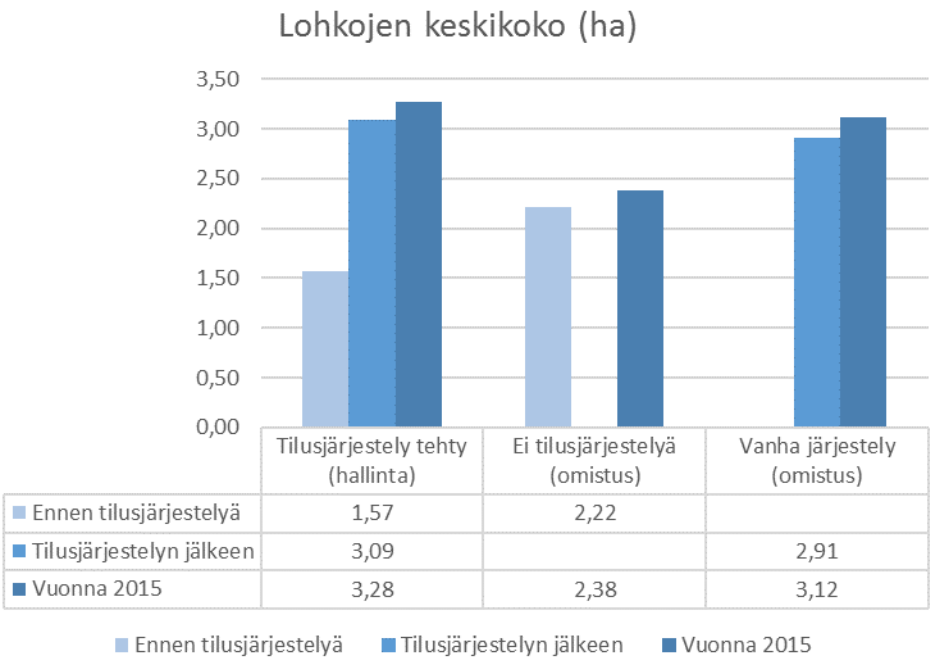

Chart 6. Average parcel size in all surveyed 23 areas before land consolidation, after land consolidation and in year 2015. Columns from left to right: roughly 15 years ago completed land consolidations, no land consolidation and over 100-year-old land consolidation. (Potka, p. 53)

4. INVESTIGATORS PROPOSALS

In his report Timo Potka proposed several different actions that NLS and MAF should take to improve the efficiency of land consolidations in Finland. The first action proposed was improving the knowledge concerning land consolidations. Especially the knowledge of land consolidations in the agricultural and forestry sector must be improved. Also, land consolidations should be integrated into the National Rural Development Program. In recent years land consolidations have remained very land surveyor driven and unattached to rural development. This proposal led to action when NLS established a team to promote knowledge of land consolidations and to participate in the planning of the next rural development program. (Potka p. 78-79)

Traditionally, benefits of land consolidations have been calculated through agricultural cost savings. Other impacts have been forgotten. Timo Potka proposed that social effects of land consolidations should be researched. This proposal led also immediate action when NLS organised project group to survey this in year 2017. (Potka p. 78)

The funding of land consolidations has been in turbulence in Finland. Timo Potka proposed many improvements to clarify funding of land consolidations. Currently drainage works and ditching are supported by two separate funding systems, one for land consolidations and one

for general drainage works. Potka proposed a combination of these two funding systems. (Potka p. 83)

Land Consolidation normally promotes the enlargement of active farms. Timo Potka proposed that this structural development should be supported more vigorously in land consolidations and in general and means to this should be examined. This could be achieved, for example, by more active land banking, taxation relief of agricultural land purchase and promotion of long term leases of agricultural land. In September 2016 these propositions have not yet led any actions in Finland. (Potka p. 82)

Timo Potka also proposed several smaller improvements to land consolidations. Active follow-up, faster start and implementation, simplified traffic of payments, improvements to legislation and funding more suited for EU regulations were proposed to make land consolidations in Finland more efficient. Many of these proposals are now in active preparation at the National Land Survey of Finland. (Potka p. 78-84)

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Use of Multi-Criteria Analysis for the Ranking of Land Consolidation Areas

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Key words: multi-criteria analysis, land consolidation, priority ranking

SUMMARY

In Croatia, as in other post-socialist countries, agricultural land is extremely fragmented. This significantly raises the costs of and impedes agricultural production. The land fragmentation manifests as a big number of relatively small cadastral parcels of each individual land owner. Additionally, the parcels are often very irregular in shape, which hinders an effective application of modern agricultural machinery. Land consolidation procedure, i.e., regrouping and merging partitioned agricultural land into bigger and more regular parcels, and simultaneously arranging road and canal networks, enables a significant improvement in the conditions of agricultural production. An analysis of Croatian official land administration data was made in order to determine land fragmentation and other agricultural indicators.

The basis for conducting land consolidation is the legal framework. Multi annual and annual plans are to specify priority areas for conducting consolidation. These plans should take into consideration the ratio between consolidation costs and benefits from improved conditions for agricultural producers. To ascertain that, it is necessary to determine areas suitable for consolidation and express their qualitative features in a quantitative manner. In this way it is possible to create a system for deciding on priority areas, based on a multi-criteria analysis of spatial data. Most of the necessary data on land and space can be found in the Land Administration System (LAS). However, some of the data was not available as an official, country-wide, data, and other sources of data were used. The base spatial unit for which assessment has been carried out for the whole territory of Republic of Croatia was cadastral municipality. The final result is a complete list of all cadastral municipalities, ranked accordingly to the suitability for agricultural land consolidation. The process of spatial unit's suitability ranking revealed some shortcoming of the existing Land Administration System, which will be further researched and considered within the Croatian Science Foundation Project named: Development of the Multipurpose Land Administration System, goal of which is improvement of efficiency and usability of LAS.

1. INTRODUCTION

Land is the essential limited natural resource. Among the other goods, land resources differ in that they are limited, it cannot be increased or decreased. It has a great importance for economic and social development. It is essential for economic and social activities of every person. It is an income source and therefore interesting for the individual and the state. The increase in the population, especially in recent decades, creates increasing pressure on land resources (Cetl and Prosen 2001). Land has been more and more intensively used and people to the land relations are becoming more complex. In order to use land more efficiently and sustainably its use must be carefully and efficiently governed (Zevenbergen et al. 2015).

Agricultural Land Consolidation is the agrarian-technical operation which aims to group and collect the segmented and fragmented holdings into one or more rounded whole in order to achieve a more rational agricultural production (Medić 1978, Van Dijk 2002, Vitikainen 2004). Land consolidation is a comprehensive procedure that requires careful planning in order to better utilize rural areas (UN FAO 2003, UN FAO 2004). Land consolidation on Croatian territory was carried out in the past, but for a long time there were no such projects. Start of the Land Consolidation procedures on a national level requires preparatory activities in order to determine the priority areas, i.e. areas for which it is assumed that redistribution of land is most needed and there are certain prerequisites for successful agricultural production together with the interests from people and state. This can be done by Land Consolidation Programme which should be done on the basis of measurable indicators, specific to a representative sample.

2. HISTORICAL OVERVIEW OF LAND CONSOLIDATION ON THE CROATIAN TERRITORY

In the Croatian areas, the first consolidation of the feudal estates emerged in the late 17th century as land arondation. Those regrouping was implemented by feudal lords, snatching land from the peasants and the lower nobility which continued into the 18th century. Karl VI prohibited this kind of enlargement of feudal arable land, which was followed by series of similar interventions made by Empress Maria Theresa. Urbarium (comprehensive register of farms) was made for three Counties in year 1756., and for additional three Counties were made by 1780. These registers regulated land distribution among individual peasant's family (Medić 1993).

In year 1902 a new law on land consolidation was introduced. The main features were: facilitated initiation of procedure, accelerated process, the performance of amelioration, Land Book correction, division of land communities and reduced implementation costs. To start a land consolidation it is sufficient to get a consent of the participants fifth who have in total half of the land, and, in exceptional cases, it is sufficient to have a consent of participants tenth and only a quarter of the land in total.

Land consolidation was typically covering the whole cadastral municipality undeveloped area with the possibility of inclusion of neighbouring municipalities' parts. As an advisory body in the process of land consolidation participated land consolidation committee with 4 to 12 members. Half of the members were elected by the participants, and the other half were nominated by the land consolidation authorities from the ranks of small, medium and large

landowners. Land valuation was performed as a land capability evaluation by a professional expert.

The Law on Land Consolidation from December 24, 1954, prescribes land consolidation at the request of interested parties, unless there is a larger hydro-technical, amelioration or road works, or other large objects of general interest. This law is significantly amended on April, 20th 1965 and on February, 23rd 1979. The main feature of this act is a planned approach: land consolidation is based on agricultural and urban documentation and it included re-organization of settlements in the extent necessary to achieve the purpose and objective of land consolidation.

From 1956 to 1980 land consolidation is performed on more than 650,000 hectares in 420 boulders. Most of the land consolidation works (Figure 1) refers to the area of Eastern Slavonia and Baranya (around 60% of total).

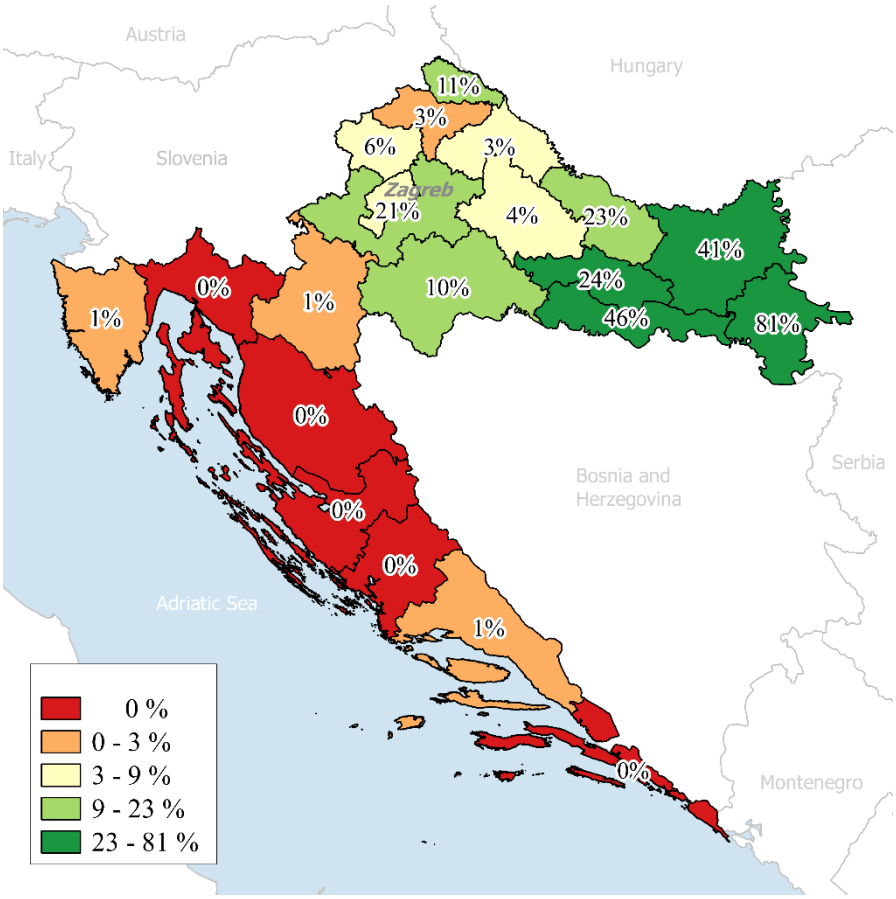

Figure 1. The percentage of land consolidated areas by Counties

3. CURRENT STATE OF CROATIAN LAND ADMINISTRATION SYSTEM

Croatia has approximately 14 million cadastral parcels (Figure 2) and total land area is 56,594 km^2. Many of these parcels records and ownership relations do not correspond to the situation on the field. Land consolidation is impossible to plan and to implement without a good and up-to-date land administration system and other spatial register's data.

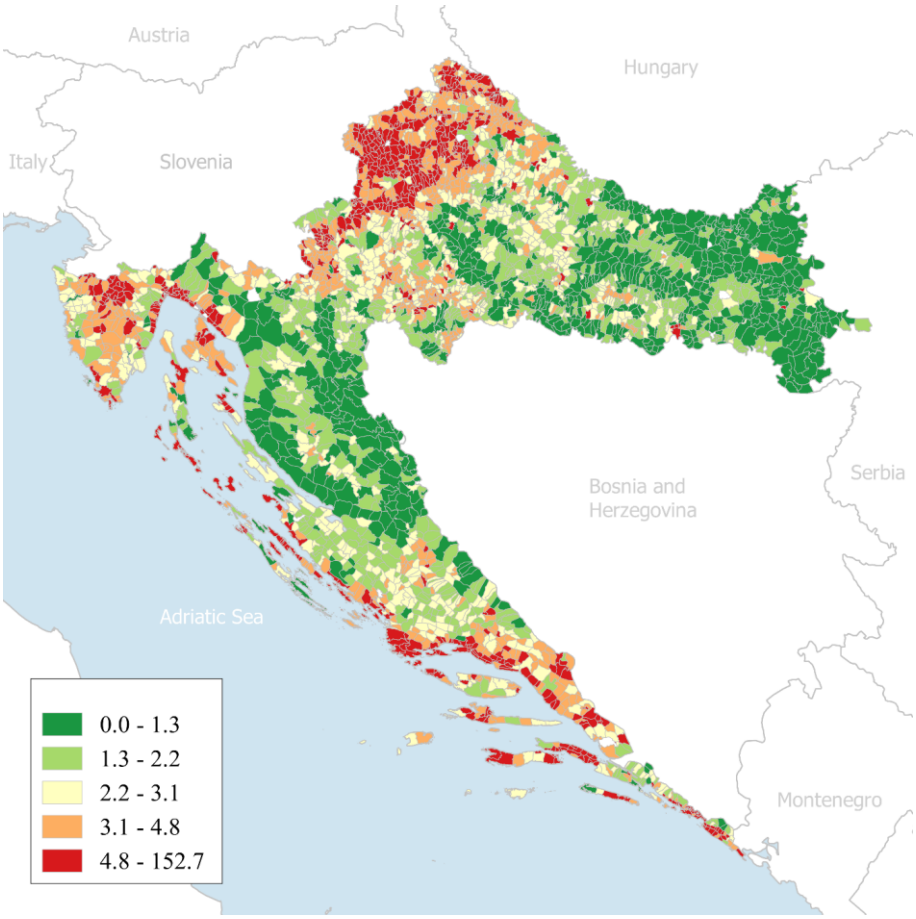

Figure 2. Average number of parcels/hectare

The Land Book is a public register of real and other rights to the property, regulated by the Law on property and other property rights. The fact that land registration is optional represents the biggest drawback because it calls into question completeness and accuracy of the registered data. Due to this, Land Book data cannot be used to determine land consolidation suitability index.

Total agricultural land is registered in the Cadastre. However, many years of lack of maintenance lack together with inappropriate classification makes use of these data questionable. In addition, cadastral records were not available in the form in which it would be possible to use them for suitability analysis. For this reason, for the purpose of priority areas valuation, data on current active agricultural land parcels was taken form Land Parcel Information System (LPIS, Croatian abbreviation: ARKOD).

ARKOD (LPIS) is the national system of agricultural parcels identification which register the agricultural use of land in the Republic of Croatia. The purpose of is to enable farmers to apply for subsidies in agriculture as well as their more transparent use. Agricultural parcels registered in ARKOD are the most reliable data on active agricultural land in Croatia. According to Corine Land Cover (CLC) project data from the year 2012, Croatia has total of 56% of agricultural land (31907 km2) (Figure 3). Of that total, only 33% of agricultural land is currently active (LPIS – ARKOD, 2015: 10679 km2).

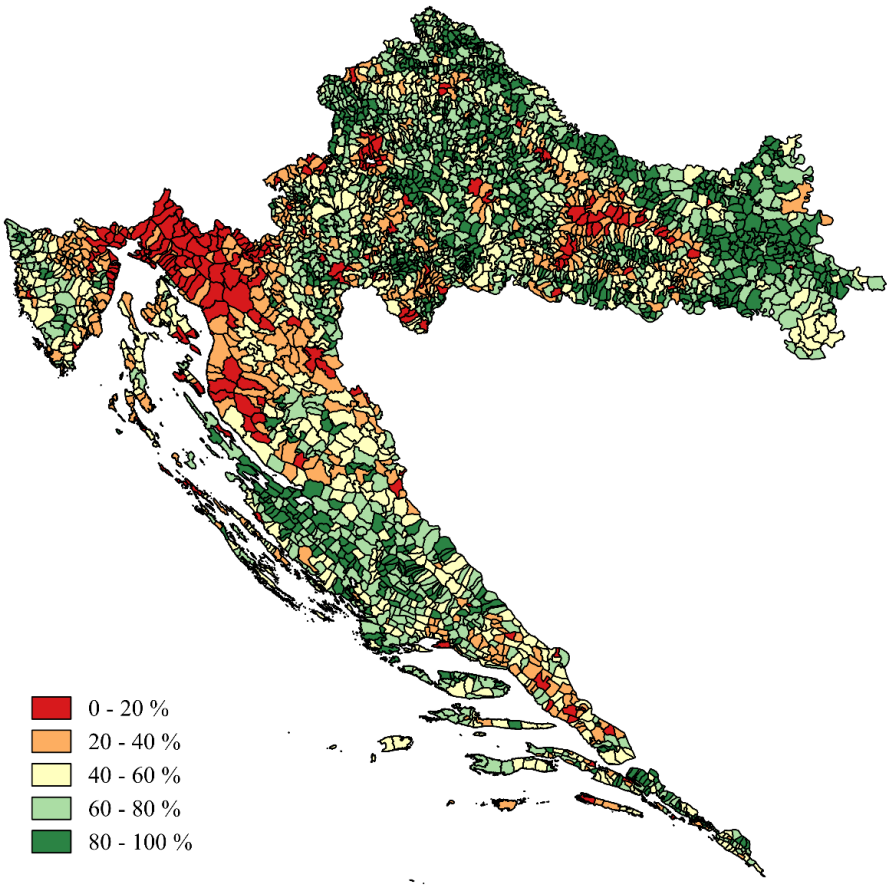

Figure 3. The share of agricultural land by cadastral municipalities according to CLC 2012

4. FACTORS AND METHODS OF PRIORITY AREAS RANKING

A prerequisite of the rural areas and agricultural land development is a rational approach to the ranking of the priority areas for the implementation of land consolidation. Priority areas can be ranked according to many factors. Transparent and rational method, together with the previously known criteria, will help avoid the doubts in impartial ranking of priority areas.

It is generally agreed that the factors of priority ranking in the purpose of agricultural land consolidation can be divided into three main groups:

- existing state of natural and anthropogenic characteristics
- demographic characteristics and social development
- economic feasibility requirements.

According to current Croatian regulations, land consolidation projects will be implemented accordingly to multi-year program adopted by Croatian Parliament, for a period of five years and annual programs approved by the Croatian Government (Official Gazette 51/2015). Based on Act of Land Consolidation, there is a need for analyses of all cadastral municipalities for the purpose of priority ranking.

Factors, for which data were available for all cadastral municipalities, were selected and used to calculate indicators values (Table 1) to form the final Land Consolidation Suitability Index.

Table 1. Indicators used to calculate land consolidation suitability index

Indicator number	Indicator name	Description	Datasource
1	Agricultural land share	Share of agricultural land in total area of cadastral municipality	ARKOD (LPIS)
2	Agricultural parcel size	Average size of agricultural parcel area	ARKOD (LPIS)
3	Agricultural parcel shape index	Average index of parcel shape fragmentation - measure of parcel shape irregularity	ARKOD (LPIS)
4	Agricultural holdings fragmentation index	Average index of agricultural holdings fragmentation	ARKOD (LPIS)
5	Share of state owned agricultural land	Share of state owned agricultural land parcels area in total cadastral municipality area	Agricultural Land Agency (ALA) database
6	Regional development index (RDI)	Composite indicator calculated as a weighted average of more fundamental socio-economic indicators	Ministry of Regional Development and EU Funds
7	Number of agricultural holdings	Number of agricultural holdings in cadastral municipality	ARKOD (LPIS)

For each indicator it was determined how they will be valued and weighed. Depending on the nature of each indicator, determining of their values can be a relatively simple task, but sometimes it can also involve a complex, time consuming spatial analysis, for which it is necessary to create automatic calculating procedures. One of the most challenging indicators to determine was Agricultural holdings fragmentation index (Indicator 4), which evaluate the form (compactness) of agricultural holdings (Figure 6) in each cadastral municipality. The analysis calculates this index as the average value (median was used) of each holding fragmentation index, which is calculated as ratio of minimum polygon area which covers all the agricultural parcels of one holding in one cadastral municipality (Figure 7), divided by total area of holding's agricultural parcels.

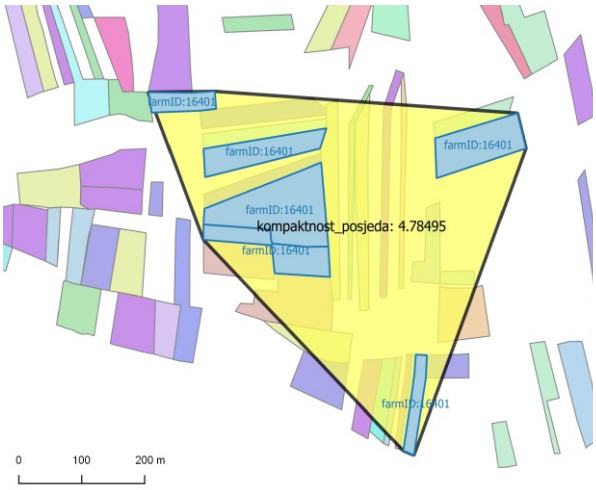

Figure 4. Example of Indicator 4 polygon area for one farm holding

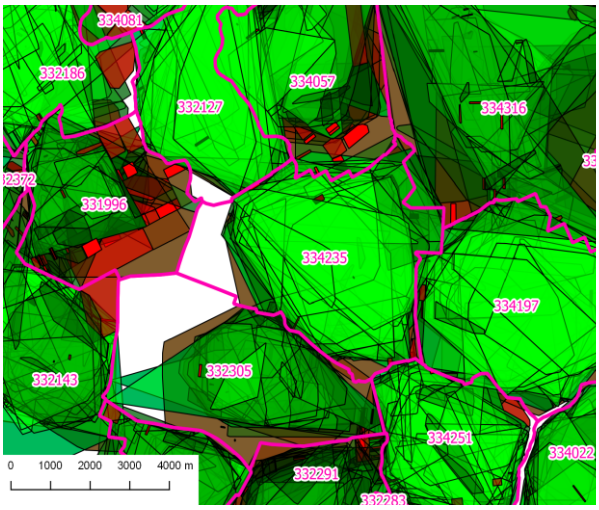

Figure 5. Farm holding polygons used to calculate Indicator 4 value

Based on all calculated indicator values, it is possible to determine the value of land consolidation suitability index – LCSI. The value of this index is determined in a way that all indicator ranges were normalized to range from 0 to 1 and then used to combine in order to calculate LCSI. The value of this index gives indexed measure of impact of all included indicators (Table 2). The higher value of LCSI means that the related cadastral municipality is more suitable for agricultural land consolidation (Figure 4).

Table 2. Final Rankings of Cadastral Municipalities

No.	CM_id	CM_name	LG_name	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5	Indicator 6	Indicator 7	LCSI
1	302775	Belica	Belica	0,799	0,181	0,902	1,000	0,068	0,750	0,527	4,227
2	308927	Krndija	Punitovci	1,000	1,000	0,155	0,027	1,000	0,750	0,023	3,955
3	334103	Grabovo	Vukovar	0,982	1,000	0,202	0,031	0,960	0,750	0,009	3,934
4	302996	Gardinovec	Belica	0,877	0,160	0,979	0,400	0,160	0,750	0,600	3,926
5	316849	Sesvete Ludbreške	Sveti Đurđ	0,919	0,156	0,693	0,508	0,205	0,750	0,673	3,903
...	...	...	...	...	...	...	...	...	...	...	...
3370	335266	Črnomerec	Zagreb	0,0000	0,0000	0,0000	0,0000	0,0005	0,0000	0,0000	0,0005

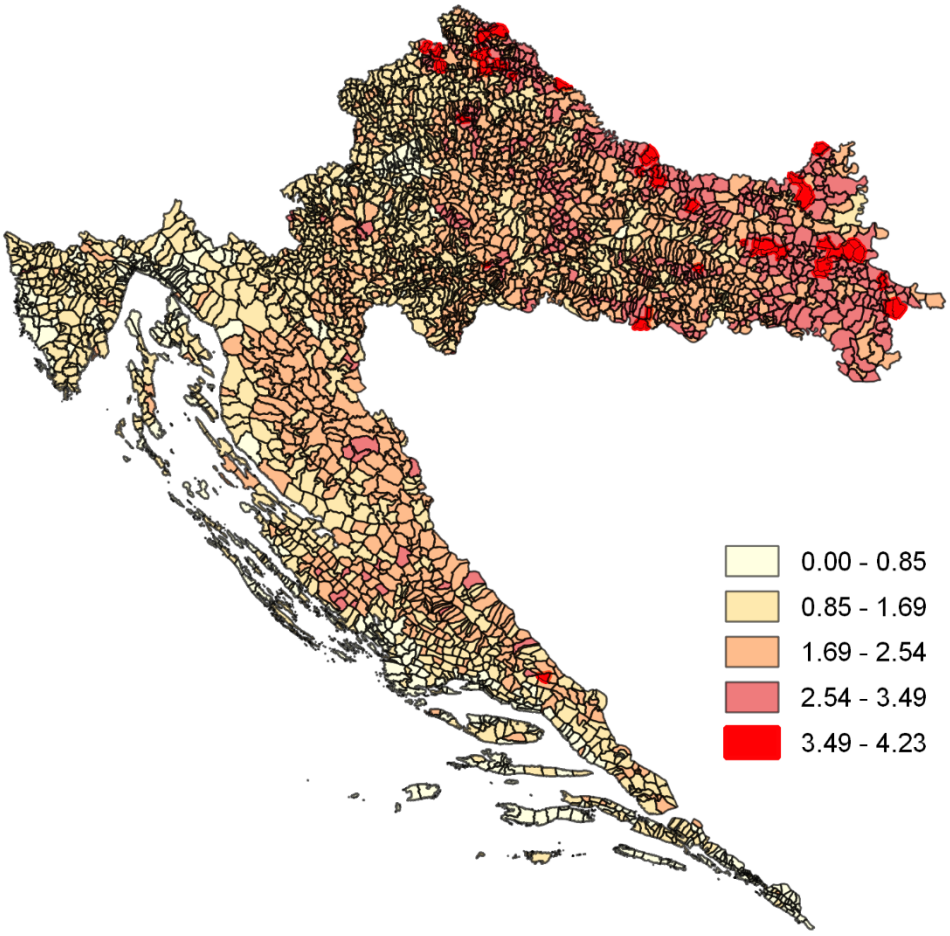

Figure 6. Thematic map of Cadastral municipalities LCSI values

For the needs of this project, normalized values of individual indicators were combined in a way that all the indicators values are simply summed (Figure 5 shows LCSI values distribution). Manual visual inspection was used to check the determined results and it showed that proposed ranking results are satisfactory and that they reflect the actual situation. However, for building of more complex combination and including weight impacts of each indicator it would be more suitable to use some of the currently available tools for multi-criteria analysis (some QGIS plugins were tested in project preparation phase). These tools allow easier and more effective setting of each individual indicators significance, thus changing the ranking results.

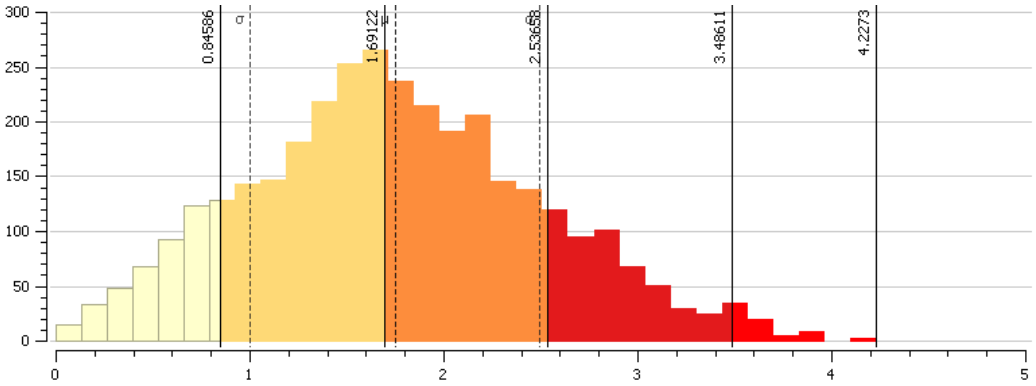

Figure 7. Cadastral municipality LCSI values distribution

5. CONCLUSION

In creation of a proposal for the cadastral municipalities priority ranking it is possible to use international experiences with respect to Croatian specifics.

The LCSI was calculated for each Cadastral Municipality based on selected individual indicators. These indicators included: share of agricultural land, size and shape of agricultural parcels, the distance between parcels of each holding, the number of possible land consolidation users, regional development index (RDI) and the share of state owned agricultural land.

Selection and calculation of used suitability indicators were strongly conditioned by the availability of the required data. Some of the important datasets were not available or were not available in a form suitable for automatic data processing. However, it is possible to evaluate that the set of available data was sufficient and representative to give a reliable priority ranking list. Of course, by including some additional data (e.g. accurate data on inactive agricultural parcels obtained from Cadastre) which have not been available, the result could be improved.

Tre proposed ranking contains the technical indicators and it is a good basis for the development of land consolidation program. Together with local community, from which it is possible to collect other indicators (e.g. interests for land consolidation…), sustainable agricultural land consolidation program can be made.

ACKNOWLEDGEMENTS

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Financial arrangements in land consolidation

A visual method for valuation explained

Gerjan Meijer, Nyncke Emmens

Key words: Financial arrangements, funding, valuation, cost of land land consolidation

Summary

Rural land consolidation projects can be diverse in their objectives. Some aim only at improving farming conditions for a few farmers. Other projects aim to improve infrastructure or to create new nature reserves. Often projects have multi-purpose goals. With these multipurpose goals more parties benefit from the result and in these kinds of complex projects the role of the government is substantial.

In The Netherlands there are two types of land consolidation as described in the Dutch rural development act (Wet Inrichting Landelijk Gebied; 2007). The two types are voluntary re-allotment and formal land consolidation. Next to the big difference of being voluntary or mandatory there is also a big difference in the complexity of legislation and guidelines about financial arrangements.

In this paper we aim to explain how the financial arrangements are made and determined. The Dutch rural development act (Wet Inrichting Landelijk Gebied; 2007) defines the two different types of land consolidation and its procedures. Next to an elaboration about the practice in the Netherlands of funding land consolidation projects this paper will focus on the method used. The method used ensures that the costs are divided in such way that those who benefit more from land consolidation pay more than those who do not. The framework for dividing cost is set in the rural development act. The method is based on experience.

As Vitikainen stated in his Overview of Land Consolidation in Europe: “a task of its own is the valuation of the benefit falling on the landowners. The objective of such valuation is to determine the final benefit for each property or functional unit according to which the landowners will participate in the costs caused by the procedure” (Vitikainen; 2004).

There are 2 types of cost. 1. Costs of the procedure and 2. Implementation costs (Vitikainen; 2004). These implementation costs can be subdivided into costs for measures which are beneficial for all and costs made for measures that only benefit the interests of a specific farmer. The valuations of benefits are to divide the costs of implementation.

Public goals are mostly being funded by the (local) government or organisations such as waterboards. A water retention area for example, is a public necessity and benefits all citizens, even citizens outside the land consolidation area. There are also measures that only benefit participants within a land consolidation area. For example the building of new

agricultural roads. That part of the project costs must be paid by the participants together. An example of a benefit for a specific farmer is farm enlargement. These cost are for the farmer.

To determine the benefits and valuate these, the subjective term “improvement” has to be objectified through a valuation method. The method used in the Netherlands takes 4 themes in account to measure “improvement”. An independent commission determines for every farm holding the improvement rate due to re-allotment. This commission will do this visually, with reference to examples. The whole farm holding is given a classification. The classification determines eventually what percentage of the project implementation costs must be paid.

Financial arrangements in land consolidation

A visual method for valuation explained

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1. Introduction

The last phase in a formal land consolidation progress in the Netherlands is the financial arrangement (figure 1). When the reallotment plan is definitive and the deed has been signed the calculation of costs ca start. The method used is part of the legislation of the Dutch rural development act (Wet Inrichting Landelijk Gebied; 2007). The procedure is almost the same as it was in de former Dutch rural development act (Landinrichtingswet; 1985). Only the way to payoff is changed. In the old act the costs where imposed on the property. The owner could pay the costs in 26 years off, with 6% interest rate. In the current legislation the landowners have to pay the costs all at the end of the procedure.

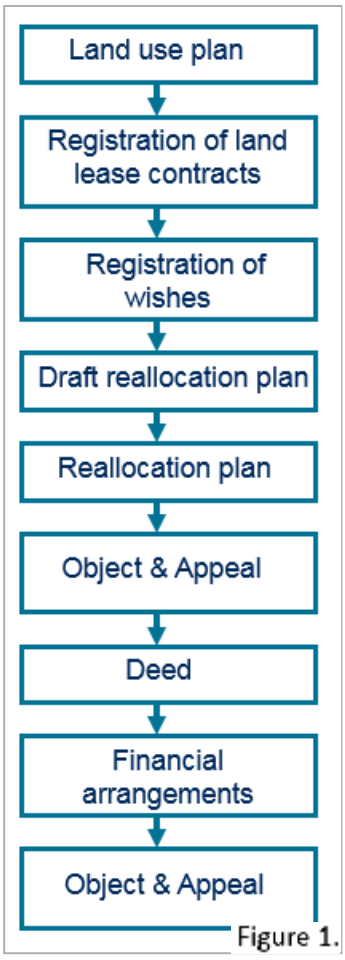

Figure 1.

There are two types of costs. The first are financial settlements. These are costs that are the result of the exchanges. For example costs for increasing property area or improving of soil quality. When a landowner gets more or less property due to land consolidation he will have to pay or has to be compensated. In chapter 4 are more examples listed.

The second type of costs are procedure and implementation costs. These are the costs that will contribute to the landowners in the progress. The amount of these costs will depend of the project costs in total. The landowners who benefit more from the land consolidation pay more than those wo do less. The benefits of allotment have to be valuated. In the Netherlands this is done by an independent commission.

2. Funding and cost allocation in landconsolidation

When a land consolidation project is started, you have to define the goals. In early days agriculture was the main objective. The perspective on this objective of the landowner is often reduction of production cost. From the perspective of government often an optimally food production. Nowadays also other objectives and goals are the reason to start a project. Goals can be the realisation of nature reserves, water retention or infrastructure. Often it is a combination of multiple targets.

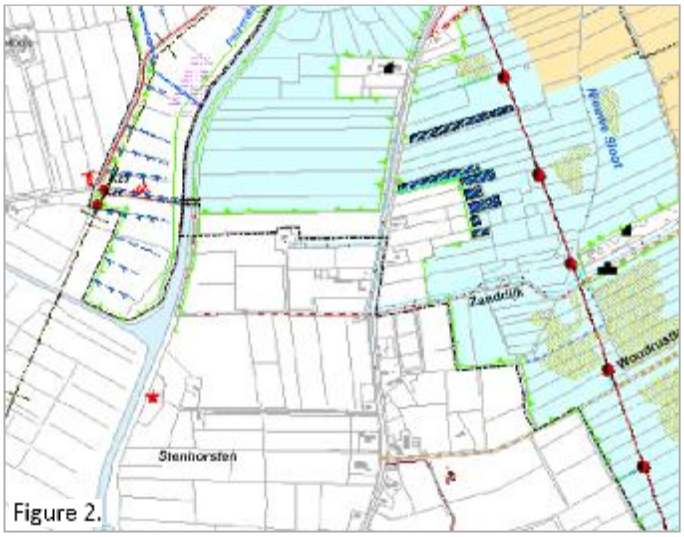

Figure 2.

Figure 2 shows a piece of "Herinrichting Peize". In this project there were multiple goals: agriculture, water retention, nature and recreation (biking and hiking trails and viewpoints).

The principle of "those who benefits more, pays more" also translates to the goals. If the only goal is an agriculture one, only the farmers have to pay. When a water retention area or nature reserve is realised, the waterboard or nature organisation also have to take their part in the costs. When there are multiple goals there is an advantage that you can split the costs. Another advantage is that there are also several possibilities to grant. For example in the "Herinrichting Peize" the farmers had to be compensated for the construction of water retention. Measures that are necessary for this compensation, for example draining, are also on costs of the waterboard. In the Herinrichting Peize the joint owners had to pay €500.000,- of all the measures The total work is budgeted throughout the project is € 20 million.

3. Legislation of financial arrangements

In the Dutch rural development act (Wet Inrichting Landelijk Gebied; 2007) is defined which procedure must be followed. This procedure is defined the rules for the government and for the private persons.

Before starting the financial arrangement you have to make a financial overview of the costs which are made in the project, the costs you are expecting to make and the financial benefits (for example grants). The expecting costs must be a good estimate of these costs. If too many assumptions you can make any good cost estimate yet. Most of the work had to be performed. The Provincial Executive making up this calculation estimation. This calculation also follows what part should be contribute by the joint landowners. Not for the individual landowner.

Before you start the further procedure there are rules to make how you divide the costs. The legislation gives some standard rules, but there are opportunities to deviate from these rules. The land consolidation commission is responsible to make this rules.

A standard rule is for example the factors that make the improvement: farm building parcel, less parcels on distance, the shape of parcels and the distance to the holding. Rules you can change, or omission are for example the financial settlements. Some projects offset financially electricity pylons, because you cannot make full use of your land. Other projects don't offset the pylons, because landowners receive annual compensation of the energy companies. The Provincial Executive must adopt these rules. With these rules an independent committee determines the improvement of the commission is a group that is familiar with the area in which the land consolidation project takes place. The results of this estimate, a list of landowners rated by class of improvements are recorded and processed by Cadastre. The Cadastre makes a list of all costs (process and improvement costs and financial settlements) for every landowner in the project. The data will be deposited for public inspection. The landowners have the opportunity to submit an objection. The land consolidation commission will hear the persons. The commission will make a decision and the Cadastre makes possible changes in the calculation. If this changes are made, the commission sending the financial arrangements to the Provincial Executive. The Provincial Executive shall adopt and submit them again for public inspection. Landowners who had previously lodged an objection may submit an objection to the court if they disagree with the decision of the Provincial Executive. The court ultimately makes a decision. After that there is also the possibility to go to the Supreme Court, the last possible way to objection. If all objections are resolved, or have a judgment the final bill will be made. The Provincial Executive sent every landowner that have to pay the bill. Landowners who gets money in the process will be paid.

4. Financial settlements

The financial settlements are transfer charges between landowners arising from the exchange process. It only can be costs directly resulting from the exchanges. The landowners are not paying this to each other, but are paying this to the project. The project is paying this back to the landowners who have disadvantage of the exchange.

Two types of charges are always settled: The differences in surface and the quality of the soil. Some landowners getting more property, some will get less. These transfer charges are equal on the market prices. These market prices are based on their productive capacity. The better the quality of the soil, the more you can grow. The quality of the soil is had already been determined before the procedure of the reallocation plan based on soil maps.


Figure 4. Example of an electricity pylon

Next to the loss or gaining of land acres and the quality of soil there are more values that could be settled. Electricity pylons for example are always placed on a parcel of a private landowner. If the property exchanged in the land consolidation you can make a settlement for it. The former landowner don't have any problems anymore with this parcel. The new owner didn't have this parcel in his property, now he has. It's not only inconvenient to cultivate the parcel. The electricity companies should always get to the pylon when needed. Some projects don't make this settlement, because there are annual fees from the electricity companies. If you're going to settle this you have to fix this in the rules. Also the level of compensation should be set in the rules. Some other examples of settlements are:

- Damage by shadow: if a parcel lays next to a forest there is a possible shadow damage for agriculture crops. Of course, this depends on the side where it is in relation to the position of the sun.
- Root development: if there are large trees near parcels there is a possible problem with drought.
- Buildings or other stalling: sometimes there is a building, shelter or manure basin on a exchanged parcel. In the Dutch legislation it is only possible on voluntary basis. The settlement is determined by an independent valuator. The new owner has to pay the cost, the former owner gets the compensation for losing this building.

5. Procedural and implementation costs: factors

The procedural and implementation costs are the costs that landowners have to pay for the process of land consolidation. Most of the landowners are agricultural businesses. As stated in 2, farmer's objective is often a reduction in production cost. They have an economic interest in a better editable parcels. In rural development act there are four factors determine that are taken in account when valuating the improvement / benefits of a farm:

- Farm building parcel enlarging
- less and larger parcels on distance
- The shape of the parcels
- Distance to the farm building parcel

Not all factors are equally important, it depends on the project. Every landowner will get a rate based on the 4 factors. The higher the score, how more there have to be paid.

5.1 Farm building parcel enlarging

Especially dairy farmers benefit from a large farm building parcel. In order to be able to milk efficiently the farmers want to keep the livestock near the holding. The committee rates the landowners on this factor. In an area with many dairy farms these factor of enlarging the home parcel will be valuated as more important than the other factors.

5.2 Less and larger parcels on distance

Unlike the dairy farmers, the arable farmers don't need big home parcels. They are primarily served by larger and less parcels. The quality of the soil is more important than the distance. To measure made due to landconsolidation parcels are counted is before and after the reallocation. In an area with most arable farmers this factor will be valuated as most important.

5.3 The shape of parcels

Each farmer benefits from a good shape of the parcel. Especially with the increasing of agricultural vehicles right angles are important to work efficient on a parcel. The more angles you have, how more difficult it is to work on the field. Triangles are even more difficult to work on..

5.4 Distance to the holding

When parcels are closer to the building you need less fuel and it takes less time to work on the land. Every farmer benefits from parcels closer to their holding. All the land close to the farm building parcel is the most prefect situation, especially for dairy farmers.

5.5 Calculation per owner

When all the factors are valuated an overall score can be determined for every owner. Class "0" is always "0" points per hectare. Class "1" is for example "1" point per hectare. Class "4" is in this example "4" points. So a farm with 30 hectare property and class "2" gets overall 60 points. You can make a system of higher pointing ratings, if the ratio remains the same.

5.5 Calculation overall

As explained, in the end every landowner gets points. These points are added up. When the costs of the land consolidation are divided by the total points you get the value of a point. And then you can calculate how many every landowner needs to pay for the land consolidation.

6. The method Visually determining the improvement

Figure 5.

To visually determine the improvement due to the reallotment, there are model classes. That are examples that show the classes . Class "0" means no progress. In most of the projects class "4" is the highest. In order to classify a farm, examples are given to the classifiers. With this visual method the commission can compare and rate the farms.

In the project "Herinrichting Peize" an example of all factors was made. In the figure 5 the 5 classes for less and lager parcels on distance. In green you see the farm building parcel. In blue is the situation before the reallotment. In red you see the situation after the reallotment. Class "0" there is no progress, there are still four parcels on distance. Class "4" is the maximum progress that be can made, no parcels on distance anymore. All parcels are near the farm building parcel. In the appendix you see all examples of the factors.

7. Examples from project Peze

Here there are two examples from the "Herinrichting Peize". farm building parcel enlarging (40%) and less and larger parcels on distance (40%) are the highest rated factors which determine the rate of improvement. The shape of the parcels (10%) and the distance to the holding (10%) are less important.

In blue there is a reproduction of the ownership before the reallotment. In red there is a reproduction of the ownership after. The four factors were rated as:


Figure 6. First example from the Herinrichting Peize

- The farm building parcel is not enlarged. So this is classified as a class "0".
- There are less parcels on distance. This example is equal as class 2.

- The shapes of the parcels are a bit better, because there are fewer angles. The parcels in the west are not ideally because of the triangular. But is it better than before? The committee thought that class “3” would be realistic.
- The property is a bit closer to the holding. So it will be a class “1”.

Overall scores this holding 1,2 for the improvement. But we work only with whole numbers. So overall it will be a class “1”.

In the second practice the blue is again before and in the red you see after the land consolidation. The farm building parcel is the most eastern parcel.

Figure 7. Second example from the Herinrichting Peize

- The farm building parcel is enlarge enormous. This can only be Class “4”.
- There are no parcels on distance anymore. So also for this factor is Class “4” righteous.

- The shape of the parcels are better, but not best. So suffice in Class “2”.
- The distance is maximum improved, so Class “4”.

The overall score is 3,8, is rounded to “4”.

8. Conclusions and discussion

The financial arrangement in the Netherlands is based on a ratio of progress. The progress will be assessed by an independent committee. But it remains an estimate. Would a calculation based on using maps, with for example a Geographic Information System (GIS) not be more accurate? The answer is yes, but that’s exactly the problem.

Making an financial settlement based on calculation would be more work than an estimate. The project costs will be higher in preparation. And probably also in a later stage of the progress. In the legislation of the Netherlands is the possibility to make an objection against the Financial Arrangement. When the calculation is to precise the landowners probably making more objections to details. The result will be that there are several more objections will be made.

Many land consolidation projects chose not to estimate all factors parted. Landowners getting directly a class, based on the opinion of the committee. That’s also allowed in the legislation. In the land consolidation “Herinrichting Peize” they have chosen to estimate all factors and thus determine the total progress. There were two reasons for this system in this land consolidation:

- It gives landowners a better understanding of how the committee came to this class. It is easier to understand why they are still have to pay for the improving.

- Because it is more transparent than the other system less objections were expected. They succeeded. In this process there were 60% less objections than in other similar land consolidations.

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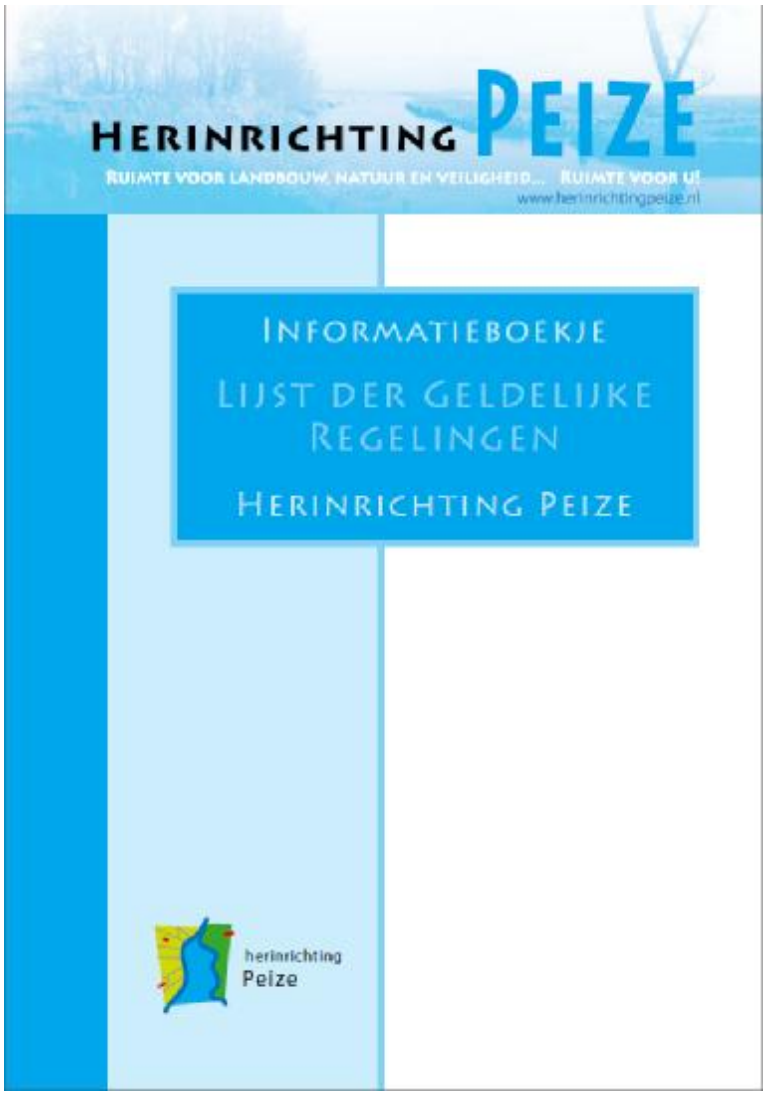
Appendix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Less and larger parcels on distance

farm building parcel enlarging

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The shape of parcels

Evaluating regional impacts of land consolidation projects

Pauliina KRIGSHOLM, Juhani KESKITALO, Kirsikka RIEKKINEN, Juhana HIIRONEN, Karin KOLIS, Finland

Key words: Land consolidation, Input-output model, Regional impacts

SUMMARY

The impacts of land consolidation projects have traditionally been assessed from the agricultural point of view. Also ecological and traffic-related aspects have been increasingly covered during the past decades. The impact of land consolidations on regional economic development, however, is a less examined topic. In this study we present two land consolidation cases from Finland and evaluate their regional economic effects (at NUTS-3 level) by using an input-output (IO) model.

Regional IO models provide multipliers that can be used to estimate the economy-wide effects that an initial change in economic activity, in this case a land consolidation project, has on a regional economy. We analyze both the impacts of costs and benefits of land consolidation projects. In the first case project, Sievinkylä, the immediate revenue impacts of the costs were €2.245.000 and the employment impact were 15 person-work years. The wages paid for households were €614.000, indirect impact on businesses was €555.000, indirect multiplier impacts on households were €173.000 and on businesses €269.000. The effect of multiplier impacts on employment was 5.8 person-work years. In the second project, Yli-Kannus, the immediate revenue impacts of the costs were €1.019.000 and the employment impact were 7.6 person-work years. Indirect impacts on household wages were €318.000 and €276.000 on businesses, with an employment impact of 3.2 person-work years in businesses. The multiplier impacts on households were €89.000 and on businesses €198.000.

As to the land consolidation benefits, the total annual impact in Sievinkylä was estimated to be €209.000 and in Yli-Kannus €158.000. There is great uncertainty in interpreting the benefit impacts, which results from the fact that these benefits are partly formed by the cost savings. Therefore the sign and magnitude of the benefit impacts on regional economic development remains unclear. In addition, we note that in the future IO modeling could be utilized when determining the state's part in land consolidation costs. For this application, instead of regional, the calculations should be conducted at national level.

Evaluating regional impacts of land consolidation projects

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1. INTRODUCTION

The first prerequisite of a land consolidation project in Finland is its profitability. In order to ensure that the benefits outweigh the costs of a project, potential land consolidation areas are evaluated with a special application (called UJ-Hyöty) developed by National Land Survey (NLS). During recent years, discussion has shifted towards potential wider regional impacts of land consolidation projects. In general, policy makers are increasingly concerned about allocating public capital spending on productive targets. Public infrastructure investments, for instance, are regularly evaluated based on their wider economic impacts.

Many earlier studies have examined agricultural (e.g. Hiironen and Riekkinen, 2016) and environmental effects of land consolidation projects. The aim of this study is to assess the regional economic impacts associated with implementation of land consolidations. Particularly, we focus on modelling: 1) total regional effects, 2) direct multiplier effects, and 3) indirect multiplier effects.

To our best knowledge, this is a first study to evaluate regional impacts of land consolidation projects with input-output models. Due to shortage of previous studies, we draw inspiration mainly from other domains. For example regional impacts of tourism (Huhtala et al., 2009), infrastructure projects (Honkatukia and Törmä, 2007; Laakso and Kostiainen, 2009) and forestry (Vatanen, 1992) have been studied earlier with Finnish data.

2. THEORETICAL FRAMEWORK AND DATA

2.1 Input-output framework

In this study we employ the widely acknowledged input-output (IO) framework (see Miller and Blair, 2009) for estimating regional impacts of two land consolidation projects. Case study areas are located in Central Ostrobothnia and in Northern Ostrobothnia, regions with total 69 032 and 410 054 inhabitants, respectively, by the end of year 2015 (OSF 2016). IO methodology draws upon an inter-industry transactions matrix that compiles observed economic data for a certain region. A starting point is a coefficient matrix that presents the economic linkages that exist between the industries within the local economy. The coefficient matrix *A* is formulated by:

$$A = z_{ij} \big/ x_j , \qquad (1)$$

where z_{ij} is the input purchased from industry *i*, by industry *j*; and x_j is the total output of the industry. How the outputs of industries become inputs for other industries which produce goods and services for consumption in final demand, is the principal question. For this purpose, we connect industry output with final demand through the Leontief inverse (Leontief, 1936):

$$x = (I - A)^{-1} f = Lf, \quad (2)$$

where *x* is a column vector of industry output, *I* the identity matrix, *A* the technical coefficient matrix, *f* a column vector of exogenous final demands, and *L* the Leontief inverse matrix (also called the total requirements matrix). The economic linkages are quantified in the Leontief inverse. These linkages or "ripple effects" can be further divided into direct and indirect multiplier effects. A change in final demand for the output of a given industry is an example of direct effects. By indirect effects we refer to the interindustry activity that occurs as industries increase or decrease in order to produce the inputs demanded by the initial industry.

In the context of our study, the above presented model developed by Leontief is not feasible. In that model, part of the industries produce only intermediate products. Instead we use so-called *total output model* that estimates total outputs of industries in a similar way but instead of end product units we focus on total output units. For total output model, we need so-called *total flow* (TF) matrix, which can be obtained by dividing the columns coefficients of matrix *A* by the diagonal coefficients. Thus,

$$TF = \begin{bmatrix} \frac{\alpha_{11}}{\alpha_{11}} & \cdots & \frac{\alpha_{1n}}{\alpha_{nn}} \\ \vdots & \ddots & \vdots \\ \frac{\alpha_{n1}}{\alpha_{11}} & \cdots & \frac{\alpha_{nn}}{\alpha_{nn}} \end{bmatrix}$$

It is good to be aware of some of the obvious limitations related to IO methodology. First of all, we are bounded to structural limitations associated with static production functions. In other words, we assume that all production relationships within an economy remain constant and that industries will demand a constant proportion of inputs in order to produce outputs. Second, without the use of simulation, an IO model only produces a single outcome: a scenario in which all positive expectations are realized (see e.g. Hendricks et al., 2016). In addition, there are major data limitations associated with using input-output tables for small-scale regions. For instance, in our case the last time regional level IO tables were produced by Statistics Finland was in year 2002. Obviously the world is not the same anymore as it was fifteen years ago. Consequently, we are forced to use estimated regional IO tables[1].

[1] We do not estimate regional IO tables ourselves. Instead, the necessary data was received from Vatanen (2016).

2.2. Division of regional impacts

Figure 1 presents the conceptual framework of regional impacts in the context of land consolidations. To make it clear, *direct economic effects* are the ones that originate from initial purchases of goods and services. For example ordering an underdrainage plan from a local entrepreneur forms a direct effect on regional economy. *Indirect economic effects* are born when firms that receive direct income from the project (e.g. the planning company) make purchase goods and services from other firms. On top of direct and indirect economic effects, the initial costs also create so-called *induced economic effects*. They are born when households employed by the project (or investment) buy goods and services. It is worth noting that by construction, the IO method assumes that part of the induced economic effects 'spillover' to nearby regions[2].

In what follows, indirect economic effects and induced economic effects together are referred to as *direct multiplier effects* (the yellow box in Figure 1). *Indirect multiplier effects* are ripple down effects from subcontracts (the blue box in Figure 1). As together they form the *economic multiplier effects* (the second largest box in Figure 1). Finally, when we combine direct economic effects and economic multiplier effects, we have the total regional impacts.

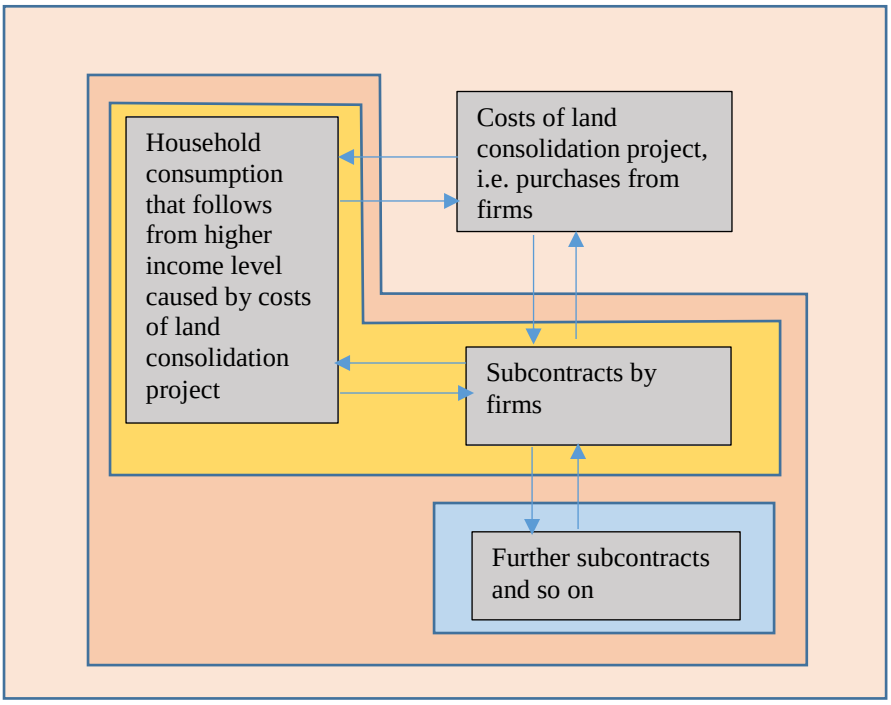

Figure 1 Conceptual framework of regional impacts in the context of land consolidations.

2.3. Data

Our main data sources are cost information of case projects (data received from NLS) and regional IO tables (received from Vatanen, 2016). Some general characteristics of case projects is collected in

[2] Only in a closed economy all induced economic effects would fall on the region itself completely.

Table 1 Case project characteristics

Project	**Sievinkylä**	**Yli-Kannus**
Region	Northern Ostrobothnia	Central Ostrobothnia
Total land area	2 000 ha	1 300 ha
Cultivated land area	1 500 ha	892 ha
No. of landowners	150	70
Main industry	Agriculture	Agriculture

Allocating costs and benefits of land consolidation projects to different industries can be seen as a starting point of regional impact evaluation. We use Standard Industrial Classification (TOL 2008) provided by Statistics Finland (OSF 2008) for this purpose. Costs are not estimated but rather present actual realized costs from the case projects. Costs included in analysis are summarized in Table 2. Sources of cost can be divided into four main categories: underdrainage, drainage, roads and costs of proceedings. In total, costs are allocated to eleven different industrial classes.

Table 2 Costs included in input-output calculations

Source of cost	**Segment**	**Industrial class**
Underdrainage	Drainpipes	Manufacture of chemicals and chemical products
	Underdraining	Construction
	Gravel delivery	Transportation and storage
	Taking of gravel	Mining and quarrying
	Planning and pile driving	Professional, scientific and technical activities
Drainage	Drainpipes	Manufacture of chemicals and chemical products
	Draining	Construction
	Gravel delivery	Transportation and storage
	Taking of gravel	Mining and quarrying
	Planning and pile driving	Professional, scientific and technical activities
Roads	Concrete/cement	Manufacture of building materials
	Excavation work	
	Junction permissions	Public administration and defence
	Timber	Manufacture of wood and products of wood and cork
	Culvert pipes (plastic)	Manufacture of rubber and plastic products
	Culvert pipes (metal)	Manufacture of fabricated metal products.

	Gravel delivery	Transportation and storage
	Taking of gravel	Mining and quarrying
	Filter cloths	Manufacture of textiles
	Planning and supervision	Professional, scientific and technical activities
Cost of proceedings	Meeting room rents	Other real estate services
	Boundary marks	Manufacture of fabricated metal products.
	Work compensation	Professional, scientific and technical activities

Presenting the benefits of land consolidation projects is somewhat more challenging than presenting the costs of projects. We estimate benefits by using an application developed earlier at National Land Survey (NLS). Benefits are examined with three different capitalization horizons, namely with one-year, twenty-year and thirty-year timeframe. The discounting rate is five percent in all calculations. Though it is possible to identify several type of benefits (see Table 3), only agricultural benefits and benefits related to operational preconditions (draining etc.) are included in the analysis. This is mainly due to the fact that other benefits are hard to quantify and allocate to certain industrial classes.

Table 3 Benefits included in input-output calculations

Type of benefit	**Included (yes/no)**	**Industrial class**
Agricultural benefits	Yes	Agriculture, forestry and fishing
Transportational benefits	No	
Draining etc. benefits	Yes	Agriculture, forestry and fishing
Ecological benefits	No	
Social and regional benefits	No	

3. **RESULTS**

3.1 Immediate effects of land consolidation projects

The IO model is not needed for the calculation of immediate effects. Immediate effects occur *during* the cadastral procedure. In Table 4 we present cost shares of cadastral procedure for both case projects. Furthermore, we allocate costs to industrial classes and present their employment effects in Table 5. The cost structure of both projects is fairly similar. Also the

cost allocation pattern seems to be uniform. We cannot make any definite conclusions from that observation though. This can be simply a coincidence or result from the fact that our two regions, Northern Ostrobothnia and Central Ostrobothnia, are neighboring regions with very similar production structures. As can be seen from Table 5, construction and professional, scientific and technical activities form the greater part of costs in this exercise.

Table 4 Cost shares of cadastral procedure

Cost component	**Share of total costs of cadastral procedure**	
	Sievinkylä	**Yli-Kannus**
Cadastral survey fee	20 %	32 %
Regional roads	2 %	13 %
Other roads	2 %	0 %
Main drainage	19 %	11 %
Assimilation underdrainage	54 %	45 %
Other drainage	3 %	0 %

Table 5 Cost allocation by industrial classes

Industrial class	**Sievinkylä**			**Yli-Kannus**		
	Cost (euros)	Share	Person-year	Cost (euros)	Share	Person-year
Construction	791 385,9	35 %	4,7	328 980,1	32 %	2,2
Transportation and storage	172 728,1	8 %	1,6	64 723,3	6 %	0,4
Chemical industry	330 001,7	15 %	0,7	132 062,3	13 %	0,2
Professional, sci. and tech. activities	613 500,3	27 %	7,4	368 414,2	36 %	4,6
Mining and quarr.	288 273,2	13 %	0,4	99 494,3	10 %	0,2
Manuf. of metal products	45 754,0	2 %	0,2	4 077,33	0 %	0
Manuf. of wood and prod. of wood	1 739,4	0 %	0	434,2	0 %	0
Rakennusaineteoll.	814,4	0 %	0	8 505,0	1 %	0
Manuf. of textiles	0,00	0 %	0	10 316,90	1 %	0
Public administ.	424,0	0 %	0	1 002,7	0 %	0
Other real estate services	210,2	0 %	0	1 024,4	0 %	0
Total	**2 244 831**	**100 %**	**15,0**	**1 019 035**	**100%**	**7,6**

As mentioned earlier, evaluation of benefits is subject to greater uncertainties. Immediate effects of land consolidation benefits mainly stem from cost savings. Thus, it is assumed that agricultural production becomes more effective due to land consolidation project. We present the estimated cost savings in monetary terms and in person-years in Table 6.

Table 6 Cost savings and savings in person-years

		Capitalization time horizon (years)		
		1	20	30
Sievinkylä	Total benefit	125 000 e	1 611 000 e	1 989 000 e
	Person-year	2,3	30,1	37,2
Yli-Kannus	Total benefit	100 000 e	1 257 000 e	1 549 000 e
	Person-year	1,3	16,5	20,3

3.2 Computational regional impacts of land consolidation projects

We estimate the total regional impacts as well as direct and indirect multiplier effects (terms are explained in Section 2). In short, direct multiplier effects are formed by increased consumption in households and sub-contractors that receive salary that originates from the land consolidation project. Indirect multiplier effects are ripple down effects from subcontracts (i.e. subcontractor's subcontracts). Table 7 summarizes the regional impacts of costs and payment shares for both case projects, whereas Table 8 summarizes the regional impacts that originate from land consolidation benefits. Interestingly, regional impacts of benefits can be interpreted either as a cost saving to farms or as additional finances to farms. In the first case, the regional economic impacts are negative, while in the latter case, the impacts are positive. However, we argue that a pure form of either of them is not very meaningful interpretation. Time savings indeed decrease regional work contribution but we should keep in mind that in the same time, labor as a factor of production can be allocated towards other (possibly more productive) directions.

Table 7 Regional impacts of costs summarized

Type		**Sievinkylä**	**Yli-Kannus**
Total regional impacts		3 856 000	1 901 000
Multiplier effects	Direct	1 169 000	594 000
	Indirect	442 000	288 000
Amount of costs, government		1 340 000	549 000
Amount of costs, landowners		905 000	470 000

Table 8 Regional impacts of benefits summarized

	Sievinkylä			**Yli-Kannus**		
Timeframe	1	20	30	1	20	30
Total regional impacts	209 000	2 688 000	3 319 000	158 000	1 980 000	2 440 000
Direct multiplier effects	74 000	956 000	1 181 000	54 000	678 000	835 000
Indirect multiplier effects	9 000	121 000	150 000	4 000	45 000	56 000

In addition, we evaluate gross and net impacts to regional output and employment for those industries that gain the most from land consolidation projects. These results are presented in Appendix 1 and 2. Industry-specific gross impacts present the type of regional impact that a creation of new industry (or closing one) would generate. Thus gross impacts should be evaluated by one industry at time. With net impacts we eliminate 'duplicate' effects born in calculation of gross impacts.

4. DISCUSSION

In this paper, we present novel results for regional impacts of land consolidation projects in a simple methodological framework.

Within IO framework, the regional impacts of land consolidation project depend on two factors: 1) the regional IO tables, and 2) the immediate effects of cadastral procedure. The IO tables are both spatially and temporally bounded. Hence the data cannot be utilized on studies concerning different regions or different timeframes. The interpretation of regional impacts originating from land consolidation benefits is the single most unreliable factor of this study. Bottom line is that they might as well be negative or positive. Moreover, they are pure estimates based on assumptions about time savings etc.

One further limitation of our study is that only fraction of the land consolidation benefits were included in the analysis. Transportational, ecological as well as social benefits were left out due to computational and methodological issues. Additionally, we would like to emphasize the *ex post* nature of the analysis. In this framework, we are able to study backward-looking regional impacts of land consolidation projects. The forward-looking impacts, on the other hand, cannot be studied with IO methodology. In the future, it would be interesting to study the regional impacts in *ex ante* setting. In practice, this type of inspection requires the use of computational general equilibrium (CGE) models.

Though the results are highly sensitive and present the best-case scenario, they provide some information about proportion of direct effects to indirect effects. However, it should be noted information about this ratio on national level would be more relevant. That type of information can be useful for example when determining share of payments in future land consolidation projects. For example, it would be possible to settle that landowners contribute by paying the share of direct effects, and government pays the share of indirect effects. Regardless, considering the current economic circumstances, financing of land consolidation projects needs to be redesigned.

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Appendix 1. Gross and net impacts for five most relevant industries in Sievinkylä, 1 000 euros

	Mining and quarrying		Chemical industry		Construction		Transportation and storage		Professional, sci. and tech.	
	Output	Empl.	Output	Empl.	Output	Empl.	Output	Empl.	Output	Empl.
Agriculture	0		1		5	0,1	1		7	0,1
Forestry	0		1		11	0,1	0		2	
Mining and quarrying	288	0,4	2		10		0		1	
Food industry	1		3		9		3		16	
Textile etc. industry	0		0		1		0		1	0,1
Wood industry	0		1		62	0,3	1		2	
Paper	0		3		3		1		8	
Chemical industry	1		330	0,7	8		4		4	
Build. material industry	0		1		21	0,1	0		1	
Metals	1		3		36	0,1	1		5	
Electronical industry	1		2		13		1		8	
Machines and machinery	0		0		1		0		2	
Vehicle prod.	1		0		0		0		0	
Furniture prod.	2		2		7	0,1	2		5	
Energy	3		10		8		3		10	
Construction	1		4		791	4,7	4		8	
Retail	3		11	0,1	40	0,5	15	0,2	31	0,4
Transp. and storage	5		12	0,1	15	0,1	173	1,6	19	0,2
Accommodation	1		1		7	0,1	3		11	0,1
Publishing	1		4		7	0,1	3		18	0,1
Finance and insurance	1		3		6		2		10	0,1
Real estate	1		2		9		4		16	0,1
Renting	3		4		24		6		29	
Professional, sci. and tech.	2		5	0,1	25	0,3	3		614	7,4
Bureaucracy	1		4	0,1	11	0,2	4	0,1	15	0,2
Public administ.	1		3		5		2		9	0,1
Education	0		0		1		0		3	
Social and healthcare	1		1		8	0,1	2		11	0,2
Arts	1		1		6	0,1	2		10	0,1
Household services	0		0		0		0		0	
Households	32		45		287		70		344	
Gross	**353**	**0,6**	**462**	**1,3**	**1442**	**7,1**	**314**	**2,1**	**1218**	**9,3**
Net	**338**	**0,6**	**444**	**1,3**	**1424**	**7,0**	**261**	**1,7**	**1182**	**8,9**

Appendix 2. Gross and net impacts for five most relevant industries in Yli-Kannus

	Mining and quarrying		Chemical industry		Construction		Transportation and storage		Professional, sci. and tech.	
	Output	Empl.	Output	Empl.	Output	Empl.	Output	Empl.	Output	Empl.
Agriculture	1		0		3		0		5	0,07
Forestry	0		0		4		0		1	
Mining and quarrying	99	0,14	0		1		0		0	
Food industry	2		1		6		1		14	
Textile etc. industry	0		0		1		0		1	0,04
Wood industry	0		0		26	0,14	0		1	
Paper	0		0		0		0		0	
Chemical industry	7		132	0,15	16		4		8	
Build. material industry	1		0		10		0		1	
Metals	2		1		18		0		4	
Electronical industry	0		0		0		0		0	
Machines and machinery	2		0		1		0		2	
Vehicle prod.	0		0		1		0		1	
Furniture prod.	5		0		5		1		4	
Energy	7		1		3		1		50	
Construction	2		1		329	2,18	1		4	
Retail	6	0,1	1		22	0,30	4	0,05	24	0,34
Transp. and storage	15		3	0,1	13	0,1	65	0,42	19	0,12
Accommodation	1		0		3		1		6	
Publishing	1		0		4		1		17	
Finance and insurance	2		0		3		1		8	
Real estate	2		1		8		2		18	
Renting	2		1		9		1		14	
Professional, sci. and tech.	4	0,05	0		7		0		368	4,56
Bureaucracy	2		0		4	0,07	1		10	0,17
Public administ.	1		0		3		0		7	
Education	0		0		0		0		2	
Social and healthcare	1		0		3	0,06	1		6	0,10
Arts	1		0		3		0		7	0,09
Household services	0		0		0		0		0	
Households	35		8		132		18		206	
Gross	**205**	**0,61**	**153**	**0,24**	**636**	**3,30**	**103**	**0,55**	**763**	**5,93**
Net	**204**	**0,61**	**116**	**0,20**	**629**	**3,25**	**52**	**0,22**	**750**	**5,78**

BASIC REQUIREMENTS FOR A SUCCESSFUL LAND CONSOLIDATION

Mats BACKMAN, Sweden

Key words: Costs of Land Fragmentation, benefits of Land Consolidation (LC), influencing factors on the costs of the LC procedure.

SUMMARY

Land Fragmentation is often acknowledged as a problem by decision makers, even if its impact on economic growth in rural areas is largely underestimated. Land Fragmentation in Sweden is mainly concentrated to the county of Dalarna in Central Sweden where there is an urgent need of Land Consolidation of 500 000 hectares of forest land. The Swedish government initiated an official investigation 1993 regarding the financing, co-ordination and legal regulation of the mapping and property formation activities. One of the findings was that the costs for the land register, the cadastre and taxation were approx. 1,7 Million USD higher per year in the county of Dalarna than in the neighbouring counties due to the high fragmentation of properties in Dalarna. Furthermore Land Fragmentation causes considerable extra costs for society regarding access to land for the municipalities, the National Road Administration, the National Rail Administration, the telecommunication companies and the electric power suppliers. The total extra costs for society related to Land Fragmentation in Dalarna is approx. 3,4 Million USD annually. This amount with a perpetual capitalization at a real rate of interest of 3 % is 112 Million USD. Work with planning and land use is also more expensive for municipalities and the county administration. Land Fragmentation causes retained activities and employment in forestry as well as retained tax revenues. As a matter fact the increase of tax revenues in Land Consolidation project in Dalarna concluded during 1993 – 1997 was at least as large as the governmental subsidies assigned for these projects.

Land Fragmentation from a landowner's commercial point of view causes reduced income in agriculture and forestry, high management costs, long boundary lengths and complicated ownership conditions. The Swedish Property Formation Act requires that the benefit condition is fulfilled, which means that the profits and advantages must exceed the costs and disadvantages of the procedure. It should be emphasized that sentimental values must not be considered. The benefit condition was for the first time trialled by the Court of Appeals, Stockholm, in June 2009 regarding a Land Consolidation project in Dalarna. The appellants with support of the National Land Survey argued that the benefits were approximately four times larger than the costs of the procedure. The court accepted the arguments from the appellants and approved the appeals.

The main costs for a Land Consolidation project are

- investigation of the composition and size of every owner's farm
- individual talks with the land owners at *"days of wishes"*
- elaboration of the design of the new consolidated properties
- valuation of all properties
- mediation and negotiation with all participating land owners
- surveying of the new boundaries

The costs for a Land Consolidation project are influenced by:

- degree of fragmentation
- number of real properties/parcels
- number of landowners and their attitude
- size of the consolidation area
- the length of all boundaries

Besides the measurable costs and disadvantages of Land Fragmentation for the proprietors there are factors which cannot be measured e.g.

- Inefficient management in forestry
- Insecure ownership of many properties
- Inaccurate property registers and cadastral index maps
- Uncertain boundaries
- Ignorance among the proprietors regarding rights and location of boundaries causing disputes and conflicts
- Decision problems in co-owned properties

Experiences from several Land Consolidation projects show that the benefits for both society and the land owners substantially exceed the costs. Land Consolidation is therefore a very profitable investment.

COST-BENEFIT ANALYSIS OF LAND CONSOLIDATION IN SWEDEN FROM THE VIEWPOINT OF SOCIETY AND A LANDOWNER

Mats BACKMAN, Sweden

1. INTRODUCTION

Land Fragmentation is often acknowledged as a problem by decision makers, even if its impact on economic growth in rural areas is largely underestimated. At the same time decision makers underestimate the advantages and benefits of Land Consolidation.

Land Consolidation projects in Sweden have since the 18th century been implemented as legal procedures. The legislation has been changed several times to adapt to the prevailing situations in the society. The present Swedish Real Property Formation Act requires a cost-benefit analysis on behalf of the participating landowners before a property formation order can be decided. It is, of course, important that the benefits for the participating landowners exceed their costs for the procedure. Otherwise the procedure will be cancelled. However the law does not require any cost-benefit analysis from the viewpoint of society. Instead the influence of Land Consolidation on the society's costs is judged without a formal monetary calculation when the decision of subsidies is taken. This is different from several other European countries where a formal cost-benefit analysis has to be calculated before the implementation decision. Subsidies from the EAFRD fund (EU), are also granted without formal monetary calculations if the conditions in the four axes are fulfilled.

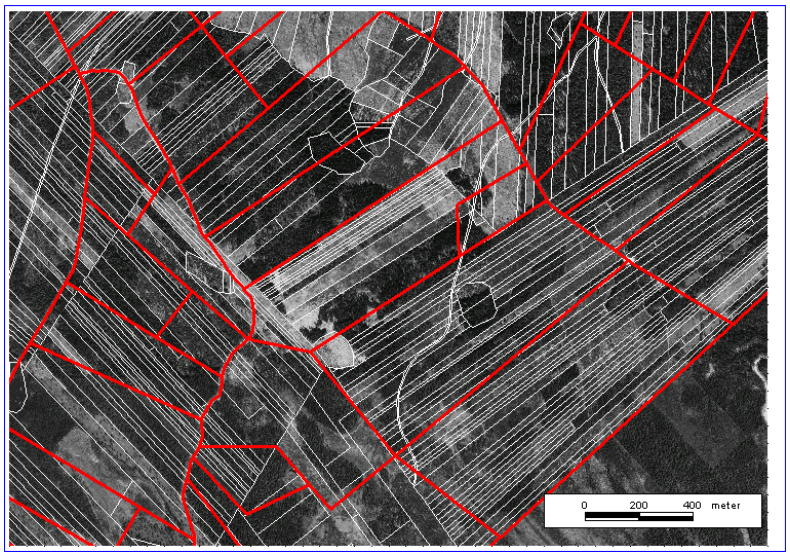

Figure 1.1. White boundaries *before* Land Consolidation
Red boundaries *after* Land Consolidation

This paper will however consider the cost-benefit analysis of Land Consolidation in Sweden from both the viewpoint of society and a landowner. From some aspects a monetary calculation of costs and benefits is possible but in other aspects such calculations have not been made or cannot be made.

Figure 1.1 is an example of how the division into property units in a forest area dramatically can be improved by Land Consolidation. The objective of this paper is to show the economic conse

quences of Land Consolidation. Hopefully the conclusions in this paper may be considered by politicians and landowners.

The cost of Land Consolidation depends on several circumstances e.g. the degree of fragmentation, number of participants, attitude among the participants, voluntary or compulsory approach. This paper will focus on compulsory Land Consolidation in forest areas in Central Sweden with very bad fragmentation.

2. LAND FRAGMENTATION – COSTS FOR THE SOCIETY

Fragmentation of real properties results in considerable costs and disadvantages both for the society and the land owners. From society's viewpoint the costs of fragmentation were investigated ten years ago regarding the county of Dalarna which is characterized by a very high fragmentation of properties. The fragmented area in this county covers approximately 500 000 hectares with an urgent need of Land Consolidation.

The fragmentation of properties is mainly a result of the traditions among the landowners during generations in inheritance situations. The heirs after a deceased person very often have divided the ownership of a real property according to the inheritance act. After some generations the ownership situation will become very chaotic.

The Swedish government initiated an official investigation in 1993 regarding the financing, coordination and legal regulation of the mapping and property activities. One of the findings was that the costs for the land register, the cadastre and taxation were approx. 1,7 Million USD/annually higher in the county of Dalarna than in the neighbouring counties due to the high fragmentation of properties.

Furthermore Land Fragmentation causes considerable extra costs for society regarding access to land for the municipalities (pipelines for water supply, sewage and district heating), the National Road Administration, the National Rail Administration, the telecommunication companies and the electric power suppliers. These extra costs are estimated to the same size as those for the authorities i.e. 1,7 Million USD/annually higher in Dalarna compared with similar costs for counties with normal or good division into property units. The total extra costs are then 3,4 Million USD or a perpetual capitalized cost of 112 Mill. USD at a real rate of interest of 3 %. Work with planning and land use is also more expensive for municipalities and the county administration but are not included in calculated costs. Land Fragmentation causes retained activities and employment in forestry as well as retained tax revenues. Therefore the government and authorities should take this into consideration when subsidies to Land Consolidation should be decided in the future.

3. LAND CONSOLIDATION – BENEFITS FROM THE VIEWPOINT OF SOCIETY

At the same time the activities and employment in forestry after a Land Consolidation project increase as well as the tax revenues. As a matter fact the tax revenues as a result of concluded Land Consolidation projects in Dalarna during 1993 – 1997 were at least as large as the subsidies from the government assigned for these projects. Furthermore the increase of employment and activities in forestry should also be considered but these issues have not been calculated.

4. LAND FRAGMENTATION – CONSEQUENCES FOR A LANDOWNER REGARDING COSTS AND BENEFITS

Land Fragmentation from a landowner's commercial point of view causes reduced income in forestry, high management costs, long boundary lengths and complicated ownership conditions. The fragmentation for a landowner can be described as follows:

In fragmented areas the holding of a land owner is often fragmented in 20 – 75 real properties which are further fragmented into 50 – 500 small parcels. The real properties have further-more in many cases shares in several joint properties. The number of participating properties in a joint property can be 5 – 50. If each property is owned by several persons the decision situation is just chaotic! See Figure 4.1.

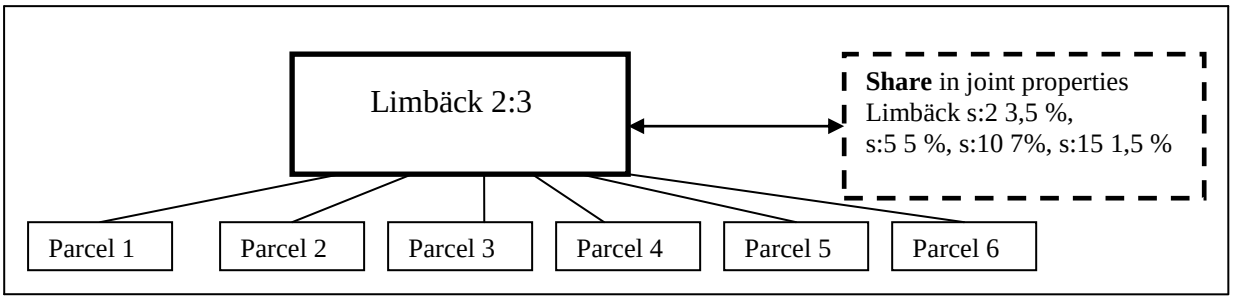

Figure 4.1. Cadastral situation for real property Limbäck 2.3.

It should also be mentioned that in some cases the size and the value of a joint property can be very big. Beside the bad cadastral situation the ownership situation for many land owners is very complicated due to co-ownership with several/many other persons in a number of ownership groups (constellations). In such cases the bad ownership situation is even worse from a management point of view than the bad cadastral situation. A practical example for Mrs Arkeberg see Figure 4.2.

Under such circumstances the area of the management unit becomes very small which causes high costs per cubic metre solid wood. The big number of parcels also causes higher costs to keep the boundaries well cleared. Such boundarywork is one of the main costs for the land-

- Area 35 hectares
- Distributed in 9 villages
- Ownership in 71 real properties (separate designations)
- Shares in 189 joint properties
- Properties and joint properties distributed in 532 parcels
- 100 % ownership in only one property (her building site)

Figure 4.2. Situation for Mrs Arkeberg *before* Land Consolidation

owner in fragmented forest areas. The typical design of forest parcels is long narrow parcels which are not adjusted to achieve low logging costs. Figure 4.3 shows the pattern of forest parcels clearly. Every activity of logging or silviculture requires reconnaissance, planning and calculations by supervisors. Contacts have to be taken with several forest owners, labourers and entrepreneurs.

Every assignment which is executed by an entrepreneur involves a certain fixed cost regardless of the size of the assignment. The distance between the different parcels causes also extra costs for moving the logging machines and personnel compared if the logging and silvicultural operations could be concentrated to large treatment areas. Most of the logging operations today are executed by machines. To use an effective machine on small logging areas is often an expensive combination. Manual logging with chain saws has today been replaced by mechanical logging with effective

Fig. 4.3. Mr Johnsons fragmented holding before LC

machinery systems. Heavy work in the forest are executed by machines and less workdemanding jobs e.g. cleaning, planting and cleaning of boundaries are often executed by the forest owner himself. Transports and movements of machinery between logging areas involve costs for the machinery systems. Frequent movements result in unproductive work. The Forest research foundation, Skogsarbeten, has found that the costs per cubic metre rise dramatically for logging areas with less than 200 cubic metres. See an example Figure 4.3.

5. BENEFITS OF LAND CONSOLIDATION FROM THE VIEWPOINT OF A LANDOWNER

Land Consolidation in the county of Dalarna has been implemented during the last 80 years in large projects with sizes of 2 000 – 54 000 hectares. Normally 200 – 2 000 landowners and 3 000 – 15 000 parcels are concerned in these projects. Land Consolidation has normally been implemented in forest areas with very high Land Fragmentation by the use of the compulsory rules according to The Swedish Property Formation Act. It should however be mentioned that in areas with moderate Land Fragmentation voluntary Land Consolidation is the normal procedure.

The Swedish Property Formation Act requires that the benefit condition is fulfilled, which means that the benefits and advantages must exceed the net costs after subsidies and disadvantages of the Land Consolidation procedure. It should be emphasized that sentimental values must not be considered. Normally the benefit condition has not been questioned by the landowners but recently the benefit condition in a rather large Land Consolidation project was trialled judicially. Subsidies to Land Consolidation have since several years been decided to 50 % of the gross cost of the procedure. That means that the subsidies in this project amounted to 154 USD/hectare and consequently the net cost is 154 USD/hectare. The benefits have in this project been calculated to approximately 660 USD/hectare. A real rate of interest of 3 % was used in these calculations to be on the *"safe"* side. The real rate of interest for long-term investments has during a long sequence of years been relatively low 1,4 – 3 %. Therefore there are good arguments to use a lower real rate

of interest if the market values of forest properties are considered. The capitalized benefit would increase by 50 % if 2 % real rate of interest would be used.

The case was trialled by the Court of Appeals in Stockholm in June 2009. The appellants with support of the National Land Survey argued that the benefits were more than four times larger than the costs of the procedure. The court accepted the arguments from the appellants and approved the appeals. **The Supreme Court finally settled the decision by the court of appeals in February 2010.** In this calculation the drawbacks of complex ownership conditions, uncertain boundaries, ignorance among the proprietors regarding rights and location of boundaries causing disputes and conflicts and decision problems in co-owned properties have not been considered.

The drawbacks and disadvantages of Land Fragmentation from the viewpoint of a land owner disappear after concluded Land Consolidation. The number of parcels, joint properties and the length of boundaries are reduced by approximately 90 %. The new consolidated parcels are well suited for forestry. The size of the parcels has increased 15 – 20 times compared with the situation before Land Consolidation. The parcels have good access to truck roads and the boundaries are well adjusted to wet areas and topography in order to facilitate logging and silviculture as much as possible. Depending on size of land fund or land bank a number of holdings will be expanded which will result in additional benefits. Simultaneously the ownership situation has improved dramatically and a great majority of the consolidated properties are owned by one single person. Forest companies in Dalarna therefore consider that the conditions for forest management after the implemented Land Consolidation projects match the requirements of modern forestry.

Besides these mentioned benefits the yield or timber production and timber prices will increase thanks to Land Consolidation. The improved access to forest land thanks to construction of new roads should also be recognized.

6. MAIN COSTS FOR A LAND CONSOLIDATION PROJECT

Normally the Land Consolidation projects in Dalarna involve hundreds of participating landowners and thousands of parcels. We strive to apply an integrated, participatory and *"bottom-up"* approach in order to facilitate the mediation/negotiation with the participants and achieve as high degree of acceptance as possible before the main decisions will be taken. The main costs of a Land Consolidation procedure are shown in Figure 6.1.

- Investigation of the composition and size of every owner's holding
- Individual talks at meetings where the land owners can express their wishes and interests, so called *"days of wishes"*
- Investigation of infrastructural measures - optional
- Valuation of all properties
- Elaboration of the re-allotment design
- Mediation and negotiation
- Surveying of the new boundaries
- Decision making

Figure 6.1. Main costs for Land Consolidation

Before the *"days of wishes"* are carried out with each landowner it is necessary to investigate the composition and size of his/her holding. After these individual talks with the landowners the procedure continues with investigation of possible infrastructural measures, mainly roads, and valuation of all properties. Valuation is the basis for the compensation order and therefore very important for the landowners. Valuation records are therefore sent to all landowners to enable them to check if the valuation can be accepted or not. In cases of complaints the cadastral authority will carry out a thorough control. If inaccuracies are discovered the valuation will be adjusted. Then it is time to elaborate the new re-allotment design - the most spectacular and interesting activity during the procedure. The draft design is sent to all landowners who are requested to respond to the proposal. GIS technique has been used with good success since fifteen years. Several landowners are normally not satisfied with the first draft and require changes of size and location of the new consolidated property. Possible approvals of complaints will cause side effects on other landowners which will result in numerous mediations and negotiations in order to satisfy as many landowners as possible. It is time-consuming and a difficult task to satisfy hundreds of wills. The land surveyor in charge of the Land Consolidation project has to be very skilled in mediation/negotiation in order to achieve trust among the landowners and success in the procedure. When the adjusted re-allotment design has been accepted by a great majority of the landowners the surveying of the boundaries of the new consolidated properties can start. Valuation and surveying of the new boundaries of the new consolidated properties are the most time-consuming and expensive activities in the Land Consolidation procedure. After the completed surveying and the preparation of the cadastral documents a final meeting with the participating landowners takes place when the main orders are taken e.g. property formation order, compensation order, possession order, order of distribution of costs and conclusion order.

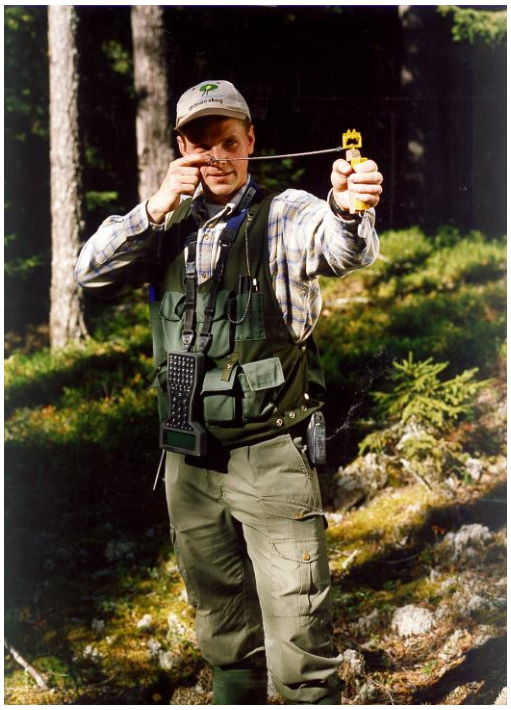

Figure 6.2. Forest valuation

Figure 6.3. Surveying of "new" boundaries

7. COSTS FOR LAND CONSOLIDATION – INFLUENCING FACTORS

Land Consolidation projects are implemented in very fragmented areas. In order to achieve trust and a good communication with the landowners several committees of landowners are elected to assist the land surveyor in discussions of principal issues and preparations of the various decisions. The costs of the Land Consolidation procedure are affected by several factors, see Figure 7.1. Of course the degree of fragmentation can vary which influences work and the costs for the procedure. The total number of real properties/parcels is related to the degree of fragmentation and influences the surveying work.

- Degree of fragmentation
- Number of real properties/parcels
- Number of landowners and their attitude
- Size of the consolidation area
- The length of all boundaries

The number of real properties/parcels has a strong correlation to the number of landowners involved and affect the time needed for discussions with every individual landowner at the *"days of wishes"* and for mediation and negotiation.

Figure 7.1. Costs for the Land Consolidation procedure influencing factors

Especially the *"days of wishes"* are a very important occasion for the land surveyor to give thorough information for the landowner in those issues which have bothered him/her.

Fig 7.2. Discussion at the *"days of wishes"*

The number of participating landowners is less than the number of properties, because normally a landowner owns 5 - 6 properties or parts of properties. Normally individual discussions will occur at three occasions during the Land Consolidation procedure.

1. *"days of wishes"*
2. Discussion for the valuation
3. Discussion of the reallotment design

The attitude among the land owners regarding Land Consolidation has also a strong influence on the costs and affects the work with mediation and negotiation with the landowners considerably. The size of the Land Consolidation area and the composition of the forests affect the costs of valuation because the valuation includes laser scanning, photo interpretation and field inventory of the whole area concerned. Indirectly the degree of fragmentation and the size of the Land Consolidation area influence the total length of the *"old"* boundaries but also the length of the *"new"* boundaries and

simultaneously the costs of surveying. The topography and density of the forests have a strong impact on the time consumption for surveying.

8. NON-MEASURABLE ADVANTAGES OF LAND CONSOLIDATION

8.1. Improved rural conditions

There are a number of benefits or advantages created by Land Consolidation which are more or less impossible to calculate, see Figure 8.1.1.

Earlier the rural development emphasized agricultural development. Today rural conditions can be improved by balancing the interests of agriculture/forestry, transportation, environment, recreation, cultural heritage and tourism. In some Land Consolidation projects the environment issue was important because some rather large forest areas were considered very valuable and should be preserved. In several cases it was possible to establish such preserved areas with an integrated approach. Also the cultural heritage nearby twelve valuable chalets could be preserved as joint properties inside and around the building areas in the chalets. The chalets as such were also attractive recreational and tourist areas that could be established by Land Consolidation. In most Land Consolidation projects where it is a need to preserve valuable forest areas it has been possible to

establish protected properties owned by the government. Some protected sites have an area of several thousand hectares. That would have been very difficult and expensive if Land Consolidation had not been implemented.

- Improved rural conditions
- Increased market values for consolidated properties
- Improved ownership conditions
- Improved infrastructure e.g. road network
- Accurate property registers and cadastral index maps
- Increased employment, activities and tax revenues
- Problems with supervision of the management of farms

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Figure 8.1.1. Non-measurable benefits of Land Consolidation

8.2. Increased market values for consolidated forest properties

Consolidated forest properties are much more demanded compared to fragmented forest properties. This statement is confirmed by the actors on the property market. The value of a forest property is constituted not only by the effect on the yield value by the Land Consolidation but also by the competition between the buyers of well consolidated properties. One circumstance that speaks for that the market value is higher than the yield value calculated in the usual way with a discounting at a real rate of interest of 3 % is also confirmed by the broad opinion in favour of the Land Consolidation.

8.3. Improvement of ownership

In section 3 in this paper the problems of complex ownership was highlighted for Mrs Arkeberg. Her ownership situation after Land Consolidation can be seen in Figure 8.3.1.

- Area 61 hectares (36 hectares her own prop. and 25 hectares in 2 joint properties)
- Allocated in 1 village
- 100 % ownership in 1 real property
- Shares in 2 joint properties (hunting and common use)
- Parcels (2 her own and 24 in joint properties)

Figure 8.3.1. Situation for Mrs Arkeberg *after* Land Consolidation

The improved situation for Mrs. Arkeberg is outstanding. Now she do not need to ask any co-owner regarding the management of her property e.g. timber sales, silvicultural measures. There will be no decision delays because Mrs Arkeberg has the sovereign decision capacity. Neither does Mrs Arkeberg need to ask a neighbouring landowner's permission to cross his property because her new consolidated property has direct access to a good truck road. The size and design of her forest parcel matches the demands of forestry today and she will be well paid for her timber. The length of the boundaries is less than 2 % of the length before Land Consolidation.

In this context another serious drawback of co-ownership should be noticed. If a co-owner is not satisfied with the management of a property then he/she is entitled to apply to the district court to appoint a trustworthy person to sell the property at a public auction. In such a case the person who gives the highest bid will buy the property. Therefore this possibility is a threat for landowners involved in co-ownership of real properties to lose their ownership. However, under certain circumstances such an auction is not allowed if it is possible to partition the property into shares for all co-owners. This exception is quite common during the implementation of Land Consolidation projects in Dalarna where co-ownership exists frequently. Problems with co-ownership and disputes among the co-owners are anyway very common and therefore most landowners want to own a real property by him/herself and get away from problems with co-owners.

8.4. Improved infrastructure

The road network in fragmented forest areas is normally insufficient and many parcels do not have access to truck roads. In the biggest Land Consolidation in Dalarna approximately 180 kms new truck roads were constructed and after Land Consolidation almost 100 % of the new parcels had access to truck roads. A complete road network increases the availability for the properties which facilitates the management and supervision of the properties but it also gives possibilities to a better prize for the timber. The costs for the reforestation will also decrease.

8.5. Accurate property registers and cadastral index maps

In fragmented forest areas the quality of information in property registers and accuracy in property index maps is inferior. Sometimes this inferior quality causes serious economic problems – losses for one landowner and profits for the neighbour, when timber has been cut on the wrong property. Under such circumstances it is not surprising that conflicts between neighbours appear. After Land Consolidation there is correct information in the property registers and the property index maps are extremely accurate. As a result there are no more conflicts and court trials.

8.6. Increased employment, activities and tax revenues

In section 2 has been mentioned that in fragmented forest areas employment, activities in forestry and tax revenues are retained. After the conclusion of a Land Consolidation project the possibilities for employment for the local people increase considerably as well as the activities e.g. logging and silvicultural measures. Under such circumstances the livelihood for the local population will be more sustainable and prosperous. It should also be underlined that the tax revenues after a Land Consolidation project increase considerably.

8.7. Improved supervision of the management of farms

To a forest owner with hundreds of parcels among which many are owned together with other persons the management and supervision of the parcels are very difficult because he does not know the location of all the parcels and their boundaries. After Land Consolidation the same landowner will get only one or two well shaped parcels with clear boundaries with access to a truck road.

8.8. Adequate income taxation of forest properties

In fragmented areas the taxation authority could hardly carry out its taxation duty very well – the authority did not have enough knowledge regarding the basic facts for a correct taxation. After concluded Land Consolidation projects we have seen that the tax revenues increase because of more accurate facts regarding the size and yield of the real properties and correct information about the landowner

9. IS LAND CONSOLIDATION A PROFITABLE INVESTMENT OR NOT?

10. After the description in section 3 and 4 it is obvious that Land Consolidation in the fragmented forest areas in Dalarna is a very profitable investment from both the viewpoint of society and the landowner. Some professional stakeholders consider that the pay-off time is very short for an investment in a Land Consolidation, normally less than three years. The non-measurable benefits have still not been considered.

11. ATTITUDE AMONG PARTICIPATING LANDOWNERS IN LAND CONSOLIDATION PROJECTS

In the previous sections it has been stated that Land Consolidation is very profitable from a landowner's point of view. Land Consolidation will however result in great changes for the landowners which might in several cases affect their attitude regarding Land Consolidation. The Swedish

Property Formation Act requires that the opinion condition is fulfilled, which means that the resistance against Land Consolidation must not be too strong. The attitude among the landowners is therefore very important in a Land Consolidation procedure and is decisive for a successful procedure. Otherwise the project has to be cancelled. Normally the attitude against Land Consolidation is stronger during the early stages of the procedure because the landowners do not know what will happen to their properties. Stakeholders, either in favour or against Land Consolidation, play a very important role for influencing the public opinion. Therefore the Swedish experiences regarding the attitude issue should be discussed in this paper.

During the period 1972 – 2009 only one Land Consolidation project has been cancelled although the compulsory rules in the Property Formation Act has been used. According to our experience it is obvious that participants in Land Consolidation projects during the later stages in the procedure become very satisfied with the re-allotment plan and the compensation order. This has been accomplished by strong mediation and negotiation efforts. After conclusion of a project those landowners who are not satisfied with some orders have the opportunity to appeal to court.

The number of appeals to court is however very low and the number of appeals mainly against re-allotment plan and compensation order is an indication of the satisfaction among the landowners. The frequency of appeals has been studied for Land Consolidation projects which were concluded during the period 1975 – 2007. These projects concerned approximately 10 500 landowners but only 33 landowners or 0,3 % appealed to court. During the trials only 20 % of the appeals were approved concerning 7 landowners. We therefore conclude that a very great majority is satisfied with Land Consolidation and do not think that the use of the compulsory rules is a threat. In areas with high fragmentation in Sweden we do not hesitate to apply the compulsory rules in our Property Formation Act.

11. CONCLUDING REMARKS

In a number of countries, especially the east European countries, there is an urgent need of Land Reforms because of the very high Land Fragmentation. From an economical point of view the benefits of a Land Consolidation are so obvious that a Land Reform should be implemented as soon as possible. Because Land Fragmentation in several of these countries is worse than in Dalarna such an investment would be very profitable according to the Swedish experiences both from the viewpoint of society and the landowners. It is also my conviction that compulsory rules should be used to achieve very good results and satisfy the participating landowners. A Land Reform in such countries is therefore an important challenge both for the politicians, who are the decision makers and the stakeholders.

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BIOGRAPHICAL NOTES

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Technical Session D1

Preconditions for land consolidation: land administration and tenure arrangements

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Land Governance and Development in Brazilian Rural Space: A comparison between Livestock and Agricultural production in Mato Grosso do Sul state.

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Key words: *Land Governance, Investment analysis, Land Speculation, Land use change.*

SUMMARY

This article presents a comparison for the impact from lack of land governance in Brazil between livestock and agricultural production. It begins with a brief description of the land regulatory system and its development in Mato Grosso do Sul State and Brazil. The methodology was based on focus groups research, conducted by CEPEA/USP (Center for advanced Studies on Applied Economics/University of São Paulo) on local production sites in Mato Grosso do Sul state, where a regional modal farm was established. With these data, a comparison for the importance of land prices in livestock and soybean investment indicators (Net Present Value, Internal Rate of Return) was performed to understand how land speculation process can be described through the traditional succession of these two activities. The results shows how lack of land governance affects in different ways the Livestock and Agricultural production. In livestock production there is lower investment demand, lower risk and lower profitability given a distinguished importance for land appreciation in the investment analysis. As for soybean and corn production, land appreciation showed a less important role, since it has been a clearly profitable activity on its own. Because soybean and corn production has a considerably higher risk and demand for investment, land prices showed a greater importance as the "opportunity cost of land" than speculative uses, what increases the pressure over the owner to be more productive (since the farmer could alternatively lease or sell the land for a lower risk income). Still, the great amount of capital to acquire land tend to keep away new investors from the development of production activities through the acquisition of agricultural land, given its impact on investment indicators.

Land Governance and Development in Brazilian Rural Space: A comparison between Livestock and Soybean production in Mato Grosso do Sul state.

1. INTRODUCTION

1.1 Preliminary factors and motivation

Brazil have always been a country economically driven by its agricultural potentialities. Although this is a true affirmative, it is important to note that the process of agricultural development and land occupation are deeply correlated with its fragilities on land governance mechanisms and institutions. As previous articles suggests (Guedes & Reydon, 2012; Reydon et.al. 2015), the characteristics of the Brazilian land institutional framework allow for the occurrence of three main types of land use: speculative use, productive use and exploitative use. These three main types of land use encompass several kinds of activities, some diffuse and other deeply correlated. When it comes to agricultural production and livestock production as a means of land use, characteristics of the legal institutions that regulate land use should (in theory) benefit the productive use of land over the speculative use of land. Still, in practice, evidence has shown that land appreciation play a very important role when considered as an economic asset in livestock production (Santos, 2015). Moreover, it is a decisive factor in livestock investment feasibility when we see it in the investment analysis through financial indicators, such as Internal Rate of Return and Net Present Value (Santos, 2015).

With this in mind, two possible inferences may arise. First, that Brazilian land laws are ineffective to foster productive land use over speculative land use. Second, Brazilian farmers may also be concerned with gains from the appreciation of land, and not only from the profitability of their own economic activity[1]. Although not at a first glimpse, both conclusions share a strong connection. This connection clarifies itself when we focus our analysis in a historical perspective. Since the beginning of Brazilian colonization, livestock was crucial to expand territory over natural land (Furtado, 1964; Prado Jr., 1945). In time, the activity became a successful pathway to consolidate property over new areas, especially in newly opened places. The succession from natural land areas, to pasture land, and then to agricultural land have been remarkably common. As perceived by Reydon (2011), the appreciation on land prices that occur through the shift from natural land to agricultural land can reach up to 1.455% in some areas, turning land opening into a very lucrative investment alternative. These gains from the expansion of new areas become even higher if we consider that historically, land occupation grew over public land with no cost of acquisition.

1.2 Historical Aspects of Land Occupation and Land Laws on "Mato Grosso do Sul" State

The state that is known today as Mato Grosso do Sul, once was part of Mato Grosso, a result from the occupational process fostered by the Europeans colonizers, particularly the Portuguese and Spanish enterprises, marked by the Cross-Atlantic distance trade and

[1] Santos (2015) concludes that not only land appreciation, but also the low risk of the activity and historical and cultural characteristics may also interfere on the landowner's decision.

the exploitation of their colonies. The mercantilist economies at that time was based upon the Americans supply for colonial goods destined only for European markets.

By that time, the land ownership regulation in the Portuguese standard was the “Law of Ferdinand Sesmarias”, dated from June 1375, which aimed to reverse the framework of land abandonment and consequent reduction of the production of foodstuffs. The law required "the practice of crop production by the owners, lessees, tenants and others, and other matters". In 1536, with the establishment of Portuguese captaincies in Brazil, the same land administration system was implanted in the colony (Guimarães, cited Barrozo, s / d, p. 44).

In 1718, the discovery of gold in La Plata region, under Spanish control, represented a major threat to Portuguese metropolis, due to its proximity to their trading routes. Consequently, the foundation of Cuiabá was a direct result of it, an attempt for Portugal to force its presence and power upon the growing markets. In the metropolitan point of view, gold production was central to its trade balance while in the colony, the maintenance of this source of revenue implies institutional changes and also movements towards a political and spatial reorganization of the region. While these goals are pursued by the metropolitan authorities within the colony local interests, different from those fed by Lisbon, start to take their own course. Smuggling runs rampant in the mining areas (Maxwell, 1996).

The Dismemberment of São Paulo capitania created the Mato Grosso capitania in 1748. The strategic position of the capitania allowed the Portuguese attempts to contain the Spanish advance and expand its territorial occupation (Silva cited Volpato, 1987). According to Silva (2008) a Provision of the King authorized the land grant in Mato Grosso capitania for "men of possessions".

The rigidity of military administration and the clear economic purpose of auriferous extraction distinguished the social and economic dynamics of the western border of Portuguese colonies. The authority enjoyed by landowners, by being not only holders of economic power but also military dignitaries at the service of the crown, contributed decisively for the historical prevalence of structures that favor land concentration in the region. This status is fundamental to understand the process of occupation and possession of land in the Mato Grosso do Sul State region.

Historically, the fundamental institutional framework of Brazil regarding land ownership is definitely the Land Law of 1850, which sets the formal occupation process of the Brazilian empire. Land tenure was already a common practice in the “sesmarial” system, so as the practical ownership of more land than the official limits established by law. Thus, the Land Law is enacted with restrictions on access to land, intended to rationalize it providing institutional support to purchase, sale and use of land, preventing irregular access to unoccupied land; establishing a land registry office of the state (to define unoccupied areas) and turning land into a reliable asset for use as collateral for loans. The Decree No. 1,318 / 1854 brought the administrative procedure to be performed for regularization of possessions, setting deadlines for measurement of previously acquired properties. I was also responsible for the establishment of the General Bureau of Public Lands (Repartição Geral de Terras Públicas), the disciplinary body of the legal regime applicable to public lands. It was up to the bureau to manage and ensure the public property.

With the establishment of the 1889 Brazilian Republic and its Constitution from 1891, the unoccupied lands became responsibility of the federal states. Ssoon after that Brazil witnessed the birth of several state-based laws on land ownership, use and access. As for Mato Grosso, it has evolved in a peculiar way due to the migration euphoria caused by gold and diamond findings during the 18th century. Its population growth was

exponential, clearly related to the economic activities pursued in the Province, and the expansion of cattle, extensive since its debut, that opened up a wide availability of land.

According to Miranda Borges (2001), the evidence suggests three steps to this process:

- 1st) 1870-1890: limited exports;
- 2nd) 1890-1914: organization and predominance of extractive products (yerba mate and rubber);
- 3rd) 1914-1930: preponderance of livestock exports (live cattle, beef jerky and other animal products).

Figure 1 shows the importance of livestock and its components on Mato Grosso State, throughout the first 30 years of the 20th century.

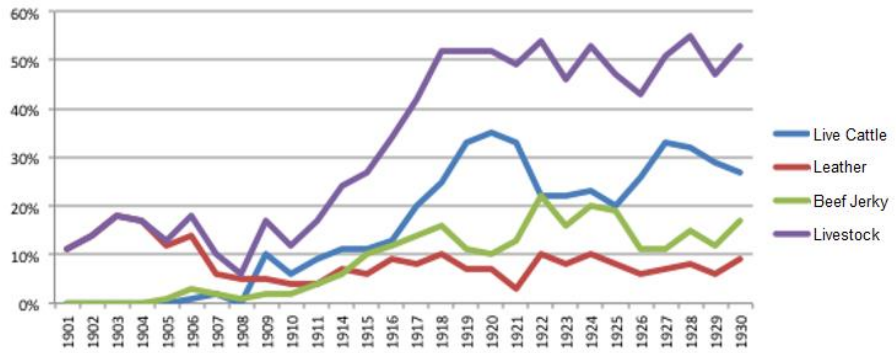

Figure 1 - Livestock and its component in Mato Grosso Exports (1901 - 1930)
Source: Borges (2001).

According to Corrêa (2009) the story of Mato Grosso in the late nineteenth to the twentieth century can be read as the "story of an armed people", especially after the war with Paraguay, that established new leaderships who clashed with the old colonels over control of land and reestablished a political tension that developed into social banditry. At that moment, the participation of the Portuguese in administrative positions was perceived as a privilege inherited from the colonial period and created an insurmountable divide within the Province.

This state of political dispute, mediated by violence between the vested interests affected any intention of economic growth. The exports gained some momentum in the late nineteenth century with increased exports of rubber and yerba mate that accounted together for 80% of the value of exports until near the outbreak of the First World War and the crisis of rubber, when the increase of cattle herds in the state provided the formation of a new set of products. Once exhausted the economic boost provided by mining, the economic stagnation definitively marked nineteenth century, with extractive activities held under way in extremely limited scope, linked to circumstantial demand. Although extensive livestock farming is the hallmark land occupation of Mato Grosso, the use and land tenure do not follow the same path.

By 1920 cattle raising was concentrated in the southern region of the province (what would become the state of Mato Grosso do Sul in the future) and had the important function of integrating the region to new commercial channels in the Empire. Extensive cattle raising was economically interesting for the imperial authority, since it occupied a broad border space, necessary for the defense of the Western frontier. According to Bonjour et al, 2008, 2) Cattle raising in Mato Grosso developed a process of opening

areas as a way to legitimate land use. This dynamic allowed extensive pasture areas to be opened over natural land, without proper ownership.

Thus, between 1892 and 1930 the efforts of the state government focused on legitimating old possessions, even after the federal ban, validating titles that individuals irregularly held, in accordance with their political power/influences. The measuring, recording and marking of areas were the responsibility of a Judge Commissioner, appointed by the President of the Province, and a surveyor. In the case of vacant lands (*terras devolutas*), however, measurement and demarcation were the responsibility of the applicant, being the Judge Commissioner tasked with the approval of the service and the routing of the maps of the areas measured. In the case of Mato Grosso, the legislation allowed the incorporation of surrounding vacant lands to the occupied areas, as long as they did not exceeded the spatial limit of 150 ha. The number of expansions of regularized areas was such that between 1899 to 1929, of 910 land titles issued by this expedient, the process reached the sum of 650,877.50 hectares of possession and 4,294,216 acres of excess area (ie, arising from the merger of neighboring lands) (Moreno, 1999).

The creation of "Measurement Districts" and the Judge Commissioner figure had the objective of assuring that any attempt of regularizing land ownership remained subject to the vested interests of the state, since the Judge should act in consonance with the established powers and also had the last word on local matters pertaining to land regularization. There were so many excesses that the figure of the Judge Commissioner was abolished in 1897.

In this sense, the Revolution of the 1930's impacts on the Mato Grosso socio-political context through the dismantling of the repressive structure and expropriation of the human component. It sets up the opposition to situations like the widespread trafficking in the region, responsible for supplying an agricultural labor system based on - and vastly similar to - enslavement, and the establishment of militias by local political and economic leaders. With regard to land issues, the "Provisional Government" determined that new land adjustments were to be made in court, extinguishing the administrative form as it was until then.

In short, from the establishment of the first institutional framework of land in Brazil to the revisions proposed by the Vargas government, there is a consolidation in Mato Grosso, of the repressive apparatus associated with the ownership of land by large landowners. Marked by a selective flexibility, regulatory institutions of land property had structural deficiencies in their construction, favoring those with sufficient power or resources to assert themselves as owners of the disputed land on the border.

In 1938, the Getulio Vargas government, adopted the "March to the West" initiative, as a form of occupying "empty spaces", motivated by the organization of colonial settlements, the development of infrastructure projects such as hospitals, roads, rural sanitation and the organization of land ownership. With the increase of migration and state interest in the region in the following decades, this situation became even more problematic, as the tensions grew stronger, since land access became more regulated, scarce and valuable.

With the rising of the dictatorship period, the Constitution of 1946 turned its attention to the Amazon region and the state government began to conduct a review of the land legislation, creating a set of liberal laws in order to speed up privatization of unoccupied lands and legalizing ancient particular areas, while at the same time enforcing the federal government colonization plans. Between 1950 and 1964 there was an indiscriminate sale of vacant land, transforming the settlement policy into a profitable business - including the payment of patronage, as decided in 1955 by the Senate.

The DTC (Department of Land and Colonization) was closed several times due to land fraud in the state of Mato Grosso, and definitely closed in 1966. However, the DTC closing further encouraged speculation and negotiations with irregular land titles. After acquired, these titles were adjusted to areas not described in other titles and registered in the Registry of Deeds. It was from this practice that the expression "bunk beds titles" ("*beliches fundiários*") arose, with areas been sold and registered to different people, generating title overlaps.

The follow-up to this first national development rapture of the military, with the so-called Economic Miracle (1968-1974), bequeathed to the Brazilian economy similar consequences. Given the limits found by development plans and stabilization of the previous decade, the pressure for land throughout the country acted as a 'safety valve' for directing the attention of the population and some of the major political and economic agents.

As part of this new development perspective, the Cuiabá-Santarém highway was planned and begun to be constructed in the 70´s, with the main objective of improving the infrastructure that supported exports, providing the region with an outlet to the sea. Among its secondary objectives was the goal of reducing the impact of the creation of the State of Mato Grosso do Sul on the economy of Mato Grosso.

Along this axis of the highway, occupation and colonization projects were developed by private companies as highlighted by Guimarães Neto (2002) and Santana (2009). The settlement policy motivated 101 settlement companies to operate in the country until 1981, with 42% operating in that State and 49% of the 75 settlement projects developed along the axis of BR-163 road. As form of occupation through the implementation of private colonization projects, large agricultural projects and expansion of logging, the situation with regards to land ownership comprised three different possibilities: Mato Grosso lands were either destined for colonization projects, squatters (settled or not by Incra) or still in possession of the natives.

Under the state land policy, the government of Mato Grosso came to take three great historical impact measures. The first was the resumption of the granting of lots, now at 25 hectares in size and with a term of 10 years for effective occupation. Second, to develop the first state land code, which aimed for the systematization of guidelines involving the issue of land ownership and access. And the deployment of the Delegacia Especial de Terras, from the period of 1950 to 1966 (Moreno, 1999).

This culminated in the federalization of the state land, through Decree 1164/71, which placed under the guardianship of the Union about 60% of Mato Grosso land, reducing much of the state autonomy to formulate, implement and manage its own land policy. In 1977 the breakup of the Mato Grosso granted the condition of State to Mato Grosso do Sul region in 1978, along with the repeal of Decree 1167/71 that returned land shares to the “new born” state. Its first elected governor only came in 1982 (Reydon, et.al, 2014).

2. OBJECTIVE

Considering the historical process aforementioned, this article will perform a comparison between the importance of land appreciation in livestock and soybean investments at Dourados region in Mato Grosso do Sul State. The idea is to perform an analysis that can depict how weak land governance and the resulting appreciation of land, affected the economic aspects of agricultural and livestock activities and investment.

3. METHODOLOGY

3.1 Data gathering

The State of Mato Grosso do Sul, where the analysis was focused, encompass traditional agricultural and livestock producers municipalities. Its relevance resides on the fact that it is simultaneously: a traditional livestock producer State, and has seen a recent growth in cultivated area (42%) in the last seven seasons (Conab, 2016). The data gathering methodology was the same as described by Santos (2015), where focus groups meetings were organized by CEPEA in partnership with CNA (Livestock and Agriculture Confederation) to define a regionally representative production farm. This is also the methodology used by the Research Service of the United States Department of Agriculture (USDA) for the design of agricultural governmental policies since the 1960's (USDA, 2014). The representative rural farm, also known as modal farm, is a theoretical model that represents the production characteristics that are more statistically present in a sample of production farms. This model describes all of the production characteristics, detailing the whole production system, with information of total area utilized, human resources, applied technologies and the productivity obtained (ELLIOT, 1928; PLAXICO & TWEETEN, 1963; FEUZ & SKOLD, 1991; DEBLITZ et al, 1998).

3.2 Agricultural investment analysis

For the agricultural investment analysis, the selected region was the municipality of Dourados. In 2014, its representative agricultural farm had 300 hectares of productive land. In this area, the farm cultivated 300 hectares of soybeans in the summer, and 242.25 hectares of corn as a successive crop after the harvest of the soybean crop. Although in the following years the proportion of the crops cultivated in the land and the size of the representative farm itself changed, these values had to remain in the entire analysis in this work, for the costs and revenues projection to be realized in a satisfactory way.

The production costs considered were obtained through focus group meetings realized in 2014. After 2014, an average cost was projected until 2026, so that the investment horizon could reach 12 years. For the operational costs projection, we considered the average growth of the input prices since 2010, and then utilized this growth rate to design the future scenarios until 2026. The values for these inputs are gathered monthly by Cepea, since 2003, in several production regions in Brazil. The productivity indicator utilized was the amount of produced sacks (weighing 60 kilograms) per hectare, and the revenue was calculated considering the regional annual average price of sack for soybean and corn, also considering the succession of both harvests (one of soybeans, and one of corn, in the same production area), the traditional regional production system. The productivity value utilized was 47.63 sacks per hectare, a value that Cepea considers typical for the region, this productivity was replied for all years of the investment project.

Regarding the cost structure, the methodology will consider the Total Operational Cost (TOC) of the farm (Matsunaga, 1976). The TOC considers all operational expenses (costs with workforce, all inputs, fuel, general costs) and the depreciation of the machinery used in the season. Also as a cost, the payment of the index rates applied over the capital obtained with financial institutions was considered.

As mentioned before, the 12 years agricultural investment project was established to verify its feasibility through financial indicators. The TOC considers the depreciation rate

of constructions and machinery of the farm (tractors, combines, among others). Still it does not considers the initial amount of capital invested to acquire these productive factors in the beginning of the activity. To analyze it, the financial indicators of the Net Present Value (NPV), and the Internal Rate of Return (IRR) were calculated. The NPV brings to the present value (hypothetic moment of the investment decision) the annual monetary net revenue of the activity for each year, discounted by an interest rate that reflects the minimum remuneration that the investors are willing to apply their capital, minus the amount of capital invested in the first year. The NPV is represented in the expression (1) (Buarque, 1991):

$$NPV = \sum_{t=1}^{n} \frac{Rt-Ct}{(1+i)^t} - I \quad (1)$$

Where:
NPV = Net Present Value
Rt = Period Revenue
Ct = Period Cost
(Rt-Ct) = Net cash flow in the period
i = Interest Rate
t = Time in years
I = Initial Investment

To be considered feasible the NPV must return a positive value. In this study the interest rate utilized was 3.6%, the same as in Santos (2015) to compare the results with livestock production. To verify the impact of land appreciation in the agricultural investment, we stipulated two scenarios: one that considers land acquisition, appreciation and selling at the end of 12 years, and one scenario where we excluded the land factor from the analysis, and evaluated only the revenue from the activity.

To complement the feasibility analysis of the investment we utilized the Internal Rate of Return (IRR) in both scenarios. This tool represents the interest rate that will nullify the NPV (Noronha, 1981), represented by the expression (2):

$$0 = \sum_{t-0}^{n} \frac{Rt-Ct}{(1+tir)^t} - I \quad (2)$$

Where:
Rt = Revenue on period t;
Ct = Cost in period t;
(Rt – Ct) = Net Revenue in the period;
tir = Internal Rate of Return;
t = Time in years;
I = Initial Investment.

3.3 Land appreciation analysis

To analyze land appreciation, the Agriannual Report (FNP, 2003-2015) was considered as the main source for land market prices in Mato Grosso do Sul State. With a historical series of land prices in several types of occupation, it was possible to establish an average rate of appreciation for the municipality of Dourados. This average rate was considered in the agricultural investment analysis, so that we could comprehend its impact on the feasibility of the activity. The type of occupation was "high productivity agricultural land". The average growth rate of the land price in Dourados was established based on the average growth from 2003 to 2014. This average growth rate was considered to establish estimates for the projection of the land appreciation from 2016 to 2026.

4. Results and Discussion

4.1 Financial Indicators

The comparison between the two scenarios in the agricultural investment showed the following results (Table 1). First, it became clear that the agricultural activity in Dourados region is feasible in both scenarios, although the projections did not consider climate related risks that could diminish the productivity of the activity. Second, compared with livestock activity, land appreciation takes a secondary part in the feasibility of the agricultural farm. That is possible to affirm because the difference between the NPV values in both scenarios for agricultural production is R$ 1,893,959, what in fact represents the contribution from land appreciation in the investment. That value represents only 16.4% of the NPV value of the scenario that considers land appreciation.

Table 1 - Financial Indicators Results for Agriculture and Livestock Farms in Dourados - Mato Grosso do Sul State

Production System	NPV without land	NPV with land	IRR without land	IRR with land
Agriculture production Soybean+Corn	R$ 9.614.581,49	R$ 11.508.540,52	27%	8%
Livestock "Cria" production system (Santos, 2015)	-R$ 1.261.325	R$ 522.389	13,56%	4,34%
Livestock "Recria-Engorda" production system (Santos, 2015)	-R$ 3.209.552	-R$ 1.789.410	-	1,38%

Source: Santos, 2015; Elaborated by the authors.

For both the investments (agriculture and livestock), the difference in the Internal Rate of Return between the two scenarios resides on the fact that the amount of capital invested for the acquisition of land in the first year have a negative impact on the indicator. If we perform the same comparison between the livestock scenarios, the smaller difference (than the one between the two scenarios of the agricultural investment) resides on the fact that the value for pastureland are also significantly smaller than the price of high productivity agricultural land on the municipality (Table 2). It also shows that the opportunity cost of land for the agricultural investment is significantly higher than in the livestock activity. With a considerably higher amount of initial investment (land, machinery and implements), the opportunity cost of land sums up to the pressure on the agricultural farmer to be more productive.

Table 2 - Land Prices, Dourados (MS) region

Land Classification	Annual Average (R$/hectare)			Variation (%)	
	2006	2014	2015	2015/2006	2015/2014
Cerrado Natural Land	1.923	9.467	11.917	619,71%	125,88%
High Support Pastureland (Dourados)	4.671	13.667	14.833	317,56%	108,53%
High Support Pastureland (Ponta Porã)	4.281	13.667	13.500	315,35%	98,78%
Low Support Pastureland (Dourados)	3.726	10.500	10.833	290,74%	103,17%
Low Support Pastureland (Ponta Porã)	3.712	10.467	11.500	309,81%	109,87%
High Productivity Agricultural Land (Dourados)	5.446	20.333	23.250	426,92%	114,35%
High Productivity Agricultural Land (Ponta Porã)	5.174	19.833	20.500	396,21%	103,36%
Low Productivity Agricultural Land (Dourados)	4.221	17.683	19.000	450,13%	107,45%
Low Productivity Agricultural Land (Ponta Porã)	3.812	17.367	17.750	465,63%	102,21%

Source: FNP – Agrianual, (various years)

It is important to note that in the scenarios established, the gains obtained through land appreciation can only be realized if the selling of land occurs in the final year of the activity, so its value is only added to the revenue in the last year of the cash flow of the scenarios. With that in mind, as a secondary result, if we do consider the acquisition of land in the initial year of the agricultural production, taking the land price of 2014 for high productive agricultural land (R$ 20.333/hectare), and do not sell it after the 12 years of reasonable agricultural production, the activity becomes unfeasible. In other words, if investors decide to apply their capital in agricultural production (soybean+corn in high productivity areas of Dourados) through the acquisition of land, the analysis shows that in 12 years the investment would still not be feasible.

5. Conclusion

With the results from the financial indicators, we can conclude that land appreciation still plays a very important role in the development of agricultural and livestock activities. The historical proccess that generated weak land governance instruments, made possible to obtain very significant gains through land speculation. The historical proccess also explains the situation regarding land concentration in the country. In one hand, high values on land prices puts pressure on the agricultural producers to be more productive, due to a higher opportunity cost of land (that means the farmer could alternatively lease, or sell the high productivity agricultural land in a considerable price). In the other hand, higher land prices discourages new investors to develop agricultural acitvities through the acquisition of agricultural land. That fact helps to maintain the current agrarian structure, keeping the majority of available land in the hands of the traditional landowners.

By comparing the results between the livestock activity and the agricultural activity it is possible to conclude that the cicle of land transformation (natural land - to pasture land - to agricultural land) is deeply related with the historical land ocupation process. The traditional livestock activity (away from recent and interesting attempts to modernize it), with lower initial investment and lower profitability, relyes more in the appreciation of land than in the gains of productivity to generate revenue. It is in fact an initial activity of the cycle. In a second moment, after the land consolidation, the investment in agriculture can be realized, with significant revenues from it.

Finnally, it is important to note that the issue with land speculation does not rely on the gains from its appreciation itself, but with the fact that the weak land governance mechanisms benefits economically the opening of new land, and the consolidation of its possession through low productivity activities. That will ultimattelly foster land concentration and a general permanent state of low productivity livestock production.

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THE AGRARIAN QUESTION AND SUCESSION PROCESS IN THE AMAZON

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1. INTRODUCTION

In recent years, Brazil has gone through an important period of economic growth, with significant improvement in social indicators (VASQUEZ, 2016), however, the land situation, rural and urban, remains precarious. The land of the country is a serious problem since its occupation and is characterized by a high level of conflict and tension (REYDON, 2000).

The high concentration of land ownership remains, despite recent efforts towards democratization of land through land reform policy. This high concentration of land is one of the main sources of social and economic inequality in the country, and a significant part of its rural poverty (REYDON, 2011).

According to data of the agricultural census (IBGE, 2006), participating in a total area of 50% smaller agricultural establishments still in the range of 2.3%, while the 5% larger establishments totaled more than 69.3% of the total land, confirming the extremely high degree of concentration of land in the country, despite extensive land reform not modified the country's agrarian structure.

In this context, land reform appears not only as a social demand, but also as a fundamental instrument for the development of the country, since it is closely related to a set of social, economic, environmental conditions and different policies.

The agricultural settlements are designed as alternatives for fixing the man in the field, in addition to potential promoters of rural development. It is clear that the quantity and quality of rural settlements by the agrarian reform are still far from ideal, however, research shows that families have settled an improvement, albeit slight, in their living conditions (SOUZA, 2008). The problems are many, ranging from the quality and location of lands, lack of infrastructure, to the absence of a proper agricultural policy, to strengthen family agriculture in the settlements,

supporting mainly the issues of financing, organization of production and environmental sustainability (SOUZA, 2008).

From the data of INCRA, we observe that the Amazon is the main region of the country with regard to agrarian reform efforts, both in terms of the number of families settled as of area occupied, but the projects deployed little fit economically and environmentally to Amazon (TOURNEAU; BURSZTYN, 2010). The importance of the Amazon for humanity lies not only in the role for the global ecological balance, but is for your mass plant, its rivers, its fauna and houses a significant collection of indigenous and traditional populations that include rubber tappers, chestnut trees, bordering, quilombolas, babassu coconut breakers, among others, that give it notability in terms of cultural diversity. Draws attention to the need for regulation of soil in rural areas to promote the development of the families that there resides and continuity of populations in rural areas, which over time comes down.

Another important issue to this discussion are the demographic changes that have occurred in rural areas. The example of what had already occurred in urban areas, the population of the field comes systematically, both by lowering endogenous factors to family structure, as the decline in the fertility rate and the fragmentation of families (SAKAMOTO; MAIA, 2013), as by exogenous factors to family structure as the modernization of agriculture and the extreme territorial inequalities (MAIA, 2014). In addition, has taken place the masculinization and aging of this population, given the persistence of the rural exodus, now more strongly observed among women and young people (ABRAMOVAY; CAMARANO, 1999).

In this way, there is another problem, which is the continuity of production units for lack of successors, both by reducing the number of heirs and the departure of young people to the cities, since more, and more, the children leave the family business in search of better opportunities for income generation (SILVESTRO et alli, 2010). Thus, the objective of this article is to understand the land issue in Brazilian Amazonian settlements, emphasizing the determinants of migration of the rural population. The survey results show that migrants are predominantly young men and women, and suggest that the main reason among young people is the quest for better living conditions in the cities, linked to factors of better schooling, housing and income. Often, this search gives less willingness to change the field city and more to supplement the insufficient family income from work on Earth. In addition, for most of these people out of agriculture into urban areas.

The development of agricultural regions is essential for poverty reduction and economic and social development of the country (World Bank, 2008). It is concluded that the migration is inevitable while not taking to rural populations the same existing living conditions in the urban environment.

2. BRAZIL: LAND GOVERNANCE CHAOS AND THE NEED TO IMPROVE IT

2.1. Land concentration, land speculation and illegal land grabbing of public land ("grilagem")

The Brazilian agrarian question manifests itself in the high historical land concentration. According to Reydon (2011b), Brazil is one of the countries with the highest land concentration in the world[1], where the area of the 50% smallest agricultural establishments is 2,3% of the total sum of all establishments' areas, and the area of the 5% larger establishments sum up about 69,3% of the total area, as Table 1 shows.

Table 1. Brazilian agricultural establishments land structure.

	1975	1985	1995/6	2006
Number of establishments (millions)	5,0	5,7	4,8	4,9
Total area (millions of hectares)	323,9	369,6	353,6	294,0
Mean area (hectares)	64,9	71,7	72,8	67,1
Gini Index	0,9	0,9	0,9	0,9
Area of the smaller 50% (%)	2,5	2,4	2,3	2,3
Area of the larger 5% (%)	68,7	69,7	68,8	69,3

Source: Censos Agropecuários, IBGE. *In:* REYDON, 2011.

In a capitalist economy the production factors (land, capital, labor, technology and natural resources) are essential to the productive process. The land market is strongly inserted in this process because it is in the land that the production processes and human living happen. Moreover, this asset has three important characteristics: it is scarce, not mobile and it is durable (Reydon, 2006).

[1] According to FAO (2011), the Brazil has the 9th higher Gini index for land concentration (0,85), only being lower than Peru (0,86), Spain (0,86), Bahamas (0,87), Panama (0,87), Virgin Islands (USA) (0,87), Guam (0,88), Paraguay (0,93) and Barbados (0,94) – which is even more dreadful if we take the Brazilian vast continental territory into account.

According to Plata (2001), the emergence of the land market in Europe happened as a mean to overcome the feudal ties and enrich the bourgeois class that, from then on, would have a distinctive control over the economic relations. In Brazil, the land market was only consolidated after the abolishment of slavery, when also begins the formation of labor, products and credit markets (Plata, 2001). On this, Reydon and Plata (2000:10) bring forth the thoughts of Karl Polanyi (1980:84-85):

> "The crucial point is as follows: labor, land and money are essential elements to industry. They also have to be organized in markets and, of course, these markets make up an absolutely vital part of the economic system. Nevertheless, labor, land and money are not commodities. […] The labor, land a money markets are, without doubt, essentials to a market economy." (Reydon e Plata, 2000:10, free translation from Portuguese)

The land market studies in Reydon (1992), Reydon and Cornélio (2006) assert that the most common ways that economic agents profit with land, especially in the Amazon, is through fiscal incentives, subsidized credit policies and land speculation. Thus, the speculation with land was historically considered as the most profitable activity for the landowners. This raised questions point to the need of debating about the urgent need of land governance instruments in Brazil.

According to Reydon (2006), in the period of 1500 to 1850, all the rules involving land uses were given by the powers of the king, the church and the political and physical power of those who were occupying the land. Plata (2001) and Reydon (2006) indicate that the land market begun to exist from 1850 on, with the Land Law, and from there on, the notaries and governmental institutions begun to formulate rules for the land occupation. This law aimed to occupy free lands and give the property to particulars. By doing so, it was instituted the regularization of existing lands and the transmission by means of buying and selling, private lands would be registered and, by exclusion, the unregistered lands would be the free lands that belonged to the State ("terras devolutas") (Reydon, 2007).

Observing the studies of Silva (1997), Reydon (2006) traces a timeline of the Brazilian land regulation history, revealing that changes in the political and institutional framework were rarely translated in a real improvement of the regulation and effective enforcement of land property rights – from the slavery abolishment, the Republic proclamation, creation of the Civil Code in 1916, the promulgation of 1822 and 1988's Constitutions, the creation of the Land

Statute (Estatuto da Terra) and to the creation of some government organizations. Within the study, what could be perceived throughout the Brazilian land regulation history was the constant struggle between the State, trying to define, restrict and enforce regulations, and the enormous resistance of the large land property owners who objected any restrictions to the private property (Reydon, 2006). For this author, the large capital always took advantage and, in seeking its interests to obtain financial advantages, never respected the social and environmental land uses.

The Brazilian agrarian question is yet to be solved and is still a major hindrance to the country's development (Table 2). The violence in land conflicts in the first decade of the 21st reveal that, between 2002 and 2010, there were more than 5 million individuals involved in a total of 13 thousand episodes of land conflict, resulting in an average of 1,448 cases per year (Reydon, 2011b:7).

Table 2. Some numbers on the rural conflicts in Brasil, 2002-2010.

Year	Num. of conflicts	Num. of persons involved	Conflicts in area (hectares)	Num. of murders	Num. of murder attempts	Num. of death threats	Num. of persons arrested	Num. of aggressions
2002	925	425.780	3.066.436	43	36	244	158	18
2003	1690	1.127.205	3.831.405	73	64	266	380	48
2004	1801	965.710	5.069.399	39	99	284	421	335
2005	1881	803.850	11.487.072	38	56	266	261	166
2006	1657	703.250	5.051.348	39	72	207	917	749
2007	1538	612.000	8.420.083	28	66	259	428	443
2008	1170	354.225	6.568.755	28	44	90	168	800
2009	1184	415.290	15.116.590	25	62	143	204	277
2010	1186	315.935	13.312.343	34	55	125	88	90

Source: Comissão Pastoral da Terra (CPT) *in* REYDON, 2011b, adapted.

Another problem created by the lack of land governance is the intense deforestation in the Amazon. A recent study of Reydon (2011a), inspired in Margulis (2000), reveal the complexity of the variables and causes of the Amazonian deforestation. These studies show that once the fiscal incentives and government development projects were the main inducers of deforestation. In verifying Margulis' (2000, 2003) arguments it can be noted that beyond these massive fiscal incentives the deforestation is also motivated by the large profits obtained through land speculation via irregular appropriation of public unregistered lands (terras devolutas), opening of new areas for pasture, wood logging and other activities that cause more social and environmental losses for the population than economic gains.

Currently, when analyzing the irregular appropriation of public unregistered lands (terras devolutas) in the Legal Amazon (Amazônia Legal) it is possible to see clearly the crescent expansion of the agricultural frontier – be it deforestation to open lands for pasture, for illegal logging of trees, mineral extraction or for large scale cultivation of soy, corn, castor beans, etc., to produce biofuels or for other purposes. For authors like Barreto, Pinto, Brito and Hayashi (2008), the lack of clear and reliable land regularization, the existence of innumerous falsified land titles or the occurrence of informal land possessions engender major difficulties to the elaboration and implementation of economic development or environmental governance projects in the Legal Amazon (Amazônia Legal). These lacks of regulation problems accompany the Brazilian land regulation history since as early as the Land Law of 1850 and reveal the fragility of the formal institutions relative to the demarcation, registry and property rights regulation (Reydon, Bueno and Tiozo, 2006). The uncertainty with property rights hampers economic and social development projects in the Amazon, creates numerous class conflicts, as well as creates serious difficulties for the State in the promotion of essential policies for the reduction of deforestation, such as command and control[2] and economic incentives[3] (Barreto, Pinto, Brito e Hayashi, 2008; Reydon, 2011a).

The land regularization is vital for the sustainable development promotion in the Legal Amazon. This statement is reinforced by the study of Maciel (2003) which highlights that the greatest Amazonian challenge is to implement public policies aiming at improving social justice, containing the deforestation and the rational utilization of the environment with actions seeking its conservation. Due to the lack of a cadastre and effective land property regulation in Brazil, the most common practice is the land possession, especially in the Amazon. The data in Figure 1 reveal that only 4% of the private areas (20 million hectares) have their registers validated by INCRA[4]. There is more than 158 million hectares (32%) of land supposedly private without register validated by INCRA. Yet there is the remainder 21% which were not in neither of the above categories and are, therefore, technically considered public lands without

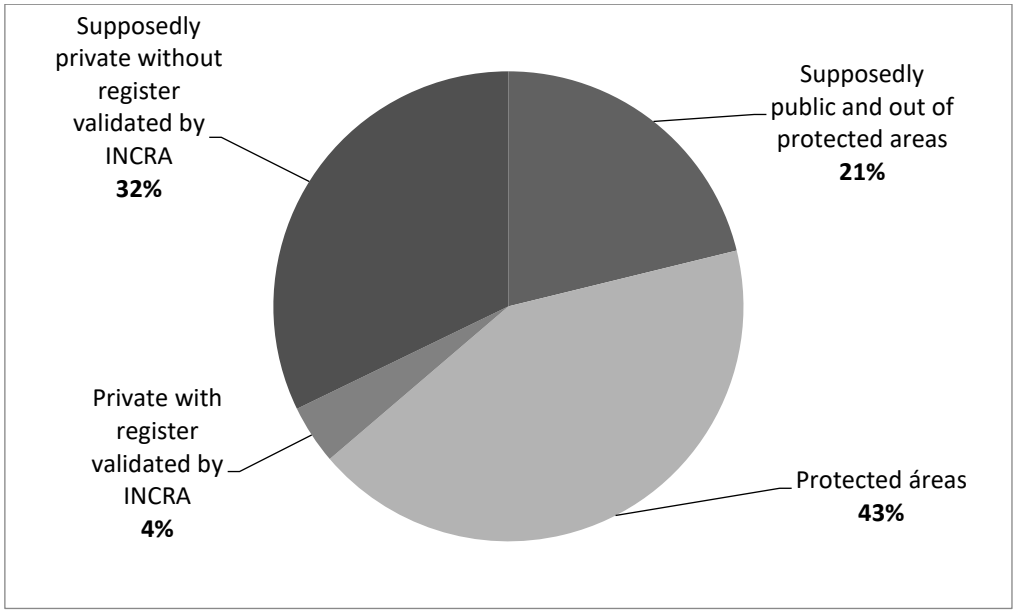
[2] "The main Command and Control Policies, direct State interventions that modify the behavior of the deforesters, were the operations: a) Curupira (2005) and Arc of Fire (Arco de Fogo) (2008) that fought the illegal wood logging; b) decree 6321/07 which restricts the credit grants from the banks and compel the land property owners in the municipalities with higher deforestation rates to re-register their properties; c) the creation of protected areas (Unidades de Conservação) summing up more than 20 million hectares to the existing 80 million, for a total of 273 protected areas; d) homologation of 87 Indigenous Territories (Terras Indígenas) with almost 18 million hectares; e) restrictions on the agricultural products from properties of the municipalities with the highest deforestation rates." (Reydon, 2011a:1, free translation from Portuguese)

[3] "The economic incentives policies which use economic strategies (prices and others) to encourage or inhibit economic agents to lower the deforestation were the following ones: a) operation Green Arc (Arco Verde) (2008); b) Special credit line under FNO, FNE and FCO (Constitutional Financing Funds for the Northwest region, FNO; for the Northeast region, FNE; and for the Central-western region, FCO) for deforested areas recovery, reforestation, and environmental regularization in the Legal Amazon." (Reydon, 2011a:1, free translation from Portuguese)

[4] Brazilian National Institute for Colonization and Agrarian Reform (Instituto Nacional de Colonização e Reforma Agrária).

allocation. Thus, the lack of land regulation in the Amazon significantly corroborates to the generation of the economic, social and environmental problems, with emphasis to the deforestation.

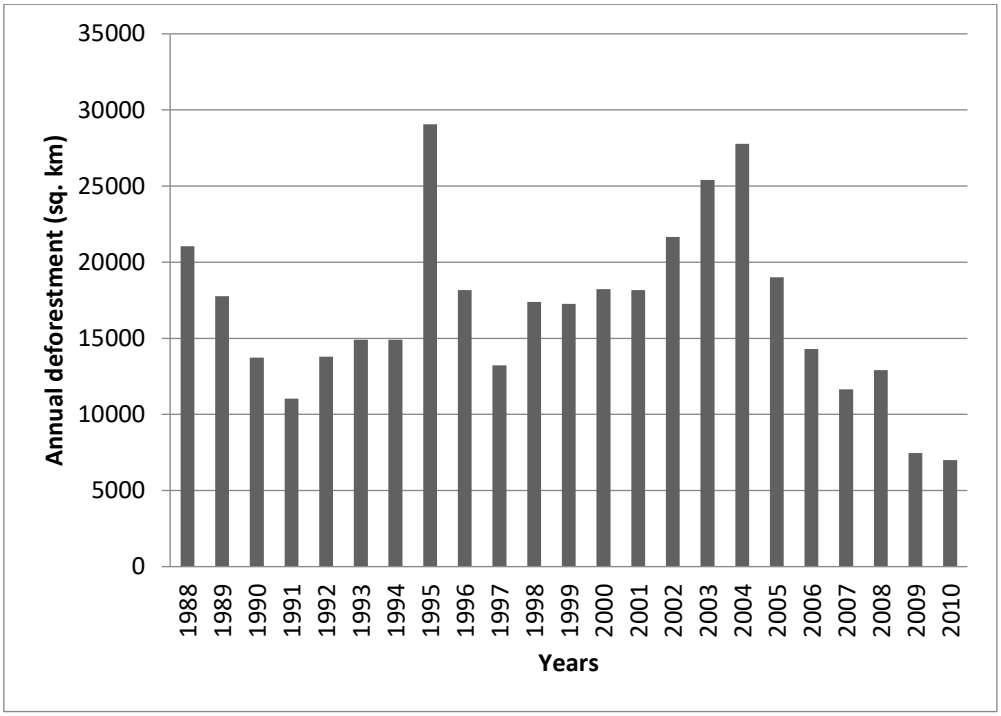
Figure 1. Juridical condition of land in the Amazon (% of area)



Source: Barreto (2008), apud Reydon (2011b). Modified and freely translated from Portuguese.

Based on satellite imagery, the annual deforestation in the Legal Amazon in the last years was around 6.4 and 7.4 million hectares, meaning a substantive improvement when compared to previous periods, but despite this reduction, the deforestation rates are still very high for a biome with the characteristics of the Amazonian.

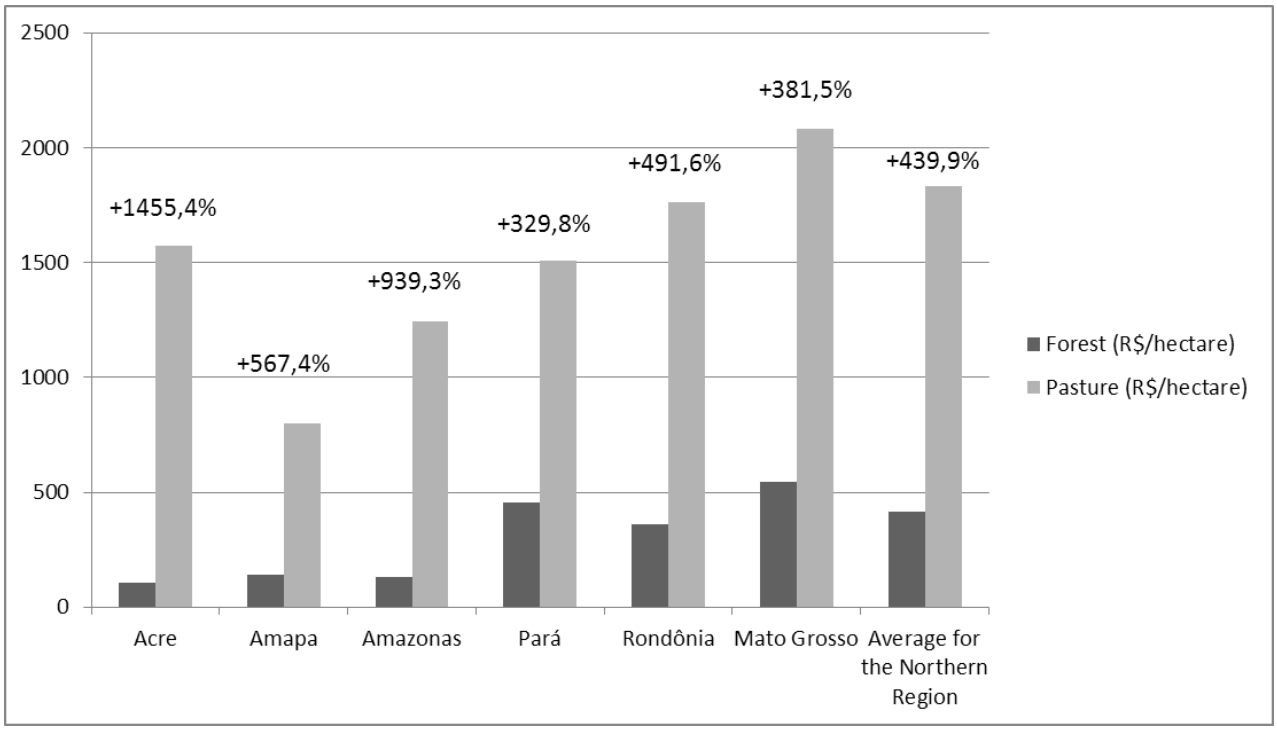
Figure 2. Annual deforestation in the Legal Amazonia, in square km, 1988-2010



Source: Prodes (2011) apud Reydon (2011b). Adapted, free translation from Portuguese.

Analyzing the data on land prices in the states of the Legal Amazon, it can be perceived that the deforestation always increases significantly the property price, as the hectare values paid for forested areas are lower than in pasture areas. This occurs because the land prices are fundamentally determined by the expected productive gains from livestock farming linked to the land, as the land productive utilization in the deforested lands can begin immediately and without capital expending in the deforestation activity. The forested land prices are inferior and this stimulate speculative agents into buying them for a low price and, after the deforestation process, selling it with a higher price as pastureland. This way the speculator also can obtain profits with (not always legal) tree logging, besides the value increase in the transformation to pasture later. In the Acre, the land price of a hectare can be increased as high as 14 times, while in the state of Amazonas the price can be increased as high as 10 times. Few investments have high paybacks as these (Figure 3). In this case, there is no doubt that the lack of land regulation, especially in large territorial extension states like those of Legal Amazon, is one of the major setbacks for the promotion of regional sustainable development

Figure 3. Average land prices in the Amazon (R$ (current)/hectare, 2008)



Source: Reydon (2011b), adapted, free translation.

The lack of a clear definition over land property rights in the Legal Amazon opens precedents for the occurrence of all the above-cited problems and creates difficulties to the sustainable development projects and policies for the region. Adapting Cavalcanti's (2002) idea to the Amazonian context and to the objectives of this study, the definition of sustainability comes from a relation between the human being and the natural environment – the forest – in such a way that man could use natural resources, but in such a way that it would not be harmful to the environment or to the next generations' welfare, guaranteeing economic efficiency, social justice and ecological prudence. It is the opinion of the present study that sustainability also involves a clear definition on property rights and effective land regularization.

3. RURAL SETTLEMENTS

The processes of rural settlements even following a law, acquire its own characteristics in each country and in each region within the country, as the culture or the economic interests. In the Amazon, considered as a storehouse of natural resources, with enormous riches to be

exploited, occupation and exploitation policies vary according to the countries, following their own interests (ARAGÓN, 2013).

The settlements of INCRA in Amazon continue outperforming those of other regions (TOURNEAU, BURSZTIN, 2010). 9,272 registered at INCRA settlements ' till 2015, 3,448 are in Legal Amazon, corresponding to 37.2% of settlements and 63% of the total number of families settled (table 3).

Table 3. Rural Settlements in the *Amazônia Legal*

Local	Settlements in the *Amazônia Legal*		Families Settled in *Amazônia Legal*	
	Total	Δ %	Total	Δ %
SR-01/PA	400	4,3	98.789	10,4
SR-12/MA	805	8,7	112.341	11,8
SR-13/MT	549	5,9	82.876	8,7
SR-14/AC	161	1,7	32.900	3,4
SR-15/AM	146	1,6	57.382	6,0
SR-17/RO	221	2,4	39.053	4,1
SR-21/AP	54	0,6	14.953	1,6
SR-25/RR	67	0,7	16.639	1,7
SR-26/TO	378	4,1	23.635	2,5
SR-27/MB	511	5,5	72.219	7,6
SR-30/STM	156	1,7	53.790	5,6
Total	3.448	37,2	604.577	63,4
Total Settlements in the Brazil	9.272	100,0	953.930	100,0

Source: INCRA

To TOURNEAU and BURSZTIN (2010), the settled areas had become one of the main elements of the rural world in Legal Amazon, representing almost a third of the land used and almost 74 percent of rural establishments. However, according to the authors, not all of these lots if effect resource as an agricultural establishment, mainly because of the difficulties faced by these families to develop any economic activity is due to the lack of infrastructure, quality of land, access to financing or support policies, resulting in the abandonment of the land and, consequently, contributing to the process of land concentration. However, the overcoming of these difficulties, basic transformation of the rural settlement in an agricultural establishment, does not remove the threat to the continuity of the production units. In recent years has significantly increasing the problem of lack of successors in these rural settlements, generating another risk factor.

Table 4 - The Brazilian population according to place of residence

Year	Urban			Rural		
	Population (1000)	%	Households (1000)	Population (1000)	%	Households (1000)
1991	110.423	75,6	27.248	35.714	24	7.633
2000	137.434	81,2	37.516	31.848	19	7.508
2010	160.438	84,4	49.296	29.655	16	8.131

Source: (MAIA, 2014)

It is important to highlight that, young people are the ones that comes to the countryside and leaving, among these, is the leading participation of women (CAMARANO; ABRAMOVAY, 1999). Schooling is also preponderant in the definition of the employment prospects of urban areas and fulfills an important role in increasing the chances of migration of rural residents. As consequences of selective migration from rural areas (i.e., the predominant flow of young people more educated and female), has to accelerate the aging process and the masculinization of the rural population, compromising the reproduction of households and rural society (MAIA, 2014). Another important aspect of demography of the family is the aging population that also occurs in rural areas, and the significant growth of the average number of people with income of retirement and pensions. In rural areas, almost doubled the average number of retirees or pensioners (of 0.25 Member for entering in 1991).

4. RURAL EMPLOYEMENT AND MIGRATION IN THE AMAZON

Fundamental part of the question of succession in the settlements, in particular, and on family agriculture, in General, is that the children of farmers, traditionally considered as stocks of labor available to the production increasingly seek other non-agricultural activities outside the property. Add to that the profound transformations of productive agricultural sector, resulting in greatly increased productivity and drastic reduction of agricultural jobs. Thus, increasing the transfer of rural workers to the cities. As shown in the Census, between 2000 and 2010, there is a relative reduction of the persons employed in agricultural work, particularly in the traditionally agricultural regions.

Table 5 - Non Agricultural Employment - 2000 e 2010

Region	2000			2010		
	Total	Urban	Rural	Total	Urban	Rural
Brasil	**81,5**	**93,5**	**29,1**	**85,1**	**93,8**	**33,5**
Norte	72,0	90,8	**27,5**	76,5	91,6	**29,6**
Nordeste	68,6	89,0	**24,3**	75,1	90,0	**30,9**
Sudeste	90,2	95,5	**40,1**	91,9	95,7	**40,7**
Sul	80,1	94,4	**27,5**	84,2	94,2	**33,4**
Centro-Oeste	84,8	92,6	**29,7**	87,7	93,7	**35,0**

Source: Censos Demográficos/ IBGE 2000 e 2010

In summary, despite the reason that drives people to seek opportunities outside of the family, in addition to the significant reduction in the number of rural residents has decreased substantially the share of those who perform agricultural activities (MAIA, 2014) according to the *Censo Demográfico* of 2010, the Brazilian Amazon had a population of 25,474,365 people in 2010. Of these, 2,094,017 were Brazilian recent migrants, were foreign migrants recent 9,853 (natural from other countries) and 323,810 were migrants with less than 5 years of age, in the period 2005-2010. Already the period accounted for migrants not 20,935,610 with 5 years or more of age and 2,110,671 non-migrants under 5 years of age (JAKOB, 2016). According to ARAGÓN (2013), the internal migration patterns in the Amazon have been modified over the years, intensifying the intraregional mobility and urban destination. In this sense, migration represents the destruction of the possibility of continuity.

5. CONCLUSION

The World Bank report (2008, p. 163), strongly condemns what it calls creating barriers against the mobility of workers, but our argument is that the improvement of public policies in order to secure the rural workers in the field, giving them decent living and working conditions would have a positive impact in reducing world poverty, since the migrants in most cases, are not only exercising their free choice of mobility, but forced to look for new opportunities to sell their work force in Exchange for supplying the basic needs of survival. In this sense, for these

young migrants to exit the House, would be the way out of poverty, which is not always come true.

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An experience of Regularization Private Urban in Brazil: the case of Terra Nova Urban Land Regularization Ltda.

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KEY-WORDS: Land urban regularization, democratic participation, mediation

SUMMARY

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INTRODUCTION

In Brazil, as in many developing countries, the uncontrolled urbanization has happened largely through informal and illegal settlements. This has resulted in a vicious circle of illegality, which all too often is powered by the discontinuity of public policy or political interests.

In this article, we show the methodology and evaluate the Terra Nova Regularization Urban Ltda which is to regulate urban slums, using conflict mediation procedures. Mediation is done by creating dialogue and integration between the various actors involved in land tenure. The company promotes synergy between the sectors public, private and civil society in order to adjust and make the settlement benefits all actors, each of which performs a function to achieve the goal, which reduces public investment needs and create the conditions for a real democratic participation of the population involved, makes this unique process that is effectiveness, transparence and efficiency.

The methodology will be presented based on the companies fifteen years experience regularizing different illegal settlements around the country (2.5 million of square meters and 22 thousand families). The evaluation will be done more profoundly based on the regularizing process of Vila Marinho Paranagua (PR). Besides the direct costs and revenues from it, the study will analyze its impacts on the land prices and other indirect benefits.

The article is divided into four items; the first will analyze the legal and institutional framework of urban regularization and its problems. The second will show the land regularization process methodology used by the company with emphasis on

popular participation in regularization. The third will evaluate the cost/benefices of the process. The fourth item will analyze the indirect benefices of the regularization manly on land prices.

1. ANALYSE THE LEGAL AND INSTITUTIONAL FRAMEWORK OF URBAN REGULARIZATION AND ITS PROBLEM

From the 1960s have become visible the harmful effects of illegal occupation of land in the brazilian cities and begin to be traced the first studies on the resulting social inequality this process. At the end of that decade, the precariousness of the settlements of the low-income population was alarming, which modified the design of clandestinity and irregularity, passing this to be a social issue to be addressed.

But only in the 1979 that it approved the Federal Law nº. 6,766 which were treated issues relating to the parceling of land and urban land regularization.

In 1979, the government in order to tackle mass regularization of precarious settlements, implemented two measures: a) specifies minimum urban norms to be followed in regularizing subdivisions (Decree nº 15,764/79); b) is intersecretariais groups to deal with the settlement with the regional administrations and the Collegiate, under the coordination of a Collegiate Pilot, based at the Secretariat of the Regional Administrations - SAR (Ordinance nº 76/79).

The second legal framework of greater importance was in 1988 with the promulgation of the Federal Constitution, where the Chapter of the Urban Policy has been incorporated who founded the concept of "social function of property" in Brazil.

In view of the increase in illegal occupation urban areas and their respective social and environmental impact, in 1999 Law of Division Land Urban was amended so that has to be given special treatment to popular settlements regularized within local public actions .

In 2000, the Constitutional Amendment No. 26 presented as social law the right to housing, making the State's obligation and duty to provide, directly or indirectly, that everyone has access to decent and adequate housing, whose citizenship rights are respected and the human dignity and social work values.

In 2001 the National Congress approved the Statute of the City (Federal Law 10,257/2001) that regulates the chapter on "Urban Policy" of the Federal Constitution of Brazil. Its basic principles are participatory planning and social function of property.

In 2003 it is created the Ministry of Cities instituting the National Policy for Land Regularization and soon in 2004 approved the Federal Law No. 10.931 ensuring the gratuity of the first registration in the Real Estate Registry of land regularization.

The *caput* of Article 2º Statute of the Cities (Federal Law nº 10,257/2001) refers to the objective of urban policy, which is organizing the full development of the social functions of the city and of urban property, with the guideline in item two that requires democratic management through participation of the population and associations representing various segments of the community in the formulation, implementation and monitoring of plans, programs and urban development projects.

The Statute of the Cities establishes democratic management, ensuring the participation of the urban population in all decisions of public interest. Popular participation is expected and, through it, the associations representing various segments of society are involved in all construction stages of the Master Plan - design, implementation and evaluation - and in the formulation, implementation and monitoring of the other plans, programs and projects municipal urban development. It is fixed also promoting public hearings.

Although the Statute of the Cities has innovated in the aspect of democratic management of urban space, this did not apply to resolve urban conflict arising from the housing shortage, given that the popular participation and the integration of this with the other agents involved in the settlement of irregular settlements did not occur in practice.

In 2009 it was approved Federal Law nº 11,977, which establishes the "Minha Casa Minha Vida" and devotes a chapter to urban land regularization of informal settlements, chapter three, which is a legal framework of national character, given that it offers on a national level institutes for urban land tenure, creating procedures, defining powers and responsibilities in order to give effect to the settlement process with the specialty that denote "social interest", consolidating the achievements in previous decades.

Among the many innovations introduced by Federal Law nº 11,977/09, the law defines, in article 46 which is the Regularization as:

"The set of legal, urban, environmental and social aimed at the regularization of informal settlements and the titration of the occupants in order to guarantee the social

right to housing, the full development of the social functions of urban property and the right to an ecologically balanced environment ".

The Federal Law nº 11,977/2009 also established the following principles:

I - increasing access to urbanized land for low-income population, with priority for his stay in the occupied area, ensuring the adequate level of housing and improvement of urban, social and environmental sustainability;

II - coordination with sectoral policies for housing, environment, sanitation and urban mobility at different levels of government and with public and private initiatives aimed at social integration and the generation of employment and income;

III - involvement of stakeholders at all stages of the settlement process;

IV - encouragement of extrajudicial resolution of conflicts; and

V - granting the title preferably to the woman.

Thus land tenure has become a process carried out collectively, which depends on the participation and the coordinated actions of various stakeholders, at times and with specific roles, according to the characteristics of the area and the conditions for regularization.

According to the Law, the following actors are entitled to promote land regularization:

• the Union, the states, the Federal District and the municipalities;

• the population living in informal settlements, individually or in groups;

• housing cooperatives, neighborhood associations, social organizations, civil society organizations of public interest; and

• civil entities established for the purpose of promoting activities related to urban development or land tenure.

In this context, we consider of vital interest to the possibility of the population resident in the settlements, promote land regularization and the regularization process to be built with the effective participation of the population in all phases of the work.

It turns out that, even after the edition of the Federal Law nº 11,977/09, some parts of the land regularization were still not healed and others generated doubts.

To enlighten them, came the Federal Law nº 12,424 /11 which, among other changes, revoked item three of article 59, which limited 250m² in size of the lot area or susceptible undivided possession of legitimation; allowed the settlement also on permanent preservation areas (article 54,§1º); now expressly provides explicitly state that the possession of legitimacy is conferred on the holder of shares or undivided, since

exercised the right in individual lot and identified (Article 59, §2º); dismissed the rectification of the register for the registration of urban demarcation of self and the installment of the record due to land regularization project (Article 213, § 11, IV.); released care of the requirements of Federal Law nº 6,766/79 for the registration of land regularization installment (article 65, single paragraph) and gave the Government the power to extinguish the special use concession contracts for housing and use of grant previously signed the intervention area in order to facilitate urbanization works in irregular settlements (article 71-A).

Coming to today observed the great evolution legislation in order not only to ensure individual security of tenure for the occupants, but mainly the socio-spatial integration of informal settlements, and including popular participation, along with the public and private sectors, as mainspring of the main process purpose.

Thus, brazilian law provides that the operationalization of land regularization projects demand the involvement of various stakeholders in the discussion of policy proposals, execution of projects and works, preparation and adoption of laws, use of instruments and enabling resources. The main actors involved in the land regularization project are: Municipal, State and Federal authorities, Real Estate Registry, Public Defender or legal aid services to municipalities, Judiciary, occupants of the area to be regularized, owner, Public Prosecution, Chamber Councilors, Non-Governmental Organizations.

Although there is a specific legislation for the land urban regularization, this can be accomplished with the judicial Repossession Action proposition provided for in article nº 1228 of the Brazilian Civil Code (2002) and, where possession of the property of reintegration involves a considerable number of people who are occupying the area claimed for more than five years, will be applied to §§ 4º and 5º of the same article consisting of judicial dispossession.

The article states:

> *Article 1228. The owner has the right to use, enjoy and dispose of it, and the right to reclaim it the power to whoever unjustly owned or possessed.*
>
> *§ 4º The owner may also be deprived of it if the property claimed consist of large area in uninterrupted possession and in good faith, for more than five years, a considerable number of people, and those in it there are held together or separately,*

works and services considered by the judge of relevant social and economic interest.

§ 5º In the case of the preceding paragraph, the judge shall determine the just compensation due to the owner; paid the price, it will be the sentence as the title to the property registry on behalf of the owners.

According to Nelson Nery Junior and Rosa Maria de Andrade Nery (YEAR AND PAG), "the rule creates the legal expropriation, considered an innovation" the highest range, inspired by the social sense of ownership, implying not only new concept of this, but also new concept of ownership, which could qualify as office work. "

With systematic interpretation of the code, it is clear that it is expropriation (judicial expropriation) as in the preceding paragraph, the legislature, content the article 5 °, XXIV, of the Federal Constitution, regulated expressly the cases of expropriation for public necessity or utility and social interest, to then dispose the device under comment, the owner also could be deprived of it, in terms of ownership exercised by a third party upon payment of compensation (§5º).

Thus, according to these authors, to exercise the right and necessary that the property owner demand repossession action, the defendants, holders, present request opposed by defense or by counterclaim, alleging the existence of the office work and fulfillment of legal requirements, when then the judgment, accepting the said request, states the right to determine the payment of fair compensation for squatters, using the sentence as transmissive title of the property to registration with the competent Real Estate Registry Office.

With regard to compensation, it should be paid by the holders, as though understanding of the doctrine, it would be up to the Government to bear this burden, it is not fair to assign to the State, and via transverse the entire community, the duty to pay an amount that will benefit few.

However, although not legal basis is disposed in land tenure regularization, it should support the process that is triggered judicial dispossession, using the principles and procedures of Federal Law nº 11,977/2009. Thus, to have it to a regularization process chaired by the Judiciary, through the democratic participation of the population involved, municipalities, Real Estate Registry Offices, residents' associations, Public Prosecutors, companies providing public services and others interested in land urban regularization.

The experience of using the Expropriation Judicial together with Federal Law nº 11,977/2009 has been the object of work of Social Enterprise Terra Nova Regularization.

This company has used a type of methodology that works through the mediation of conflicts between the owner of the area occupied irregularly and its occupants. Amid the lawsuit the other actors (public, private and civil society sector) are called to prepare a plea agreement in which all have rights and assume obligations, so that together the land regularization process to occur. Given that the company has been successful in a considerable number of mediations. The following item will report the methodology used by the Social Enterprise Terra Nova Regularization company.

2. THE MEHOTDOLY OF TERRA NOVA REGULARIZATION LTDA

The adjustment is made in a participatory manner, paying attention to the urban, environmental and social aspects. Thus, it is possible to public investment in the area resulting in improvements such as: sanitation, electricity, paving, street lighting, title registration, new homes, among others.

This all results in the improvement of life and the consequent social reintegration, increasing the area illegally occupied the neighborhood status, resulting in fertile ground for the development of other social policies that bring more benefits to the residents who already will be better articulated with a view engagement provided by the adopted mediation strategy that focuses on conscious participation of all stakeholders.

In the land regularization process of Terra Nova building is made from the effective participation of the population, as well as other actors in the public, private and civil society sectors in all phases of the work.

It is worth clarifying that the company operates in private areas that were occupied illegally, given that most of them are peripheral and lacking in basic public infrastructure.

The whole process of mediation is based on the transparency principle and other principles of Law No. 11,977 / 2009 where meetings are held, with the presence of the various stakeholders involved to ensure the credibility of the decisions at all stages of the processes of land regularization .

The process begins with a feasibility study is to verify the existence of conflict of private property invasion. Noted the existence of the conflict, the company sought the owner to know whether or not repossession action filed in the Judicial Branch.

Concomitantly, irregular occupants of the area are sought by the company to find out if there is, by the same, a willingness to pay for land tenure that provide them the land regularly and basic infrastructure improvements. This stage is prepared a budget that covers the cost of providing the services of a mediator company, the value of the agreed area with the owner, the amount of expenditure on technical work, value of infrastructure works and other expenses that may arise from the demands pled by occupants . From the total budget value is set the value per square meter to be paid by the occupants to regularize the land situation.

Existing interest of both parties, the company draws up a memorial of understanding, which will be the demands of the owner and occupants of irregular and price to pay. The memorial is presented in meeting satisfaction representatives of both parties to be ratified. After ratification a residents' association is formed to have irregular occupants representative for formalization of judicial and extrajudicial agreement that will occur in the course of the regularization process.

From the ratification of the memorial starts an assessment of the legal situation, land, environmental, socio-economic study of the occupants, among others, to define the individual terms of payment, deciding in how many installments payments will be made, establishing time where each occupant will have your property title and hands and stipulate a deadline for the completion of land regularization. Decided these conditions, individual contracts of adhesion to land tenure are made between the Newfoundland company, the owner and irregular occupants establishing the general and particular conditions of the settlement.

Through legislation, the land regularization process the prosecutor is required to participate, given that they are in collective environmental and social issues discussion of which the organ has the power to supervise and act. So the company makes contact with the prosecution, and the contract news reached between the Terra Nova, the owner and the illegal occupants and being aware of the intention to regularize the area, call the public bodies such as municipalities, state environmental institutions, federal agencies, companies providing public services, neighborhood associations, non-governmental organizations, in short, all stakeholders who may be involved in land tenure. All stakeholders involved attending meetings to decide on the rights and duties of each party.

Thus, the company gathers around the case all possible stakeholders interact dynamically, as the company and with each other.

The participation of stakeholders may vary according to the case to be regularization, ie, the methodology has a capacity to adapt to each reality of the area to be regularized.

Source: Authors

All decisions will be in the Conduct Adjustment Term, including seeking greater transparency of the whole process. It created the Technical Comitee that will bring together a represent each stakeholder involved in the regularization of the area with the purpose of coordinating the implementation of the Plan of Land Regularization and the objectives to be achieved.

The Technical Comitee will meet monthly and their meetings will be recorded in the Minutes, attached in the proper book.

To oversee the Plan Regularization will set deadlines for the implementation of measures laid down therein, and judge the requests of residents and will be able to resolve

conflicts that exist between those involved in the Settlement Plan and may also decide on penalties and solutions.

The Conduct Adjustment Term prepared by prosecutors and signed by all the stakeholders involved have fully effective and valid as extrajudicial executive title against either party to become delinquent.

In view of the agreements between the parties and the preparation of the Judiciary Conduct Adjustment Term is driven by Possession Reintegration Action, filed jointly by all parties containing the contract determinations drawn up between the owner and the occupants and the orders set out in the Conduct Adjustment Term.

The judge ratifies the agreement between the parties and give the judgment that after completion of all contractual requirements, including payment by the regulated area, it will be as skilled Title for registration of the lots in the Real Estate Registry office. The worth sentence individually for each party, so that if the occupant does not pay the amount stipulated in the contract made between him, the social enterprise and the owner, your area will return to the owner who may exercise the established legal rights, including sell it to someone else.

Completed the formalities in the Judiciary has commenced preparation of the Cooperation Agreement between the stakeholders involved in the regulation which will result in the project definition.

Set design are made arrangements with public companies to provide services such as sanitation, water, electricity, among others giving it beginning to plan Regularization created a participatory and democratic way by the various stakeholders understood by the Conduct Adjustment Term.

The project management is done by the Technical Board which will monitor the project so that all commitments are met satisfactorily.

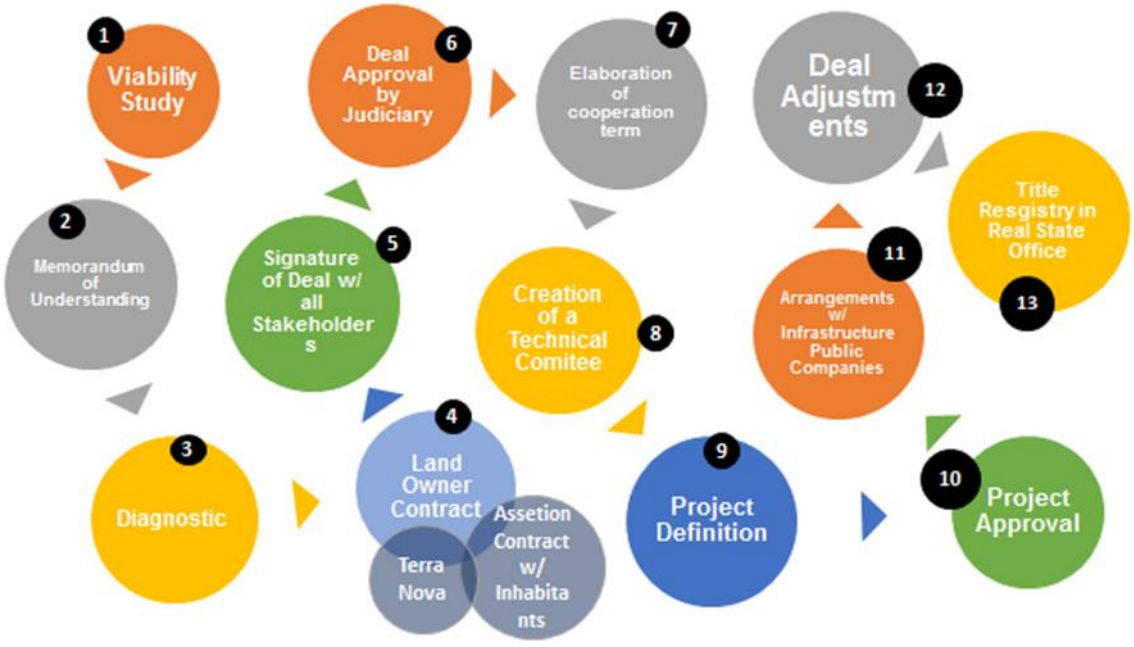
As for irregular occupants, as they occur contractual settlements they receive a letter of individualized sentence that contains the person's data and features of the property acquired, authorizing the title registration at the Registry Office, consolidating thus held previously irregular in property set in the legal manner.

The adjustment is made in a participatory manner, paying attention to the urban, environmental and social aspects. Thus, it is possible that future public investment in the area resulting in improvements such as: sanitation, electricity, paving, street lighting, among others.

This all results in the improvement of life and the consequent social reintegration, increasing the area occupied organized and formal neighborhood stage, resulting in fertile ground for the development of many other social policies that can bring even more benefits to the residents who are already better articulated in view of all the engagement provided by the mediation strategy adopted that favors the conscious participation of each resident.

The methodology applied by the Terra Nova company can be demonstrated by the flow chart below which shows step by step the steps described in this item:

Figure 1 - Flowchart of the Company Terra Nova methodology



Source: Authors elaboration based in Terra Nova Regularization Fundiária Ltda

Importantly, the methodology is dynamic and can be adapted to various existing realities in the occupied areas since these are private areas, may or may not already be a lawsuit Repossession, given that the methodology of the pillars are: conflict mediation

(check your owner's interest in receiving compensation and occupants to pay), preparation of contract between owner and occupants, promoting judicial agreement with its approval, preparation of Conduct Adjustment agreement as a legal instrument that involves stakeholders so that everyone has their rights and clearly defined obligations, preparation of Plan Regularization and its execution, for final, after the payment by the occupants issuing the judgment Letter of the judiciary, which is the proper title to give rise to the Registering property in the Real estate registry.

3. LAND REGULARIZATION AND TERRITORIAL REARRANGEMENT: The Case of Villa Marinho/Paranaguá/PR

Paranaguá is a seaside town plan relief surrounded by a remnant of the Atlantic Forest that covers important natural parks, including Superagui National Park, State Parks of Serra do Mar, Ilha do Cardoso, Ilha do Mel, and Pico do Paraná. In conjunction with the bays of Antonina (east) of Guaraqueçaba, Pinheiros and Orange (north), form the largest South Atlantic nursery and the third in the world with respect to the biosphere reserve. It has about 300 km2 of area dotted islands, beaches, headlands, coves and channels.

Because of the intense port activity and demand for affordable housing, not supplied by the government over the years, there was a process of occupation of permanent preservation areas, such as borders of the rivers that make up the Bay of Paranaguá and mangrove areas, these areas are protected by law, with all federal and state public areas.

The Vila Marinho is a recent irregular settlements located near the port area of Paranaguá, which had its beginning in 2000, totally disorganized way, like other occupations present in the municipality.

The area of 229,926 m², which was occupied by about 500 families, is adjacent to the Jardim Iguaçu, irregular occupation, already established for over 10 years. Both occupations are embedded in a larger area owned by the “Marinho family”, whose representatives opposed from the beginning the permanence of the occupants, which at

the beginning of the land regularization process were already approximately 1,500 families.

The figure below shows the footprint of the Marine Village satellite view in the topographic plan:

Source: Terra Nova Regularizações Fundiárias Ltda

The opposition of the owners was through a lawsuit for reinstatement of ownership of both properties (Vila Marinho and Jardim Itaguaçu), where after several years of uncertainty, through the methodology used by the Company Terra Nova Regularização Fundiárias Ltda, found a way to mediate the conflict, preventing the forced eviction of families and a great social impact on the entire city.

The construction of urban land regularization of Marine Village project, took place from the performance of the partnership between Terra Nova, Paraná Housing Company - COHAPAR, the municipality of Paranaguá, Local Community and Residents Association.

The families who occupied the property are from the region and neighborhoods, mostly with family composition in the range of 04 people and average household income of up to 03 minimum wages.

The Judicial Agreement was approved in 2005 and established the legal conditions for the settlement of the whole area: amount and terms of payment of compensation to the owners, procurement, TERRA NOVA duties as regulating agent.

From the Judicial Agreement, the team involved in the project realized that would be the time to establish a joint commitment with the occupying population to freeze the occupation, avoiding excessive density and establishing bases and criteria for the redevelopment of the area, taking into account the social, environmental, urbanistic and legal aspects.

In this case, in particular, to avoid excessive densification and create strict criteria for all involved the prosecutor was asked to involve all stakeholders in the Conduct Adjustment Term, but in this case, the Cooperation Agreement was considered legally more appropriate to the situation.

THE COOPERATION TERM

The Cooperation Term was an important instrument that occurred interventions, as provided the main actions and responsibilities of those involved: Owner, Association of Residents, TERRA NOVA, COHAPAR, City Hall, **Paranaguá Waters**, EMS / COLIT - Coastal Council.

At this time, the Technical Board, which had the participation of all stakeholders involved in the regularization process was established.

THE TECHNICAL COMMITTEE.

The basis of the technical team action project execution was the establishment of a Technical Board, composed of representatives of COHAPAR, TERRA NOVA, City Hall and residents, which had the signed assignment and agreed with residents, set the selection criteria and answering each of the occupying families, as well as maintaining an ongoing relationship forwarding all questions regarding the progress of the settlement project.

In March 2005 began a broad survey of the area, boundaries of blocks and lots according to the installment project proposed to implement a regular housing development in the area, and a full socioeconomic registration with the identification of

each of the existing buildings, lots and occupying families, as well as those who were in occupation process, but they had not carried out the construction in lots.

The Technical Board has become a major reference in the community because everyone involved had daily contact with the locals, and were multipliers of the design criteria and arguments. This action of the Technical Chamber was a strong component of transparency in the project in the community.

THE URBAN PROJECT.

The COHAPAR was responsible for preparing the Urban Project, which after some discussions with the community, is configured as follows:

Source: Terra Nova Regularizações Fundiárias Ltda

This format created around 770 lots in relation to the existing precarious and disorganized occupation, created leisure and community facilities.

THE REORDERING.

The reordering of project implementation itself, that is, dismantling and reconstruction of houses / shacks into the lot according to the Project, started by a great Mutirão with the participation of all involved - COHAPAR - Housing Company Parana,

Newfoundland Regularisations agrarian lands, Municipality of Paranaguá, Provopar that gave food baskets to feed "mutirantes" community and volunteers, the municipal school that gave space and school equipment to prepare meals and do activities with children so that parents could work, and volunteers.

The participation of institutions from their leaders and coordinators to their field technicians, gave credibility and encouragement to all the residents who could not discern the viability of this "reconstruction."

The pictures bellow show

Opening roads

Source: Terra Nova Regularizações Fundiárias Ltda

Opening streets and construction of new homes

Source: Terra Nova Regularizações Fundiárias Ltda

Power deployment

Source: Terra Nova Regularizações Fundiárias Ltda

Water Implementation

Source: Terra Nova Regularizações Fundiárias Ltda

During the regularization of Vila Marinho, there were situations that were not resolved, even with effort mediator company to resolve the conflicts.

The most critical moment of the work took place from March to July 2006, when 15 families strong, who refused to join the project and remained resisting to their homes in the middle of the layout of the streets, preventing the start of construction works of light networks, water and sewage, had to be notified in court and cited by the bailiff for demolition of their homes. In this case, once again the Technical Board played a key role in the peaceful solution of the situation.

The positives related to this experience were:

1. The profile of the components of the Technical Comitee, intense professional bond and established staff, and clarity of purpose and commitment to the families involved.

2. The transparency of information on the criteria adopted, stimulating the participation and organization of the community, and the intense relationship between the population and the members of the Technical Board, with an establishment of ties of friendship, respect and fellowship among all. At all times remained the atmosphere of cordiality and closeness.

3. The understanding and support of the judiciary, which played a decisive role, since the Judicial Agreement, to the reintegration and necessary educational and demolition orders;

4. The Cooperation Agreement, a key instrument which supported all interventions implemented and political conflicts between government agencies;

5. The demonstration effect that the multi-stakeholder composition is a solid element in building solutions to achieve good land governance with the reordering of land through organized democratic social participation and self-sustainable;

6. The transformation of a disorderly occupation in an organized neighborhood with urban parameters and the hands of the people themselves, giving a sense of ownership of their space.

The values that were emphasized were related to ethics, respect, cooperation, acceptance of the other, trust, truth, integrity. Thus, in addition to the sense of citizenship provided for the regularization of their areas occupants had financial benefits since the regulated area turned into a marketable financial assets within the formal land market.

4. EVALUATE THE COST/BENEFICES OF THE PROCESS AND ANALYZE THE INDIRECT BENEFICES OF THE REGULARIZATION MANLY ON LAND PRICES.

The value set for the regularization behaved the amount to be paid as compensation to the owner, the provision of service of Terra Nova company, providing technical services (surveyors, architects, engineers, etc.) and amounts paid to the infrastructure works.

Thus, taking into account all the costs necessary to the process of regularization, it was determined that the value would be around R $ 37.50 / m2 (Thirty-seven reais and fifty cents) and lots averaged 160m², so the amount paid by each household was approximately R $ 6,000.00 (Six thousand Reais) and after 10 years of the beginning of the adjustment process, the value of the lots range from R $ 50,000.00 to R $ 60,000.00, or is R $ 375.00 / m2.

It is observed that during the 10 years that have passed through the process of regularization, there was an increase of 900% in the value of the lots

According to the methodology used by the Company Newfoundland, the value of benefits are fixed between R $ 90.00 to R $ 200.00 per month, depending on the socio-economic assessment of the family, may vary the number of installments to reach the value total area to be regularized.

Because it was not performed during the feasibility study a study which was the way they gave access to the area by the various occupants, it is not possible to know if those were the primary occupants of the area or bought it from someone who obtained access before, but the fact is that from the beginning of the regularization process, there was an increase of about 10 times the amount paid for each lot.

Where there were conflicts of understanding, the Technical Board played a key role, discharging up to address them, however, even with many benefits, including the enhancement of the lots, the improvement of basic infrastructure and the formalization of opportunity their properties, were not all the occupants of the area that joined the settlement program.

It is observed that the Vila Marinho has an area of 381,039.44 m2, and the area was subdivided net 237,696.8 m2 and from the addition, it appears that there was a 75.35% participation of the population, or is approximately 1,500 families. Thus, relative to the rest of the population that did not join the regularization program, the process of ownership revindication followed and their plots returned to the owner.

CONCLUSION

Analyzing the methodology used by social enterprise of Terra Nova, we realized that although there is legal provision for social participation and cooperation between those involved in regularizing the Government, does not show capacity of articulation and mediation to bring together all the stakeholders involved and finalize the regularization process land.

The company, as private and neutral esnte before the interests of all was able to mediate the conflicting situations between owner and occupants; call all government bodies and other stakeholders could act synergistically achieving the goals proposed in the Settlement Plan, even when entering the public prosecutor in the Regularization

process by making the Conduct Adjustment Agreement was possible to create rights and obligations to the various actors , which would have penalties for noncompliance; the creation of the Technical Comitee, to supervise, execute and settle internal conflicts of the regularization process was of great importance in order that prevented the legalization of these conflicts that could take longer for that consolidate the objectives of regulation.

Another important result to be mentioned is that from the experience of the New Social Enterprise Land Regularization Sustainable Urban, whose methodology of sustainable settlement through direct negotiations between owners and occupants reduces public spending, increasing the state's capacity to act on other fronts social care, and also allows the company to participate consciously and thus improve their management capacity and organization, contributing to a social empowerment resulted in a greater rooting of the population involved.

All instruments are very important for all situations are resolved in a good way as they are forms of collaborative participation that had contributed to transparency throughout the land regularization process which led to the credibility of the methodology.

Thus, the transformation of irregular footprint in formal neighborhood also generates a social transformation that raises the quality of life of the people involved in the process, particularly the occupants of the areas that will become part of the formal city and the villas come a postal address, something so common to many and so inaccessible to many.

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Technical Session A2

Land consolidation: the general principles

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The Rearrangement of Leasehold Agreements as an Alternative to Land Consolidation

Siim MAASIKAMÄE, Evelin JÜRGENSON, and Kristiin SIKK. Estonia

Key words: land fragmentation, landholding structure, landholdings overlap

SUMMARY

Land reform created a large number of small landed properties in Estonia's rural areas. Many people became landowners through land restitution. These new land owners had no farming capacity. Quite often, the new landowners lived in cities, not on the plots they owned, and they lacked necessary machinery and knowledge of farming. Today many land owners don't use their land, and the people who use the land do not own it. Moreover, small farms are often not efficient, so such small farmers stop farming. Those farmers will not sell their land to its users because of different reasons, including the low price of land. The decrease in the number of small farms and the increase of large landholdings was observed in Estonia over the last decade. The above-mentioned circumstances have led to a situation where many farmers and agricultural companies don't own the land they use; instead, they lease it. It is quite common that the parcels of one producer are located between the parcels of other users, and it can be said that the land use regions of different producers overlap. The high ratio of leasehold land in Estonian agriculture leads to the need for new approaches in order to improve the structure of landholdings. The aim of this paper is to introduce a new approach or method that can assist in improving the land use structure in agriculture by rearranging leasehold agreements. The main components of the system for the rearrangement of leasehold relations are described. Land consolidation has been considered a main tool for improving the spatial structure of landholdings. However, land owners who don't use their land are not interested in land consolidation, which means it is almost impossible to implement land consolidation for agricultural landholdings. The rearrangement of leasehold relations by swapping leased plots can be an appropriate tool for this purpose. Finally, a comparison of land consolidation and the leasehold agreement rearrangement system is presented.

The Rearrangement of Leasehold Agreements as an Alternative to Land Consolidation

Siim MAASIKAMÄE, Evelin JÜRGENSON, and Kristiin SIKK. Estonia

1. INTRODUCTION

Land reform changed land ownership structure and land relations radically in almost all post-communist countries. The main aim of those land reforms was to restore the private ownership of land. The Land Reform Act (entered into force on November 1 in 1991) laid the legal basis for land reform in Estonia. It was stated in article 2 of the Estonian Land Reform Act (https://www.riigiteataja.ee/en/eli/529062016001/consolide) that "… the objective of land reform is to transform relations based on state ownership of land into relations primarily based on private ownership of land." By this it was meant that many small and medium-size private farms would be created instead of the former large state and collective farms. The aim of land reform was also to create preconditions for more effective land use, and it was assumed that small and medium-size private farms would increase land use efficiency.

The reality is that a large number of small landed properties were created in Estonia's rural areas, but new land owners had no farming capacity. They did not have the knowledge or machinery necessary for farming. Quite often, the new landowners lived in the cities, not on the plots they owned or even close to them. On the other hand, active people in rural areas privatized the means of production (e.g. machinery, cattle barns, etc.) at the same time. Those people usually had the knowledge necessary for farming. Due to these circumstances, large areas of agricultural land (mainly arable land) was used as the leasehold bases. According to some estimates, about 70–80 percent of arable land is leased in Estonia today.

Today we have a trend that shows that the number of agricultural producers is decreasing and the area per one producer (farm, enterprise) is increasing. According to Statistics Estonia (http://www.stat.ee/) data, there were 55,748 agricultural holdings with a total area of 1,344,546 hectares in 2001, while in 2013 those figures were 19,186 and 1,229,425 respectively. The average area of one holding increased from 24.1 hectares to 64.8 hectares during this period. Thus, from 2001 to 2013 the number of holdings decreased 2.9 times and the average area of one holding increased 2.7 times. The reason for those changes is that many small and medium farmers gave up and terminated their farming activities.

However, two aspects should be kept in mind when talking about the decrease in the number of agricultural producers and the increase in the average area of agricultural land holdings. First, the farmers who own the land and stop farming are not willing to sell their land to the users due to different reasons, including the low price of land. Quite often, they try to lease out their land. Second, there were and are small farmers who don't own (totally or even partially) the land they are cultivating; they are tenants. The leasehold relations are rearranged when those farmers stop farming.

We can say that land lease relations have developed sporadically and by chance. The study by Sikk and Maasikamäe (2013) shows that the plots of different users located between each other and the land use regions of adjacent landholdings overlap. This is a typical feature of the current Estonian land use structure in rural areas. This paper proposes a new approach or method that can assist in improving the land use structure in agriculture and reduce the scattering of parcels over the space. The focus of the proposed method is on the use of arable land.

First we present the nature of the current problems of land use in agriculture. To describe the current land use problems, we use a sample area consisting of five agricultural landholdings that are located adjacently and have overlapping land regions. Second, we introduce a possible system for the rearrangement of land lease relations (contracts). Finally, we make a comparison between land consolidation and rearrangement of the land lease relations as a method for improving land use conditions.

Some terminology must be defined in order to avoid misconceptions when reading the following text. A landholding is a set of agricultural parcels, no matter whether under ownership or leased, for what an agricultural producer applies for subsidies from the Agricultural Registers and Information Board (hereinafter ARIB). The reality is that some landholdings are fully under ownership while the opposite case is that the producer leases all used agricultural land. Besides that, some landholdings have a mixture of land under ownership and leased land.

The parcels of one landholding are often scattered over the space. The total area of an imaginary polygon surrounding the land parcels of one landholding is denoted in the following text as the "producer's region".

2. DESCRIPTION OF THE STUDY AREA AND ESTABLISHING THE PROBLEM

The nature of the problem of land use overlap is described in this chapter in detail. The study area is determined by the producer's regions of five sample landholdings. Their location is presented in Figure 1.

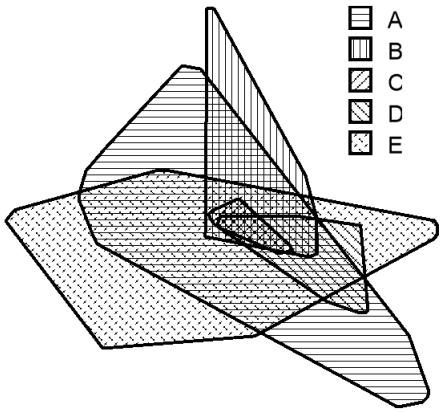

Figure 1. The location of five (A, B, C, D and E) overlapping producer's regions.

It is necessary to note that the producer's regions in Figure 1 is an extract from the map of all producer's regions. There is an area in Figure 1 where all five producer's regions overlap, while in some areas they don't overlap. The reality is more complicated and complex. The map of all overlapping producer's regions is almost unreadable, which makes it difficult to use such maps.

Figure 2 and Figure 3 illustrate the location of parcels inside the five producer's regions. The parcels of the five producers that formed the study area are presented in Figure 2. We can see that some parcels are relatively far from their neighbours.

Figure 2. The location of parcels that are cultivated by five (A, B, C, D and E) producers.

Figure 3. The location of all parcels inside the five producer's regions.

The comparison of Figure 2 and Figure 3 show that there are actually many more parcels in the study area than the parcels of five producers used for the formation of the study area. The description of the sample landholdings of the study area is presented in Table 1. It is necessary to note that the number of ARIB parcels is compared to the number of properties. The reason for that is the fact that some ARIB parcels consist of more than one cadastral unit and thus can belong to different owners. On the other hand, one owner can own more than one cadastral unit and different cadastral units are leased out to different users.

Table 1. Description of sample landholdings of the study area

Produ-cer	No. of ARIB parcels cultivated by a particular producer	Area of arable land cultivated by a particular producer (ha)	Area of convex hull for a particular land-holding (ha)	No. of different properties inside the convex hull of particular landholding containing arable land	
				Total No	Cultivated by a particular producer
A	130	2477	20553	897	68
B	61	835	6716	363	32
C	11	80	775	57	7
D	25	261	3305	221	32
E	46	407	19297	864	36

The data in Table 1 show that the areas of producer's regions (convex hull) are about eight to 47 times larger than the area cultivated by one particular producer. The figures of Table 1 also show that one landholding comprises different properties. The landholding of producer A consists of 130 ARIB parcels and this area is a part of 68 different properties. It is about 1.9 ARIB parcels per one property. The number of different properties inside the producer's regions (convex hull) of a particular landholding is about seven to 24 times bigger than the number of properties used by one particular producer.

Table 2 describes the distribution of the landholdings in the study area grouped by the number of parcels in one landholding. The total number landholdings that cultivated up to five parcels is 119 and they used about 11 per cent of land of the study area. At the same time about 74 per cent of land area is used by producers cultivating more than 20 ARIB parcels.

Table 2. Description (distribution) of the landholding groups in the study area

Groups of landholdings	Number of landholdings	Area of landholdings (ha)	The ratio of the area of landholding groups in the study area in per cents
1 ARIB parcel	39	222	1.5
2 to 5 ARIB parcels	80	1400	9.7
6 to 20 ARIB parcels	27	2166	14.9
More than 20 ARIB parcels	21	10702	73.9
Total	167	14490	100.0

Figure 2, Figure 3, Table 1 and Table 2 show clearly that there is the possibility to improve the spatial structure of landholdings. This possibility also refers to the need for the rearrangement of leasehold relations. The main attention should be paid to the landholdings that consist of many properties.

3. THE LEASEHOLD AGREEMENT REARRANGEMENT SYSTEM

Leasehold relations can be established (and have been) sporadically. There is no need for a special system for that. The process is occasional and the parcels of different users (both leased parcels and parcels under ownership) are located in a disordered way throughout the space. A system and rules are needed for the rearrangement of land lease relations and agreements. The main idea of such a system is presented in Figure 4.

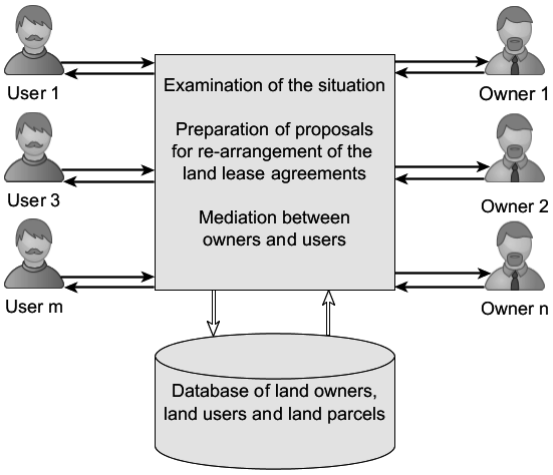

Figure 4. A conceptual description of the system for the rearrangement of leasehold relations.

The system comprises four types of components. The agricultural producers (land users) who are interested in rearranging leases based on land use relations make up the first type of component. It is necessary to emphasise that land users must be active and they must initiate the rearrangement process. The second component of the leasehold relations rearrangement system comprises land owners who are leasing out their land. We can say that they are a passive component of the system. However, in certain situations they can also be active.

The central component of the system is the mediator, who will be the link between users and owners. The general role of the mediator is to work out the possible options for rearrangement of leasehold agreements. The mediator must contact the owners and other users in order to find the reasonable options for rearrangement of leasehold agreements. The fourth component of the system is a database of the land owners, land users and land parcels. A proper and up-to-date database is a necessary precondition for the successful work of the mediator.

4. REARRANGEMENT OF LEASEHOLD AGREEMENTS COMPARED TO LAND CONSOLIDATION

For many years, land consolidation has been an important tool for improving the property structure in rural areas. The importance of land consolidation for improving land use

condition and rural development has been pointed out by many researchers, e.g. Hartvigsen (2015a), Thomas (2006 and 2011) and Vitikainen (2004). Land consolidation has also been the focus of FAO (e.g. FAO 2003, FAO 2004) and FIG (e.g. Hartvigsen 2015b). The need for land consolidation in Estonia is recognised (Aasmäe and Maasikamäe 2014, Jürgenson 2016, Sikk and Maasikamäe 2015).

However, one of the preconditions for land consolidation is the interest and willingness of land owners to participate in the process. The owners who are not using their land by themselves don't care much about the shape and location of the plots they own. This might be one reason why land consolidation is not a topical issue today in Estonia.

The system for the rearrangement of leasehold relations has some methodical similarities with land consolidation. It is not possible to consolidate land property by property. The properties of certain area are treated as a whole. The rearrangement of leasehold relations is a reasonable and similar approach. The actual situation of land lease relations in a particular region must be analysed as a whole. It offers more flexible solutions for reasonable rearrangement of leasehold agreements.

There are some important differences between land consolidation and the rearrangement of leasehold relations. The main difference is that the rearrangement of leasehold relations does not deal with the property boundaries while the aim of land consolidation is to project new boundaries for properties.

The possibility to include land lease relations into the land consolidation process is investigated, for example, by Louwsma and Lemmen (2015). However, the readiness and willingness of owners to consolidate their land is needed for that. In this case, the rearrangement of land lease agreements can be a part of the process. It is possible to rearrange the leasehold agreements without land consolidation.

It is also necessary to raise the awareness of the land users and land owners about the benefits of rearrangement of leasehold agreements. It is not possible to introduce the leasehold relation rearrangement system without it.

5. FINAL REMARKS

The general idea of the system for rearrangement of leasehold agreements was presented in this paper. It could be an option for regulating leasehold relations and improving the land use structure. The task is challenging and requires considerable effort. However, it is necessary to start to deal with the problems of regulation of leasehold relations because large land areas are used on the leasehold basis.

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BIOGRAPHICAL NOTES

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Agricultural Land Consolidation in the Russian Federation

Alexander SAGAYDAK and Anna SAGAYDAK, Russian Federation

Key words: Agricultural Land Consolidation, Agricultural Land Market, Orel Region, Russian Federation

SUMMARY

Agricultural Land Consolidation is a merging, enlargement, eliminating of mosaic land ownership and improvement of configuration as well as optimization of size of land plots in order to increase the efficiency of agricultural production via rational use of scare resources: land, labor and capital based on reduction of transaction costs. The specific objectives of Agricultural Land Consolidation are the following: increasing the efficiency of agricultural production; providing of sustainable development of agrarian sector; rational use of land, labor and capital in agriculture; optimization of agricultural production structures both in territorial and production aspects; increasing the competitiveness of agricultural producers in domestic as well as foreign markets; environmental protection; development of production as well as social infrastructure in agriculture. Land Consolidation should be carried out based on the following principles: voluntariness; openness and transparency; financial and economic feasibility; taking into account the interests of the population groups involved including women and youth as well as indigenous people; step by step implementation; consideration of local conditions; state and NGO support.

The super goal of Agricultural Land Consolidation in Russia is to create the conditions and incentives to provide sustainable development of agricultural production to solve the country's food problem. Currently there is a trend of development of Agricultural Land Consolidation at both the federal and regional level, for example, in Orel Region.

1. INTRODUCTION

Development of Agricultural Land Consolidation is unique in Russia as compared to other countries. The abolition of serfdom in 1861 and Stolypin's Reform as well as subsequent development of Agricultural Land Market and Agricultural Land Consolidation undermined the communal land system. It should be noted that Modern Russian Land Reform is focused on the redistribution of land from collective to private farming in order to provide rational use and protection of lands in Russia.

The state's land monopoly in Russia was abolished and two main forms of land ownership: public uses and private farming were introduced. Land may be converted into individual private property of citizens for personal use, farming, horticulture, and animal husbandry as well as to accommodate buildings and constructions for individual enterprise, to build and maintain dwelling houses, country cottages, garages.

The private property may be established also as the result of the conversion of lands belonged to former collective and state farms as well as joint-stock companies including those established on the basis of state farms and other state owned enterprises, and lands granted for collective horticultural production, animal husbandry, and collective country-house construction.

The principle of independent agricultural production by land proprietors, landowners, and tenants has been secured. Any interference in their activity by state, economic or other bodies is prohibited. The economic, social and legal basis for the organization and activity of private farms and coops on the territory of Russia has been determined. The rights of citizens to organize private farms, economic independence, assistance, state protection of their legitimate interests and the right to free cooperation have been guaranteed.

It is proclaimed that a private farm should be an independent economic entity having the rights of a legal subject, which produces, processes, and sells agricultural products. The local authorities or citizens who are land proprietors may lease parcels of land. This was the first time in Russia a right is available to divide and reform collective and state farmland into shares.

Member of former collective farm and state farm has the right to withdraw and start up a farmstead of his own without asking for consent of collective or the management. Upon decision by the local authorities, such a farmstead is granted a piece of land of a size corresponding to the farmstead member's share in the land stock or value. A withdrawing farmer may expand his land possessions by purchase. During the reorganization of collective and state farms, these farms were broken up into smaller units and their juridical status was made consistent with legislation of the Russian Federation.

We can treat Agricultural Land Consolidation as a merging, enlargement, eliminating of mosaic land ownership and improvement of configuration as well as optimization of size of land plots in order to increase the efficiency of agricultural production via rational use of scare resources: land, labor and capital based on reduction of transaction costs.

The super goal of Agricultural Land Consolidation is to create the conditions and incentives to provide sustainable development of agricultural production and to solve the country's food problem.

The specific objectives of Agricultural Land Consolidation are the following: increasing the efficiency of agricultural production; providing of sustainable development of agrarian sector; rational use of land, labor and capital in agriculture; optimization of agricultural production structures both in territorial and production aspects; increasing the competitiveness of agricultural producers in domestic as well as foreign markets; environmental protection; development of production as well as social infrastructure in agriculture.

Agricultural Land Consolidation should be carried out based on the following principles: voluntariness; openness and transparency; financial and economic feasibility; taking into account the interests of the population groups involved including women and youth as well as indigenous people; step by step implementation; consideration of local conditions; state and NGO support.

In theory, Agricultural Land Consolidation can be carried out as Voluntary Land Consolidation and Compulsory Land Consolidation as so-called “collectivization” as well as enlargement of size collective farms (kolkhozes) and state farm (sovkhoses) took place respectively in former Soviet Union in thirties and fifties of last century.

Both administrative and economic methods, for example, development of Agricultural Land Market could be used for it. In our opinion, preference should be given to Voluntary Agricultural Land Consolidation. In that sense, development of Agricultural Land Market is very important for stimulation of Agricultural Land Consolidation.

There are different models of Agricultural Land Consolidation in Russian Agriculture. The first of them - Nizhny Novgorod Model, was intended to consolidate the land shares with the aim of creating production cooperatives. However, due to the absence of post-privatization support this task remained unfulfilled. In this regard, noteworthy Belgorod Model and Orel Model, which are introduced and used respectively in the Belgorod and Orel regions based on purchase and lease of land shares by private farms, parastatals and agricultural holding corporation as well as local authorities.

However, Agricultural Land Market, which is the basis for Agricultural Land Consolidation, is still underdeveloped in Russia. Agricultural Land Market in Russia is still not formed, which impedes the formation of a flexible system of land tenure and land use. In agriculture, dominant role plays lease of land shares. Meanwhile, the number of Agricultural Land sale and purchase as well as mortgage transactions is limited.

By its nature, Agricultural Land Market represents a market of imperfect competition. This is manifested in the following. The number of sellers and buyers of land plots does not match among themselves. Market information on the transactions is incomplete and non-transparent.

Transactions are mostly local in nature. The supply and demand for the land plots are inelastic. In this market, there are externalities, such as the state registration of the deals, restrictions on the sale and purchase of agricultural land, which prevent the formation of equilibrium prices of agricultural land plots. There is also inappropriate agricultural land use, pollution, and illegal allotment for commercial needs.

The agricultural land is the product of a special kind, the main means of production in agriculture, the cost of which may increase if the normal use for a period. The price of the land is determined based on the interaction between market regulators: land rent and interest rate. Fertility and location of the land plot as well as the additional costs of capital determine the amount of rent.

2. LAND TENURE

The Russian Federation's territory was amounted 1,709.9 million hectares in 2014. It increased from 1,709.8 million hectares in 2013 to 1,709.9 million hectares in 2014 by .1 million hectares.

Most important piece of the area is agricultural land. The total agricultural land area was estimated 385.5 million hectares in 2014 or 22.5 % of the total Russian Federation area (See Table 1).

Table 1. Land Categories, Russian Federation, 2013-2014, million hectares

	Item	2014	2013	2014/2013 (+,-)	2014/ 2013, % (+,-)
1	Agricultural Land	385.5	386.5	-1.0	-.2
2	Urban Land	20.1	20.0	+.1	+.5
3	Industrial Land	17.2	16.9	+.3	+1.7
4	Special Protected Regime Land	47.0	46.8	+.2	+.4
5	Forest Land	1,122.6	1,122.3	+.3	+.03
6	Water Land	28.0	28.0	–	-
7	Reserve Land	89.5	89.3	+.2	+.2
	Total	1,709.9	1,709.8	+.1	+.006

Source: Rosreestr', 2015

The total area of agricultural land in the country decreased in 2014 compared to 2013 by one million hectares or .2%. At the same time for the given period the area of industrial land increased by 1.7 % , urban land increased by .5% as well as lands of especially protected territories by .4%, which indicates the strengthening of the allotment of agricultural lands for non-agricultural needs.

The cropland, perennial, pastures, hay field lands as well as idle land were amounted 196.2 million hectares or 50.9 % of total agricultural land area in 2014 (See Table 2).

Table 2. Agricultural Land, Russian Federation, 2014, million hectares

	Item	Area	%
1	Agricultural Land [1]	196.2	50.9
2	Forest Land	28.1	7.3
3	Bush Land	19.2	5.0
4	Road Land	2.3	.6
5	Building Site Land	1.1	.3
6	Water Land	13.1	3.4
7	Marsh Land	24.8	6.4
8	Others	100.7	26.1
	Total	385.5	100.0

Source: Rosreestr', 2015

The dominant role in the Russian Agricultural Land Tenure has played production coops as well as joint stock companies or parastatals (See Table 3). The share of joint-stock companies and partnerships in the total area of agricultural land in 2014 amounted 51.1%, and in the area of cropland - 56.2%. The share of production cooperatives in the total area of agricultural land in 2014 was amounted 37.6%, and in the area of cropland – 34.0 %.

Table 3. Land Area of Parastatals, Russian Federation, 2014, 1000 hectares

Item	Total	Cropland	Idle Land	Perennial	Hayfield Land	Pasture
Joint Stock Companies and Partnerships	59,889.9	42,344.2	934.5	197.5	4,363.6	12,050.1
Production Coops	44,025.8	25,649.2	1,066.1	83	4,033.2	13,194.3
State and Municipal Enterprises	6,263.6	2,849.6	81.6	37.2	605.7	2,689.5
Research Institutions	1,702.1	1,300.7	20	11.5	109.5	260.4
Subsidiary Farms	958.6	590.4	23.1	4.4	114.9	225.8
Others	4,146.4	2,586.7	74.7	10.7	304.4	1,169.9
Tribal Land	16.1	.3	–	–	9.1	6.7
Kazak Society Land	88.6	59.6	.1	.1	6	22.8
Total	117,091.1	75,380.7	2,200.1	344.4	9,546.4	29,619.5

Source: Rosreestr', 2015

Private farms as well as subsidiary farms have played an important role in the Russian Agricultural Private Land Tenure too (See Table 4). The share of private farms in the total area of the privatized agricultural land in 2014 amounted 31.6%, and in the area of cropland – 40.4 %. The share of unclaimed land shares in the total area of the privatized agricultural land in 2014 was amounted 17.6%, and in the area of cropland – 17.7%.

[1] Includes: cropland, perennial, pasture, hay field land as well as idle land

Table 4. Agricultural Private Land, Russian Federation, 2014, 1000 hectares

Item	Total	Crop Land	Idle Land	Perennial	Hay Field Land	Pasture
Private farms	23,461.6	16,207.8	121.4	17	1,050.1	6,065.3
Individual Entrepreneurs	2,607.7	1,948.5	30.8	11.5	110.2	506.7
Subsidiary Farms	7,323.5	5,044	71.3	214.9	1,008	985.3
Service Land Farms	53.8	10.8	-	.4	37.7	4.9
Horticulture Farms	1,101.6	46	1.5	1,049.7	1.5	2.9
Vegetable Growing Farms	273.5	272.2	.7	.3	-	.3
Dacha Farms	75.1	59.2	1.2	6.8	2.5	5.4
Housing	555.4	463.7	.5	63	8.9	19.3
Livestock Farms	301.5	44.8	.1	.1	64.6	191.9
Grazing Farms	15,165.9	1,254.7	109.4	8.1	3,203.6	10,590.1
Agricultural Land Owners	10,194.2	7,637.2	143.1	22.5	592.5	1,798.9
Land Shares	13,080.9	7,115.2	910.7	9.2	1,467	3,578.8
Total	74,194.7	40,104.1	1,390.7	1,403.5	7,546.6	23,749.8

Source: Rosreestr', 2015

However, the total agricultural land area has been reduced (See Table 5). According to the Rosreestr, the total agricultural land area decreased by .9 million ha in 2014 compared to 2000 from 221.1 million hectares to 220.2 million hectares or by .4%. The cropland area decreased by 2.8 million ha in 2014 compared to 2000 from 124.3 million hectares to 121.5 million hectares or by 2.3%.

Table 5. Agricultural Land, Russian Federation, 2000-2014, million hectares

Item	2000	2010	2011	2012	2013	2014	2014/ 2000,%
Agricultural Land-total, including:	221.1	220.4	220.3	220.2	220.2	220.2	99.6
Cropland	124.3	121.4	121.4	121.4	121.4	121.5	97.7
Pasture	91.0	92.0	92.0	92.0	92.0	92.0	101.1
Idle	3.9	5.1	5.0	5.0	5.0	4.9	125.6

Source: Rosreestr', 2015

After boom at the first period of reform, the number of private farms has been decreased due to severe macroeconomic instability and lack of market infrastructure as well as market economy knowledge.

However, the average size of agricultural land occupied by private farm has been increased due to land consolidation. It was estimated 68.3 hectares in 2014 (See Table 6). Thus, it increased by 59.2 % compared to 1995.

Table 6. Private Farms, Russian Federation, 1995-2014

Item	1995	2000	2010	2012	2013	2014	2014/ 1995,%
Number of farms, 1000	279.1	263.7	261.7	259.2	258.5	258.9	92.7
Total land area, 1000 hectares	11,982.1	15,368.7	16,284.1	16,780.2	17,128.8	17,681.6	147.6
Average land size, hectares	42.9	58.3	62.2	64.7	66.3	68.3	159.2

Source: Rosreestr', 2015

The agricultural land has been also consolidated by purchase or rent of property rights on land shares belonged to former collective and state farmers by agricultural holding corporations. Land Tenure of the largest agricultural holding corporations in 2014 is displayed in Table 7.

Table 7. Agricultural Holdings, Russian Federation, 2014

Name	Cash Flow, bln.rubles	%	Net Income, bln.rubles	%	Agricultural Land Area,1000 ha	%
Mirotorg	74	15.1	16.4	23.7	594	17.2
Cherkizovo	68.99	14.1	13.3	19.2	100	2.9
Efko	61.4	12.5	.86	1.2	-	-
Rusagro	59.1	12.1	20.2	29.2	594	17.2
Agro-Belogor'e	57.6	11.8	5.99	8.6	110	3.2
Prodimex+Agrokultura	41.3	8.4	.7	1.0	790	22.8
Youg Rossii	37.6	7.7	1.4	2.0	200	5.8
Prioskol'e	33.0	6.7	4.9	7.1	106	3.1
Ak bars	29.9	6.2	1.5	2.2	505	14.6
Agrokomplex	26.5	5.4	4.0	5.8	456	13.2
Total	489.39	100.0	69.25	100.0	3,455	100.0

Source: Vedomosti daily dated August 8, 2016, p.21

3. LEGAL FRAMEWORK

The legal framework for Agricultural Land Consolidation must be improved. There are some contradictions between basic legal acts (the Constitution of the Russian Federation, the Civil Code, the Land Code, the Federal Mortgage Act, the Agricultural Land Market Act, the Federal State Registration of the Rights to Real Estate Act, and etc.) related to regulation of Agricultural Land Market and Agricultural Land Consolidation. Due to it, despite of adoption the Land Code and the Agricultural Land Market Act as well as Federal Law #435, the legal basis for implementation of Agricultural Land Market and Agricultural Land Consolidation is still unclear.

Both the Russian Constitution adopted in 1993, and the Civil Code adopted in 1994, upholds the right to own private property, which includes both land plots and buildings. Despite these guarantees, however, land reform was for a long time the subject of national political debate. The general principles of land ownership are set out in the Constitution. Article 9 of the Constitution establishes the principle of private ownership of land. However, it does not provide any procedure for the transfer of land, historically owned by the state, into private ownership.

The Land Code approved by the State Duma in 2001 has limited applicability to some categories of land, which are the subject of the separate Federal Laws. Such land includes water, forestland as well as agricultural land. According to the Land Code, the Agricultural Land Market Act governs the agricultural land market transactions. Thus, in fact, the Land Code applies only to non-agricultural land. In accordance with the Agricultural Land Market Act, the Federal Mortgage Act governs the agricultural land mortgage transactions. However, the Farm Credit System must be further developed to provide an access for farmers to agricultural credit and to guarantee them the right to use their land as well as other real estate as collateral.

In that sense, it is very important to make cadastre information more understandable and transparent for customers. It must be pointed out that so-called ”cadastral value” of agricultural land using in Russia is not applicable for Agricultural Land Taxation as well as Agricultural Land Market because there is no relation to market land value.

As a result, Russian banks have not accepted “cadastral value” as a basis for Agricultural Land Mortgage Transactions. Because of it, outside investors as well as other customers are not being able to get reliable information about the value of agricultural land plots and participate as educated and well-informed market agents (buyers or sellers) in Agricultural Land Market Transactions. Despite of it, a new Land Taxation System is based on so-called “cadastral value” was adopted by the Russian Parliament in November 2004. According to it, the maximum Agricultural Land Tax Rate defines as .3% of “cadastral value” of agricultural land. However, a new Cadastre Valuation Methodology based on Market Economy principles should be developed.

On July 24, 2007, the State Real Estate Cadastre Act (Zakon o gosudarstvennom kadastre nedvizhimosti) was issued. According to the Law, the State Real Estate Cadastre was introduced on March 1, 2009. The Law governs the Real Estate Cadastre Survey Activities as well as collection, processing and usage of the Real Estate Cadastre Information. In accordance with p.2 of article 1 of the Law, the State Real Estate Cadastre is a registered record that shows the ownership, boundaries, and values of land as well as buildings. Such register shows the owner of each parcel of land, its area, its use and category, buildings as well as their fiscal assessment. In accordance with p.5 of article 1 of the Law, the land plots, buildings and other property are the subjects of the Real Estate Cadastral Survey.

It should be noted that the Federal Law on Development of Agriculture # 264(Zakon o razvitii sel'skogo khozyaistva) was adopted by the Russian Parliament on December 29, 2006. The State Agricultural Development and Agricultural Markets Regulation Program for 2008-2012 was introduced in accordance with mentioned above Law. The State Agricultural Development and Agricultural Markets Regulation Program for 2013-2020 (Gosudarstvennaya programma razvitiya selskogo khozyaistva i regulirovaniya rynkov sel'skokhozyaistvennoi produkcii, syr'ya i prodovol'stviya) was adopted by the Russian Government on July 14, 2012. These documents are focused on improving the efficiency of agriculture, ensuring sustainable development of agricultural production and ensure food security of the country.

The special Federal Law #435 amended the Agricultural Land Market Act as well as some other land acts on December 29, 2010. The right and the order of compulsory withdrawal of the agricultural land plots were settled. According to the Law, it is possible through court in case when the land is not used 3 years and more, and at essential decrease in fertility or considerable deterioration of ecological conditions.

On December 24, 2014, in accordance with the order # 540 of the Ministry of Economic Development (Ministerstvo ekonomicheskogo razvitiya) of Russia issued on September 1, 2014, a new classification of types of permitted land use within the land categories was introduced. According to it, owner of the land plot shall have the right to choose any type of permitted use of the installed for the given land plot. The order identifies 12 target types or zones. They are agricultural, residential, public, business, recreational, industrial, transport, defense and security, special protection, forest, water, general use. In turn, each zone is divided into smaller sub-zones. For example, agricultural zone divided into crop, animal husbandry etc.

On June 23, 2014, the special Federal Law # 171 amended the Land Code. According to the Law, the goal of the amendment is to optimize the procedure for transferring land plots available in state or municipal ownership via development of land auction trading in Russia. The possibility of allocation of land plots for development, not only for housing, but also for other types of construction, including social has been recognized. Land plots might be transferred without bidding only for the construction of important infrastructure projects, for individual housing construction, personal subsidiary farming and in other specific cases. The authorities must put up for sale vacant land plots based on applications of citizens and legal entities, except if they are reserved for state or municipal needs, limited in circulation, etc. According to the Law, the starting auction price of the land plot is the cadastral value. Information on the availability of free land plots authorities are obliged to display on the official websites. The Federal Law was entered into force on 1 March 2015.

The Federal Law #354 issued on July 3, 2016, amended some earlier issued federal regulations including the Civil Code and Agricultural Land Market Act. The Law is focused on development of Agricultural Land Market and Agricultural Land Consolidation via involvement of unused agricultural land in turnover and improvement the procedure of withdrawal of agricultural land plots in case of their misuse. The mentioned above law stipulates that agricultural land plots located less than thirty kilometers from the borders of rural settlements could not be used for nonagricultural activities. Agricultural land plot, except land subject to mortgage, or land, in respect of the owner which the court instituted bankruptcy proceedings, could be forcibly withdrawn from the owner in a judicial procedure in case if such land not used for agricultural production for three or more consecutive years. According to the Federal Law #354, the starting auction price of the withdrawn agricultural land plot is the market value of such land, determined in accordance with the Federal Law #135 issued on July 29, 1998, on valuation activities in the Russian Federation, or the cadastral value of such land if the results of the state cadastral valuation approved no earlier than five years before the date of the decision on public tenders. The method of determining the starting auction price of the seized land plot at public auction must be stated in the court decision on seizure of a land plot and selling it at public auction.

Private farms and parastatals involved in state agricultural production support programs could lease state and municipal land up to 5 years without bidding or via land auction in case of availability of several applications. Thus, the implementation of the mentioned above law will allow to redistribute and consolidate unused agricultural land in order to increase the efficiency of agricultural production by reducing transaction costs.

4. INSTITUTIONAL FRAMEWORK

Ministry of Agriculture of the Russian Federation as well as Federal Service for State Registration, Cadaster and Cartography of the Russian Federation (Rosreestr) are played a dominant role in carrying out of Agricultural Land Consolidation in Russia. On December 25, 2009, in accordance with the President of the Russian Federation Decree on the Federal Service of State Registration, Cadaster and Cartography, the Federal Service of Real Estate Cadastre as well as the Federal Agency of Geodesy and Mapping were dissolved. According to the Decree, the Federal Registration Service was renamed into the Federal Service for State Registration, Cadaster and Cartography of the Russian Federation (Rosreestr). The functions of mentioned above agencies were transferred to the Rosreestr. The Federal Service on State Registration, Cadaster and Cartography is now under authority of Ministry of Economic Development of the Russian Federation. At regional level, local offices of former Federal Service of Real Estate Cadastre as well as Land Cadastre Chambers were transferred to the Federal Service on State Registration, Cadaster and Cartography.

5. REGIONAL LAND POLICIES

Development of Agricultural Land Consolidation in the Russian Federation is mostly depended on Regional Land Policies. One of the successful examples of them is Orel Region or Oblast Land Policy. Orel Oblast Land Policy is based on legal framework included the Federal Legislation as well as local regulations.

Orel Oblast Land Legislation is based on the following acts: Decree of the Head of Administration of Orel Oblast # 616 issued on December 12, 1997, on farm reorganization and land privatization and Target Program on development of the Legal Basis of Orel Oblast Land Reform approved by the regional authorities on October 10, 1998.Land Policy is the main part of Orel Regional Government Agricultural Policy included the following components: farm reorganization and land privatization, horizontal and vertical cooperation as well as integration of agricultural producers, development of innovation and investment activities in agriculture, development of Regional Agricultural Land Market. On June 5, 2003, Orel Oblast's Agricultural Land Market Act was introduced.

Orel Oblast agricultural land was amounted 2, 031.7 thousand hectares or 82.4 % of total regional land in 2015 (See Table 8). However, the total agricultural land area has been reduced. Break down of Orel Oblast Land is displayed in Table 9.

Table 8. Orel Oblast Land Categories, 2008-2015

Item	2015		2008		2015/ 2008, %
	1000 hectares	%	1000 hectares	%	
Agricultural Land	2,031.7	82.4	2,106.6	85.5	96.4
Urban Land	197.9	8.0	196.0	7.9	101.0
Industrial Land	23.1	1.0	22.6	.9	102.2
Special Protected Regime Land	35.5	1.4	32.1	1.3	110.6
Forest Land	169.2	6.9	100.0	4.1	169.2
Water Land	1.2	-	1.2	-	100.0
Reserve Land	6.6	.3	6.7	.3	98.5
Total	2,465.2	100,0	2,465.2	100.0	100.0

Source: Orelreestr, 2016

Table 9. Break down of Orel Oblast Land, 2015, 1000 hectares

Item	Total	Agri Land	Crop land	Forest Land	Water Land	Building Site Land	Road Land
Agricultural Land	2,031.7	1,896.4	1,508.0	62.9	12.4	4.9	38.2
Urban Land	197.9	143.2	57.1	10.6	2.6	14.7	22.4
Industrial Land	23.1	2.8	.8	4.8	1.3	2.1	10.8
Special Protected Regime Land	35.5	2.0	.7	32.9	.1	-	.4
Forest Land	169.2	1.7	.2	165.5	.6	.1	.6
Water Land	1.2	-	-	-	1.2	-	-
Reserve Land	6.6	5.1	3.3	.6	-	-	.4
Total	2,465.2	2,051.2	1,570.1	277.3	18.2	21.8	72.8

Source: Orelreestr, 2016

The private land ownership plays the dominant role in the regional agriculture and consists mostly of land shares belonged to former collective and state farmers (See Table 10).

Table 10. Land Tenure, Orel Oblast, 2015, 1000 hectares

Item	Total	Private owner ship	Ownership of legal entities	State and municipal ownership				
				Total	Citizens		Legal entities	
					In use	Lease	In use	Lease
Agri Land	2,031.7	1,156.4	259.1	616.2	-	.7	28.7	13.9
Urban Land	197.9	60.1	1.7	136.1	.2	.1	5.6	1.1
Industrial Land	23.1	.2	.9	22.0	-	-	8.8	1.4
Special Regime Land	35.5	-	-	35.5	-	-	33.2	-
Forest Land	169.2	-	-	169.2	-	-	-	-
Water Land	1.2	-	-	1.2	-	-	-	-
Reserve Land	6.6	-	-	6.6	-	-	-	-
Total	2,465.2	1,216.7	261.7	986.8	.2	.8	76.3	16.4

Source: Orelreestr, 2016

Break down of Orel Oblast private land ownership is displayed in Table 11. We can see that private land ownership tends to increase in the region.

Table 11. Private Agricultural Land Ownership, Orel Oblast, 1990-2015

Item	Years	Total Land, 1000 hectares	including AgriLand 1000 hectares	including Cropland, 1000 hectares	Total Land, 2013/ 1990, (+,-) 1000 hectares
Private farms	1990	-	-	-	-
	2015	201.0	200.2	183.0	+201.0
Personal Subsidiary Farms	1990	42.0	39.9	33.6	-
	2015	85.3	82.3	74.3	+43.3
Individual Housing	1990	-	-	-	-
	2015	4.9	2.4	1.9	+4.9
Collective Horticulture	1990	3.7	3.7	-	-
	2015	9.9	8.8	.1	+6,2
Collective Vegetable Growing	1990	2.7	2.7	2.7	-
	2015	2.4	2.4	2.4	-.3
Land Shares, Grazing, Haymaking Land and etc	1990	-	-	-	-
	2015	289.4	288.9	131.4	+289.4
Total	1990	48.4	46.3	36.3	-
	2015	592.9	585.0	393.1	+544.5

Source: Orelreestr, 2016

The main role in Orel Oblast Agricultural Land Tenure plays joint stock companies and partnerships (See Table 12). They occupied 1,305 (86 %) thousand hectares of agricultural land of parastatals in 2015. They have also rented most of agricultural land shares. The production coops occupied 143.5 (9.5%) thousand hectares of agricultural land of parastatals in 2015. State and municipal enterprises, research institutions and subsidiary farms as well as other parastatals occupied 68.3 (4.5%) thousand hectares of agricultural land area in 2015.

Table 12. Land of Parastatals, Orel Oblast, 2015, 1000 hectares

	Item	Area	Land Shares	Including not claimed land shares	Legal entities land ownership	State and municipal land ownership
1	Joint stock companies and partnerships	1,305	762.1	146.0	95.8	284.9
2	Production coops	143.5	90.1	37.8	.8	41.8
3	State and municipal enterprises	6.1	.2	-	-	5.9
4	Research Institutions	27.3	-	-	-	27.3
5	Subsidiary farms	19.1	2.6	-	-	10.1
6	Others	15.8	1.3	-	-	4.3
7	Total	1,516.8	856.3	183.8	96.6	374.3

Source: Orelreestr, 2016

In 2015, there were 1,292 private farms in the region. The number of private farms has been decreased. However, their total area and cropland have been increased. In 2015, the average size of the farm was amounted 155.6 hectares. In 2015, it increased by 3.1 times compared to 1994 due to land consolidation (See Table 13).

Table 13. Private Farms, Orel Oblast, 1994-2015

Item	1994	2000	2010	2013	2014	2015	2015/ 1994,%
Number of farms, 1000	1,754	1,420	1,247	1,293	1,302	1,292	73.7
Total land area, 1000 hectares	89.2	124.6	177.5	196.2	198.2	201.0	225.3
Average land size, hectares	50.8	87.7	142.3	151.7	152.2	155.6	306.3

Source: Orelreestr', 2016

As we mentioned before the main role in the regional Agricultural Land Tenure have played land shares. Local authorities have officially registered most of land shareowners. The agricultural land has been consolidated by purchase or rent of property rights on land shares belonged to former collective and state farmers by private farms and parastatals as well as agricultural holding corporations.

In this sense, it is very important to determine Agricultural Land Mortgage Value based on Agricultural Land Market Value. The Land Market Auction Price Model looks like:

$$V_a = [R_0(1+g)(1-t)]/\{[k(1-at)-g](1+c)+p(1-t)\}, \quad (1)$$

where:

V_a - Land Market Auction Price, rubles per hectare; V_0 - Cadastral Value of Agricultural Land, rubles per hectare; V_1 - Cadastral Value of Agricultural Land adjusted for the Land Rent Growth, rubles per hectare; R_0 - Land Rent, rubles per hectare; g - Land Rent Growth, %; t - Income Tax, %; p - Land Tax, %; k - Interest Rate, %; c - Transaction Costs, %; a - Tax Adjustment Coefficient, calculated as $a=R_0(1+g)/[R_0(1+g)+(V_1-V_0)]$.

Land Rent value (R_0) was calculated on the base of cadastral value of agricultural land treated as V_0 and interest rate (3%) used for determination of the value. Land Rent Growth was estimated 12%. Transaction costs were estimated as 10% too. Income Tax was taken as 20 %. Agricultural Land Tax was estimated .3 % of cadastral land value. Interest Rate was taken as 17.5 %.

In general, we can treat the Land Market Auction Price as a ratio between Land Rent and Interest Rate adjusted for income as well as land taxation. The ratio between Agricultural Land Market Auction Price and Agricultural Land Mortgage Value was taken as 70 %.

In our opinion, the value should be accepted both commercial banks and agricultural producers. Orel Oblast Districts Agricultural Land Mortgage Values calculated based on Land Market Auction Prices are displayed in Table 14.

Table 14. Agricultural Land Cadastral, Auction Prices and Mortgage Values, Orel Oblast, 2015

Districts	Cadastral Value of Land, rub/ha	Starting Auction Price of Land, rub/ha	Mortgage Value of Land, rub/ha	Land Tax, rub/ha	Land Rent, rub/ha
Bolhovsky	108,500	47,638	33,347	143	200
Verhovsky	129,300	56,771	39,739	170	238
Glazunovsky	124,300	54,575	38,203	164	229
Dmitrovsky	90,800	39,867	27,907	120	167
Dolzhansky	135,300	59,405	41,583	178	250
Zalegochshensky	118,500	52,029	36,420	156	218
Znamensky	123,300	54,136	37,895	162	227
Kolpnyansky	131,700	57,824	40,477	173	243
Korsakovsky	121,700	53,434	37,404	160	224
Krasnozorensky	135,800	59,624	41,737	179	250
Kromskoy	110,600	48,560	33,992	146	204
Livensky	130,600	57,341	40,139	172	241
Maloarhangelsky	126,000	55,322	38,725	166	232
Mtsensky	98,200	43,116	30,181	129	181
Novoderevenkovsky	131,200	57,605	40,323	173	242
Novosilsky	112,400	49,350	34,545	148	207
Orlovsky	125,200	54,970	38,479	165	231
Pokrovsky	131,700	57,824	40,477	173	243
Sverdlovsky	134,800	59,185	41,430	178	248
Soskovsky	100,500	44,126	30,888	132	185
Trosnyansky	104,500	45,882	32,117	138	193
Uritsky	109,700	48,165	33,715	144	202
Hotynetsky	103,700	45,531	31,871	136	191
Shablykynsky	100,200	43,994	30,796	132	185
Average	120,700	52,995	37,096	159	222

6. CONCLUSION

The following measures must be implemented to strengthen the organizational as well as institutional sustainability of Agricultural Land Consolidation in the Russian Federation**.**

- The Agricultural Land Consolidation Legislation must be revised and improved both at federal as well as at regional level;
- The institutional framework for implementation of Agricultural Land Consolidation must be improved both at federal as well as at regional level too;
- The Agricultural Land Auctions must be introduced to stimulate development of Agricultural Land Market and Agricultural Land Consolidation in regions of the Russian Federation;
- The training and retraining programs related to Agricultural Land Consolidation issues must be introduced;
- The public relation campaign to strengthen people's ability to understand the role and importance of Agricultural Land Consolidation Development must be initiated;

- The pilot projects focused on Agricultural Land Consolidation Development should be launched in some regions of the Russian Federation to make demonstration effect.

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Plot exchange/re-allotment
Civil and tax aspects: where are the limits?

Jeroen RHEINFELD, the Netherlands

Key words: plot exchange, re-allotment, civil aspects, tax aspects, subsidy, cross-border

SUMMARY

Summary of my thesis, defended on 10th July 2014 at the Radboud University of Nijmegen

Three research topics

Plot exchange, the exchange of real estate outside the urban area, deserves to be further researched and elucidated from various sides. It is only possible to get an idea of the legal complexity, diversity and extensive application possibilities of the land use instrument when plot exchange is considered from various perspectives such as civil law, tax and international. As one of the fruits of this research, the *'land readjustment'* proves that one should not only look at the agricultural sector and the rural area. The land readjustment, the urban match for the plot exchange, is not the main focus of the thesis, as this instrument does not (yet) have a legal basis in the Netherlands, whereas the plot exchange has a long and captivating legal history.

The research was carried out on the basis of three research topics, which are:

1. Dutch plot exchange: what are the quality, effectiveness and practicability of plot exchange in the Netherlands like in a civil law and tax sense?
2. Plot exchange from a comparative law perspective: how is plot exchange regulated in neighbouring countries and what are the similarities and differences with the Dutch regulations?
3. Plot exchange from a cross-border perspective: is cross border application of plot exchange possible?

With regard to the third cross-border research topic it should be remarked here that as well as external cross border, cross border within national borders but outside of the primary legal playing field is also dealt with: the main features of the spatial, sociological and geographical aspects of plot exchange are looked at. Here it was noticed that the relationship between plot exchange and *spatial planning* in the Netherlands is difficult to define to say the least: clear coordination between destination (spatial planning) and use (plot exchange) is absent. In that respect, the Netherlands can take a leaf out of the Belgians' book, who have clearly and concisely detailed the relationship between voluntary plot exchange and spatial planning. Nevertheless, plot exchange is not really affected by the absence of this coordination with regard to spatial planning.

The role of *sociology* in plot exchange appears to be severely underemphasized. Evidently, plot exchange lawyers suffer from "tunnel vision" in view of the fact that the legal and sociological aspects of plot exchange, although clearly present and a huge influence on the deployability and effectiveness of the instrument, are not given a place in legal considerations and laws at all. I therefore recommend devoting more attention to the effect and influence of plot exchange on the interhuman society.

The same applies, be it to a considerably lesser extent, to the *geography*: the geographical "impact" of a plot exchange product at rural level deserves the attention of the plot exchange practitioner.

Civil law bottlenecks/adjustments

In order to be able to deal with the first research topic the current plot exchange arrangement must first be put into a legal history perspective. It can be concluded that plot exchange has a particular and generally politically tinted background. Arising from the compulsory land consolidation scheme which in its turn was grafted on the market divisions, plot exchange profited in a certain sense from the delayed completion and long duration of the land consolidation scheme as well as the absence of public backing for the instrument. Already in the run-up to the second Land Consolidation Act (1938) there was a realisation that as well as the compulsory land consolidation scheme, a consensual form of land use had to be implemented which could be used flexibly and rapidly. The first, cautious steps were taken on the voluntary path by the government by way of the land consolidation by agreement introduced in that year. In 1971 the voluntary child appeared to be able to stand on its own feet and continued independently on its way to plot exchange, where the government influence was still only marginal. This step hit the bull’s eye: plot exchange was used frequently and successfully and the supporting financial subsidy and tax measures (exemption) paid off. The popularity of plot exchange is still just as great today. That does not alter the fact however that there is still plenty of parcelling out work do to in the Dutch rural area in 2014.

Along the way plot exchange has continued to discard its public law jacket and has grown into a practically complete civil-law form of land use.

From a civil law aspect there are still a few obstacles which could stand in the way of an effective application of plot exchange. In my opinion the sketchy and in part obscure legislative text, which insofar as its content is concerned is practically the same as the regulation under the Land Use Act (which in turn was pretty much copied in full from the Land Consolidation Act 1954) is an example of apathetic and sometimes sloppy legislation. Also in view of the just as sketchy explanation during the parliamentary debate, the impression arises that the legislature wanted to quickly get off the subject of "plot exchange". It would have been better if the questions and lack of clarity that already existed under the Land Consolidation Act had been remedied in the WILG [Rural Areas (Planning) Act] by clear legislative texts, which are not eligible for various interpretations.

The "loose ends" in the legislative text include the issue of the exact scope of the entrant's regulation, the special route via "article 88" and the content and purport of the remarkable and

undesirable phrase "transactions which can just as well take place outside of the exchange process" from the parliamentary debate. Possibly a future evaluation of the WILG will allow for the existing uncertainty in parts to be removed by implementing the necessary changes and adjustments in the legislative texts.

The legislative text which is not always clearly formulated moreover leaves room for all kinds of civil law connections, which in turn invoke legal issues and lack of clarity. I am thinking here in particular of the hard to specify relationship between plot exchange and the "Book 7 exchange" and the various explainable ties with the legal concept "distribution" from the legal history. In my opinion the current sketchy legislative text for plot exchange, which leaves such civil law matters unresolved, but nonetheless does use terms derived from civil law is inadequate and moreover does not do justice to the *own legal sphere* which characterises plot exchange.

Moreover a good, solid legislative text eradicates cross-border conduct. Hence in the presence of a clear, unequivocal, statutory regulation, "Section 49 Book 7 Dutch Civil Code" exchanges, disguised as plot exchange, have less of a chance of penetrating the civil law limits of plot exchange.

Finally, in my opinion the time is ripe to give plot exchange a place in the Civil Code as a special civil law agreement. Plot exchange can then definitively discard its WILG straitjacket which it grew out of years ago. Inclusion in the Civil Code does justice to the essential features of plot exchange. Moreover the recent experiences with regard to the lease agreement have shown that transposition towards the Civil Code will benefit the accessibility and hence the popularity of the legal concept.

Tax bottlenecks/amendment

The adage *'tax follows civil'* effectively reflects the actual state of affairs with regard to the tax handling of plot exchange: the tax authorities only have to "tick off" the civil law requirements of plot exchange. With regard to tax matters the playing rules, after a period of uncertainty, are therefore clear.

This "luxury position" of plot exchange with regard to tax was not achieved without a struggle. The tax fortunes of plot exchange have a particularly stormy history, in which the tax street scene was defined for years by policy decisions, letters from the state secretary, assessments, a flow of case law and obscurity in literature and practice.

Those days are behind us now however, although incidentally various interesting lessons can be drawn from them. Now the taxman is on the second plan and the playing room for the Tax Authorities has been reduced to a minimum. Only the *fraus legis* doctrine can where applicable be taken out of the tax stable as a last resort to torpedo a tax inadmissible plot exchange. The tax gates are therefore wide open in the WILG.

Aside from this tax change of course the text of the tax exemption of article 15, paragraph 1, section I, WBR [Legal Transactions (Taxation) Act] should be updated in my opinion:

references to statutory arrangements which are no longer applied in practice because they have expired or been replaced by other regulations should be scrapped. In addition, I recommend supplementing the WBR with a text proposal that I have formulated, where the unwanted loss of a tax exemption for transfer tax due to the title releasing effect of an interim reallotment deed is no longer relevant. The legislature should also consider a statutory regulation for tax substitution of property within the limits of plot exchange.

The current tax situation which exists since 1 January 2007 can be called very practical but is unsatisfactory legally and substantively: I find *fraus legis* too ineffective and inadequate a means to combat bogus schemes intended to share in the tax facility via a construed plot exchange.

Moreover, the freedom offered burdens the practice with huge responsibility. Tax freedom is a great asset, but in my eyes not a carte blanche to construe all kinds of transactions as plot exchange, merely to benefit from the tax exemption. Even though possibly very admissible from a civil-law point of view, the practice should be forewarned for an unrestrained use of plot exchange merely for tax benefit. In the long term, plot exchange could possibly fail due to its own success because the government would be forced to call a tax halt to the "runaway" plot exchange practice. However paradoxical it may sound: overenthusiastic use of the acquired tax freedom in the short term could lead to restriction of this freedom in the long term. Therefore the tax aspects of plot exchange must be dealt with carefully.
In this respect, the convergence with and the comparison between the "plot exchange exemption" and other agricultural tax exemptions in the WBR were researched. This showed that for convergence between sections l and q the choice always falls on section l, in view of the unconditional intent of this exemption. When this unconditional intent is compared to the other exemptions researched, this appears to be a unique situation. Section l must therefore count its blessings.

In the light of the above inconvenience with regard to the almost unlimited tax freedom on plot exchange it was also researched in the scope of the tax comparative law exercise whether the exemption of section l could be further restricted in any way using elements from the other exemptions, such to prevent potential tax cross-border and hence inadmissible conduct. This research showed that many purely agricultural grafted further conditions could not be transitioned to section l, because plot exchange has not been exclusively agricultural by nature and content for a long time. It did appear that there was room for some restriction of section l without this being at the cost of the exemption's effectiveness. In particular the introduction of a follow-up period (more specifically: possession period) should be considered.

A latent danger does lurk in the strong emphasis on the tax facilitation of plot exchanges in my opinion: should the government ever decide to abolish the transfer tax then plot exchange will suddenly lose an extremely important foundation. Nevertheless in my view, even in such a situation there is still an ample need for a fast and flexible manner of land exchange to improve the use of the rural area, meaning that plot exchange would survive such a blow. The civil law advantages and particulars of a plot exchange, even in the event of any lapse of the tax facilities,

still remain present and constitute an adequate reason in such a situation to continue to "join, allocate and distribute". The tax facility may well be an important cornerstone but it is not a "supporting wall" under plot exchange. After the elimination of the tax facility the trias has become a tandem and the subsidy will have to take the lead to compensate the tax loss.
The current interaction between civil, tax and be it to a lesser extent, subsidy (see hereinafter) must be seen as the optimum situation however, where there is a certain balance between the various elements which make plot exchange a successful formula. It should be remarked that the tax facility now compensates and transcends the crumbling interest of the subsidy.

Bottlenecks/adjustments in the subsidy route

As well as the consideration of the civil law and tax aspects of plot exchange the subsidy forms the third and last component of the *trias* which has branded plot exchange a "success formula" since its introduction in 1971.

However, at subsidy level the appropriate steps have been taken in recent years. Here the continual further decentralisation of of the subsidy route is in my opinion a deterioration compared to the central system as applied under the Land Use Act. Obviously, at least theoretically, there is more concrete knowledge of the local situation and the measures required in individual cases at a provincial level but the provinces have considerably reduced the uniformity that existed until that time in their independent subsidy schemes. A certain extent of diversification accompanies the policy freedom of each province, but for a flexible use of plot exchange in the Netherlands a certain extent of *coordination* between the various subsidy ordinances is essential in my opinion. The "user" of the plot exchange instrument, just as is the case in civil and tax fields, must also know the lay of the land in the subsidy field. A system where varying conditions for subsidisation apply per province in which the amount of the subsidy moreover also differs considerably per province is incompatible with this need for clarity in my opinion.

In my opinion, in the matter of subsidy a renewed balance between the wishes, departure points and opinions which are present in a certain province on the one hand and a certain extent of streamlining and/or coordination which should take place between the various provincial regulations on the other hand must be sought in order to guarantee an effective province cross-border use of plot exchange. It must be prevented that the subsidy, due to the restrictions and additional requirements which apply per province, even more so than is the case now, becomes a "consolation prize" in the total plot exchange process. I also see a task for co-financier Europe within this "reconsideration".

Despite the often relatively subordinate financial interest with regard to the tax exemption, subsidy forms one of the foundations of the "plot exchange building". In these economically barren times the central government and the provinces must be most aware of this in their decentralisation urge. Plot exchange can also only be a properly working instrument in 2014 in the toolbox of the practice, government bodies and the agricultural advisor if the trias civil-tax-subsidy works properly.

In my opinion the Netherlands should take a leaf out of its neighbours' book, Germany and Belgium, on the matter of subsidy, where the subsidy policy, with regard to both amount and content, is unequivocally and effectively designed.

Legislature/politics/notary

The legal history research showed that land use is continually subject to substantive and organisational changes. Stimulated by the social, political and economic context one vision after the other followed the use and the design of the rural area. This means the land use can be characterised as the textbook example of "law in development".

During this continual evolution of the land use instrumentation, seen from the view of the legislature, continual attention to social acceptance of and backing with regard to land use at a local level is needed. As a voluntary form of land use where the social backing is practically always very good, plot exchange can fulfil a useful pioneer's role in this respect.

The rural area has lost its status as exclusive domain of the farmer throughout the years. This also means that a "new reality" has arisen, where the agricultural sector has become one of the players (be it still a relatively large one) on the land use playing field.

These development directions, mainly based on political choices and visions have had their repercussions on plot exchange, which over the years has developed into a multifunctional usable land use instrument. It is striking that the element "voluntary" is seen earlier by the government as a threat rather than as an opportunity. Plot exchange is therefore benefited by and in a certain sense dependent on adequate political backing.

In addition, the knowledge of and attention for plot exchange at government level can be safeguarded at all times and where necessary improved. A repetition of the parliamentary "makeshift solution" as occurred at the parliamentary debate on WILG can possibly be prevented.
Finally, the notarial profession is broadly discussed in this research. The message to this profession should be clear: plot exchange is a great market for the notary skilled in this matter. The agricultural notary must embrace plot exchange and must actively and expeditiously get to work on it. The experiences in Germany show where a passive attitude and an inefficient procedural working manner in the field of voluntary exchange of land can lead: the notary has disappeared entirely from the land use stage there. In the Netherlands the notary still fulfils an important task in this field and moreover is blessed with a domain monopoly.

The Dutch notary can therefore consider himself lucky with this prominent role in the plot exchange process. In my opinion if he can perform his duties properly, he will be seen as the *executor* of plot exchange, unlike his Belgian colleague who is limited to the role of administrator just as the Dutch notary in the Dutch reallotment process. An active and expert notary in this respect is a notice board for plot exchange, both towards "the market" as well as towards politics.

In addition, it should be noted that the notary should carry out his plot exchange tasks carefully, accurately and within the civil law and tax limits of the land use instrument at all times, such possibly subject to penalty of being held liable under civil law. Belehrung with regard to the civil law and tax consequences of land use also belongs to these notarial tasks. The notary should be aware that his responsibility in tax matters has considerably increased since the tax change of course as of January 2007: in the absence of points of reference in the form of approval from the government, the notary must independently assess the tax merits of plot exchange agreements.

All in all knowledge of all dimensions of plot exchange is a notarial *condito sine qua non*. This knowledge should be safeguarded for the future and where necessary expanded.

Germany, Belgium and Europe

A comparative law look inside the plot exchange kitchens of our "neighbours" Germany and Belgium was needed to discuss the second research topic and has had great results. Firstly it became apparent that the content of the "plot exchange law" of a country is largely determined by the country's historical and social background and developments. To an important extent the content and design of the legislation is adjusted to the views of the population with regard to land use.

In addition, it has become clear that Germany can be seen as the cradle of the current day land consolidation civilisation and a shining example for most Western European countries. The idea that historically speaking land consolidation and plot exchange are closely related to the legal concept of distribution arose in Germany, where the German *Umlegung* put me on to the distribution track.

In addition with regard to the *freiwilliger Landtausch* (voluntary plot exchange) the Germans are blessed with a thorough and properly functioning system, where contrary to the Dutch plot exchange, the presence of two participating parties is already enough. Also in the subsidy field and with regard to tax matters it is clear how the Germans lay the land, so that "Gründlichkeit" can be justly spoken of.

The presence of the *Surrogationsprinzip* in German legislation, both legally and with regard to tax matters as a "counterpart" for the Dutch title release which manifests itself in reallocation in my view is a very fitting system for Dutch plot exchange that should certainly be considered by the legislature.

At a terminological and ideological level the Belgians have a proper statutory regulation for voluntary plot exchange. Unfortunately this regulation is less successful in a practical aspect: excessive government influence and bureaucracy have ensured an unnecessary and undesirable inhibitory effect on the voluntary variation of land consolidation. The Belgian system contains a for my taste remarkable and legally illogical concerted action between the doctrines of substitution of property and title release.

Further, with regard to tax matters, just as in Germany there is a case of a clear system: a "plot exchange" approved by the government will automatically qualify for the tax facility. It has become apparent that the Belgians with regard to tax matters are fighting against *improper use* of the land use instrument, a development which has also been seen in the Netherlands.

Further, the comparative law research has also shown that where the Dutch plot exchange is increasingly being "driven away" from its agricultural core, its German and Belgian equivalents are still in "agricultural spheres".

Subsequently a course has been set towards Europe. Plot exchange has little to fear from this supranational possibility but unfortunately also not much to expect. The focus of European agricultural policy lies on income support to European farmers and sustainability of what they produce, the first cornerstone of the Common Agricultural Policy (CAP) therefore. It is true that there is perceived growing attention for rural development and therefore the second cornerstone of the CAP but as long as an expansion of the investments in the latter area is fully at the expense of the available money for income support, the rural development policy (RDP) and therefore the financial support for plot exchange at European level will always be a poor relation.

It should be remarked in this respect that the second cornerstone of the CAP for plot exchange is certainly not a "supporting wall". In a constructive aspect the minor European share in the funding of plot exchange is therefore not a major shortcoming, but funding is desired, in view of its important function as "lubricant".

For the time being though no miracles need be expected in the area of harmonisation of land use legislation from Europe. However, cross border projects such as Interreg and CROBECO may offer opportunities for a cross border use of plot exchange.

Cross-border plot exchange

A limited vision has dominated plot exchange within land use spheres for a long time in a territorial sense: the instrument should only be applied within the country borders. However, since then legal consciousness has developed, be it very gradually. In my opinion the days of an exclusively nationally tinted view of land use in general and plot exchange in particular are definitively over and a more international view is required. The third research topic therefore focuses on cross border plot exchange.

I am positive about the fact that in practice the first cross border recognition has already taken place. In my eyes the ‘de Slinge’ project where a cross-border plot exchange was applied for the first time in history marks the starting point of a further, internationally oriented use of plot exchange. The ball is now in the court of the national and supranational authorities and implementation agencies, who must further develop this cautious begin. This continued development however will not be easy, in view of the fact that the time is still not ripe for a structural, cross-border transcending legal approach to plot exchange. Cross-border plot exchange, as a concept and incentive for further globalisation is nonetheless desirable. In my view, the existing practical and legal objections which are largely to blame on the ever present

sovereignty of the EU member states in the land use area may not stand in the way of the further deliberations on and elaboration of the cross-border plot exchange.

As well as the aforementioned *external* cross border, attention must also be given to an *internal* cross border. This means the control of the civil law and tax aspects of plot exchange and the relationship between both legal areas. Plot exchange has a hybrid nature. "Multilingualism" is therefore a basic condition for any lawyer who is professionally involved in plot exchange.

In closing
One is not possible without the other: an external cross border will only be successful when there is proper insight into and control of the internal limits of plot exchange. Possibly the emphasis must be on this for now, independent from a single cross-border pilot project. In my opinion there is still a lot of work to be done. The practice, authorities and the notarial profession must be convinced of the added value of Dutch plot exchange. Where the statutory reallocation as follower of land consolidation is increasingly seen as "a traditional land use instrument" in my eyes plot exchange should be seen as a newer and more modern variation, which due to its small scale is able to adapt more rapidly than the "old" reallocation to changing circumstances and new areas of application. Therefore it is time for a "silent plot exchange revolution". As the land use chameleon, plot exchange can be used for various diverse purposes. In my view this ability to adapt is still inadequately acknowledged and used. ‘Clear the way for plot exchange’ therefore.

SAMENVATTING

Samenvatting van mijn proefschrift, verdedigd op 10 juli 2014 aan de Radboud Universiteit Nijmegen

De drie onderzoeksvragen

De kavelruil verdient het om nader te worden onderzocht en van diverse zijden te worden belicht. Pas wanneer men de kavelruil vanuit diverse (civielrechtelijke, fiscale en internationale) perspectieven beziet, krijgt men zicht op de juridische complexiteit, verscheidenheid en uitgebreide toepassingsmogelijkheden van het landinrichtingsinstrument. Dat daarbij niet enkel in agrarische hoek moet worden gezocht bewijst de ‘stedelijke kavelruil’, als een van de vruchten van dit onderzoek.

Het onderzoek is uitgevoerd aan de hand van drie onderzoeksvragen, luidend als volgt:

1. De Nederlandse kavelruil: hoe is het gesteld met de kwaliteit, de effectiviteit en de werkbaarheid van de kavelruil in Nederland, zowel in civielrechtelijke als in fiscale zin?
2. Kavelruil in rechtsvergelijkend perspectief: hoe is de kavelruil in de ons omringende landen geregeld en wat zijn de overeenkomsten en verschillen met de Nederlandse regeling?
3. Kavelruil in grensoverschrijdend perspectief: is (lands)grensoverschrijdende toepassing van kavelruil mogelijk?

Ten aanzien van de derde (grensoverschrijdende) onderzoeksvraag zij reeds op deze plaats opgemerkt dat, behalve externe grensoverschrijding, ook grensoverschrijding binnen de landsgrenzen, maar buiten het primaire juridische speelveld heeft plaatsgevonden: onder meer de ruimtelijke, sociologische en geografische kanten van de kavelruil zijn op hoofdlijnen belicht. Daarbij viel op dat de relatie tussen kavelruil en ruimtelijke ordening in Nederland op zijn minst moeizaam te noemen is: een duidelijke coördinatie tussen bestemming (ruimtelijke ordening) en inrichting (kavelruil) ontbreekt. In dat opzicht kan Nederland een voorbeeld nemen aan de Belgen, die de relatie tussen de ruilverkaveling in der minne en de ruimtelijke ordening op duidelijke en kernachtige wijze hebben vormgegeven. Niettemin ondervindt de kavelruil nagenoeg geen hinder van de afwezigheid van deze coördinatie ten opzichte van de ruimtelijke ordening.

De rol van de sociologie binnen de kavelruil bleek zwaar onderbelicht te zijn. Kennelijk lijdt de kavelruil-jurist aan 'tunnelvisie', aangezien de (rechts)sociologische aspecten van kavelruil, hoewel zeer duidelijk aanwezig en van grote invloed op de inzetbaarheid en effectiviteit van het instrument, in juridische beschouwingen en wetten geen enkele plek lijken te krijgen. Mijn advies luidt dan ook om meer aandacht te hebben voor het effect en de invloed van de kavelruil op de (inter)menselijke samenleving.

Hetzelfde geldt, zij het in aanzienlijk mindere mate, voor de geografie: ook de geografische 'impact' van een kavelruilproject op het landelijk gebied verdient de aandacht van de kavelruil-practicus.

Civielrechtelijke knelpunten/aanpassingen

Om de eerste onderzoeksvraag te kunnen beantwoorden, is de huidige regeling van de kavelruil allereerst in rechtshistorisch perspectief geplaatst. Geconcludeerd werd onder meer dat de kavelruil een bijzondere, veelal politiek gekleurde (voor)geschiedenis kent. Ontstaan vanuit de dwingende ruilverkaveling, die op haar beurt geënt was op de markeverdelingen, profiteerde de kavelruil in zekere zin van de trage afwikkeling en de lange duur van de ruilverkaveling, alsmede het gebrek aan maatschappelijk draagvlak van het instrument. Reeds in de aanloop naar de tweede Ruilverkavelingswet (1938), ontstond het besef dat er, naast de dwingende ruilverkaveling, een consensuele vorm van landinrichting moest worden ingevoerd, die flexibel en snel kon worden ingezet. Middels de in dat jaar geïntroduceerde ruilverkaveling bij overeenkomst werden de eerste, voorzichtige schreden op het vrijwillige pad, aan de hand van de overheid, gezet. In 1971 bleek het vrijwillige kind op eigen benen te kunnen staan en vervolgde het zijn weg zelfstandig als kavelruil, waar de overheidsinvloed nog slechts marginaal was. Deze stap bleek een schot in de roos: de kavelruil werd veelvuldig en succesvol ingezet, waarbij de flankerende maatregelen op financieel (subsidie) en fiscaal gebied (vrijstelling) hun vruchten afwierpen. De populariteit van de kavelruil is tot op heden onverminderd hoog te noemen. Dat neemt echter niet weg dat er in het Nederlandse landelijke gebied anno 2014 nog voldoende (verkavelings)werk aan de winkel is.

Gaandeweg heeft de kavelruil zich meer en meer van zijn publiekrechtelijke jas ontdaan en groeide hij uit tot een nagenoeg volledig civielrechtelijke vorm van landinrichting.

Civielrechtelijk zijn er thans nog weinig obstakels die een effectieve toepassing van de kavelruil zouden kunnen verhinderen. Wel is de summiere en op onderdelen onduidelijke wettekst, die inhoudelijk nagenoeg gelijk is aan de regeling onder de Landinrichtingswet (die op haar beurt weer nagenoeg integraal was overgenomen uit de Ruilverkavelingswet 1954), mijns inziens een voorbeeld van gemakzuchtige en soms slordige wetgeving. Mede gezien de eveneens summiere toelichting tijdens de parlementaire behandeling, bestaat de indruk dat de wetgever zich van het onderwerp 'kavelruil' wel erg gemakkelijk heeft willen afmaken. Het ware beter geweest indien in de WILG de reeds onder de Landinrichtingswet bestaande vragen en onduidelijkheden waren gerepareerd door middel van heldere wetteksten, die niet voor meerdere uitleg vatbaar zijn.

De 'losse eindjes' binnen de wettekst betreffen onder meer de vraag naar de exacte reikwijdte van de toetredersregeling, de bijzondere route via 'artikel 88' en de inhoud en strekking van de merkwaardige en ongewenste zinsnede 'transacties die evengoed buiten het ruilproces kunnen plaatsvinden' uit de parlementaire geschiedenis. Wellicht biedt een toekomstige evaluatie van de WILG de ruimte om de bestaande onduidelijkheden op onderdelen weg te nemen door in de wetteksten de nodige wijzigingen en aanpassingen door te voeren.

De niet op alle onderdelen even scherp geformuleerde wettekst laat bovendien ruimte voor allerhande civielrechtelijke dwarsverbanden, die op hun beurt weer juridische vragen en onduidelijkheden oproepen. Ik denk daarbij met name aan de moeilijk te duiden verhouding tussen de kavelruil en de 'Boek 7-ruil' en de diverse, vanuit de rechtshistorie verklaarbare banden met de rechtsfiguur 'verdeling'. De huidige summiere wettekst van de kavelruil, die dergelijke civielrechtelijke kwesties onopgelost laat, maar zich niettemin wel bedient van begrippen, ontleend aan het civiele recht, is naar mijn mening ontoereikend en doet bovendien te weinig recht aan de eigen rechtssfeer die de kavelruil kenmerkt.

Bovendien bant een goede, solide wettekst grensoverschrijdend gedrag uit. Zo zullen als kavelruil vermomde 'artikel 7:49 BW-ruilingen' bij aanwezigheid van een heldere, eenduidige wettelijke regeling, minder kans hebben om binnen te dringen binnen de (civielrechtelijke) grenzen van de kavelruil.

Ten slotte is mijns inziens thans de tijd rijp om de kavelruil als bijzondere (civielrechtelijke) overeenkomst een plek te geven in het BW. De kavelruil kan zijn WILG-keurslijf, dat hij al jaren is ontgroeid, daarmee definitief achter zich laten. Een opname in het BW doet recht aan de wezenskenmerken van de kavelruil. Bovendien hebben de (recente) ervaringen ten aanzien van de pachtovereenkomst geleerd dat een transponering richting het BW de kenbaarheid en daarmee de populariteit van de rechtsfiguur (verder) ten goede komt.

Fiscale knelpunten/aanpassingen

Het adagium 'fiscaal volgt civiel' geeft de actuele stand van zaken op het gebied van de fiscale behandeling van de kavelruil treffend weer: de fiscus dient enkel de civielrechtelijke vereisten aan de kavelruil 'af te vinken.' Op fiscaal gebied zijn de spelregels, na een periode van onzekerheid, derhalve helder.

Deze ‘luxepositie’ van de kavelruil op fiscaal terrein is echter niet zonder slag of stoot bereikt. De fiscale lotgevallen van de kavelruil kennen een bijzonder roerige historie, waarbij beleidsbesluiten, brieven van de staatssecretaris, naheffingen, een stroom aan jurisprudentie en onduidelijkheid in literatuur en praktijk jarenlang het fiscale straatbeeld hebben bepaald.

Die tijd, waaruit overigens verschillende interessante lessen te trekken zijn, ligt echter achter ons. Thans staat de fiscus op het tweede plan en is de speelruimte voor de Belastingdienst tot een minimum gereduceerd. Enkel het leerstuk fraus legis kan in een voorkomend geval als ‘ultimum remedium’ van de fiscale stal gehaald worden om een fiscaal ontoelaatbare kavelruil te torpederen. De fiscale poorten staan binnen de WILG derhalve ver open.

Los van deze fiscale koerswijziging dient de tekst van de fiscale vrijstelling van artikel 15, lid 1, onderdeel l, WBR mijns inziens te worden geactualiseerd: verwijzingen naar wettelijke regelingen die in de praktijk niet meer worden toegepast omdat zij uitgewerkt zijn of vervangen zijn door een andere regeling, dienen te worden geschrapt. Daarnaast beveel ik een door mij geformuleerd tekstvoorstel voor aanvulling van de WBR aan, waardoor het (ongewenste) verlies van een fiscale vrijstelling van overdrachtsbelasting door de titelzuiverende werking van een (tussentijdse) herverkavelingsakte niet langer aan de orde zal zijn. Ook dient de wetgever een wettelijke regeling van de (fiscale) zaaksvervanging binnen de kaders van de kavelruil te overwegen.

De huidige, sinds 1 januari 2007 bestaande situatie in fiscalibus is zeer zeker praktisch te noemen, maar juridisch-inhoudelijk is zij niet bevredigend: ik acht fraus legis een te weinig effectief en adequaat in te zetten middel om schijnconstructies, bedoeld om via een geconstrueerde kavelruil de fiscale faciliteit deelachtig te worden, te kunnen bestrijden.

Bovendien zadelt de geboden vrijheid de praktijk met een zware verantwoordelijkheid op. De fiscale vrijheid is een groot goed, maar is in mijn ogen geen vrijbrief om allerhande transacties tot kavelruil te construeren, enkel om de fiscale vrijstelling te kunnen benutten. Hoewel civielrechtelijk wellicht volledig toelaatbaar, zij de praktijk gewaarschuwd voor een ongebreidelde inzet van de kavelruil (enkel) voor fiscaal gewin. Op de lange termijn zou de kavelruil mogelijk aan zijn eigen succes ten onder kunnen gaan, doordat de overheid genoodzaakt zou kunnen worden de ‘losgeslagen’ kavelruilpraktijk een fiscale halt toe te roepen. Hoe paradoxaal het misschien ook klinkt: een te enthousiaste benutting van de verworven fiscale vrijheid op korte termijn, zou op lange termijn kunnen leiden tot inperking van deze vrijheid. Er dient derhalve met zorg omgesprongen te worden met de fiscale aspecten van de kavelruil.

In dit verband is tevens de samenloop met en de vergelijking tussen de ‘kavelruilvrijstelling’ en andere (agro)fiscale vrijstellingen uit de WBR onderzocht. Daarbij bleek dat bij samenloop tussen de onderdelen l en q de keuze altijd op onderdeel l valt, gezien de ongeclausuleerde opzet van deze vrijstelling. Wanneer deze ongeclausuleerde opzet werd vergeleken met de andere onderzochte vrijstellingen, bleek dit een unieke situatie te zijn. Onderdeel l moet zijn zegeningen derhalve tellen.

In het licht van voorgaande ongemakkelijkheid ten aanzien van de welhaast onbeperkte fiscale vrijheid op kavelruilgebied is in het kader van de fiscale rechtsvergelijkende exercitie tevens onderzocht of de vrijstelling van onderdeel l met gebruikmaking van elementen uit de overige vrijstellingen op enige wijze nader geclausuleerd kon worden, zulks ter voorkoming van potentieel fiscaal grensoverschrijdend en dus ontoelaatbaar gedrag. Bij dit onderzoek bleek dat vele puur-agrarisch geënte nadere voorwaarden niet konden worden getransponeerd naar onderdeel l, omdat de kavelruil reeds lange tijd niet meer uitsluitend agrarisch van aard en inhoud is. Wel bleek dat er wel degelijk ruimte bestaat voor enige clausulering van onderdeel l, zonder dat dit ten koste gaat van effectiviteit van de vrijstelling. Daarbij dient met name aan de introductie van een volgtermijn (meer specifiek: bezitstermijn) gedacht te worden.

De sterke nadruk op de fiscale facilitering van kavelruilen draagt mijns inziens wel een (latent) gevaar in zich: mocht de overheid ooit besluiten tot afschaffing van de overdrachtsbelasting, dan verliest de kavelruil plotsklaps een zeer belangrijk fundament. Niettemin blijft er in mijn optiek ook in een dergelijke situatie nog steeds ruime behoefte aan een snelle, flexibele wijze van grondruil ter verbetering van de inrichting van het landelijk gebied, zodat de kavelruil een dergelijke klap wel te boven zal komen. De civielrechtelijke voordelen en bijzonderheden van een kavelruil blijven, ook bij het eventueel vervallen van de fiscale faciliteiten, nog steeds pregnant aanwezig en vormen voldoende reden om ook in een dergelijke situatie te blijven ‘samenvoegen, verkavelen en verdelen.’ De fiscale faciliteit is weliswaar een belangrijke pijler, maar geen ‘dragende muur’ onder de kavelruil. Wel is de trias na eliminatie van de fiscale faciliteit een tandem geworden en zal de subsidie meer het voortouw moeten nemen om het fiscale gemis te compenseren.

De huidige wisselwerking tussen civiel, fiscaal en, zij het in mindere mate, subsidie (zie hierna), moet echter beschouwd worden als de optimale situatie, waarbij er een zeker evenwicht is tussen de diverse elementen die kavelruil tot een succesformule maken. Daarbij zij wel opgemerkt dat thans de fiscale faciliteit het afkalvende belang van de subsidie compenseert en overtreft.

Knelpunten/aanpassingen binnen het subsidietraject

Naast de beschouwing van de civielrechtelijke en de fiscale aspecten van de kavelruil vormt de subsidie het derde en laatste bestanddeel van de trias die de kavelruil sinds zijn introductie in 1971 het predicaat ‘succesformule’ oplevert.

Op het vlak van de subsidiëring is er de afgelopen jaren echter het nodige gebeurd. Daarbij is de steeds verdergaande decentralisatie van het subsidietraject naar mijn mening een achteruitgang ten opzichte van het (centrale) systeem zoals dat onder (onder meer) in de Landinrichtingswet gold. Natuurlijk is er, althans theoretisch, op provinciaal niveau meer concrete kennis van de lokale situatie en de in een individueel geval benodigde maatregelen aanwezig, maar de provincies hebben in hun afzonderlijke subsidieregelingen de tot die tijd bestaande uniformiteit, aanmerkelijk gereduceerd. Een zekere mate van diversificatie behoort daarbij uiteraard tot de beleidsvrijheid van iedere provincie, maar voor een soepele inzet van kavelruil in Nederland is een zekere mate van afstemming tussen de diverse subsidieverordeningen mijns inziens onmisbaar. De ‘gebruiker’ van het instrument kavelruil

moet, net als dat op civiel en fiscaal gebied het geval is, ook op subsidieterrein weten hoe de hazen lopen. Een systeem waarbij per provincie verschillende voorwaarden voor subsidiëring gelden, waarbij de omvang van de subsidie bovendien ook per provincie aanmerkelijk verschilt, verdraagt zich naar mijn mening met deze behoefte aan duidelijkheid niet.

Op subsidieterrein zal naar mijn mening gezocht moeten worden naar een (hernieuwd) evenwicht tussen enerzijds de wensen, uitgangspunten en opvattingen die binnen een bepaalde provincie aanwezig zijn en anderzijds de zekere mate van stroomlijning casu quo afstemming die er tussen de diverse provinciale regelgevingen dient plaats te vinden, om een effectieve (provinciegrensoverschrijdende) inzet van kavelruil te kunnen waarborgen. Voorkomen moet worden dat de subsidie, door de beperkingen en aanvullende eisen die per provincie gelden, nog verder dan thans het geval is, verwordt tot een 'troostprijs' in het totale kavelruilproces. Binnen deze 'herbezinning' zie ik tevens een taak voor mede-financier Europa weggelegd.

Ondanks het ten opzichte van de fiscale vrijstelling vaak relatief ondergeschikte (financiële) belang, vormt de subsidie één van de fundamenten onder het 'kavelruil-gebouw'. Het Rijk en de provincies dienen zich hiervan in al hun decentralisatiedrang en ook zeker in deze economisch barre tijden terdege bewust te zijn. Alleen door het goed functioneren van de trias civiel-fiscaal-subsidie kan de kavelruil ook anno 2014 een goed werkend instrument zijn in de gereedschapskoffer van de praktijk, (overheids)instanties en de agrarisch adviseur.

Op subsidieterrein zou Nederland in mijn opinie zijn licht moeten opsteken bij onze buurlanden Duitsland en België, waar het subsidiebeleid, zowel qua omvang als inhoud, eenduidig en effectief is vormgegeven.

Wetgever/politiek/notariaat

Het rechtshistorisch onderzoek heeft aangetoond dat de landinrichting voortdurend onderhevig is (geweest) aan inhoudelijke en organisatorische veranderingen. Gestimuleerd door de maatschappelijke, politieke en economische context volgde de ene visie op het gebruik en de inrichting van het landelijk gebied de andere op. De landinrichting is daarmee te kenmerken als het schoolvoorbeeld van 'recht in ontwikkeling'.

Gedurende deze voortdurende evolutie van het landinrichtingsinstrumentarium is, vanuit de wetgever bezien, blijvende aandacht voor maatschappelijke acceptatie van en draagvlak met betrekking tot de landinrichting op lokaal niveau noodzakelijk. Als vrijwillige vorm van landinrichting waarbij het maatschappelijk draagvlak vrijwel altijd (zeer) goed te noemen is, kan de kavelruil in dit kader een nuttige (voortrekkers)rol vervullen.

Het landelijk gebied heeft daarbij in de loop der jaren zijn status als exclusieve domein van de boer verloren. Mede daardoor is een 'nieuwe realiteit' ontstaan, waarin de agrarische sector geworden is tot een van de spelers (zij het nog steeds een relatief grote) op het landinrichtingsspeelveld.

Dergelijke, veelal op politieke keuzes en visies gebaseerde ontwikkelingsrichtingen hebben hun weerslag gehad op de kavelruil, dat zich gedurende de jaren ontwikkeld heeft tot een multifunctioneel inzetbaar landinrichtingsinstrument. Opvallend daarbij is dat het element

‘vrijwilligheid’ door de overheid vaak eerder als een bedreiging dan als een kans lijkt te worden gezien. De kavelruil is derhalve gebaat bij, en in zekere zin afhankelijk van, voldoende politiek draagvlak.

Daarnaast dienen ook de kennis van en aandacht voor de kavelruil op rijksniveau te allen tijde te zijn gewaarborgd en waar nodig te worden verbeterd. Zo kan een herhaling van het parlementaire ‘lapwerk’, zoals dat plaatsvond bij de parlementaire behandeling van de WILG, mogelijk worden voorkomen.

Tot slot kwam het notariaat in dit onderzoek ruim aan bod. De boodschap aan deze beroepsgroep moge duidelijk zijn: de kavelruil vormt een mooie markt voor de terzake kundige notaris. De agro-notaris dient de kavelruil dan ook te omarmen en dient er actief en voortvarend mee aan de slag te gaan. Waar een passieve houding en een inefficiënte procedurele werkwijze op het gebied van vrijwillige ruil van gronden toe kan leiden hebben de ervaringen in Duitsland uitgewezen: de notaris is aldaar geheel van het landinrichtingstoneel verdwenen. In Nederland vervult de notaris (nog) een belangrijke taak op dit gebied en is hij bovendien gezegend met een (domein)monopolie.

De Nederlandse notaris kan zich derhalve gelukkig prijzen met zijn prominente rol binnen het kavelruilproces. Hij kan daarbij naar mijn mening, indien hij zijn taakuitoefening op gedegen wijze vormgeeft, worden gezien als executeur van de kavelruil. Dit in tegenstelling tot zijn Belgische collega, die, net als de notariële rol binnen het Nederlandse herverkavelingsproces, beperkt is tot die van administrateur. Een actief en ter zake kundig notariaat vormt een uithangbord voor de kavelruil, zowel richting ‘de markt’ als richting de politiek.

Daarbij dient te worden aangetekend dat de notaris zijn kavelruil-taken te allen tijde zorgvuldig, nauwgezet en binnen de civielrechtelijke en fiscale grenzen van het landinrichtingsinstrument dient uit te voeren, zulks mogelijk op straffe van civielrechtelijke aansprakelijkheidsstelling. Ook Belehrung inzake de civielrechtelijke en fiscale gevolgen van landinrichting behoort tot dit notariële takenpakket. Hierbij dient de notaris zich ervan bewust te zijn dat zijn verantwoordelijkheid op fiscaal gebied sinds de fiscale koerswijziging per 1 januari 2007 aanmerkelijk is uitgebreid: de notaris dient, bij gebrek aan handvatten in de vorm van een goedkeuring van overheidswege, de kavelruil(overeenkomst) zelfstandig op zijn fiscale merites te beoordelen.

Al met al is kennis van alle dimensies van de kavelruil een notariële conditio sine qua non. Deze kennis dient (voor de toekomst) gewaarborgd en zo nodig uitgebreid te worden.

Duitsland, België en Europa

Een rechtsvergelijkende kijk in de kavelruilkeukens van onze ‘buren’ Duitsland en België, benodigd voor de beantwoording van de tweede onderzoeksvraag, heeft veel opgeleverd. Zo is allereerst gebleken dat de inhoud van het ‘ruilverkavelingsrecht’ van een land grotendeels bepaald wordt door de historische en sociale achtergronden en ontwikkelingen van een land. De inhoud en inrichting van de wetgeving is daarbij in belangrijke mate afgestemd op de zienswijze van de bevolking ten aanzien van de landinrichting.

Daarnaast is duidelijk geworden dat Duitsland als bakermat van de hedendaagse ruilverkavelingsbeschaving en lichtend voorbeeld voor de meeste West-Europese landen gezien kan worden. De gedachte dat ruilverkaveling en kavelruil historisch bezien een grote mate van verwantschap met de rechtsfiguur verdeling hebben, is dan ook ontstaan in Duitsland, alwaar de Duitse Umlegung mij op het verdelingsspoor bracht.

De Duitsers zijn daarnaast op het gebied van de freiwilliger Landtausch gezegend met een degelijk, goed functionerend systeem, waarbij, in tegenstelling tot hetgeen bij de Nederlandse kavelruil het geval is, de aanwezigheid van twee deelnemende partijen reeds voldoende is. Ook op het subsidiëringsgebied en op fiscaal terrein is duidelijk hoe de (Duitse) hazen lopen, zodat met recht van 'Gründlichkeit' kan worden gesproken.

De aanwezigheid van het Surrogationsprinzip binnen de Duitse wetgeving, zowel op juridisch als op fiscaal gebied, als 'tegenhanger' van de (Nederlandse) titelzuivering, die zich manifesteert bij de herverkaveling, is mijns inziens een voor de Nederlandse kavelruil zeer goed passend systeem, dat zeker overwogen dient te worden door de wetgever.

De Belgen beschikken over een op terminologisch en ideologisch vlak gedegen wettelijke regeling van de ruilverkaveling in der minne. Helaas is deze regeling in praktisch opzicht minder geslaagd: de overdaad aan overheidsinvloed en bureaucratie hebben gezorgd voor een onnodig en onwenselijk remmend effect op de vrijwillige variant van de ruilverkaveling. Daarbij wordt binnen het Belgische systeem een naar mijn smaak merkwaardig en juridisch onlogisch samenspel tussen de leerstukken zaaksvervanging en titelzuivering aangetroffen.

Op fiscaal terrein is voorts, net als in Duitsland, sprake van een duidelijke systematiek: een door de overheid goedgekeurde 'kavelruil' kwalificeert automatisch voor de fiscale faciliteit. Gebleken is dat de Belgen op fiscaal gebied strijden tegen oneigenlijk gebruik van het landinrichtingsinstrument, een ontwikkeling die ook in Nederland te zien is geweest.

Wat voorts is opgevallen bij het rechtsvergelijkend onderzoek is dat, waar de Nederlandse kavelruil meer en meer 'weggedreven' is van zijn agrarische kern, de Duitse en Belgische equivalenten nog volop in 'agrarische sferen' vertoeven.

Vervolgens is koers gezet richting Europa. Van deze supranationale mogendheid valt op kavelruilgebied weinig te vrezen, maar helaas ook weinig te verwachten. De focus van het Europese landbouwbeleid ligt op inkomensondersteuning van de Europese boeren en duurzaamheid van het door hen geproduceerde, de eerste pijler van het Gemeenschappelijk Landbouwbeleid (GLB) derhalve. Er is weliswaar een toenemende aandacht voor plattelandsontwikkeling en daarmee de tweede pijler van het GLB waarneembaar, maar zolang een uitbreiding van de investeringen op dit laatste gebied nog volledig ten koste gaat van de beschikbare gelden voor inkomenssteun, zal het plattelandsontwikkelingsbeleid (POP) en daarmee de financiële ondersteuning van de kavelruil op Europees niveau altijd een ondergeschoven kindje blijven.

Daarbij zij opgemerkt dat de tweede pijler van het GLB voor de kavelruil zeker geen 'dragende muur' is. In constructief opzicht is het geringe Europese aandeel in de financiering van de

kavelruil dus geen groot gemis, maar financiering is wel gewenst, gezien haar belangrijke functie als 'smeermiddel'.

Ook op het gebied van harmonisatie van (landinrichtings)wetgeving hoeven van Europa voorlopig geen wonderen te worden verwacht. Wel bieden concrete grensoverschrijdende trajecten als Interreg en CROBECO wellicht kansen voor een grensoverschrijdende inzet van kavelruil.

Grensoverschrijdende kavelruil

Binnen landinrichtingssferen is lange tijd een in territoriale zin beperkte visie op kavelruil dominant is geweest: de toepassing van het instrument dient uitsluitend binnen de landsgrenzen plaats te vinden. Het rechtsbewustzijn is echter sinds die tijd ontwikkeld, zij het zeer geleidelijk. Thans zijn de tijden voor een uitsluitend nationaal-gekleurde visie op landinrichting in het algemeen en kavelruil in het bijzonder mijns inziens definitief voorbij en is een internationale(re) blik vereist. De derde onderzoeksvraag heeft daarom de grensoverschrijdende kavelruil als onderwerp.

Het stemt mij daarbij positief dat in de praktijk de eerste grensoverschrijdende verkenning reeds heeft plaatsgevonden. Het project 'de Slinge', waarbij voor het eerst in de historie een grensoverschrijdende kavelruil is toegepast, markeert in mijn ogen het startpunt voor een verdere, internationaal georiënteerde inzet van de kavelruil. De bal ligt thans bij de (nationale en supranationale) overheden en uitvoeringsdiensten, die deze voorzichtige aanzet verder dienen te ontwikkelen. Deze doorontwikkeling zal echter niet gemakkelijk zijn, aangezien is gebleken dat de tijd thans nog niet rijp is voor een structurele, landsgrens-overstijgende juridische benadering van de kavelruil. De grensoverschrijdende kavelruil, als concept en stimulans voor (verdere) globalisering, is niettemin wenselijk. Bestaande praktische en juridische bezwaren, grotendeels te wijten aan de nog immer aanwezige soevereiniteit van de EU-lidstaten op landinrichtingsgebied, mogen mijns inziens geen belemmering vormen voor de verdere gedachtenvorming en uitwerking van de grensoverschrijdende kavelruil.

Naast voormelde externe grensoverschrijding dient er (ook) aandacht te worden geschonken aan interne grensoverschrijding. Daarmee wordt bedoeld de beheersing van de civielrechtelijke en fiscale aspecten van de kavelruil en de relatie tussen beide rechtsgebieden. De kavelruil bezit daarmee een hybride karakter. 'Multilingualisme' is derhalve een basisvoorwaarde voor de jurist die zich op professioneel bezighoudt met kavelruil.

Tot slot

Het een kan niet zonder het ander: pas bij voldoende zicht op en beheersing van de interne grenzen van kavelruil kan op succesvolle wijze aan externe grensoverschrijding gedaan worden. Wellicht dat daarop, los van een enkel grensoverschrijdend (pilot)project, vooralsnog de nadruk moet liggen. Want er is mijns inziens nog veel werk aan de winkel. Praktijk, overheid en notariaat dienen alle overtuigd te zijn van de meerwaarde van de (Nederlandse) kavelruil. Waar de wettelijke herverkaveling, als opvolger van de ruilverkaveling, meer en meer als 'een traditioneel landinrichtingsinstrument' beschouwd wordt, dient de kavelruil in mijn ogen te

worden gezien als een nieuwere, modernere variant, die vanwege zijn kleinschaligheid in staat is om zich, sneller dan de ‘oude’ herverkaveling, aan te kunnen passen aan veranderende omstandigheden en nieuwe toepassingsgebieden. Het is daarom tijd voor een ‘stille revolutie’ van de kavelruil. Als kameleon van de landinrichting kan de kavelruil voor diverse uiteenlopende doeleinden worden ingezet. Dit aanpassend vermogen wordt mijns inziens nog onvoldoende onderkend en benut. ‘Ruim baan voor de kavelruil’ derhalve.

Implementation of improved LC model in Serbia in accordance with the best EU practice

Zoran KNEŽEVIĆ and Nenad GVOZDENOVIĆ, Serbia

Key words: Land Consolidation, Good Governance, Serbia, EU best practice, Agriculture

SUMMARY

The European Union and Government of the Federal Republic of Germany decided to support Serbian Ministry of Agriculture through IPA project improvement of agriculture land management on state and local level in Serbia. The project had 4 components.
The management of state owned agricultural land was improved by providing an IT system which will allow for more efficient and transparent procedures especially for the leasing of state land. Several pilot municipalities were included in the development process of the IT system, which will now be used to elaborate yearly programs for the leasing of state land
7 pilot projects for land consolidation were implemented, especially in southern and eastern parts of Serbia. The overall area of land consolidation was more than 5000 ha. Of that, more than 3300 ha were added during the projects on demand and with financing of the partner municipalities. The average size of the land parcels in the completed projects rose between 42% (smallest individual project) and more than 200% (biggest project) respectively. This will allow for better and more productive agricultural production as well as improved income of farmers. Main innovations introduced into the land consolidation process in Serbia were improved participation of land owners and farmers, more transparent land valuation as well as environmental assessment.
The problem of land abandonment was addressed by elaborating a procedure for identification of abandoned land plots and a process to getting such lots back into use. During the project at least 55 ha were put back into use.
The above mentioned topics were also addressed in draft by-laws elaborated for the Law on Agricultural Land. These by-laws will secure sustainability of the project outcomes and provide for improved framework conditions for the management and use of agricultural land in Serbia.
Besides the main beneficiary, the Directorate of Agricultural Land (DAL) of the Ministry of Agriculture and Environmental Protection, other important stakeholders of land management in Serbia, such as the Republic Geodetic Authority (RGZ) and the Standing Conference of Towns and Municipalities were included in project implementation.

Implementation of improved LC model in Serbia in accordance with the best EU practice

Zoran KNEŽEVIĆ and Nenad GVOZDENOVIĆ, Serbia

1. HISTORY

The Republic of Serbia has a long tradition of land consolidation. First land consolidation processes in Serbia started in 1860. The most important activities and the largest area in Serbia were consolidated in the period from 1955 to 1995. During this period land consolidation was completed in the area of 710 cadastral municipalities i.e. more than 1.4 million hectares, which amounts to about 25% of the total agricultural land in Serbia. In the subsequent period from 1995 to 2005 there were no land consolidation activities. Since 2005, the activities in preparation of new land consolidation programs in Serbia have started again. The Strategy for land consolidation in Serbia was developed in coordination with FAO, which was followed by adoption of a new Law on Agricultural Land in 2006, containing the regulations in the area of land consolidation. The Law on Agricultural Land stipulates that land consolidation may be voluntary and mandatory.
In the last ten years, the land consolidation procedures were initated in an area of 275,166 hectares in 47 municipalities (106 cadastral municipalities). The largest part is still in the preparatory stage (63% of the total area). In the area of 30,122 ha i.e. 11% of the total land consolidation area in Serbia, land consolidation process is completed. In the area of 73,287 ha (26%), the process of land consolidation is still in implementation.

2. FINANCING

In this period (2006-2016), land consolidation was financed from the national budget, the budget of autonomous province and the municipal budget, with additional funding from land owners and international organizations (EU, FAO, German Government). The largest amount of money for land consolidation was provided from the lease of agricultural land owned by the state, which was allocated to the budget of municipalities, the budget of the province and to the national budget.
The total value of contracted geodetic-technical works from 2005 to 2016 was 51.5 million EUR**.**

3. Improvement of the LC model

During the implementation of the land consolidation according the LAL (2006), it has been identified that there is a need for improvement of institutional level and legal framework. Fragmented land parcels with irregular shape, often not accessible by field and track roads, underdeveloped infrastructure, outdated cadaster records resulting in a low agricultural productivity are also a big problem in Serbia, especially in the southeastern part of the country. For the aforementioned reasons and upon the request of the Republic of Serbia, the European Union and the Government of the Federal Republic of Germany decided to support the Serbian Ministry of Agriculture through IPA project named "Rural development: Effective Land Management/Strengthening Municipal Land Management in Serbia", implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), with the aim to improve land management in Serbia at the national and local level as a part of rural development measures. There were 7 LC pilot projects within this project. The lessons learned from pilots should be used in order to improve the traditional LC model in Serbia, particularly the existing legal framework and land consolidation implementation procedures. The decision to place pilot projects in Southeastern and Central Serbia was based on the fact that this region has a problem with prevailingly fragmented plot structure (average size of parcel is 0,11 ha) and a lack of infrastructure.

4. Partners involved

Key partners of the project were the Ministry of Agriculture and Environmental Protection – in particular its Directorate for Agriculture Land (DAL), 7 municipalities in Southeast Serbia, to be specific Municipalities of Paraćin, Boljevac, Knjaževac, Svrljig, Pirot, Negotin and Žitorađa. In addition, the cadastral authority at the national and local level (Republic Geodetic Authority) was also a partner of the project.

5. Goal

The main goal was improvement of Serbian land consolidation model in accordance to the EU best practices.

6. Novelties and improvement

6.1 Participation and Visibility

Awareness of the local population, especially farmers, for the needs and chances that land consolidation offers is of the utmost importance for successful implementation of land consolidation pilot schemes. Public hearings, workshops, promotional and awareness raising campaigns were organized to meet this purpose. The additional support to the process was given by printing flyers and brochures as well as by interviews in newspapers and TV. The project also made a documentary about all important phases in implementation of land consolidation and introduced novelties.

6.2 Establishing Criteria and Selection of Pilot Projects

The project and the main project partner – Ministry of Agriculture and Environmental Protection (Directorate of Agriculture Land) have jointly visited 22 municipalities in the southeastern region of Serbia in order to select 7. The selection of pilot municipalities was based on the comparison of criteria (support from local authorities, willingness of community members to participate, suitability of the area proposed for land consolidation, fragmented, scattered and abandoned parcels) and indicators collected through questionnaires, field visits and discussions with workshop participants.

6.3 Implementation of Environmental Impact Assessment (EIA) in LC process

The Plan of Common and Public Facilities (PCPF) was used to introduce EIA in LC process. Activities which influence transformation in the land consolidation process should be environmentally acceptable. Significant or lasting negative effects should be avoided . Protection of valuable habitats and species, including elements of the landscape which have the function of structuring and resuscitation should be preserved, provided and protected against negative influences as well as developed and interconnected as much as possible. The project has organized a serious of the trainings (10) and advisor support for the national environmental expert who has implemented EIA.

6.4 Improvement of the work of Land Consolidation Commission (LCC)

According to the the Law on Agriculture Land, the Land Consolidation Commission is a legal and formal body responsible for implementing Land Consolidation. The project has organized a series of trainings (10) for pilot municipalities' LCC in the most important phases of LC. In all pilot projects, LCCs were visited and supported by the GIZ team.

As mentioned under 6.2, 22 municipalities in the southeastern part of Serbia were visited in the selection phase. Unfortunately, the project could support only 7 local authorities. Due to that fact, the project also organized trainings for LCCs in additional 7 municipalities which were not selected as pilots (Bela Palanka, Vladičin Han, Ražanj, Leskovac, Dimitrovgrad and Kladovo).

6.5 Improvement of the role and tasks of Board of Participants (BoP)

The Board's particular role is to mediate between the Land Consolidation Commission and the entirety of the participants; individual private affairs remain a personal issue of the participants. The Board of Participants provides advice for the Land Consolidation Commission and its sub-commissions during the whole course of the project, and it regularly requests information regarding the progress of the project. This perceived role of the Board of Participants shall contribute to better mutual understanding and more transparency in the land consolidation process. This manner of cooperation shall guarantee optimal decisions by the Land Consolidation Commission, and shall make necessary decisions comprehensible. The project has organized the trainings and technical-advisory support for all 7 BoPs.

6.6 Improvement of the Land Valuation Methodology

The goal was to improve land valuation methodology through theoretical and practical training (in order to better define differences between land valuation classes). For this purpose, the project supported trainings, technical advisor support and equipment for licensed land evaluation companies in order to enable the implementation of presented methodology improvements.

Pilot municipalities	Number of parcel before LC	Number of parcel after LC	Number of participants before LC	Number of participants after LC	Average size of the parcel before LC (ha)	Average size of the parcel after LC (ha)	The lenght of new field road network (km)	The lenght of new canal network (km)
Boljevac LC area 255 ha	926	409	292	258	0,28	0,63	11,06	1,92
Knjaževac LC area 200 ha	869	352	147	81	0,22	0,55	18,6	1,17
Paraćin LC area 1200 ha	8283	-	1899	-	-	-	-	-
Negotin LC area 2500 ha	12537	5041	1864	1049	0,19	0,80	99	-
Žitorađa LC area 514 ha	2542	1389	926	843	0,20	0,65	46	10,5
Pirot LC area 320 ha	1742	1158	880	955	0,18	0,27	23	-
Svrljig LC area 314 ha	2148	1196	610	411	0,12	0,25	19	5,77

7. Lessons Learnt

In general, there is a lack of awareness about the benefits and advantages of LC at all institutional levels. The development of LC programs for planning LC projects required more time than expected. According to the current Law on Agriculture Land, the LC Program is a very important document. Based on the Program, the Municipality may adopt the Decision on Land Consolidation Implementation, appoint the Land Consolidation Commission, adopt the land consolidation principles, secure funding for implementation, initiate public procurement and contracting of works in implementation, as well as monitor the implementation of the works. In accordance to the improvement of legislation, the LC program should also be improved. The experiences gained in implementing LC pilot projects were used as inputs for drafting bylaws and improving LC legislation. Monitoring and improvement of institutional-administration level capacities were necessary during the entire LC process. Clearly defined roles and tasks of all stakeholders, development of standards for technical procedures, ensuring sufficient funding and proper public procurement processes were identified as important preconditions for successfull finalization of the projects. New Law on Land Consolidation is a necessary solution for solving all legal and technical issues.

8. Follow up phase LM3

Based on the funding of the Government of the Federal Republic of Germany, in 2016 has started a new project with the aim to further increase the administrative and personnel capacities in order to enhance Serbia's agricultural productivity and competitiveness on the EU market.

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Re-inventing Land Readjustment: Implications for Eminent Domain, Public-Private Partnership, and Land Governance[1]

Mansha CHEN and Yu-Hung HONG, USA

Key words: land readjustment, eminent domain, public-private partnership, land governance

SUMMARY

Land readjustment has been conventionally perceived as merely a tool to assemble adjacent land plots from different owners for efficient land redevelopment. Surprisingly recent applications of this land tool in developing countries have, to certain extent, shown its potential for minimizing the use of eminent domain or government compulsory purchase, facilitating public-private partnership, and encouraging good land governance. Based on actual cases from the developing world and emerging economies including Angola, Bhutan, China, Colombia, Egypt, Ethiopia, India, Indonesia, Thailand, Turkey, and Vietnam, we will discuss how supporting legislation, organized community, collaboration between the public and private sectors, and trust relationship among stakeholders were gradually institutionalized in accordance with experiences learned from land readjustment experiments. These phenomena are quite different from the traditional argument that the above-mentioned institutional environments must exist prior to adopting this land tool. Although the cases that we examined are neither exhaustive nor randomly selected, they help raise important questions about whether or not land readjustment could be used to build viable institutions and governance for managing land development. The rethinking of the possibilities and limitations of land readjustment could open the door for more application of this approach in developing countries than it has been deployed in the past.

[1] This paper is based on the World Bank Land Readjustment e-learning course developed by the authors. Course can be accessed via the World Bank Open Learning Campus at: https://olc.worldbank.org/content/land-readjustment-self-paced

Re-inventing Land Readjustment: Implications for Eminent Domain, Public-Private Partnership, and Land Governance

Mansha CHEN, China and Yu-Hung HONG, USA

1. INTRODUCTION

Land readjustment has been conventionally perceived as merely a tool to assemble adjacent land plots from different owners for efficient land redevelopment. Surprisingly recent applications of this land tool in developing countries have, to certain extent, shown its potential for minimizing the use of eminent domain or government compulsory purchase, facilitating public-private partnership, and encouraging good land governance. Based on actual cases from the developing world and emerging economies including Angola, Bhutan, China, Colombia, Egypt, Ethiopia, India, Indonesia, Thailand, Turkey, and Vietnam[2], we will discuss how supporting legislation, organized community, collaboration between the public and private sectors, and trust relationship among stakeholders were gradually institutionalized in accordance with experiences learned from land readjustment experiments. These phenomena are quite different from the traditional argument that the above-mentioned institutional environments must exist prior to adopting this land tool. Although the cases that we examined are neither exhaustive nor randomly selected, they help raise important questions about whether or not land readjustment could be used to build viable institutions and governance for managing land development. The rethinking of the possibilities and limitations of land readjustment could open the door for more application of this approach in developing countries than it has been deployed in the past.

2. MYTH AND REALITIES

Based on the experiences of conducting land readjustment in developed countries, scholars and analysts alike have proposed a set of preconditions for adopting this land tool. Since these preconditions play some role in determining the adoptability of land readjustment in industrialized nations, many analysts consider it impossible to apply similar techniques in developing countries because these conditions do not exist. However, as we will explain later, none of the preconditions for land readjustment are fixed naturally such that developing nations will never be able to develop them in their countries. In this section, we will analyze these arguments, separating the myths from the realities. This will help us provide better suggestions for adopting land readjustment in some developing countries.

It is essential to state at the onset that our observations are based on the research on recent land readjustment, pooling, or sharing practices and experiments in several countries including Angola, Bhutan, China, Colombia, Egypt, Ethiopia, India, Indonesia, Thailand, Turkey, and Vietnam. There are certainly many other experiences around the world; however, we cannot cover them all here. Thus, we would like to limit our arguments to these selected countries and avoid any generalizations.

[2] Detailed case studies can be found in the World Bank Land Readjustment e-learning course: https://olc.worldbank.org/content/land-readjustment-self-paced

2.1 Myth No. 1

2.1.1 Is a land readjustment legislation needed to implement the tool?

Many scholars and analysts alike have argued that countries need land readjustment legislation prior to adopting this approach. A prime reason is to empower an implementing agency to legally take land from dissenting landowners when the supermajority of their neighbors has agreed to participate, in order to avoid holdout.

In principle, having some legal rules to guide the operations of land readjustment is a good idea. Yet the procedure for establishing new laws in most developing countries is very long and politically driven. Legislators are often unwilling to take the risk of formalizing rules for a new practice that has no precedent in their countries. The potential complications and risks of proposing a special law for land readjustment have deterred many developing countries from experimenting with the idea.

Interestingly, we learned from the selected land-readjustment experiences in developing countries that not having special legislation did not hinder implementation of the idea. Examples include Angola, Bhutan, China, Ethiopia and Vietnam. In testing the transferability of land readjustment to their country, project initiators did not try to work with their legislators to establish a special law first. Instead, they started with some pilot projects and then gradually institutionalized the locally generated experiences into some semi-formal rules as more experiments were conducted in different regions of their country. They also did not try to adopt a land readjustment law based on other countries' experiences. Rather, they learned from their own practices and then came up with enforceable legislation to scale up the application of land readjustment.

In dealing with dissenting landowners, officials in these countries did not resort to their power of eminent domain. Rather they worked hard to convince all landowners either to partake in the project or to transfer their properties to the implementing agency with compensation. In Angola and China, project organizers used eminent domain only as a threat to motivate dissenting landowners to come to the bargaining table. In Bhutan, local officials who were in charge of land pooling in Thimphu worked tirelessly to have unanimous agreement from landowners before they went forward with their land-pooling proposal (Box 1).

Although these land readjustment experiences were not governed by law, these countries were able to transfer their knowledge learned from experimenting with land readjustment to more systematic formal rules and eventually institutionalized these experimental experiences into laws. These laws founded on domestic actual experiences are most effective in guiding local practices.

Box 1: Land Pooling in Bhutan

Thimphu, the capital city of Bhutan, is challenged by significant urban population increase, on top of an already haphazard development pattern and inadequate infrastructure. Since 2003, the city planning authorities adopted the land pooling approach to cope with these problems, even though Bhutan did not have any legislation that would guide or legitimize the land pooling practices. Land pooling was intended to reconfigure existing land in such a way that each landowner retained a smaller parcel close to their original location but with improved access to local infrastructure, amenities, and services. It was also intended to avoid the complicated and contentious land acquisition process of eminent domain.

Land pooling involved bringing many different—and even conflicting—interests together to agree upon a redevelopment plan for the City. With extensive public participation and consultation, city officials were able to achieve a unanimous consensus among landowners to contribute a portion of their land for infrastructure development. Based on substantial land pooling experience, Bhutan formalized land pooling with the adoption of the Land Pooling Rules and Regulations in 2009, which provides a legal basis for land pooling and offers dispute-resolution mechanisms for occupants or landowners unwilling to be part of the process. By then, 12 land pooling schemes were already approved for implementation.

Source: Norbu, 2014.

In fact, having a pre-existing law does not seem to help the design and implementation of land readjustment if the legal provisions do not reflect the realities on the ground. Some countries have specified in their legislation the landowners' obligation of contributing a part of their landholding to accommodate the public infrastructure construction in their neighborhood. The intention is to make the amount of land contribution explicit to affected parties, thereby lowering the negotiation costs. For instance, the Egyptian government has stated in its Building Law that landowners could be asked to give up as much as 20 percent of their land to make space available for the construction of public roads and other necessary facilities. Landowners may also have to pay a betterment levy to cover the related construction costs of public goods. Both India and Turkey (Box 2) have similar provisions to delimit contributions from landowners.

Contrary to the original intent of these legal rules, they add constraints and complications to the negotiation between the government and landowners. In some cases, because the supply of infrastructure has lagged far behind demand, municipalities may need landowners to contribute a high percentage of their landholding to build the necessary road network and facilities to serve the increasing population growth. Limiting landowners' contributions to an arbitrary percentage without any consideration of varying local contexts has created inefficiency. On one hand, places with rapid growth are unable to get the amount of land needed to upgrade their provision of public services. On the other hand, officials in areas that are under less development pressure may take more land from owners than they need, leading to resistance from landowners and failure to implement the proposed project. Ideally, the land contribution ratio for land readjustment should not be pre-determined by the law. Instead it should be the outcome of repeated discussions and negotiations between landowners and an

implementing agency. It should take into account factors such as local preferences, level of public infrastructure and amenities, specific land and housing market conditions, as well as the proportion of development costs the project intends to recover. There is no "one-size-fits-all" land contribution ratio.

Box 2: Land Readjustment in Turkey

Public land readjustment projects have been implemented in Turkey since the second half of the 19th century to deal with inadequate infrastructure and informal settlements. Many legal resources related to land readjustment were established during the time of rapid urbanization to implement detailed local plans, create serviced urban plots of appropriate size and shape, and provide local services and infrastructure for urban residents.

To make land space available for these public undertakings, a 1933 law was established to designate the land contribution by owners to be 15 percent of their landholdings. This was later increased to 40 percent in 2003, because the purposes for using contributed land have been broadened from roads and squares to parks, car parking spaces, playgrounds, green areas, religious buildings, police stations, and elementary and secondary schools. The percentage of land contribution and its usage are clearly set in the law. Although these legal rules may minimize uncertainties in some cases, they add rigidity to the negotiation between landowners and the government when these parties are willing to increase or decrease land contribution according to varying local preferences for public service levels.

Source: Turk, 2014.

We are not implying that establishing legal rules for guiding the experimentation and adoption of land readjustment is not useful. Laws always play a critical role in institutionalizing workable practices on the ground and help scale up land readjustment when the approach has proven suitable for a country. The key message for developing countries is to maintain a certain degree of flexibility with the rule of law when land readjustment is still going through its experimental stage.

2.1.2 How legislation could be conducive to land readjustment experiments?

Based on our examination of the selected cases, we propose possible features of helpful legislation that supports enabling land readjustment in developing countries.

First, it will be useful if there is a constitutional provision that recognizes land, and land value increments created by public actions, as social assets. This constitutional order can set the expectation of private landowners that their enjoyment of property rights entails obligations to fulfill the social functions of land. Put simply, when land is needed for public purposes, private landowners must surrender their land for such undertaking with just compensation. This is universally true around the world. The difference is the extent to which these public-private property rights relations are articulated in the law. For examples, the Brazilian City Statute and Colombian Law 388 have specified clearly, among other things, the social functions of land and the equitable distribution of benefits and costs of urban development. Establishing similar legislations in countries where public officials are considering adopting

land readjustment could set the stage for the government to negotiate with private landowners for land contributions to pay for public infrastructure investments. That said, we do not imply that countries where similar constitutional provisions do not exist should amend their constitutions without careful consideration. In most countries, a constitutional amendment is normally a very serious undertaking that entails a very long time period for implementation. We recommend experimenting with these ideas incrementally first, and then convincing legislators to change the laws if necessary.

Second, in connection with the social functions of land, it will also be useful if there is a law that gives all citizens the right to access to affordable land and housing. The equal right to shelter, like the rights to education and free speech, is considered a basic human right that can give legitimacy to the government to ask landowners to share their wealth with the society for assisting the low-income groups. The project-based redistributive function of land ownership provided by land readjustment can help prevent political and social instability caused by unequal distribution of land-based wealth. More importantly, this law can set a guideline for government takings of private property for public benefit only. That said, it is important to consider also the fiscal implications of giving all citizens the right to access to affordable land and housing. Governments should try to balance the policy goals of helping the poor to obtain affordable housing with the need to maintain fiscal health.

Another rule that can help achieve the goals of land readjustment is the legal requirement for seeking the consent of the supermajority of affected landowners or occupants to approve the land readjustment proposal. A unique feature of land readjustment is its participatory mechanism for policy decisionmaking. Unfortunately, when adopting land readjustment, many countries have overlooked this special feature. As a result, communities have lost their chances to learn how to make decisions collectively. Land readjustment projects that lack the consent of affected owners are more coercive and controversial. Having a law that mandates the implementing agency to obtain the consent of the supermajority of landowners to approve the proposal would avoid this problem. There is no universal threshold for the supermajority requirement. The percentage should be determined based on local contexts and with adequate public consultations.

More importantly, if a group of landowners or the local community organizes land readjustment as a site-level intervention, the effort must be guided by updated national, regional, and local urban planning legislations to ensure that similar micro-level efforts can add up into a coherent whole. Enforceable detailed plans that are designed based on an updated master plan and national and regional development strategies are indispensable for coordinating land readjustment projects. If these planning functions are not well-developed at the moment, land readjustment projects should be at least guided by a generally agreed upon vision of land use in and around cities.

2.2 Myth No. 2.

2.2.1 Is a clear delineation of registered property rights necessary?

Another myth about land readjustment is that it requires a clear delineation of property rights. Some practitioners believe that without knowing the ownership of land, the implementing agency will be unable to ascertain who has the right to participate in land exchanges. In

reality, clearly defined property rights are not always present in developing countries. Current land users might have occupied land informally or do not register their land to avoid high registration costs or the time-consuming bureaucratic procedure. Many practitioners in the global south have all too often dismissed the potential of land readjustment based on this reason.

We did not find that unclear delineation of property rights was a major hindrance to adopting land readjustment in Angola (Box 3), Ethiopia, and Thailand. These cases were all related to the upgrading of informal settlements. The self-settlers in some of these cases were driven to squat on public or private lands due to involuntary displacements caused by wars and sectarian conflicts or by their inability to find affordable land and housing in urban areas.

Governments in these cases recognized administratively the existence of the informal neighborhoods as part of their jurisdictions. Informal settlers then verified their occupancy rights based on the knowledge of local representatives and leaders or testimonies from their neighbors. The officially acknowledged and publicly certified occupancy rights immediately protected informal settlers from forced eviction and entitled them to participate in land readjustment if they chose to do so. Recognition of occupancy rights is gaining a lot of momentum nowadays and is generally done without any formal law. Instead, it builds on customary practices and is mostly dealt with at the municipal level.

Box 3: Land Readjustment in Angola

In post-war Angola, land has emerged as a critical point of conflict when involuntarily displaced people have sought sites in emerging cities for their new homes or sought to formalize their informal occupations during the civil war. Their lack of tenure security undermines the well-being of the poor and threatens them with mass expropriation. Land readjustment was used to mediate these conflicts in Angola despite its limited culture of participation in urban planning practice and weak local governance.

There are at least two well-documented land readjustment projects in Hyambo—Bairro Fátima and Bairro Camussamba. The key characteristic of both projects was the *de facto* recognition of the occupancy rights of existing self-settlers. In both pilot projects, the calculations for redistribution and capturing of land value increments were not based on any land-value study, but on an estimate. Thirty percent of the pooled land was used for infrastructure. Of the remaining 70 percent, half was redistributed to previous land-occupants and half sold, with funds reinvested into basic infrastructure.

Bairro Fátima was perceived to be successful, by all stakeholders, in incorporating the informal settlements into the formally planned part of the city, as well as benefiting the occupants because the value of their landholdings increased. It also demonstrated the crucial role played by a local NGO—Development Workshop—in building bridges between the land occupants and the government, convincing the former to participate in the project and securing the backing of the latter.

Source: Cain, Weber, and Festo. 2013

Certainly, these processes could only happen under a "flexible" property rights regime. A rigid property law that only recognizes the rights of formal landowners could marginalize the landless in any land readjustment initiatives. Because only the persons who hold title to the land can participate in the project, formal or informal renters and occupants will be excluded from the decision-making process. These parties are normally the most vulnerable and represent the poorest of the poor who could not afford formal housing and must rent shelter from informal landlords. These marginalized groups will be displaced when their informal neighborhoods are upgraded. Some redevelopment initiatives of urban villages in China are illustrative of this serious problem (Box 4).

Box 4: Land Readjustment in China

China is experiencing the largest scale of urbanization. Guangdong Province became the site of a national experiment with land readjustment, particularly around innovative institutional arrangements to provide local governments with more flexibility and power to determine the distribution of benefits from land redevelopment. Some of the redevelopment initiatives were led by the village collective and managed by the collective's members, such as Lie De village in Guangzhou. In Lie De, the city government subsidized the project by waving the collection of the land conversion fee. The collective utilized the revenue generated from auctioning part of its land for commercial uses to pay for the redevelopment costs. Villagers who participated in the project were resettled within the same neighborhood and given extra apartment units to rent out to outsiders to generate income for improving their livelihood. In addition, the village also reserved a piece of land to build a hotel complex that will also generate income for the collective members.

Higher intensity of land use and an improved living environment raised land values of the rural enclave in the city center that was previously suppressed by both institutional restriction over market circulation and a run-down living environment. Villagers welcomed this price hike, but the increase in rental costs became a nightmare for the migrant population. The demolition of the village and its resettlement with modern and pricy apartment buildings meant that the low-cost housing in which the migrant population resided along with the social networks for communication and mutual assistance were completely destroyed.

Source: Lin and Li, 2014.

2.2.2 What are helpful property rights perspectives?

To avoid the problems indicated above, what would be the helpful legal perspectives on property rights that could facilitate the application of land readjustment?

We suggest instituting a flexible legal framework that recognizes the diverse land tenure arrangements and property claims of all residents, regardless of whether they are renters or property owners. The law should not just acknowledge and protect registered freehold rights, but should also recognize formal and informal occupancy and leasehold rights. Self-settlers or renters who have resided in a neighborhood should be entitled to legal protection from

forced eviction. If relocation is inevitable due to redevelopment, occupants and tenants should have the right to claim proper compensation.

All these changes in perspectives on property relations do not have to be covered in some major constitutional amendments. Instead, they could be adopted by a government decree or executive order. Good examples of how this approach works are found in the temporary administrative recognition of informal settlements by many governments in Latin American countries and Thailand (Box 5) —which gradually led to the granting of fee simple or long-term leasehold rights through land readjustment (or sharing).

Box 5: Land Sharing in Thailand

The most often used land-readjustment-like method that is tailored for informal settlement upgrading is land sharing. Land sharing originated in Bangkok, Thailand during the 1970s and 1980s as an innovative way to resolve land conflicts between legal landowners and informal settlers. The approach involves the partitioning of a parcel of contested land so that the landowner regains access to a large portion of the original parcel, free of squatters, for redevelopment. At the same time, the informal settlers can stay on or near their present site on another portion of the land, with improved housing and local services and legal tenure.

The Sengki project is considered to be one of the most important and successful cases of land sharing in Bangkok. Sengki is an urban poor community that was upgraded in a participatory manner in partnership with the National Housing Authority of Thailand in the early 1990s. Up until the early 1930s, the land in Sengki that the poor occupied belonged to close relatives of His Majesty, the King of Thailand. The residents rented the land from the Royal Property Bureau (now the Crown's Property Bureau) at below-market rates. In early 1984, the agency that managed the royal property offered to sell a portion of the land to existing residents, and an agreement was reached in 1987. A cooperative was formed to negotiate with the managing agency and the National Housing Authority and was in charge of collecting payments from participating residents and overseeing the implementation of the project.

Source: Leeruttanawisut, 2014.

2.3 Myth No. 3.

2.3.1 Does land readjustment need a vibrant real estate market?

It is generally true that land readjustment needs a vibrant real estate market to be implementable, because one of its objectives is to mobilize land value increments generated by land redevelopment to finance infrastructure investment and neighborhood improvements. If a project is carried out in a slow real estate market where the demand for land and housing is weak, land value may not increase enough to provide sufficient incentive for landowners and occupants to partake in the project or to cover the redevelopment costs. Certainly, if cost recovery is not the primary objective, this matter is less important.

The fundamental operation of land readjustment is to incentivize landowners and occupants to exchange a piece of un-serviced land for another serviced plot of higher value, albeit smaller

in size. The increase in land value after land readjustment must be sufficient to compensate residents for their loss of land area during the exchange. Thus, a vibrant real estate market will help encourage residents to participate in land readjustment.

That said, there are situations in which a vibrant land market may discourage landowners from partaking in land readjustment projects. This happens mainly in industrialized countries where landowners find selling land to private developers at a high price is more profitable and less risky than participating in land readjustment. Hence, once again, the validity of the argument will depend on the context.

Although it is true that most land readjustment projects need a vibrant real estate market to succeed, this condition does not always benefit the poor. This is especially problematic when the landless are not included in sharing the benefits of land readjustment. If generating high enough financial benefits for participating owners is the dominating goal, there will be little incentive for the municipalities, the implementing agency, and other stakeholders to keep land prices affordable. If there is no social program to protect the urban poor, housing could become unaffordable for low- or even middle-income households. Poor neighborhoods that offer a safe-haven to the poor will be gentrified, making affordable housing increasingly less available. An overheated housing market may also create investment bubbles, threatening the stability of the entire economy. These problems have occurred in Thailand, China, Egypt, Turkey, and India. That said, if land readjustment could be done at scale, it might increase the overall supply of serviced land for residential development.

To maintain housing affordability and lower the chance of gentrification, the government could mandate land readjustment projects to reserve a certain portion of the serviced land for affordable housing. Alternatively, if the implementing agency will build apartment units for existing landowners in return for their land contribution, the government could ask the agency to sell or rent a certain percentage of the housing units to the poor at below market value. This way, the renters and other vulnerable groups will not be priced out from the neighborhood after land readjustment.

Certainly, implementing these proposals does not always occur without complications. First, they may require the government to subsidize the project or to grant an extra density bonus to the developer to build housing units that will be sold or rented below costs. The financial burden of providing affordable housing to the poor should not fall entirely on the shoulder of landowners in the targeted area, because it is the responsibility of the entire population. Second, the process of identifying the right persons who are qualified for the assistance is not trivial. Some people who do not truly need help may take advantage of the system. Third, mixed income housing development may not be attractive to would-be homebuyers, thereby lowering the selling prices for the market-rate units. Hence, to make this proposal work, the mindset of the more affluent segments of the population needs to be changed, and the construction materials for the affordable housing units should not be of lower quality simply because they are built for the poor. Both approaches could minimize the chance of segregation.

2.3.2 How to make market work for the poor?

The market is a powerful institution for solving urbanization issues. Yet, it will not automatically help us achieve social goals without proper designs. To make the market work for the poor, we need to ensure that all stakeholders are market informed. There should not be a single interest group that monopolizes the access to the market or its information.

Besides, all market participants, especially the poor, need to understand the financial risks of real estate investment. Property prices are cyclical in the short run. There is no guarantee that investing one's lifetime savings in real property is the best way to store wealth. A possible strategy to allow the poor to accumulate equity, and at the same time to protect them from the investment risks, is to form a housing cooperative, if the local context permits. For example, in Sengki, Thailand, landowners and occupants shared their land for redevelopment, and the informal settlers did not receive a title to the serviced land from the implementing agency immediately after land sharing. Instead, they became members of a cooperative which acted as their legal representative to collectively obtain loan from a bank to purchase the land from the landlord. And in turn, residents paid monthly repayment to the cooperative over five years. This arrangement allowed the poor households with limited financial resources to participate in land sharing while, at the same time, it precluded beneficiaries from cashing in their land hastily, which would possibly have led to massive market displacement and gentrification of the neighborhood.

More importantly, real estate investment is complex and involves a large sum of capital. Investors, rich and poor, need advice from the professionals. Hence, it is also important to have the government or another reputable entity oversee the integrity and qualification of real estate brokers. They should act as neutral parties to lower the transaction costs of buying and selling real assets. In Britain, estate surveyors are licensed property management professionals whose qualifications and conduct are monitored by the Royal Institution of Chartered Surveyors. It is also important to ensure that services provided by certified real estate brokers are accessible to the poor.

2.4 Myth No. 4.

2.4.1 Does the community need to be well organized and have experience of participatory planning?

As discussed before, land readjustment generally requires the consent of the supermajority of the landowners (or land users in cases of informal settlements) who must work together to design, implement, and supervise the project. Many practitioners are concerned about the potentially huge negotiation costs involved in situations where affected parties have little trust in each other and do not have any past experience of collective action. Thus, some of them have concluded that members of the community must trust each other as well as the government (or the project initiator) and have experience with participatory planning to render the adoption of land readjustment viable.

In the developing country cases that we examined, none of the communities displayed pre-existing trust-based relationships prior to the introduction of land readjustment, except the Angolan cases. In Angola, Development Workshop, a non-governmental organization, worked with local communities for many years, even during the wartime, thus gaining tremendous trust and respect from residents.

Project initiators in other examined cases did not pick their sites for implementing land readjustment based on the level of trust and cohesiveness of the affected communities. In Bhutan, for instance, landowners were concerned about their self-interest as much as any other landowners in other parts of the world. It was only after public officials had spent years of effort to convince every single landowner of the necessity of balancing self-interest with the community's needs that they were willing to participate in the land pooling project. In Ethiopia, city officials of Addis Ababa organized countless meetings to solicit inputs from affected slum dwellers before designing their land readjustment project. Based on the opinions gathered from public meetings, they formulated multiple housing options from which residents could select in reaction to the government proposal to redevelop their neighborhood.

What these cases have shown is that land readjustment can be adopted in both organized and non-organized neighborhoods. Indeed more time and efforts will be needed to introduce land readjustment to a community where neighbors do not know each other well. However, that is true for all instruments if we take the proposal of building local governance as one of the key development goals. In fact, a well-organized community should not be viewed as a precondition for adopting land readjustment. Rather, implementing agencies should view community organizing as a key objective of land readjustment and develop neighborhood spirit and collective action through its process.

In terms of organizing effort, it is true that communities with homogenous interests may take less time to organize. Yet, tailoring organizing programs towards homogenous groups could also run the risk of marginalizing the minority and the poor. For example, most land readjustment projects examined here included mostly landowners in the decision-making process. In the Chinese case, only the villagers who were members of the collective that owned the land could share the benefits of redevelopment. As a result, renters' interests were being ignored. Similar problems occurred in the two projects in Magarpatta and Khed, India where the interests of the landless and lower caste were not considered when formulating the method of allocating the redevelopment benefits.

2.4.2 How should communities be organized?

Given that neighborhood mobilization is a key feature of land readjustment, how should communities be organized?

There are at least three principles. First, implementing agencies should ensure community participation throughout all phases of the project. The conventional public participation approach is to consult with the affected community at the inception and the end of the project. Past experiences with this approach have shown that this may be insufficient to help the community generate a sense of ownership of the project, creating a feeling that the consultations are merely token efforts. This happened in Colombia (Box 6), and the Fenicia project in Bogotá aimed to correct this problem. The initiator, which was the Los Andes University, had engaged local communities and other stakeholders in all key decisions throughout the entire planning process. This was to ensure that all concerns about the project, and related opposition to the project, were resolved before the implementation stage. There were numerous examples in the past where developers received the government's approval of

the design of a project but only found out later that they could not implement the plan due to strong public resistance. In Indonesia, the reconstruction of the Gampong Lambung, Banda Aceh after the 2004 Tsunami was a voluntary, community-initiated effort. The community led by the village leader rejected initial help from donors to build housing and instead engaged all the surviving residents to collectively plan and rebuild their community through a participatory land readjustment process.

Box 6: Land Readjustment in Colombia

The *Triángulo de Fenicia* is an urban renewal project in downtown Bogotá within the immediate vicinity of Los Andes University. The project was approved in October 2014 and is still being implemented.

Taking advantage of the fact that the 2003 revision of the Bogotá Land Use Plan (POT) included an area adjacent to the university's traditional campus as part of the areas open to urban renewal, beginning in the 2007 the university decided to play a leading role in formulating the partial plan for the area. However, the initial partial plan proposal was not involved consultation or participation with the community. By 2010, public resentment of the project was growing, and a social movement organized to defend the land in the city center from urban renewal with no consideration for resident communities gained ground in public discussions. In the end, all private initiatives regarding partial plans for renewal were blocked in their processes of formulation and approval.

It was at this moment that an unprecedented process took place within the university. Oscar Pardo, a professor of the business school argued that an urban project in the zone adjacent to the university's traditional campus should be an opportunity not just for the physical transformation of the university surroundings, but for the social and economic integration of neighborhood inhabitants as well. With his leadership, a process of raising awareness and negotiations began with those responsible for the initiative. By the end of 2010, Pardo obtained the endorsement of the university authority to modify the project and form a multidisciplinary team of university professors charged with creating a different and innovative workspace for this urban transformation initiative. The University team started to form bonds of trust with the local neighborhood, conducted an extensive census of the community, and organized participatory urban design workshops to define a collective vision of urban transformation for the zone.

Source: Pinilla, 2014.

Second, implementing agencies must set explicit standards of public participation that are sensitive to local contexts. They include, but are not limited to, who should participate, how often the participants should meet and for what purposes, and what conflict resolution mechanisms should be put in place to deal with disagreements. As shown from the cases, community participation will only be meaningful if participants feel that issues discussed at the meetings are significant to them and their families and that their opinions will make a difference in the final decision. Community members will find public meetings burdensome if the gatherings are not well-organized and are dominated by special interest groups. In some situations, separate focus group sessions with minority groups, such as women, youths, and other ethnic minorities—who may be hesitant to speak out in public—could be more effective than a big meeting to collect their opinions. It is also important to be sensitive to the cultural

differences in expressing disagreements. Not all cultures encourage citizens to confront their neighbors publicly when disagreements emerge. Hence, there should be some informal and anonymous channels for members to voice their opinions privately. Again there is no one-size-fits-all strategy for systematizing public engagement in land readjustment projects.

Third, if a community has not been organized in the past, it may be useful to set up small income-generating activities to attract members to interact and get to know each other. These activities could be a small handicraft workshop that brings together female members to manufacture some small sellable products that could help them earn extra income. More importantly, it provides a great opportunity for them to associate with each other, building trust in their relations with one another. Similar community activities such as training workshops or sport competitions could facilitate community organization.

2.5 Myth No. 5.

2.5.1 Do stakeholders must already trust each other?

Some analysts have suggested that land readjustment is not viable if stakeholders do not have pre-existing trust in each other. This perception is derived from observations of land readjustment practices in Germany, Japan, and South Korea where citizens have great confidence in the capacity and integrity of their government. They also trust their social, legal, and political systems to prevent and punish fraudulent practices. Indeed it is important that landowners trust their implementing agencies and the system, because they are putting their wealth in the hands of other people who promise to return another piece of land of high value in the future. In many developing countries where the rule of law does not govern the nation, it is inconceivable that such property exchanges could take place.

Ironically, land readjustment has been adopted in many developing countries where there is a lack of trust between the government and citizens and between community members. In examining the case studies, there are always landowners who care about individual interests and do not always understand their social responsibilities. Some politicians and public officials care more about reelections and job security than their commitments to the society. Some private developers care more about profits and believe that affordable housing should solely be the responsibility of the public sector. In most cases, there may be no overlapping interests that motivate these parties to work together. Thus, it is important to realistically assess and understand the motivations of the parties who engage in collective action to make the win-win outcomes of land readjustment possible.

2.5.2 How to build trust?

If we can agree that trust-based relationships require a long-term investment from the interacting parties, the key question is how to build trust.

Our case studies showed that it is important to find a reputable and neutral broker to initiate the project. If the project is proposed by a government that landowners or informal settlers do not trust, it will require a lot of work to change the perception of the residents before any meaningful negotiations can be carried out. These neutral brokers could be local academic institutions such as the Los Andes University in Bogota, international and local NGOs such as

Development Workshop in Angola, or international development agencies such as the World Bank in Vietnam, who could use their financial and technical support to incentivize the cooperation from different stakeholders.

Because a single stakeholder cannot achieve the redevelopment goals alone, the prime function of the neutral broker is to identify mutual interests for involved parties, assign responsibilities to different stakeholders, mediate conflicts, and nurture parties' commitments to their duties. To do that, the broker must maintain a reputation of impartiality in order to gain the trust and respect of all stakeholders. By directing and shaping the interactions among stakeholders, the broker will be able to create substantive dialogues and facilitate collective decisions and actions among these parties. With repeated cooperation and positive reinforcement, trust-based relationships will emerge.

3. PRE-CONDITIONS

It's important that the conditions discussed above are examined carefully to tailor the operation of land readjustment to the local contexts. Although there's no one-size-fits-all land readjustment, our case studies have shown some commonalities important to successfully adopting land readjustment.

First, it is generally believed that land readjustment is most appropriate for situations in which affected landowners or land occupants have motivation to stay in the neighborhood. Because they do not plan to move, due to either their attachment to the community or proximity to their workplace, the idea of property swapping will enable them to return to the same neighborhood. If residents prefer to move to somewhere else and start a new life, purchasing property through voluntary market exchanges or government acquisition may be a more direct alternative. That said, there have been many land readjustment projects in which absentee landowners were the majority of the interested parties. Under these situations, the negotiation of land readjustment will follow a very different direction, because these landowners are mainly interested in maximizing the capital gains on their real assets.

Second, it is generally true that financial assistance or bridge loans provided by the government or international development agencies (such as the World Bank, the Asian Development Bank and UN-Habitat) through central authorities can help facilitate land readjustment, even though part of the project costs can be recovered from land sale.

Third, government's credible commitment to land readjustment is critical for its successful adoption. This is especially true in the case of Bhutan, Thailand, Ethiopia and Vietnam where the government was actively promoting the project. This prerequisite is undoubtedly true not only for land readjustment but for all policy experiments. Without the government's long-term support, no policy experiments could survive inevitable setbacks during their trial period. If government commitment is absent, international development agencies could act as honest brokers to facilitate cooperation among stakeholders.

4. CONCLUSION: TOWARDS A GOVERNANCE-CENTERED APPROACH

As can be seen from earlier discussions, we are suggesting a different focus for conducting land readjustment. We are not suggesting a major shift away from perfecting the technical

aspects of this land tool. Instead, we want to propose expanding the professional focuses to a governance-centered approach that emphasizes the following three factors.

First, land readjustment is a consensus-building mechanism. Given the lack of data and technical expertise in most developing countries, it will be hard to calculate accurately a land exchange formula. That said, land readjustment could still be implemented if the stakeholders can agree upon a generally acceptable arrangement for land swapping. Hence negotiation and consensus building are the operations that actually drive the project, not the scientific estimation of land values before and after land readjustment.

Second, land readjustment should be founded on the idea of creating win-win outcomes for all involved parties. Again, this relates closely to the possibility of building a governance structure that will allow all parties to have a share of the gains; and at the same time, no single party will reap the entire redevelopment benefits. Land readjustment is not a winner-takes-all scenario.

Last, but not least, the above two factors require developing reciprocity and the perception of fairness, both of which are fundamental for engendering the collective action required for land readjustment. Most people will be unwilling to cooperate if others do not reciprocate their collaborative efforts. To encourage reciprocity, collaborative gestures must be perceived as fair. Because contexts are different, the perception of fairness has to be established through open discussions and mutual understanding. This leads us back to the idea of governance—that is, to design open and inclusive decision-making procedures so that no stakeholders would feel that they were left out from the decision on how to allocate the costs and benefits of land development.

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BIOGRAPHICAL NOTES

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Yu-Hung Hong is the founding Director of the Samuel Tak Lee MIT Real Estate Entrepreneurship Laboratory that promotes social responsibility among entrepreneurs and academics in the real estate profession worldwide, with a particular focus on China. He is also the founder and Executive Director of Land Governance Laboratory where he studies the use of land tools to facilitate open and inclusive decision-making processes for land resource allocation in developing countries. Dr. Hong teaches urban public finance at Massachusetts Institute of Technology (MIT) where he earned his Ph.D. in Urban Development and Masters in City Planning from the Department of Urban Studies and Planning. His research focuses on property rights and obligations, land readjustment, and local public finance. Specifically, he is interested in investigating how land value increments created by public investment and community collaboration could be shared equitably among key stakeholders and be used for financing local infrastructure and durable shelters for the poor.

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Land consolidation, customary lands, and Ghana's Northern Savannah Ecological Zone: An evaluation of the possibilities and pitfalls

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Keywords: Land consolidation, Tendaamba, Chief, Customary tenure, Land fragmentation

Land fragmentation has been identified to greatly undermine crop production in many countries. In the case of Ghana's customary tenure system, household farmlands are relatively small and are highly fragmented. Recent agricultural drives, however, have focused on farm level interventions that are ad hoc with short-term benefits. A sustainable long-term application of land consolidation which reorganizes farmlands may improve yields, reduce the cost of production and improve the incomes of farmers. The successful implementation of land consolidation depends greatly on the suitability of local conditions with respect to land tenure and land use. However, in Ghana's customary lands, the alignment between the requirements for land consolidation and existing conditions remains unexplored. This study investigated the feasibility of land consolidation within the customary tenure by juxtaposing the local conditions of the study areas with the baseline conditions for land consolidation outlined in literature. Using both qualitative and spatial data, the study revealed some traits of convergence and divergence with respect to the baseline conditions in the study areas. For example, conditions such as the existence of land fragmentation, suitable topography and soil distribution were fully met. Conditions such as the existence of a land bank, technical expertise, and infrastructure and supportive legal frameworks were partially met. The remaining conditions such as the willingness to participate, availability of a land information system and favorable land ownership structure were non-existent. The circumstances surrounding these unmet conditions are deeply embedded in customs and traditions that hardly yield to change. Since these conditions are fundamental for land consolidation, their absence negates the feasibility of land consolidation under the current tenure system of the study areas.

1. INTRODUCTION

Agricultural productivity depends on a number of factors which vary in extent across the globe. These include climatic conditions, level of technological advancement, farming practices and government policies – including those related to land tenure systems. With respect to the latter, a land tenure system might promote land fragmentation, which is known to undermine agricultural productivity (Demetriou et al., 2013b). Land fragmentation creates disjointed and small farmlands, thus acting as a disincentive and a hindrance to the development of agriculture (Manjunatha, Anik, Speelman, & Nuppenau, 2013). This viewpoint is however debated: (Blarel, et al. 1992) argues in favour of land fragmentation describing it as a way of reducing risk and easing seasonal bottlenecks. In Ghana, it is estimated that about 90% of farming households operate on less than 2 hectares (MoFA-SRID, 2011): these farmers keep multiple farmlands for the production of a variety of crops. Land is predominantly owned and controlled by customary institutions including

chiefdoms, families and Tendaamba (Arko-Adjei, 2011). The control and ownership exercised by these institutions is built on the concept of collective ownership of land which gives every member the right to use a portion of the communal land. It is generally believed that an increase in the number of owners creates land fragmentation (Farley et al., 2012). Asiama (2002) shares the view that customary tenure arrangements provide members with equal interests in land which leads to fragmentation of farmlands as they try to allocate land for the use of every member. Fragmentation is also linked to inheritance(Demetriou et al., 2013b; Niroula and Thapa, 2005) as the continual intergenerational devolution of land from parents to children increases ownership creates common property which lead to both ownership and use fragmentation.

For cases like Ghana, if farmland fragmentation is accepted as a problem, responses will likely depend on innovative approaches such as land consolidation. Land consolidation is the process of re-allocating rural land that are considered fragmented (Vitikainen, 2004). It is also seen as a tool for enhancing agriculture and assisting rural development (Sklenicka, 2006; Thomas, 2006). The concept of land consolidation has a history dating back to the Medieval Ages in Europe. The current form of land consolidation practices have evolved in Europe towards the end of the 19th Century to the beginning of the 20th Century (Vitikainen, 2004). The concept developed and became multidimensional incorporating emerging issues like environmental management, development of rural areas (Zhang et al., 2014) and improvement of appropriate infrastructure (Vitikainen, 2004). Lemmen et al. (2012) indicated that, the initial mono-functionality of land consolidation was to increase agricultural production through parcel enhancement; reduction of production cost and increase in farm efficiency.

Current interventions in the Ghana agricultural sector including the Food and Agriculture Sector Development Policy (FASDEP I & II) and strategies like the Growth and Poverty reduction Strategy (GPRS I & II) provide seemingly good objectives including the improvement of food security, enhancement of farmers' income, application of science and technology, sustainable management of land, and improvement of institutional coordination (MoFA-SRID, 2011). However, the implementation of these objectives focus on subsidies and credit access programmes which are mostly supported by international donor agencies, and they subsist as long there is continues support. Over the years, the attention has therefore always been on short to medium term programmes, with little or no attention on the sustainable application of long-term strategies such as land consolidation. Land consolidation is self-supporting and appears more sustainable and does not require continuous support from either government or donor agencies.

Experiences with land consolidation in countries like the Netherlands, Germany and Denmark have demonstrated good results for agricultural output. In these countries private property rights and state ownership are dominant, however, scientific research is lacking on the use of land consolidation within the customary tenure environment where there is communal ownership of land. Ghana, a country dominated by customary tenure, has not tested land consolidation as an option for enhancing agricultural development. Having regard to the complexities of customary tenure such as oral allocation, indeterminate boundaries and emotional attachment to land, it is unclear if land consolidation will be feasible. This premise underlies the overarching objective of

this paper: to investigate the feasibility of land consolidation in the customary areas of the Northern Savannah Ecological Zone (NSEZ) of Ghana. Specifically, the study enumerates the baseline conditions required for conventional land consolidation, examines the existing tenure and land use situation, and compares the baseline conditions to the context of the study areas. The paper first provides a background on customary tenure systems in northern Ghana, land fragmentation and the consolidation nexus. Subsequently, the study methodology, discussion of results, conclusion, and policy recommendations.

2. CUSTOMARY LAND TENURE SYSTEMS IN GHANA

The concept of customary tenure is multi-dimensional and has been used synonymously in different contexts with the terms 'indigenous tenure', 'traditional tenure' and 'communal tenure' by various researchers (Arko-Adjei, 2011). USAID (2012) describes customary tenure as the embodiment of rules that govern the access, use and disposition of land and its resources within a community. Under customary tenure, land is sometimes seen as a spiritual entity recognised as a divine heritage in which the spirits of the ancestors are preserved (Asiama, 2002). Elias (1956) viewed land in the customary context as an age-long entity that connects the past, present and future members of a community.

In Ghana, customary ownership accounts for about 80% of the total land (Kasanga & Kotey, 2001). Families and communities (through stools/skins[1]), own these lands. Although differences exist amongst various ethnicities, there is enough commonality to enable a categorisation of the Ghanaian customary tenure systems into two broad groups. The first category is land owned by communities that exist as chiefdoms. In this category there is a centralised political structure composed of a hierarchy of chiefs headed by a king. The hierarchy devolves from the king to paramount chiefs, divisional chiefs and caretaker chiefs (Arko-Adjei, 2011). Under chiefdoms, each hierarchy of authority has an overriding power over all the smaller chiefs below it. The second category is land owned by families where the *Tendaamba* play an eminent role in the ownership of land and alienation. Family lands are controlled by family heads, usually the father in a nuclear family and the oldest elder in an extended family (Godwin & Kyeretwie, 2010).

3. LAND FRAGMENTATION AND LAND CONSOLIDATION NEXUSES

Land fragmentation is defined as the division of single farmlands into spatially distinct units (Binns, 1950; McPherson, 1982). King and Burten (1982a) described the manifestation of land fragmentation in two forms. First, the division of farmlands into units too small for profitable exploitation, and secondly, the spatial separation of farmlands belonging to a single farmer/household. Demetriou (2014) describes land fragmentation as a spatial problem concerned

[1] The use of the terms stool and skin represents the symbols of authority of chiefs in Ghana. Whilst the stool is the symbol of authority for chiefs in the southern part of Ghana, the skin (of an animal) is the symbol of authority for chiefs in the northern part. There is often the tendency in Ghana to refer to the chieftaincy of a particular area as the stool or skin. There are even verbal forms created: to *enskin*, to *enstool*; and derived nouns: *enskinment* and *enstoolment*.

with farmlands, which are organised poorly in space with reference to their shape, size and distribution. Van Dijk (2004) categorised land fragmentation in terms of ownership and land use. Land fragmentation may be caused by a number of factors, such as population growth and inheritance (Binns, 1950; McPherson, 1982; Niroula and Thapa, 2005).

The relationship between land fragmentation and agricultural productivity is opened to debate. Some researchers including Blarel et al. (1992) argued in their study in Ghana and Rwanda that fragmentation of farmland is not as inefficient as generally perceived. They supported this view by arguing in favour of fragmentation as a tool for the management of risk, seasonal bottlenecks and food insecurity. This view is also shared by FAO (2012) who advocated for the maintenance of fragmented farmlands if they result in productive benefits. Monchuk et al., (2010) in a study in India concluded that the adverse economic impacts of land fragmentation are somewhat small but provide room for adaptation for a variety of circumstances. Contrary to this opinion, (Niroula and Thapa, 2005) viewed land fragmentation as a mark of farm inefficiency pointing to its ripple effects on distance, size and shape of farmlands. Manjunatha et al. (2013) explains that land fragmentation deprives farmers of the benefits of economies of scale. Demetriou et al., (2013a) also noted that fragmentation is a disincentive to mechanised large-scale agriculture. In line with this second debate, land consolidation has been promoted as a long-term strategy to manage land fragmentation and promote land use efficiency.

Land consolidation is the procedure of re-allocating a rural area consisting of fragmented agricultural or forest holdings or their parts (Vitikainen, 2004). It is a tool for improving land cultivation and assisting rural development (Sklenicka, 2006). The common principle that underlie most land consolidation projects is the reconstruction of fragmented and disorganised landholdings (Thapa and Niroula, 2008).

3.1 Baseline conditions required for land consolidation

Certain conditions are required as input for the implementation of land consolidation. There exist variations as to what these conditions are and their difference depends on the particular type of land consolidation, the objective of implementation and the geographical context within which it is implemented (Vitikainen, 2004). Conditional requirements that underpin land consolidation are generally similar but may be fine-tuned to enable tailor-made packages that meet the needs of society (Van Dijk, 2007). Contrary to earlier research works of Bullard (2007) and Vitikainen (2004) which focused more on formal legal framework, Lisec et al. (2014) argued that the conditions for the implementation of land consolidation should be reflective of both the formal and informal institutional framework. For land consolidation to be implemented, land fragmentation of some sort should have been established within the geographic area in question (FAO, 2012). Some researchers have pointed to land fragmentation in a number of ways as a fundamental factor that calls for land consolidation (Bullard, 2007; Demetriou, 2014; Long, 2014; Van Dijk, 2007). In the design of land consolidation for central and eastern European countries, FAO (2003) enumerated some of the conditions for land consolidation to include; enabling legislation, land information system, land bank, willingness of participants to consolidate and

technical know-how. Other researchers such as Jansen et al. (2010) categorised the requirements for land consolidation broadly into legal and institutional requirements.

Land consolidation in many countries is regulated by legislation(s) (Vitikainen, 2004). The need for the development of land consolidation regulations was occasioned in the past when it became apparent that fragmented lands could not be consolidation based on the operations of the free land market (Van der Molen and Lemmen, 2004). Legislation is not only meant to address land fragmentation, but also to prevent the reoccurrence of fragmentation in the future (Bullard, 2007). Most importantly, the interference with private property rights during land consolidation requires a legitimate legal backing so as to protect the rights of landowners and land users. In view of this, land consolidation legislation amongst other things defines the limit and manner to which private property rights may be interfered, the category of right holders that are recognised and can participate in land consolidation (Hong and Needham, 2007).

Van Dijk (2007) observed that success in land consolidation depends on the willingness of landowners and land users to participate in the process. This is especially the case, where there is no element of compulsion in participation (Louwsma et al., 2014). FAO (2003) indicated that the willingness of land owners sometimes depend on the proposed benefits and the terms of cost sharing between central government agencies, local government, land owners and users.

When stakeholders are willing to participate in land consolidation it then becomes necessary have to a reliable land information system (Demetriou et al., 2013a) which provides an inventory of land ownership/use rights and also acts as a platform for verifying claims (Sonnenberg, 2002). The reallocation of lands which involves the exchange, distribution and portioning of land requires detailed land information that provides ownership rights, property boundary information, digital topographic data as well as proposed developments in the project area (Bullard, 2007). As discussed earlier, land consolidation in recent times, for most parts of the developed world, incorporates adjoining public works such as construction of roads, drainage systems and irrigation facilities which makes it even more relevant to have a sufficient land information system (Demetriou et al., 2013a).

Another condition for land consolidation is the existence of a land bank. Damen (2004) sees land banking as the bedrock for successful land consolidation. Damen described land banking as a means of acquiring and managing land in rural areas by state organisations for the purpose of redistribution/leasing with the aim of improving agriculture or in the general interest of the public. Land banks provide an opportunity for expansion, shaping of farmlands, and creation of adjoining infrastructure (Van Dijk, 2007). Land bank increases land mobility and creates room for a flexible land consolidation design and reallocation process (Hartvigsen, 2014).

Being a surface activity, land consolidation is affected by geographical conditions such as topography, soil and water distribution. Differences in topography and quality of soil affects land reallocation which is the core of land consolidation (Lemmen et al., 2012; Sonnenberg, 2002). In hilly and mountainous areas there exist sharp variations in surface characteristics and creation of regular shapes for farmlands may be interrupted by natural physical characteristics of the terrain like hill tops or cliff faces (Demetriou et al., 2012). This is further supported by Sklenicka (2006)

who sees sharp topographic differences as one of the factors that hinders land consolidation. Likewise, substantial soil quality heterogeneity inhibits reallocation of lands compared to a fairly homogenous distribution of soil quality.

The nature of rights, use and ownership of land affects land reallocation. Modern land consolidation results in change of ownership rights and registration of new titles in the land register (Lemmen et al., 2012). The ability of a private landowner to choose to participate in land reallocation without any ownership constraints is therefore important. Thus, dual and multiple ownership either at the family or community level restricts unilateral decision making. This may hinder the decision of members in exchanging land during reallocation (Demetriou et al., 2012). Also, implementing land consolidation requires some technical capacity and infrastructure. It is difficult to wholly import and implement land consolidation based on the framework of other countries that have succeeded in its implementation (Thomas, 2006). It is necessary for countries, which have not yet implemented land consolidation to adopt and modify the existing examples to meet their local needs (Van Dijk, 2007). This can only be done based on expert technical knowledge. Thus, land use planners, land surveyors, estate valuation surveyors, land administrators, agricultural engineers and environmentalist are needed for the preparation and execution of the land consolidation. Based on the knowledge of the local legal framework, land market conditions and land tenure, experts are can develop a land consolidation that efficiently meets local needs. Table 1 summarises the main baseline conditions.

Table 1: Summary of baseline conditions for land consolidation

Baseline Factor	**Remark**
Existence of land fragmentation	Land consolidation is the cure for land fragmentation. Where there is no land fragmentation at all, land consolidation may not be useful.
Willingness to participate	Willingness to participate in land consolidation implies stakeholder acceptability and consent. Even without unanimous willingness, some level of it is required for a successful land consolidation. In some countries compulsion is used to attain full participation.
Availability of land information system	Land consolidation requires reliable inventory of ownership rights and boundary information for its implementation. This enhances re-allocation; which is the core of land consolidation and dispute curtailment.
Existence of land bank	Land banks provide additional land for uneconomic holdings, infrastructure and as a substitute stock for unwilling participants
Existence of legal framework	This enables the protection of private property rights by defining the limits and manner to which such rights can be interfered.
Suitable topography and soil distribution	Uniformity in surface characteristics of land aids land consolidation as it affords a fair platform for the exchange of farmlands.

Technical Expertise and infrastructure	To engender fit-for-purpose land consolidation technical expertise in local land tenure and land management dynamics and good infrastructure are essential for success in land consolidation.

4. METHODOLOGY AND DATA COLLECTION

This study was conducted in the Northern Savannah Ecological Zone of Ghana. Specifically, the Upper West and Northern regions were selected. This was necessary to represent the two forms of customary land classification according to Godwin & Kyeretwie (2010). In the Upper West Region of Ghana, the customary institution was originally built around the earth priests (*Tendaamba*) who were literally the owners of the land. In the case of the Northern region, the customary institution is organised in chiefdoms headed by kings who manage the land on behalf of the people. Authority over land devolves from the king through paramount chiefs to divisional chiefs and caretaker chiefs. Chiefs have the highest control over land and the level of control exercisable depends on a chief's position along the hierarchy. Therefore, to make the study representative of the customary tenure systems in northern Ghana, two farming communities were considered; Yaruu, in the Wa Municipality of the Upper West region, and Tindan in the Savelugu-Nanton district of the Northern region. These communities were selected because they are typical farming communities with no formalisation of land rights, no land commodification, and land uses are dominated by agriculture.

The sample frame for this study comprised 30 farmers with multiple farmlands from the study areas and 2 customary institutional heads (*Tendaamba* and Chief). The institutional heads were purposively sampled and they assisted in accessing farmers. Primary data was collected through interviews, focus group discussions and direct observation. This was supported by multiple sourced secondary data to enrich the discussions in this paper. The studied farmers were interviewed regarding the number of farmlands, reasons for the choice of farm locations, the reasons for having multiple spatially separated farmlands, the environmental factors that affect the choice of land for farming and willingness to exchange farmlands. The *Tendaana* and chief were interviewed using open-ended questions to examine the land ownership structure and also their role in and processes of land allocation. Interviews were conducted with respondents at their homes and on their farms. Two separate focus group discussions were held in the two study areas. The focus discussions comprised farmers, chief and *Tendaamba.* The focus discussions provided a wider understanding of complex issues and circumstances that could not be collected from individual interview sessions. They also provided an opportunity for participants to express their views and discuss multiple views with other participants, which gave a clear understanding of the interwoven dynamics of land ownership and land allocation. For each respondent, we visited their farmlands and collected data on their locations and characteristics. The process was made more participatory and interactive through the use of geo-referenced satellite images downloaded from Google Earth and geo-referenced using Elshayal Smart GIS software. Soft copies of the maps were

loaded onto a mobile device equipped with a global positioning system (GPS), which was used to record the geographic positions of farmlands.

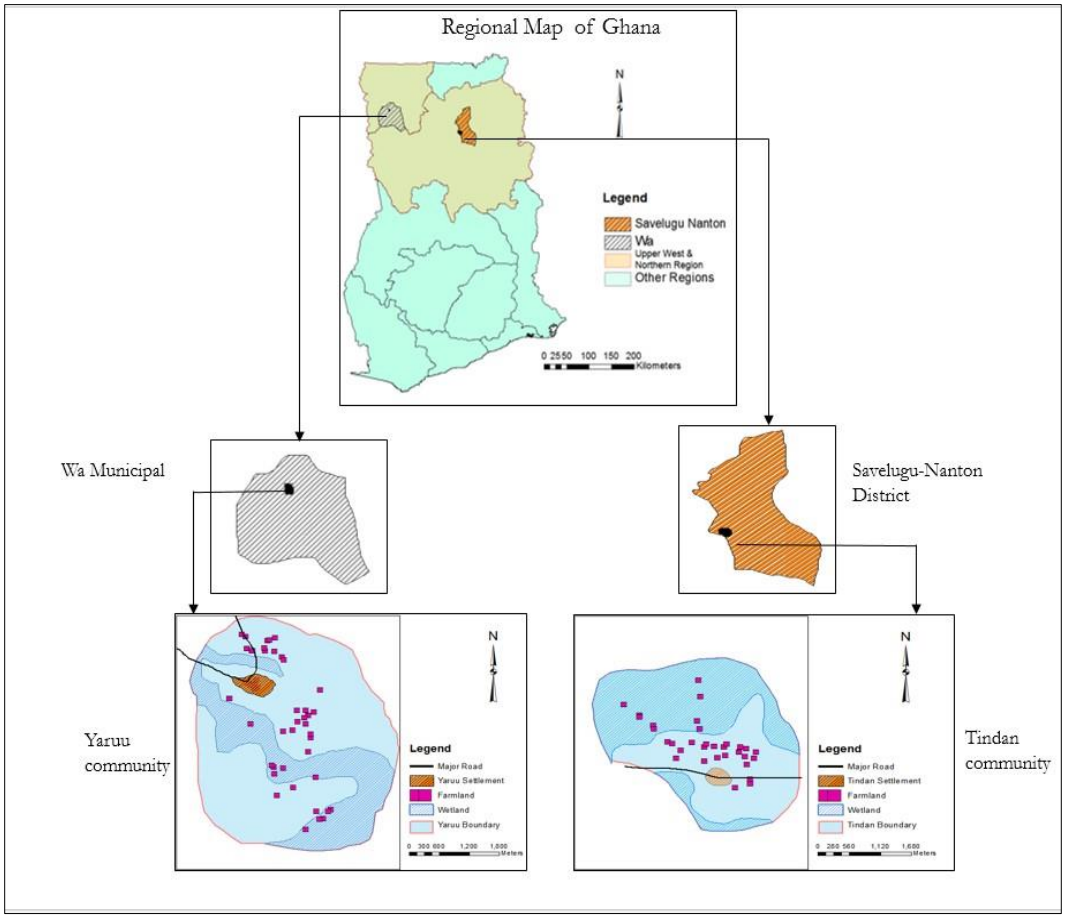

Figure 1: Map of the Study Areas

5. OPPORTUNITIES FOR LAND CONSOLIDATION

5.1 The existence of land fragmentation

Literature highlights land fragmentation as the basis for undertaking land consolidation especially when it reduces agricultural productivity (FAO, 2003). The results obtained from this study confirmed the existence of land fragmentation in terms of land ownership and use in both study areas. This deduction has been drawn through the juxtaposition of the findings on household size, farmland size as well as the number of farmlands per household. On the average, a household owns three (3) separate farmlands in both study areas. Meanwhile, the total size of land operated per household ranges from 1- 20 acres resulting in a size of approximately 1-6acres per farmland, which is an indication of fragmentation in terms of size. Also, considering the spatial distribution of discrete farmlands, the average distance between farmlands of the same owner is approximately 1600m in the case of Yaruu and approximately 600m in the case of Tindan. Comparing this level

of dispersion to the small size of farmlands gives an idea that farmlands are somewhat scattered. Similar to the findings of Thapa & Niroula (2008) in the mountains of Nepal, the study areas exhibited the tendencies of further fragmentation through the continual inheritance of farmlands. Considering the household sizes, which range from 3 to 36 persons, it can be reasoned that fragmentation of ownership is inherent since all male household members have the right of succession. This is further supported by the fact that most farmers rely on inherence as the main source of land acquisition. On the contrary, Blarel et al. (1992) identified farmland fragmentation as a tool for managing seasonal bottlenecks and food insecurity. In this study, it was revealed that 67% of the respondents keep multiple farms because of crop diversity and seasonal risk management. However, 93% of the respondents acknowledged the problems faced with the operation of fragmented farmlands to include; the inability to supervise all farms at the same time, increased travel time and cost and this goes in line with the argument of Bentley (1987) and Niroula & Thapa (2005). From the foregoing discussion, it is established that there exist farmland fragmentation, and this may increase significantly in future.

5.2 Willingness to participate

The success of land consolidation relies on land reallocation which involves the exchange, portioning and redistribution of farmlands (Van Dijk, 2007). This interferes with private property rights, and therefore requires the willingness of landowners and land users to enhance implementation. In some countries, legislation provides compulsion in terms of participation since it is difficult to gain full voluntary agreement. Sometimes voting is conducted in order to determine the level of willingness of a people when implementing land consolidation. In the case of Denmark two-thirds majority vote of landowners was solicited for the execution of land consolidation, while the rest were compelled to participate. In other countries like Norway, the decision to consolidate is made by a land consolidation court (Sky, 2002). However, in the study areas in northern Ghana, consensus is reached through majority community acceptance and lobbying of opposition groups.

Although Lerman & Cimpoies (2006) identified the success of land consolidation to be dependent on the willingness of landowners to exchange farmlands, this study revealed otherwise. Only 40% of the respondents are willing to exchange farmlands, while 60% of them are unwilling. Within those who are willing to participate in exchange, only 3 out of a total of 13 are interested in permanent exchange, the rest are only interested in a short term exchange. In respect of the study areas, the question arose whether short-term exchanges fit the purpose of land consolidation? Short-term exchanges undermine the purpose of land consolidation in northern Ghana in line with the work of Jie-yong, Yu-fu, & Yan-sui (2012), who emphasize active willingness as key for the success of land consolidation. From the study, only 10% of the respondents effectively supported land consolidation through their willingness to engage in long-term/permanent exchanges. Contrary to this pattern of response, 93% of the respondents studied are willing to have their farmlands consolidated if it promises economic benefits. Reconciling these contrasting responses creates a dilemma. On one hand farmers are unwilling to exchange their land because of social reasons, and on the other hand they desire economic gains. Can there ever be a compromise

between these extremes? From the economic point of view, this situation can be changed if some agricultural infrastructure is provided and farmers are afforded the opportunity to use single contiguous farmlands for multiple crops. However, from the social point of view, strong emotional attachments to land are hard to break. As noted by Arko-Adjei (2011), the bond between people and land under customary tenure is only broken under land commercialisation and urbanisation. Therefore, under the current social climate and remoteness of these communities, emotional attachment cannot easily be discounted. However, in the long term the bond may weaken as the communities develop, and open up opportunities for land commodification. Short-term exchange of farmlands is inconsistent with modern land consolidation as it will contradict with permanent change of ownership rights in the land register (Lemmen et al., 2012).

5.3 Availability of land information system

To successfully undertake land consolidation, there is the need to have a detail inventory of land ownership, use rights and boundary information. This provides the basis for verifying ownership claims, reallocation and settling boundary disagreements. From both study areas, such land information was non-existent. Land allocation is done with no written record on ownership, use and boundaries. Boundaries are mostly demarcated using natural objects. In view of this systemic lapse of land administration in the area, it may only support private land consolidation in which participants may exchange lands within their own agreed terms and criteria. However, comprehensive, simplified and voluntary land consolidation cannot be done without sufficient land information. The absence of recorded land information may also call for the creation of project based land information, however, this is difficult and time consuming, yet its correctness may not be guaranteed (Sonnenberg, 2002).

5.4 Existence of a land bank

A land bank creates the opportunity for the expansion of farmlands and improves adjoining agricultural infrastructure (Damen, 2004). Assessing land banking from the study areas reveals unique traits. Kotey (1995) indicated that, allodial title of ownership in chiefdoms resides in the chief while the subjects have usufructuary interest. This description fits the Tindan community, which is under the Dagbon chiefdom. The land belongs to the entire community, while the chief acts as a trustee. In such a case, all unallocated land within the community belongs to everybody and is indirectly a land bank that can be used for farmland expansion and infrastructure creation. Conversely, in the case of the Yaruu community, all unallocated land is the property of the *Tendaamba*. Hence, unallocated land in this situation cannot be classified as a land bank since it is a private property and entry into it will constitute trespass. Essentially, the *Tendaamba* are regarded as one of the many owners of land though their ownership is the biggest. Neither the *Tendaamba* nor individual families have overriding powers over one another.

5.5 Existence of Legal framework

Legislation as a condition for land consolidation in the context of the study areas is viewed from the national level since there are no written laws at the community level, except the norms and

customs of the community. There are no laws on land consolidation in Ghana, and this form of land reform has never been implemented. However, there exist pieces of legislations that can be interpreted together to provide the basis for its implementation. These legislations include the State Lands Act 1962 (Act 125), which provides regulations for the expropriation of private property by government; the Administration of Lands Act 1962 (Act 123), which deals with the management and disposition of customary land and its revenues; the Ghana Highway Act 1997 (Act 540) which provides regulations for private property interferences in respect of road construction and the Lands (Statutory Wayleaves) Act 1963 (Act 186), which provides regulations for private property interferences in respect of public installations and utility works. These pieces of legislation may serve as the legal basis for the implementation of land consolidation in the interim, but the extent to which they can adequately support land consolidation is uncertain. Bearing in mind that they are not tailor-made for land consolidation, there is a likelihood of redundancy and inefficiency. These inefficiencies can impede the realisation of land consolidation. Contrary to having a multiplicity of legislation, a tailor-made legislation synchronises all the roles of institutions and stakeholders in an efficient manner. From this point of view, it can be reasoned that these different legislations may not provide a solid base for the implementation of land consolidation.

5.6 Suitable topography and soil distribution

Land consolidation is affected by topography and soil quality. Sharp changes in topography and high level soil heterogeneity limits the land reallocation process during land consolidation (Lemmen et al., 2012; Sonnenberg, 2002). The findings indicate that there exist favourable geographic characteristics. Topographies of both study areas are fairly flat with a height distribution of 100 - 150 and 300 – 350 meters above sea level in the Yaruu and Tindan communities respectively. Height difference in both areas is relatively gentle and is about 50 meters. Soil on the hand is fairly homogenous and mainly composes of *vertisols* and *planosols* in the Yaruu and Tindan areas respectively. Where there exist differences in the natural attributes of lands, valuation is used as a platform for comparison and possible exchange (Sonnenberg, 2002). It might be based on market valuation (FAO, 2003) or natural yield potential (Van Dijk, 2003). With respect to the study areas, it stands to reason that the use of yield potential of soil is most suitable bearing in mind that, there is no land market in these areas and agriculture remains the dominant land use.

5.7 Technical expertise and infrastructure

A combination of technical expertise and infrastructure is required to successfully commence and implement land consolidation. Right from the conception of the decision to consolidate fragmented farmlands, expert knowledge in the fields of planning, land surveying, land administration, financing, engineering and project management is required for preparatory works and actual execution (Van Dijk, 2007). Findings from both study areas revealed that local technical expertise at the community level was lacking. However, human resource is available and could be harnessed from state institutions which are in charge of land management, planning and agricultural development. These institutions include the Land Commission, Town and Country Planning and

the Ministry of Agriculture (MoFA). Experts from these institutions could be used in the execution of land consolidation in these customary areas.

6. Conclusion and policy recommendations

In all, the study found out that some of the conditions for land consolidation were met in a supportive manner. Those conditions, which were not met, are considered fundamental for land consolidation. The low level of willingness, absence of a land information system and unfavourable ownership structure make bleak any opportunity of implementing land consolidation. Against this background, land consolidation in its theoretical sense is not feasible in northern Ghana. However, privately motivated and voluntary land consolidation may somewhat be supported in a very limited sense. Comparing the suitability of the two categories of customary tenure systems for land consolidation, the study found that chiefdoms are more suitable than communities with *Tendaamba*. The reasons being that; (1) there is an overriding authority of the chief over trusted land which can be exercised to address disagreements (2) there is the opportunity of using unallocated community land as a land bank. Looking at the trends of development and transformation of customary tenure under the influence of urbanisation in Ghana, it is reasonably foreseeable that these communities will lose their customary characteristics with time. As it is in many urban areas, there is increased individualisation of customary land, thus stimulating commercialisation and formalisation. When this happens, new dynamics of the land market will set in and land will be held for its economic benefits with no or little emotional attachment to it and this may open new opportunities for land consolidation in a much broader context. To this end, the implementation of land consolidation may not be a very successful intervention to enhance food security in the customary areas of Northern and Upper West region of Ghana at this moment.

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Land Consolidation for Sub-Saharan Africa's Customary Lands – The Need for Responsible Approaches

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Key Words: Land Consolidation; Land Fragmentation; Food Productivity; Land Administration

SUMMARY

This paper explores the potential of land consolidation for dealing with land fragmentation in Sub-Saharan Africa's (SSA) customary areas – where the intention is to increase food productivity. In SSA's customary areas, the use of mechanized farming technology and intensive farming techniques have largely failed to increase food productivity. This is despite foreign investment and the interest of the farmers to do so. In many cases, neither the farm parcel structure nor the land tenure arrangements support the use of, or investment in, mechanized equipment. This implies a strong need to deal with the land fragmentation situation. Although land consolidation is argued as an effective response to land fragmentation; its application in SSA's customary areas has either not been successful, or it has ended up breaking down the customary land tenure arrangements. We argue that past attempts at land consolidation in SSA's customary areas have failed mainly due to the transfer of European strategies without adequate consideration for the local factors in the planning and implementation, as well as inadequate land information.

On the first issue, land consolidation strategies in Europe have shown that responsible approaches continually considered the changing local factors. There has been a recent push for more responsible approaches to land reform and planning activities that consider social, cultural, and economic factors that were previously not considered.

On the second issue, one of the basic requirements for land consolidation is a well-functioning land administration system, however, the majority of lands in SSA lack this. The registration of customary land tenure rights has been attempted in many ways, however, the approaches usually do not support subsequent land consolidation activities. The need for new methods of recording land rights has led to suggestions about the potential of adopting crowdsourcing techniques – using trusted intermediaries – that has been termed as Participatory Land Administration.

In this paper, the nature and causes of land fragmentation in customary areas will first be explored, then current approaches seeking to increase farm productivity are reviewed. Analysing the problems of land fragmentation in customary areas, the failure to adapt land consolidation approaches in customary areas in the past, and the potential of participatory land administration as an enabling tool, we conclude that responsible approaches are an important component of increasing food productivity in sub-Saharan Africa.

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1. INTRODUCTION

Food security has received much attention over the past two decades from international bodies, especially with respect to sub-Saharan Africa (SSA). Food productivity is a key component of food security. Attempts to increase food productivity in SSA have mostly taken the form of mechanization and fertilization. However, the farm parcel structure and the land tenure system have largely failed to increase food productivity to the optimum. This shows a need to deal with the land fragmentation situation. Despite being successful at dealing with land fragmentation in Europe and some parts of SSA, attempts at applying conventional land consolidation in SSA's customary lands have largely been a failure. This paper explores the potential of land consolidation for dealing with land fragmentation in Sub-Saharan Africa's customary areas – where the intention is to increase food productivity. The paper starts by providing an overview of SSA's customary land tenure and the nature and causes of land fragmentation occurs in the region. This is followed by an examination of the attempts, both past and present, at increasing food productivity on the region. The provision of land information and the need for responsible approaches, two issues that militate against the use of land consolidation in customary lands are then discussed. The paper ends with a summary and conclusion on the need for responsible approaches to land consolidation as well as the support participatory land administration can provide.

2. LAND FRAGMENTATION, AND SUB-SAHARAN AFRICA'S CUSTOMARY LAND TENURE

Land Fragmentation, is defined as the spatial dispersion of a single farm holding into several distinct parcels over a wide area usually separated by other farms, as well as a high density of land users on a small farm (Binns, 1950; King & Burton, 1982). Van Dijk (2003b) points to two dimensions of land fragmentation – the spatial (physical) aspect, and the tenure (legal) aspect. Based on these two dimensions, four forms of land fragmentation are shown – fragmentation of land ownership, fragmentation of land use, ownership-use fragmentation, and internal fragmentation. Land ownership fragmentation characterizes the situation where several persons own one parcel of land. The second form of fragmentation, land use fragmentation, refers to a high density of land users on a small sized farm. These land users may be tenants or land owners. The third form of fragmentation, ownership-use fragmentation refers to a high proportion of land users being tenants therefore the land owner-land use relationship is broken. The fourth form of fragmentation, internal fragmentation, has received the most attention. This form of fragmentation deals with the shape and size of the parcels as well as the distance between the parcels. A cursory look over the four forms of fragmentation shows the first three dealing with the legal aspect (**Error!**

Reference source not found.), and the fourth looking at the physical aspect. Demetriou (2014) observes that Western Europe mostly deals with fragmentation of land use and internal fragmentation. The ownership fragmentation and the ownership-use fragmentation is however a problem in Central and Eastern Europe (CEE), stemming from the privatization process after the fall of communism. This section reviews the nature and causes of land fragmentation in SSA's customary areas, to provide a background for the need for land consolidation in customary area. Land fragmentation has always been prevalent in the agricultural system of SSA's customary lands, however its emergence as a problem is a recent occurrence (Braimoh, 2009; Eastwood et al., 2010; Headey & Jayne, 2014; Pingali et al., 1987). Many studies have examined land fragmentation in SSA's customary areas, with recent studies focusing on the mechanisation of farms (Baudron et al., 2015; Binswanger & Pingali, 1989; Houmy et al., 2013; Nothale, 1986; Thurston, 1987). The combination of two characteristics of customary areas has been identified as the causes of land fragmentation – the customary land tenure system and the agricultural system.

The customary land tenure system is identified as one of the major causes of land fragmentation (Abubakari et al., 2016; Blarel et al., 1992; Migot-Adholla et al., 1991; Takane, 2008). Customary tenure describes the form of land tenure that is based on the customs and traditions of a group of people, reflecting the socio-cultural, and spiritual connection among generations; present, past and future (Asiama, 1981; Elias, 1956). This fuels the belief that the current generation is merely a caretaker, steward, or protector of the land. Two main interests in customary land tenure – the Allodial/Paramount title, and the Customary Freehold interest are identified (Arko-Adjei, 2011; Chimhowu & Woodhouse, 2006). The allodial title is held by the community and managed by its leaders. Customary freehold/ usufractuary interest is held by the members of the land owning group based on their inherent right to use any vacant land within the confines of the customary area. Although the modes of acquiring the land include the clearing of an unencumbered land followed by uninterrupted settlement, conquest and occupation, or as a gift or purchase; inheritance is currently the most common means of land acquisition (Arko-Adjei, 2011; Ollennu, 1962; Udo, 1965). The customary freehold is held in perpetuity except for situations of abandonment, forfeiture, or want of successor; in which case, the land reverts to the allodial title holder (Kalabamu, 2000; Ollennu, 1962). The customary freehold is held in perpetuity except for situations of abandonment, forfeiture, or want of successor; in which case, the land reverts to the allodial title holder (Kalabamu, 2000; Ollennu, 1962). The nature of the customary freehold restricts farmers from expanding as contiguous parcels' holders are unwilling to sell their parcels in order to hold the land for the future generation. This causes land fragmentation because to expand their operations, farmers have to move parcels further away from their primary parcels.

Shifting cultivation, as the predominant agricultural system of customary areas, is another key cause of land fragmentation in the area (Migot-Adholla et al., 1991; Pingali et al., 1987). This system however moves to a more intensive system as the population density grows. Shifting cultivation, which thrives on land fragmentation, involves farming a parcel of land for a period and then leaving it to fallow whilst another area is farmed. The system favours the acquisition of land by forest clearance as it uses the natural fertility of land, small farming equipment as well as small parcels, resulting in low productivity (Headey & Jayne, 2014; Pingali et al., 1987). Since one of the manners of the land use rights acquisition in the customary land tenure system is the clearing of unencumbered land, after using the cleared land, the farmer keeps his use rights to be transferred to his heirs. Shifting cultivation allows for the tilling of the farms one after the other gradually causing land fragmentation. The fragmented parcels is not a problem at this point as population numbers are low, the farmers uses small equipment and it deals with the critical seasonal labour

bottlenecks (Fenoaltea, 1976; Ohene-Yankyera, 2004). As the population increases, more intensive agricultural systems such as the annual cultivation and the multiple cropping farming systems which need intensive weeding and ploughing emerge. Higher returns to labour offered by the industrial and service sectors, as against the farming sector, substantially reduces the available pool of labour that can be hired, resulting in the farm labour being determined by the household size. The labour reduction necessitates the adoption of large farm machinery which is difficult with small, scattered farms. The simultaneous farming of the fragmented parcels with the use of the rudimentary farming equipment still resulted in lower productivity experienced with the shifting cultivation.

Studies into land fragmentation in SSA mainly focused on the spatial of internal fragmentation, with little attention paid to the land tenure fragmentation (Abubakari et al., 2016; Ansoms et al., 2008; Blarel et al., 1992). However, the other aspect of fragmentation – tenure has not been adequately investigated. Van Dijk (2003a)'s attempt to characterise land tenure fragmentation into three categories, does not apply in customary areas. This is because unlike Western Europe, which deals mostly with fragmentation of land use and internal fragmentation, and Central and Eastern Europe (CEE) that deal ownership and ownership-use fragmentation stemming from the fall of communism, customary areas' land tenure does not fall under any of these categories of land fragmentation because the land tenure system in Europe is mostly individual tenure, where customary areas have a group ownership with individuals having use rights. The nature of land fragmentation in customary lands is described in terms of the relationship between parcel ownership and use in Figure 1. The differences are shown, in a more generalized manner, among the three contexts, where A, B, C, and D, are land owners and 1, 2, 3, and 4, are tenants/users. In Figure 1, three current dominant forms of relationships between parcel ownership and use are presented. The first situation (i) shows where owners use the lands themselves, with the accompanying spatial fragmentation. This is a situation identified in the Western Europe. The second situation (ii) is seen in CEE and Western Europe where the farmlands are leased out. The third situation (iii) is found in SSA's customary lands.

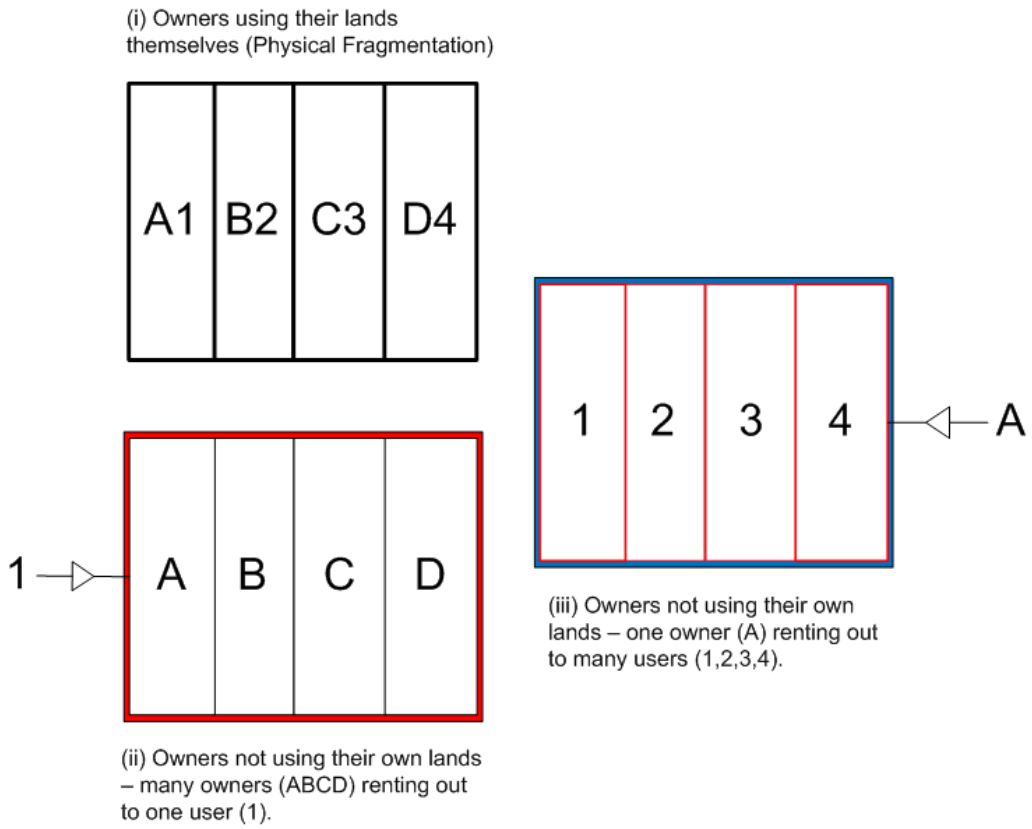

Figure 1: General Representation of the predominant types of land fragmentation in the Europe, and Sub-Saharan Africa (Author's Construct)

3. ATTEMPTS AT REDUCING LAND FRAGMENTATION AND INCREASING FOOD PRODUCTIVITY IN SUB-SAHARAN AFRICA

Land consolidation, in various forms, has been successfully used in Europe to curb land fragmentation and increase food productivity, and further develop rural areas. However majority of land consolidation attempts in customary areas in sub-Saharan Africa have either failed or broken down the customary land tenure in the areas (Coldham, 1978; Nothale, 1986; Takane, 2008; Taylor, 1964). These attempts at land consolidation were predicated on the assumption that land consolidation was needed as an approach to developing the agricultural sector, even though land tenure and agricultural systems did not favour it (Makana, 2009; Swynnerton, 1955; Thurston, 1987). Makana (2009) however notes that land consolidation in some customary areas rather yielded positive results in terms of increase in food production, despite the breakdown of the customary land tenure. Various reasons have been advanced for the success and the failures of these land consolidation schemes. One group attributes the fortunes of the process to the participation of all the parties involved, whilst another is the failure to adapt the land consolidation scheme to the conditions of the customary area (Abubakari, 2015; Taylor, 1964). In Malawi, land consolidation was started in the 1940's, and although the government was successful in consolidating 81,000 hectares of farmlands, complete with infrastructural improvements, the programme still failed because it was solely run by the colonial government, after being prematurely rolled out without consideration for local factors and conditions (Nothale, 1986). Kenya's land consolidation was also started by the colonial government; however, a major objective was a complete overhaul of the land tenure system that was to do away with the customary

land tenure and replace it with individual titles, as customary rules were seen to be a militating factor against the benefits of land consolidation and a well-functioning land market (Coldham, 1978). Here the land consolidation planning was participatory, with the plans being drawn by the government officials together with the clan elders. However, the last step of the plan was to grant individual titles, thus effectively ending the coverage of customary land in these areas.

The most recent of the land consolidation activities in Sub-Saharan Africa is from Rwanda, which undertook a new form of land use consolidation. Land use consolidation is the procedure of putting together small plots of land in order to manage the land use in an efficient manner so the land is more productive (Republic of Rwanda, 2005). With the prime objective of increasing agricultural production, the reasoning behind this is to be able to undertake a land consolidation programme that does not alter the land tenure relations (Musahara, Nyamulinda, Bizimana, & Niyonzima, 2014).

Recent approaches to increase agricultural productivity in SSA have largely focused on intensive cropping of farms, use of fertilizers, and mechanized farming (Houmy et al., 2013; Pingali, 2007). These attempts to increase agricultural productivity through mechanization took a prominent place on the development agenda of the governments of many developing countries in the 1970's and 1980's. Mechanization at the time was supported by several governments through the direct importation and financing of farm machinery to extend the service to smallholder farmers. The investment in mechanized farming was largely influenced by the donor-driven development strategies that largely characterized the SSA's economies after their independence and during structural readjustment programmes to increase food productivity. However, during this period of state-led push to mechanization, there was low demand for the farm machinery leading to the failure of these programmes despite the desire of farmers to increase their farm productivity. This led Pingali (2007) to conclude that mechanization is not necessarily a driver for intensifying agriculture. Recently, there has been an increase in the demand for mechanized farming equipment (Baudron et al., 2015; Sims & Kienzle, 2016). Diao et al. (2014) assign the key reason for this as the widespread labour constraints, which are mostly due to rural-urban drift and the demand for labour from non-agricultural sectors on the economy. Mechanization is linked to expansion of farmlands as in other parts of the world (Ansoms et al., 2008; Heltberg, 1998). However, because the expansion of land to a contiguous parcel in customary areas is not easy, the farmers have no option but to find land further away from the farm parcels to expand their farms worsening the land fragmentation situation. This necessitates the consolidation of lands in order allow for the use of the mechanised farming equipment.

4. LAND CONSOLIDATION AND PARTICIPATORY LAND ADMINISTRATION IN CUSTOMARY AREAS

A basic requirement for land consolidation is a well-functioning land administration system with an up-to-date land information system (Vitikainen, 2004). Although many western countries began contemporary registration of their lands in at least 1808 (Based on Napoleon's Cadastre) and have covered the entire countries with an effective land administration system, this is not the same for Sub-Saharan African countries (UN-Habitat, 2012; Williamson, 1985; Zevenbergen et al., 2013). Land administration processes serves important prerequisites for undertaking land management activities such as land consolidation. However, most sub-Saharan African countries with customary lands undertake land administration processes in order improve land transactions, and create a market economy (Binns, 1953; Zevenbergen, 2004). They attempt to replicate the conventional

style of land registration that favours individual rights, leading to the exclusion of secondary rights holders. The conventional land administration processes are also slow and expensive and do not serve the goal of aiding land management activities. There is therefore the need for innovative processes, approaches, and technologies to remedy the situation.

Land consolidation in this study will be described as the a land management activity that involves all the procedures for exchanging, rearranging, realigning, and expanding farmland parcels in rural areas with the goal of increasing food productivity. Affecting both the tenure and spatial aspects of land, land consolidation requires land information that covers both areas. The mapping customary land boundaries has not been an integral part of customary land management as the boundaries being determined mostly natural such as trees and foot paths, resting on the account of witnesses, though having the ability to map their rights in their own way (de Vries et al., 2015; Zevenbergen, 2006). Responding to calls for new faster, cheaper, and more fit for purpose approaches to mapping SSA customary areas' lands, tools such as the use of old map documents, high resolution satellite images (HRSI), low altitude remote sensing imagery (LARSI), Global Navigation Satellite Systems (GNSS), and Unmanned Ariel Vehicles (UAVs) respectively for boundary surveys (Basiouka & Potsiou, 2012; de Vries et al., 2015; Mumbone et al., 2015).

Recent studies have however looked into the use of Volunteered Geographic Information (VGI), the collecting and editing of digital spatial data by people responding to an open call, for as a fast and cheap method for the collection of land (Goodchild, 2007; Laarakker & de Vries, 2011; McLaren, 2011; Sui, 2008). This method of land administration process is seen to be ideal for SSA as it has a wide coverage of mobile phone network, with the proliferation of cheap smart phones, allowing citizens to view, create, and edit spatial information (McLaren, 2011). This ideal is however challenged in the sense that with land administration being a public administration function, given the numerous legal and standards covering the process, VGI will not be able to achieve its goals (Navratil & Frank, 2013). This has necessitated the need for a governmental partnership, or at least the introduction of a trusted intermediary to influence the process (McLaren, 2013; Zevenbergen, 2006). This has been described by Asiama et al. (2015) as Participatory Land Administration.

5. TOWARDS RESPONSIBLE LAND CONSOLIDATION

Studies have shown that public administration, and more recently land administration need responsible approaches in order to serve their purpose (Bourgon, 2007; Burke & Cleary, 1989; de Vries et al., 2015b). Responsible approaches are described here as practices that that tailor the internal processes and resources towards the specific needs of the user and the beneficiaries through the building of collaborative partnerships with citizens, sharing responsibilities and information, and creating opportunities for citizens to engage in government activities (Bourgon, 2007; de Vries et al., 2015b). Responsible approaches are needed as conventional approaches to land management activities are rooted in western historical notions that do not apply to all areas in the world, most especially customary lands. Responsible approaches align land management activities with the ever-changing requirements, and abilities of individuals, government and the society. Several social, economic, legal, and cultural factors affect a society's make up, their notion of development, their view of capital, as well as their reaction to the government's activities. The failure of land consolidation in customary areas failed to consider these factors through a lack of participation and inadequate land information. The adoption of responsible approaches to land consolidation is therefore needed to be able to align the land consolidation approaches to the conditions that exist

on customary lands. There is therefore the need to comparatively study the areas that have already undertaken land consolidation and customary areas, to be able identify their commonalities and peculiarities before a responsible land consolidation approach for customary areas can be developed. The technological advances in land administration that has paved way for participatory land administration to be aligned to customary areas and used as an aid to combat the problem of inadequate land information. This has led to the conceptual framework that builds up an approach to develop responsible land consolidation for customary areas. It is acknowledged that certain characteristics of customary lands cause land fragmentation and that land fragmentation can be reduced by land consolidation. However, attempts to undertake land consolidation on customary lands have largely failed in the face of inadequate land administration processes on customary lands. There is therefore the need to adapt responsible approaches to land consolidation and land administration to adapt land consolidation. Responsible land consolidation will therefore be defined as land consolidation approaches that continuously align the internal processes, technical and administration requirements of land consolidation to the dynamic local societal demands, economic conditions, cultural and legal requirements.

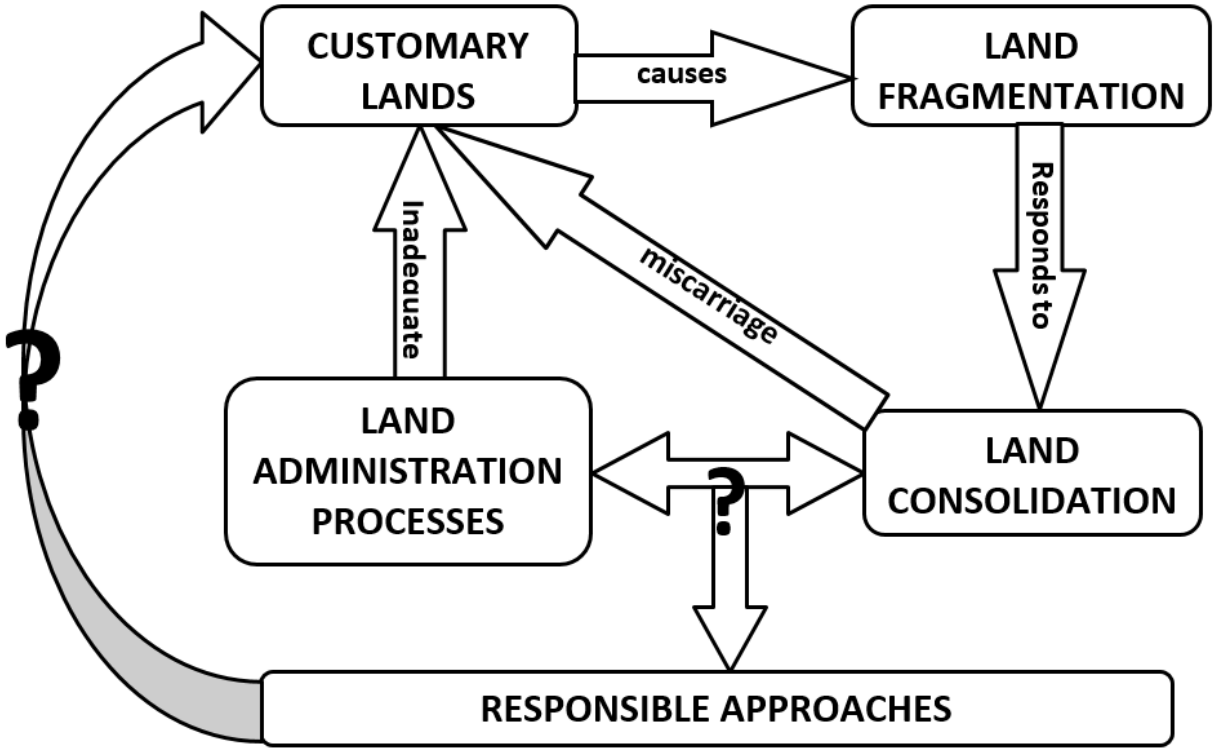

Figure 2: Conceptual Framework for the Responsible Land Consolidation - From the known to the unknown

6. CONCLUSION

Although land consolidation has been successfully undertaken in Europe for the past four centuries, attempts to use it in customary areas have largely failed, with little being known on how to adapt it for customary areas. These failures have mostly been attributed to the land tenure and agricultural systems of customary areas that do not match with those conditions that favour the use of the conventional land consolidation. Although the agricultural system has evolved from the shifting

cultivation system to the multiple cropping system that call for the need for land consolidation, the land tenure system still remains customary, thus making it necessary for further studies to be conducted on how the conventional land consolidation can be adapted. Furthermore, the inadequate land information available necessitates a fast, cheap and more fit for purpose approach to collecting land information for land consolidation. This paper concludes that responsible approaches need to be developed in order to adapt land consolidation to customary areas.

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Institutional innovation for the solution to Amazonia's land ownership problems: the case of the internal affairs department in Mato Grosso

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Keywords: Colonization; cadastre; land structure methodology

Summary

Introduction

The serious land ownership problem which the country is experiencing today stems from the process of occupation implemented by the Portuguese at the beginning of the 16th century. The set of legal and institutional solutions, no matter how much they attempted to address the problem, mostly only aggravated the situation. Historically, the land ownership situation in Brazil has been marked by the existence of formal regulation, but not applied across the board, making the rules of land access somewhat fragile and inchoate. The aim of the 1850 Land Law was to regulate property through: planning of territorial appropriation in Brazil; end of squatter's possession; land registration; transformation of land into reliable collateral for loans.

However this is not what happened: land, both rural and urban, has largely unreliable legal guarantees and an absolute lack of regulation over its use. Up until now, there has been no cadaster for private property or even public land (vacant or otherwise) let alone any form of social regulation of its use. Therefore, with this situation, land is capable of being used as the owners deem appropriate, ranging from speculative use to production or even predatory activity. Even now we have no real notion of the land that belongs to the State through the various mechanisms in existence; not even the vacant lands defined in the Land Law have been itemized in detail.

In the case of Mato Grosso, the situation of insecurity of land ownership is substantially aggravated in comparison with other states through having had a largely disorderly occupation in which the public agencies in the state, granted lands in haphazard fashion. There exist, however, a wealth of articles and texts that have demonstrated how these processes occurred. The big innovation in the present article is the demonstration of a solution which arose out of a local need and which is being implemented by the most important stakeholders in the state, through the creation of the Agrarian Affairs and Public Registries Committee of the Justice Internal Affairs Department in the State of Mato Grosso.

The principal goal of the present article is to show that it is possible to resolve the main land ownership problems in the state of Mato Grosso using measures that promote synergy between land administration agencies as well as to analyze the progress achieved by the committee and its results.

The state's land ownership problems were pondered using a combination of the Land Governance Assessment Framework (LGAF) methodology created by the World Bank, applied to the most important actors on the state's agrarian stage, with focus group methodology applied to local stakeholders in several municipalities in the north of the state. In addition to these methodologies, the

retrieval of the historical process of territorial occupation was fundamental to an understanding of the interface of national policies with the main land ownership mechanisms of land concession or occupation.

The first item of the article will recall the historical process of occupation in the state of Mato Grosso, demonstrating how this took place without the presence of territorial ordinance. The next item will demonstrate the results of the World Bank's LGAF methodology in respect of the problems found, explaining them one by one and relating them to the historical aspects which contributed to the current problem. The third item will show how the Agrarian Affairs and Public Registries Committee of the Justice Internal Affairs Department in the State of Mato Grosso operates, and what measures are being employed by the Committee to promote land ownership regularization, tackling the obstacles put in the way by some of the bodies that make up the committee and are fundamental in the resolution of law suits and, finally, the scope and effectiveness of the decisions taken by the committee in resolving the existing land ownership demands in the state will be analyzed.

1. The Historical Process of Occupation in Mato Grosso and the Lack of Territorial Ordinance

This item consists of a brief historical overview of the region known today as the state of Mato Grosso, which will serve as a benchmark for the evaluation of the lack of land governance in this state. The understanding of the historical, legal and institutional specifics of land access, its use and the public policies employed throughout the years are drivers for understanding the present structure of land administration in the state of Mato Grosso and the reason for the lack of land governance.

The historical process of territorial, legal and institutional occupation was divided into periods that were established on the basis of the years of historical events relevant to the process of occupation in the state, which will be explained below.

The period from 1500 to 1850 corresponds to the colonial stage and to the early days of our monarchy. Understood to be the logical outcome of the gold rush and the exploratory expeditions by the citizens from the state of São Paulo, the occupation of the territory that would become Mato Grosso is, in this period, notable for its military and extractive profile, the interest in tracts of land aims for and takes the form of military occupation, on the first frontier near the borders of Spanish America. In 1536, in Brazil, the captaincies, or hereditary fiefdoms, were created and the system of *sesmarias* was implemented in the country, creating the notion that the effective, productive *possession* of land generates the right to property, a characteristic which is defined, even today, as the principal mechanism of use and occupation of the soil. However, the combination of mining and protection of the territory did not establish a significant population in the state. Throughout the 18th century, with the exploration of gold and diamonds, the population of Mato Grosso reached 40,000, of which, according to Silva

(2011), only 768 were farmers holding property with *Sesmarias* in the entire state. By the start of the 19th century, the number of inhabitants had already dropped to a little more than 27,000, maintaining vegetative growth over the course of the century.

The Land Law of 1850 is considered to be a fundamental, legal milestone as it was the first land ownership ordinance in Brazil in explicit legal language as it was the act which attempted to rationalize land property. The law had the following objectives which were to regulate property: plan for territorial appropriation in Brazil; end squatter's possession; make a land cadaster; make land a reliable guarantee for loans. The law, however, did not succeed in achieving its objectives, it being the case that territorial occupation was carried out through the appropriation of the lands of the Empire and by the lack of control on the part of the Portuguese Crown.

In this period, at the end of the 19th century, the population of the state of Mato Grosso had climbed to 90,000 as a result of an intensive migration, as can be seen in the following tables and graphs. Nevertheless, the heaviest population growth and therefore the most intensive occupation of space, would only take place in the 20th century, with the northern part of the state remaining as a demographic and economic void.

The following tables and graphs demonstrate the dynamics of population growth between 1872 and 1940:

Table 1 – Population growth in the state of Mato Grosso 1872-1930

Population of Mato Grosso	
Year	Inhabitants
1872	60417
1890	90827
1900	118025
1920	246612
1930	349857

Graph 1 - Population growth in the state of Mato Grosso

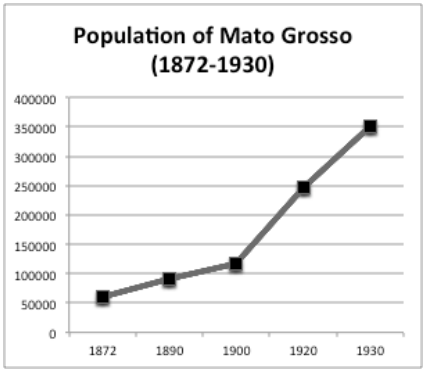
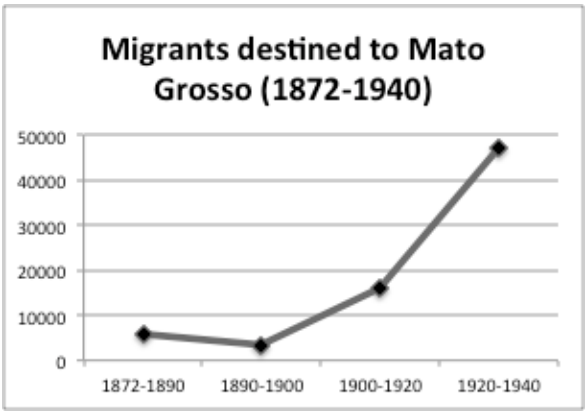


Table 2 – Migrants destined for Mato Grosso 1872-1940

Migrants destined to Mato Grosso	
Years	Net internal migration
1872-1890	5896
1890-1900	3445
1900-1920	15864
1920-1940	47002

Graph 2 – Population growth in the state of Mato Grosso



Source: Demographic Census, various years.

An analysis of the Agriculture Census in tables 3 and 4 shows that between 1920 and 1940 there is a generalized increase in the number of rural establishments, which rose from 3,484 to 10,022, with little incorporation of the area in relative terms, rising from 19.6 to 20.7 million hectares, suggesting a division of property and certainly little occupation in the north of the state.

In short, from the establishment of the first institutional milestone of land in Brazil, i.e. the Land Law of 1850, to the revisions proposed by the Vargas government, the activity of occupation in Mato Grosso can be observed through the possession of land by the large landowners.

Table 3 - Number of agricultural establishments and the area occupied by them in Mato Grosso, 1920-1940

Number of agricultural establishments and the area occupied by them in Mato Grosso, 1920-1940								
Area categories, according to number of hectares	1920				1940			
	N. of establishments	%	Area (hectares)	%	N. of establishments	%	Area (hectares)	%
Less than 10 ha	598	17,2%	14.558	0,1%	659	6,6%	2.869	0,0%
10 to 100 ha					1.903	19,0%	80.692	0,4%
100 to 1.000 ha	873	25,1%	450.928	2,3%	4.379	43,7%	1.500.952	7,2%
1.000 to 10.000 ha	1.623	46,6%	5.990.265	30,6%	2.511	25,1%	8.338.849	40,3%
10.000 ha nd above	390	11,2%	13.145.142	67,1%	393	3,9%	10.784.044	52,1%
Area not declared by owner	-	-	-	-	177	1,8%	-	-
Total	3.484		19.600.893		10.022		20.707.406	

Source: IBGE, Census of agriculture, 1960.

Table 4 - Number of agricultural establishments and the area occupied by them in Mato Grosso, 1950-1960[1]

Number of agricultural establishments and the area occupied by them in Mato Grosso, 1950-1960								
Area categories, according to number of hectares	1950				1960			
	N. of establishments	%	Area (hectares)	%	N. of establishments	%	Area (hectares)	%
Less than 10 ha	612	12,1%	2.955	0,0%	3.348	26,0%	14.271	0,2%
10 to 100 ha	1.455	28,7%	53.577	0,8%	4.789	37,2%	152.109	1,9%
100 to 1.000 ha	1.906	37,6%	749.343	10,6%	3.369	26,1%	1.201.211	15,4%
1.000 to 10.000 ha	971	19,2%	2.592.689	36,8%	1.230	9,5%	3.450.368	44,2%
10.000 ha nd above	119	2,3%	3.638.705	51,7%	145	1,1%	2.988.344	38,3%
Area not declared by owner	5	0,1%	-	-	4	0,0%	-	-
Total	5.068		7.037.269		12.885		7.806.303	

Source: IBGE, Census of agriculture, various years.

Institutionally, in the period from 1850 to 1945, the historical process in the state of Mato Grosso, was such that the first Land Law was 20/1892 and its regulation, decree 38/1893. Generally speaking, the state land law was structured based on the principles of the Imperial Law of 1850, though adapted to the interests of the landowners, providing the conditions for the recognition of the *sesmarias*, even without having complied with the clauses imposed in the past, and the calm and peaceful possession, of occupied, cultivated land. The deadlines for mediation and regularization of the areas were extended, in contradiction of the Land Law of 1850; they guaranteed the right of preference for the purchase of vacant lands that were under the control of the private individual, whose titles did not meet the desired requirements for legitimization or revalidation; with these measures, the state law was benefiting the interests of the larger squatters. (MORENO, 1999)

From 1892 to 1930, the state government continued legitimizing former squats, even after federal prohibition, reaffirming the validity of the titles that the private individuals had in their possession; in the course of the administrative procedure, between the issuance of the provisional and definitive titles, the areas underwent changes, growing indiscriminately on average 5,000 ha (e.g. between 1899 and 1929 a total of 910 titles were issued equating to 650,877.5 hectares of legal area and 4,294,216 hectares of excess area). (MORENO, 1999)

National, agricultural colonies were implemented in the 1940s with the aim of occupying the empty areas and strengthening control in the frontier areas for the integration of Mato Grosso into the national economy (by way of the expansion of activities such as livestock farming and latex extraction, in the rubber plantations in the North). Tensions stirred surrounding this space, which became even more

[1]It is important to stress that data prior to 1970 necessarily come from surveys conducted prior to the split into two separate states: Mato Grosso and Mato Grosso do Sul. So the data incorporated from the Census of Agriculture in 1960 (displayed in Table 3) relate to this dimension. The data for the two subsequent censuses (1950 and 1960), presented in Table 4, on the other hand, are obtained from forecasts made by the Institute's technicians for the region which in 19977, would be transformed into the state of Mato Grosso, and are therefore closer to the later historical data series.

valuable. With the increased migration and the state interest in the region in the following decades, this picture became even more of a problem.

The period between 1945 and 1970 is marked by the importance the region gained, not only in the eyes of Vargas but also the subsequent heads of government, translating into a set of objective policies aimed at developing Mato Grosso (particularly its bit of Amazonia), which represents a certain progress for the region and also for the distribution of the lands in Mato Grosso. Nevertheless, it is also necessary to emphasize the *privatist* nature that was assumed, from the beginning, through the colonization initiatives and how these are affirmed not as a mechanism for guaranteeing democratic access to land, but as a tool in the service of expanding the large agricultural enterprises (as an impoverished settler becomes cheap labor for the livestock or grain industry in the Midwest region).

Evidence suggests a growing incorporation of new areas or expansion of the frontier, since it is a region perceived to be one of the “existing voids in national territory". One obvious outcome of this policy, as can be seen in the following table, is the significant growth of the state’s population, which more than doubled between the 1940s and 1960s.

Table 5 – Population growth in the state of Mato Grosso, 1940-1960

Population Growth in Mato Grosso, according to habitation (in thousands of inhabitants)					
Year	Urban		Rural		Total
1940	129	29,8%	304	70,2%	432
1950	178	34,1%	344	65,9%	522
1960	344	38,6%	546	61,4%	890

Source: SEPLAN-MT

As for the institutional and administrative aspects of the land ownership structure in the state, with the democratic openness of the 1946 Constitution, the state government prioritized the policy of selling public/vacant lands, together with the policy of colonization. In the background, it began to promote regularization of land ownership by creating the Department of Land and Colonization (DTC), in 1946.

The state government went on to carry out a review of land ownership legislation, creating a set of liberal laws with the aim of accelerating the process of vacant land privatization and legalization of former private domains and it provided continuity to the federal government’s colonization plan, publishing the Land Code of 1949 which once again revalidated the expired deadlines for the legalization of land acquired from the state and innovated, with the authorization of colonization by private individuals, which expanded the room for maneuver in land transactions.

Between 1950 and 1964 the indiscriminate sale of vacant lands took place, transforming colonization policy into a profitable business, even corresponding to the payment for political favors, verified in 1955 by the Federal Senate.

On average, the colonizers received 200,000 hectares, although the 1948 Constitution prohibited the transfer of vacant lands of more than 100,000 hectares, without the prior authorization of the Federal Senate, for a price of between Cr$ 7.00 and Cr$ 10.00 and sold them on at prices varying between Cr$ 100.00 and Cr$ 300.00 per hectare.

The DTC was closed down several times due to fraud involving lands in the state of Mato Grosso, the agency finally closing in 1966. However the closure of the DTC favored speculation to an even greater degree as well as negotiations with cold or flying titles[2].

Ferreira (1984:64) stated "These titles entered the land market and became known as "Flying Titles", it being up to the acquirers of these titles to match them to some unoccupied "free land", a necessary prerequisite for the regularization of the actual real estate." (Moreno,1999 *apud* Ferreira, 1984)

Thus, after the titles were acquired, they were matched with areas without title registered with the Land Registry. The State itself used this expedient to check the status of the lands under its control. It was during this period that the so-called "bunk bed land ownership"[3] emerged, having in view that the same area was sold and registered by different people, producing overlapping.

In short, the state of Mato Grosso benefited from a variety of development programs, namely PIN, PROTERRA, POLAMAZONIA, POLOCENTRO and POLONOROESTE, all of which were financed through SUDAM; "in the 1970s and 1980s a total of 268 colonization projects were implemented in the state, intermediated by businesses, 84.9% of which were agricultural projects" (LAMERA, 2008:18).

We can glean from the following tables that in 21 years both the population and also the number of establishments and their occupied area grew significantly.

Table 6 – Population growth in the state of Mato Grosso, 1970-1991

[2] "Flying titles" ("títulos voadores", in Portuguese) are titles issued with no clear or previous demarcations of boundaries, so they could be expanded or moved to new areas upon issue. On a traditional land fraud expedient, the responsibles would issue titles with unclear demarcations so as to use them for claiming ownership over much larger (or altogether different) tracts of land.

[3] "Bunk bed land ownership" (beliche fundiário, in Portuguese) refers to the widespread practice of issuing conflicting titles referring to the same tract of land, and transactioning on these as if they were legitimate. Thus, several titles would link to a same geographical location, preventing effective regularization by public authorities.

Population Growth in Mato Grosso, according to habitation (in thousands of inhabitants)					
Year	Urban		Rural		Total
1970	240	39,1%	373	60,9%	613
1980	673	57,5%	497	42,5%	1170
1991	1481	73,2%	541	26,8%	2023

Source: IBGE, Demographic Census, various years.

Table 7 – Number of agricultural establishments in Mato Grosso and the area occupied by them, 1970-1985

Number of agricultural establishments and the area occupied by them in Mato Grosso, 1970-1985								
Area categories, according to number of hectares	1970				1975			
	N. of establishments	%	Area (hectares)	%	N. of establishments	%	Area (hectares)	%
Less than 10 ha	Menos de 10 ha	Menos de	Menos de 10 ha	Menos d	Menos de 10 ha	Menos d	122.426	0,6%
10 to 100 ha	14.572	61,4%	468.403	2,7%	17.113	63,0%	596.338	2,7%
100 to 1.000 ha	6.351	26,8%	2.003.199	11,7%	7.249	26,7%	2.257.082	10,3%
1.000 to 10.000 ha	1.884	7,9%	5.177.464	30,1%	2.280	8,4%	6.800.302	31,0%
10.000 ha nd above	294	1,2%	9.532.289	55,5%	426	1,6%	12.172.999	55,5%
Area not declared by owner	613	2,6%	-	-	75	0,3%	-	-
Total	23.714		17.181.355		27.143		21.949.147	
Area categories, according to number of hectares	1980				1985			
	N. of establishments	%	Area (hectares)	%	N. of establishments	%	Area (hectares)	%
Less than 10 ha	23.902	37,7%	108.340	0,3%	25.705	33,0%	113.737	0,3%
10 to 100 ha	21.633	34,1%	791.355	2,3%	29.368	37,7%	1.099.282	2,9%
100 to 1.000 ha	13.273	20,9%	4.058.747	11,7%	17.280	22,2%	5.033.008	13,3%
1.000 to 10.000 ha	3.867	6,1%	11.703.548	33,9%	4.916	6,3%	14.148.827	37,4%
10.000 ha nd above	643	1,0%	17.892.557	51,8%	645	0,8%	17.440.797	46,1%
Area not declared by owner	65	0,1%	-	-	7	0,0%	-	-
Total	63.383		34.554.547		77.921		37.835.651	

Source: IBGE, Census of agriculture, various years

Table 7 represents the number of agricultural establishments in the state and the area they occupy, surveyed in 1950 and 1960, already with the forecast prior to the 1977 separation into two states, Mato Grosso and Mato Grosso do Sul. The occupied area amounts to approximately 7 million hectares, or 8.64% of the territory of the state. In subsequent years, the growth in the number and occupied area of establishments can be observed through the analysis in Table 7.

Another point that should be noted in the process of the intensification of territorial occupation in the state between 1960 and 1985, is the fact that between 1960 and 1977, the state had no land ownership administration body, considering that in 1966 the DTC was closed as a result of fraud in the concession of land. In this period, the concession of land was performed by the state's Legislative Assembly and it was an intense period of land concession giving rise to territorial occupation and a growth in the number of rural establishments.

In 1977, the Mato Grosso Development Company (CODEMAT) was created, following the separation of the state of Mato Grosso into Mato Grosso and Mato Grosso do Sul, and it was responsible purely for private colonization.

The following year, the Mato Grosso Land Institute (INTERMAT) was created, responsible for land ownership actions in the state, except for the colonization that came under the responsibility of CODEMAT.

In 1977, CODEMAT published a new land code, Law 3922/77, which included a variety of technical and legal mechanisms for retaking control over the land access process, under the jurisdiction of the state. INTERMAT, however, created a series of internal policies that exercised control over the regularization process on a case by case basis. Through these internal expedients, INTERMAT took over the regularization process in indiscriminate fashion, increasing speculation surrounding provisional titles and execution of sale concessions, based on the 1949 land code from the time of the now extinct DTC. So the two bodies associated with land ownership administration in this period, CODEMAT and INTERMAT, were at loggerheads over the promotion of land ownership actions, causing dissension and problems, both with the process of colonization and the concession of public lands to private individuals. During this period, INTERMAT administratively and summarily took into its custody around 6.4 million hectares of the state's vacant lands. Similarly, INCRA also took into its custody over 7 million hectares of vacant lands and granted definitive title to around 3.6 million hectares at the margins of the federal highways.

So from 1985 onwards, the state's territorial occupation scenario has witnessed the coexistence of various factors which would contribute to stirring up confusion over land ownership, prompted by the indiscriminate concession of what were, until then, public lands: the emergence of new municipalities; the involvement of the federal government, particularly INCRA, with the implementation of agrarian reform settlement projects; the confusion created by the de-federalization of the control over vacant lands via Decree 2375/1987, which granted the state dominion over areas previously under the custody of the federal government, without them being demarcated; the creation of settlements by INTERMAT; the proclamation of the Federal Constitution of 1988 which brought together the social function of property, assumed custody over environmental protection; established agricultural and land ownership policies; created various conservation units and demarcated native lands, amongst other actions.

The 1990s begin with the 1988 Constitution to be fulfilled with regulatory measures that would be published by the Union, states and municipalities, in order to put into practice the execution of the new land ownership and environmental regulations.

In 1992, in the state of Mato Grosso, CODEMAT was extinguished and INTERMAT absorbed the jurisdiction and estate of the extinct body, and indeed received the real estate registered in the name of CODEMAT in the Land Registry, in accordance with article 7 of Supplementary Law 36 of October 11, 1995. Since then, this body has been responsible for the management of land within the scope of the

state, and is responsible for maintaining the registration of state, vacant lands and the organization of the land cadaster granted by previous agencies.

The actions taken at the federal and state government levels to improve the land ownership issue in the state ran into obstacles on account of the lack of definition between public and private land and the absence of a cadaster, which had the effect of stirring up land disputes in the state. However, even given this scenario, of a lack of definition and land ownership confusion, the development which agribusiness was witnessing in the country as a whole from the 1970s, arrived in Mato Grosso with great impetus.

The state of Mato Grosso became a protagonist in domestic agricultural production. In 2012, it produced nearly 21.8 million tons of soy, representing 57% of domestic production. In addition to soy, it is one of the largest producers of cotton and corn and possesses the largest beef herd in the country, at 28.7 million head of cattle. Therefore, the state's efforts, in terms of productive occupation, are undeniably reflected in the reality that this state is perhaps the largest of the big agricultural producers in the country, and it is clear that the winning strategy of the productive occupation of land intends to continue expanding through the occupation of new regions in the state. On the other hand, the social and environmental demand for land has been evident since 1985, creating a climate of tension over land within the state.

Nevertheless, productive occupation coexists in the state with the socio-environmental demands exercised by the national executive, through its specific agencies and the social movements: the Landless Worker Movement (MST) which is demanding settlements, the native communities who are demanding protected reserves, the *quilombo* inhabitants who are demanding their traditional areas and environmentalist movements which are demanding new Conservation Units and preservation of the forests.

All of these demands are supported by specific legislation which generates in the country large areas destined for social and environmental use, which must be organized in order to provide legal security and social justice. The state's land ownership administrative structure, however, does not enjoy a level of governance sufficiently high to permit this aim to be realized.

The following table summarizes the information obtained during the application of the World Bank's LGAF methodology, on the recent land ownership picture in the state of Mato Grosso.

It is believed that these latest results are close to the actual occupation situation, at least the productive occupation situation, in which Mato Grosso finds itself. Although this information on land is also declared by the establishment farmers, they are not overestimated as they are in the SNCR cadasters and, moreover, they do include, for example, small properties that fall outside of the SNCI. Added to this, the establishments surveyed in the Census include various types of property such as

settlements, those that have definitive title and those that do not yet have it (i.e. still not in conformity, awaiting title).

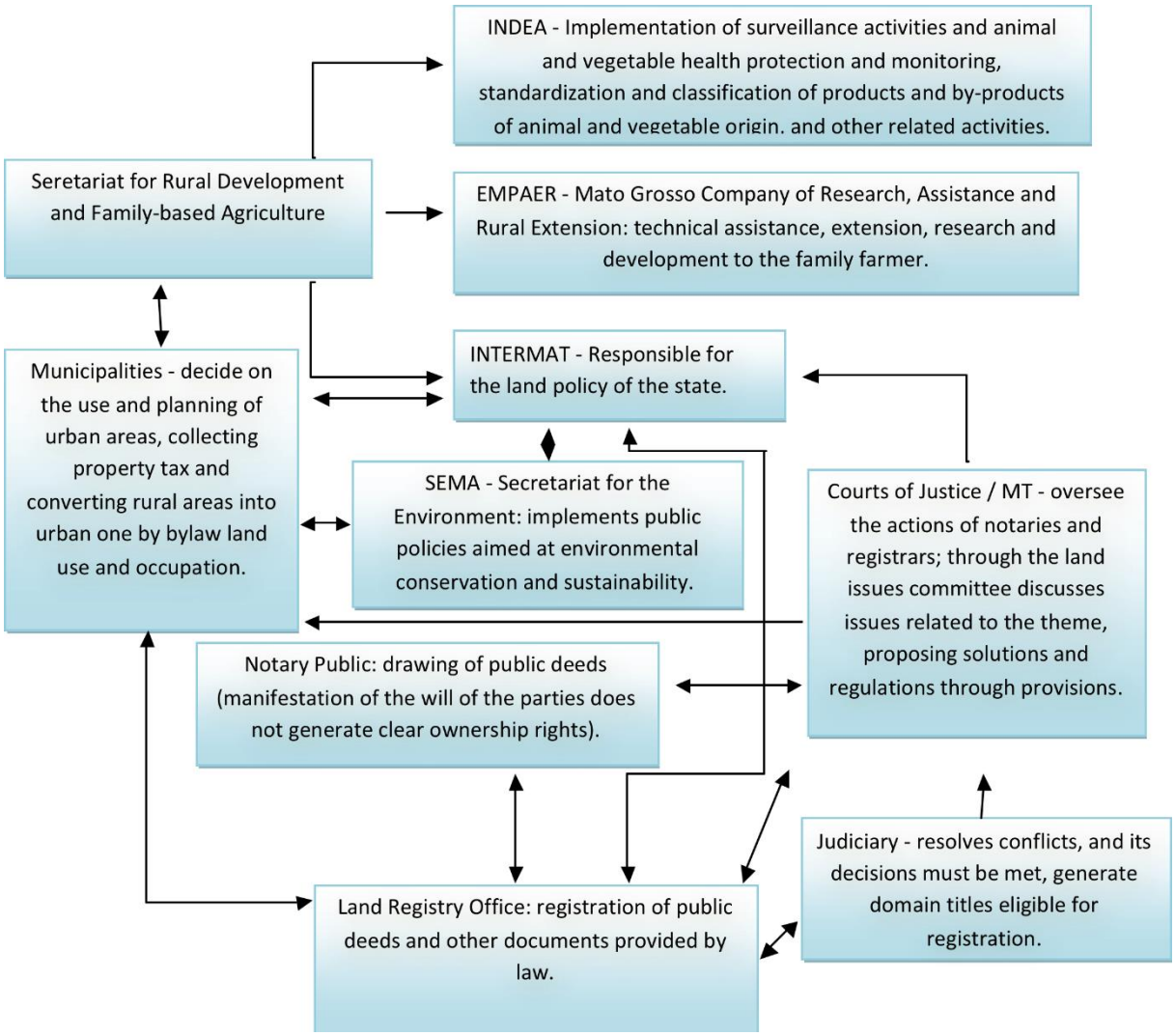
Table 8 – Summary of the land ownership structure in the state of Mato Grosso

Description	Area (ha)	%	Reference year
Indigenous land (A)[1]	13.667.702,68	15,13%	2010
Federal Conservation Units (B)[1]	1.697.533,94	1,88%	2010
State Conservation Units (C)[1]	2.636.113,91	2,92%	2010
Municipal Conservation Units (D)[1]	651.885,89	72,50%	2010
SNCI (F)[3]	25.690.490,54	28,44%	01/2004 - 10/2013
Sigef Certified (G)[4]	8.035.102,36	8,89%	2014
Settlements (H)[6]	6.094.043,00	6,75%	2012
Incorporated Federal Plots (I)	2.800.000,00	3,10%	
State plots (G)	2.050.000,00	2,27%	
Estimated total	63.322.872,32	70,10%	
Public lands not yet incorporated	27.013.747,00	29,90%	
SNCR (E)[2]	91.478.970,00	101,26%	2012
Agricultural Establishments (H)[5]	48.688.711,00	53,90%	2006
Mato Grosso - Total Area	**90.336.619,32**	**100,00%**	

Source: [1] Data from SEMA, 2012; [2] Data from DATALUTA, 2013; [3] Data from INCRA, available at: http://www.incra.gov.br/estrutura-fundiaria/regularizacao-fundiaria/certificacao-de-imoveis-rurais/file/1715-relacao-de-imoveis-privados-certificados-de-01-01-2004-a-31-10-2013. Last accessed on June 15, 2014; [4] Data from SIGEF, available at: https://sigef.incra.gov.br/sobre/apresentacao/. Last accessed on July 4, 2014; [5] Data from the Census of agriculture; [6] Data from INCRA.

The institutional picture of land administration in Mato Grosso is organized as follows:

Picture of Land Ownership Administration in the state of Mato Grosso



Source: Current legislation, Bueno, 2014.

In this land ownership administration structure, the central land administration body is the State Land Institute, INTERMAT and, in parallel, the Justice Internal Affairs Department which has been playing an important, innovative role in the solution of existing land ownership problems, enabling improvement in the state's land governance, which will be the subject of a more detailed analysis in the following paragraphs.

Consequently it can be seen that, since the proclamation of the Land Law, the state has not succeeded in efficiently promoting the administration of land ownership, which would result in a process of public land transfer to the private sector in an organized and transparent fashion. The agencies created for land ownership management, namely DTC, CODEMAT and INTERMAT, indiscriminately sold and/or donated areas, without any demarcation of the areas described in the titles, land concession procedures were not transparent, and were practiced by CODEMAT and INTERMAT in different ways. The consequences of this level of disorganization are still being felt with it being impossible to achieve good land governance as a result of problems with the lack of transparency of the land-related agencies,

overlapping real estate, mismatched titles and the absence of an integrated cadaster which distinguishes public land from private land and, finally, the identification of vacant lands.

2. Land Ownership Problems Detected Via the LGAF Methodology in the State of Mato Grosso

In applying the World Bank's LGAF methodology to evaluate and understand land governance in the state of Mato Grosso, commissioned by the Life Center Institute (ICV) and the Mato Grosso Sustainable Municipalities Program (PMS), conducted between May and December 2014, it was possible to detect various problems arising from the historical process of disorderly territorial occupation, associated with the manner in which the state was institutionally organized throughout this process.

It would be impossible to debate all the methodology's indicators, however it was possible to note that some problems are more extensive, giving rise to others which could be resolved subsidiarily to the main ones.

The main problems are presented and divided as follows:

2.1. Lack of understanding of the land ownership base of state and federal origin

Neither the federal nor state vacant lands, that give rise to all rural real estate, have been mapped and have not been organized into cadasters for subsequent verification. In the case of Mato Grosso, the lack of administrative continuity and the use of different cartographic bases by the various state agencies established over time, means that the concession of public land has become a serious problem, having the effect that, in the quest for the origins of the real estate, the properties have been difficult to identify and localize.

2.2. Mismatches on the land ownership base

As the land ownership base was unknown and squatter's possession was possible, many of those who obtained legitimate title, whether state or federal, took possession of land that was not always in the pre-established location, making the already confused land ownership picture even more precarious and frequently impossible to register.

2.3. Problems with the state land agency (INTERMAT)

Firstly, it can be seen that the cadaster of the historical record of concession of state public land is not available. The responsibility for consolidating the record of state lands conceded should belong to INTERMAT, however there are lingering doubts as to whether it even has the information. If it does have it, it is not making it available.

The absence of a historical cadaster for the concession of state land is one of the factors that have made it impossible to build a functional land ownership base that clearly demonstrates who the land belongs to, where they are and what are the boundaries thereof.

There is also a lack of synergy between INTERMAT and the other public land management agencies. The lack of articulation is revealed, for example, in the delay in submitting land ownership information to other institutions (such as FUNAI, INCRA and other state agencies like the Department of the Environment), generating inefficiency with regard to land ownership administration in the state.

As can be seen in item 1, the concession of state public land was carried out in a non-transparent, unorganized and unenforced manner, which constitutes a problem for INTERMAT itself which possibly has no way of organizing them for the preparation of a solid land ownership base so as to support public bodies to carry out efficient public policies and civil society with regard to security in terms of land-related rights. Added to these specifics of involvement of the Mato Grosso Land Institute are the extensive mismatch of titles across the entire territory, whether on account of deficiencies in the land ownership base or conflicting information between the records held by INTERMAT and those of other institutions.

On this topic it could be said that this engenders difficulties related to the regularization of legitimate possession. This occurs due to the sluggishness of the process and also on account of the mismatch of the titles..

By way of example, it has been found that at least 70% of the municipalities have an irregular land ownership situation in relation to the original titles, due to the question of overlapping.

2.4. Absence of a cadaster for private real estate, possibility of appropriation and the fragility of the registration system

The fact that Brazil does not have a consolidated cadaster creates serious difficulties with the achievement of good land governance. In the case of Mato Grosso, the dismemberment of matriculations with precarious descriptions was found on many occasions, as well as the transfer of property without registration in the land registry. These problems are also related to the mismatch of titles, as previously discussed, as well as difficulties related to the regularization of legitimate possession.

In the end, this facet of absence of governance is directly linked to the inefficient collection of land duties (particularly ITR), which constrains the government's ability to collect taxes and control land speculation, not to mention that it renders inviable fiscal exemption policies based on this tax.

Instances of this problem can be found in the following examples: a) less than 50% of properties are registered; b) existence of titles with as many as 15 "stories"; c) less than 10% of all private real estate has been mapped.

2.5. Confused, disjointed institutional arrangements and policies

The evolution of the institutions took place in a rather confused manner in Brazil in general and in the state of Mato Grosso in particular, insofar as the governance of land is concerned. One of the great demonstrations of this institutional confusion relates to the lack of institutional definition in terms of the responsibility for public land management, where it is unclear where the responsibility for public land of each entity starts and where it ends, creating overlapping and disputes over responsibility.

Accordingly a chronic situation exists of a lack of knowledge of the land ownership base of state and federal origin, significantly undermining the ability of the public sector to carry out land ownership policies.

Another striking element is the lack of control over the transfer of large extents of land to investors. Present regulations do not include an effective analysis of the shared benefits of a given investment or even control over guarantees that investment in large tracts of land will be productive and efficient, nor a system to monitor it.

The absence of governance caused by this lack of interconnectivity between the various agencies also produces a lack of control over the use of and rights to the forest and common, rural land, making it more difficult to control the adverse use of forests and irregular or illegal deforestation.

Finally, the absence was detected of concession of public land to the seats of municipal government. This renders them incapable in many cases of planning and regularizing urban and rural occupation under their jurisdiction, leaving significant sections of the population on the sidelines in respect of land rights.

As an example of these problems, it is known that at least 4 different agencies issued titles without communicating the fact to each other, which confirms the earlier indication that at least 70% of municipalities have an irregular land ownership situation, with regard to the original title, due to overlapping land. Moreover the inability to regulate the use of and rights to the forest are vouched for by the fact that Mato Grosso was the state with the highest growth in rates of deforestation between 2012 and 2013 (38.3%, or an increase from 774km^2 to 1,070km^2), according to Imazon (2014).

2.6. Problems with the State Courts

The lack of land governance also manifests itself in problems involving the judiciary. The difficulty of access to justice is a real problem due to the distances involved and the absence of substitute agencies that could cover the population affected by land ownership conflicts far from the state capital. Herein lies the problem of recognition of possession-related rights which, despite existing legally, in practice they are difficult to exercise because of the other problems already mentioned, such as the lack of understanding of the land ownership base and the lack of continuity with dismemberments in the matriculation of areas conceded by the state to private individuals in order to search for the title of origin

and the adjoining owners required for any legal action. Another problem with regard to justice is the inordinate length of time it takes to resolve lawsuits. One example of these judicial deficiencies is that less than 10% of actions in the courts referring to land ownership issues have their sentences passed in under 2 years.

Even before starting to apply the LGAF methodology in the state, these problems were already known by some agencies which decided to instigate actions which could identify, discuss and seek solutions to minimize the effects on bad land governance.

This is the case of the Justice Internal Affairs Department in the state of Mato Grosso, which in 2012 formed the Land Affairs and Public Registry Committee which, through the coming together of various stakeholders, is finding ways to resolve land ownership problems, making advances in the improvement of land ownership problems for the state and for civil society.

3. Justice Internal Affairs Department in the state and the Problem-Solving Proposal

The state's Justice Internal Affairs Department has been in existence since 1946, when the first internal affairs judge was selected in the Courts of Justice. The chief function of this entity is to enforce the acts of Notaries and Registrars, as set out in article 236 of the Federal Constitution, and regulated by article 37 of Law 8935/94. The other functions include guidance, enforcement and enhancement of the judiciary services. The mission of the Justice Internal Affairs Department of the state of Mato Grosso is to continuously intensify and enhance the judiciary services and the means of administrative instruction and enforcement, in order to guarantee efficiency in jurisdictional provision (http://www.tjmt.jus.br/internal affairs department/Areas/Conteudo/Conteudo.aspx?c=23590).

The Justice Internal Affairs Department in the State of Mato Grosso, considering that land ownership issues involve demands of public interest, which need to be resolved by the judiciary or by its auxiliary services, the Notary Offices and the Land Registries, in conjunction, through the demand for solutions that prevent the development of the state with regard to land ownership problems imposed by the various stakeholders involved in the dynamics of land, via Directive 70/2011, created the Land Affairs and Public Registry Committee of the Courts of Justice with the aim of promoting, via joint efforts between the institutions responsible for land ownership regularization, a joint debate on the existing land ownership problems in state of Mato Grosso, in the search for alternatives (administrative and judicial; prescriptive and executive) to resolve (or at least minimize) problems of an agrarian nature, by promoting the land ownership regularization of both urban and rural real estate in the state, as a way to provide economic development at both the local and national levels.

Initially the Committee was composed of the Justice Internal Affairs Department in the State of Mato Grosso, National Institute for Colonization and Agrarian Reform (INCRA), Ministry of Land

Development (MDA), Land Institute for the State of Mato Grosso (INTERMAT), Association of Notaries and Registrars for the State of Mato Grosso (ANOREG-MT) and the Brazilian Association of Georeferencing and Geomatics Engineering (ABRAGEO). However due to the importance of the topics involved in the debates and their multidisciplinary nature, various other stakeholders were subsequently added to this list: federal, state and municipal executive authorities, legislative authorities, representatives from the municipalities, professional bodies, rural trades unions, representative from civil society and other parties with an interest in land ownership issues.

The goal of the committee is to encourage land ownership discussions in order to understand and enable regularization in the state. Monthly meetings are held in the Justice Internal Affairs Department to discuss the problems, recommend solutions and, based on these, publish provisions that will provide guidance to government agencies, non-governmental organizations and civil society on procedures that will enable the resolution of land ownership problems.

The Committee has the following duties: I – To study the occupation of land by creating a database on this subject; II – To identify the main problems between Land Registries and Land Management in the state of Mato Grosso; III – To submit a proposal for concrete solutions for cases submitted to it; IV – To promote the qualification of professionals operating in the area covered by this directive; V – To analyze queries or processes submitted to them by the participating institutions or any other entities which, for the purposes of clarification, may enter into contact.

Directive 70/2011 was superseded by Directive 45/2013, the objectives being the same. Thus, from 2013, the committee has undertaken efforts to fulfill its duties for the benefit of improvement in land ownership management in the state through the publication of a variety of provisions.

One of the actions which is having a positive effect, speeding up the resolution of land ownership disputes and problems, was the possibility of creating land ownership committees within the municipalities.

Provision 15/2014 created committees in the municipal domain, linked to the Executive Office of the courts in each judicial district in the state, i.e. in every city where judicial courts exist, a municipal committee could also exist to analyze, discuss, address and resolve land ownership issues of both an urban and rural nature, whether or not they have generated any conflict, that exist in each of the municipalities in the state of Mato Grosso. The Justice Internal Affairs Department, through the land affairs committee, has stimulated the creation of councils for land ownership regularization and sustainable economic development in the municipalities, with the aim of assisting with land ownership problems on a timely basis, producing municipal bills to help the municipal governments to implement councils, amongst other examples which will be addressed subsequently.

These innovative measures by the Internal Affairs Department of the Courts of Justice, to create a committee for land ownership affairs to improve governance in the state, has had a beneficial effect by expediting solutions so that, within a short space of time, i.e. two years, various solutions have been published contributing to the resolution of problems.

4. Measures Taken by the Land Affairs and Public Registry Committee

Amongst the regulations published on the basis of discussions had by the Land Affairs and Public Registry Committee are: Provision 36/2013 – CGJ/MT (Provides for the standardization of georeferencing legalization procedures and recording of Definitive Titles issued by the State and/or Federal Public Authorities), Provision 37/2013 – CGJ/MT (Provides for the extinction of condominium *pro diviso*), Provision 15/2014 – CGJ/MT (Creates the Municipal Land Affairs Committee), Provision 63/2014 – CGJ/MT (Provides for the standardization of the georeferencing registration procedure in the matriculation of mismatched and/or overlapping titles), Provision 68/2014 – CGJ/MT (Provides for the regularization of INCRA Rural Settlement Projects and the registration of agrarian reform titles).

One of the Committee's initiatives is the creation of the Municipal Land Affairs Committees, presided over by the Chief Judge of the Judicial District Court, and composed of various entities (both public and private) situated in the municipal area, including the Executive, Legislative and Judiciary Branches, Public Attorney's Office, Order of Attorneys of Brazil, Land Registry and Notary Public, and also recommends the creation, through municipal law, of Municipal Land Regularization Councils to discuss matters related to land regularization in all the municipalities, even those where there are no judicial districts. The Committee has already produced a draft bill that was sent to the municipalities, suggesting the creation of these councils. The measure aims to provide an understanding of the land ownership problems in each municipality in order to facilitate the dialogue between municipality, state and federation, to resolve problems on a more timely basis. The municipal committees are being set up, speeding up the solutions to land ownership problems and expediting municipal development.

Another directive of the Committee was that the State Land Institute of Mato Grosso (INTERMAT) should share its land ownership base and other land-related information with other administrative bodies in order to speed up the processes. However, the agency was not prepared to share its land ownership information, stressing that the interested parties could obtain access through the establishment of a procedure provided for in the regulations, paying a fee for the service. Although the stipulated procedure may exist, the land ownership issue in the state is very complex for information not to be made available to the other agencies involved. The Committee's directive is based on the fact that INTERMAT is the agency responsible for administering vacant lands in the state, that it is not managing to provide the necessary clarification within a reasonable time frame and on account of the lack of

coherence in the data supplied by the agency, bearing in mind that it is common for it to issue two letters of consent on the same subject but with different content.

The refusal by INTERMAT to make available information on the land under its control acts as an obstacle to the committee in resolving land ownership problems. To give an example of the difficulties involved, the chairman of the Committee reported that they are attempting to find a solution to the problem of mismatched titles and overlapping areas, however there is no way that the correct initiatives can be taken as it does not have knowledge of the geographical dimensions of these problems, given that INTERMAT is the holder of all the titles issued by the state and the location thereof, thus it is essential that the institute's database be made available, at least to the members of the land affairs committee, in order to be able to take decisions to resolve the problem and not create even more instability with regard to the state's land ownership issues. Nevertheless, the issue of the absence of synergy between INTERMAT and other agencies was one of the problems identified using the LGAF methodology, as discussed in item 2.

However the agency is bereft of the structure and organization it needs to promote good land governance, such that when asked to do so, it takes a long time to respond to requests for information, whether from other agencies or the general public.

To resolve these structural difficulties with INTERMAT and to continue to promote the georeferencing registration in the matriculation of mismatched and/or overlapping titles, promptly and with legal security, the Committee published Provision 56/2014 – CGJ/MT, which set a period of 60 days for INTERMAT to supply the Letter of Consent[4], and at the end of this period, the applicant should present the proof of request of the letter of consent to the Land Registry, which will once again notify the agency to supply the document within 10 days, in order to expedite the georeferencing registration procedure. If the institution does not issue said letter, this will be regarded as tacit acceptance. The publication of this provision had the participation of INTERMAT representatives and other committee participants, the outcome being a consensus between everyone who resolved the problems of the land institution and its users.

With Provision 63/2014 – CGJ/MT, all land registries in the state will be able to go ahead with the georeferencing registration in the matriculation of mismatched and/or overlapping titles, provided that it does not fall upon land in the public domain. This means that the owner of rural real estate will not need to appeal to the courts when it receives the letter of consent from the Mato Grosso Land Institute establishing the mismatching and/or overlapping with private real estate. Therefore, the registry itself will summon the owners of adjoining properties and proceed to make the georeferencing registration in

[4] Letter of consent is the declaration by INTERMAT with regard to the similarity of location between the property being georeferenced and the area's original title.

the matriculation. This measure has speeded up the process that is required for the transfer, unification or dismemberment of areas, as provided for in Law 10267/2001.

Practical examples of the innovation brought about by the state's Justice Internal Affairs Department through the Land Affairs and Public Registry Committee are increasingly frequent:

> "The Land Affairs and Public Registry Committee, led by the Justice Internal Affairs Department of Mato Grosso, has developed a set of urban, environmental and social measures whose aims are to regularize settlements and the situation of their occupiers. Provision 68/2014 – CGJ (DJE 9370) shall assure the social right to an abode, development of the urban property and an ecologically balanced environment. Based on this provision, settlements can be regularized more quickly, which will facilitate access to finance and consequently the strengthening of family agriculture and the settlement of man in the fields. Over 80,000 families in the state will benefit. The provision makes it feasible to regularize the rural settlement projects of the National Institute for Colonization and Agrarian Reform (INCRA) and the registration of agrarian reform titles with Land Registries in the state of Mato Grosso. Even with the release of possession or title, the entities (State, Municipal and District) can already make the request directly to the registry office, which previously was only possible with legal action. According to INCRA data, there currently exist 539 projects covering a total area of 5.937 million hectares. At the present time, 2,082 families have received definitive title of the possession of their areas while a further 80,406 families should benefit from this provision". (Source: TJ/MT, September 19, 2014, published at http://www.portaldori.com.br/2014/09/23/tjmt-provision-facilitara-regularizacao-fundiaria/)
>
> "The city of Comodoro (almost 400 miles from Cuiabá) is developing a land regularization program that proposes to legalize over 1,500 plots of land located in a low-income community in the urban zone. To date, Comodoro's program has taken at least 100 families out of a situation of informality.
>
> Rogério Victor de Oliveira, an active participant in the project and registrar of the 1st Notary Public of Titles and Documents of the Judicial District of Comodoro and also associate member of the Association of Notaries and Registrars in the State of Mato Grosso (ANOREG/MT), explains that the action was developed to eliminate the bureaucracy associated with the

> legalization of plots of land occupied by low-income residents. He added "Our intention is to reduce costs, time and bureaucracy".
>
> The regularization model adopted in Comodoro and approved by municipal law, is very different from that practiced by the Federal Government, beginning with the definitive property title. In the federal model, the owner receives the contract of concession of real right of use and five years later will receive the definitive title. "Via the program established by the municipality, this dweller receives the title and becomes a full owner, without needing to wait five years", Rogério explains.
>
> Moreover, the dwellers are also exempted from duties, as is the case with the Urban Land and Building Tax (IPTU) and the Inter-Vivos Property Transfer Tax (ITBI) and also the fees relating to the registration of the land. In this way, regularization happens more quickly and is closer to the condition of the low-income families which the municipality is assisting.
>
> The expectation is that over 200 plots of land in another community will also be regularized by the end of this year. The Official Registrar stated that the there is a possibility that the program will be extended to the rural zone. "Our aim is also to educate the citizen that the registry is somewhere that is accessible and it is our desire to facilitate and democratize the regularization of land ownership", the land registrar stressed.
>
> (Source: http://www.anoregmt.org.br/portal/conteudo,8944,0,2,nt,cartorio-de-comodoro-integra-programa-de-regularizacao-fundiaria-no-municipio.html)

The experience of the municipality of Nova Ubiratã/MT has been extracted from the record of municipal experiences reported to the Mato Grosso Sustainable Municipalities Program in November 2014. The municipality served as a pilot for various land regularization actions that have taken off in the state since the creation of the Land Affairs and Public Registry Committee of the Justice Internal Affairs Department:

> "The Municipality of Nova Ubiratã has developed actions that are being replicated in other municipalities within the state. The creation of the Municipal Council for Land Regularization and Sustainable Economic Development in Nova Ubiratã (CONREDES) and the involvement of the land

registry in land ownership issues, consisting of a pilot project developed in the Municipality of Nova Ubiratã, and with the backing of the Land Affairs and Public Registry Committee of the Mato Grosso Courts of Law, is already a reality in other municipalities in the state. Currently, through the Provision of the Justice Internal Affairs Department of the State of Mato Grosso, Municipal Land Affairs Committees are being set up in every municipality in the state of Mato Grosso, providing greater speed and direction for land regularization projects and guaranteeing institutional cooperation between the Executive, Legislative and Judiciary Branches, Public Attorney's Office, Public Defense Attorney, Land Registry, Notary Public and other entities representing civil society.

Land ownership regularization procedures are being developed in conjunction with the Municipality, observing the steps of georeferencing, registration and concession of title".

The irregular land ownership situation in Nova Ubiratã and the progress made by the end of 2014 have been reported as follows in the Register of Municipal Experiences submitted to the Committee of the Mato Grosso Sustainable Municipalities Program:

"Ongoing INCRA Rural Settlement Projects (P.A.) in Municipality 4 (four): P.A Piratininga; P.A Boa Esperança I, II and III; P.A Santa Teresina II; P.A Cedro Rosa.

Irregularity of land ownership is having a significant impact on the **Settlement Projects (PAs)** in the municipality, introduced decades ago by the Federal Government at the time of the implementation of agrarian reform in the area, **there being a total of 950 plots without any form of title**, out of a total of 72,800 ha, covering around 3,040 people inhabiting the settlements, who are awaiting title in order to be able to exercise their agricultural activities with excellence.

However, in executing the project of land ownership regularization in Nova Ubiratã, the complete georeferencing was performed of 3 (three) INCRA Rural Settlements (P.A Piratininga; P.A Santa Teresinha II; P.A Cedro Rosa), with the georeferencing of P.A Boa Esperança I, II and III still in-progress.

Similarly, the mapping and registration was carried out of the occupants of the urban plots of land in 5 districts of Nova Ubiratã, and administrative and legal proceedings are underway to acquire the urban area of the district by the Municipality by way of donation, appropriation and the execution of

amicable accords, with the aim of subsequently regularizing the plots in the name of their legitimate occupants.

In the land ownership regularization project, CONREDES monitors the progress of various judicial actions that involve land ownership issues and disputes (squatting rights, fulfillment of obligation to perform, appropriation, bankruptcy proceedings, etc.), with the aim of providing support to the interested party to arrive at a quick, satisfactory outcome: the regularization of the constituent occupations.

The filing of collective, adverse possession actions is also programmed through the Municipality or the Public Defense Office, thereby benefiting those occupants who do not have sufficient financial resources to bring individual actions".

Given the examples set out above, it can be seen that institutional innovation of creating land affairs and public registry committees has succeeded in bringing an improvement with regard to the various problems identified via the LGAF methodology, such as: regularization of possession by consolidating rights, problems with State Courts with slow access to justice, area mapping through georeferencing, all of which is promoting an awareness of the land ownership base in the state, giving title to settlements and squatters that had been stagnant due to the inertia and lack of efficiency of the federal and state governments, land ownership regularization of the urban areas of the municipalities, etc. The committee is managing to supplant the refusal of INTERMAT to furnish the land ownership base, as it is promoting the georeferencing of both rural and urban areas, and providing title to those occupants who can prove the requirements for the action of adverse possession.

Conclusions

It can be concluded that the land ownership problems in Mato Grosso result from the disorderly manner in which territorial occupation was carried out, which was aggravated over the years by the absence of a cadaster and the lack of knowledge of what was public and private land, as a result of various factors, amongst which was the lack of structure, organization and transparency of the state's land agency, INTERMAT. The creation of a land affairs committee at the state and municipal levels, to identify land ownership problems, propose solutions and publish policies to make these solutions viable, is an ideal mechanism for achieving good land governance. The promotion of dialogue and the exchange of information between government agencies, non-government organizations and civil society that the committee provided, has been found to be essential for the problems to be satisfactorily rated, clarified and resolved with the legal security necessary for the right of access to land.

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Brazilian Amazon Deforestation and land governance

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Key Words: Deforestation, Property rights, Amazon Rain forest, Land Policies, Land Governance.

SUMMARY
This article's aim is to show that the main cause of deforestation in the Amazon[3] rain forest is the lack of land governance. The deforestation occurs mainly because property rights are not clearly established, and occurs on land directly or indirectly related to the state. After making a literature review on the Amazon deforestation causes, data from PRODES (published by IMAZON, IPAN and ISA) on deforestation for the Amazon region and for the states will show the main landowners types in which deforestation occurs more frequently. Based on this data, the article will show that most of the deforestation happens in land under different types of state control, making more evident that the need of land governance for the diminishing of the deforestation should start with state controlled land. New actions on land administration of the Brazilian government plays an important role: efforts to improve the cadaster (SIGEF) and Terra Legal that is solving problems with public land in a large area of the Amazon. The concluding section will synthesize the main findings and remark that the continuous effort to reduce deforestation will only be possible through a more efficient land governance for the country, particularly for the Amazon region. It will also show other important contributions that the participatory Land Governance will have on the better use of land, on the control of land ownership, manly trough the charging of land taxes.

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[3] The Legal Amazon region comprises all six states of the Brazilian Northern Region (Acre, Amapá, Amazonas, Pará, Rondônia, Roraima and Tocantins) and part of Mato Grosso and Maranhão, for a total of 5,217,423 sq. km (521,742,300 ha) (Brasil, 2014). In other words, 59% of the Brazilian territory is part of Legal Amazon and 12.34% of the Brazilian population lives here summing up to more than 25 million, 62 % of them in urban areas.

Brazilian Amazon Deforestation and land governance

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1. INTRODUCTION

The deforestation of the Amazon rainforest has been debated on a number of different fronts, often superficially or steeped in ideology. Amongst the subjects most commented upon we find the debate that revolves around changes in the Brazilian Forestry Code and the recent increase in the rates of deforestation. First, it is necessary to clearly identify the process, then determine the causes and, finally, reflect on short, medium and long-term solutions.

It is undeniable that the strong command and control policies[6] and economic incentives[7] implemented in recent years have played a crucial part in reducing deforestation. As these depend on the direct intervention of the State, it is difficult for them to be maintained in the long run, mainly because the principal production-related agents of deforestation, ranging from livestock farming to the production of grain and ultimately the production of electricity, will persist and lasting solutions must be found. The core aim of the present study is to demonstrate that the definitive solution to this problem must necessarily address the solution of the country's agrarian problems that mainly consist of the Brazilian State taking on, in conjunction with the society, the effective governance over land ownership, particularly land under the control of the State.

Initially, the present article presents a brief description of the main causes of deforestation that have been identified in the literature on this topic. Then it will be shown how two problems that appear at the margins of the literature are, when brought together, the main drivers of deforestation: land speculation via the deforestation of land itself and the absence of land governance. The fourth item analyzes historically the creation of the institutional framework that leads to the absence of regulation in the land market. The fifth will show the efforts from the government in increasing land governance trough two main instruments: the Terra Legal regularization program that has finally, in the last section, as well as arguing for the need for effective land property governance, the main implementation mechanisms and the benefits it will generate will be demonstrated.

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[6] The main Command and Control Policies, direct State interventions that change the behavior of the deforesters, were: a) the operations known as Curupira (2005) and Arco de Fogo (2008), to combat illegal timber extraction; b) decree 6321/07, which restricts the granting of bank loans and obliges owners in the municipality who are the biggest offenders of deforestation, to reregister; c) the creation of Conservation Units, adding a further 20 million hectares to the more than 80 million already in existence, totaling 273 units; d) certification of 87 Native Lands and approximately 18 million hectares; e) limited to agricultural products emanating from municipalities with highest rates of deforestation.

[7] Economic Incentive policies that use economic mechanisms (prices or otherwise) to incentivize or inhibit economic agents to reduce deforestation are as follows: a) operation Arco Verde (2008),and b) Special line of credit in the area of FNO, FNE and FCO for the recovery of degraded areas, reforestation, management and regularization in the Legal Amazon.

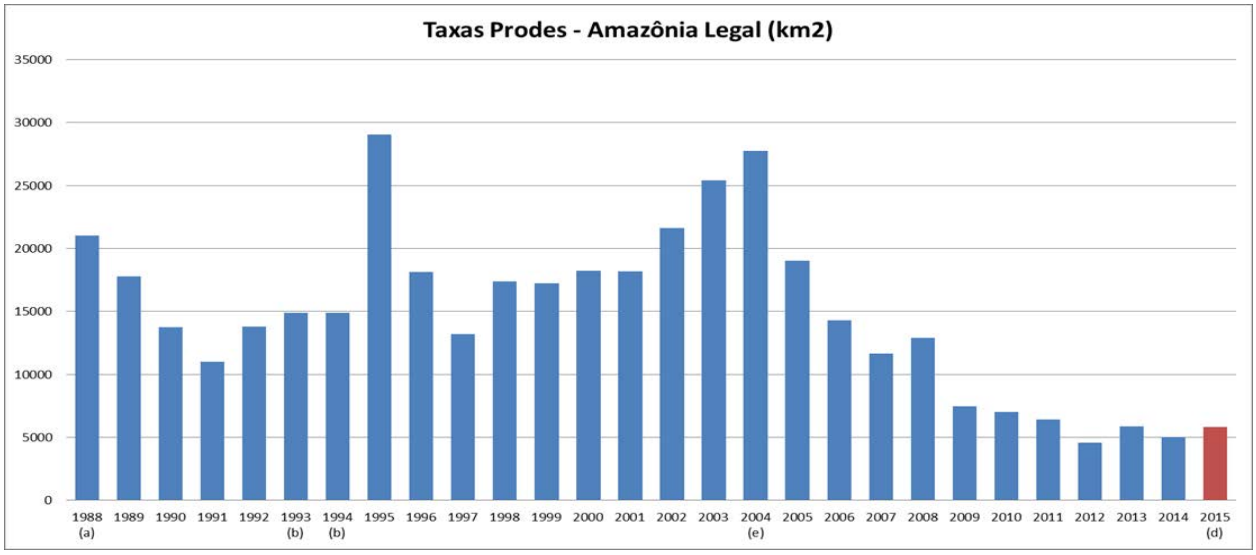
2. DEFORESTATION AND ITS PRINCIPAL CAUSES

According to the FAO (2010),

> "Brazil has lost an average of 2.6 million hectares of forest per year over the last 10 years, compared with an annual loss of 2.9 million hectares in the 1990s; in Indonesia the losses were 500,000 hectares between 2000 and 2010 and 1.9 million hectares between 1990 and 2000."

Graph 1 shows deforestation in Amazonia based on images produced by the PRODES satellite and it shows that the average annual deforestation between 2000 and 2013 was 14,315 km^2 per year, amounting to 200,416 km^2 (around 20 million hectares) in the period. The decrease in annual deforestation from 2004 (27,700 km^2) to 2013 (5,891 km^2) represents a substantial improvement but it is still a very high level of deforestation for a biome with the characteristics of the Amazon. This is a biome whose standing forest represents its greatest riches, given its great biodiversity, its importance for regulating the climate of the planet, its production of fresh water and a soil that is unsuited to agricultural pasture activities.

Graph 1. Annual rate of Deforestation in square km the Legal Brazilian Amazon



SOURCE: PRODES (2016).

The question that remains is, how can we turn an increase in the rates of deforestation inviable and more importantly, how do we significantly reduce them? Deforestation of the Amazon forest is a complex process with multiple drivers and has been the object of various theoretical and empirical studies[8]. Margulis (2000:9) states: "We do not believe that there is a single, principal force which drives or explains the deforestations in Amazonia. The causes are manifold and result from a sophisticated combination of diverse variables and factors".

[8]For an in-depth review, see Soares Filho et al (2005).

The main groups of variables that lead to deforestation, evident in Margulis (2000) and in the best part of the literature are:

a) Benefits associated with the use of land in Amazonia, determined by agricultural prices, increase in the price of land, variation in the price of inputs, increase in the price of timber and the reduction in rural wages;

b) Public policies and credit – the availability of cheap credit(FINAM, FNO)and fiscal incentives (SUDAM);

c) Accessibility – the construction of highways and/or other works that facilitate access to the frontier areas;

d) Macroeconomics – cycles of GDP growth, population growth.

Inasmuch as these four groups of variables have directly interfered with the deforestation of Amazonia, it may be said that, after the interventions of recent years and the crisis of 2008/2009, all have probably had positive impacts on deforestation, nevertheless deforestation has decreased. On the other hand, even in the periods in which these variables are not growing, deforestation rose. This shows that there are other, more profound factors at work whose relative importance has not been highlighted.

3. DEFORESTATION IN DETAIL: IN THE STATES AND BY TYPE OF LAND ACCESS

Before discussing the causes and main steps to be taken with regard to deforestation, it is necessary to go deeper into its characteristics, in other words to find out in which states it is happening more intensely and if there have been any significant changes in incidence over recent periods. Table 1 shows that the state with the highest incidence of deforestation is Pará, with a little more than 40% of the total deforestation of the Amazon region and an area of 2,037 km² cleared in 2013. However, deforestation in the state of Pará, though higher, grew at a slower pace between 2012 and 2013, at 13%, than states like Mato Grosso and Rondônia that exhibited the highest deforestation growth, at 38.3% and 29% respectively. However, other states demonstrated significant reductions in deforestation: Amapá, Tocantins and Acre fell between 21% and 94%. The reason for these differences requires greater research and explanations. The Map 1 shows this linked with the geographical space. It also shows the large amount of conservation units and indigenous peoples lands that surely reduced deforestation as established clearly that that is state land.

Table 1. Deforestation of the Amazon forest per km² in different states in the northern region of Brazil -2012 and 2013.

State	Deforestation in 2012	% of total 2012	Deforestation in 2013	% of total 2013	2013/2012, %
AC	274	6.2	158	3.2	-42.4
AM	458	10.3	360	7.4	-21.4
AP	20	0.4	1	0.0	-94.4
MA	304	6.8	230	4.7	-24.4

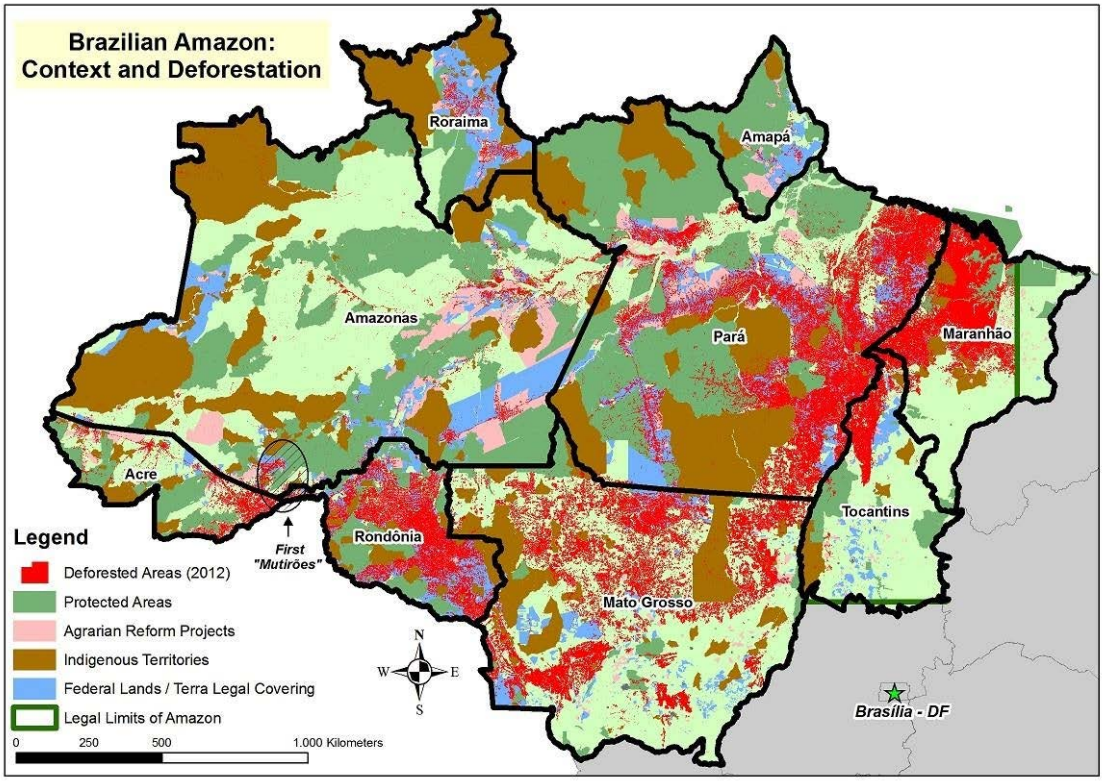
MT	774	17.3	1,070	21.9	38.3
PA	1,794	40.2	2,037	41.8	13.6
RO	679	15.2	876	18.0	29.0
RR	108	2.4	116	2.4	7.4
TO	48	1.1	27	0.6	-43.9
Grand Total	**4,459**	**100.0**	**4,875**	**100.0**	9.3

Source: ISA/IMAZON/IPAM (2014).

The information that is most important for the objectives of this study is the type of property (agrarian category) where the deforestation took place. First it should be pointed out that the largest share of deforestation goes to the agrarian reform settlements with 28.7% of the total deforestation, a growth of 9.4% in the period. This is clearly down to the absence of a clear policy to limit deforestation in the agrarian reform settlement projects in Amazonia. Next come the areas for which no information exists, that may be public or private land, with 23% in 2013, a growth in area in the period of 16.8%. Deforestation on private property, although it dropped slightly in absolute numbers, appears in third place, accounting for over 20% of the deforestation, quite a significant percentage.

The categories of property that should be showing almost zero deforestation, on account of them being protected areas (environmental protection areas, Conservation Units, Indigenous Lands), still appear, however, to have areas of deforestation, between 140 and 230 km^2 in each category, which is not insignificant. Except for the indigenous lands, all demonstrated significant growth between 2012 and 2013, being higher in the environmental protection areas (a growth of over 42%).

Figure 1: Deforestation and Main Public Land Use Categories in the Amazon 2016



Source: Duchrom (2016)

This group of information is more than enough to argue for the need of greater control over the land use and occupation in Amazonia. However if we were to add together all the agrarian categories associated with Brazilian states, excluding those that are clearly private, it can be seen, as depicted in table 2, that 79.6 % of deforestation in 2013 occurred in lands directly controlled by the state. Therefore, an effective control over the different categories of public land is the decisive first step to reduce deforestation in the country.

Table 2. Deforestation by type of agrarian category - Amazonia - 2012 and 2013 - (in km^2)

Agrarian Category	Deforestation in 2012	% of total 2012	Deforestation in 2013	% of total 2013	% 2013/ 2012
Environmental Protection Area	164	3.7	234	4.8	42.5
Settlement Projects	1,279	28.7	1,400	28.7	9.4
Private property (Rural Environment Registry (CAR) certified by INCRA)	1,041	23.3	994	20.4	-4.5
Areas without any information (unregistered public or private land)	960	21.5	1,121	23.0	16.8
Native Lands	174	3.9	148	3.0	-15.0
State public land	15	0.3	1	0.0	-94.4

Federal public land	540	12.1	664	13.6	23.0
State Conservation Units	119	2.7	142	2.9	19.7
Federal Conservation Units	167	3.7	170	3.5	1.9
Grand Total	**4,459**	**100.0**	**4,875**	**100.0**	9.3

Source: ISA, IMAZON, IPAM (2014).

4. INSTITUTIONAL FRAMEWORK OF LAND REGULATION: WHY THERE IS NO EFFECTIVE REGISTRATION SYSTEM AND WHY LAND GOVERNANCE IS NON EXISTENT

This section historically analyzes the creation of the institutional framework in Brazil, which leads to the absence of land market regulation. It will be shown that many of the characteristics that causes this absence are inherited from the Brazilian State's historical ineptitude with regard to land governance.

Prior to the Brazilian Land Law of 1850, the rules regarding the occupation of urban and rural soil were defined based upon the powers of the kings, the Church or the political and physical power of the occupants. The Land Law should be understood in a more general context of laws that placed restrictions on access to land in the whole colonized world[9]. In keeping with the interests of landowners in the country, the Land Law made it possible to regularize possession[10], the fruit of the occupation of vacant lands, which once again rendered unviable the creation of a register. Put more directly, there always existed the possibility of regularization of possession arising from vacant land occupation. In addition to adverse possession (which establishes that the squatter may regularize his property after a number of years), the states themselves (mainly after the Republic was created) at some points in history granted property with or without titles. This is the basic mechanism which meant and still means that it has never been possible to establish an effective register, which would even permit the definition of vacant areas and assign them for use in various agrarian policies.

Until the Land Law, the registration of property was done with the Parish Land Registries, under the responsibility of the local vicar (law of 1822, with the demise of the *sesmarias*). This registry continued to be used for a long time after the proclamation of the Land Law. In 1864, a land law decree obliged all holders of land to register their possessions in the vicar's registry – however this was never enforced.

The Proclamation of the Republic in 1889, by passing to the states the rights over the vacant lands, generated the possibility that their representatives might transfer them via the granting of unregistered titles. This happened to a greater or lesser degree according to the state, but irrespective of this, it created yet another ambiguity over the granting of titles, which made the state registration of the land market difficult[11].

[9] As in Latin America, Australia and the USA.

[10] i.e. transformation of possession into property through legal channels.

[11] In spite of this, there has been a failed attempt at regulating property via the Torrens Registry (1891) in which squatters and owners would be able to obtain definitive title through an uncontested petition. On the other hand, the possibility of legalization of squatter's possession in 1895 and in 1922 (in respect of possession between 1895 and 1921) has the effect of creating the conditions for squatter's possession to persist and for land market regulation, as expressed in the Land Law of 1850, to be weakened.

The institutionalization of the Public Land Registry in 1900 is arguably the main step to the system that prevails today for registering property in registry offices. This ruling states that everyone must demarcate and register their rural or urban properties, though without any form of audit and without the existence of a registry. The State would also need to demarcate and register their (vacant) lands, which is impractical given that they are defined by process of elimination. The State itself therefore is acting illegally. This obligation has the effect of augmenting the possibility of fraud in the registration at public registry offices.
The proclamation of the Civil Code of 1916 created the inability to regulate the Brazilian land markets, whether by reaffirming the registry office as the institution of registration or by enabling public lands to be the object of adverse possession. In the words of Ligia Osório Silva (1996:324),

> "with this, the framework for the transformation of the State into an owner like anyone else, was complete. And thus the doctrine of statute of limitation over vacant lands was sustained. In other words, the possibility of adverse possession of vacant lands".

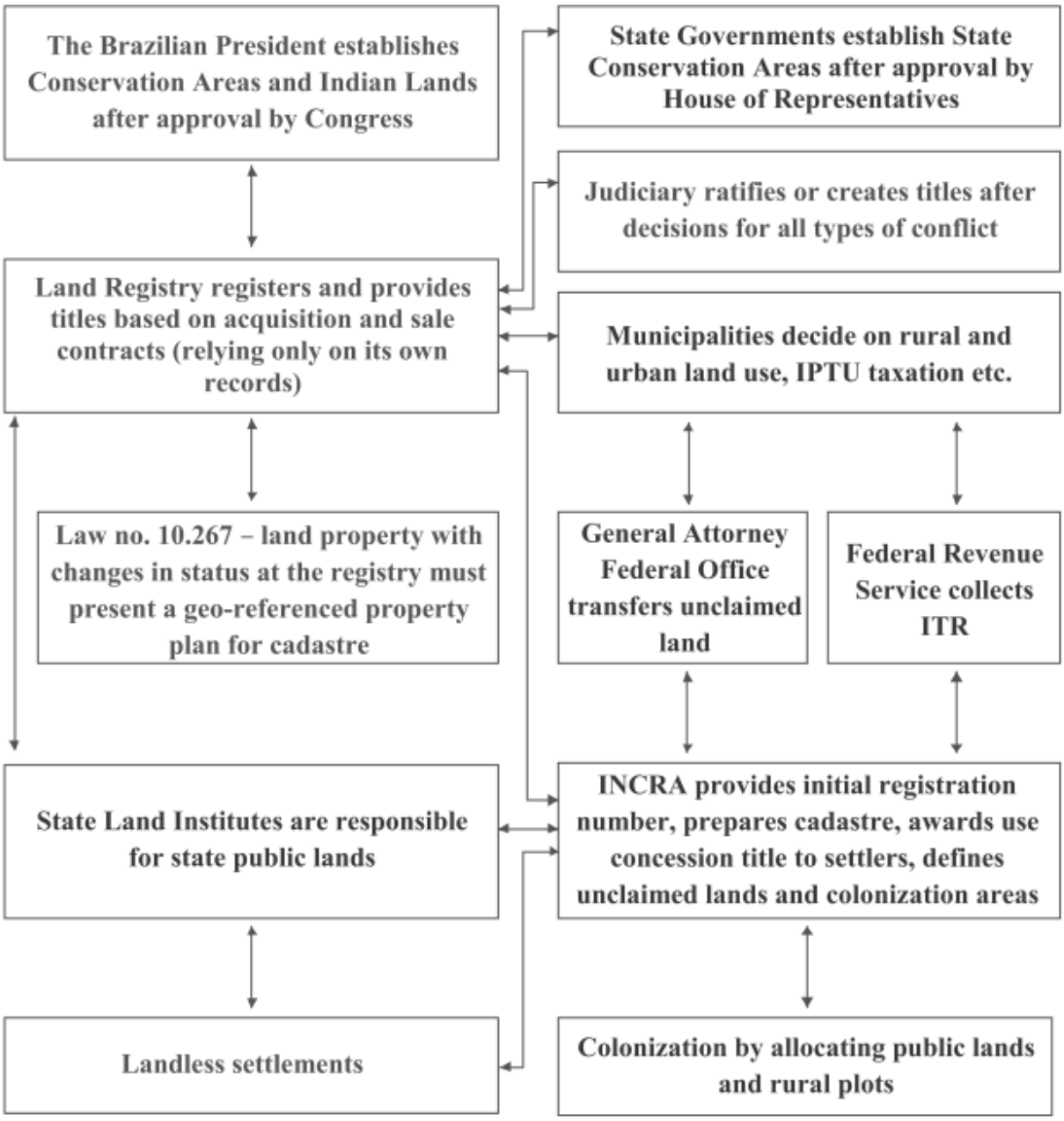
The Civil Code, therefore, through motives not necessarily linked to the interests of landowners, had the effect of establishing the great milestones in the institutionalization of land access in Brazil, by defining that the registration in property registries was required (sometimes it was also sufficient) to prove ownership. In a way, the registration at the registry office gave an air of legality to the property without there being any mechanism to guarantee it[12].

The big institutional innovation in the area of Agrarian Policy and Administration in Brazil is the Land Statute of 1964, whose rules and concepts continue to be valid to the present day. Therefore, to guide the implementation of agrarian and agricultural policy, the Statute of 1964 created the Rural Property Registration[13]. All private or public property should be registered, including squatter's possession. The owners should provide information on the situation of documentation and use of land (used to estimate productivity) in order to facilitate agrarian reform. INCRA, created in 1970, became responsible for the management of the National System of Rural Cadastre (SNCR), which maintained the Rural Property Registration. Once the property was registered, INCRA would issue a Rural Property Registration Certificate (CCIR) required for any type of land transaction. Squatters registered by INCRA also received the CCIR and would have to pay the Rural Property Tax, though the value of these taxes was always kept at a low level. The Land Statute once again maintained legitimacy of possession, thereby permitting entitlement to informally occupied public lands.

Diagram 1. Institutions responsible for Land Administration System in Brazil 2014

[12]The most common irregularities are the granting of titles for nonexistent or vacant properties and the superimposition of various areas, i.e. various owners having tile over the same land. When this occurs, it is said that the land has 'floors': for every owner with an irregular title in that area, an extra floor is added. The federal government is taking a decisive step in the regulation of the rural and urban land market by implementing, not without some difficulty, Law 10267/2001 in which the registry offices are obliged, whenever there is a change in property, to transfer it to INCRA on a plan with its boundaries in map form (latitude and longitude).

[13] As the 1967 registration and subsequent re-registrations were for fiscal purposes (ITR) based on the declarations of the landowners and were not audited, this is not very reliable as was shown in the study by Sabato (2003), based on information arising from Decree 558/98. Other recent attempts to integrate the cadastres of the various public agencies in order to improve the quality of information, have failed on account of the absence of political will and of an agency that is prepared to take on the role of carrying out agrarian governance in the country.



Source: Reydon, Fernandes, Telles (2015).

Diagram 1 aims to summarize, from a schematic point of view, the interrelationships between agencies in the Agrarian Administration system in Brazil. One can see that there are no links between INCRA and the municipalities, causing many agrarian problems in the linkage between rural and urban lands. Moreover, there is no single institution that centralizes the registration and provides a link with the Judiciary bodies responsible for property entitlement. It does not appear in the chart, but a large part of agrarian problems in Brazil, both rural and urban, when not resolved in the administrative domain, end up in court, and this, as there are a lot of cases in the various courts, ends up taking years to process, meaning that land-related cases, whether rural or urban, are tried as *faits accomplis*.

Therefore, the big problem with deforestation in Amazonia is associated with the absence of agrarian governance in the country, resulting from the historical process of the construction of a legal and institutional framework that is inadequate to this end. Only with the construction of

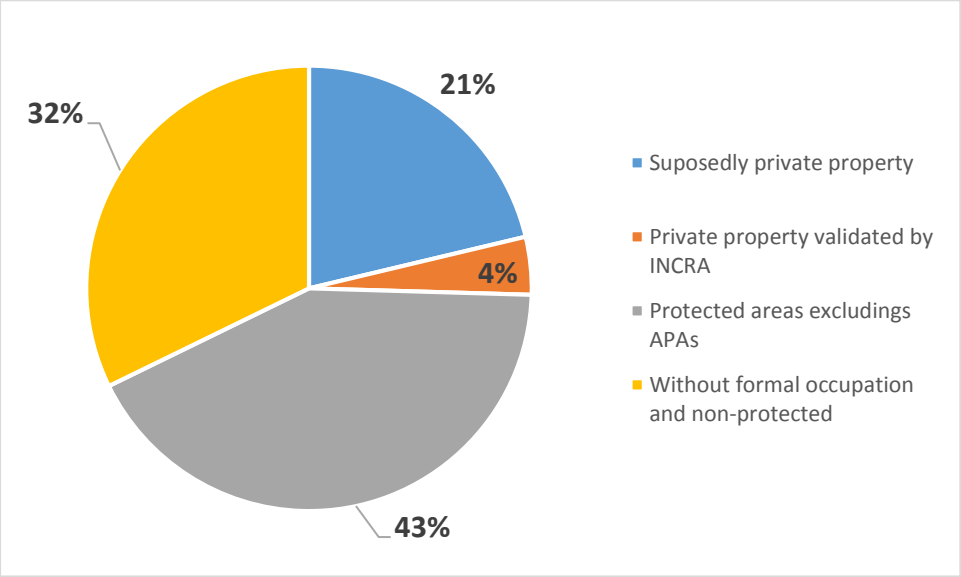
an institution whose goal is to improve the land governance and build an appropriate legal framework in Brazil it will be possible to reduce deforestation and have an adequate use of the soil in the country.

5. LAND APPROPRIATION IN AMAZONIA AND THE INSECURITY OF PROPERTY RIGHTS

The practice of land appropriation can be witnessed with the absence of registration and an effective regulation of land property in Brazil and particularly in Amazonia. Existing registration data, based on the declarations of landowners registered with INCRA, show that in 2003, 35% of the 509 million hectares of land in the Legal Amazon were occupied under the right of private possession, either as registered property or as possession. On the other hand, the recent process of creating Federal or State reserves of different types means that today 42% of the Legal Amazon is under some form of protection; approximately half of this area was Native Land and the other half Conservation Units of various types. The remaining 24% did not belong to any of these categories and therefore is technically considered to be unallocated public land (Figure 1).

The situation is more complex and uncertain than these numbers suggest. Much of the Protected Areas is physically occupied by private users whose claims to occupation may or may not be valid, depending upon the complex legislation presented. The large area described as private by the registration system is also questionable. Of the 178 million hectares declared as private property, 100 million hectares may be based on fraudulent documentation. A further 42 million hectares of this area are classified based on registry declarations as possession, which may or may not be capable of agrarian regularization, again depending on the circumstances of size, history and location[14]. Accordingly 30% of the area could be legally uncertain and/or contested.

Diagram 2. Legal status of land in the Amazon from data in the National System of Rural Cadastre (2003) and Protected Areas (2006).



[14]There are all types and sizes of squatters in the INCRA cadastre, both small holders with less than 200 ha and those with over 1,000 ha.

Source: Imazon (2009).

The Brazilian State is so aware of its inability to regulate the use of land, mainly as it does not have a Cadaster, that it was obliged to take the following concrete actions to reduce deforestation in the Amazonia and increase agrarian governance, albeit on an emergency basis without addressing the problem at its source:

a) It established Law 11952/09 regularizing possessions of up to 400 ha at no cost and selling possessions of between 401 and 1,500 ha (the squatters have to be able to prove they have lived on the land since 2004).

b) Creation of numerous environmental protection areas (APA) in the form of Conservation Units (based on Law 9985 of July 2000) for the protection of the margins of the main highways under construction in the Amazon region, in order to avoid appropriation and deforestation.

c) It created the Rural Environment Registration (CAR), under the auspices of the Forestry Code, to oblige owners to georeference their properties to try and identify the properties and their respective Legal Reserves;

The clearest evidence of the Brazilian State's inability to provide effective governance of the land market is the publication of Directive 558/99, applicable to all Brazilian territory and not just the Legal Amazon. With this directive, INCRA imposed on all owners of property with over 10,000 hectares the need to submit documentary proof. Of the 3,065 owners called upon, only 1,438 (46.9%) appeared, meaning that 1,627 properties had their registration canceled, amounting to 46 million ha[15]. In addition, 53% of the area of these properties lies in the states of the northern region of Brazil, mostly in the Amazon forest. In the state of Amazonas alone, according to Lima (2002), the equivalent of 48.5 million hectares of property, registered with the respective land registry offices at the start of 2000, were canceled in 14 districts. There have also been academic studies, like the one by Araújo et al (2008), that have evidenced from municipal data that the largely insecure property rights, as in Amazonia, have had a positive impact on deforestation.

6. DEFORESTATION AND LAND SPECULATION

It is our understanding that the deforestation of Amazonia is a product of the continuation of the traditional form of expansion of the agricultural frontiers in Brazil which generally occurs by way of the following steps: the occupation of virgin land (private or public), the legal extraction of timber, the introduction of livestock farming[16] and, finally, the development of a more modern forms of agriculture. These economic activities exercise the role of generating income and legitimizing the occupation of the new owners in the short term, almost without the need for any resources[17]. In the long term, the lands either remain under more intensive

[15]See Sabatto (2003) for further details.

[16] Reydon and Romeiro (2000) show that the main driver of conversion to agriculture is, on the one hand, the existence of a lot of vacant land that can be appropriated, combined with the possibility of introducing agricultural farming, at low cost, turning deforestation into an unbeatable capital appreciation strategy.

[17] It is these occupiers that frequently make use of slave labor.

livestock farming or, if the demand exists, they will be converted to grain or another economic activity.

The most important factor is that there is an expectation that there will be demand for this land[18], to be used at some future point in time, meaning that its price is significantly increased. The closer the land is physically to the regions that permit productive use, the higher the price. The appreciation in the value of these lands will occur as these expectations increase.

In the studies conducted by Margulis (2000 and 2003), and in the literature already cited, the question of land speculation appears, but it is usually associated with increases in land price. However, the increase in land price does not necessarily mean that a speculation process is underway. In this regard, the price of land in the northern region, roughly speaking, tracks the movement in land price in the rest of the country and does not generate substantial speculative gains.

Land speculation which, as this article proposes, is the driving force of the deforestation of the Amazon forest, occurs in a far more microeconomic way and is associated with the actual occupation of land, and can be seen very clearly in the field research. In reality, what happens is that anybody who acquires or occupies the land that includes forest, has a clear understanding that his land, his investment, will grow in value with the deforestation process. Table 1[19]shows initially that the price of forested land ranges, in the different states, from R$108 in Acre to R$546 in Mato Grosso. Here it can also be seen how the least deforested states have the lowest land prices, while the states of Mato Grosso, Pará and Rondônia have the highest prices.

The most important conclusion to be drawn from the table is that in all the states, deforestation always raises the value of property substantially, and in these states, on average, deforestation increased the value of land more than fourfold. This happens because the price of land is still essentially the product of expectations of productive gains arising from the associated agricultural activity and in deforested areas it can be used immediately without the costs involved in clearing the forest.

In the most extreme case, in Acre, deforestation multiplies this value more than 14 times, while in the state of Amazonas, the multiple is almost 10 times. Very few investments have such high returns as these.

It should be borne in mind that these owners, in addition to the increase in net worth occasioned by deforestation, also make gains from the sale of timber (in Cotriguaçú, in Mato Grosso, net returns in the order of R$2,400 per hectare are estimated) and also from its subsequent economic use (if this is due to livestock farming, it will generate additional net revenue of over R$120 per hectare per year[20]).Therefore the best catalyst of deforestation is the combination of gains from the appreciation of the land, its conversion from forest to productive land, associated with gains from timber and livestock farming, established in subsequent periods.

Table 3. **Average prices of forest and pasture land** – states comprising Amazonia- in R$ per hectare in 2015

[18] This arises as a result of the increase in the price of an arroba of beef cattle, soy or even the announcement that the country is to be the largest producer of alcohol in the world. In recent periods, these factors have converged, making demand for land, and its price, grow even more, putting ever more pressure on deforestation.

[19]The Agra FNP methodology is to collect average prices inhomogeneous regions in the cited states using a non-uniform terminology. To forest we add so-called forest, forests that are easy to access and those that are difficult to access. For pasture land we use formed pasture (easy and difficult access), formed high-maintenance pasture and formed low-maintenance pasture.

[20]See Margulis (2003).

STATES	Forest R$/ha	Pasture R$/ha	encrease %
Acre	534,25	3.246,80	608%
Amapá	470,00	1.006,50	214%
Amazonas	574,33	1.448,38	252%
Pará	1.715,09	2.976,84	174%
Rondônia	2.453,40	7.288,89	297%
Roraima	817,00	1.277,50	156%
Mato Grosso	3.005,8	6.906,2	230%
Average NORTH	1.367,12	3.450,16	252%

SOURCE: FNP 2016

This process of acquisition and deforestation, which is already extremely profitable in private areas, is becoming much more lucrative in vacant lands which, according to estimates[21], represents 42% of the total area of Amazonia, where the majority of deforestation takes place. This means that on appropriating vacant lands, the gains from timber, livestock farming and the appreciation of the land are multiplied as the land in itself did not need to be acquired, simply usurped from the public property[22].

7. THE NEED FOR LAND GOVERNANCE[23] AS A PREREQUISITE FOR THE REDUCTION IN DEFORESTATION

Agriculture in Brazil is exemplary, with growth in food production, supply of energy and foreign currency earnings, greater inclusion internationally, amongst others. Nevertheless, the security associated with land ownership remains a big problem, particularly in Amazonia. The solution to this requires adequate, participative agrarian governance, according to FAO (2007) and Deininger et al (2010), amongst others.

The benefit to be obtained from an adequate system of land management depends on the clear identification of registered properties and a simple, effective mechanism to obtain the information and keep it up-to-date. This process needs to be started without depending on title information or other forms of formal documentation that can be used whenever property disputes arise.

Only with the effective governance of the land, particularly the creation of a modern, self-perpetuating register will it be possible to:

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[21] Estimates by Shiqui (2007) show that 42% of land in Amazonia is vacant land.

[22] Perhaps some expense incurred on hired thugs, weapons and the legal and illegal costs of regularizing the area.

[23] FAO (2008:9) operates with an adequate definition of agrarian governance: "We shall adopt as the starting point the conceptual definition proposed by the FAO in its recent analysis on this topic: 'Governance is the system of values, policies and institutions by which a society manages its economic, political and social affairs through its interactions within and between the state, civil society and the private sector. Land governance concerns the rules, processes and organizations through which decisions are made about access to land and its use, the manner in which the decisions are implemented and the way that competing interests in land are managed'."

a) Guarantee the rights of private property for different ends: business, leasing, credit guarantees, for the granting of payments for environmental services, amongst others;

b) Identify public land and guarantee its adequate use for: creation of reserves, settlements or colonization;

c) Establish other agrarian policies with greater security: agrarian reform, agrarian credit, taxation of land;

d) Regulate the land purchase processes to: limit access to foreign stakeholders, owners who already have a lot of land or other owners;

e) Zone the use of land– establish and regulate by imposing limits through Zoning, agricultural and livestock production in specific regions. Establish protected areas and prohibition of deforestation;

f) Regulate the processes of conversion of agricultural land into urban land and therefore establish a register for the collection of taxes on property (IPTU and ITR);

Agrarian governance will not solve the problem of deforestation in Amazonia, but it is a prerequisite for addressing the problem. As for the vacant lands, registration, by permitting the State to identify and control them will make inappropriate private appropriation and deforestation very difficult. It will also make it possible to use these vacant lands in the execution of agrarian policy in Brazil, through organized colonization, agrarian reform and others.

On private land, effective, participative governance will, based on knowledge of the actual situation, allow for a discussion of priorities for use and adequate enforcement, planning and regulation of soil use. Moreover, through zoning and other compulsory tools, it will prevent deforestation and will certainly limit land speculation, which is the main cause of deforestation.

8. RECENT ADVANCES IN LAND GOVERNANCE AND IN THE AMAZON REGION

With the incentive of the FAO Voluntary Guidelines land administration and land governance is improving much in Brazil trough actions related to public and private land. The main advances are taking place are the: a) improvements of the cadaster[24] efforts based on the law 10.267/2001; b) regularization of land ownership, urban and rural. For the purpose of this paper will only be analyzed what has had an impact in the Amazon region.

8.1. Land cadaster in Brazil CNCR, SIGEF

The enactment of Law 10,267/2001 created to CNIR (National Cadaster of Rural properties) a georeferenced cadaster. The procedure is to obligate the owner to georeference its property when registering any change in it at the notaries. This georeferenced information would be send to be integrated to INCRA and the RFB (Receita Federal - Federal Income Tax agency) existing main cadasters (SNCR and CAFIR).

As Reydon *et al* (2013) showed only around 2010 the system started to have some progress in the cadaster of private properties and the land ownership mosaic begun to be formed. But in

[24] The new environment Cadaster (CAR) and its system SICAR is also part of that but will not be analyzed here.

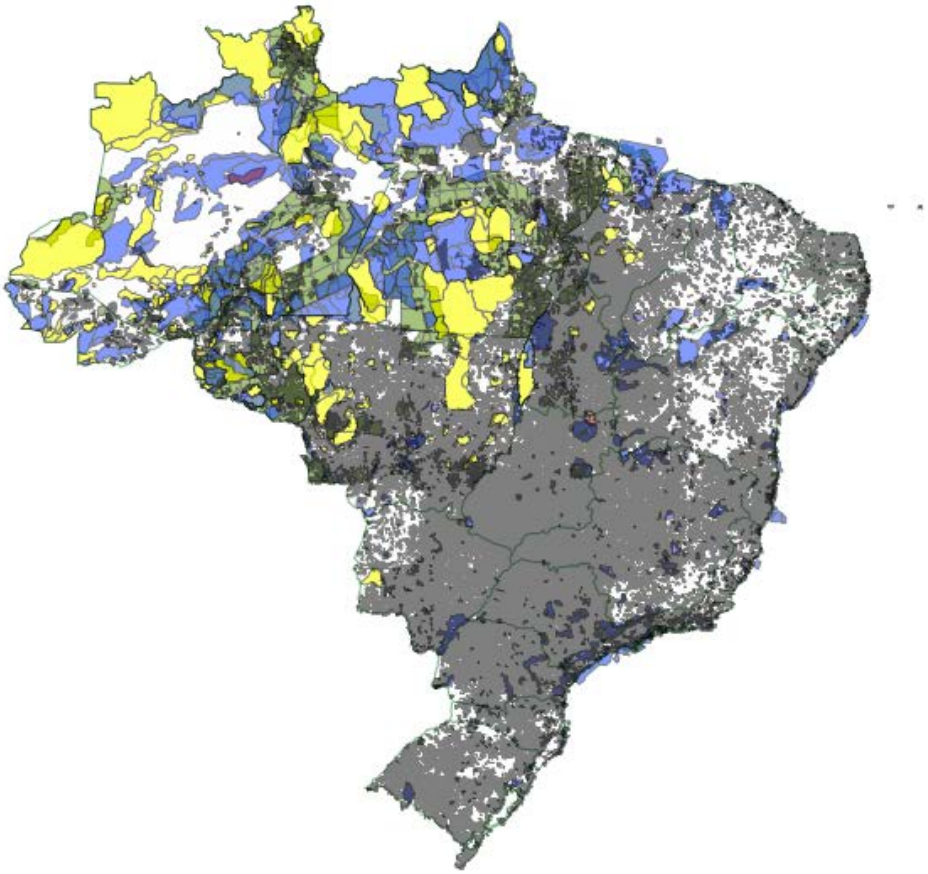
2013 an important innovation happened linked to the Terra Legal was designed: the Land Management System - SIGEF (Sistema de Gestão Fundiária). The SIGEF is an electronic tool developed by INCRA and MDA, which automatized the procedures and since than the cadaster has mapped already 61 % of the Brazilian.

INCRA's Land Data Collection (Acervo Fundiário) is a visualization tool that allows the general public access to downloading and visualizing 3485 million hectares of georeferenced parcels (public and private). Summed up with the information from other government agencies (FUNAI – indigenous land, ICMBio – federal and other protected areas, for instance) this area reaches up to 522.4 million hectares or 61.3 % of the Brazilian territory, excluding overlaps.

The Map 2 below illustrates the dimension of the certified parcels (public and private) in Brazil and the table 4, below shows the data on the Land Data Collection (Acervo Fundiário/INCRA) related to the georeferenced parcels.

The advances demonstrated are significant to improve the Brazilian land governance; nevertheless, the main question unsolved is the consolidation of the CNIR and the practical integration of all the cadasters related to land – i.e. building a integrated consolidated cadaster.

Map 2. Public and private parcels georeferenced at the CNIR Cadaster 2015



Source: Acervo Fundiário
INCRA/MDA

Table 4. Cadaster information available – Brazil 2016

INCRA CNIR Consolidated			
INCRA own information			
TYPE	**Properties**	**Área (ha)**	**%**
Settlements projects	7,796	76,907,385.5915	22.1
Tradicional people´s land - Quilombola	312	2,323,928.4275	0.7
Certified Public Properties Number/Area	9,800	86,554,346.3380	24.8
Certified Private Properties Number/Area	263,038	178,342,807.0506	51.2
Agreements of Land Regularization	107,853	4,335,993.9629	1.2
subtotal	**388,799**	**348,464,461.3705**	
BASE ACESS OF ENTTITIES PARTNRES			
TYPE	**Properties**	**Área (ha)**	**%**
Indegenous people´s land	588	116,625,185.0128	18.1
Conservation Areas UC	1,481	152,029,511.1307	23.6
Geo reference Polygons of SRA	80,041	3,254,260.6942	0.5
Geo reference Polygons of Terra legal Program	148,969	23,976,310.1240	3.7
subtotal	**231,079**	**295,885,266.9617**	45.9
Total Geral	**619,878**	**644,349,728.3322**	
	Área líquida no acervo:	**522,397,153.39**	61.3
	Área liquida (257,5 mi) mais certificados (264,8 mi)		
Total Area of Brazil		**851,576,700.0000**	
Sorce: INCRA acervo fundiario September 2016			

8.2. Land Destination and the Terra Legal Regularization Program

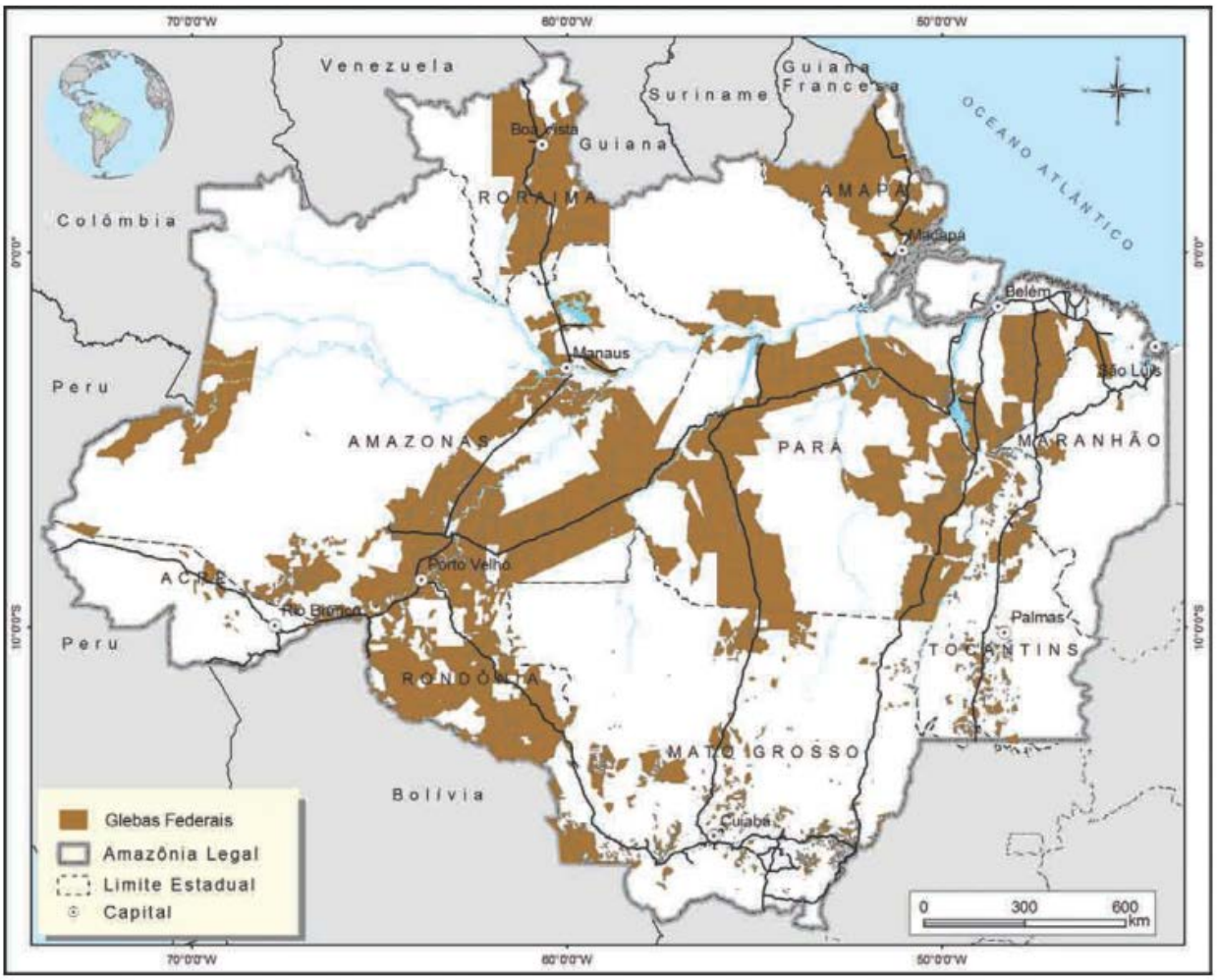
The Terra Legal (Legal Land) federal program was designed to tackle problems related to the large amount of land with no clear property rights, mostly through land regularization of private land and destination of land to public uses. The Law 11,952, passed in July 25 of 2009, provides on regularization and titling of individual or familiar land holds on federal public land located in the Legal Amazon territory.

First of all, the law requires the Agrarian Development Ministry (MDA) to transfer the lands without destination to the municipalities, provinces and other federal institutions for regularization of urban plots, indigenous lands, protected areas, land reform settlements, *quilombola's* settlements and other public interest ends. For this purposes the law also created the Legal Amazon Land Regularization Special Office (Serfal), under the MDA hierarchy.

The main purpose of Law 11,952 is the regularization and titling of landholders without legal titles (adverse prescription) up to 15 fiscal modules (the maximum size varies depending on the municipality, but the limit is 1,650 hectares, for a fiscal module of 110 hectares). The basic requirements are that the landholder cannot have other land titles and must, to receive the title, have its land under productive use.

Initially, the federal government forecasted the titling of 300 thousand rural and urban land occupants during a 3-year period in 463 municipalities located on the Legal Amazon. This represents 67 million hectares of public land that could be destined to landholders via regularization – equivalent to the area of Germany and Poland together or 13.42% of the Legal Amazon area (Oliveira, 2013, p. 69). Figure 1, below, illustrates the location of these federal lands.

Map 3. Federal public lands in the Legal Amazon



Source: Brito, Barreto (2010).

Until now, the main actions developed by Serfal was identifying, georeferencing and digitalizing the federal land, as determined by Law 10,267/2001, because this information was not available. Data from Legal Amazon Land Regularization Special Office (Serfal, 2015) shows that between 2009 and 2015 already a grand total of 113 million hectares of federal public land in the Legal Amazon were identified, around 51 million were georeferenced and certified and 29.7 million ha were registered at the register offices, as can be seen in table 1. The same table shows that from the total land of Terra Legal about 58 million hectares (51.3%) has been destined, 21 million (36.2%) of this has been georeferenced and 11.4 million (19.7%) is registered at the cartorios. Table shows that from the land yet to be destined 30 million ha has been georeferenced and certified (54%) and 29.7 million ha has been registered (33.3%).

Table 5. Federal public land destination in the Legal Amazon, 2015. (all in million)

	Hectares	Hectares Georeferenced and certified	Hectares registered at the land notaries
Federal public land destined	58	21	11.4
Federal public land yet to be destined	55	30	18.3
Total	113	51	29.7
Legal Amazon total area	**501.6**		

Source: Serfal, 2015.

Analyzing the results from 2009-2014, the Terra Legal program georeferenced almost 10 million hectares of federal public land in the Legal Amazon, for a total of 51 million hectares of federal public land georeferenced (45% of the total federal public land in the Legal Amazon). Also, 11 million hectares of land was titled through regularization in this period, representing almost 17% of the initial forecast (56 million hectares). Even with the great increase of titles emitted in 2014, we can see that titling is underperforming through the total number of titles emitted contrasted with the initial forecast.

Table 6: Areas assigned and titles emitted by Terra Legal

LAND ASSIGNMENT *(destinação)*	**Million ha**	**%**
Federal lands assigned by TL until January 2016	38,202,778	67.50%
Federal lands assigned by TL to FUNAI (indigenous land)	*2,292*	*0.00%*
Federal lands assigned by TL to INCRA	*92,047*	*0.20%*
Federal lands assigned by TL to SPU	*55*	*0.00%*
Federal lands assigned by TL to MMA (conservation units)	*6,271,543*	*11.10%*
Federal lands assigned by TL to MDA (land reform / tenure regularization)	*31,836,841*	*56.20%*
Land currently being studied by TL	8,288,868	14.60%
Land yet to be consulted	6,808,354	12.00%
Assigned federal lands before entering into force of CT	2,000,000	3.50%
LAND TITLES EMITED *(titularização)*		
Land titles emitted until January 2016	1,300,000	2.30%
TOTAL FEDERAL LANDS IN THE MANDATE OF TERRA LEGAL	**56,600,000**	**100%**

Source: Duchrom (2016)

These results, eventhougth being below the aim of the program, shows that this is the way forward. There is a large need for more regularization, but this is to occur on public land from the federation states[25].

9. FINAL REMARKS

This articles started debating the main causes of deforestation in the Brazilian Amazon forest. Demonstrating that states with most increase in deforestation are the expected ones: Para and

[25]In the last year some progresses in this field took place, as meetings of the representatives of the State Land Institutes and other ministries related to land issues created the Cartas of Palmas, some principles to be followed by them. For more information see Duchrom (2016).

Mato Grosso. The other important conclusion is that most deforestation, at least in the years of 2012 and 2013, occurred in direct or indirect controlled by the state. The fourth and fifth items showed that this deforestation comes from the lack of adequate land administration/governance system in the country that has created very insecure property rights mostly from the public land that is grabbed and deforested. The sixth item showed that besides the macro determinants for deforestation there is a micro determinant that is the speculation with land and the large increase in its value that comes from its deforestation. The eighth item shows the large improvements that the land administration/governance has had in Brazil, mostly through the new cadaster (CNI with SIGEF) that has been created and the experience of regularization of public land in the Amazon region through the Terra Legal.

From all this it is clear that to diminish more the deforestation in Brazilian Amazon improvements in the Land Administration/Governance System are needed. The cadaster has to be completed and integrated also with CAR. The regularization of ownership similar to the Terra Legal has to continue and amplified to public land form the States. As has been proposed with a good cadaster land taxes can be improved to diminish speculation and with all this a control over forested land is much more effective to even use the law of environmental crimes.

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Technical Session A3

Land consolidation for environment and climate issues

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Changes resulting from land consolidation project (LCP) and its effects

Zhengfeng Zhang, China

Abstract: Land consolidation (LC) is currently essential for ensuring rural development and for increasing land use effectiveness. In order to increase available cropland area, reduce fragmentation and promote agricultural productivity, LC has been implementing in China since the mid-1990s. This paper, taking the land consolidation project of Tianmen City of Hubei Province in central China as the study area, focus on the changes of plots size, plots shape, the density and connectivity of field-roads, the density and connectivity of irrigation systems, area of cropland and land use types in consolidation region between pre-consolidation and post-consolidation, then discusses the effects of LCP. The results show there are both positive effects and negative effects of LCP execution in the study area. The total score of agricultural productivity in the consolidation region was increased by 37.38, which represents agricultural productivity was improved immensely after LC. The numbers of plots per household was decreased from 2.69 to 1.25, which represents that LCP execution can centralize scattered household plots so farmers can reduce time spent on moving among plots. The tillage time was also decreased from 65 min/ha before LC to 50 min/ha after LC, at a decreasing rate of 23.08%. However, the total ecosystem services value of consolidation region was decreased by 0.55 million Chinese Yuan/yr, which caused by the value decrease of ponds and unused land was offset by value increase in cropland. Analysis of the changes resulting from LCP execution and its effects will help to improve the methodological principles underlying LCP, and it will also support the decision-making processes of the LC authorities.

Keywords: Land consolidation project; land use type; plot size; agricultural productivity; ecosystem services value

1. Introduction

Land consolidation (LC) is a tool for improving the effectiveness of land cultivation and for supporting rural development (Petr, 2006). It is also a very useful tool for facilitating environmental management (Gonzalez et al., 2004; Crecente et al., 2002; van Lier, 2000) and other social and economic issues in managing the development of rural areas (Wittlingerova and Kriz, 1998).

In the late 1970s and the early 1980s, Household Responsibility System replaced the less efficient Commune System in China. Although the HRS had greatly improved agricultural productivity in the early years (Tan, 2006), it had resulted in many problems in recent years. These problems has not favored rational land use and mechanization of agriculture, and has made agricultural problematic. The basic features of these problems are:

- land fragment,
- small plots and unsuitable plot shapes,
- some idle lands in cultivated area,
- a deficit in irrigation management systems and drainage systems,
- inaccessibility of field-roads,
- plots belonging to the same household are scattered over numerous non-continuous plots.

In order to increase cropland area, reduce fragmentation, rationalize plots size and shape, improve agriculture infrastructure and promote agricultural productivity, LC has been implementing in China since the mid-1990s. The first set of the government invested LCP started in 2001. By the end of 2007, 3,054 LCPs had been funded by the Land Resources Ministry and the Finance Ministry in China. The total areas of these projects were 24,900 km^2, resulting in an increased cropland area of 4500km^2 (Yu et al., 2010), which exceeded the areas damaged by disasters and the areas occupied by built-up in the same period. These practices effectively protect the food security of China.

In China, LCPs are most often associated with government-funded engineering works. There are four main engineering works of LC in China. The first type amalgamates small plots into large plots by taking out the small ridge of earth that typically divide plots of land in China to increase the available cropland area and to remove obstacles to the use of agricultural machinery. The second type of engineering work is the construction of agricultural irrigation and drainage systems. The third type is the construction of field- roads. The fourth type plants trees to protect the fields from wind erosion. So these engineering works result in the changes of available cropland areas, plots shape and size, infrastructures situations and land use types in the LCP region. Moreover, these changes bring wide and profound influences to the region ecosystem and socioeconomic system. Analysis of the changes resulting from land consolidation project execution and its effects will help to improve the methodological principles underlying LCP, and it will also support the decision-making processes of the LC authorities.

2. Materials and Methods

2.1 Study area

The study area is situated in Tianmen City of Hubei Province in Central China. The region of this LCP can be characterized as hilly landscape, with an average annual precipitation of 1108mm. The project region involved a total area of 691ha with the cropland area of 427ha. The annual income per capita is 3205 Chinese Yuan (about 465 US Dollars).

This LCP of Tianmen City was funded by Land Consolidation Center of Hubei Province in 2003 and accomplished in 2006. Due to LCP execution, cropland area was increased from 427ha to 546ha and the available land ratio was increased from 87.04% to 94.11% in the consolidation region.

2.2 The changes resulting from LCP execution

Generally, the changes resulting from LCP execution can be split into six main categories:

- available cropland area;
- plots size and shape;
- field-roads quality and accessibility;
- density and connectivity of irrigation systems and drainage systems;
- land use types; and
- numbers of plots per household in LCP region.

2.3 The effects of LCP execution

The expression "LCP effects" has two interpretations: one is the rate of consolidation as the difference between the pre-consolidation and post-consolidation situations; another emphasis only on the post-consolidation state according to absolute values (Petr Sklenicka, 2006). In this study, we use the first expression to represent the effects of LCP.

As the changes of LCP mentioned above are not independent, the effects of LCP execution result from one change at a time or several changes. In this study, the effects of LCP were classified into four main categories as below.

2.3.1 Agricultural productivity

Changes in plots size and shape, field-road quality, connectivity of irrigation systems and drainage systems, have a strong effect on agricultural productivity in the LCP region. In this study, the Integrated Index of Agricultural Productivity (*AP*) was defined in Eqs.(1) to evaluate the integrated influences of LCP on agricultural productivity.

$$AP = \sum_{i=1}^{n} W_i U_i \tag{1}$$

Where *AP* is the integrated index of agricultural productivity, W_i is the weight of index or factor "*I*"; U_i is the score of index, and *n* is the total numbers of index.

In this study, 8 indices are selected to constitute the framework of agricultural productivity evaluation, including plots, agriculture infrastructure and water resource factors. These 8 indices are defined in Table 1.

Table 1 The index framework for agricultural production capacity evaluation

Factor	Index	Definition
Plots (C_1)	Plots Fragmentation Index (U_1)	The ratio of the numbers of plots to the total area of LCP [plots/km^2]
	Plots Shape Index (U_2)	The ratio of total plots boundary to the square root of the total plots area and adjusted by a constant
Agriculture infrastructure (C_2)	Field-roads Density (U_3)	The ratio of field-roads length to the total area of LCP [km/km^2]
	Field-roads Connectivity (U_4)	$U_4 = \left[\frac{\sum_{j=k}^{n} F_{jk}}{\frac{n(n-1)}{2}} \right] \cdot 100$. Where F_{jk} is the connecting state between field-road "i" and "j" (connection is 1; disconnection is 0), and n is the numbers of field-roads.
	Density of Irrigation Systems and Drainage Systems (U_5)	The ratio of irrigation systems and drainage systems length to the total area of LCP [km/km^2]
	Connectivity of Irrigation Systems and Drainage Systems (U_6)	$U_6 = \left[\frac{\sum_{j=k}^{n} D_{jk}}{\frac{n(n-1)}{2}} \right] \cdot 100$ Where D_{jk} is the connecting state between irrigation and drainage system "i" and "j" (connection is 1; disconnection is 0), and n is the numbers of irrigation and drainage systems.
Water resource (C_3)	Water Resources Supply and Demand Balance Index (U_7)	The ratio of obtainable water supply to the water demand in the LCP region [%]
	Assurance of Irrigation Design (U_8)	The ratio of the number of years the crop irrigation can be contented to the total number of years selected in this study in the irrigated region [%]

2.3.2 Ecosystem services value

Land use is a suitable environmental indicator, the expression of the result of human activity and natural resource utilization (Rafael et al., 2002). Changes of land use types in

LCP region may significantly affect the ecosystem processes and services that they provide. So ecosystem services value has been compared before and after LCP execution to evaluate the impacts of land use type changes in LCP region.

Costanza et al. (1997a,b) classified the global biosphere into 16 types of ecosystems and 17 types of service functions and then estimated their ecosystem services value. Based on Costanza et al.'s parameters, Xie et al. (2003) extracted the equivalent weight factor of ecosystem services per hectare of terrestrial ecosystems in China and modified the value coefficient of Chinese ecosystems .

Once the ecosystem services value of one unit for each land use type has been extracted, the services value for each land use type, and services function are given in Eqs. (2) and (3).

$$ESV = \sum(A_k \times VC_k) \quad (2)$$

Where *ESV* is the estimated ecosystem services value, A_k is the area and VC_k is the value coefficient (Yuan/ha/yr) for land use type "*k*".

$$ESV_f = \sum(A_k \times VC_{fk}) \quad (3)$$

Where ESV_f is the estimated ecosystem services value of function *f*, A_k is the area and VC_{fk} is the value coefficient of function *f* (Yuan/ha/yr) for land use type "*k*".

2.3.3 Numbers of plots per household

In China, Household Responsibility System (HRS) had greatly improved agricultural productivity in the early years; it had resulted in land fragment and some plots belonging to the household are scattered over numerous non-continuous plots. The numbers of plots per household (*N*) can be decreased via LCP execution. The numbers of plots per household are a simple but most likely a relevant criterion for the effect of LCP execution. Theoretically, maximum consolidation is achieved when each household had just one plot (N_{max}=1).

$$N = \frac{P}{H} \quad (4)$$

Where *P* is the numbers of plots and *H* is the numbers of households of LCP region.

2.3.4 Tillage time

Both plot size and plot shape is known to have a significant influence on the efficiency of the operations to which the plot is subjected, especially in the case of small plots (King and Burton, 1982). Gonzalez et al. (2004) proposed index (the Combined Size and Shape Index (*CSSI*)), which is essentially the average of two estimates of tillage time per hectare of useful surface area (*RT*), one based on plot size and the other on plot shape. It has been taken into consideration that land consolidation will be more feasible or cost-effectiveness increase with a higher size of the new parcels and a more favorable shape, as time employed for tilling

operations is minimized. In general, of course, plot tillage time is not the time required for operations other than tillage, but it is assumed to be approximately proportional to the times required for these other operations (Gonzalez et al., 2004). In this study, *CSSI* was used to evaluate the effect of the changes of plots size and plots shape. X.P. Gonzalez et al. (2004) defined *CSSI* as below.

$$CSSI = 1/2(a+b)RT^{*} \tag{5}$$

Where *RT** is the *RT* of S(P), the standard plot that is nearest in shape and size to P, and the factors *a* and *b* are designed to correct for discrepancies between P and S(P) in size and shape, respectively.

$$a = (A_{ub} - A)/(A_{ub} - A^{*}) \tag{6}$$

Where A_{ub} is a strict upper bound on plot size and *A** is the area of S(P). The upper bound A_{ub} should be chosen large enough to ensure that it really is larger than the area of any individual plot, but small enough for a not to be always very close to unity.

$$b = \left|AFF_{opt} - AFF + \delta AFF\right| / \left|AFF_{opt} - AFF^{*} + \delta AFF^{*}\right| \tag{7}$$

Where *AFF** is the areal form factor of *S(P),* AFF_{opt} is the optimal areal form factor, defined as that of the rectangular plot with maximum *UA/A* ratio (the 4:1 plot), for which *AFF* = 0.04; and $\delta : [0.039,0.041] \rightarrow [0, 0.001]$ is a function that is included to prevent b from becoming to small or too large.

$$AFF = A/P^{2} \tag{8}$$

Where *A* is the area of plots, and *P* is the perimeter of the plots.

Since the *CSSI i*s an estimate of tillage time per unit of useful area, it is applied to a multi-plot area such as a whole consolidation region by taking *UA* weight mean of the *CSSI* values of the individual component plots:

$$CSSI_{global} = (\sum_i UA_i CSSI_i)/(\sum_i UA_i) \tag{9}$$

Where the sum is taken over all the plots in the multi-plot area considered and the UA_i values required for this are previously estimated using the formula:

$$UA_i \approx A_i r_{F(i)}(A_i) \tag{10}$$

Where A_i is the total area of plot P_i, *F(i)* is its standardized shape, and $r_{F(i)}$ is a function giving the ratio *UA/A* as a function of *A* for shape *F(i)*.

3. Results

3.1 The changes resulting from LCP execution

In the study area, the area of available cropland was 426.80ha before LC and 545.51 ha after LC, increasing by 118.71 ha. The plots shape index was reduced from 30.8 before LC to 16.98 after LC, representing the plots shape become regular after LC. The field-roads density and the field-roads connectivity were increased from 6.43 to 8.26, and from 32.53 to 82.10 respectively, representing the field-roads quality and accessibility was improved after LC. Meanwhile, the density and connectivity of irrigation systems and drainage systems were increased from 2.67 to 11.93, and from 23.48 to 86.99 respectively, representing the irrigation systems and drainage systems in LCP region were all improved after LC.

Through LC the smallest size categories (< 0.3ha; 0.3-0.5ha; 0.5-0.7ha) and the largest size categories (2.0-4.0ha; > 4.0ha) were minimized, and the percentage of medium categories (0.7-1.0ha; 1.0-2.0ha) was increased.

Land uses data before and after LC is from Land Use Map and Land Use Planning Map of LCP. Cropland comprises the largest portion of the total area, 61.77% of the total LCP area. The area of cropland was increased at a rate of 27.81%. By contrast, the area of orchard and woodland was very small, only 7.70 ha and 13.82 ha before LC and the same after LC. The area of ditch and road was small too, only 17.41 ha and 9.12 ha before LC, 28.75 ha and 15.62 ha after LC, at a rapid increasing rate of 65.13% and 71.27% respectively. The most affected type was settlement, which shrank in area from 66.61 ha before LC to 9.88 ha after LC, at a decreasing rate of 85.17%. The area of pond and unused land is 59.96 ha and 89.57 ha before LC, 29.02 ha and 40.7 ha after LC, at a decreasing rate of 51.60% and 54.56% respectively. Changes of land use types in LCP region are showed in Table 2.

Table 2 Changes of land use types in the LCP region

Land use types	Before LC		After LC		Changes	
	Area(ha)	Ratio (%)	Area(ha)	Ratio (%)	Area(ha)	Rate (%)
Cropland	426.80	61.77	545.51	78.95	118.71	27.81
Orchard	7.70	1.11	7.70	1.11	0.00	0.00
Woodland	13.82	2.00	13.82	2.00	0.00	0.00
Settlement	66.61	9.64	9.88	1.43	-56.73	-85.17
Road	9.12	1.32	15.62	2.26	6.50	71.27
Ditch	17.41	2.52	28.75	4.16	11.34	65.13
Pond	59.96	8.68	29.02	4.20	-30.94	-51.60
Unused land	89.57	12.96	40.7	5.89	-48.87	-54.56
Total	691	100	691	100	—	—

3.2 The effects of LCP execution

The index value of U_1, U_2, U_3, U_4, U_5 and U_6 before and after LC is obtained based on Land Use Map and Land Use Planning Map of LCP with the scale 1:4000 using ArcGIS9.1 and Frastas3.3. The index value of U_7 and U_8 before and after LC is from the Report of

Planning and Design for LCP. The index weight is yielded based on the Analytic Hierarchy Process (AHP) to avoid arbitrary and subjective notation. The weight is showed in Table 3.

Based on the index value, index weight and index grading (Table 3), the total score of *AP* can be obtained (Table 4). The total score of *AP* was 41.58 before LC and 78.96 after LC, increasing by 37.38. The total score of C_1, C_2 and C_3 was risen from 9.96 to 12.64, from 18.72 to 50.42, and from 12.96 to 15.90 respectively.

Table 3 The index weight and grading of agricultural production capacity evaluation

Grading score and value Index	Weight	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
		[0, 20)	[20, 40)	[40, 60)	[60, 80)	[80, 100]
U_1	0.120	>4.0	[4.0, 2.0)	[2.0, 1.0)	[1.0, 0.4)	⩽0.4
U_2	0.080	>50.0	[50.0, 35)	[35.0, 20.0)	[20.0, 5.0)	[5.0, 1.0]
U_3	0.145	<2.0	[2.0, 4.0)	[4.0, 6.0)	[6.0, 7.5)	⩾7.5
U_4	0.125	<40	[40, 60)	[60, 75)	[75, 90)	[90, 100]
U_5	0.195	<2.0	[2.0, 5.0)	[5.0, 8.0)	[8.0, 10.0)	⩾10.0
U_6	0.135	<30	[30, 50)	[50, 70)	[70, 85)	[85, 100]
U_7	0.100	<0.5	[0.5, 1.0)	[1.0, 2.0)	[2.0, 4.0)	⩾4.0
U_8	0.100	<50	[50, 60)	[60, 75)	[75, 90)	[90, 100]

Table 4 The changes of agricultural production capacity in the LCP region

Factor	Index	Value		Score		*AP*	
		Before LC	After LC	Before LC	After LC	Before LC	After LC
C_1	U_1	1.64	0.76	53	64	6.36	7.68
	U_2	30.8	16.98	45	62	3.60	4.96
C_1 Total *AP*						**9.96**	**12.64**
C_2	U_3	6.43	8.26	65	90	9.43	13.05
	U_4	32.53	92.10	17	82	2.13	10.25
	U_5	2.67	11.93	25	83	4.88	16.19
	U_6	23.48	86.88	17	81	2.30	10.94
C_2 Total *AP*						**18.72**	**50.42**
C_3	U_7	2.16	2.91	62	69	6.20	6.90
	U_8	80	95	67	90	6.70	9.00
C_3 Total *AP*						**12.90**	**15.90**
Total *AP*						**41.58**	**78.96**

Ecosystem services value of one unit area of each land use type in LCP region was assigned based on the nearest equivalent ecosystems. For example, woodland equates to forest, and unused land equates to barren land. It is supposed that the services value of one unit area of orchard equals to the average services value of forest and grassland combined. The services value for settlement, road and ditch is zero.

By utilizing the value coefficients and areas of land use types, the total ecosystem services value and value of ecosystem services function type "f" in LCP region could be obtained before LC and after LC. These results are shown in Table 5 and Table 6.

The total ecosystem services value of LCP region was about 5.45 million Yuan/yr before LC and 4.90 million Yuan/yr after LC, decreasing by 0.55 million Yuan/yr. The decline in ecosystem services value caused by the value decrease in pond and unused land was offset by value increase in cropland.

The contributions of ecosystem functions to total value of ecosystem services before LC and after LC were ranked based on their estimated ESV_f. The shift in the contribution of each ecosystem function to the total value of the ecosystem services is presented in Table 6 by an upward arrow for increasing contribution and downward arrow for decrease in contribution.

Table 5 Changes of ecosystem services value in the LCP region

Land use types	Before LC		After LC		Changes
	ESV(10^3US$/yr)	Ratio (%)	*ESV*(10^3US$/yr)	Ratio (%)	
Cropland	414.3	47.9	530.2	68.0	115.9
Orchard	15.9	1.8	15.9	2.0	0.0
Woodland	42.9	5.0	42.9	5.5	0.0
Settlement	0.0	0.0	0.0	0.0	0.0
Road and Ditch	0.0	0.0	0.0	0.0	0.0
Pond	387.3	44.8	187.3	24.0	-200.0
Unused land	4.8	0.6	3.2	0.4	-1.6
Total	865.1	100.0	779.4	100.0	-85.7

The numbers of household in the study area were 420. The numbers of plots were 1133 before LC, and were decreased to 525 after LC. Then the numbers of plots per household was decreased from 2.69 to 1.25.

In the study area, we assume a fixed ploughing speed of 6 km/h and a plough width of 2m. And according to the Report of Planning and Design for LCP, the area of the standard plot (S(P)) is 4 ha (200m×200m). Based on Eqs. (4). through Eqs. (10), the *CSSI* value of the individual plots was computed and $CSSI_{global}$ value before and after LC was then obtained. LC reduced $CSSI_{global}$ value by about 23.08%, from 65 to 50 min/ha.

Table 6 Changes of ecosystem services value functions in the LCP region

Ecosystem service	Before LC			After LC			Tendency
	ESV_f(10^3US$/yr)	Ratio (%)	Rank	ESV_f(10^3US$/yr)	Ratio (%)	Rank	
Gas regulation	39.7	4.6	8	49.2	6.3	7	↑
Climate regulation	65.1	7.5	5	77.8	10.0	5	↑
Water supply	215.9	25.0	2	138.1	17.7	2	↓
Soil formation	98.4	11.4	3	122.2	15.7	3	↑
Waste treatment	255.6	29.5	1	203.2	26.1	1	↓
Biological control	76.2	8.8	4	74.6	9.6	6	↓
Food production	61.9	7.2	6	77.8	10.0	4	↑
Raw materials	12.7	1.5	9	14.3	1.8	9	↑
Recreation and cultural	39.7	4.6	7	22.2	2.9	8	↓
Total	865.1	100.0		779.4	100.0		↓

4. Discussion and conclusion

In the study area, the area of cropland was increased by 118.71 ha via LCP execution. The percentage of smallest size categories was minimized; however, the percentage of medium categories was increased. And the plots shape index was reduced from 30.8 to 16.98. All these facts showed LCP execution resulted in the increase of cropland area, the enlargement of plots size and the regularization of plots shape.

In China, the increase of cropland area is one of the most important objectives of LC. In the study area, cropland area was increased by two ways. The first way is to amalgamate small plots into large plots by taking out the small ridge of earth that typically divides plots of land to increase cropland area. The second way is to incorporate some underused land, pond and settlement in the consolidation region into cropland. So the area of unused land, pond and settlement shrank at a rate of 54.56%, 51.60% and 85.17% respectively.

In this study, the field-roads density, the field-roads connectivity, the density of irrigation systems and drainage systems, the connectivity of irrigation systems and drainage systems express the situation of the infrastructure in the LCP region. After LC, all of them were increased in different increasing rate, which represent that LCP execution can improve the accessibility of field-roads, extend the irrigation systems and improve the drainage system.

This study showed that both positive effects and negative effects were all found due to the LCP execution in the study area. Positive effects of LCP execution were demonstrated in agricultural productivity, tillage time and numbers of plots per household. The negative effect of LCP execution was demonstrated in Ecosystem Services Value.

In this study, 8 indices are used to evaluate the agricultural productivity before and after LC, including plots, agriculture infrastructure and water resource factors. The total score of agricultural productivity index was increased by 37.38. And the total score of plots, agriculture infrastructure and water resource were all raised. The results showed that agricultural productivity was improved immensely via LCP execution in the study area. According to Table 5, the total score of agriculture infrastructure was increased from 18.72 to 50.42 and its contribution to the improvement of agricultural productivity is 84.80%. The increased total score of plots and water resource was respectively 2.68 and 3.00, and their contributions are lower than agriculture infrastructure. The improvement of field-roads can facilitate farm operation and management including the fertilizing, farming, transportation of cropland materials and shorten the distance between field plots and farm buildings. It also can raise the degree of agricultural mechanization, thus the traditional framing modes were changed. The improvement and extension of the irrigation system can add available irrigated cropland since deficient irrigation systems are a common restriction to agricultural productivity in China. Meanwhile, the improvement of drainage system can reduce the probability of flood disaster occurrence. In line with these facts, agricultural productivity was raised after LCP execution. The lower contribution of plots and water resource to improve the agricultural productivity is attributed to the little gap of index value between pre-consolidation and post-consolidation. For example, the value of water resources supply and demand balance index was increased from 2.16 before LC to 2.91 after LC in the study area, only increasing by 0.75. And the value of Assurance of Irrigation Design was increased from 80% to 95%, only increasing by 15%.

Numbers of plots per household and tillage time were all positive effects of LCP execution. In this study area, the numbers of plots per household was decreased from 2.69 to 1.25, represents that LCP execution can centralize scattered household plots so farmers can reduce time spent on moving among plots. Theoretically, maximum consolidation is achieved when each household has just one plot (N_{max}=1). The numbers of plots per household before LC provides a good expression of the "consolidation potential" of the area, while the difference between the numbers of plots per household after LC and N_{max} can be referred to as the "unfulfilled consolidation potential" (Petr Sklenicka, 2006). The tillage time was decreased from 65 min/ha before LC to 50 min/ha after LC, at a decreasing rate of 23.08%. This fact showed that LCP execution can change the agricultural size and shape of the plots to make more efficient use of agricultural machine.

In the study area, ecosystem services value was the negative effect of LCP execution. The total ecosystem services value of LCP region was decreased by 0.55 million Yuan/yr, which caused by the value decrease of pond and unused land was offset by the value increase in cropland. The ecosystem services value of pond was decreased from 2.44 million Yuan/yr to 1.18 million Yuan/yr; its contribution to the total decrease of ecosystem services value is

98.44%. Ponds scattering in the LCP region are a typical landscape in the study area and play an important role in keeping balance of ecosystem. However, aiming to increase cropland area and improve cohesion of field-roads, irrigation water management systems and drainage systems, many ponds in the LCP region were incorporated into cropland. So the area of pond was decreased at a rate of 51.60%, which decreased the ecosystem service value by 1.26 million Yuan/yr. Meanwhile, due to the build-up of irrigation systems and field-roads using cement usually in China, the natural ecosystems was separated. The fragment of natural ecosystems as a result of inappropriate land consolidation has been recognized as one of the major causes of the decline of biodiversity, the others being wind and water erosion, and the lowering of the water table (Lisec et al., 2005).

Land consolidation project results in the changes of plots size, plots shape, density and connectivity of agricultural infrastructure, area of cropland and land use types, and brings wide and profound influences to region ecosystem and socioeconomic systems of the consolidation region.

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The State Land Office and Its Functions in the Rural Areas of the Czech Republic

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Key words: State Land Office, land consolidation, common facility plan

SUMMARY

The State Land Office of the Czech Republic was established on January 1st 2013 as an organizational unit of the Ministry of Agriculture by the Act no. 503/2012 Coll., about the State Land Office. The office fulfills three main agendas: restitution of agricultural and church property, state property management, and land consolidation.
Land consolidation in the Czech Republic is perceived as a multidimensional instrument for landscape planning, supporting sustainable development of rural areas. Land consolidation spatially and functionally arranges the land in public interest; consolidates or splits plots (parcels) while ensuring their accessibility; and provides conditions for improving the environment, land resources protection, water-management and improving the ecological stability of the landscape.
Drought has recently been introduced (alongside soil erosion and soil degradation) as the key topic which needs to be addressed by the State Land Office policies. New mitigating strategies will improve drought resilience by supporting irrigation and soil drainage infrastructure. Alongside these processes the emphasis is placed on the sustainable agriculture which significantly helps developing rural areas.
Land consolidation is perceived as a key tool for increasing drought resilience of the landscape through improved land management projects that include soft (soil management) and hard (infrastructure) measures.

The State Land Office and Its Functions in the Rural Areas of the Czech Republic

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1. INTRODUCTION

Development of rural areas in the Czech Republic has been influenced by many factors during the last 100 years.
From a historical point of view, the most significant changes happened during the period of communism between 1948 and 1989. This period was characterized by the suppression of property law of private persons and legal entities, when property including land was transferred to the state. Collective farms were established and many land plots were merged into large plots.
From the climate point of view, mean air temperature in the Czech Republic has increased by approximately 1,3°C in the last 150 years. Mean precipitation has remained the same, but the distribution has changed obviously. The Czech Republic encounters rainfalls of shorter duration and higher intensity. This causes not only flash floods, but also droughts (both agricultural and hydrological drought).
From the environmental perspective, more than 50% of agricultural land is affected by soil erosion and almost 50% of agricultural land by compaction. More than 40% of soils are affected by acidification. Soil sealing is reaching around 11–16 hectares/day.
At present state, from the ownership point of view, more than half of the land area of the Czech Republic is used for agriculture purposes. The dominant part of agricultural land, more than 3700 thousand hectares, is owned by private persons or different types of legal entities. A minor portion, about 320 thousand hectares (illustration 1), is owned by the state. Private persons manage only about 30% of agricultural land, while the remaining 70% manage legal entities, cooperatives and other companies that have leased the land from private persons. This means that the farming entity in majority is not the entity owning the land and hence has low intentions in preserving the soil.

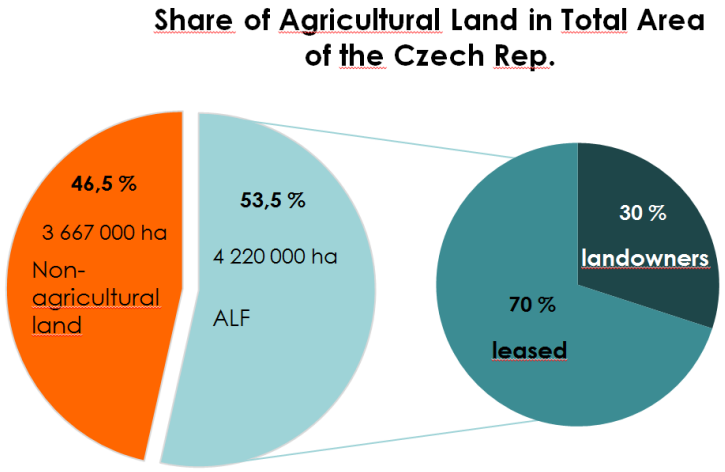

Illustration 1: Share of agricultural land

The factors mentioned above place high demands and priorities on the land consolidation process, which can help mitigate these negative factors. Land consolidation in the Czech Republic is administered by the State Land Office.

2. STATE LAND OFFICE

The State Land Office of the Czech Republic was established on January 1st, 2013 as an organizational unit of the Ministry of Agriculture by the Act no. 503/2012 Coll., about the State Land Office. It is endowed with national authority. The organizational structure consists of the main office, 14 regional Land Offices and 64 district Land Offices (see illustration 2).

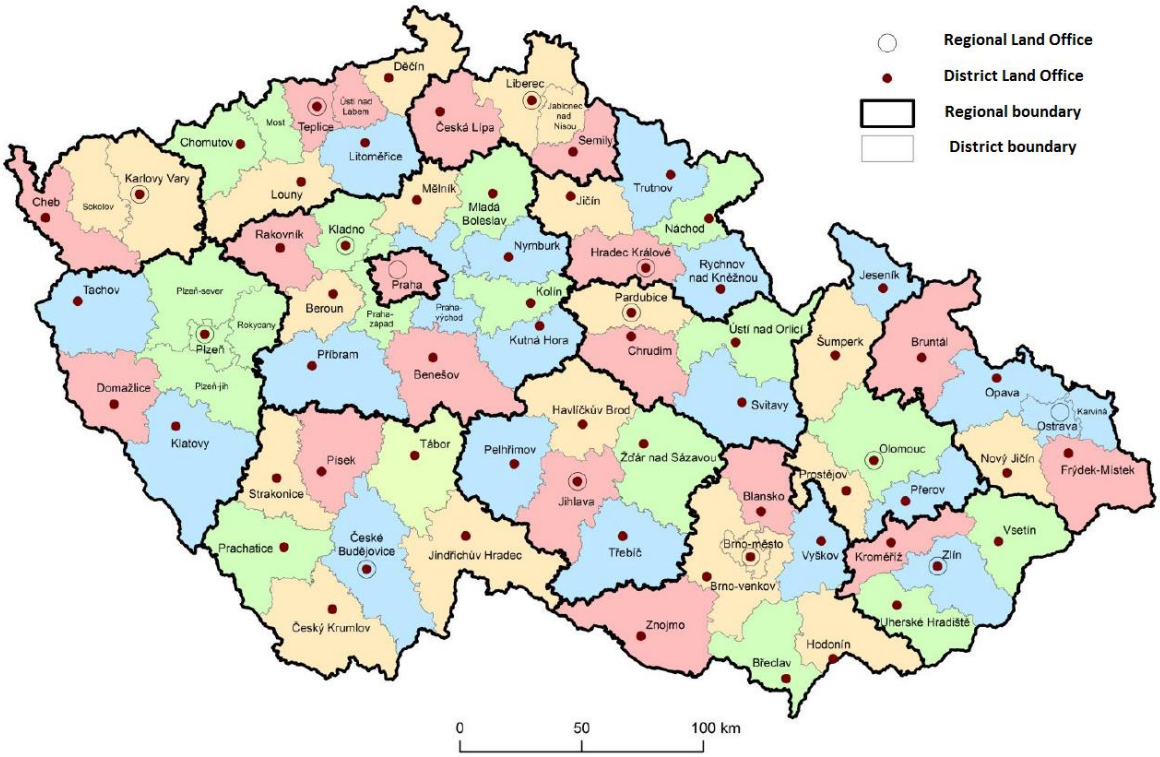

Illustration 2: Overview map of the State Land Office authority

The State Land Office fulfills three main agendas:

- restitution of agricultural and church property,
- state property management including privatization, property transfers, and management of small water management structures,
- land consolidation.

Restitution has been carried out during the last 20 years according to the Act No. 428/2012 Coll. on Property Settlement with Churches and Religious Institutions. Currently, this agenda is diminishing.
The agenda of state property management is based on the Act No. 92/1991 Coll. on the Conditions of Transfer of the State Assets to Other Persons and the Act No. 229/1991 Coll., on the Ownership of Land and Other Agricultural Properties. The State Land office

administers the agricultural land owned by the state as well as some small water management structures, such as main drainage channels and small water bodies.
Land consolidation is implemented by the Act. no. 139/2002 Coll., about Land Consolidation and Land Offices, and amending Act No. 229/1991 Coll. mentioned above, and according to the Decree implementing this Act No. 13/2014 Coll. Other applicable regulations are the Act No. 500/2004 Coll., Code of Administrative Procedure and the regulations related to the cadastre (Cadastral Act, Cadastral Regulation etc.).

3. LAND CONSOLIDATION IN THE CZECH REPUBLIC

Land consolidation in the Czech Republic is perceived as a multidimensional instrument for landscape planning, supporting sustainable development of rural areas. Land consolidation consists of spatially and functionally arranging land in public interest and consolidating or splitting plots while ensuring their accessibility. Land consolidation provides conditions for improving the environment, land resources protection, water management, and ecological stability of the landscape.
According to current legislation, land consolidation may take two forms:

- complex land consolidation, or
- simple land consolidation.

Simple land consolidation, unlike the complex one, deals with smaller areas and is often focused on some particular issue.
The whole process of land consolidation in the Czech Republic lasts an average of 4 to 6 years. The process consists of the following phases displayed in illustration 3 below.

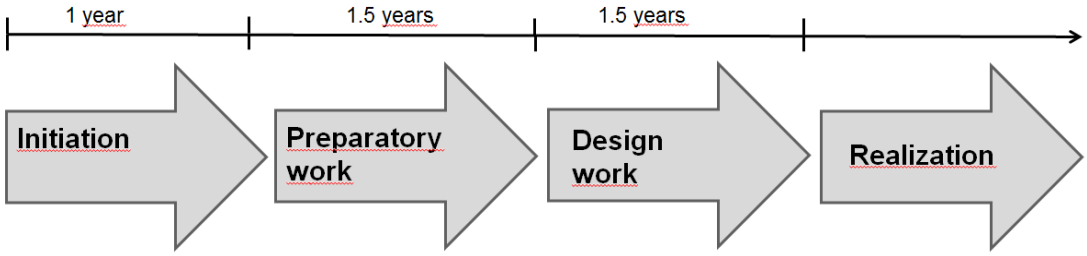

Illustration 3: Phases of land consolidation

3.1 Initiation

Land consolidation is initiated in the following cases:

- if more than 50% of acreage of owners in a particular cadastral unit apply,
- if municipality applies.

Land consolidation may be initiated:

- if external subjects apply (e.g. construction company),
- based on the initiative of the State Land Office.

3.2 Preparatory Work

Preparatory work includes:

- reconnaissance, measurement, restoration and establishment of geodetic points,
- survey (measurement) of the actual state of the area,
- definition of the perimeter of land consolidation,
- terrain analysis (morphology, hydrology, soil and erosion conditions)

- determination of owners' claims.

3.3 Design Phase

During the design phase, a proposal of the Common Facility Plan is created and discussed. The Common Facility Plan is approved by the municipality council and related public authorities. Common facilities include measures in public interest, such as:

- soil erosion control (organizational, agronomic or technical measures),
- water management (reservoirs, revitalization),
- land accessibility (field roads, fords, etc.),
- increasing ecological stability.

During the design phase, a series of spatial analysis is performed, one example focusing on soil erosion is displayed in illustration 5.

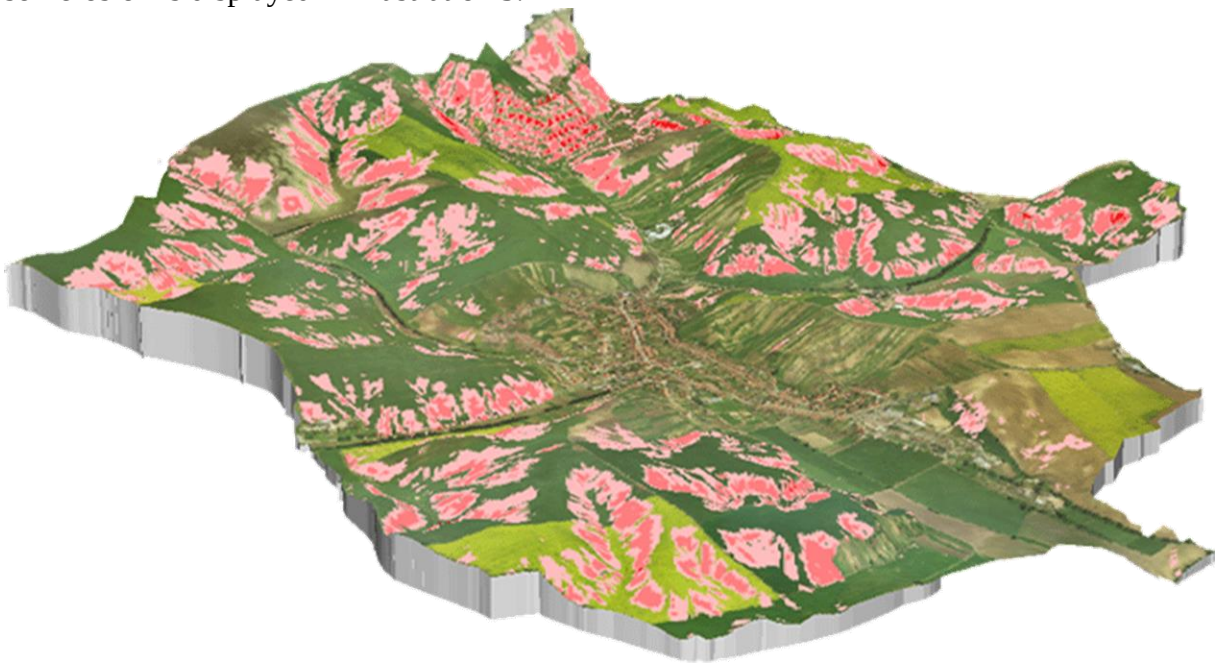

Illustration 5: Soil erosion analysis.

The map of the actual state and the Common Facility Plan are the basis for the design of a new plot arrangement. In such structure ("skeleton"), new plots are designed for each owner that adequately correspond to their original plots within the tolerance of the following variables:

- price (4%),
- acreage (10%),
- distance (20%)

New plots may have different boundaries than the original ones or more plots of one owner may be unified.

3.4 Realization

Realization is the construction of proposed measures (including designs of construction projects). The realization phase has no time frame, since it can be initiated and finished any time depending on the individual projects.

Illustration 6: Example of realization of water management measure – stabilization of concentrated runoff paths

In summary, the main results of land consolidation are:

- Common Facility Plan,
- renewal of the cadastral (new digital cadastral map),
- realization of the proposed measures.

3.5 The State of Art of Land Consolidation

Land consolidation in the Czech Republic started in 1991. In July 2016, complex land consolidation processes have been finished in 16% of acreage of the Czech Republic. In counting unfinished land consolidation processes, land consolidation covers almost 38% of acreage. Spatial distribution of land consolidation is displayed in illustration 7 below. Land consolidation is initiated in about 200 cadastral units each year in the Czech Republic.

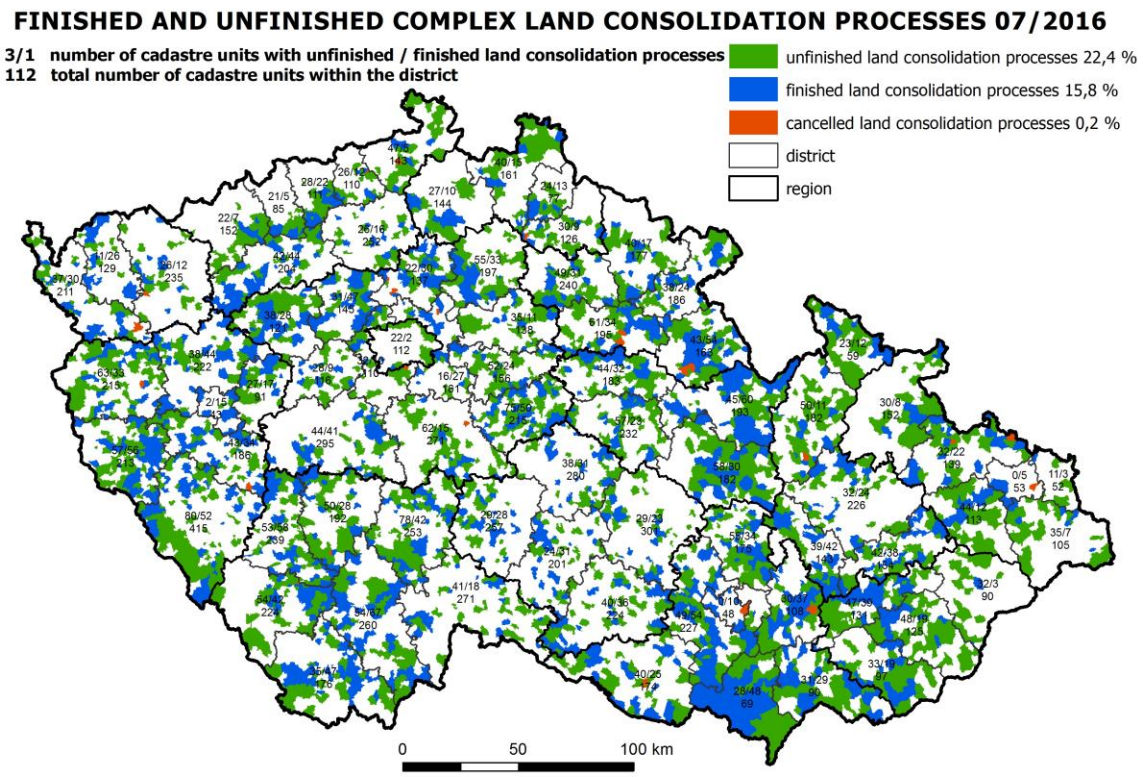

Illustration 7: Spatial distribution of land consolidation in the Czech Republic

The ratio of realized measures according to the Common Facility Plan is displayed in illustration 7.

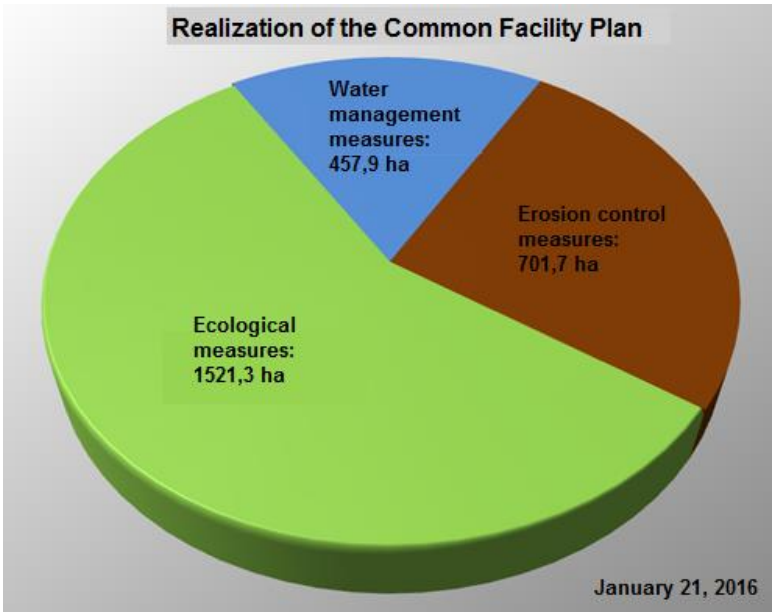

Illustration 7: Chart of realization measures

3.6 Financing Land Consolidation

The costs of land consolidation are covered by the government budget or by the Rural Development Program of the European Union. The chart in illustration 8 shows total costs including design and realization during the last years. Between 2007 and 2015, the realization of projects of Common Facility Plans alone cost 320 mil. EUR.

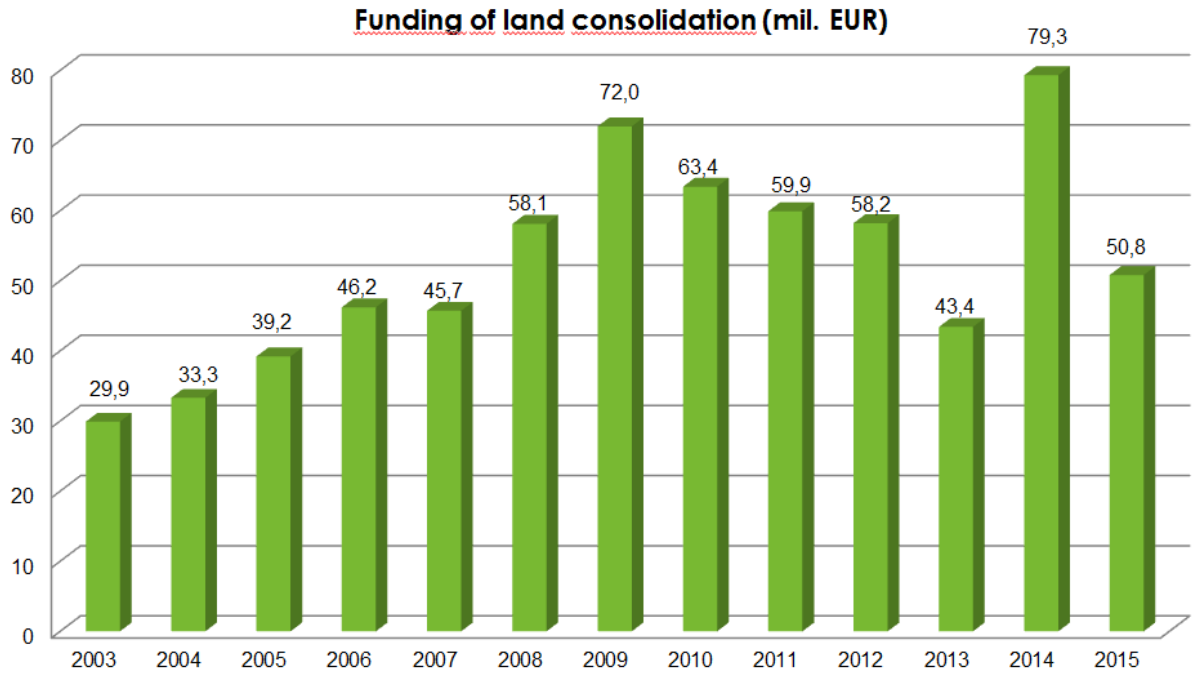

Illustration 8: Total costs of land consolidation in the Czech Republic

4. CONCLUSION

Land consolidation in the Czech Republic is perceived as a multidimensional instrument for landscape planning, supporting sustainable development of rural areas. It introduces effective tools for solving water retention in the landscape, soil erosion and flood protection.
Land consolidation faces new challenges such as climate change (flash floods as well as droughts), soil erosion, setting the role of farmers and more. New mitigating strategies will improve drought resilience by supporting irrigation and soil drainage infrastructure.
Alongside these processes, the emphasis is placed on sustainable agriculture, which significantly helps developing rural areas.
Land consolidation design needs to be addressed from a complex perspective with respect to the effectiveness of both – functions of new measures and their financial costs.

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BIOGRAPHICAL NOTES

Arnost Muller graduated in 2010 from the Department of Mapping and Cartography at CTU in Prague with his thesis called “Spatial modeling of climate”, in which he presented animated maps of annual mean air temperatures and rainfall at high spatial resolution.
During his undergraduate studies he spent two semesters at Kansas State University in USA, where he obtained the Undergraduate GIS Certificate and during his master studies he studied one semester at the University of Adelaide in Australia.
He focuses on integrating GIS in the public sector, working at the State Land Office as a GIS analyst implementing GIS into the process of land consolidation. He is also a member of a team developing new GIS strategy for the Czech Republic, so called Geoinfostrategy.

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Adaptation Measures for Climate Change in the Process of Land Consolidation

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Key words: Land consolidation process, climate change, adaptation measures, common facility plan

SUMMARY

There have been increasing hydrological extremes in the Czech Republic during the last years. Drought periods are often alternated by flood events including flash floods. According to predictions of global climate models for the Czech Republic these phenomena will be more likely in the future. These facts cause higher demand on the land consolidation process and introduce new challenges especially in the design of adaptation measures through the Common Facilities Plan as an important part of land consolidation process.
The Common Facilities Plan proposes a new structure (infrastructure), in which new plots (parcels) are situated. Adaptation measures are designed using a complex multifunctional system: organizational (the shape and size of plots, direction of farming), agro-technical (seeding, leaving harvest residue) and technical (ditches, retention basins) measures.
The State Land Office is currently participating in the project, which is focused on conceptual modification of landscape with respect to impacts associated with climate change. This project from the agricultural practice aims to define most vulnerable areas of the Czech Republic and develop adaptation measures to mitigate negative effects, especially floods and droughts. Proposed measures need to be acceptable by farmers. The project responds to the priorities of the Government in the food self-sufficiency, increasing flood protection, and increasing protection of soil and landscape. State Land Office was delegated by the Czech Republic´s Government in 2015 to be responsible within the Ministry of Agriculture for the development and maintenance of the national agricultural drought monitoring and early warning system.
The Common Facilities Plan as a part of Land Consolidation process it is one of the tools for implementation of new findings from the present project or monitoring of drought into practice of designing adaptation measures.
State Land Office try to be ready for new challenges in process of Land Consolidation.
The decisive factor in adapting to climate change remains the political will to implement the proposed measures.

Adaptation Measures for Climate Change in the Process of Land Consolidation

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1. INTRODUCTION

Present day landscape of the Czech Republic faces multiple challenges including the ongoing climate change that is at many locations combined with soil degradation. At the same time, erosion risks and the rate of the soil degradation are still deemed as unsustainable in some areas despite a number of existing measures being taken (Vopravil et al. 2012). The deterioration of the soil properties through unsustainable agricultural practices and changing climate could lead to fall in the productivity beyond the point of no return with devastating effect on the ecosystem services in large area (Trnka et al., 2016). With that closely related increasing hydrological extremes in the Czech Republic during the last years, drought periods are often alternated by flood events including flash floods. According to predictions of global climate models for the Czech Republic these phenomena will be more likely in the future. This also realized the Agrarian Chamber (representing the great majority of farmers in Czech Republic) and State Land Office that major revisions of the existing policies related to the management of soil degradation frequently associated with intensive rains and the increased drought risks due to climate change are needed. Therefore multidisciplinary task force was formed and supported through so called "Master Plan of Landscape Water Management of the Czech Republic".

The ultimate goal of the whole procedure is the quantification of these risks, putting into place policies and measures leading to risk reduction and ensuring their adoption in practice through the use of demonstration areas, as well as through technical and financial assistance. This may be achieved only when hazards, vulnerability and exposure are known, allowing for the calculation of the expected damages related to the risks associated with different hazardous scenarios. This study uses concept of more-than-one-hazard and focuses on drought and soil degradation hazard assessments for the agricultural landscape of the Czech Republic. While according to Kappes (2012) the multi-hazard assessment maybe understood as assessment of „the totality of relevant hazards in a defined area''.

For the supression of hydrological extremes is possible to use the process of Land Consolidation which can propound and then implement water management, erosion control, ecological and land accessibility measures and so the measures to reduce the effects of drought. Nevertheless the expected climate change cause higher demand on the land consolidation process and introduce new challenges especially in the design of adaptation measures through the Common Facilities Plan. In this process is therefore essential to use latest scientific knowledge and respond to the economic and political development. Very important is also to choose the right measures for the specific area of the Czech Republic in the current and expected future climate.

2. MATERIAL AND METHODS

2.1 Common Facilities Plan

Common Facilities Plan is an elementary document of the whole Land Consolidation because it allows propound many elements and measures which fulfill public interest (Figure 1). These measures we divide into measures for land accessibility, for erosion control, water management measures and ecological measures.

Common Facilities Plan (CFP) must tally to the Urban Planning Documentation (UPD), otherwise the CFP represents a propound for actualization or a change in UPD. If it is necessary to provide an area of land fund for common facilities, firstly is used land in ownership of state and then in the ownership of municipality. Finished CFP has to be passed by the municipality council and other involved authorities are expected to apply their objections. Municipality council also defines the priorities in implementation of realizations of the proposed measures.

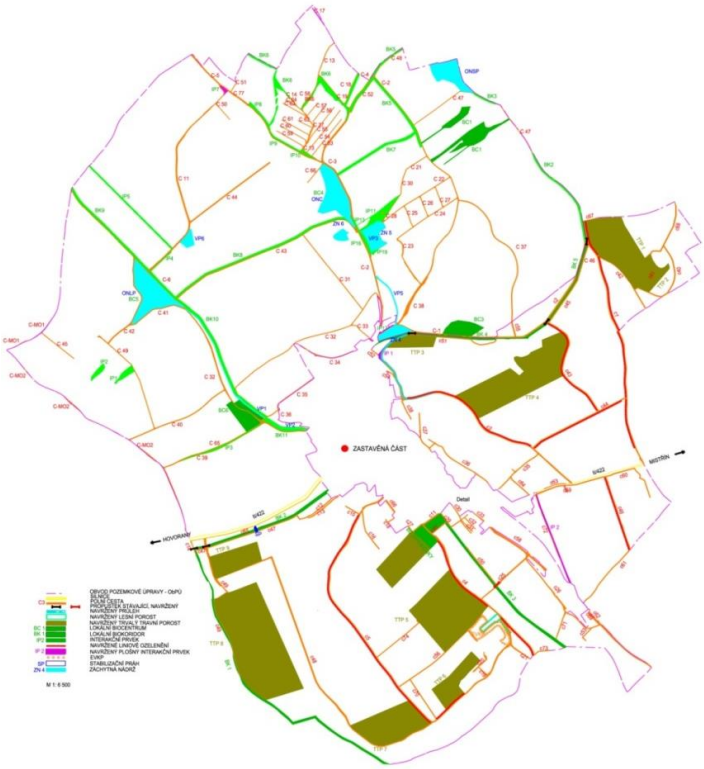

Figure 1. Example of Common Facilities Plan

In CFP there are often combinations of various types of measures to complement each other. An example can be a field road with tree alley and dike alongside (Fig. 2).

Figure 2. Erosion control belt with a planting

2.1.1 Measures for land accessibility

These measures are trying to solve the principles of the proposed concept of the transport system and in the same time it includes relations with the transport system network with the higher order. The proposed transport system and its technical parameters must be in accordance with the valid technical standards and regulations. This transport system also has to fulfill the requirements for the movement of the agricultural vehicles, enable the rational agriculture and other use out of agricultural transport. Measures which provide land accessibility include field or forest roads (Fig. 3), small bridges, fords, railroad crossings etc.

Figure 3. Example of measures for land accessibility

2.1.2 Ecological measures

Proposals of these measures have to document the process for maintaining and improving the ecological stability of land after the Land Consolidation Process. It also has to document the relations with the areas out of bounds of the land consolidations and functional relations with the transport, erosion control and water management parts of the CFP.

To this category belong measures like local system of ecological stability (biocenters, biocorridors), interaction elements, small water pools, wetlands (Fig.4) etc.

Figure 4. Example of ecological measure

2.1.3 Soil erosion control measures

To prevent soil erosion CFP often designes a complex of organizational, agronomic and technical measures which complement each other to reach the highest efficiency. These measures are aimed at protecting watercourses, water pools and urban areas against the negative effects of soil erosion, retarding surface runoff and supporting water retention in the landscape, all with taking under consideration requirements and abilities of the agriculture. The enforceability of the measures, especially the "soft" ones (organizational and agrotechnical), largely depends on the willingness (or its lack) of agricultural subjects to implement these measures. Therefore is essential to consult the planned measures with these subjects.

Soil erosion control measures are divided into three groups:

1) Organizational measures – grassing, foresting, shape and size of the parcels, rotation of crops on the soil, change of land use (Fig. 5) etc.

Figure 5. Change of land use (arable / vineyard with anti-erosion function)

2) Agrotechnical measures – growing measures, grassing between fields, seeding into protective crop (Fig. 6), leaving crop residues etc.

Figure 6. Seeding into protective crop

3) Technical measures – sedimentation reservoirs, ditches, stabilization of the paths of runoff (Fig. 7), infiltration zones, terraces, windbreaks etc.

Figure 7. Stabilization of the paths of runoff

2.1.4 Water management measures

These measures deal with the water management with particular attention to the relations in the watershed (which means also outside the border of the land consolidation). The principles of these measures are based on legal obligations consisted of improving water conditions, drainage of surface water, flood protection, water resources protection, surface and groundwater protection, measures for water works and the elimination of the drought. These measures are projected primarily to eliminate negative hydrological conditions (floods, droughts) and they include reservoirs, revitalizations of water streams, ponds, dams, stream adjustments etc.

2.2 Master Plan of Landscape Water Management of the Czech Republic

Master Plan of Landscape Water Management of the Czech Republic is a project which is focused on conceptual modification of landscape with respect to impacts associated with climate change. The project tries to find new legislative, economical and technical solutions which can be enforced by the process of Land Consolidations (CFP). The main institutions involved under the rule of State Land Office are Czech Agrarian Chamber, universities (Mendel University in Brno, Brno University of Technology), Research Institute for Soil and Water Conservation, T. G. Masaryk Water Research Institute and Global Change Research Institute. This project from the agricultural practice aims to define most vulnerable areas of the Czech Republic and develop adaptation measures to mitigate negative effects, especially floods and droughts. Proposed measures need to be acceptable by farmers. The project responds to the priorities of the Government in the food self-sufficiency, increasing flood protection, and increasing protection of soil and landscape.

2.2.1 Description of the solution

First step of the solution was to describe the current situation (studies, legislation, foreign experience, etc.) and evaluation of available data sources.
The second step towards the implementation of the proposed framework is the identification regions with the highest hazards so that the next steps of risk assessment (vulnerability and exposure assessments) and policy application can be targeted to these regions.
The potential indicators that could be used to for the assessment of hazards are numerous. Because the focus of this study was on assessing combined hazards for agricultural land, we focused on the indicators that in our view can best be used to quantify these hazards.
Towards the assessment of the combined hazard (Fig. 8) for the agricultural lands analyzed, we identified the following hazards as being the most critical ones:

- Agricultural drought during the growing season
- Pre-existing poor soil conditions decreasing the ability of the soil to hold water (quicklyt drying soils)
- Increased susceptibility to water erosion, including the occurrence of concentrated runoff pathways
- Pre-existent infrastructure and/or settlements in the path of the concentrated runoff pathways

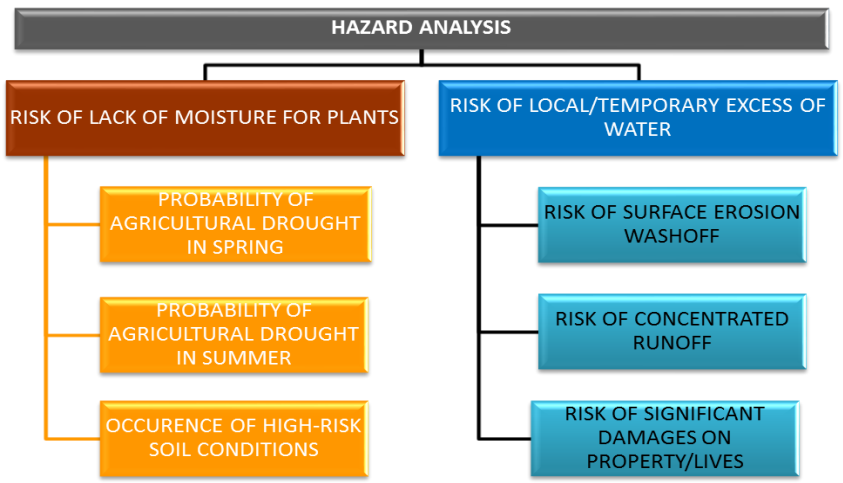

Figure 8. Overview of the individual hazard indicators with arrows showing their interactions

2.2.2 Individual hazard indicators

Agricultural drought during the growing season

As the indicator of drought hazard, we selected the median number of days per season (based on 1991-2014 data) with a saturation of the surface soil layer below 30 % of the relative soil water content (i.e., the percentage up to which water fills the soil pores between the so-called wilting point and field capacity) in the topsoil. In general, this value could be considered as the level below which the physiological processes of the plant begin to be significantly limited by a lack of water (e.g., Larcher 2003). The calculations were performed in 500 m grid covering the whole Czech Republic (Trnka et al., 2015b). Based on the drought-yield relationship, we divided the growing season into two parts: April-June and July-September. The former, mostly spring- and winter-sown cereals (usually harvested in July) are known to be affected the most (e.g., Hlavinka et al., 2009), while the latter season represents the time period in which latter-maturing crops (e.g., maize, potatoes or sugar beets) can be negatively affected.

Quickly drying soils

In Czech Republic, this issue is of concern in the northwestern and southeastern parts of the country. The expansion of fast drying soils is driven by erosion, and many areas with very fertile soils less than 100 years ago (e.g., chernozems) are presently fast drying soils consisting of an underlying loess or sand from the original bottom of the sea. The process is accelerated by ongoing climate change connected with the increasingly frequent occurrence of long periods of drought and also by unsuitable tillage practices with a low re-supply rate of organic matter to the soil. Determining the occurrence of fast drying soils was performed through the evaluation of a high resolution (5x5 m grid) map of the soil conditions based on the information obtained from the soil database that is maintained and permanently updated by the Research Institute for Soil and Water Conservation

Sheet, interrill and rill soil erosion

The first indicator of an erosion hazard for agricultural land focuses predominantly on so-called sheet erosion (i.e., the transport of loosened soil particles by overland flow). In this study was used an approach based on the universal soil loss equation USLE (Wischmeier & Smith 1978). The topography factors were estimated according to the modified equation of Desmet & Govers (Desmet & Govers 1996) using a 5x5 m grid digital elevation model. The efficiency factor of erosive rainfall was set to R = 40 $MJ.ha^{-1}.cm.h^{-1}$ (Janeček et al. 2012), and the C factor was based on the actual crop proportions at the same resolution as the slope and length estimates. After estimating annual soil loss, those 5x5 m grids showing the annual potential loss higher than 4 tons per ha (i.e. nationally enforced limit) were marked as those with a significantly higher than permissible erosion rate.

Rill and ephemeral gully erosion

In addition to the classic erosion furrows on the surface slopes of arable land, there are also so-called “rills” and "ephemeral gullies' present, which differ from the classic erosion furrows because of their cross-sectional area (larger than 1 square foot) (Morgan, 2005).
For the analysis of ephemeral gully erosion hazards, the method of plotting potential paths of runoff concentration at the spatial resolution of 5 m was used. This method is based on the modeling of flow accumulation from drainage areas, the interpretation of the nature of the terrain and the visual interpretation of aerial photos of the affected land blocks. Contributing

areas were used to automatically generate the direction and accumulation of runoff over a digital terrain model with manual correction using raster topographic maps and aerial orthophotos (Dumbrovský et al. 2011).

Localized floods originating from agricultural land
Drbal & Dumbrovský (2009) reported that even a contributing area of 5 ha is sufficient to generate a flow that can cause severe damage to property. The causal factors critical for the formation of a concentrated runoff were determined based on the number of recent flood events from torrential rainfall, and parameters were set to estimate so-called "critical points". Critical point (CP) was defined as the point where the trajectory of the concentrated runoff penetrates into the municipality. CPs were thus determined based on the intersection of a municipality (urban) boundary with concentric lines of a track drainage area with the contributing to a region ≥ 0.3 km^2. As the area affected by torrential rainfall tends to be limited, the contributing area was also limited to10 km^2. In this analysis we assumed that torrential rain could occur at any location in the Czech Republic.

2.2.3 Multiple hazard analysis

The original quantification of the indicators was based on different resolutions, with data on drought occurrence being available as a 500 x 500 m grid and the remaining indicators being calculated at 5 m resolution due to the importance of the local terrain conditions. As the study aimed at identifying the areas with the highest hazard level for policy making purposes, the indicators were aggregated at the level of the cadaster unit, which is the smallest administrative unit in the Czech administrative division system. For each cadaster unit, the value of each indicator was calculated. All indicators were normalized using a z-score approach. It is one of the most commonly used normalization procedures in which all indicators are converted into a common scale with an average of zero and the standard deviation of one.
Value of Z-score was calculated as:

$$z = \frac{x - \mu}{\sigma}$$

where:
x - parameter value in the cadastral; μ - average value for all cadastral; σ – standard deviation for all cadastral

Hazard of solved area was classified according to the value of Z-scores as show Table 1.

Table 1: Z-score table used to interpret the standardized values of the indicators

Indicator interpretation	z-score range
Above average	0-0.5
Markedly above average	>0.5 and < 1.0
Highly above average	1.0-1.5
Very highly above average	>1.5 and < 2.0
Extremely above average	2.0 and higher

2.2.4 Results of Multiple hazard analysis

Spatial distribution of multiple hazard analysis is shown in Fig. 9. The percentage of territory at where the hazard level is highly above average or worse is 8% (Fig. 9a). Within the multi-criteria analysis, was simultaneously examined how a large part of the territory of Czech Republic meets at least one of the criteria for an extreme degree of risk (Fig. 9b). This combined approach provides a good overview of the areas where the hazard level is significantly higher than the rest of the territory. The last step of this analysis was to define the territory that may be considered to be at a particularly high risk. As such, was considered a territory where the average value of the z-scores was higher than 1.5 and/or where at least two criteria had z-scores above 2.0 to be at a high risk. These criteria are met by 4.5% of the territory of Czech Republic. As Fig. 9c shows, two areas can be pinpointed as the most at risk. These most vulnerable regions constitute areas where attention and resources should be given the highest priority.

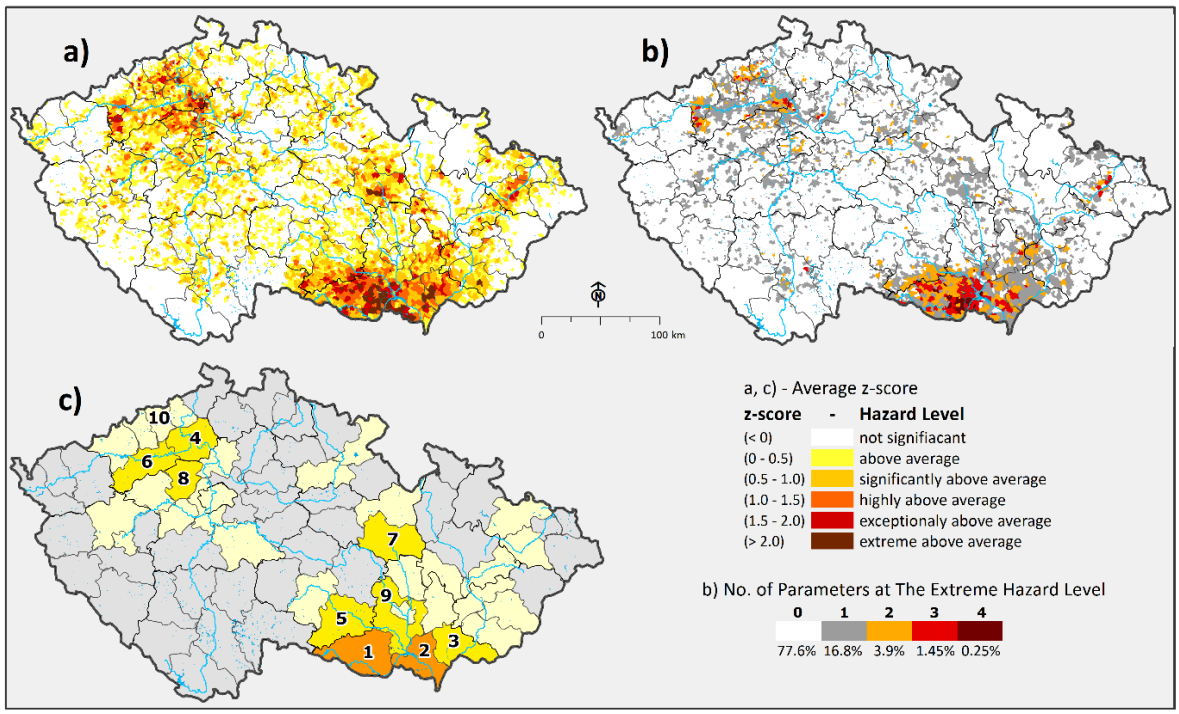

Figure 9. The result of the multiple-hazard analysis at the cadastre (a-b) and district (c) level: a) mean z-score of all six individual hazards, b) number of individual hazards per cadastre unit in the worst category, and c) the districts with the highest combined hazard level within the country. The top 10 regions according to hazard level are numbered.

3. CONCLUSION

The mapping of multiple hazards for agricultural land is intended as an important step in the assessment of the vulnerability of the agricultural sector to the occurrence of drought and extreme precipitation events under the present conditions and under the predicted future climate conditions in Czech Republic. The map presented here synthesizes a variety of data and serves as an indicator of areas deserving more detailed attention. Regions whith highest

hazard level are concentrated in the southeastern and northwestern lowland areas. As typical areas with the highest hazard levels, we can identify regions with below average precipitation and a high proportion of soils with a degraded or naturally occurring low water-holding capacity, and those with steeper than average slopes and terrain configurations in relatively large catchment areas that have urbanized landscapes located at their lower elevations.
The identification of the most vulnerable areas in the Czech Republic through a multi-hazard analysis is an important source of information in guiding the prioritization of the land consolidation process and its spatial targeting for the State Land Office. In this way, the State Land Office receives unique material that can be used to improve their ability to mitigate the impacts of climate change. In addition, it will be able to effectively participate in the establishment of a legislative and economic framework that could possibly realize adaptation measures acceptable to agricultural entities.
As the next step in the search of new measures (technical, economic and legislative) and their efficient spatial targeting will be analyzed in detail farms from areas with the highest hazard levels. It will also made a detailed proposal of adaptation measures that will be acceptable to farms under the current (climate, economical, legislative) and future (climate) conditions. Experiences from the pilot farms will help indicate the necessary adaptation measures for the future. An important question is the political will and ability to enforce the necessary adaptation measures at national and international level.

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Land readjustment: inclusiveness and participation of stakeholders

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Voluntary urban land readjustment: influencing factors on owner empowerment

Friso DE ZEEUW, Johan GROOT NIBBELINK and Tom VERBRUGGEN, The Netherlands

Key words: urban land readjustment, owner empowerment, Cadastre, pilot projects

SUMMARY

The challenges for spatial planning in the Netherlands have significantly changed during the last years. Until 2008 the focus was on the expansion of urban development. Now, as a consequence of the economic crisis and decreasing demand there is increasing attention for regeneration of existing urban areas. On the other hand more and more small scale, flexible citizen initiatives determine how space is used in the Netherlands. Because of these developments, the Dutch administration is constantly seeking to implement new spatial planning instruments that can deal with flexibility and bottom up initiatives.

One of these instruments is urban land readjustment. The instrument makes it possible for owners to voluntary exchange property of land and solve problems which are caused by an inappropriate parcel structure. It is a bottom up approach where land- and real estate owners can work together to find solutions for degrading urban areas. The instrument can for example be used to make city centres more compact and resilient. It is only one of the land policy instruments, and will be most effective in combination with other instruments.

This paper focusses on the critical factors that influence the success of urban land readjustment initiatives. These factors are derived from case studies accompanied by the Dutch Cadastre. Founded on these practical cases, there are six critical factors identified which determine the success of processes with the instrument of urban land readjustment:

1. The degree of owner organisation
2. The availability of an independent area 'director'
3. The possibility of financing in advance
4. A positive business case
5. An open mind regarding interests
6. An equal sense of urgency

These critical factors are illustrated by four case studies (Maasbracht Koeweide, Helmond Induma-West, Rotterdam Brainpark, and Doetinchem De Veentjes). The main question in stimulating urban land readjustment seems to be: how can one manage the sense of urgency to the individual owners in such a way they begin to act? One part of the question is: take all interests of all owners into account. An independent area manager has an important role here. The other part of the answer is that the individual business case of each participating owner has to be a positive one. This can be reached by increasing the deliverables or reducing the costs. Stimulating urban land readjustment has to focus on this aspect. When starting a project in urban land readjustment one has to consider if the six critical factors on owner empowerment presented here, are sufficiently addressed within the actual case. And if not, how you can improve these basic principles in advance.

Voluntary urban land readjustment: influencing factors on owner empowerment

Friso DE ZEEUW, Johan GROOT NIBBELINK and Tom VERBRUGGEN, The Netherlands

1. INTRODUCTION

During a long time area development in the Netherlands distinguished itself from development in other western countries by a top-down approach. Since the economic crisis, starting in 2008, new strategies are needed (Van der Krabben and Heurkens, 2015), for the former strategy doesn't work anymore when demand on housing drops.

One of those new strategies is urban land readjustment. Urban land readjustment has been subject of discussion for a long time in the Netherlands, but is never implemented (Bregman, 2015, Groot Nibbelink, 2016). The Dutch administration has now proposed legislation for voluntary urban land readjustment (Ministry van Infrastructure and the Environment, 2016) in addition to the current land policy instruments. Urban land readjustment can be used in redevelopment projects where fragmentation of ownership is an issue.

The Minister calls urban land readjustment an instrument for the energetic society. Land owners who are willing to realise building or redevelopment plans by themselves are able to overcome impediments e.g. an infelicitous allotment. Urban land readjustment gives empowerment to the owners.

Due to the revival of interests, experiments on urban land readjustment take place. Can we learn from those cases in which context urban land readjustment will work? More specific: are owners able to cooperate in order to raise a land readjustment project? What kind of factors influence the success or failure of these projects and how does the regulation of urban land readjustment take effect on it?

2. ADDITIONAL ACT ON LAND PROPERTY

2.1 Revision of land policy instruments

The Dutch government including municipalities have changed their spatial development strategy (Ministry of Infrastructure and the Environment, 2016). Differences between regions increase. While most cities in the west of the Netherlands face a new increasing demand for housing, in northern and eastern provinces a decline of population numbers is still going on. A shift is made from building on green fields to building on brown fields. Too many zones are reserved for offices and shops, and therefore vacancy in these functions still increases.

Society itself changes too. More and more citizen initiatives come up and they expect the government to react adequately and flexibly. That is the reason why the Dutch government adjusts the system of spatial planning in the Netherlands. In certain cases a municipality still wants to participate in an active way by acquiring land, in other cases it will facilitate the owners more and more. Therefore spatial planning instruments are revised at the moment and

become more flexible. Beside of revision of land policy instruments like expropriation, pre-emption right and land consolidation, the government now introduces a new instrument in the Netherlands: urban land readjustment.

2.2 No compulsory way of urban land readjustment

In 2014 the Commission for Urban Land Readjustment advised the Minister of Infrastructure and the Environment to establish a committee to give advice regarding the introduction of rules for compulsory urban land readjustment, in the case that a majority of owners agree to a readjustment plan that is blocked by a minority (Commission for Urban Land Readjustment, 2014). Unfortunately the Minister did not incorporate this compulsory way of urban land consolidation. She argues compulsory urban land readjustment is unnecessary and undesirable (Ministry of Infrastructure and the Environment, 2015, see also Groot Nibbelink, 2016). Not necessary, according to the minister, because expropriation is the most preferred instrument, when one of the owners will not or cannot join the redevelopment. Not desirable, because compulsory urban land readjustment contravenes property rights severely and owners can be forced to take risk in development.

Bregman thinks the first argument implies urban land readjustment cannot be seen as an independent instrument for facilitating land policy anymore and the last argument is based on two misunderstandings. The first misunderstanding is the assumption that property value is less in case of land readjustment comparing to expropriation and the second misunderstanding is land readjustment convenes land property rights more severely than expropriation. Bregman contradicts both (Bregman, 2015). Also De Zeeuw thinks the Minister is missing the essential point. Just the presence of the possibility to use compulsory land readjustment, will promote owners to participate and to collaborate. When one takes the stick to beat away, the proposal of the committee is castrated (De Zeeuw, 2015).

2.3 Goals for urban land readjustment

It is important to consider why rules for urban land readjustment are needed.
The Minister her selves explains the following: Urban land readjustment is a facility for the energetic society. With these rules owners can realize building or redevelopment plans by their own. Urban land readjustment makes it possible for owners to exchange property of land and solve problems which are caused by an inappropriate parcel structure.
Possibly it can be attractive for owners to adjust the boundaries of their land or to exchange real estate property, in order to settle down at a more appropriate site. Especially in areas of economic decline and unoccupied shops or office buildings, urban land readjustment can contribute to area transformation and restructuring (Ministry of Infrastructure and the Environment, 2016).

Urban land readjustment is therefore and instrument which can be stimulated by a facilitating municipality. It is only one of the land policy instruments, and will be most effective in combination with other instruments (Expertgroep Provincie Overijssel Stedelijke Herverkaveling, 2016).

One has to consider urban land readjustment suits only in certain cases. Analysing literature (e.g. Commissie Stedelijke Herverkaveling, 2014, Van der Krabben and Heurkens, 2015, Cadastre, 2016, Expertgroep Provincie Overijssel Stedelijke Herverkaveling, 2016) result in

mainly three elements, found in descriptions about the applicability of urban land readjustment:

- There is a spatial demand for development
- The current fragmentation of ownership impedes this development
- Owners have an essential role in raising the development.

The goal of the regulation of urban readjustment is to give owners an instrument that empowers them to start the area transformation. The owners then have the key to success to urban land development. Nevertheless, with urban land readjustment as proposed by the Dutch government success is not guaranteed. It is still based on voluntary participation, so owners can withdraw at any moment. So it is not enough to design an adequate instrument, it is even more essential that the process which empowers the owners is successful. Therefore the Dutch government also wants to stimulate owners to start with voluntary urban land readjustment. Besides the instrument (par. 2.4) the Dutch governments also invests in the process (par. 2.5).

2.4 Content of the regulation on urban land readjustment

The proposed rules for urban land readjustment are part of the new Act on Spatial Planning and the Environment. This act will probably be in force in 2019.
Special to the rules now proposed is these are almost identical to the rules for voluntary land readjustment in the rural areas. There are no specific elements added to the urban regulation regarding the urban context. In essence the way of voluntary land readjustment in rural areas now becomes possible to urban areas.

This means at least three owners are needed who bring in land and at least two of them get land in return. Owners make up an agreement and have to register it in the land registry of the cadastre, anticipating formal checks, the delivery of the real estate and finishing the readjustment deed. Legal successors, for instance the inheritors when an owner passes away, are bound by the registered agreement made by the deceased person, even when the exchange of land wasn't executed yet.

Registering the agreement protects the participating owners for unexpected situations like the situation the person known as owner in the land register appears not to be the legal owner[i]. Due to the new rules it is also possible to exchange condominium rights. Of course this is important to the urban context, while apartment buildings can be part of the reconstruction area. But the regulation gives no specific added rules for condominiums. This means when a land readjustment plan also includes merging or splitting apartments, all owners of the condominium has to agree to the readjustment plan. This makes exchanges of condominium rights still very complex.

Another advantage of the proposed regulation similarly to rural areas; it will not be necessary to re-establish mortgages again in all cases. This has to be worked out furthermore. But this is an important advantage, since the conditions on giving mortgages are sharpened during the economic crisis.

2.5 Stimulating program on urban land readjustment

Although the rules are almost the same, urban land readjustment is quite different from rural land readjustment. Private stakeholders and local governments face different unsolved

questions. The interests of stakeholders in urban areas are more divergent and a variety of private activities is involved. Financial interests are more significant and due to fragmentation of rights reallocation is more complex. In general in the urban area the municipality does not only play a public role, but also investigates possibilities in public-private partnership. Therefore the process of readjustment will be different, different calculation models will be needed and the relation between private and public stakeholders will be different.

Also the Minister of Infrastructure and the Environment realises these are real problems. That is why she is starting a stimulating program in 2016. Owners have to be triggered to attempt urban readjustment before the new rules are implemented.

The differences between rural and urban context are the reason for developing new methods and models. The stimulating program supports this in two directions. Firstly the Minister wants to offer general tools, partly to inform stakeholders (leaflets, websites, and meetings) and partly to make stakeholders more confident with urban land readjustment (serious game) and partly to reach out to stakeholders with practical models (calculation model and model for a readjustment deed).
Secondly the minister wants to support elected pilot projects. These pilot projects combined are a community of practice in which experience can be shared. The pilot projects also receive a small amount of money to manage the readjustment process.

The Dutch Cadastre, Land Registry and Mapping Agency is involved to this stimulating program because of the knowledge and experience in readjustment processes. During the last three years the Dutch Cadastre has been involved in various pilot projects starting urban land readjustment programs. Lessons are drawn and brought in to the stimulation program.

3. CRITICAL FACTORS WHICH INFLUENCE THE SUCCES OF URBAN LAND READJUSTMENT

The research on critical factors for the success of urban land readjustment is very limited. The Dutch Cadastre, Land Registry and Mapping Agency gained experience in the field by accompanying many initiatives that make use of this instrument. Founded on these practical cases, there are six critical factors identified which determine the success of processes with the instrument of urban land readjustment.

3.1 Degree of organisation

Land- and real estate owners within the project area need to be well organised. The better the individual property owners are organised, the better the chances are that urban land readjustment will lead to success. A highly organised group often means that property owners are aware of the fact that working together will benefit the whole area. A well-known example of organisation is when a community of owners is present. Additionally, this makes it easier to mutually communicate with each other and with governmental institutes.

3.2 The area ‘director’

The area director is important when it comes to taking note of interests and eventually mediation between different interests. For this task a professional is needed, who probably does not do the job for free. Therefore some financial means from a governmental party or from the collaborating owners in the area is necessary. Having confidence in a successful end result is essential for parties wanting to invest in an area director.

3.3 Options financing in advance

In many cases it is necessary that the cooperating parties need to invest in advance to eventually benefit from it. Not every party has these financial means to do so. Therefore there is need for a party that is willing to invest in advance. For instance this can be done by a revolving fund. Caution is at its place here, because not every financial construction is allowed by European law. One has to be aware of illegal subsidies for private businesses.

3.4 Positive business case

It is obvious that a positive business case is of great importance. Otherwise it is not sensible to invest. The business case must be positive for the project as a whole and for the individual participants as well. An independent organisation can calculate various scenario's to determine if it would result in a positive business case and to determine how many years it would take to earn back the money invested.

3.5 Openness regarding interests

It is not always in everyone's interest to share future plans with the neighbours, because these parties can also be the competitor. However, during a participatory process it is essential that participants are open to one another. Only if everyone is transparent, all options can be openly discussed.

3.6 Equal sense of urgency

Often the sense of urgency to act in an area is present. However, the degree of this sense of urgency can be experienced differently by each participant. Some parties think they can manage on their own, and they think they can work independently. However, one thing you would like to overcome is free riding. This is when a party does not contribute to the development process, and at the same time profits from the efforts of the other parties working together. Therefore an equal sense of urgency is eminent to make sure that every party can contribute at its best efforts to the common goal of improving the spatial characteristics of the area.

4. PRACTICE OF URBAN LAND READJUSTMENT

4.1 Introduction

These influencing factors are derived from experience in several pilot projects. In this paragraph we explain four of these projects and discuss how these factors did influence the owner empowerment. Two of these projects, Maasbracht Koeweide and Rotterdam Brainpark, are evaluated before by Raanhuis (Raanhuis, 2016).

4.2 Maasbracht, Koeweide

4.2.1 Context

Koeweide is a water related industrial area at the port of Maasbracht, laying at the river Meuse. The port of Maasbracht is the most inland lying harbour of the Netherlands, where sea ships can arrive and where cargo has to be trans-shipped to smaller inland vessels. The industrial area of Koeweide measures 55,7 hectare. One third (18,2 hectare) is owned by five owners, who represent the ship building sector in Maasbracht.
Koeweide is one of four water related industrial areas of the municipality Maasgouw.

Figure 1Ownership at Koeweide

4.2.2 Problem

Mainly there are three spatial related problems in the Koeweide area. The first issue is the length of the quays. The ship locks in the river Meuse are lengthened in the last decade, so taller ships can reach the port of Maasbracht. The length of a quays owned by one owner are too short for docking with these taller ships.

The second problem is that three companies in the south part of the harbor are not able to expand. Almost all parcels are used and the neighbouring parcels are not available for expansion.

The last issue is that more and more ship building activities do not fit the environmental rules. There is an expansion of the maximum allowed level of noise in the southern part of the harbour. In the northern part the maximum level of noise allowed is higher – there are no dwellings in the neighbourhood – and this level is not yet reached.

4.2.3 Approach

In Maasgouw a project group was established to reconstruct the water related industrial areas in Maasgouw. Urban land readjustment was one of the measurements considered by the project group. A new allocation of the parcels of one of the owners at a new quay could give more expansion possibilities to the other owners. Three alternatives for reallocation of plots proposed to the owners were discussed in a common meeting. The owners preferred one of the alternatives, and this alternative is refined during individual conversations by the Cadastre with the owners. In a second general meeting the owners were given a better insight in the general costs and in the costs for individual owners.

4.2.4 Discussion

In Maasgouw there was no organised community to represent the owners. One of the owners was represented by his agent, this obstructs the openness of interests. There was no independent local area director to lead the conversations. Cadastre took this role in the individual conversations and the project group in the general meetings. The sense of urgency for the readjustment was different between the owners, three of them experienced a high sense of urgency, two a low sense of urgency (Raanhuis, 2016). On the other hand, most owners expected a high profit to be obtained by one of the owners who did think there was a low sense of urgency. Some owners thought the costs were too uncertain and their investment should become too high to earn it back in a reasonable period of time. Finally one of the owners quitted the process and the project was stopped.

4.3 Helmond, Induma-West

4.3.1 Context

In 2013 the municipality of Helmond started the reconstruction of the industrial area Induma-East. This area suffered from a bad appearance of business facades, an outdated public space,

bad sewage and parking problems. A spatial impulse was needed. Accordingly, the municipality initiated a traditional restructuring task because at that time there were still some financial means available to purchase plots and real estate for the benefit of a better spatial design of the area. The reconstruction was a success. However there was still a challenge ahead for the neighbouring area of Induma-West. This time the basic situation was changed. Because the budget for reconstruction was significantly cut, there was no potential for spatial interventions by the municipality. A new approach was needed.

4.3.2 Problem

Induma-West is an industrial area of approximately 6 hectares. It dates back from the ’60 and nowadays it is characterised by an outdated appearance and unattractive building facades. Independently of the degradation of a large part of the commercial units in the area, this also means that the public space does not meet present day requirements. The road profile for the supply of goods is insufficient, the pavement is degraded and the sewage system is outdated. Additionally there are parking problems mainly caused by the nearby social facility of the municipality.

4.3.3 Approach

Just as was the case in Induma-East, the municipality started the process by collaboration between the BOM (Brabant Development Company), the SBH (Industrial Foundation Helmond) and the municipality itself. These parties requested the assistance of the Dutch Cadastre to experiment with voluntary urban land readjustment. At first the municipality did not have high hopes for this approach. However, the first meeting with a group of land- and real estate owners proved them otherwise. The owners were surprisingly open to each other about their plans for the future. Several concrete readjustment proposals were presented in the following meetings.

Figure 2 Meeting and sketch session group of land- and real estate owners

4.3.4 Discussion

As was discussed in the previous paragraph, the land- and real estate owners in the area are surprisingly open to each other regarding their future plans and their interests. All of them are aware of the need for a common strategy in the area to turn the tide of degradation. However, some of the owners have a higher sense of urgency than others. Some owners want to expand

and invest a significant amount of resources. Others are fine with some minor refurbishment activities.

At least the owners in the area are well organized. Their common interests are represented by the SBH. This foundation also delivers one person who can be seen as the ‘area director’. He fulfils the function as intermediary person between the owners and the municipality. The BOM is involved because of their experience with many reconstruction activities in the province of Brabant. This party also has the ability to finance spatial interventions by private land- and real estate owners in advance. The idea is to use the principles of a revolving fund. At this moment it is not sure whether these interventions would lead to a positive business case. However, some of the owners in the area are already sure about their positive business case, at least if competitive trading prices are used. This is a significant challenge because some of the land owners in the area simply ask an unreasonable high financial compensation for their plots. They want to maximize their revenues. To enhance the process, several local real estate agents are asked to determine what would be a fair price to trade land in the area. The intention is that this will bring supply and demand more in line with each other and boost the process to a successful transformation of the area.

4.4 Rotterdam, Brainpark

4.4.1 Context and problem

Rotterdam Brainpark is a mono functional business park situated at the highway at the one hand and at the other hand the Erasmus University of Rotterdam. This park measures about 16 hectares and counts 24 office buildings. The vacancy rate of the office buildings is about 30%. Four owners are working together in an association of owners. These four owners represent 15 of the 24 buildings, the remaining office buildings are owned by investors who possess only one building in Brainpark.

The four owners want the park to become more attractive and livelier. To reach this goal new functions can be added to the public space and office buildings can be transformed into student apartments or startup offices.

Figure 3 Development zoning at Brainpark

4.4.2 Approach

The initiative for the project is taken by a project developer. A project group is established with a representative of the owners, an architect, the project developer and the Dutch Cadastre. This project group has contacted each owner about the goal and the approach of the project. The project group collected information about vacancy, tenure prices, technical installations, value etc. Two meetings were held together with the owners. During the first meeting the owners brainstormed about the potentials of the area. Between the meetings the architect translated this potentials in a zoning plan with development possibilities. In the second meeting the zoning plan was discussed and it was explained how exchange of real estate and land could help to realize the plan. In this second meeting the municipality was present, too.

4.4.3 Discussion

During the two meetings it became clear there was a distinct difference in sense of urgency felt by different owners. One of the owners possessing buildings in the zone most appropriate to transformation did rarely have to deal with vacancy. There was no need for him to participate in the plan. Two of the other owners felt a high sense of urgency. On the other hand all owners regarded the project mainly as a pilot, a try out (Raanhuis, 2016). So maybe none of them was really convinced urban land readjustment is the best way to solve the problems faced. The owners were well organised, but in both meetings not all were represented. The owners were also not all willing to discuss their interests openly and share information. The process management was done by the project developer, who had a significant interest regarding the success of the project, for this should generate business to him.

During the second meeting financial consequences could not be given. One of the representatives did not have the authority to speak on behalf of the real owner. It seemed to be there was more intention to get information than to bring information (Raanhuis, 2016).

The municipality was not very concerned. At the one hand the municipality did support the private initiative; on the other hand the area had no priority regarding spatial facilitation. The municipality turned out to have other interests, when new student housing was permitted at

the neighbouring university campus, instead of transforming office buildings to student apartments at Brainpark.

4.5 Doetinchem, De Veentjes

4.5.1 Context

Doetinchem De Veentjes is part of the experimental program of the province Gelderland on urban land readjustment (PSH). Within the program there are several cooperating parties who work together in cases to study the functioning of the instrument of urban land readjustment in practice. In Doetinchem the research focusses on the question how urban land readjustment can contribute to the transformation of the area De Veentjes and the nearby area around the Dr. Huber Noodtplaats.

4.5.2 Problem

The municipality aims at the consolidation of the city centre. The area of this case study is situated just outside of the city centre. However, both areas are dependent on each other because there is a limited program for retail and housing in the area. It is sensible to consolidate this area as a unity. On the other hand, the municipality tries to stop the degradation and to reduce the vacancy. The main challenge of this area is to find a new future-proof identity for the area that is complementary to the remaining part of the area. At the same time the municipal property in the area should be used in a more efficient way. The study area of De Veentjes and the Dr. Huber Noodtplaats is around 13 hectares and there are over 60 owners involved.

4.5.3 Approach

The municipality initiated four exploratory meetings, nine bilateral talks and 3 discussion meetings with the involved owners. At first a scenario was developed which resulted in a negative business case. However, this collective business case was financially more attractive in contrast to a scenario where every owner would invest individually. Later the Bank Dutch Municipalities (BNG) developed an alternative scenario which led to a positive business case. These efforts have led to two spatial programmatic scenarios. The first aims at the development of a food court, the second on the development of a residential care concept. Both of the scenarios are financially substantiated by calculations of the Bank Dutch Municipalities (BNG) and supported by a development strategy.

4.5.4 Discussion

Despite of the fact that the BNG concludes that the transformation will result in a profitable investment, many of the owners in the area would have to mark down their property values. The sense of urgency is present. However, this sense of urgency is not experienced equally by all parties. Additionally there is no strong belief in working together. Some owners prefer to develop their property independently. For instance, one real estate developer has received a promise from the municipality for his site within the area. For this developer it is not essential to cooperate with the others, because he can develop the site independently from the others. Consequently it is also not possible to involve this site in the urban land readjustment process. Additionally, the common approach for urban land readjustment would also need a more prominent investment in process management. However, until this moment there is no independent consultant who connects all parties as an ‘area director’.

At the moment the process of urban land readjustment is still ongoing. There are exploratory meetings for the Noodtplaats. Additionally, there are some new calculations for De Veentjes by the BNG. And now the decision making process is still in procedure.

5. DISCUSSION

The experiences with urban land readjustment are all based on a voluntary readjustment process. At this moment this is the only way in the Netherlands, for there is no act on compulsory land readjustment available. This also impacts the process of voluntary land readjustment. Owners feel more pressure to make deals when they otherwise should be forced to a legal readjustment.

The consequence is that the success of urban land readjustment mainly depends on good process management. Factors influencing the empowerment of the owners and in such way the success of the process, are mainly:

- The degree of owner organisation
- The availability of an independent area director
- The possibility of financing in advance
- A positive business case
- An open mind regarding interests
- An equal sense of urgency

Two of the four considered pilot projects are still ongoing. In the remaining two the process came to a standstill. Considering the earlier mentioned influencing factors, most of them are estimated in a positive way in Helmond. This project offers also the best perspective to exchange real estate. Although the fragmentation of ownership in Maasbracht is evident, most influencing process factors are negative. Here we have seen the process failed and readjustment did not succeed.

In all considered projects a certain sense of urgency is present among the owners, but also in all projects there is a distinguished feeling about the sense of urgency among the owners. Apparently there can be differences in the sense of urgency, for the projects of Helmond and Doetinchem are still going on, as long as all interests are taken into account.

Based on a pilot case in Woerden, the Dutch Cadastre made a simulation game in which readjustment can take place based on the headlines of the owner made vision. In December 2015 this game is played by stakeholders of urban land development in the Netherlands. The participants of the game gained a greater understanding of the process of urban land readjustment. During the discussion after the game the following conclusions were drawn (Jager, 2016):

- Start with options for the exchange of real estate that are most obvious;
- Face-to-face contact between stakeholders is very important;
- Stakeholders: be open about interests, motivations, ambitions
- Municipality: define roles and communicate your role clearly
- Appoint an independent process manager;
- A positive business case is a condition, take the local market into account;
- Exchanging real estate and exchanging tenure are to different things.

To conclude, one sees the appearance of some of the mentioned factors: openness about interests, the availability of an independent area director and a positive business case. The stimulating program of the Ministry of Infrastructure and the Environment encourages municipalities to share this kind of experiences by creating a community of practice involving the pilot projects selected by the program.
Beside this, one sees also the different roles of the municipality mentioned. This appeared to be an important factor in the Brainpark project, too.

The main question in stimulating urban land readjustment seems to be: how can one manage the sense of urgency to the individual owners in such a way they begin to act? One part of the question is: take all interests of all owners into account. An independent area manager has an important role here. The other part of the answer is that the individual business case of each participating owner has to be a positive one. This can be reached by increasing the deliverables or reducing the costs. Stimulating urban land readjustment has to focus on this aspect.
We mentioned six influencing factors which help to make urban land readjustment successful. When starting a project in urban land readjustment one has to consider if the influencing factors on owner empowerment presented here, are sufficiently addressed within the actual case. And if not, how you can improve these basic principles in advance.

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BIOGRAPHICAL NOTES

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Tom Verbruggen completed his major in landscape architecture at Wageningen University & Research. At the Radboud University Nijmegen he majored in spatial planning with a focus on real estate and land policy. He graduated from both universities in 2012. Currently he works as a project leader at the Dutch Cadastre in the field of urban and rural land readjustment.

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[i] The Netherlands have a negative land registration system. This means the land owner in the land register is not necessarily in all cases the legal owner. The land register registers land rights based on the offered deeds. Owners are obliged to register the transaction deed. But ownerships can also be legally acquired without a deed, for instance when someone possesses land for many years while he behaviors like the owner.

Technical Session A4

Managing complexity in multi-purpose land consolidation

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New tasks for land management works and land consolidation in Poland

Jacek M. PIJANOWSKI, Edyta SOBAŚ, Jarosław TASZAKOWSKI, Poland

Key words:
Development of rural areas, land management, land consolidation, social participation, villages renewal, protection of the landscape

SUMMARY

The article presents the results of research and implementation works, carried out in 2011-2015 in Małopolska (one of the 16 Polish regions), as a part of two independent Polish-German projects, concerning an integrated development of rural areas (IDRA). The first project was aimed at the development of guidelines for the improvement of administrative structures responsible for development of rural areas at the regional level. The second one expanded these studies and was aimed at the development of the rules of participation of local communities in the preparation of proceedings for IDRA with much wider material scope.

The main assumption of the study was to achieve the objectives not on the basis of analyzes and of theoretical comparisons, but in parallel to the development of modular concepts of proceedings for IDRA on particular objects. The works within the first project (2011-2012) took place in the district of Tarnow, and the partners were institutions from Thuringia. Within the second project (2014-2015) implemented in the district of Brzesko, the partners were institutions and experts from Bavaria (Lower Franconia).

Basing on the results of the study, the recommendations concerning new tasks for the agricultural-arrangement works in Poland were developed, as an important tool supporting the socio-economic changes in rural areas in Poland.

Artykuł prezentuje wyniki prac badawczo-wdrożeniowych, zrealizowanych w latach 2011-2015 w Małopolsce (jednym z 16 regionów Polski), prac badawczo-wdrożeniowych, w ramach dwóch niezależnych projektów polsko-niemieckich, dotyczących zintegrowanego rozwoju obszarów wiejskich (IDRA). Pierwszy z nich miał na celu wypracowanie założeń dla poprawy struktur administracji odpowiedzialnej za rozwój obszarów wiejskich na poziomie regionalnym. Drugi poszerzał te badania i miał na celu wypracowanie zasad udziału społeczności lokalnych w przygotowaniu postępowań dla IDRA o znacznie szerszym zakresie rzeczowym.

Głównym założeniem badań było osiągnięcie celów nie na podstawie analiz i porównań teoretycznych, ale równolegle do opracowywania modelowych koncepcji postępowania dla IDRA na konkretnych obiektach. Prace w ramach pierwszego projektu (2011-2012) odbywały się na terenie powiatu tarnowskiego a partnerem były instytucje z Turyngii. W ramach drugiego projektu (2014-2015) zrealizowanego w powiecie brzeskim, partnerem były instytucje i eksperci z Bawarii (Dolna Frankonia).

Na podstawie wyników badań, opracowano zalecenia dotyczące nowych zadań prac urządzeniowo-rolnych w Polsce, jako ważnego narzędzia wspomagającego przemiany społeczno-gospodarcze na obszarach wiejskich w Polsce.

New tasks for land management works and land consolidation in Poland

Jacek M. PIJANOWSKI, Edyta SOBAŚ, Jarosław TASZAKOWSKI, Poland

1. INTRODUCTION

Along with the socio-economic changes in the end of the 80s of the twentieth century, the conditions for the development of rural areas and agriculture in Poland have changed fundamentally. Reconstruction of the economy significantly increased the unemployment rate, which struck the rural population in particular. Because of the poor infrastructure in rural areas and insufficient amount of non-agricultural jobs, farms in many parts of the country have the function of the social buffer. The average size of agricultural use (AU) in a farm in Poland in 2016 amounted to approximately 10.59 ha[1]. While the number of farms was 1.4 million in 2015, with more than half of the farms producing only or mainly for their own needs. In 2015 in Poland there were about 1.38 millions of farms with a size greater than 1 ha. The most farms (73.2%) were in the area group 1-10 ha AU (approx. 1.03 mln of farms)[2]. The experts estimate, that about 370.000 small farms (i.e. about 16% of all farms) will disappear by the end of 2020.

Characteristic for rural areas in the south-eastern Poland is fragmentation and low average size of family farms (approx. 4 ha), which according to the standards of Western European agriculture show considerable deficits as regards the area of owned or leased land, the level of mechanization and financial resources. Typical for this part of Poland settlement in the form of linear village and scattered buildings hinder the construction and increase the costs of infrastructure. In recent years there has been a rapid decline in the population living mainly from agriculture. The rural population derives income from many sources, especially from hired work. The remaining, significant part of the rural population lives off pensions, especially in households of the former owner of the farm. Due to the lack of non-agricultural (mostly large) employers, in most communes the possibility of non-agricultural employment is limited.

Rural areas in Poland will be subject to profound changes. The reasons for these transformations – beside the rapid advances in agricultural technology – are the progressive changes in the agrarian structure. Great importance for these transformations will have demographic processes and migration movements, availability of jobs, new habits of residents, as well as the increasingly diverse requirements of the society with respect to the land use, landscape and the space. The situation of peripheral rural areas is far different from the suburban villages. Therefore, it is difficult to determine a single pattern of development. The solutions to the problems of rural areas will be created by the new strategic document of the Ministry of Agriculture and Rural Development of Poland – "Pact for rural areas", which will come into force from 2017. This document will aim to sustainable rural development, taking into account the different purposes and competitive expectations. Thus understood development will include beside economic objectives of agriculture also socio-economic aspects, development objectives of settlements, infrastructure, environment, landscape, cultural heritage, water management and non-agricultural economic development.

[1] http://www.arimr.gov.pl/dla-beneficjenta/srednia-powierzchnia-gospodarstwa.html (access: 07.10.2016).

[2] http://www.gospodarz.pl/aktualnosci/artykuly-porady-analizy/uzytkowanie-gruntow.html (access: 04.10.2016).

In the spatial dimension at the same time will be needed respectively wide scope and ways of elaboration of the phase of changes planning, based on modern Landmanagement – which is not included in the project of this document. It is therefore important to consider the possibility of introducing in Poland the IDRA mechanism, which functions in the most countries and regions of Western Europe for many years.

An important role in the development processes will play land, as the economic value – its ownership, mobility, availability and its use. An important problem of Polish rural areas was the possibility of universal acquisition and marketing of agricultural land for construction purposes. In order to eliminate this process since April 2016 has been implemented the law preventing speculation of agricultural land and its purchase by a person not being a farmer [Ustawa 2016]. This was an important step for the possibility of "healing" the spatial planning law – also essential for development of rural areas.

2. DESCRIPTION OF THE RESEARCH

The research presented in the framework of article involved the creation of assumptions to proceedings for IDRA in selected villages in Małopolska using the legal basis and methods used in Thuringia and Bavaria. They are described in later sections. The objective was to verify whether this methodology can help to solve problems of development of rural areas, and whether it is possible to implement it in Poland.

2.1 A general description of the project with Thuringia

The aim of the project carried out with Thuringia under the name "Improvement of the actions of regional administration responsible for land consolidation in Malopolska" was to develop model solutions on the effectiveness of the voivodeship actions in terms of improvement of rural areas structures, using the so-called agricultural arrangements – as an essential element of regional development. The point was in the first place to make assessment and prepare recommendations to improve the functioning of the broadly understood administration responsible for the development of rural areas.

The basis to achieve the objective of the project was development by experts from the Office of the Rural Areas Development and Agricultural Equipment in Meiningen, in cooperation with the Office of the Marshal of the Malopolska Region and the University of Agriculture in Krakow of „The Integrated Rural Areas Development Plan (IRADP) for the preparation of the agricultural-arrangement proceedings together with the implementation of investment projects in agricultural and forestry production space and projects in the scope of development and renewal of rural areas for villages Nieciecza and Czyżów”.

Villages Nieciecza and Czyżów are located in the Żabno commune. Nieciecza covers an area of 490 hectares and has a population of 750, while Czyżów 199 hectares and 107 inhabitants. The analyzed area extends along the valley of the Dunajec, which is dominated by good and very good soils. Climatic conditions and one of the longest growing seasons in Poland are particularly suitable for growing fruit, vegetables and cereals. In areas with poor soils the afforestation can be observed, less frequently setting-aside. In the both villages, the agriculture is dominated by small and highly fragmented farms. The most of agricultural transport roads are in poor condition. In the both villages occure floodings of farmlands and habitats, which is caused by inadequate state of maintenance of drainage devices. The settlement structure in Nieciecza has a rather compact form, with the trend of development

along the communal roads, what also characterizes Czyżów.

The joint work included in the first place the phase of the study of the available plans and documents related to the Żabno commune. In addition, the letters were sent to various offices, asking for information on existing and approved plans or investment plans in the project area. In the second phase, the experts conducted a specific survey of the existing condition of the area of proceedings, which showed mentioned above serious structural problems of the agricultural land. The works included the additional polls among parties representing the public interests and collecting the further necessary documents and supplementary information in selected offices. An important element of the work was meeting with residents, informing about the conducted survey and possible agricultural-arrangements proceedings in the future. In the third phase, a IRADP document was prepared with attachments, according to the extent applicable in Thuringia. In the fourth phase, during the meeting the information about the prepared IRADP was presented and explained to the representatives of entities representing the interests of the public, representatives of trade unions of farmers and residents of villages covered by the elaboration, which met with a very high approval. Extremely valuable is the fact, that within the project Małopolska was supported by the experts and specialists from Thuringia, who 26 years ago, on the basis of the Bavarian patterns very quickly created a modern agricultural-arrangements administration and on the legal basis of the Federal Republic of Germany (Flurbereinigungsgesetz) elaborated a whole series of regional guidelines [Freistaat Thüringen 2011].

Figure 1. A picture speaks more than words – snapshots of the work of experts from Thuringia in Małopolska (phot. J.M. Pijanowski)

The project of Malopolska and Thuringia should be described as a very important "first step", with the task to investigate the possibility of implementing similar solutions on Polish ground.

After the political transformation of 1989/1990 (as mentioned) on a similar principle Bavaria supported Thuringia to build effective administrative structures, responsible for development of rural areas. Since Thuringia is a Partner Region of Małopolska, the first attempt was made to implement its solutions on the ground of Małopolska/Poland.

2.2 A general description of the project with Bavaria

Within the second project under the name „Integrated rural development programming in Malopolska on the basis of Bavarian patterns" it was reached to the sources – that is, to the experiences of Bavaria, as one of the precursors and advocates of IDRA in Europe. The project focuses on a new, integrated approach to planning the development of rural areas implemented with the participation of local communities, including simultaneously:

- mobilization of the community and strengthening the sense of community,
- creation of public-private partnerships for the preparation and implementation of integrated development concept and
- combining a wide range of activities as: local development strategies, village renewal, agricultural arrangements, nature and landscape conservation and management of agricultural water resources.

Within the project, the experts from the Office of the Rural Areas Development in Würzburg and from the Association of the Rural Areas Development of Lower Franconia, as well as experts from the University of Agriculture in Krakow elaborated in collaboration with the Office of the Marshal of the Malopolska Region „The concept of proceedings for IDRA, including recommendations for the future proceedings". The study was created on the basis of works carried out in the Strzelce Wielkie village.

Strzelce Wielkie is located in the Szczurowa commune and occupy an area of 1,708 hectares and is inhabited by approx. 820 inhabitants. Most of the rural population is employed outside the agriculture. The big problem is the danger of flooding, which occurs in particular in the period from March to July, due to the surrounding village small rivers Uszewka and Gróbka. The second reason is the seasonal water release from the forest located in the north of the village. Through the project area runs a creek bed Młynówka, cut off from the water supply in the 70s of the twentieth century. Its course is still preserved only in part, and to the south only its relics can be found. Młynówka was originally powered by water drawn from the forest. In Strzelce Wielkie the stream flowed into the village pond, and then by the non-existent today mill flowed into the northern part of the village. In the north-western part of the project area the Natura 2000 site and „Bratucicki Protected Landscape Area" are located. In Strzelce Wielkie there are also natural and cultural monuments, including a number of wooden houses and other buildings and parts of them, which are protected. The village is a multiroad one surrounded by small hamlets.

An important feature of the method of Bavaria used in Strzelce Wielkie is intensive preparation phase of such proceedings together with the residents of the area it covers, who (later) as a community of participants in the proceedings – according to the Federal Law on agricultural arrangements [Flurbereinigungsgesetz 1976] – in principle they decide themselves on the basis of the Bavarian agricultural arrangements law [Bayerisches Gesetz 1994] on carrying out investment activities[3]. The following motto applies here: „Together we

[3] It should be noted that similar rules were in force in interwar Poland –the reclamation companies or associations, being the main investor of the projects were created.

think, together we plan, together we shape!". Bavarian methodology of carrying out proceedings is also characterized by co-operation of agricultural-arrangement department with private experts. Activities from the scope of landscape and ecology shaping and village renewal are commissioned to them.

Therefore the work of the project was carried out in three working groups (WG):

- WG „Agricultural arrangements and agriculture",
- WG „Landscape and nature",
- WG „Village renewal and development".

In the first phase the work involved discussing of existing problems and the objectives necessary to achieve. Experts and institutions worked on this together. Next in WG in the first step "The current state" (it is) and "The desired state" (should be) were prepared. Later, together with experts the "problems" (in achieving the desired state) and "Solutions" were identified, which constituted the basis for determining actions and investments. The following sections present the scope and results of these activities in three areas of planning WG.

2.2.1 Agricultural arrangements and agriculture

On the project area the agricultural-arrangement proceeding has not yet been carried out (land consolidation). The agricultural plots are generally irregular and small, not meeting the demands of modern mechanization. The current form of settlement has buildings which hinder the access to the agricultural land lying behind it. There is no action plan on water-drainage devices. A large percentage of the agricultural parcels do not have access to a public road. The major part of the existing roads needs to be repaired and it is often too narrow. Along the waters and ditches there are no roads necessary to maintain the water-drainage devices. In the south-eastern part of the project area repeatedly occure floodings on large areas, what is caused by insufficient possibility of outflow of water. A large part of the ditches is very neglected in their maintenance. Also drainages require cleaning. Because of these problems Strzelce Wielkie is characterized by expanding area of fallow land (about 260 ha, i.e. approx. 25% of all AU) and succession of coincidence seedling on the surface of approx. 130 hectares (about 12% AU). Therefore, in the area of the Natura 2000 network, dry grasslands are plowed and then sown with corn, which threatens the population of modraszek butterfly (Maculinea).

The results of the work in „Agricultural arrangements and agriculture" WG show, that unfavorable shape of plots, dispersion of ownership and inadequate infrastructure and water problems can be significantly improved in the course of agricultural-arrangement proceedings (land consolidation together with post-consolidation development), which will strengthen the economic situation of farms. Land currently set aside or excluded from agricultural production will become areas for potential enlargement of farms AU by the way of purchase or lease.

According to WG statements the key investment should be Młynówka revitalization. This will lead to the improvement of flood protection and ecology of the watercourse, and thanks to it the historic cultural landscape of villages and agricultural land in connection with a historical buildings will be reproduced, which may be a potential for the development of tourism.

2.2.2 Landscape and nature

The characteristic feature of the cultural landscape of the Polish countryside, with its valuable

protected areas is a strong relationship with the agricultural land development. The state of the agrarian structure at the most of the south-eastern area of Poland corresponds to conditions that prevailed in the landscape of Europe before the mechanization of agriculture. The processes of changes in the structure of farms in the Strzelce Wielkie, appearing and developing gradually, require anticipating concepts, for the preservation and development of the cultural landscape. To do this, the sustainable management of all arable land, meadows and woodlands is needed. Agricultural-arrangements proceedings can make a significant contribution to this.

As follows from the agreement with the Regional Directorate of Environmental Protection, thanks to the implementation of the planned roads in the Natura 2000 area, the disappearance of valuable habitats of plants and animals will be minimized. Better access roads to cultivation complexes (restoration / optimization of agricultural activities), improving of economic conditions, creating ecological bridges between biotopes along roads and surface waters, planting rows of roadside trees and the creation of zones of nature conservation in the village will have significantly positive impact on the environment. Therefore, any significant negative effects of agricultural arrangements on the environment should not be expected – provided regard to the protection requirements with respect to acting area network Natura 2000. Thanks to the investment activities the most important species and habitats in this area can be much more supported and developed than the threatened ones. Only within the concept of agricultural-arrangements proceedings the suitable areas for the implementation of pro-environmental projects fit within the logic of a comprehensive development can be identified. In the Strzelce Wielkie the center of gravity of goals and projects for the landscape management is determined by the preservation and development of open living spaces of particular importance for species protected by the community legislation (in particular species-rich extensive meadows) and revitalization of waters together with the accompanying structures of aquatic and terrestrial habitats. The realization of these goals will allow carrying out the entire procedure in a virtually harmless way for the environment.

Figure 2. A picture speaks more than words – snapshots of the work of experts from Bavaria in Małopolska (phot. J. Taszakowski, J.M. Pijanowski, B. Müller, R. Schäffner)

Also, for that reason within the project the impact of planned agricultural infrastructure on nature is balanced. For example, in the Area of Priority 1 construction of approx. 1 km of asphalt roads and approx. 1.2 km of new dirt roads was planned. At the same time liquidation of approx. 1.3 km of existing dirt roads was planned. Construction of roads is planned for intensively used agricultural areas, but also concerns the areas extensively used, landscape elements and biotopes structures, which were classified as replaceable or necessary to maintain. Taking into account the above, the equalization needs were defined to compensate for the construction of road for approx. 0.9 hectares. With the elimination of replaceable dirt roads 0.1 hectares balances further of surface alignment. With proper design of the road network taking into account the structure of valuable biotopes it would be possible to compensate for the reduction of land for a total of approx. 0.8 hectares (Table 2).

Table 1. Interference balance of agricultural roads in natural areas for the selected Priority Area in Strzelce Wielkie (Source: Elaborated by R. Schäffner and B. Faschingbauer 2015, published in [Pijanowski and Zedler (ed.) 2015])

Road surface	Evaluation	Area in m²	Factor	Compensation in m²
Asphalt	0 Arable land / intensive grassland	1,004	1.0	1,004
	1 (areas needed to preservation)	463	3.0	1,389
	2 (areas worth preservation)	902	1.5	1,353
	3 (replaceable areas)	444	1.0	444
Crushed stone	0 intensive grassland	5	0.5	3
	1	–	3.0	0
	2	–	1.5	0
	3	7	1.0	7
Dirt road	1	469	3.0	1,407
	2	1,610	1.5	2,415
	3	111	0.0	0
Sub-total				**114**
Liquidation of dirt roads	3	2,418	0.5	1,209
The sum of the needs of the compensation area for the Priority Area				**9,231**
Reduction of the need of compensation area				**-981**
The sum taking into account the measures to mitigate roads interference				**8,250**

2.2.3 Village renewal and development

Works of „Village renewal and development" WG were based on the active participation of citizens of all the generations in elaboration of development goals, in planning future investments and intangible assets. The works also included the urban and the socio-cultural sphere. The planning range extended not only to the village but also to the hamlets and other buildings. WG survey included on-site verification, mapping, photographic and sketch documentation. The survey covered mainly qualitative and quantitative description of the types of buildings, taking into account: the function and use of the buildings; the layout of

locations of historical and contemporary buildings; the concentration of vacancies and buildings, which will soon become empty, the concentration of buildings in poor condition and the age of residents of buildings.

During the analysis of urban development, it turned out that the built-up area, as specified in the planning documents exceeds the actual demand for building plots of 14,000% (!). They are indeed partially built-up, however, such area in any way is not related to the expected - even under the most optimistic estimates – construction activity.

At the completion of works all three of WG and experts have identified targets according to which the development should follow in Strzelce Wielkie:

- The development objective 1: Improvement of living conditions.
- The development objective 2: Preservation of local distinctiveness (identification) of the village.
- The development objective 3: Protection and care of nature and landscape.
- The development objective 4: Strengthening of agriculture and structural improvement of the agricultural land.

3. DISCUSSION OF THE RESULTS OF RESEARCH

The studies show, that in Thuringia the planning process of structural transformation by the administration for the development of rural areas takes very wide agricultural production area and includes primarily the water supply, land reclamation and roads infrastructure and the improvement of spatial structure of farms (agricultural and settlement areas). The activities towards the development and protection of the landscape and nature are also planned. The works are carried out by agricultural-arrangement administrative personnel, who in the first phase notify about them all institutions which may be interested in actions, and the local community. Apart from these activities, the commune can commission a study of the plan for renewal of the village to external experts.

This is a very advanced range of work compared to the practice followed in Poland based on outdated regulations of the Law on land consolidation of 1982 [Ustawa 1982]. Here, the regional administration is developing only the so-called assumptions to land consolidation project, which include only the infrastructure investments within the scope of so-called post-consolidation development[4], enabling taking possession by the participants of the land consolidation of the land separated for them [Pijanowski 2014]. Measures for the protection of landscape and nature can be taken into account, but only as the protection of areas. Village renewal in Poland is a separate investment implemented by the commune and cultural or church institutions. The lack of uniform standards of preparing post-consolidation development plans is a grave problem in Poland [Noga 2001]. In view of increasing frequency of water-logging of arable land or even local floods, it seems extremely dangerous that measures aimed accurate identification of local and regional water conditions and at solving

[4] For the first time post-consolidation development (road network and land improvement structures) was defined in The Regulation of the Minister of Agriculture and Rural Development of 24th of April 2008 on detailed conditions and procedures of providing financial aid within the project: "Improvement and development of infrastructure related to development and adaptation of agriculture and forestry by land consolidation" included in the Rural Development Programme for 2007-2013 [Rozporządzenie 2008]. The issue is also presented in the Act of 29th of July 2011 amending the act on consolidation and exchange of land [Ustawa 2011].

the problems associated there cannot be included in the post-consolidation development plan. An important reason for this situation, found as a result of the Małopolska and Thuringia project was the fact of an improper division of competences between the authorities responsible for land consolidation, drainage / water resources and village renewal. Figure 3 shows highly complicated and inefficient division of competences theoretically allowing implementation of procedures for IDRA in Poland [Pijanowski 2014].

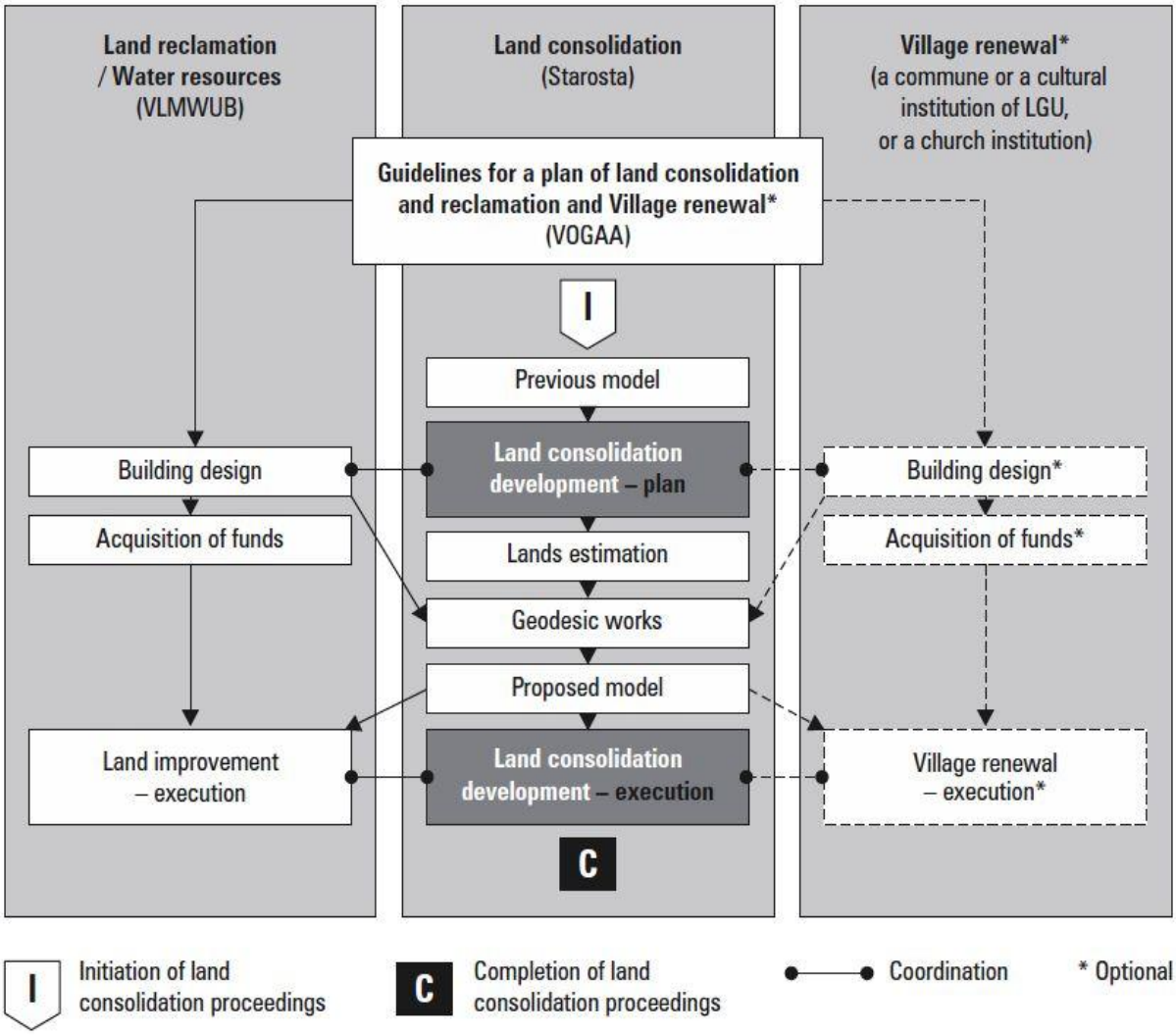

Figure 3. The theoretical model of coordination of existing administrative bodies in Poland, which would allow implementation of procedures for IDRA according to Thuringia model (Source: Elaborated by G. Korta and J. M. Pijanowski 2012, published in [Pijanowski 2014])

Bavaria worked out a very advanced process of preparation for the IDRA proceedings. A significant difference in comparison to Thuringia lies in the approach to the planning process, which from the beginning to the end is carried out with the involvement of residents. Bavarian methodology of proceedings is also characterized by cooperation of agricultural-arrangements body with private experts. Basically their work is the activity in the field of landscape design and ecology and rural renewal. Generally IDRA in Bavaria includes planning, preparation and execution of all activities, which are appropriate to preserve and improve the housing, economic and recreational functions of rural areas, and for long-term

support and improvement of living conditions outside urban areas. Therefore, in Bavaria the agricultural-arrangements administration (alongside with the commitment to the transformation of property relations) received the competence and the task of self-planning and implementation of projects for the countryside and village renewal [Pijanowski and Zedler (ed.) 2015].

The scope of the above-discussed work carried out on the objects of research is summarized in Table 2, which also contains a reference to the methodology currently used in Poland.

Table 2. Summary of the main stages of work in Malopolska with Thuringia and Bavaria projects and the comparison with the stages of the creation of assumptions to a project of land consolidation, currently implemented in Poland (Source: own study)

FEDERAL REPUBLIC OF GERMANY		POLAND
Thuringia	**Bavaria**	**Malopolska**[5]
Decision / application for undertaking the work		
Written information by the arrangement-agricultural body for institutions representing public interests about ongoing planning works procedure for IDRA.		
• Analysis of the existing planning documents, spatial development plans • Presentation of the project at the meeting of inhabitants of Nieciecza and Czyżów.	• Presentation of the project on the village meeting in Strzelce Wielkie and creation of working groups (WG). • Workshops with residents and experts and joint analysis development SWAT. • Introduction to analysis "The current state" (it is) and "The desired state" (should be).	• Meeting with the initiating group to discuss the principles of the assumptions for the land consolidation project. • Discussion of problems and limitations.
Consultative meeting with institutions representing the public interests.		Written correspondence and consultations with institutions representing the public interests.
Administration survey works.	WG, the administration and experts survey works.	Administration survey works.
• Development of the concept by the administration. • Current consultation with all local actors.	Development of the concept: • Works of WG and experts over the next steps: "Problems" and "Solutions.". • Presentation of the partial results of all WG and submission of plans developed by the administration and experts. • Arrangements with the institutions responsible for water management and land reclamation.	• Development of the concept of assumptions by the initiating group. • Current consultation with all local actors.
Village meeting aimed at the presentation of the concept of the plan of roads and water-drainage devices developed by the administration.	Village meeting aimed at the presentation of the concept of the plan of roads and water-drainage devices developed by WG, the administration and experts.	Village meeting aimed at the presentation the final concept of the assumptions of the land consolidation project developed by the administration.

4. CONCLUSIONS AND RECOMMENDATIONS ARISING FROM THE RESEARCH

Significant findings arising from the research and implementation, accompanying the preparation of proceedings for IDRA in Nieciecza, Czyżów and Strzelce Wielkie are summarized in the following paragraphs:

[5] Far different method of preparatory work is characterized by the methodology of Lower Silesia, which is just as advanced as the methods of Thuringia.

1. In the light of the problems and challenges facing rural areas in Poland, it is essential to introduce as quickly as possible to the common practice the procedures for IDRA according to the methodology used in Bavaria.
2. An important argument in favor of the Bavarian approach is its complexity, enabling sustainable spatial and structural development of rural communities. The point is the especially wide (integrated) activity involving planning, preparation and carrying out all actions needed locally to preserve and improve the economic (including agriculture) housing, natural and cultural functions of these area, as a way to a lasting improvement in working and living conditions outside the urban areas. Especially important is the possibility of liquidation (minimization) of the problems within the scope of water management, construction of rural roads and land consolidation.
3. It is equally important that the IDRA process is implemented in Bavaria using a participatory approach, i.e. the full involvement of local communities, associations and others. The project results in Strzelce Wielkie show that with such an approach social / human capital and attachment to the inhabitants own village has been strengthened.
5. The preparation phase of model procedures for IDRA in Małopolska (especially according to the Bavarian methodology) showed that
   - this methodology can be successfully applied in Poland,
   - large number of problems can be solved only in the framework of proceedings for IDRA,
   - actions and knowledge of various institutions and experts is necessary; also a responsible coordinating institution is necessary.
6. Competences in strategic planning of agricultural-arrangements proceedings, development of programs, initiating proceedings and approval of plans, technical project works and investment works are currently in Poland in different hands (Figure 3). It is necessary to shorten the decision-making way and enhance the efficiency of administration preparing and leading the proceedings for IDRA (the aforementioned coordinating institution). Improvement of the situation will be associated with the new organization of the agricultural-arrangement administration in Poland, in the direction of strong regional or sub-regional offices. Figure 4 presents as an example the general structure of such office in Bavaria.

The central services	Specialist services	A comprehensive development of rural areas and village renewal
Personnel matters and administration	Agriculture	Project teams
Legal department	Landscape	Project teams
Surveying and Information Technologies	Village renewal and construction	Project teams
Press spokesman and documentation	Financial assistance	Experts

Figure 4. Organizational chart of offices for the development of rural areas in Bavaria (source: own study based on [Pijanowski and Zedler (ed.) 2015])

7. The urgency of the land consolidation works is different in different regions of Poland. In

the framework of strengthening of local governments the amended agricultural-arrangement law could give provinces more competences in this area, comparable to the Federal Republic of Germany.

8. The act on consolidation and exchange of land of 1982, despite the amendments, does not provide substantive, organizational and legal framework for action, required in the proceedings for IDRA. It should be amended as soon as possible.
9. The definition of land consolidation (agricultural arrangements) should be changed. The purpose of the investigation should enable implementation of procedures for IDRA. The projects in the field of road construction, village renewal, maintenance and management of landscape and water management should be named in the new Act. Individual projects should also be mentioned in the principles of support.
10. Landmanagement is one of the carriers of procedures for IDRA. Besides the classic tasks of land consolidation and the improvement of the plots parameters for rational agricultural management, there is a need for the expansion of tasks concerning the coordination of intended plans. In particular, there is a need of prior acquisition of area for public purposes (e.g. environmental protection, water management).
11. Problems encountered in the proceedings for IDRA are varied and go beyond a small group of people, therefore they can be solved only through the consistent inclusion of inhabitants to the planning process, and preferably by the activating work of inhabitants.
12. The scope of IDRA planning covers many professional aspects (technical and legal). The inclusion of agricultural arrangements into the spatial management and defining the objectives of the planning of agricultural arrangements should be statutory regulated. The procedure of plans arrangements should be here prescribed and the inclusion of institutions representing the public interests.

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The Land Consolidation Implementation Studies In Turkey

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Key words: land consolidation, inheritance law, expropriation,fragmentation

SUMMARY

In this review, land consolidation and land consolidation implementations conducted by General Directorate of Soil Water (1961-1984), Undersecretary of Land and Agrarian Reform (1973-1984), General Directorate Rural Service, General Directorate of Agrarian Reform (1984-) and General Directorate of State Hydraulic Works (2009-) were presented. This review also included the objectives of the laws used in the implementations, implementation results, the problems during the implementations. Furthermore, the studies of the executive agency which is General Directorate of Agrarian Reform, were explained. As a conclusion, an assesment were given based on experiences of implementation practices.

ÖZET

Bu bildiride; Türkiye'deki tarım arazilerinin toplulaştırma açısından değerlendirilmesi ve Arazi Toplulaştırma uygulamalarını gerçekleştiren TOPRAKSU Genel Müdürlüğü(1961-1984), Toprak ve Tarım Reformu Genel Müdürlüğü (1973-1984), Köy Hizmetleri Genel Müdürlüğü (1984-2005) ile Tarım Reformu Genel Müdürlüğü (1984-) Devlet Su İşleri Genel Müdürlüğü'nün (2009-) uygulamalarda kullanılan yasaların amaçları, sonuçları ve uygulamada karşılaşılan sorunlar ile halen uygulayıcı kurum olan Tarım Reformu Genel Müdürlüğü'nün çalışmaları sahadaki deneyimlere dayanarak bir değerlendirme yapılmaktadır.

The Land Consolidation Implementation Studies In Turkey

Fatma Tüz Zehra GÜLSEVER , Osman ÖZKAN and Uğur BÜYÜKHATİPOĞLU, Turkey

1 . AGRICULTURAL LANDS AND LAND CONSOLIDATION REQUIREMENT IN TURKEY

Turkey is one of the earliest inhabited geographies and being home to several civilizations since the early ages of history. These lands, that have served mankind throughout history with its fertile, generous grounds and with its favorable climate, topographic and geographical structure, is getting more valuable through modern agricultural technologies, young population, potential labor force in agriculture, and the investments made recently.

Turkey is regarded as being one of the most important trade centers in the world due to its geopolitical position which is the closest common location between the continents of Europe, Asia and Africa. Turkey, with its climatic feature, variety of products ranging from olive to hazelnut and fruits, utilizing the highest quality, modern agricultural technologies, and significant potential market power has an important potential worldwide.

However farm enterprises size scale is the biggest constraint in agriculture. According to 2001 General Agricultural Counting (GAC) results, in Turkey, the average fell per business is 4.1 parcels, and the average plot size is 1.5 hectares. According to 2014 Farmer Registration System (FRS), total number of registered farmers is 2.206.874 and cultivated land is 14.927.689 hectares. As to these data the average farm size is 6.76 hectares. This data reveals the structure of lands is in pieces and the farms are on small scale in our country.

Agricultural Enterprise Structure Survey conducted in 2006, shows the fragmentation of agricultural land is still continued. The main factors determining the efficiency of agricultural enterprises in Turkey is agricultural enterprises being small-scale and the land belongs to them being fragmented.

The fragmentation of agriculture enterprises in our country can be stated in three ways:

- The fragmented cadastral parcels, scattered small structure (heritage, trade, public investment, geographical reasons)
- Shareholding in Title Deed (heritage, trade)
- Fragmented usage (without a shareholding in title deed sharing among the inheritors, trading among farmers, renting, using fragmented parcel owner to diversification product, copartner ship, usage the parcel for fragmented product design, usage of parcel because of farmers not having enough mechanization.

The sustainability of agriculture is possible with the planning of arable land and rural habitats and agricultural industries area. Molen (2002) emphasis that land management system related to culture, history and human behavior. Land consolidation (LC) is one of the tools used for land management in rural areas in land management system, world and our country. There are

different applications from country to country in the LC studies. Likewise, in our country for example in the implemented projects in Konya Plain the wind erosion affects planning at some areas, while some measures are needed to be taken for the floods from the Menderes River in Aydın.

Especially, in order to increase the agricultural productivity and to use different opportunities as the most effective weapon (Thomas, 2006) is the land consolidation in our country as well as in the World. To improve the competitiveness of agriculture in the economy by taking the necessary precautions, one of them LC, is located in our country development plans. Furthermore, LC is a process which must be sustainable through the needs in time.

The needs for farm land development services (land leveling, field road, irrigation, drainage, stone collection etc.) and the land for public investments, including increasing the size of LC firms, are met to get savings from the time, fuel and labor. Additionally, solutions for the domestic infrastructural problems of rural settlement areas (sewage, drinking water line), environmental precautions studies and integrated rural development oriented multi-purpose LC implementations have been conducted.

1.1 Preventive Legal Measures for Fragmentation of Agricultural Lands in Turkey

According to the Cadastral Law, it is envisaged that the minimum area of each parcel allocated from an agricultural-qualified field would be 0.5 hectare until 2005. This amount is fairly small and it increases the fragmentation due to the inheritance law. The legal studies has started to change this implementation and the minimum land size is determined by the Soil Protect and Land Use Law no.5403 in 2005 (Demirel ve Gülsever, 2007). The minimum agricultural land size is decided by the Ministry with the considerations of social, economic, ecological and technical characteristics of regions and local areas. After reaching a determined minimum size of land, these lands have a characteristic of infrangible goods. According to the 5578 numbered law, the minimum size of a land is 2 hectares for absolute agricultural lands, marginal agricultural lands and special product lands; 0.5 hectares for planted agricultural lands; and 0.3 hectares for greenhouse agricultural lands.

In addition, in agricultural lands and distributed areas (distribution norm) falling of enterprise size below the determined size for that region, and dividing of lands by inheritance are prevented by Law no 3083 in the implementation area. (Demirel and Gülsever, 2007)

Turkish Civil Code generally rules equal sharing of the lands owned by the agricultural business as in other legacy issued commodities. By "Law No. 6537 Amending the Law on Soil Conservation and Land Use Law", published and enacted on May 15, 2014 brought in a measure for determining eligible heirs. Transferring and transmission process by inheritance of agricultural lands are done by the Ministry of Food Agriculture and Livestock (MoFAL) and sent over to the Land Registry Offices under the General of Land Registry and Cadastre Directorate (TKGM).

According to 8/k article of Law No. 5403, held under the title of agricultural land and acquiring business operations; “The Ministry takes the necessary measures to make the enough income agricultural land effective in maximum in terms of economic, ecological and social aspects and increase the size of agricultural land.” Land Acquisition Department is established to carry on the procedure specified by Law number 6537 within GDAR and under Ministry of Food, Agriculture and Livestock (MoFAL). MoFAL continues to work on to simplify the feasibility

of Land Acquisition business and operations on the identification of agricultural income value, the determination of land under enough income agricultural land size, the identification of buyers and sellers and lending.

In addition, by the Law number 6537, amount norms (enough income agricultural lands size) for the lands which are not covered in the 3083 numbered Law are determined based on provincial and district. The lands will not be divided under this specified size. Following the consolidation work performed out of the Law number 3083, the division of inheritance has continued but is limited by this law.

2. LAND CONSOLIDATION IMPLEMENTING INSTITUTIONS AND LAWS FROM PAST TO PRESENT IN TURKEY

The consolidation works that have started in 1961 with General Directorate of the General Directorate of Soil and Water (abolished) have been done by General Directorate Rural Services (GDRS) (abolished) and General Directorate of Agrarian Reform (GDAR) until 2005.

The first LC implementation was started in Konya province Çumra Disrtrict Karkın village in 1961 under the Civil Law. A joint operation related to land consolidation was conducted in Antalya in 1964 by SPO with along the United Nations Food and Agriculture Organization (FAO). About 61 000 hectares area was taken under LC implementation with land development services to improve irrigation and increase agricultural production in Manisa, Salihli and Turgutlu plain with the first "Land Consolidation Statute", which came into force in 1966.

During this period, a step was taken for a farmers' organization but it was not implemented. The first LC application didn't reach to the required consolidation ratio because of not moving from one class to another class in LC area (Takka, 1993; Yıldız, 1983; Ercan, 1970). Under the Agrarian Reform Law No. 1757 applications were made by Soil and Land and Agrarian Reform Undersecretary, General Directorate of Water and Soil between 1973 and 1978 years. Once this law legislated away, with the "Land Consolidation Regulation", enacted in 1979, the works out of "Agricultural Reform Implementation Field" were carried out until 2005 by GDRS, which was abolished. The total LC implementation area done from 1961 to 2005 was 540 thousand hectares.

Provincial Special Administrations continued to the works under the same regulation from 2005 to the year of Law number 5578 was put into force. In these applications, the exchange between classes became possible thus increased consolidation ratio. The land consolidation works in the areas, which declared under Agricultural Reform Applications, have been carried out by General Directorate Agrarian Reform according to the "Agrarian Reform Law on the Land Arrangement in Irrigation Area" adopted in 11.22.1984.

On the other hand land consolidation, which was began 2005 with 12 projects at 40 985 hectare areas within the context of ARIP project financed by the World Bank, had completed by GDAR. (Demirel ve Gülsever, 2007) 03.07.2005 dated Soil Conservation and Land Use Law 5403 (TKAKK) Article 17 relates to land consolidation and deployment.

The Ministry of Agriculture and Rural Affairs was given authority to work on land consolidation by this law. By Law Number 5578 coming into force of in the 26429 numbered and 09.02.2007 dated Official Gazette Public Institutions under the control of MoFAL became capable of doing "Private Land Consolidation". The General Directorate of State Hydraulic

Works (DSI) have started to work for 37 LC project on the area opened to irrigation under private land consolidation by confirmation of GDAR (Agricultural Reform) and approval of the Council till now. DSI implementation on 277.706 hectares area with 31 projects has been continued up to now. 6 projects were completed and 41.176 hectares area have been registered. (DSI, 2016) Special Provincial Administrations did 6 projects while one consolidation of private land implementation was done by Baklan City Hall.

Nowadays LC is being carried out by different public services with Law No. 3083 and 5403 under the control of MoFAL (GDAR). GDAR works with 81 Directorates of Provincial Food Agriculture and Livestock and 919 Directorates of District. It completed LC implementation in 4.601.513 hectares area, and with 188 LC Project at 1.697.640 hectares areas implementations in 4.115 accommodation unit, which are basin based and multipurpose, have been going on in 56 provinces since the end of 2015. (GDAR, 2016) Aim of MoFAL is to complete LC implementations in 14 million hectares area until 2023**.**

3. IMPLEMENTATION STAGES FOR LAND CONSOLIDATION

GDAR performs LC project according to the "Agricultural Reform Applications" rules in the regions declared as application regions based on the cabinet decision of the government. The needed improvement services are identified for agricultural plots in terms of irrigation, drainage, roads, construction and soil; and the projects are designed in those declared regions accordingly. Cadastral data and land registry are supplied from the General Directorate of Land Registry (TKGM). The GDAR has a right to access directly to the land registry data. Orthophoto maps are used to see territory structures and to create a GIS for land consolidation for hydrology, soil map etc. The GDAR and the other public services that have investment plans in LC project areas designs LC reallotment plans. A large portion of LC work has been done across the country in areas in where the DSI opens to irrigation. Therefore, the main component of block planning is the DSI irrigation and drainage project planning data.

In the redistribution of land parcels, worth numbers of points for parcels are obtained as a result from soil survey, location and productivity points together with the evaluation of commission point given by the commission which is selected by directorate staff and parcel owners. The rating maps used for parcel worth number evaluation are made public in the villages, and then objections are received and are evaluated. The DOP (contribution reallotment plan) is cut from each owner equally as a participation share based on the area ratios of villages in the projects. The upper limit for the cut is 10%, and no payment is made to parcel owners for it. New distribution lists and parcel maps of the village are announced and made public for 15 days in the village. The Agricultural Reform assesses the objections if there is any. Final lists are sent to the TKGM for registration.

The agricultural data consolidation network software is established within GDAR in order to carry out consolidation projects quickly as well as to develop LC data archive and LC project monitoring and evaluation system. Due to fact that this is a delayed application in Turkey, collecting the necessary data, evaluation process of the data in a short period of time for the planning and implementation phases should be completed correctly.

The LC works are connected to an automation system step by step because of the expansion of the study areas, obtaining accurate information and too much personnel needs. The agricultural parcel information system was created by the MoFAL. A database is developed to track

transferring of agricultural plots and transactions of inheritance, purchase and sales of parcels in the near future. The FRS is another information system used for LC and land management in Turkey.

The LC implementations are carried out in two ways: on voluntary or on compulsory system according to the laws no 3083 and no 5403. In the voluntary basis process, owners give consent for LC implementation. In the case of owner does not give any consent, the administration can make a decision for the public benefit and make implement compulsory LC. This requirement is only concerned about taking decision to start the LC but the participation of farmers in the LC implementation process is essential.

Currently LC implementation studies take time for 3 or 5 years. The average LC project area is about 20.000- 30.000 hectares or less.

The demands for LC from farmers, municipalities, irrigation associations and public institutions are evaluated by the MoFAL. These demands are conducted according to the laws no 3083 or no 5403. LC projects and investigation studies in the parcels pointed by the law no 3083 are made by the institution personnel, however the implementation studies are conducted by the way of tendering mostly.

4. EXPROPRIATION PURPOSE LAND CONSOLIDATION

Economic and social gains by using LC as a tool at public investments and carrying out the public investments done for different proposes with along LC with or without an expropriation carry a big importance for effected region population and our country. Starting the construction works without expropriation has affected public investments with the changes done in Expropriation Law 2942 in 2001. LC became an alternative at accelerating the public investments and decreasing the costs in the next process.

There is no systematic approach doing the public investments with consolidations in our country. On the other hand having irrigation investments done with along consolidation, necessary areas, for common usage on like domestic land transport routes, irrigation and drainage channels according to projects feature, can be provided from the lands belong to public and private legal entities by different methods as to current legislations (Law Number 3083-5403). (Türker, Gülsever ,2015)

LC authorization was given to administrations which work on expropriation by 5403 Number Soil Conservation and Land Use Law (Appendix 3 par: 31.01.2007 -5578 / 4 Sec.) (Article 17), and it was given to the General Directorate of Agricultural Reform by 3083 Number Agrarian Reform Law on the Land Arrangement in Irrigation Areas (the additional paragraph, 4626 - 13.02.2001 / Article 1).

All existing or probable public institutions and organizations in the region are informed and works are done to increase opportunities for cooperation before starting consolidation for the purpose of rising the expected benefits of LC, and protocols were signed between GDAR and other investor organizations. Especially at public investments for irrigation canals, roads, railways and pipelines getting the needed areas by LC in spite of expropriation accelerates the investments. On the other hand, it has prevented the rupture of the social aspects of land farmers.

4.1. Implementations of General Directorate of Highways on GDAR Consolidation Areas

Although General Directorate of Highway (GDH) was given the authorization of consolidation implementation with the 5403 numbered Law of Soil Conservation and Land Use, this authority has not been used because of the reconstruction studies (infrastructure work, technical staff, etc.) and the difficulties on implementations. Therefore, the practices have been done under the authorization of the GDAR on consolidation since 2010 according to the 3083 numbered Law of Agrarian Reform on the Land Arrangement in Irrigation Area. The protocols between GDAR and GDH have been signed in 2011, 2012 and 2013 in order to compensate the areas by consolidation on the route of highways and roads. Thus, taking under the extent of consolidation of the approved lands by Highway, State and Provincial roads and performing these projects by GDAR has begun.

Being left to the consolidation route of the treasury, external registration and pasture lands, which transferred to possession of GDAR, and the privately owned real properties, which remain within the consolidation area that taken out of the corridor, without the need for an expropriation are ensured by the Notice of Application.

The 11 land consolidation projects were designed for 223 km road route in Ankara Pozantı motorway by GDAR according to the 3083 numbered Law. Also ın projects conducted in the South East Region, 50.910.918 m² real properties are left to the road without charge in 1.470 km. road route. (Türker , Gülsever , 2015)

The expropriation saving will be 1.721.875.275,00 TL for motorways of 543 km length with 51.043.125 m^2 area when Gebze-İzmir motorway (Uluabat section) with 75 km, Ankara-Pozantı motorway with 223 km and Şanlıurfa-Habur motorway with 245 km are included. (GDAR ,2013)

In addition, GDAR still continues its studies on Ankara-Kırıkkale and Kırıkkale Delice motorway, Aydın-Denizli motorway, Uşak ring road, Konya ring road, Tatvan-Bitlis ring road, Antalya ring road projects.

The expropriation saving will be about 2.4 billion by the 2013 prices when the route of 2.343 km length with 140.052.149 m^2 area is consolidated by LC projects for especially South East Region irrigation areas and various regions.

If taking the expropriation done by GDH for the average annual 47.000.000 m² and 26.000 parcels into account, the importance of consolidation works can be really realized.(Public Investment and Land Consolidation Workshop, 2014)

Figure 1 Ankara Pozantı Highway Route LC and Development Services Projects

4.2. Irrigation Investment and Land Consolidation

Across the country a large part of the Land Consolidation work was done in areas, where DSI opened the irrigation and maintained. The irrigation and drainage lines between constructions shortened and investment costs were reduced with land consolidation plan as expropriation costs were decreased as lands for irrigation network was received by participation fee.

Other public institutions also had the authority to make LC to with the addition of "private land consolidation" substance to Law no 5403 "Soil Conservation and Land Use Law" in 2007. DSİ has been doing investments with consolidation in the areas that would be opened to irrigation in the recent years.

It reveals a very large proportion of savings achieved when total amount of integral parts payments, which were done because of common areas in projects made under DSI and the projects that are subject to study, compared to the real estate acquisition through expropriation of property in the same area.

DSI has completed expropriation work on 8724 hectares of land expropriation with 28,000 parcels with 1.302.000.000 ₺ allowance from 2014 budget appropriation for irrigation investments. In addition, about 77 million ₺ were paid to the farmers for costs or damages payments in consolidation area by the Agricultural Reform.(GDAR, 2016)

Land consolidation	Project Number	Land Consolidation Cost (₺)	Forecast Expropriation Cost (₺)	LC cost /expropriation c.
2009-2014 DSİ LC Projects	32	98 124 083	947 833 735	10,4 %

Table 1. Gain from Expropriation Irrigation projects realized with LC by DSI

Outlays for Land Consolidation activities as shown in Table 1, the projected cost of expropriation is corresponds to 10.4% saving only about 90% of the expropriation costs. In addition, by land consolidation at the construction costs of the irrigation investments savings can be made up to 40% (Öçalan,2015)

4.3 Applied Consolidation Studies by GDAR in the Context of Other Public Investment

Merzifon Civil Airport Road within Amasya Merzifon LC and Field Development Project contract signed in 04.09.2013 and the necessary area has been met with LC project without expropriation.

The Agricultural Reform planned LC covering 2.200 hectares of land in Yalova Horticulture Agriculture Based Specialized Organized Industrial Zone Çiftlikköy County Laledere and Gacık village with Yalova Çiftlikköy LC and Land Development Project as another application. In this area 61,2 ha industrial area pieced together forming one parcel, and 4,5 ha area assigned to GDH and 20,8 treasury land is taken into OSB area.

Antalya wholesale market hall and a part of North Ring Road project has been carried out together with the LC project.

A protocol between General Directorate of Forestry and GDAR was made in 03.01.2013 to determinate the border of forest in LC area.

Specified fields afforestation in the consolidation lands protocol was signed between General Directorate of Forestry, General Directorate of Desertification and Erosion Control, General Directorate of Nature Conservation and General Directorate National Parks and GDAR in 03.12.2013.

The reforestation of roads in agricultural areas, windbreaks, biological control for plantations against pests, soil conservation works that will be done in grasslands are scheduled by signing the protocol of Soil Conservation Works at Grasslands within the context of Afforestation Campaign in 17.01.2012.

By the protocol held between GDAR with Turkey Electricity Transmission Company Headquarters (TEIAS) in 22.04.2015 if the areas in the transformer center and immovable that corresponding the poles yet to be obtained by expropriation exist, about areas given in the plan by TEİAŞ will be left on behalf of Treasury or not registered area.

Common Data Generation, Sharing and Usage Protocol was signed in 16.01.2014 between General Directorate of Land Registry and Cadastre and General Directorate of Agricultural Reform.

Protocol regarding the cooperation between the GDAR and DSİ was signed on 01.08.2012

4.4 Ballıkpınar Village Highway Expropriation Purpose Application Example

Ballıkpınar Village is one of the 17 villages which take part of Ankara Gölbaşı LC and development services. Ankara Gölbaşı LC and development services Project implementation area takes 33 km. length of Ankara-Pozantı highway route with 223 km. length. A protocol on consolidation between TRGM and GDH has been signed for reorganization of highway route, which is in Gölbaşı LC Project implementation area, in 04.04.2013. It can be seen from Figure

2 that line of the highway wealth changes in the range of 100-120 m. Highway line divided parcels and parcels are located on both sides of the line. Highway line, which has done by expropriation, in the Ballıkpınar LC project area affects the 12 parcels directly. While little, fragmented and not economical agricultural parcels could have occurred by expropriation, the implementation was done without an expropriation work and the parcel number in project area dropped from 269 to 147. LC rate is 54%.

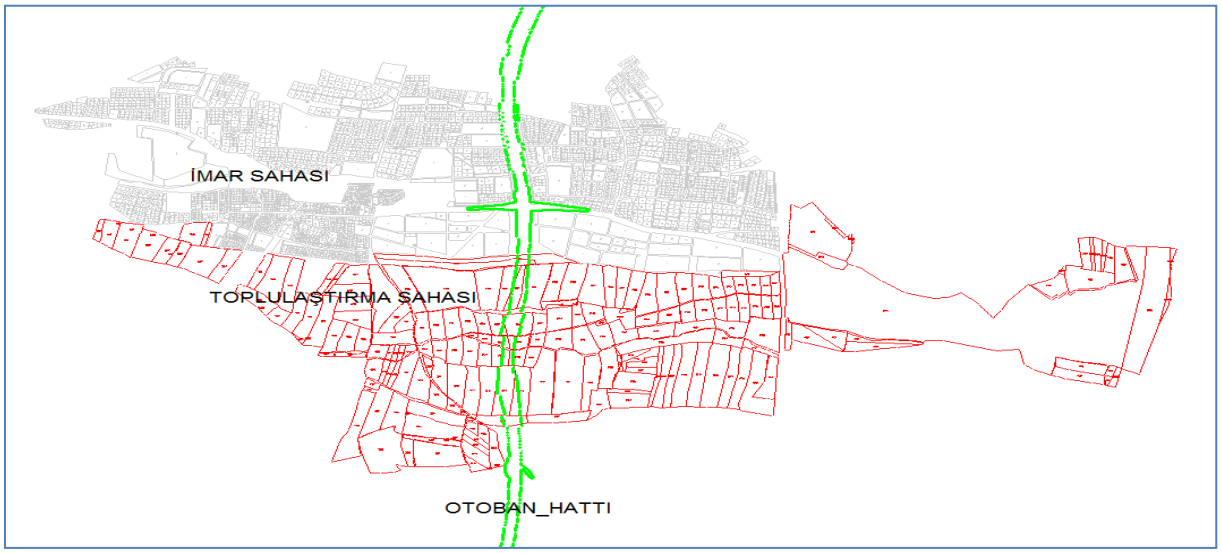

Figure 2: General situation of the LC project area and old cadastral plots.

Another block planning was implemented inside the area on highway route. The individual plots in this block implementation were exchanged with the state lands, which can cultivate utmost. The claims of the plot owners were taken into consideration and evaluated. DOP (contribution reallotment plan) the amount of deduction was about 1,5% in this study in Ballıkpınarı village Project. Drainage and ecological corridors are protected, and it is planned to keep a frontage on field road for every plot at the new formed block.

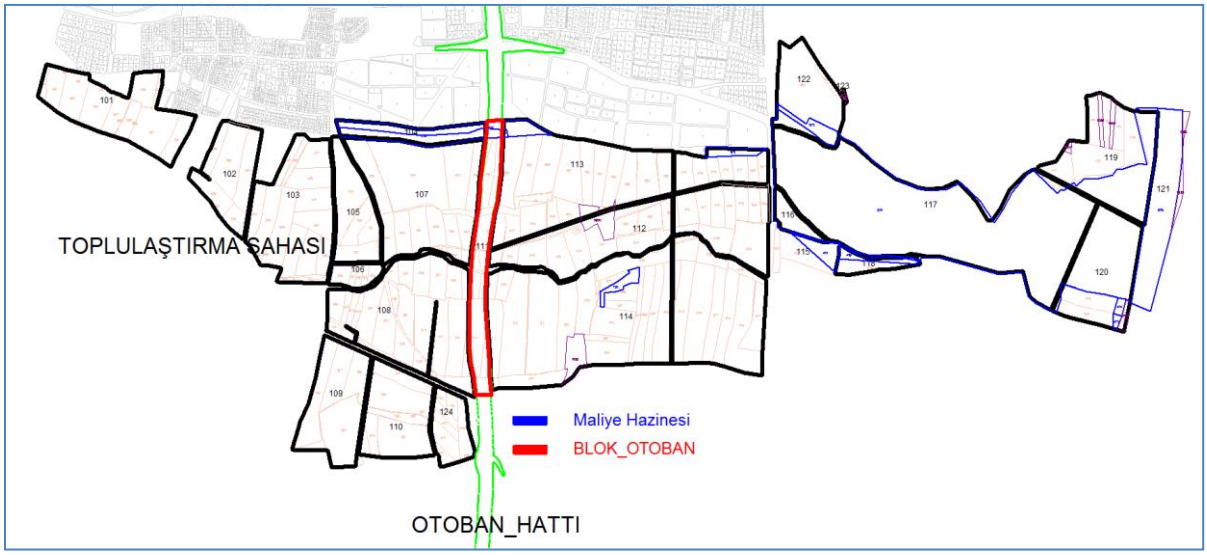

Figure 3. Land consolidation and highway block planning

There are total 183 hectares state land areas in LC Project area, which is 810 hectares. For the highway area 19 hectares state land was used.

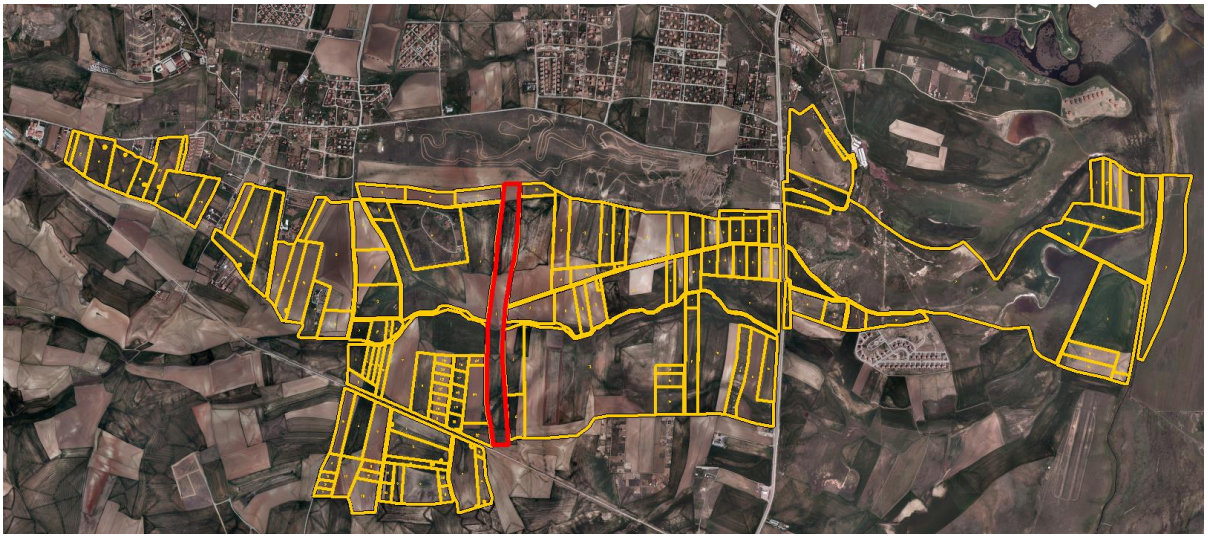

Figure 4. Reallotment plan and highway route

5. CONCLUSION AND EVALUATION

In Turkey LC has been done by different institution and legislations from 1961 to 2016 without stopping and 7 million hectares area has taken under LC. Considering the presence of land in Turkey it is observed that the expected aim has not been reached in 2000s. In 1998 Buker and colleagues stated that the most important reason for this is to last projects for very long time and, along with other factors, projects depend on the abilities of the staff. However the other reasons for not reaching the expected intention are applying the projects on small areas, not having farmer awareness, completely being done by government and being given small allowances until 2000s. Especially after 2002 LC has taken among prior labors of MoFAL and continued with rising allowance by the years. Arrangements on facility of application on the legislation and laws are done, and within development plans generalizing the LC across the country is aimed.

Agricultural activities across the country display differences. The agricultural lands meeting different needs in different areas shows we need to use different steps on planning from the agricultural point and determine services with specific solutions at every region. The fact of using LC as a tool to solve different needs' solution at the performing of these steps comes up. We don't have to apply an application of consolidation principles in another area. However basically the purpose of LC is same. Even if an awareness of LC is formed among other state agencies and farmers by the implementations, increasing the information work will increase the participation and thereby accelerate the work. Participation can be increased with an organizational structure as unions. Establishing of this structure is need for monitoring and evaluation activities on field, too.

Splitting of agricultural lands by heritage is prevented and implementation of LC being done with land acquisition by enlarging the business scale provided with the fundamental changes made at Law number 5403 in 2014 in Turkey. Especially multi shareholding deed is knotted in

the agriculture area because of the heritage problem, and it causes land mobility to be very slow. We can allot the share in the plot with LC but sometimes it increases the fragmentation. However fragmentation can result in a good way in social aspect as women, especially in East and Southeast Regions, can get information about their shareholding in the deed through LC implementation. For this reason land acquisition arrangements, preparing the sellers and buyers lists before LC implementation is important, and amendment for this law in 2014 is important arrangement in agriculture area.

A database should be formed on LC, and the changes and product design should analyzed on the fields after LC by GIS. MoFAL has been carrying our works about it. In addition, market analysis should be done for changing product designs on LC areas and also enough number of storage processing plants should be planned.

.Different areas for population working on agricultural section should be established where the employment excess is over on country conditions for agricultural sector. Implementation of integrated rural development projects that will develop and advance the rural areas not only on agricultural but also with other functions is seen as solution on these problems. (Demirel Z., Gülsever F. 2007)

While agriculture parcels are prepared, the arrangements of field road, irrigation network, resting areas, afforestation are planned by TRGM in LC fields. However there is not a legal regulation about this. A regulation on registration in the deed and cadaster of these ecological environmental protection areas should be done. Tree cutting at the LC works done until 2000s was done uncontrolled. Land leveling works, which were done without caring about soil depth, has affected the productivity in bad way. Leveling and tree cutting has been kept on minimum in the projects for last ten years, and reforestation activities have been carried out.

Priority at LC is currently on the areas which opened or will open to irrigation, and the aim is for all lands. GDAR is keeping its work based on basin. Also Law number 5403 has provided great opportunities on spreading of LC across the country with other investment institutions for expropriation purpose. LC will continue as a living process on 38.566.000 hectares agricultural area we have (2015 TurkStat) in Turkey. Although about 7 million hectares area has put into implementation, a second work will be needed, on the first applied agricultural areas. MoFAL 2023 aim is to complete LC implementation at 14 million hectares in agricultural area. Beside sustainable plans, which include measures to protect the soil, are done by MoFAL with along applying of increasing the enterprises scale as first priority for the whole rural area at LC a new comprehensive LC law is needed to be made.

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Technical Session B4

Unfolding digital support for land consolidation and land readjustment

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An Introduction to Urban Land Exchange Tooling

Mario SCHRIJVER, The Netherlands

Key words: **The Netherlands Cadastre Land Registry and Mapping Agency**
Dutch Urban Land Exchange Portal
Support and Empowerment of Land Owners

1 Introduction

The Netherlands' Cadastre, Land Registry, and Mapping Agency (the Dutch Cadastre), has implemented an internet portal for urban land readjustment. The Cadastre is carrying out an extensive programme in which it is developing a new public service for urban land readjustment. One of the key features of this programme is that owners are supported to initiate and participate in urban land readjustment projects. In this same program an internet portal is implemented which supports the execution of these projects.

It is made to do a number of things. First of all it is designed for enhancing collaboration between the participants of urban land exchange projects. It is offered as a free service to the Dutch public and designed to make these projects as transparent and simple as possible. Second, it has extensive functionality to geographically identify the project area and its exchange objects, to design a new plan and to calculate its (financial) consequences.

How and why this concept was conceived, worked out and implemented, is outlined below. Furthermore, an explanation of the underpinning concepts, how it is defined, built and implemented is provided. The article concludes with a number of screenshots.

An Introduction to Urban Land Exchange Tooling

Mario SCHRIJVER, The Netherlands

1 Background

In Dutch society there has been recent discussion concerning the use of an instrument for the purpose of urban land readjustment and its use in solving spatial issues within the urban area. The discussion is specifically focussed on problems such as the vacancy of shops, renewal of industrial or office areas. In 2014 the advising committee of Urban Land Readjustment gave recommendations to the Minister of Infrastructure and Environment in the Netherlands (I&M) about the design and implemention of legislation. The advice recommended the inclusion of an option to impose, in specific situations, the compulsory participation in urban land exchange, in much the same way as is implemented in rural land exchange projects. One important condition was that serious effort should first have been taken in order to come to a voluntary exchange.

In June 2014 parliament urged the Minister to speed up the design and implemention of legislation. This advice from the committee of Urban Land Readjustment provoked a political discussion, especially concerning the issue of compulsory participation.

In the autumn of 2016 it became apparent that this option would not be implemented in legislation. As such, current legislation supporting voluntary participation in urban land exchange project is under design. Expectations are that it will come into effect in the second half of 2018.

At this time there a more than 100 urban land readjustment initiatives. The central government (I&M) in The Hague as well as local governments have started, or are starting, financial programs to stimulate these initiatives. As a part of these projects, the Dutch Cadastre started in 2014 to develop ideas and concepts for supporting these initiatives. One of these initiatives has become the Urban Land Exchange Portal.

Concepts

Business concepts

For the design and implementation of the portal there are a number of leading business motives. One such motivation is that the Dutch Cadaster considers itself as the centre of expertise when it comes to urban land exchange. Hence, the Urban Land Exchange Portal, provides opportunities to exploit, promote and extend this expertise and these skills. It is expected that the Dutch Cadaster will be involved directly in a number of projects.

Furthermore the Urban Land Exchange Portal should form a free platform for all Dutch citizens who want to initiate and execute urban land exchange projects. While doing this the Dutch Cadastre is automatically informed about these projects.

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Another reason for implenting the Urban Land Exchange Portal is that the urban land exchange process is enriched and enhanced by supplying maps, charts, owner and object data. These data ensure that the process of exchanging urban land is executed with highest level of (legal) certainty. Furthermore, the Cadastre expects the process to be executed more efficiently. This efficiency should also increase because the portal provides a step-by-step approach to the urban land exchange process based on voluntary participation.

Functional concepts

Following the business concepts briefly mentioned above, much thought has been given to the functionality needed. It was conceived that anyone should be able to start a project. To do this one should make an account, and log on to the portal as initiator. In this role the user can invite participants into the project, thus forming a project group. The initiatior also has the role of moderator. Map functionality is available to identify the project area and to visualise the wishes of the participants. As mentioned earlier a step-by-step plan is available including help to guide the users throughout the process. The main steps include:

1. Purpose: determine your urban project area and the related goals of project members
2. Investment: determine the parcels in the project area, the owner, the value of the parcels
3. Design: determine the wishes of the individual owners and the final design. Further determine the basis of the final design and how the parcels will be apportioned to the participants and revalidated.
4. Settlement: determine the values of the new parcels and the costs for each participant.

Due to the voluntary nature of this process, these steps are recommended but not mandatory. There are various outputs available. One such output of the portal can be used as input in the land registration systems of the Dutch Cadaster.

Technical concepts

This process of urban land exchange is a relatively new for the Dutch Cadaster. Although legislation is in full preparation there is possibility that legislation could be altered after a review period of about 4 years. This is due to the belief that the urban land exchange process based on voluntarily participation could be more robust.

This has some effect on the business case of the portal. The lack of certainty that urban land exchange projects are finished successfully, could lead to uncertainty concerning the anticipated revenues from these projects.

In short, this is the main business reason why the IT Department of The Dutch Cadaster has chosen to develop and implement the portal on a cloud platform called Mendix. There are two main arguments involved:

1. Building applications that remain within the sweet spot of the cloud platform can be built with tremendous productivity. This makes it possible to build the desired functionality plus more, within a limited budget. To give an idea, building speed in

this case is about 6 times higher compared to building in more traditional environments.

2. Running costs are largely based on usage of the application on a day-to-day basis. Users who log on and use the application are counted every day and a daily fee is charged.

In short, developing within the cloud platform is relatively cheap. Running it depends largely on day-to-day usage. The fixed costs are low and variable costs are based on the number of users who utilize the portal.

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Screenshots main screens

url: www.stedelijkherverkavelen.nl

Login page:

Project overview:

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Main Step1. Purpose: determine your urban project area and the related goals of project members

Main step 2. Investment: determine the parcels in the project area, the owner, the value of the parcels

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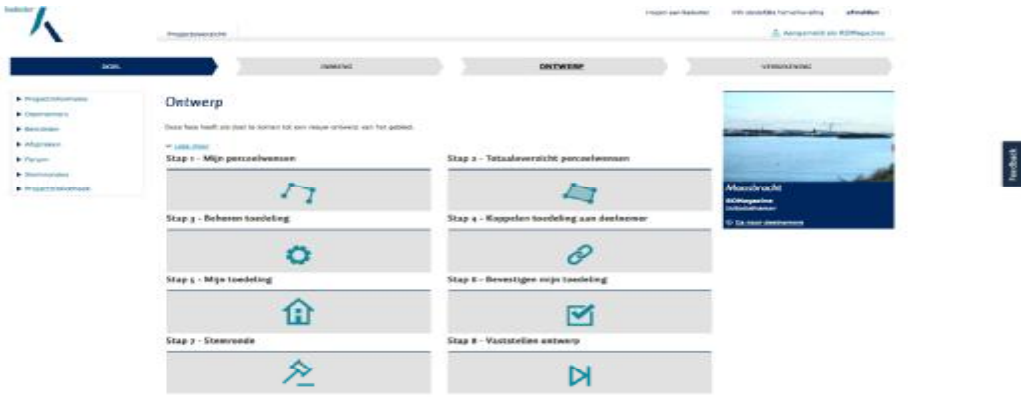
Main step 3. Design: determine the wishes of the individual owners and the final design. Further determine the basis of the final design and how the parcels will be apportioned to the participants and revalidated.



Main step 4. Settlement: determine the values of the new parcels and the costs for each participant

The Development of Computational Models in Land Consolidation as used by Kadaster

Frederik ROSMAN, The Netherlands

Key words: Computational Model, Land Consolidation

SUMMARY

Computational models for the design of a new parcellation in land consolidation projects have been part of the approach the Netherlands' Cadastre, Land Registry and Mapping Agency (Kadaster) has taken ever since programmable calculators were first introduced. While the automated design support is only a small part of the procedure, it has sparked considerable effort in research and development ever since. The paper describes the essential aspects of the models and their interrelationships. The paper concludes with a description of the current state of implementation in the Transfer application as it is in use by Kadaster at present both for the value allocation plan as well as the automated parcel boundary design.

The Development of Computational Models in Land Consolidation as used by Kadaster

Frederik ROSMAN, The Netherlands

1. INTRODUCTION

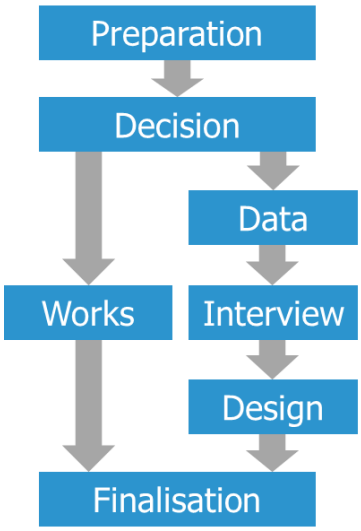
This paper aims to give a summary of the generations of computational models that have been used by Kadaster from the late 1960s to the present. The paper does not aim to introduce any new elements but instead gives an overview of earlier publications, some that are less accessible because they are from the pre-internet era. The current Symposium on 100 years of land consolidation in the Netherlands seems like an ideal opportunity to do so. This overview, with some additional "lessons learned", could be of interest to anyone designing a new model in different circumstances.

Without a doubt the application of computational models are but a small part of the land consolidation process. Legal, procedural, financial aspects are of paramount importance. Equally public relations, public participation and inter-personal skills are important success factors for projects. All these concerns need to be addressed, but this is beyond the scope of this paper. To start we will narrow down the scope relative to the general steps in a land consolidation project.

2. LAND CONSOLIDATION AS A PROCESS

2.1 Process steps

As in any project, we can distinguish between a preparation phase, a decision to go ahead with the project and an execution phase. In this case we will focus on the execution phase. The execution phase involves implementing physical work, building roads, adapting water management in the area et cetera. This can take two forms: 1) works that are predetermined and may have been the reason for starting the land consolidation project in the first place and 2) works that are related to the land use and can both influence and be influenced by the design.
The finalisation of a land consolidation project consists of financial and legal aspects, e.g. adapting tenancy contracts, linking mortgages to new parcels et cetera.
Concentrating on the computational models, we zoom in on the data and design side of the process. This consists broadly of:



- **Collecting Input Data** – Collected from cadastral records and other sources, both for establishing the ownership and tenancy situation, as well as project goals such as infrastructural (roads) and water management improvements. Nowadays in the projects this usually encompasses large scale infrastructure (highways) or inundation areas but may also include improvement of local roads and waterways.
- **Interview Sessions and Web Portal** – Collection of allocation preferences of the owners and tenants either by personal interviews at a central location or – more

recently – through the use of the web portal Kadaster built for this purpose. Crucially, for use in the computational models, this verbal information has to be translated or "structured" into numerical sizes, values and locations according to the data model of the system that is used.

- **Design Process** – From the start this step has been split into two phases: a numerical design or Value Allocation Plan and a Parcel Layout Plan.
  Much has been written in the past on design theory in relation to land consolidation. We must acknowledge the enormous contribution that René van der Schans made to this subject in general and to design theory for land consolidation in particular [SCHANS, 1971, 1975].

A design process is by nature an iterative procedure where design steps are evaluated and improved. A computational model to support design can only evaluate the numerical and ordinal aspects of a problem and is therefore limited in its depiction of reality. The outcomes are only a proposal for change which needs to be improved by human intervention. Usually a design initially is suboptimal or even infeasible if not all constraints can be met.
When this human intervention results in changing input data (e.g. by adding more options for the model) or relaxing of constraints, the model can be run again to start another iteration in the design process. In this view it is perfectly natural to change the input data to arrive at an acceptable solution. A computational model is truly (part of) a Decision *Support* System. (See also [DEMETRIOU, 2014].)
And this process has been the reality in land consolidation projects, where preferences as expressed by owners in interviews have been adapted to resolve conflicting constraints, by adding sensible alternatives, following insights gained from working with the results of the models.

2.2 Factors in Land Consolidation in the Netherlands

Land Consolidation addresses – amongst many other – economic factors in the operation of farms. To name just two factors that played a major role in the Netherlands:

- Economy of scale on the aspect of parcel size – it is more efficient to use large parcels than it is working with scattered smaller parcels, even if it means that the farmer splits the actual use of the large parcels into parts for different crops or uses. That would still mean more options in the way the land is used by a single farmer. For dairy farming it is important to have a large pasture surrounding the stables.
- Parcel numbers and distance – it is more efficient to have fewer parcels closer to the farm buildings to travel to with machines. This holds for both (frequency of) supervision and the use of e.g. harvesting machines. However circumstance can change over time, e.g. in the Netherlands the use of specialised equipment nowadays often means that work is outsourced to specialised local companies. But even then the economy of scale is relevant.
  Ultimate consolidation into one single parcel per farm is not a goal in itself: different land uses can require different soil types or soil water conditions. Also spreading of weather related risks can be a factor. The goals for consolidation will have to be tailored to any particular project area.

Of course this is a simplification, but is only meant to highlight the aspects that are covered in the models. Many other factors such as access and shape of parcels have not been part of the

computational models as such until recently, but have of course played an important role in the human input into the design process.

Some special circumstances that apply to the situation in the Netherlands are:

- In the Netherlands all the land is in use or at least is owned by some entity (either private or public), there is no barren or unclaimed land that would be issued to new owner as part of the project.
- Nearly always the farm buildings are spread out over the project area as opposed to many countries where it is more likely that farm buildings are concentrated in villages.
- Parcels connected to farm buildings (stables) should not be reduced in size (unless under special circumstances and compensation). This means that certain parcels remain in place and are not changed in size or shape, but other parts may be added to them. In general having farms spread-out over the project area is positive for the level of consolidation that can be achieved.
- A special case in the Netherlands are villages in polders where the farm building are concentrated closely together along long roads and narrow strip-parcels can stretch for several hundreds of meters. This puts a considerable constraint on the overall possibilities of consolidating land.
- Because of the traditionally long tenancy agreements, interests of both land owners and tenants are taken into consideration in the design of the reallocation. From the calculation models' point of view this is of little consequence: a party has a claim to the reallocation of a certain amount of land. The details are outside the scope of this paper. In this paper "land owner" will be used to denote the legal entities entitled to reallocation, because this more easily encompasses the majority of parties, including public entities that own land.
- In general constraints on reallocation projects have grown over the years, especially non-agricultural constraints, transforming the aim of optimizing agricultural land use to a multi-purpose procedure.

These are circumstances that are taken into account in model design decisions that may be different in other countries.

3. COMPUTATIONAL MODELS

3.1 General Approach

The general approach in the models is balancing demand and supply for land. The land owners have a legal claim to receive an amount of land equivalent to the land they bring into the project. This constitutes the demand for land in the equation. The project area itself can be seen as the supply of land.

The use of the words "equivalent amount" instead of "equal amount" is important. The quality of the soil at another location will generally be different, which should be compensated by allocating less or more area according to a quantified difference in quality. This implies the availability of a land valuation, which should be available as input data.

To organise the project area into manageable parts, it is divided into Compartments. The general rule for the formation of Compartments is to group parcels in the "before" situation together to have similar soil and access conditions. It also is of benefit to have Compartments that contain similar numbers of allocation units.
In the Netherlands - with a relatively high density of roads and waterways in rural areas – the infrastructure largely dictates the extent of the Compartments. To avoid some very small Compartments, occasionally the Compartments contain lower-order infrastructure (e.g. unmetalled roads or ditches).

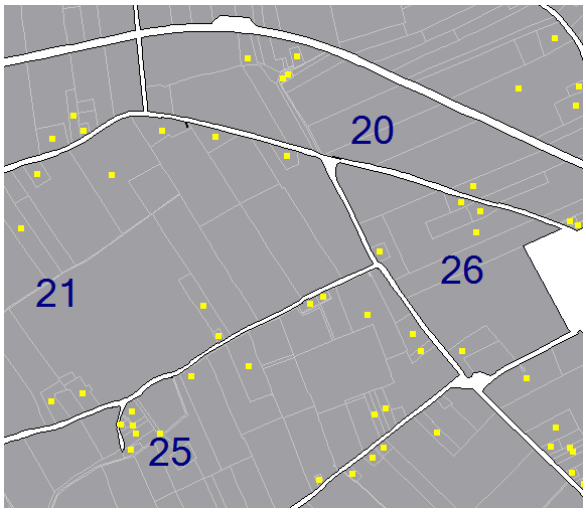


Figure 1 Compartments that exclude the infrastructure that define their extent.

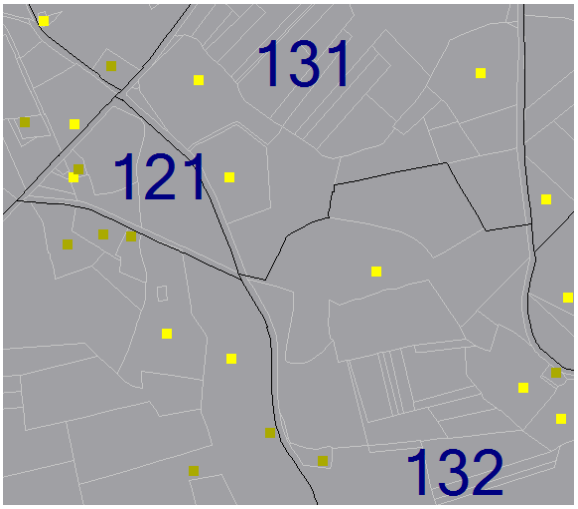


Figure 2 Compartments that cover all parcels, including (publicly owned) infrastructure parcels.

3.2 Precursor: "Wallpaper" Approach (until 1975)

As Prof. Willem De Vos liked to recall during his lectures at Delft University in the 1990s, in the days before programmable devices, the general practice in the land consolidation projects was to do the necessary reallocation calculations in a special room, with lists of owners and their claims hanging on the walls. The Compartments would equally be listed on the walls. Starting from the pre-existing "before" situation, all owner's parcels (claims) would be entered into the list of the corresponding Compartment. The process then consisted of numerous rounds of selecting a claim for transfer and moving the claim from one list to another, constantly updating all Compartment total amounts. Transfers were made by hand, and – literally – at the end of the day the supply and demand of the land in the project had to tally.
Understandably this work was error-prone and errors did occur. Needless to say that after spending weeks on this work, making corrections for forgotten claims would be next to impossible because of a domino effect that a correction would cause.
Another obvious problem with the method is the subjective nature of selecting the transfers.

Perhaps it useful to observe that nowadays any spreadsheet application could easily support this task. We would now consider that a low-tech approach to the task.

In Figure 3 the main components are shown as an example in numerical form. It shows the "before" situation in the project. The rows represent parcels, grouped by owner in the left panel and showing the total claim value for each owner. The right panel shows Compartments as columns, with the available Compartment value at the top. In the "before" situation, by definition, the sum of all parcel values in the Compartments should match: the Residual row at the bottom only shows zeroes.

Before			Compartment			
Owner			1	2	3	*No.*
No.	Claim	*Parcel*	80	50	60	Value
1	70	*1*	40			
		2			30	
2	70	*1*		40		
		2	20			
		3	10			
3	50	*1*			30	
		2	10			
		3		10		
			0	0	0	Residual

Figure 3 Numerical example of Old Situation, showing Owners (demand) and Compartments (supply) of land in the project.

3.3 ATOR (1969-1998)

The ATOR[1] system was introduced in 1975 following a period of experiments with programmable calculators. The aim was to improve both quality and processing speed by building comprehensive and consistent datasets, avoidance of errors, improving objectivity and providing possibilities for analysis.

The input data for the system starts with all preferences of owners being converted into *Allocation Parts* that can have a *Placement* in one or more Compartments. All Allocation Parts are initially placed in the most preferred Compartment. Normally some Compartments have overdemand and others underdemand. That is, supply and demand in the Compartments are not balanced. This is not an acceptable end state for the design. The model assists in finding an improved allocation by transferring Allocation parts from a Compartment with overdemand to another with underdemand based on Placements selected from the owners' preferences.

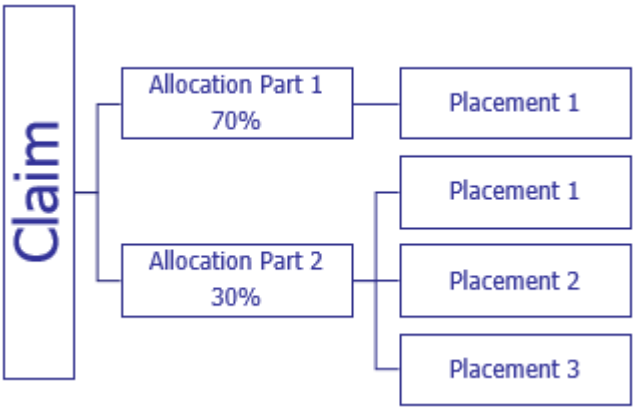


Figure 4 Data Structure for ATOR Model with some example values. Values for Allocation Parts of one owner add up to 100% of the Claim Value.

The decision to transfer an Allocation part is based on a mathematical function that is designed to capture relevant quantified aspects. It should yield a positive number when the transfer is a suitable candidate and zero or a negative number when it is not. The general rule was to only allow transfers from Compartments in overdemand (having a positive residual value) to Compartments in underdemand (negative residual value).

[1] ATOR is the Dutch abbreviation for "Automation of the Re-allotment Plan for Land Consolidation". The application was later renamed to INOK.

For each possible transfer a decision value Vi is calculated with

$$V_i = f(R_v, R_w, AP_i, R, G, r, g)$$

with

R_v = Residual value in Compartment of current Placement
R_w = Residual value in Compartment of alternate Placement
AP_i = Value of the Allocation Part under consideration for transfer
R,G = Evaluation factors at the current Placement
R,g = Evaluation factors at the alternate Placement

Two evaluation factors were used, although in principle any number could be used to distinguish between "good" and "bad" transfers. The evaluation factor R was used to evaluate the distance from the Allocation Part to the farm building, with lower values indicating a "better" Placement. The G factor was used to express a "fairness" or entitlement aspect: the entitlement of being allocated in a certain Compartment, e.g. compared to the location of the owner's land in the "before" situation, with higher values counting as "better".
The numbers used were categories in the range 1-4 or 1-6 both the R and G factors. A table with assignment rules was determined on a project-by-project basis, depending on the circumstances in the project, taking into account both physical or geographic circumstances as well as current policy, project goals and local attitudes. Different rules could apply for e.g. dairy farming (large parcel adjacent to building of great benefit) or crop farming (concentration in 1 or 2 large parcels of great benefit).

R	
Dairy farm Adj. To buildings Across road, opposite of building Field < 1 km from building Field > 1 km	 R = 1 R = 2 R = 3 R = 4
With crossing of road:	R + 2
Consolidation relative to land outside of project	R - 1
G	
Allocation Part value relative to before situation in Compartment 0-25% 26-50% 51-75% 76-100%	 G = 1 G = 2 G = 3 G = 4

(source: Training Material Kadaster, 1996)

Figure 5 Example Instruction Table for assigning R and G factors to alternative location of Allocation parts.

A commonly used implementation formula was [VOS, 1982]:

$$V_i = AP_i \times (R_v + R_w + AP_i) \times 10^{-G+g+R-r}$$

Over time alternate formulas were tested and remained available to the end user of the system.

The algorithm itself is straightforward:

1. For each possible transfer i calculate the decision value V_i.
2. Transfer the Allocation Part with the largest V_i to its alternate Placement.
3. Stop when no more transfers with positive V_i are present.

The algorithm is a heuristic method, a Hill climbing technique. It is in theory convergent, but in practice deadlocks can occur where a single transfer or a group of multiple transfers can repeat itself. The implementation therefore needs to trace and break such deadlocks.
The advantages of the system were:

- It made the collection of the owners' preferences and translation into allocation parts into a structured process.
- It made it possible to have an objective search through the solution space in a short time in a repeatable process as compared to the subjective and laborious manual procedure.
- It enabled to do research into different strategies.
- ATOR starts by allocating Allocation Parts to the first, most preferred Placement, which results in large residuals in the Compartments. The transfer procedure then moves Allocation Parts to other Compartments to reduce residuals. This means that small changes to the input data are likely to result in small or traceable changes in the solution. This is of great advantage in a design process.

Disadvantages were:

- The Allocation Parts of one owner are not linked together. This means that the only incentive to allocate parts in the same Compartment (effectively consolidating the allocation) comes from the R factor in the decision value and is basically down to chance.
- The algorithm is based on fixed values for the Allocation Parts. This limits the options to fit an optimal number of Allocation Parts into a Compartment. Splitting the claim value into smaller Allocation Parts would improve this but would in turn increase the chance of fragmentation as the individual Allocation Parts are not linked.
- The separate transfers affect each other, the order in which the transfers are performed influences the result.

3.4 AVL (1982-1998)

Although the ATOR system was seen by most people as real progress, the disadvantages gave rise to research into the application of Mathematical Programming, and in particular to optimisation of the allocation given a value function and a set of constraints [LEMMEN, 1982]. This model introduces the notion of Claim Alternatives, each of which consists of a number of Allocation Parts which together add up to the Claim Value. Allocating the parts as a package eliminates the risk of fragmentation. By allowing the Allocation Parts to vary in value between pre-set upper and lower limits the problem of having to "fit" a set of fixed values into a Compartment is alleviated. However the use of choice variables to select one of the alternative per owner, makes it necessary to use Integer Programming techniques to solve the model, which tend to be time-consuming.

The AVL model employs two consecutive steps: 1) an Allocation Model and 2) an Adjustment Model[2].
The Allocation Model is solved using the Branch and Bound technique. The Adjustment Model minimizes the remaining Compartment residuals by changing the allocated values of the Allocation Parts (within the range of their upper and lower limits) while maintaining a full allocation of the claim value of each owner.

[2] In Dutch *Allocatie en Vereffingsmodel voor de Landinrichting* or AVL.

In formulas:

The Allocation Model

Goal function:

Minimise the weights W_i *) of the alternatives that are selected for each owner.

$$minimise\ \sum_i \sum_k (W_{ik} \times Y_{ik})$$

1. The value of each Allocation Part AP_{ijk} must be between its lower limit and its upper limit ($LLAP_{ijk}$, $ULAP_{ijk}$):

$$Y_{ik} \times LLAP_{ijk} \leq AP_{ijk} \leq Y_{ik} \times ULAP_{ijk} \quad \forall\ i, j, k$$

2. The sum of the Allocation Parts in the selected alternative of an owner must be equal to the Claim Value CV_i. The sum of Allocation Parts in all other alternatives must be zero:

$$\sum_j AP_{ijk} = Y_{ik} \times CV_i \qquad \forall\ i, k$$

3. The selector variable Y_{ik} must be either zero or one:

$$Y_{ik} \in \{0,1\} \qquad \forall\ i, k$$

4. The sum of the selector variables for each owner must be one:

$$\sum_k Y_{ik} = 1 \qquad \forall\ i$$

5. The sum of the values of the Allocation Parts in a Compartment must be between its lower limit and upper limit (LLC_j, ULC_j):

$$LLC_j \leq \sum_i \sum_k AP_{ijk} \leq ULC_j \qquad \forall\ j$$

**) Indices: i for Owner, j for Compartment, k for allocation Alternative per owner.*

The Adjustment Model

Goal function:

Minimise the residuals for the Compartments *):

$$minimise\ \sum_j (R_j^+ + R_j^-)$$

Constraints:

1. The value of each Allocation Part must between its lower limit and upper limit:

$$LLAP_{ij} \leq AP_{ij} \leq ULAP_{ij} \qquad \forall\ i, j$$

2. The sum of the Allocation Parts in each selected alternative must be equal to the Claim Value:

$$\sum_j AP_{ij} = CV_i \qquad \forall\ i$$

3. The sum of the Allocation Parts with Placement in a Compartment must be between its lower limit and upper limit:

$$LLC_j \leq \sum_i AP_{ij} \leq ULC_j \qquad \forall\ j$$

4. Residuals for the Compartments are calculated as the difference between the sum of the Allocation Parts with a placement in the Compartment and the value of the Compartment:

$$R_j^+ - R_j^- = \sum_i \left(AP_{ij}\right) - C_j \qquad \forall\ i, j$$

**) Only positive values variables are allowed for solving this type of problem, therefore two variables are introduced two model both positive and negative values for the Compartment residuals.*

The weight W in the goal function was chosen to be calculated as W = R x G. Just as in the ATOR model there was similar freedom in projects to select their own method for assigning the values for individual Allocation Parts. AVL had no built-in options to evaluate alternate goal functions.

The system was integrated in the INOK application and internally used Sciconic to solve the models. When the user started a calculation run, the system generated the problem matrix for Sciconic, scheduled the nightly run and retrieved the results. The user could then check the results the next morning.

An optimization model can easily be infeasible, meaning that the constraints are too stringent and there is no solution space at all in which the goal function can do its work to find an optimal solution. In fact, as noted before, it can even be *expected* that a design problem is initially infeasible. As with ATOR, the aim for AVL was to develop a system that could be used by an end-user who would not need specific knowledge of the calculation process or internal concepts such as infeasibility. A system is rather useless when – after a night of computation – it would simply report "infeasible".
For instance, initially one or more compartments are likely to have insufficient Allocation Parts to fill it even to the lower limit. This type of infeasibility is alleviated by adding two more variables per Compartment to the goal function and to equation 4 of the Allocation Model (these variables have the same function as in the Adjustment Model), to allow the solution to extend beyond the upper or lower limit, but at a high cost in the goal function (with F set to a suitably high constant number):

$$minimise\ \sum_i \sum_k (W_{ik} \times Y_{ik}) + F \times R_j^- + F \times R_j^+$$

And formula 4 is adapted to:

$$LLC_j - R_j^- \leq \sum_i \sum_k AP_{ijk} \leq ULC_j + R_j^+ \quad \forall\ j$$

When any of the R-variables are non-zero, this signals to the end user that the original model is infeasible, and modification of the input data is needed.

On the face of it the main advantage of optimisation over a heuristic approach is the fact that it produces an optimal solution instead of just a "good" solution.
Given that we start with the preferences of the land owner as input data, this input data is only changed as little as possible to make a solution feasible. This in turn means that the "solution space" is very limited and by consequence the goal function has very little scope to select an optimal solution.

Another problem is that only a very limited number of factors can be quantified in a way that makes sense for a goal function. Furthermore using several factors in a goal function obfuscates the effect that each of the factors may have had on its own.
Only the included factors are optimised and there is very little scope to include other factors in the process.

At the time this model was operational at Kadaster in 1990-1996 it was operated on a VAX mainframe computer. A run of the model on actual projects took several hours and to avoid blocking other operations on the mainframe, the calculations were done in nightly runs. Coupled with the fact that the model frequently was infeasible, this led to computation procedures that spanned several days of making small changes to the input data and scheduling a re-run.

Another practical lesson from the use of optimisation was that small changes lead to major changes in the results. This made it very difficult to use AVL in an incremental design process.

On the plus side of the equation, AVL still had the advantage of the improved data model, with Allocation Parts linked together in alternatives and the flexibility of having upper and lower limits on the Allocation Parts instead of fixed values.

3.5 TRANSFER (1995 to present)

In 1995 in a Kadaster survey of the use of the systems concluded that there was scope for a new PC-based model that could solve some perceived disadvantages of the then current system:

- A design support system should contain more information, preferably visualised in maps instead of (only) lists of data.
- It should be possible to do the calculations more quickly instead of in nightly runs.

The system TRANSFER that was the result of the efforts is a system that relies on a map interface for viewing and editing data. As a data model it combined the AVL and ATOR models. For the computational model it returned to the heuristic approach. The system is still operational.

The data structure allows for Claim Alternatives to be formulated, consisting of one or more Allocation Parts each with one or more Placements. This combines the use of alternatives in the AVL model with the option of alternate Placements from ATOR.

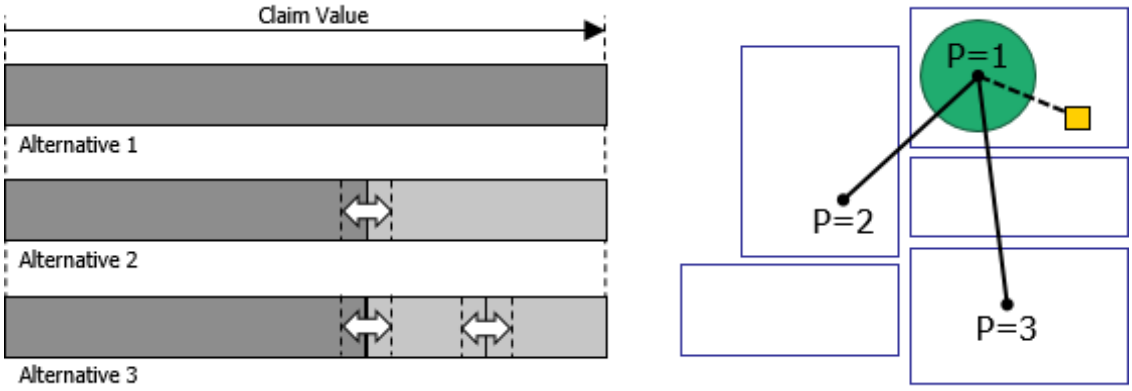


Figure 6 On the left: Three Claim Alternative as they may be formulated for one owner. Alternative 1 allocates 100% of the claim in one part, alt. 2 in two parts each with a margin, alt 3 in 3 parts, again with margins. On the right: an Allocation part with a certain value (circle) in a current Placement near the farm building, with two alternate Placements at a distance.

Each Allocation Part can be defined to have not just an allocation value as in ATOR, but can have an Upper Limit and/or a Lower Limit, as long as the sum of the values in an alternative can reach 100% of the Claim Value. The system checks and signals any problems in the input data.

The algorithm consists of steps similar to the ATOR algorithm, extended to include the selection of an alternative:

1. For each possible transfer i calculate the decision value V_i; this includes evaluating all non-realised Alternative for each owner and evaluating non-realised Placements in an realised Alternative.
2. For the largest V_i: Realise the Alternative or transfer the Allocation Part.
3. Adjust the allocated value (to within the upper and lower limits) of all Allocation Parts that are connected with the transfer in step 2, including the Allocation Parts of other land owners that have Placements in the involved Compartments.
4. Stop when no more transfers with positive V_i are present.

3.6 Current State of Implementation

The TRANSFER system as it is currently in use contains the following functionality:

- Import of data in propriety data format or as shape files (with prescribed field names);
- Import of data from the interview portal to import preferences of the owners, including selected or hand-drawn polygons (added in 2015);
- Import of road network and valuation layer (polygons with value per m^2) as well as a topographic reference layer;
- Automatic checking for errors and inconsistencies in the database;
- Processing of the ownership data into the “before” situation, where adjacent parcels of each owner are grouped into a single polygon (eliminating historical cadastral partitions in fields that are of no consequence to the reallocation);
- User assisted definition of access points for shortest-route calculations, with options to define obstacle lines were access across water-bodies, highways or rail infrastructure is not possible (subsystem added in 2003);

- Support for defining alternate datasets on project level, enabling analysis of different project implementation and support for comparing alternate datasets.
- Define farm types to support analysis of the input and allocation data in various indicator lists;
- Options to define allocation models for each of the farm types to assist analysis in the preparation phase of the project (using preliminary input data);
- Task oriented map window for user-assisted coding of topographic units that can be used by the automated sketching functionality;
- A variety of list and map windows to explore and edit the database;
- Support for the organisation of the interview session through printing of merge documents with parcel list per owner;
- Integrated list of "talking points" for issues that need to be discussed by the designer with local officials or owners;
- Automatic assignment of R and G values based on actual road-distances and comparison with the "before" situation.
- The TRANSFER algorithm;
- Sketch Plan module, enabling the automatic generation of alternate sketch plans as a preparation of the Parcel Layout Plan (added in 2012).
- Extensive integrated help and manual, both for functionality and for the design process for Value Allocation Plan and Parcel Layout Plan;

The TRANSFER algorithm as described in a previous paragraph has undergone a number of extensions to improve insight in bottlenecks in the calculation results.
Main extension is the calculation of several variations in one run, each producing a variation of the R and G assignment tables and with and without allowing extra Placements to be added by the system to solve infeasibilities. The user can compare the different scenarios both by general effectiveness indicators and by comparing allocations in details. Increased processing power in PCs made calculating several variations within minutes possible.

The Sketch Plan was the last major extension of the application. Although the generation of a sketch plan is largely automatic – i.e. with limited user assistance – it does require a lot of thought and data preparation right from the start of the data preparation in Transfer. For instance it is necessary to prevent input parcels to extend beyond the boundaries of the Compartments. This situation was allowed for infrastructure parcels in the Value Allocation Plan, as such parcels remain unchanged in the reallocation. This situation could throw off the automated sketching routines. This means that the wish to use automated sketching adds a level of complexity to the data collection and preparation step. The algorithm used is a first attempt to implement this complex problem. It is largely based on the PhD research by Annette Buis. [BUIS, 1998; ROSMAN, 2012]

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BIOGRAPHICAL NOTES

Frederik Rosman is a consultant and software developer with Delinea. He has an MSc degree in Geodetical Engineering from Delft University of Technology. From 1990-1992 he worked at Kadaster in research in Land Consolidation models. From 1992-1999 he was an Assistant Professor at the Faculty of Geodetic Engineering at Delft University of Technology on the subject of Land Consolidation with a special focus on computational models. In 1998 he founded Delinea together with Arjen de Ruijter. The software package Transfer was developed for the Kadaster and is still being maintained by Delinea for Kadaster. From 2012 until present he is working for the African Risk Capacity – a Specialized Agency of the African Union – on droughts, flooding and tropical cyclones in Africa.

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Geospatial information in good land policy and governance in Benin

Xavier ZOLA, Benin

Key words

- Land Registry
- Cartography
- Data base
- GIS

Abstract

The decentralization stated in Benin 2003 with main goals ensure the rational use of land and its resources. In the vision to support this goal, I help some of the Benin cities place for setting and operating their Land Registry.

After the feasibility study which specifies the conditions to be considered in the implementation of the project, it is conducted taking satellite images then the realization of the digital receiver and cartography from topographic survey and existing plans. Then, large comprehensive survey is organized to collect information and plot by plot data base designed for this purpose.

The junction of the cartography and scanned the database allow the town to have a better knowledge of lands, immobilizer and urban help in eliminator decision tool for the planning and urban management. It is possible to make thematic maps follow urbanization and planning. The operations of calculation and collection of taxes are computerized local and promote a substantial increase in communal financial resources also making the switch from simple, at least three times and conferring capacity of local development funding important.

The Land Tenure set up allows to have a better knowledge of land assets whose common features. The city has the opportunity to have a reliable inventory of plots on its territory and thus to contribute to securing land transactions. In the database, the parcel file traces all identified parcels that are also found on the base mapping. A well marked parcel, clearly identified from its owner and integrated in the database can not be sold to several people at once or be the subject of fraudulent assignment. Better, the procedure of purchase of a plot that does not end with the

change of owners in the database is unreliable. This ensures security of private land but mainly contributes to the identification of the public domain of the State and Local Government, public use of land plots and mode.

By doing this, the Land Tenure is a database that allows the local administration have actionable information to municipal management. The implementation process is to gather land data, urban and tax from property assets. The tool allows the municipal authorities to easily dispose of such data on the population in a neighborhood or in the

city, socio-community infrastructure or equipment, sanitation and other information, which both Mayor and Council communal to make decisions. For example, for the number of households with water, latrines or other, you just have to query the database. The operation and updating of the tool lead to the development of a Geographic Information System for the development of a map management tool localized urban data exploitable for needs of municipal management and aid to decision making. Meanwhile, social mobilization is necessary to pay employing the parties of the administration and the population. Agent training is also important for the prize in hand tool for exploitation, updating and achievement of objectives.

Introduction

Benin has known since the early 90's rapid development of all of its institutions. Benin has particularly engaged on the path of decentralization with the Constitution of December 11th, 1990. The reform related to decentralization entered its active phase in 2002 with the first communal elections and in 2003 with the installation Communal Councils headed by the Mayors. The seventy-seven (77) municipalities created by the Beninese legislators were launched.The first challenge of the Communal Councils to establish their bases and begin the gigantic work of development at the local level is the mobilization of resources. The challenge was not new but it reappeared with a vengeance with management autonomy and financial autonomy conferred on Local Communities. The municipalities must therefore define all strategies to enable them to mobilize resources to finance local development. Better, municipalities must have the planning and urban management tools for making fair and informed decisions in the context of local development. In this context, several Beninese cities have begun to set up a land, fiscal and urban management tool called LAND REGISTER. All experience allows us to understand the concept, its contours, its applications and its impact.

1. The Land Registry and his contours

1.1 Definition

The Land Registry is a municipal management tool which consists in a parcel addressed map of the city and a database for developing land applications, urban and tax. In other words, the Land Registry involves the establishment of a database from a better knowledge of land resources of the local authority. The Land Register is a register designed base form of computer data housed in a computer to be used through its various applications. The Land Registry database consists of a digital parcel mapping, a system for locating and identifying plots, activities, people and urban objects and Data on the equipment level of the plots on the built environment and the activities and the level of accessibility.

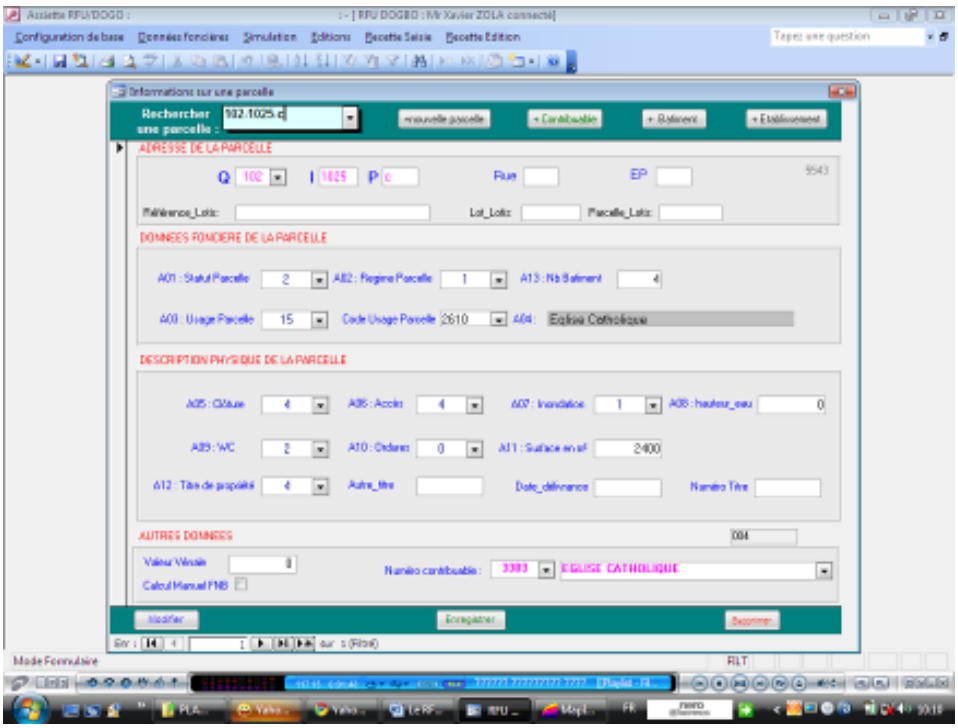
1.2 The applications of Land Registry

1.2.1 The land component

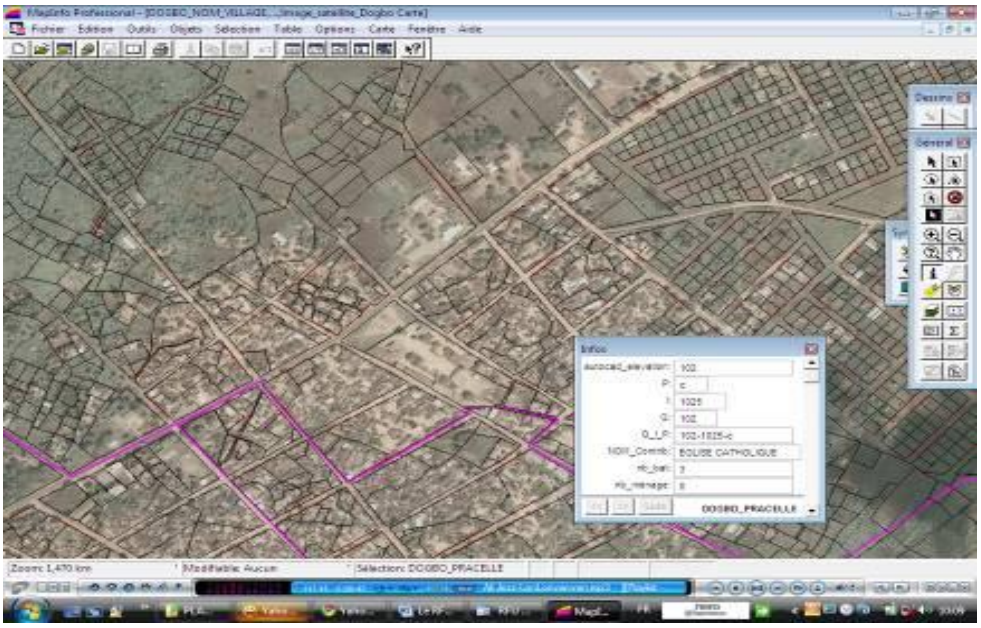
Land Registry has a first property function that is fundamental. With satellite images or aerial photographs supported by the base mapping that information is supplemented by land and urban surveys, Land Registry allows having a better knowledge of land assets whose common features. The city has the opportunity to have a reliable inventory of plots within its jurisdiction and thus be a way to contribute to the struggle for securing land transactions. In the Land Registry database, the parcel files traces all identified parcels that are also found on the base mapping. A well marked parcel, clearly identified from its owner and included in a database can not be sold to several people at once or in all cases subject to fraudulent transfers.

Better cooperation between the Department in charge of the Land Registry and the one in charge of Domaniale Affairs resulted in the purchase process of a plot that does not end with the change of owners in the database is not reliable. This ensures security of private land but mainly contributes to the identification of the public domain of the State and Local Government, public use parcels and land ownership.

For example, the plot numbered 102 – 1025 – C described as follows in the database is the Catholic Church in Dogbo.



This plot is found based on mapping at the place indicated above :



1.2.2 The tax component

Decentralization implementation in Benin aims to give municipalities the role of primary facilitator of local development. The municipalities cannot cope with their responsibilities if they

have the appropriate financial resources. A detailed analysis of their financial resources showed that they have very low yields and consist essentially of the only local tax revenues (property taxes, patents and licenses).

	Emission		Recovery	
	Last year before	**1st year after**	**Last year before**	**1st year after**
Porto – Novo (1994)	€247 882	€161 596	€796 956	€368 469
Cotonou (1990)	€2 349 239	€1 155 563	€9 406 104	€7 744 410
Parakou (1989)	€131 106	€36 588	€540 737	€353 529
Dogbo (2006)	€25 916	€12 196	€56 406	€36 588
Dassa (1996)	€16 373	€4 573	€164 645	€109 763

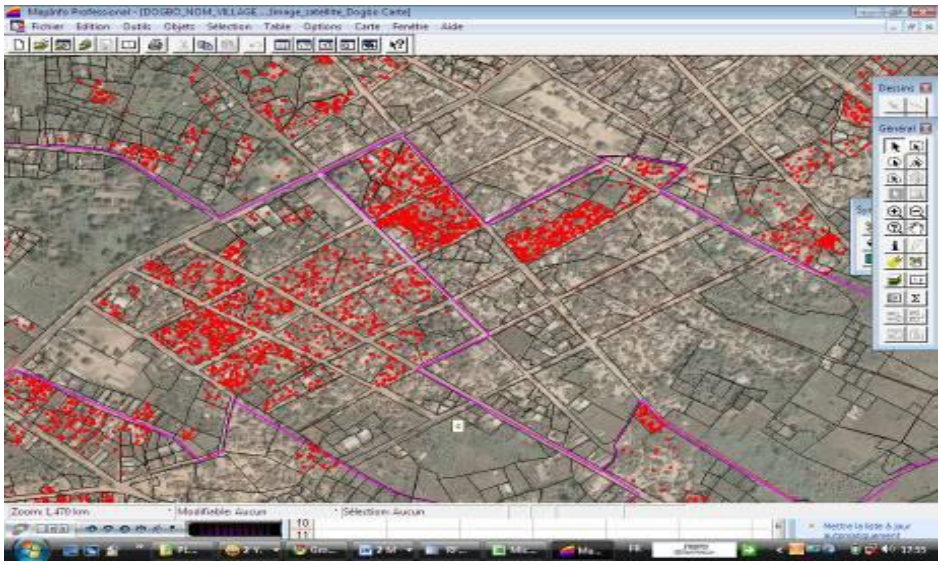
The tax treatment of the land register has been assumed that the taxable tax matters in our towns is largely under exploited. This low yield is mainly due to lack of data, difficulties locating and identification of taxable property and the ignorance of land assets. Due to lack of staff and material and financial resources, the Revenue Service can not cover all areas and cannot appreciate and take into account any tax bases. The Land Registry provides a thorough and complete knowledge of developed and undeveloped properties, establishments and their owners. The information is included in a database that enables automatic calculation of taxes according to the formula recommended by the General Tax Code. This makes the calculated taxes are consistent with fiscal reality. Everyone is required to pay taxes and thus contribute to local development and no taxpayer nor any taxable item escapes the system. For tax purposes, the Land Registry introduced computerization of procedures of assessment and collection work and allows a broadening of the tax and therefore regard a substantial increase in potentially mobilized local tax resources. The table - after showing the evolution of the mobilization of tax resources in some communes of Benin which are equipped with Land Registry tool.

Clearly, through the tax component, the Land Registry allows the town to accompany Services Tax with the database that facilitates the optimum utilization, effective and efficient tax bases. This usually leads to an increase in tax resources mobilized to scale.

The danger at this level is that taxpayers and the general populations tend to equate the Land Registry to tax. In the implementation process of the Land Registry is the communication to help explain the different applications of the Land Registry to the people so they do not cling to the idea that the project has come out tax notices.

1.2.3 The urban component

Land Registry is an urban database that allows the municipality and its authorities with actionable information to municipal management. The implementation process is to gather land data, urban and tax from property assets. The tool allows local authorities to easily dispose of such data on the population in a district, socio-community infrastructure or equipment, water, hygiene, sanitation and other information that is used by the Mayor to make decisions. It allows editing thematic maps as needed. Land Registry improves decision making to meeting the real needs and not of partisan decisions. For example, to know the number of households with toilets, just to query the database. Above - below, each point corresponds to a toilet.



2. INSTALLATION STEPS UP THE LAND REGISTER

2.1 INSTALLATION Land Registry (LR)

2.1.1. The preliminary activities

- The feasibility study

The town that wants to set up Land Register will commission a feasibility study. This study will reveal whether it is appropriate for the municipality to install the tool and possibly the conditions and characteristics that should be taken into account. With this information, the town, as Client through the Municipal Council and the Mayor, takes the decision, knowingly, to install the tool. Generally, the subject is placed on the agenda of a session of the Municipal Council making the decision in the form of deliberation.

- The mobilization of funding

Once the decision is made, it is then subject to mobilize the necessary funding. The installation of LR has a relatively expensive cost, which varies according to the size of the city and the people and the area taken into account. This is what often explains the recourse to the city with support from a technical and or financial partner. This table shows the amounts invested here and there:

City	Cost	Funding
Djougou	128 057	City of Evreux (France)
Cotonou	1 394908	French Cooperation
Parakou	198 184	French Cooperation
Porto-Novo	457 347	AFD (France)
Dogbo	149 421	City of Ridderkerk and VNG (Netherlands)
Abomey		German Cooperation

The implementation of Land Register tool therefore involves a significant investment in the local community with the aim to improve its services for the populations. In this context, it is appropriate to bring the matter to public opinion explaining the contours of the tool and issues to facilitate understanding among people and build commitment and ownership of each and all for the tool.

2.1.2. The execution phases

- The preparatory phase
  - Creation of the Land Register Office

To begin the process, the municipality, the owner, is to begin to create a land register charge exclusively service run by a design framework to ensure coordination of the project. The town will have to provide that service spacious and suitable premises to house the service to be well equipped with furniture and office equipment, computers and vehicles.

- Social mobilization

There is a very important cross-member in the establishment of the RF project. This is the communication necessary to involve local councilors, municipal administration, the decentralized services of the State and all people in the process.

- The implementation phase

Two basic tools are essential for the establishment of a Land Registry: one addressed basic mapping and a computerized database. Defining technical choice is important in the implementation of those conditions LR basic tools.

These technical choices must clarify the following concerns the basic unit of information system: the needs of the local community defined in the Land Registry goals, institutional insertion tool: choice of an institutional framework to meet, consider and respect the versatility of the information system and streamlining procedures and processing of the database: choice of the mode of processing, storage and preservation of data and information.

In all municipalities of Benin with the Land Register, the plot was chosen as the base unit to meet the needs of local taxation based on property taxes, themselves based on property values or detectable activity of plot, property inventory and the location of urban data relating to the parcel, for their graphics processing and exploitation.

- Aerial photographs or satellite images

Then to get to the heart of the Land Registry, the implementation of the tool starts with taking satellite images or aerial photos by the providers of the sector.

- Surveying and / or plans for digitization

Then a surveyor firm selected to conduct the surveying of all parcels in the defined area. These surveys take into account or not parceled zones. If there is already plans (stocktaking, subdivision, resettlement), they are scanned. All documents must be delivered in the GIS

software format. The MAP INFO software is that used for the Land Registry in most communes of Benin.

- Establishment of the addressed basic mapping

From the surveying added to existing digital plans, base mapping is established on the basis of a parcel tracking system that allows them addressing. Addressing is the operation to locate a parcel, an urban object, activity or individual. The base of the RF is the plot, this is to locate and therefore to send the parcel.

Two addressing types are implemented namely addressing Q.I.P. or addressing R.E.P. The Q.I.P. address is from the geographical location of the plot using the administrative division or any division into homogeneous areas. The plot is identified from an area. The area can be considered when the entire town is not big enough or incorporated areas as was the case in Cotonou with one Cotonou 1, Cotonou 2 and following. Conventionally, every city has a code that allows to identify it :

City	**Code**
Dogbo	407
Cotonou	215
Parakou	45
Lokossa	412

The following identification of the plot element is the area (Q) to which it is given a number. Then there is the island (I) which is a set of plots delimited by streets, 3 or 4 in general. Finally, there are the plots (P) whose numbers are alpha and lowercase letters and numbers which moves in the opposite direction clockwise, starting with the most land in the southwest of the island.

So, if we have a QIP address 105 - 1090 - b, this implies that the number given to the district is 105, the number of the island is 1090 and the plot number, b. In the system set up, it is clear that 105 corresponds to a definite area.

The REP addressing is based on the numbering of streets and plots entries whose combination leads to the entrance of each plot. We could have as Example 17, rue145 or 3, Market Square.

Within two (2) cases, the addressing must be materialized by the paneling of the plots. Satellite imagery and base mapping will be juxtaposed so as to obtain reliable parcel plans that will facilitate the continuation of the process.

- Data collection

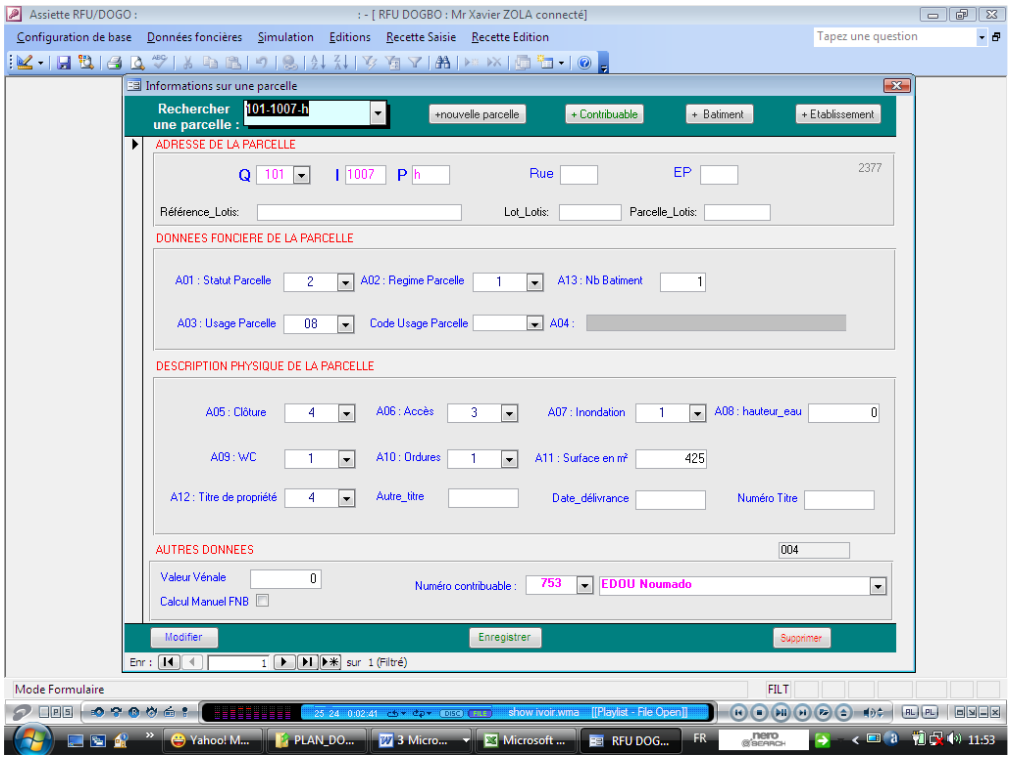
This is to collect land information, urban and tax and dispose of the information used in the construction of the database. It consists of conducting exhaustive investigations. This step is very important because it is the main source of information for the database to be set up. It requires careful preparation and proper organization in collaboration with the Plate Service from the city's tax office. This entry operation to automatically obtain the basic files.

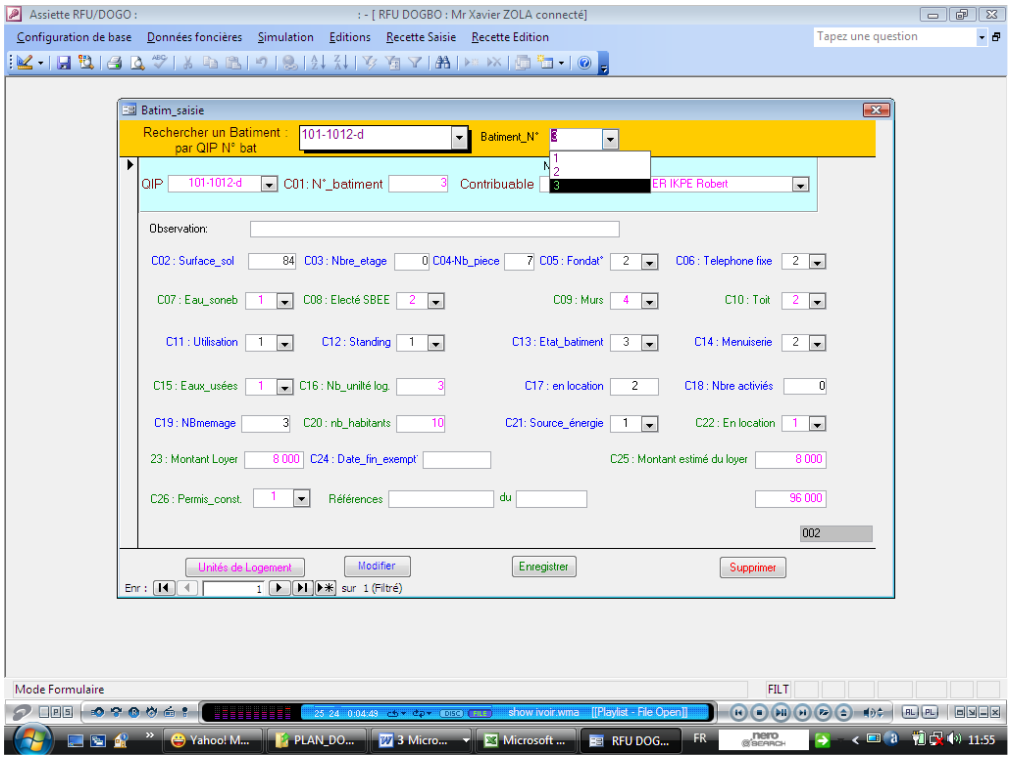
- Phase of development and consolidation

After data collection and the necessary clearance office survey sheets, ensues step of transmission to the Plate Service tax office where the Inspector of Taxes and colleagues also verified the information gathered. The involvement of agents of the Plate Service during field surveys is essential for their cooperation and facilitate their work at this level.

The capture operation is the integration of information collected and validated on investigation of records in different files of the software designed for this purpose are parcel file; buildings file, file of housing units, file of institutions and The taxpayer file.

Some database screenshots




Assiette RFU/DOGO : : - [RFU DOGBO : Mr Xavier ZOLA connecté]
Configuration de base Données foncières Simulation Editions Recette Saisie Recette Edition
Tapez une question
Batim_saisie
Rechercher un Batiment : par QIP N° bat
101-1012-d
Batiment_N°
QIP 101-1012-d C01: N°_batiment 3 Contribuable
Observation:
C02 : Surface_sol 84 C03 : Nbre_etage 0 C04-Nb_piece 7 C05 : Fondat° 2 C06 : Telephone fixe 2
C07 : Eau_soneb 1 C08 : Electé SBEE 2 C09 : Murs 4 C10 : Toit 2
C11 : Utilisation 1 C12 : Standing 1 C13 : Etat_batiment 3 C14 : Menuiserie 2
C15 : Eaux_usées 1 C16 : Nb_unité log. 3 C17 : en location 2 C18 : Nbre activiés 0
C19 : NBmemage 3 C20 : nb_habitants 10 C21: Source_énergie 1 C22 : En location 1
23 : Montant Loyer 8 000 C24 : Date_fin_exempt' C25 : Montant estimé du loyer 8 000
C26 : Permis_const. 1 Références du 96 000
002
Unités de Logement Modifier Enregistrer Supprimer
Enr : 1 sur 1 (Filtré)
Mode Formulaire FILT
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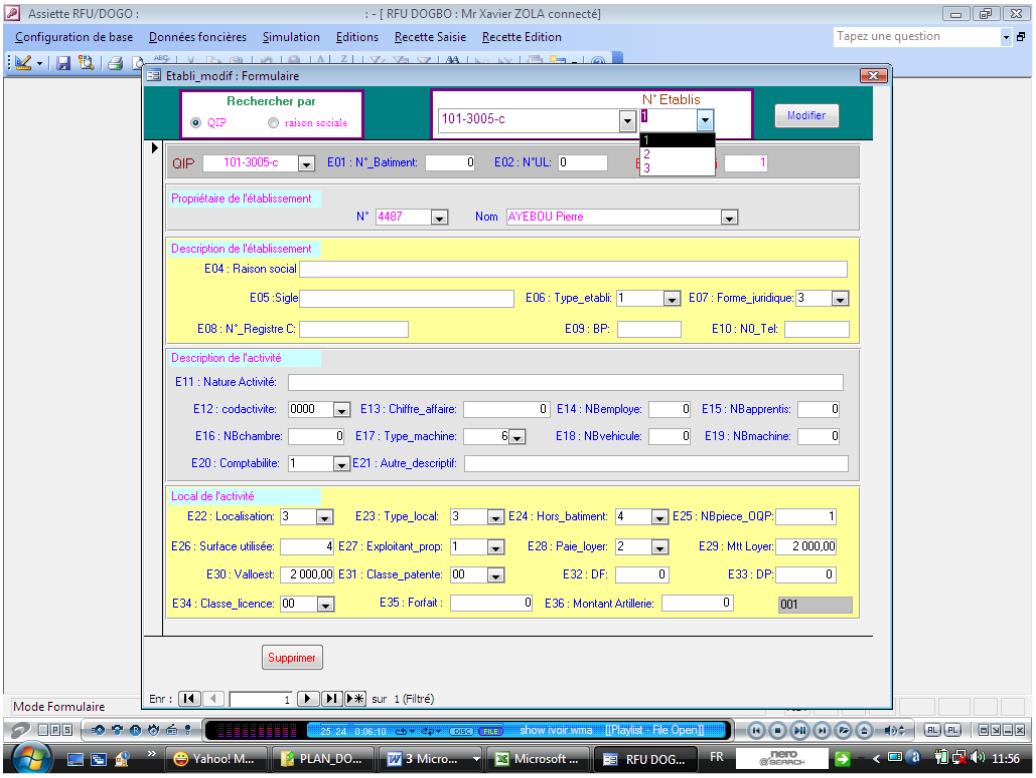
Assiette RFU/DOGO : : - [RFU DOGBO : Mr Xavier ZOLA connecté]
Configuration de base Données foncières Simulation Editions Recette Saisie Recette Edition
Tapez une question
Etabli_modif : Formulaire
Rechercher par QIP raison sociale
N° Etablis
101-3005-c
Modifier
QIP 101-3005-c E01 : N°_Batiment: 0 E02 : N°UL: 0
Propriétaire de l'établissement
N° 4487 Nom AYEBOU Pierre
Description de l'établissement
E04 : Raison social
E05 :Sigle E06 : Type_etabli: 1 E07 : Forme_juridique: 3
E08 : N°_Registre C: E09 : BP: E10 : N0_Tel:
Description de l'activité
E11 : Nature Activité:
E12 : codactivite: 0000 E13 : Chiffre_affaire: 0 E14 : NBemploye: 0 E15 : NBapprentis: 0
E16 : NBchambre: 0 E17 : Type_machine: 6 E18 : NBvehicule: 0 E19 : NBmachine: 0
E20 : Comptabilite: 1 E21 : Autre_descriptif:
Local de l'activité
E22 : Localisation: 3 E23 : Type_local: 3 E24 : Hors_batiment: 4 E25 : NBpiece_DQP: 1
E26 : Surface utilisée: 4 E27 : Exploitant_prop: 1 E28 : Paie_loyer: 2 E29 : Mlt Loyer: 2 000,00
E30 : Valloest: 2 000,00 E31 : Classe_patente: 00 E32 : DF: 0 E33 : DP: 0
E34 : Classe_licence: 00 E35 : Forfait: 0 E36 : Montant Artillerie: 0
001
Supprimer
Enr : 1 sur 1 (Filtré)
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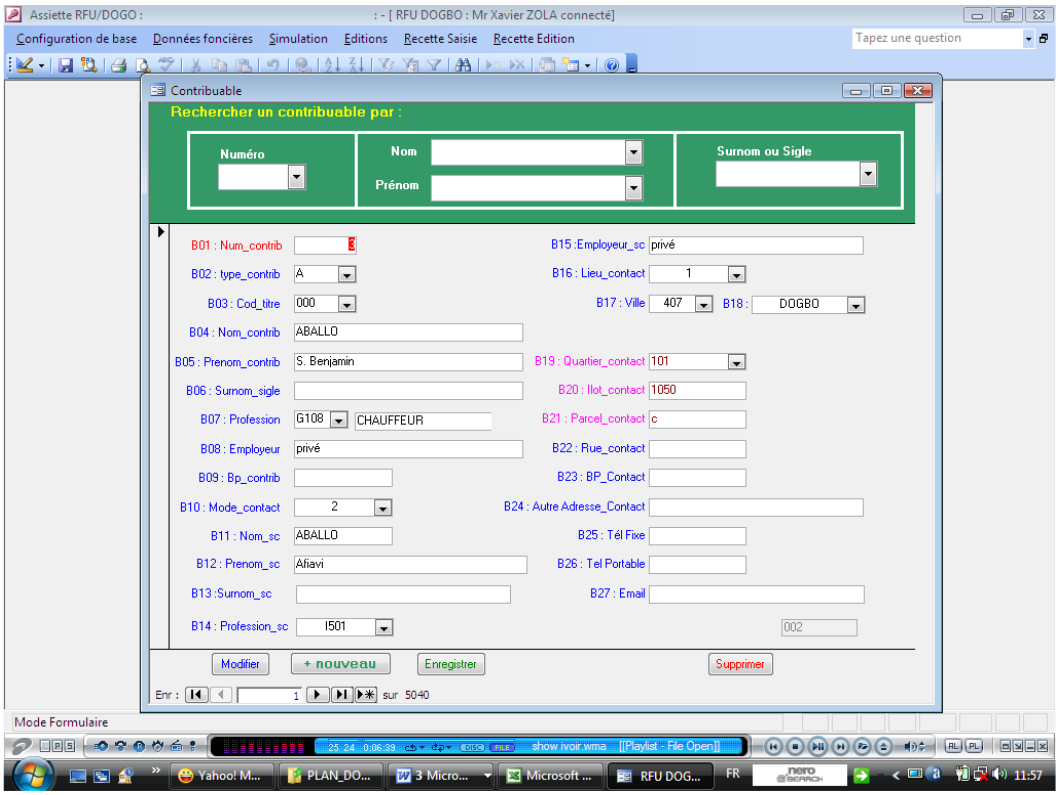

All of these files is related and develops various Land Registry applications. Thus, the Land Registry database is available as the map database made with satellite images or aerial photographs and basic mapping and provision of the city.

- The tax component

Priority was given to improving the collection of tax resources. The files " Plots ", " Buildings " and " Enterprise " put in relation to the file " taxpayer " help develop the tax industry, which is provided by the Directorate General of Taxes and Domains. The development of the tax industry involves the computerization of fiscal procedures and streamlining assessment and collection tasks. Thanks to computers, transcription manual tasks are replaced by control work on computer printouts different tax items and the tax calculation and development roles are automated. Also, the objective of this phase is to increase the efficiency of guard service by reducing the notice period of distribution to the benefit of better management of recovery.

- The land component

Land applications rely on the exploitation of the "plot file" which aims the establishment of a coherent land management policy by identification of public use parcels (socio-community

facilities and others), land ownership mode (land titles, housing permits, ...), the parcel of taxpayer and traceability of land transactions in which the plot was the subject

- The urban component

The development of this sector consists of the development of a map management tool localized urban data usable for the needs of municipal management. The crossing of data mapping and database enables publishing of thematic maps according to the needs of different actors of local development, the establishment of an urban management policy and dupport for decision making.

- The transmission phase

This phase is the ultimate level where the supplier responsible for the conduct of the Land Registry set-up will transmit the proceeds realized on the town that should take over the management, use and exploitation. For this, special emphasis should be placed on staff training available to the Land Registry load service. Training is so important for such personnel are able to learn, manage and update mapping and database after the implementation. Training should focus on the use of software entering into account in the database, on local taxation, the development and management of a Geographic Information System (GIS), the management and project management and others.

CONCLUSION

The establishment of the Land Registry and its optimal use requires a clear political will of the Municipal Council and especially the Mayor in his capacity as Client. As part of the sustainability of the tool and its development, it is necessary to strengthen the staff response capabilities in charge of its development work through specific training in computers, local taxation, mapping management, GIS and the various procedures. In addition, special emphasis should be placed on communication within the municipal administration on all activities related to the establishment and development of the database.

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BIOGRAPHICAL NOTES

After working five years ago from 2006 to 2011 at Municipality of Dogbo (Benin) where he was Chief of Land Registry Office then Local Development Director, Mr Xavier ZOLA assists Municipalities of Savalou, Comè, Ouidah and Missereté (Benin) to set up or improve their land tenure. Since 2015, he became Associate Manager of BENIN EXPERTISES & SERVICES Sarl which is an office that made technical assistance, training and studies in land management, mapping, GIS, decentralization and local governance and other. Mr Xavier ZOLA is Expert in Decentralisation, Local Governance, Land Management and GIS. He's Secretary of Land Registry Network of Benin. He's also Trainer at Local Administration Training Center of Benin.
Mr Xavier ZOLA is passionate about the media. He's the developer of newspaper SUD OUEST à Lokossa (Benin). He's also very active in the cause of children, women and youth with Foundation ZOLA of which he's Président.

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Technical Session A5

Evolutionary development of the scope of land consolidation

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The New Models and Perspectives of the Land Consolidation in the Sustainable Development Process

Stojanka BRANKOVIC, Borko DRASKOVIC, Ljiljana PAREZANOVIC, Serbia

Keywords: Land Consolidation, Sustainable Development, Legal and Institutional Framework

Abstract

Traditional land consolidation has become a multi-purpose instrument for rural development, which is used to achieve a harmonious and balanced spatial development in recent decades. Growing urbanization and industrialization require increasingly elaborate and detailed mechanisms of land use and spatial relationships, imposing the new requirements for land consolidation. The manner in which these requirements are considered will have a significant impact on the choice of land consolidation models in the process of sustainable development, as the applicable instrument of land policy in the future.

Regulating spatial relations with modern technological knowledge and information technology may be achieved under the certain preconditions, from the application of new professional knowledge, down to the adoption of legislation. This paper shows the importance of compliance of spatial plans and cadastral data on properties in the process of land consolidation, which becomes a catalyst for sustainable development of general living conditions in rural areas. Potential solutions and challenges are presented based on experiences from Serbia, with a focus on land readjustment as instruments in the implementation of spatial planning.

1. INTRODUCTION

Change of the ownership status pertaining to properties, by abolishing a land maximum limits and denationalization of agricultural land, makes a room for land consolidation intensifying in the Republic of Serbia, which has a long tradition in this region. The complexity of the land redistribution works performance is reflected in the synthesis of geodetic works on the land survey, determining and settling property rights, planning and design of infrastructure facilities, planning and design of agricultural land arrangement with its appropriate settlements. General mindset of the agricultural strategy in Serbia consists of three elements: the completion of the transition from a socialist to a full market economy; integration and accession to the European Union, a radical reconstruction and modernization of the entire agricultural sector.

Technological development brings continual improvements in production and success in every sphere of economic activity, including the agricultural field. An important task of agricultural policy is the establishment of an efficient agricultural sector able to compete on the global market, which directly leads to the increase in competitiveness of production.

Having the current average size farms of 3.5 ha, only a small number of farms have prerequisites of competitiveness, therefore the creation of the commercial farms structures, to meet the needs of a modern market economy, is a logical, priority strategic goal. In the context of improving the

competitiveness of the agricultural, water management and forestry sector, one of the priorities that seem to improve the agricultural land is its arrangement through the regulation of property-legal status and merging of agricultural holdings.
The organization and promotion of spatial arrangement, especially in rural areas, is a new approach in the implementation of land consolidation, which establishes the appropriate degree of coordination and combined development of agriculture and other economic, service and intermediary activities and establishes new principles multifunctional development of rural areas.

1.1. Rural Development Policy in Serbia

The long term goal of prosperity and efficiency in the agricultural sector and rural areas, following fifty years of planned economy, a decade of isolation, a few years of uncertainty and comprehensive discussions on the direction of development, the time has come when the adoption of a strategy become necessity, in order to ensure the smooth development of Serbia and integration into the European Union. The objectives of the agriculture development in Serbia are defined in the Strategy of Agriculture and Rural Development for the period 2015-2020, namely:

- Establishing of a sustainable and efficient agricultural sector that is competitive on the global market and contributes the national revenue growth;
- Providing food that meets the needs of consumers in terms of quality and safety;
- Provision of support for the living standard for people who depend on agriculture, in line with the economic reforms;
- Supporting the sustainable rural development;
- Protecting of the environment against the impact of the agricultural production negative effects;
- Preparing Serbian agriculture for the EU integration;
- Preparing the policy of domestic support and trade in agriculture pursuant to the WTO (World Trade Organization) rules.

Rural development policy involves both activation and optimal use of the productive potential of agriculture and other economic and service activities for a greater employment in the in the rural areas. Operationalization of this concept of rural development includes:

- Integration of the rural areas into the national development;
- Differentiation socio-economic and spatial structure of rural areas by regional and local specific traits;
- Connectivity of village and settlement systems, and communication with the higher order centers;
- Integrated development and arrangement of villages and rural districts through the process of land consolidation;
- Activating the local development potential of rural areas based on household-farm, as the basic production and socio-cultural category.

One of the limiting factors for the development of agriculture in Serbia is the fragmentation of farms, i.e. property consolidation is a basic precondition of cost-effective agricultural production.

Given the fragmentation of parcels in the formation of farms, there is an urgent need to land consolidation. Regarding the structure of rural areas and rural households, agriculture makes up only a small part that is often associated with other economic activities, social and natural environment. So far, the focus was predominantly on agricultural problems, instead of the comprehensiveness of rural areas and sustainable development, which needs to be changed (Table 1).

Table 1: Basic traits of Serbian rural areas

Basic traits		
Socio-economic structure	-	55 % of population lives in rural areas - Some 33 % of employees work in the primary sector - 45 % of the active rural population works in the agriculture
State of the agriculture	-	Low productivity - Average farm size of 3.5 ha - Poor mechanization equipment, low usage of the inputs - Insufficient budget support to the agriculture, insufficient informing of the beneficiaries
Rural infrastructure	-	Poor (physical, economic and social)
Economic structure	-	Insufficiently diversified - Rural businesses insufficiently developed - Low level of social services

Source: Bogdanov, N. 2005., Changes in the ownership and the socio-economic structure of agricultural holdings Serbia during the transition period

Long-term sustainable development of rural areas is the strategic goal of national development, given that other sectors of society have an impact on the development of rural areas, such as infrastructure, education, transport links, the development of small and medium enterprises, the development of service industries, the development of civil society and other.

1.2. Rural Development Policy in the European Union

In rural areas, which cover more than 90 % of the total territory of 28 member states and 56 % of the population, rural development policy is gaining in importance and is one of the development priorities of the EU. The implementation, in the past fifty years, the Common Agricultural Policy (CAP) and the development of rural areas, traditionally relied on farming as the main carrier of social development.

After substantial changes implemented in 2003 and 2004, the CAP changes its focus from the agricultural production support policy towards increasing the quality of products, market challenges, the use of new development opportunities and environment conservation.

That turnaround comes with the major changes of rural development policy, focused on three main objectives in the period of 2007 – 2013:

- Increase the competitiveness of agriculture and forestry;
- Improve the environment status;
- Raise the quality of living in rural areas and support rural development.

The Member States and the regions are obliged to ensure the balanced implementation of rural development policy though an appropriate allocation of resources between the three above-mentioned thematic areas. In addition, it is necessary to provide funds for the implementation of the LEADER initiative - "Connecting activities for rural development". The European model of rural development, launched in 1991, is based on a "bottom-up" approach, where the representatives of all three sectors are being involved in the development and implementation of local development strategies. The strategy is being implemented through the projects aimed at addressing specific local issues.

Legal instrument of the Community ensures the integrity of the rural development policy over the entire territory of the Union, through joint strategic guidelines, financial support of the new European Agricultural Fund for Rural Development (EAFRD) and the Regulation for the implementation of the CAP. The Member States had elaborated a common direction dialing development opportunities in the national rural development strategies, which will generate the greatest added value for the Community and regions.

1.3. Public Participation in the Development Strategies

Public participation refers to efforts to provide the general public with the access to information on development strategies, planned investment program and express their views on the planned programs. Educating the public about the development projects and their implementation and expected effects, such as the process of land consolidation, is aimed at alleviating the fear that such a procedure does not involve land seizure or confiscation, noting instead that it is an amalgamation for more efficient agricultural processing and overall local development. The benefits of public participation can be multi-faceted:

- The first and most obvious way is that public participation contributes to "good governance" and the possibility of an open dialogue with the state authorities and bodies. Public participation is an essential element in the decision-making process as well as the legal right to give one’s opinion on the issue of land consolidation;
- Another reason for motivating the general public to participate is that the provision of information contributes to the state authorities to come up with better technical solutions and better decisions in the legal sense. Local population can present useful advice regarding the proposed site for land consolidation, and the decisions on this will get breadth and rely on local conditions that technical experts themselves cannot always know;
- Having that any activity in the land consolidation program established should recognize and support the local community, this can be successfully achieved if the community had an active role in shaping the decisions on the implementation of the land consolidation process;

- Showing the local community that the competent bodies are willing to take into account the problems of the community establishes the foundation for understanding and public involvement, even if the individuals do not always agree with the results of the decision making process;
- In the long term, promoting a meaningful public participation at an early stage, means saving resources due to the avoidance of delays, legal actions and public opposition.

The concept of public involvement in discussions and decision-making in relation to the traditional way of decision-making by the local authorities, poses a new challenge in the methods and models under which the local government bodies work and function.

It is essential to identify the stakeholders whose interests and reservations should be taken into consideration at the earliest stages of planning. Usually, there are many stakeholders to engage in discussions and decisions on the identification of existing properties and creation of the new ones. It is very important for a stakeholder to be motivated to participate in the initial stages of the creation of programs for the development of the land territory through the process of land consolidation, in order to establish a sense of partnership and common goals and tasks. This, in fact, should be active, two-way process of communication, providing information and obtaining a feedback to be carefully considered.

Potential groups of stakeholders that may have vested interests in decision-making on land consolidation are:

- Regional and local government authorities whose responsibilities include agriculture;
- Business groups and industry and other branches, operators of rural development and land policy and the environment;
- Groups for the protection of public interest;
- Industrial and agricultural associations;
- Academic institutions; and
- Scientific-research institutes and other scientific and technical institutions.

Acceptance of the public by the state through its agencies as the legitimate partner is shown by the involvement of these stakeholders early in the planning process, thus before developing programs and plans of the land territory arrangement, and prior to the adoption of important decisions.Activities where the general public can participate and the communication method includes:

- Avoid using complicated technical terminology;
- Divulging as much information as possible about the effects of land management and existing practice of conducting the procedure, as well as the questions posed by the stakeholders;
- Precise notification about the opportunities and legal rights of participants in land consolidation;
- Interpretation of technical data and reporting terminology that is understandable to everyone;
- Involvement of stakeholders at the very beginning of the process.

Public participation is, in fact, a dialogue which includes the provision of information to the stakeholders and obtaining their contribution in the form of ideas, issues to be addressed and issues of concern among the population.

Therefore, it is usually necessary to develop a plan for raising public awareness and communication with those groups that have expressed their interest and their concerns about the program of land territory arrangement by the land consolidation. Such a plan should include activities and information dissemination techniques, and similar techniques to collect and share the information.

These plans are based on an estimate of the level of interest of the local community, as well as the types of problems that are of concern, which are collected from different sources. Such information may serve as the base to determine the specific activities that engage the general public in the process of planning of the land territory arrangement by the land consolidation. Informing the various groups of stakeholders requires different approaches and specific communication techniques. A well thought out communication strategy should ensure that every message actually reaches those for whom it is intended. In this context, it is necessary to measure out the advantages and disadvantages of various mechanisms for transfer of information on what is actually a redistribution of land, what are the effects and what are the possible risks related to the implementation of geodetic-technical and legal activities.

The time and effort that should be set aside for the development of programs of public participation depends on the level of participation that we want to achieve. It is important, however, to know that the participation of members of the local community in the process of deciding on the land territory and the enlargement of their possession, will give a reflection of the mood and concerns of the public, as if these are not properly addressed, it may lead to the loss of local community support.

"The dominant economic paradigm considers rural development almost exclusively as a problem of financial investments, the creation of local financial institutions, the problem of business management, technology transfer, infrastructure, apparently always searching for the principle of economic efficiency (Martinez, J., 2008).

2. IMPORTANCE OF THE LAND CONSOLIDATION FOR THE SUSTAINABLE DEVELOPMENT

The United Nations World Commission on Environment and Development gave a general definition of sustainable development in the report entitled "Our Common Future", which reads: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" Sustainable development in the conceptual notion, contains three important dimensions: environmental sustainability, economic efficiency and social responsibility, known as the "three pillars model" (Giddings, Hopwood, & O'Brein, 2002).

The environmental dimension includes bioderivates preservation, rational use of natural resources, reducing environmental pollution, concerns about endangered species, their habitats, ecosystems and the like. The areas used to monitor the environmental dimension of sustainable development are: the atmosphere, land, oceans, seas, water and bioderivates (Miltojević, 2011).

The social dimension refers to social relations, respect for human rights, achieving social welfare, transparency, social activities, involvement of people in decision-making and it is monitored through five areas: health, social justice, education, population, safety and housing.

The economic dimension of sustainable development is founded on the principles of compliance with the economic development of resources and production capacity and is viewed through the following areas: production, economic structure and consumption (Miltojević, 2011). The three dimensions of sustainable development are interdependent and are coordinated and linked to the institutional apparatus – the fourth dimension of sustainable development, *institutional*, with the aim of implementing activities related to other dimensions of sustainable development (Spangenberg, 2002).

Sustainable development, according to the National Strategy for Sustainable Development of Serbia, is "... a long-term concept … which … involves continuing economic growth that, in addition to economic efficiency, technological progress, the cleaner technologies, innovation of the entire society and socially responsible business, provides a reduction of poverty ... (NSSD). The solutions given in the strategy are in line with European strategies: development strategy of the EU (2006) and the Lisbon strategy (2000) and the Millennium development goals (UN) and the National Millennium development goals in the Republic of Serbia (2006).

Spatial Plan of Serbia is the main strategic development document which, among other things, defines the basic orientation and goals of spatial development, achievement of rational spatial organization and development, harmonizing its use with the capabilities and limitations of the available natural and created values, and the needs of long-term social and economic development.

The conceptual framework for strategic spatial arrangement planning includes:

- Compliance and integrating data from the real estate cadastre records and planning documents and their implications in the modern land information system;
- Streamlining the methods of planning and design of infrastructure facilities, for the purpose of scheduling the implementation of these works in the process of land consolidation;
- Expansion of the land consolidation activities to the construction land, especially in the implementation of spatial and urban plans;
- Implementation of land consolidation in terms of the contemporary global market developments and the introduction of a systematic analysis of the competitiveness of agriculture of Serbia;
- Public participation and communication strategies in the area where the process of land consolidation is planned.

The land territory arrangement, spatial planning and environmental protection require substantial resources, and available funds are almost always lower than needed, therefore we must carefully study the economic efficiency of new investments, against the available amount, in order to achieve the maximum production effect.

The role of the state and the producers is adjusted to the objectives to be achieved by this effort, as well as the characteristics of the socio-economic system where it operates. Great turns achieved during the development itself, reflect the totality of human activity, and the agriculture is no exception. Such changes had been experienced by the Serbian agriculture in the last six or seven decades. Under the difficult conditions of transition and political instability during the 1990’s, the agricultural sector was further impoverished. Once again, the focus is on the property rights of land.

This was followed by a wave of fragmentation of large land complexes in the mandatory return of confiscated land. It continued with privatization of the remaining social enterprises and cooperatives and leasing of state land. The processes of restitution of agricultural land had not been concluded, the law on denationalization will bring new changes in ownership relations, which will be reflected in agricultural production.
Solutions in inheritance law are outdated, so there will probably be some changes in this sensitive field. In the period after 2000, significantly more attention is paid to the development of farms, in order to form a new production structure in agriculture, able to face the growing competition in domestic and foreign market. Implementing the development documents, including primarily the Strategy agriculture and rural development for the period from 2015 to 2020, should provide Serbian agriculture, the role worthy of the importance it has in the sustainable development of the country.

2.1 Land Consolidation as the Environment Protection Factor

Environment protection includes a set of different procedures and measures to prevent environmental degradation in order to maintain biological balance. In recent years, we have witnessed the problems related to the preservation of a healthy environment. The man in the technological and industrial development neglected their preservation and improvement of environmental sustainability, which was mercilessly destroyed and polluted because of the new technology, did not follow appropriate safeguards.
In recent years, addressing these problems became much more organized, with the adoption of the Law on Environmental Protection ("Official Gazette RS", number 135/2004). Agricultural land arrangement by the land consolidation is the right measure to jointly and severally, provides the necessary land for this purpose, by taking land from each land consolidation participant, as well as to gather all the information about the area. We will deal with those environmental factors that can be solved in the process of land consolidation.

2.1.1 Land Protection

Being our greatest natural resource, the land is the most vulnerable to pollution and needs to be protected against further deterioration by taking various measures which include:

- Strict control of further occupation of agricultural land for other purposes;
- Re-cultivation of degraded areas;
- Construction of dykes and canals for drainage in areas endangered by groundwater and floods;
- Improving the productivity of agricultural land by building irrigation systems;
- Building purification systems and closed and open drainage networks for waste water in areas contaminated by the wastewater;
- Preventing the devastation of the land by wind erosion through afforestation.

More efficient monitoring and environmental management requires establishing an information system. To this end, there is the need to establish a database for all the pollutants and activities that occur in the environment, which include control of pollution of agricultural and urbanized land, surface and ground water, noise, environmental monitoring and more (Figure 1). Spatial data, which are obtained through the process of resurvey and land consolidation, are the basis of this system. The implementation of the measures will protect and preserve healthy sources of drinking water and allow the production of healthy food. Most of these measures are realized through the process of land consolidation.

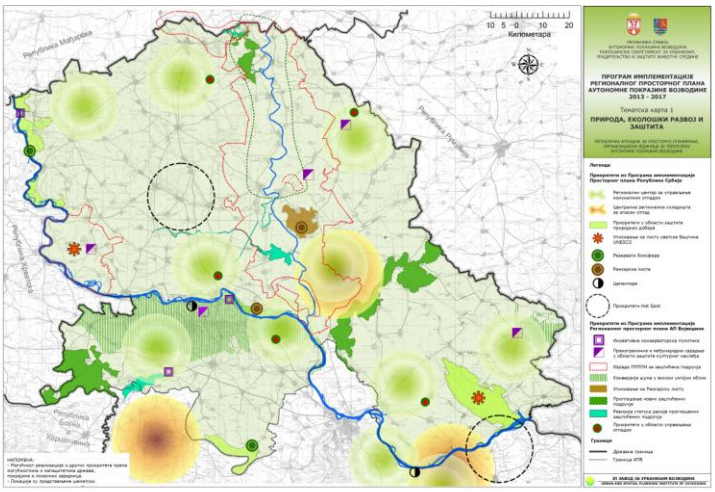

Figure 1: Regional spatial plan of Vojvodina
Map of protected natural goods and environment protection
Source: www.rapp.gov.rs

Also, inadequate waste management is one of the biggest environmental problems in Serbia. This is why the National Waste Management Strategy was passed, addressing two important issues:

- Identifies and defines the goals for improving waste management that will prevent further pollution of the environment. The current waste management method is not in line with modern one, prescribed by the European Union;
- In accordance with European standards, it is necessary to build up the necessary facilities and organize waste management. Spatial and urban plans will define the regional landfill sites, and the land will be provided under the process of land consolidation and expropriation.

2.1.2 Afforestation and Wind Protection Bells

Forestation in Serbia is low and amounts to 138,818 ha (6.8 %) of the total forest area. Optimal forestation stipulated in the Spatial Plan is 14.3%. The following areas should be used to develop the new forest belts:

- Setting up agri-protection areas along the existing and designed roads, water infrastructure and field roads in the agricultural area;
- Planting forests on degraded land, the agricultural land ranging at cadastral class from 6 to 8, land near the reservoirs, industrial facilities, land affected by wind erosion;
- Planting settlement greenery and vegetation along the boundaries of towns and cities.

In order to protect agricultural land from harmful effects of erosion caused by wind (wind erosion), anti-erosion measures used include planting of perennial woody plants or raising and breeding non-forestry greenery in the form of agri-protection areas. Non-forestry greenery needs to be established within the transportation and water infrastructure and agricultural land at about 2% of the area (Figure 2).

Figure 2: Filed protection belts design in the land consolidation for the CM Selenca
Source: www.rgz.gov.rs

2.1.3 Development and Arrangement of Village Area

One of the important measures to create conditions for the protection of the environment is an arrangement of rural areas implementing spatial plans, urban development projects for the village, integrated into the main designs of land consolidation, which provides:

- Optimal areas of construction zones for the rational development and construction of settlements;
- The necessary areas for a variety of purposes, primarily for all types of infrastructure, afforestation and field protection belts, springs, reservoirs, ponds, landfills, a bypass around the settlements, sports fields, etc.;
- The fastest and optimal connection of settlements and districts by the means of road network;
- Preserving and restoring farms, a symbol of a healthy environment, healthy food production and future development of tourism;

- Expansion of rural households, permanently oriented to agriculture, from small (up to 5 ha), medium (5-10 ha) to large farms (over 10 ha), which will be the main carriers of agricultural production.

2.1.4 Land Reclamation Efforts

In hydrological terms, the territory of Serbia is characterized by an enormous wealth of water, primarily natural streams, lakes, ponds, fish ponds and canals. The most significant natural waterways are the following rivers: Danube, Sava, Tisa, Tamis, Morava, Bega, Taras several rivers of lesser importance and the Danube-Tisa-Danube channel in Vojvodina (Figure 3). Given that frequent droughts take the form of natural disasters, it is necessary to perform agricultural land arrangement through the process of land consolidation including the irrigation. The construction of irrigation systems provides the conditions for increased agricultural production and for two harvests in a year.

Figure 3: Hydro-system over the part of Backa territory, Vojvodina
Source: www.dtdsubotica.com

2.1.5 Transportation Infrastructure

Serbia has a very favorable geographic and transportation position, both towards the countries of Central and Western Europe, and the countries of Southern and Eastern Europe. The central position on the Balkan Peninsula and the Middle Danube region provides for intensifying connectivity and participation in international transportation, particularly the development of the transit function between Europe and Asia. Spatial, functional, and especially developmental potential the Danube and the Sava river corridor are vital to the system of organization, regulation and use of Serbian transportation area. Sava-Danube transport corridor is crucial for the development and integration of the economy with the European Union, through major infrastructure and transport systems.

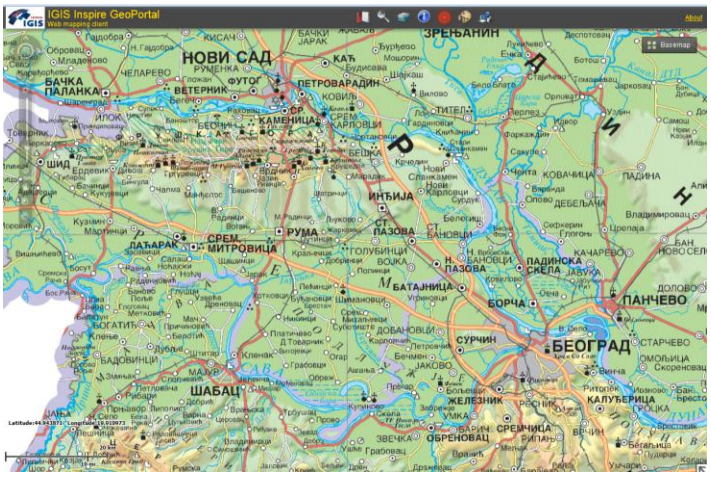

Figure 4: IGIS Geoportal Topographic map
Source: www.rgz.gov.rs

This geographic central belt is layered and very complex since it has considerable potential for the development of agriculture and energy, and includes the large urban agglomerations of Belgrade and Novi Sad (Figure 4).

3. INTEGRATED CADASTRAL AND LAND CONSOLIDATION SURVEY

Cadastral and ownership information and other information received or distributed by institutions such as cadastre and the land registers, are an integral part of national or European Spatial Data Infrastructure (SDI). Institutions responsible for the property registration and Geoinformation are facing great challenges as a result of technological development throughout the world and political changes. In Europe, more and more laws are promulgated by the European Union, especially regarding the organization of cadastre and registration of land and their competence. Important support to these organizations is provided by cadastral institutions through their strategies, in order to respond to the challenges, based on the vision for the cadastre and land registers that are used in Europe. (Branković et al, 2016).

3.1 Cadastral System in Serbia

In the Republic of Serbia, the reform of the cadastral system was carried out through the *Real Estate Cadastre and Registration Project in Serbia*, from 2004 to 2012. The project was funded by the World Bank and supported by a number of donor-funded projects of the European Union Member States. The project was implemented by Republic Geodetic Authority, which is competent for the works related to state survey, real estate cadastre, utility cadastre, basic geodetic works, address register, topographic and cartographic activities, property valuation, geodetic and cadastral information system and the National Spatial Data Infrastructure and geodetic works in engineering and technical areas (Brankovic, Stanković, 2010).

Today, the real estate cadastre in Serbia represents a unique public register of properties that contains information on: land, constructions and special parts of constructions (apartments and business premises, other buildings) and property rights, encumbrances and restrictions on properties (Law on State Survey and Cadastre, Article 4, 2009).

3.2. National Spatial Data Infrastructure

In line with European initiatives and trends, while respecting the principles of the INSPIRE directive, the Republic Geodetic Authority had successfully initiated the activities on establishing the *National Spatial Data Infrastructure in Serbia*, which is a system of geospatial data, allowing users to identify and access spatial information obtained from various domains at local, over the national, up to the global level, in a comprehensive manner (Figure 5). Geospatial data are presented by space typology of physical structures, numerical indicators of cadastral data and analysis of relevant parameters for certain natural resources, social and economic structure of the population, in all areas of living space, represent innovative measures that contribute to sustainable development of our country.

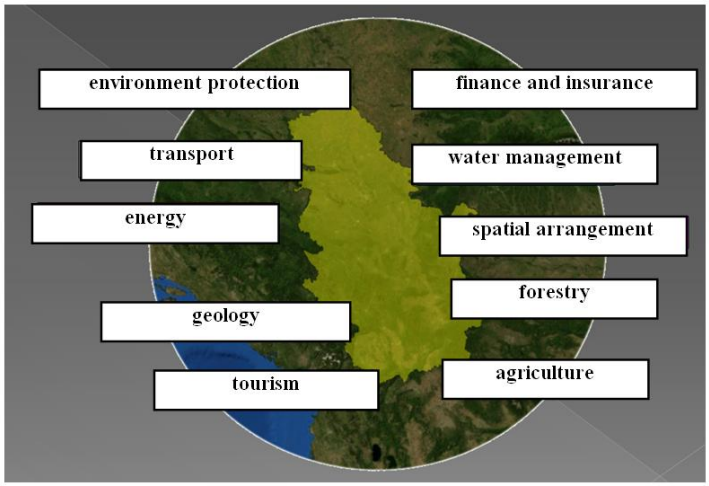

Figure 5: The NSDI system components
Source: www.rgz.gov.rs

3.3. Geospatial Data Integrated in Land Surveys

Graphical presentation of planning documents (spatial and urban plans) and the option to access technical documentation via the graphical data are important for the creation, maintenance and implementation of each individual process during the entire cycle of sustainable urban development. Giving accent to certain areas designated for construction, local transport and infrastructure, general regulation plans and detailed regulation plans, conceptual and methodological terms, are the decisions made in the preparatory phase, by the visualization of space of a particular object, based on the geospatial data (Figure 6).

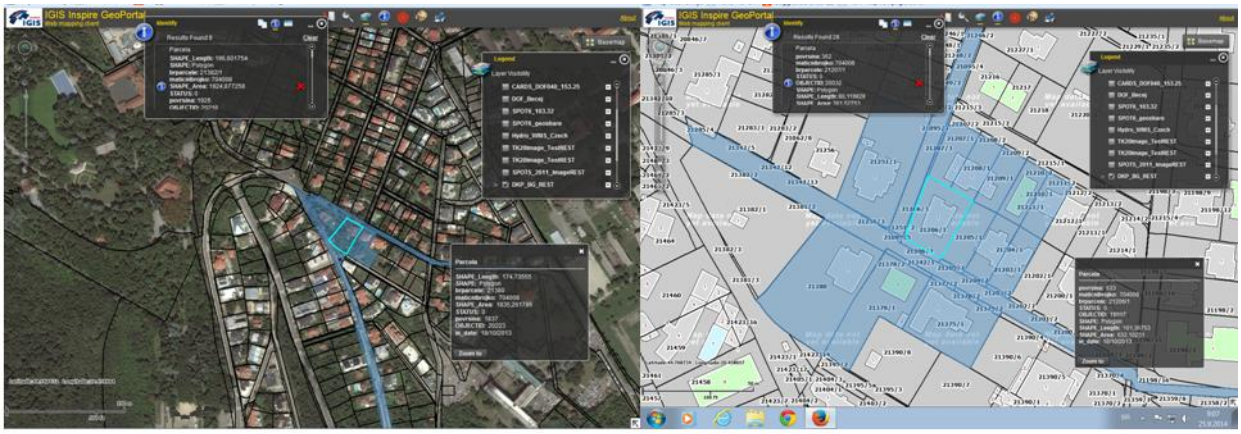

Figure 6: Visualization of the territory of the City of Belgrade
Source: www.rgz.gov.rs

The potential of integrated data (cadastral and geospatial data from other domains) is also reflected after defining the spatial extent, in its analysis by key development factors, which can be performed from the standpoint of valorization of natural, economic, demographic, social opportunities, especially in the terms of environmental restrictions and the possibility of development in the long run.

The processes of sustainable development that flow continuously, with varying intensity, causing structural changes in character, and which can prevent a faster and more stable socio-economic progress, can determine the spatial, graphical and statistical analysis of integrated cadastre and geospatial data.

Likewise, the geospatial data are the basis for the analysis of spatial and urban organization, which includes:

- Determining purposes and land use;
- Studying changes in the urban structure and morphology of space;
- Overview of open and green space and linking developed and vacant areas;
- Researching the optimal and the different transport solutions;
- Repositioning of the spatial organization planned model.

Intense urbanization that have caused rapid growth of cities and the concentration of population in small spaces, assuming an increasing importance in the mutual study the impact of urban structure and natural environment, from an environmental standpoint and the standpoint of sustainable development. Many of the problems of today's society and society in the future are associated with spatial dimension. The analyzes, quick and adequate addressing these issues require the possession of relevant geospatial information and knowledge, which must be exchanged and used effectively (Williamson,Grant 1999).

In the last decade, from 2006 to 2016, the process of implementing an integrated cadastre and land consolidation survey in Serbia had begun. According to the experience gained in numerous land consolidation projects implemented and opinions of participants in land consolidation, or the respective owners of land, it is necessary to pay attention to the needs of the local community in an urban area, in parallel with improving the organization of the agricultural land.

In the process of cadastral survey, many important issues of the local population strategy are being resolved: surveying and legalization of new constructions without a building permit, implementing the important urban plans, resolving the issue of property valuation for tax purposes and other issues.

Figure 7. Integreated Cadastral anad Land Consolidation survey CM Kulpin
www.rgz.gov.rs

From a financial point of view, addressing the issues listed through the realization of an integrated cadastre and land consolidation survey contributes to the rationalization of the cost of plans implementation in the local community, which is largely funded from the budget of the local community-municipality (Figure 7).

4. LAND CONSOLIDATION IN SERBIA – EXPERIENCES AND PERSPECTIVES

In Serbia, land consolidation was used as a measure of agrarian reform before the war, between the two wars, and in the after war period from 1955 to 1995. Agrarian reforms were carried out in order to create social ownership, which would establish the Agricultural Land Fund for improvement of agrarian policy on one hand and for creating an institutional framework of agricultural production on other.

If the reforms are to be observed from a modern standpoint, they would have included a new organization of the agricultural land, production, and reduction of the tax levied on the agriculture. Modern approach to the meaning of agrarian reform was supported by the specialized organization of the United Nations (FAO) in 1960's and 1970's. History of agrarian reform dates back to the distant past, being implemented in European countries (Austria, France, England and others) according to the set of historical and political events for their implementation.

In almost all countries in the world, where the old structures of properties had been retained until mid 20th century, being large landholdings, agrarian reforms were carried out in order to achieve a more equitable distribution of land ownership. Today, land consolidation, as a measure of organization of land territory has a wider and contemporary aspect, and that is:

- Implementation of the general land use plan;
- Grouping of agricultural parcels and property and the formation of a small number of plots that have a regular shape;
- Improvement and protection of agricultural land through a new organization of space by building new roads and drainage network and correction of construction boundary lines;
- Improving the quality of arable land and the protection of agricultural land from harmful influence of the wind;
- Accommodations, protection and use of water and water facilities and forests;
- The implementation of protection and improvement of the environment, individual protected natural resources and cultural and historical values;
- Implementation of the program of reconstruction and planning of settlements;
- Creating new cadastral/land consolidation survey documents and renovation of real estate cadastre;
- Creating a database for geodetic and cadastral information system.

4.1. Legal Basis for Land Consolidation

Pursuant to the Law on Agricultural Land ("Official Gazette RS", numbers 62/06, 65/08 and 41/09), and in accordance with the Agricultural basis for protection, development and use of agricultural land of a municipality, the Municipal Assembly defines the territory of the cadastral municipality to be regulated under the land consolidation. For the arrangement of the territory of the cadastral municipality by the land consolidation, the *Land Consolidation Program* is produced pursuant to the Article 32 of the Law on Agricultural Land.
Before commencing the works on the land consolidation, the Municipal Assembly shall, in accordance with Article 32 of the Law on Agricultural Land ("Official Gazette RS" numbers 62/2006, 65/2008 and 41/2009), previously draft and pass the Program, under the consent of the Ministry of Agriculture, Forestry and Water Management. The subject of all the land consolidation is all land in the area of land consolidation: agricultural, forestry and construction lands. Land consolidation survey data consist of the survey document that is the basis for the renewal of the real estate cadastre.

4. 2 Land Consolidation Entities

Land Consolidation Commission

All operations in the land consolidations are managed by the Land Consolidation Commission, which takes care of the organization of work, monitors the rate of implementation of individual works and their mutual harmonization, the legality of operations, etc.

As an operational land consolidation municipal body, the Land Consolidation Commission shall perform the following tasks:

- Establish sub-commission for valuation of land, valuation of facilities and perennial plants, determination of the factual situation, distribution of land consolidation bulk, takeover of land and other professional bodies;
- Identify the actual situation and to participate in the performance the land valuation;
- Funds previous projects related to cadastral municipality (design of agri-protection areas network, municipal infrastructure design, etc.);
- Provides designs of national and regional infrastructure (transport (road and rail), water management, electricity, telecommunications infrastructure, designs for the protection of cultural heritage, environmental protection, etc.);
- Adopts the land consolidation designs (design of field roads network, design of canal network, design of agri-protection forest belts and the mass distribution of land consolidation);
- Establishes a deadline for the presentation of the overview map of land consolidation bulk distribution and resolves objections of the participants in land consolidation against the land consolidation bulk distribution;
- Performs temporary handover of the land consolidation bulk and issues the minutes of provisional acceptance of land and buildings;
- Passes resolutions on the land consolidation bulk distribution (*Article 43 of the Law on Agricultural Land*).

Republic of Serbia

The Republic of Serbia is participating in the land consolidation through its competent ministries, special organizations and public enterprises.

Ministry of Agriculture, Forestry and Water Management:

- Issues a consent to the land consolidation program (*Article 32, paragraph 2 of the Law on Agricultural Land*);
- Resolves the second-instance appeals against the land consolidation bulk distribution (Article 44 of the Law).

Province Secretariat of Agriculture, Water Management and *Forestry:*

- Announces a competition for grants for the protection, development and use of agricultural land.

Republic Geodetic Authority:

- Performs if necessary, inspection of the surveying organization's work covering the design and work performance in surveying construction area and land consolidation;
- Performs, where appropriate, the land consolidation valuation and cadastral classification of land in the land consolidation area;
- Performs inspection and acceptance of geodetic-technical works and certification of survey documents;
- Participates in the presentation of data surveying and cadastral system for the public discussion;
- Performs renewal of the real estate cadastre using the certified survey documents.

National and province public enterprises

Public enterprises provide the necessary infrastructure designs (transport, water management, electricity, telecommunications, as well as the designs on cultural property, environmental protection, etc.).

4.3 Land Consolidation Perspectives

Over the territory of Serbia, comprehensive land consolidation efforts are being performed, with a model of integrated cadastral and land consolidation survey. Other models for land consolidation such as voluntary land consolidation and redistribution of land expropriation in the realization of projects for important state infrastructure facilities shall be implemented through the overarching consolidation (Brankovic, Drašković et al., 2016).

Model that integrates the land consolidation with construction and non-construction area survey in the overall sustainable development of rural areas is a new model which is applicable in the following perspectives:

- Inclusion of land consolidation in the National Strategy for Rural Development;
- Amendment of the current or creating a new legislative framework in the field of land consolidation;
- Defining procedures for the initiation and implementation of land consolidation;
- Developing clear procedures and guidelines for funding land consolidation project;
- Greater involvement of owners in the decision-making;
- Development of models of the formation of the land bulk;
- Defining the institutional competence at the national level.

4.3.1 Principles of Modern Land Consolidation

Modern society requires high-quality spatial information for optimal resource management, efficient decision-making and a steady urban development. The vision of sustainable development in Serbia, is the development of information and communication technologies, which should improve the economic efficiency and competitiveness of the national economy based on knowledge, a way to improve the exchange and availability of information, where geospatial data have an important place and role (Figure 8).

The principles of modern land consolidation can be defined through the following standpoints:

- Improvement of living standard in rural areas, in addition to improving primary agricultural production;
- Restoring communities through sustainable economic and political development of the whole community, as well as the protection and sustainable management of natural resources;
- Community participation to be inclusive, democratic and managed and in practice, not just in the concept;
- Help community to define new uses for their resources and accordingly reorganize spatial components;

- A comprehensive and cross-sectoral approach to integrating the elements of the broader rural and regional development, including rural-urban linkages;
- Land consolidation can assist in resolving potential conflicts of land use changes, the structure of land can have a significant impact on geo-ecological and bio-ecological resources, and the size and shape of the parcel, slope and type of land use can prevent land degradation.

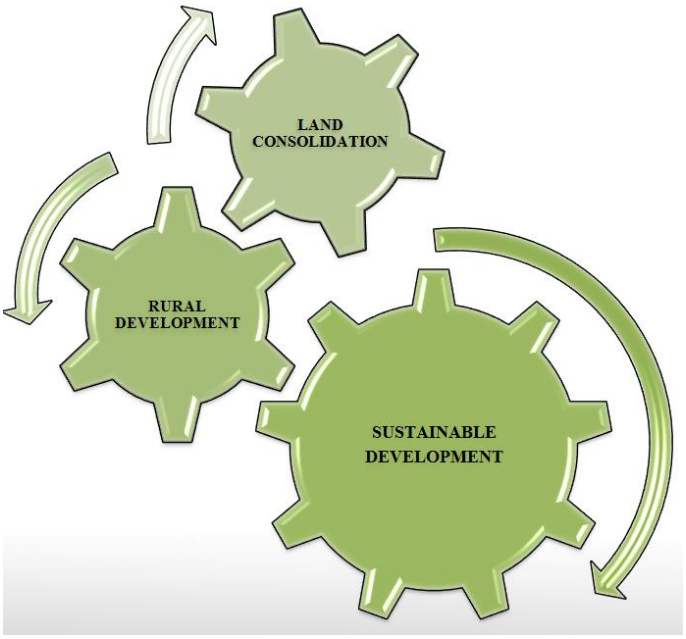

Figure 8: Principles of Modern Land Consolidation

5. CONCLUSIONS AND RECOMMENDATIONS

Land consolidation has an important role in improving rural development. When used as an instrument of rural development, land consolidation can improve the efficiency and effectiveness of public and private investments in transport and communication networks and irrigation systems, to facilitate the renewal of communities and promote social stability.

Likewise, the promotion of economic growth in the agriculture and environmental protection can be synchronized via an integrated local area planning and effective coordination of all the subjects of the land consolidation that can serve to provide a framework for the implementation of local land planning. At the same time, land consolidation program needs to include national and sub-national priorities and the priorities at the local level.

Geospatial data integrated with cadastral data on properties, subject to availability and representativeness, compatibility and standardization of data formats for the exchange, have an important role in the realization of sustainable development of cross-sector functions.

At the same time, these data can be a warning signal for approaching the sustainability limit and the need for taking appropriate measures, through the following activities:

- Introduction of modern methods of collecting and processing spatial information in the operation of governmental institutions and improving process of managing space, nature and social system in terms of environmental protection and urban development;
- The use of geospatial data as a basis for the development and implementation of environmental, economic and social projects at the national, regional and local level;
- The development of compatible and spatial information systems that will have the capacity to connect to the European neighborhood.

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The Analysis of the Scope of Implementation of the Idea of Multifunctional Rural Development in Land Consolidation Projects in Poland

Katarzyna SOBOLEWSKA–MIKULSKA and Małgorzata STAŃCZUK–GAŁWIACZEK, Poland

Key words: land consolidation project, effects of land consolidation, multifunctional rural development, rural areas in Poland

Cadastre

SUMMARY

The model of agricultural production existing in the European Union countries indicates the need for multifunctional development of rural areas. However, the mechanisms of execution of the idea are left without clear explanation. One such tool for accomplishing the goals of the concept can be land consolidation. The aim of the paper is to study the scope of implementation of the idea of multifunctional rural development in land consolidation projects in Poland. The paper attempts to assess whether all elements of the concept included in land consolidation procedures in Poland are dealt with in a sufficient manner.
The analyses were based on the example of 15 selected land consolidation projects carried out in disparate regions of Poland and different time periods. The paper presents the analyses of design solutions concerning three major aspects: the improvement of efficiency of farming in agricultural holdings, the social influence of land consolidation and the protection and preservation of the environment and the natural landscape, inter alia water and soil protection, the realization of agriculture–forest boundaries, introduction of trees, shrubs and buffer zones and landscape shaping.

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1. INTRODUCTION

The model of agriculture existing in the European Union countries indicates the need for the multifunctional development of rural areas. The term appears in many programme documents concerning the agricultural policy, such as Agenda 2000. This term has become popular in the sphere of the agricultural and environmental policies at the end of the 20th century. The multifunctional nature of agriculture was stressed in the Rio de Janeiro Convention of 1992, which pointed to non–market functions of agriculture and referred to the sustainable development idea; formally this term was used in Agenda 21, referring to the environmental protection issues (Woźniak, 2008; Sobolewska–Mikulska, Wójcik, 2012).

1.1 The Idea of Multifunctional Rural Development – Is there a definition?

The idea of the multifunctional development of rural areas is moving away from the conventional consideration of the agricultural space as a place of the plant and animal production and it is breaking the single–function model of the Polish village. The development of rural areas should be maintained using and increasing their multifunctionality, aiming at the co–existence of economic, environmental and social aspects which are equally important. The paradigm emphasizes that in addition to producing food and fibre, agriculture also produces a wide range of non–commodity goods and services, shapes the environment, affects social and cultural systems and contributes to the economic growth (Van Huylenbroeck et al., 2007). Therefore, rural areas – apart from production functions – also play other functions, such as social (as a place of living for farmers and other inhabitants), ecological, recreational, tourist and economic functions.

One, universal definition of the idea of the multifunctional development does not exist. This term has been interpreted in many ways and it refers to different dimensions. The multifunctionality is connected with different functions of particular forms of activity of the rural society; it is somehow the result of those activities (Durand, Van Huylenbroeck, 2003). This idea does not refer to the agricultural sector only, its production and economy; it also refers to farmers, their households, and to the quality of their life and work (Woźniak, 2008). Therefore the multifunctional development of rural areas is also connected with the social–and–economic development of rural areas and with their increased attractiveness (Szczurowska et al., 2005). The discussed idea is often equalised with diversification, i.e. with creation of other than agricultural types of activities and new places of work. Following Bórawski and Gotkiewicz (2012), the basic assumption of the multifunctional development is the improvement of living and working conditions of inhabitants and modernisation and development of the infrastructure in rural areas. This covers the development of all institutions and facilities which are the condition of diversified, social–and–economic development (such as education, housing, transport, communication, social capital etc.) (Krupowicz, 2016). At the same time it is necessary to keep the balance between the agriculture and the environment.

Successful development of the rural space should enable the multidirectional and optimum use of lands, with consideration of environmental and landscape conditions of rural areas.
Implementation of the idea of the multifunctional development of rural areas was initiated after the Polish accession to the European Union in 2004. It has been implemented by actions included in the Rural Areas Development Programmes (RADP) for the periods 2007–2013 and 2014–2020, i.e. the European agricultural–environmental–climatic actions supporting the development of rural areas. As it has been specified by the Agency for Restructuring and Modernisation of Agriculture (ARMA): „the essence of agricultural–environmental–climatic actions is to promote all activities which contribute to the sustainable management of resources (in order to protect soils, water and climate), to protection of valuable natural habitats and threatened birds, to landscape diversification and to protect threatened genetic resources of cultivable plants and livestock".
The basic objective of RADP 2014–2020 is to „improve the competitiveness of agriculture, sustainable management of natural resources and actions performed in the field of climate, as well as the sustainable territorial development of rural areas" (the Ministry of Agriculture and Rural Development – MARD).
Six priorities were formulated in the Programme. They include:

1. Facilitation of transfer of knowledge and innovations in agriculture, forestry and in rural areas.
2. Improvements in competitiveness of all types of agricultural economy and increased effectiveness of farms.
3. Improvements in organisation of the food chain.
4. Restoring, protection and strengthening of ecosystems which depend on agriculture and forestry.
5. Support for efficient management of resources and transfer into low emission economy, resistant to changes of climate in agricultural, food and forest sectors.
6. Promotion of economic development in rural areas with social participation.

The multifunctional development of rural areas will be implemented, among others, by means of land consolidation works, which were included in the RADP 2014–2020 as the activity 4.3 "Support for investments in the infrastructure connected with the development, modernisation and adaptation of the agricultural and forestry sector (Land consolidation)". As it turns out from research works performed by Bielska (2012) the multifunctional, sustainable development of rural areas, where land layout is inconvenient and disadvantageous, is not possible without land consolidation works).

1.2 Rural areas in Poland

Rural areas cover 93.1% of Poland, i.e. 291 1000 sq.km (following the definition used in the public statistics; according to this definition the rural areas are considered as the entire Poland without urban municipalities and urban parts of urban–and–rural municipalities) (GUS, 2010). Those areas are inhabited by almost 39% of the Polish population (14.8 million inhabitants) (GUS, 2010). According to the GUS data (2015), agricultural lands occupied 59.8% of Poland (i.e. 18682 800 thousand hectares) and forests and woodlands – 30.9 % (i.e. 9674 300 thousand hectares) (Fig. 1.1).

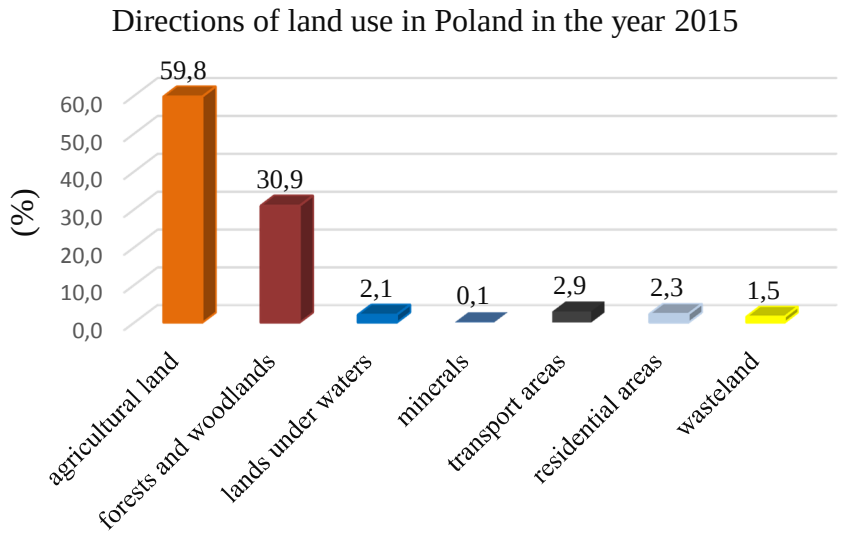

Fig. 1.1. Territorial division of Poland into urban and rural areas, according to TERYT in 2015
(Source: Own elaboration based on the data from GUS, The Statistical Yearbook of Agriculture, 2015)

According to the results of the National Agricultural census of 2010, the total number of farms equalled to 2278 000. Out of 1563 000 farms bigger than 1 hectare of arable fields, 1559 000 were individual farms (approx. 12 % of all farms in the European Union) (GUS, 2011). Table 1.1. presents the number of farms by area groups in 2003 and 2013. Data indicates the decrease of the total number of farms in Poland within the analysed period of 10 years. This trend relates to small and medium size farms. However, the increased number of big and very big farms in area groups 20.00–49.99 hectares and above 50 hectares can be noticed. The observed trends suggest the progressive concentration of farms which adapt to the European Union standards and the necessity to eliminate many, economically ineffective farms.

Years		Number of farms by area groups of agricultural land								
		Total	Up to 1 ha	1.01 – 1.99	2.00 – 4.99	5.00 – 9.99	10.00 –14.99	15.00 – 19.99	20.00 –49.99	50.00 ha and more
2003	(thous.)	2846.0	990.6	477.4	610.7	409.1	171.4	77.3	88.3	21.2
	(%)	100	34.8	16.8	21.5	14.4	6.0	2.7	3.1	0.7
2013	(thous.)	1429.0	34.4	277.6	455.3	315.2	141.3	70.2	103.2	31.8
	(%)	100	2.4	19.4	31.9	22.1	9.9	4.9	7.2	2.2

Table 1.1. The number of farms by area groups in the years 2003 and 2013.
Source: Own elaboration based on the data from GUS (www.stat.gov.pl)

The size of a statistical Polish farm equals to approx. 16 hectares; it consists of 6 cadastral parcels of 3 hectare size. However, the Polish rural areas are characterised by the high diversification of sizes of parcels and farms (Wilkowski et al., 2006; Woch, 2006). In the northern Poland the statistical size of a farm exceeds 20 hectares, while in the southern Poland the average size of a farm equals to 7 to 15 hectares (Jędrejek et al., 2014). What refers to the number of parcels in one farm, the minimum number of parcels in one farm appears in the

central and northern Poland (to 5 parcels). On the other hand, the worst conditions may be noticed in the southern and eastern Poland, where the number of parcels exceeds 6 (e.g. an average farm in the Małopolska province consists of 8.4 parcels) (Jędrejek et al., 2014).
An arbitrary division of the Polish agriculture into three macro–regions may be assumed (Sobolewska–Mikulska, 2009) (Fig. 1.2.). The most sustainable agriculture from the perspective of economy, ecology, demography and the society occurs in the Megaregion III, covering the central and eastern Poland (Krupowicz, 2016). It is also the largest megaregion and it contains 2/3 of the total number of the Polish farms. The Megaregion II, covering the northern and western parts of Poland is characterised by domination of the largest farms. The least advantageous spatial structure of farms occurs in the Megaregion I, in the southern part of Poland. Low–income, small farms of the high number of parcels of inconvenient shapes (narrow and long) occur in that megaregion (Woch, 2006). Land fragmentation and the inconvenient spatial structure of farms are the reason that – in the case of the Megaregion I – the priority task aiming at the development of the Polish agriculture is to improve the spatial organisation of farms, resulting from land consolidation works.

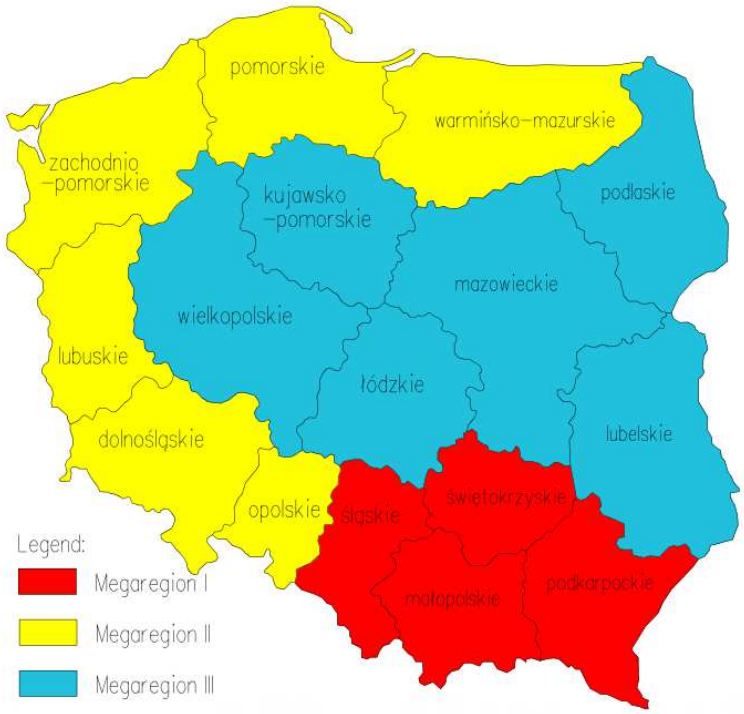

Fig. 1.2. Territorial division of Poland into assumed agricultural mega–regions (Source: Own elaboration)

1.3 Land Consolidation in Poland

1.3.1 History of land consolidation in Poland

The history of land consolidation in Poland is dated in the 14th century; however land consolidation, as it is currently understood, appeared in the second half of the 19th century, as the, so–called, "independent joining together of farmlands". In 1923 the land consolidation act was resolved which became the basis for consolidation of approximately 5.5 million hectares

of land in the period 1923–1939. According to the provisions of that act, joining together of farmlands should be understood as consolidation of fragmented, excessively narrow parcels being the property of one owner. In 1948 the decree on the adjustment of land consolidation works, assumed in the act of 1923, to conditions emerging after the war. Collectivisation of the agriculture resulted in the issue of the decree on exchange of lands on August 16,1949.
Land consolidation and land exchange process was then formalised by the act of January 24,1968 on land consolidation and exchange and by the act of land consolidation and exchange of March 26,1982 which is still binding. This was the crucial period; land consolidation works on approximately 4.7 million hectares were then performed. Therefore the intensity of work equalled to approximately 335 001 hectares per year (Fig. 1.3). Later those works were less intensive and covered approximately 20 000 hectares per year in the nineties and below 10 000 hectares after the year 2000 (Malina, Kowalczyk; 2009).
The Polish accession to the European Union in 2004 created the opportunity to develop the Polish agriculture. Spatial planning strategies pointed to the necessity to perform complex activities and to implement sustainable and multifunctional improving processes. The membership in the EU allowed to obtain the financial support for the sector of agriculture in the field of modernisation of spatial structures and the technical and social infrastructure of rural areas. The current intensity of land consolidation works in Poland equals to approximately 15 000 hectares per year (Woch, 2007). However, demands for land consolidation works are very high and they reach the level of approximately 7.1 million hectares, i.e. 69.14% of the total area of arable fields (Jędrejek et al., 2014). Considering this, the intensity of land consolidation works performed in Poland is insufficient comparing to estimated demands. Consolidation works on 50,000 hectares should be performed every year.

Fig. 1.3. Implementation of land consolidation and exchange in Poland in the period 1968–2016
(Source: Own elaboration based on the data from Ministry of Agriculture and Rural Development)

1.3.2 The scope of conventional land consolidation design solutions in Poland

The basic definition and the objective of land consolidation works are included in the act of 26 March 1982 on land consolidation and exchange (the unified text Dz. U. of 2014 r., item 700 with amendments). Land consolidation was defined as agricultural operations aiming at transformation of lands located in rural areas in order to create more advantageous conditions for agriculture and forestry by means of improvements in the area structure of farms, rational arrangements of expanse of fields and the adjustment of real property borders to the system of water meliorations, roads and the terrain relief.
Thus, the Polish legislation defines the basic objective of land consolidation as the achievement of spatial results, connected with changes in the size of the ownership and the land use in farms, as well as the rational arrangements of the agricultural transport roads, corrections in water melioration system and other elements of the technical infrastructure. Other issues, such as management of the natural environment, are not discussed by the act.

1.3.3. The land consolidation process with consideration of factors of the multifunctional development of rural areas.

In accordance with the Common Agricultural Policy the approach to land consolidation should be more complex and, besides the agriculture, also other values of the country side should be considered in the process. The paradigm changed converting land consolidation from 'agricultural restructuring' to 'comprehensive land reallocation' that might be called 'multifunctional land consolidation' (Van Dijk, 2003).
The extended scope of land consolidation results from the concept of the multifunctional development of rural areas. The land consolidation process should be understood as operations which modernise rural areas, resulting in:
– new arrangements in land use,
– correct development of networks of agricultural transport roads and improvement in exterior and interior transportation,
– protection of the natural environment and landscape development,
– protection of soils,
– exclusion of marginal lands from the agricultural use,
– rationalisation of water management,
– increase of recreation values, development of agro–tourism and rural tourism,
– revalorisation of rural areas,
– development of rural areas,
– protection of the cultural heritage of rural areas,
– creation of new places of jobs (Akińcza, Malina; 2007).

2. METHODOLOGY OF RESEARCH WORKS

The aim of the paper is to study the scope of implementation of the idea of multifunctional rural development in land consolidation projects in Poland. The paper attempts to assess whether all elements of the concept included in land consolidation procedures in Poland are dealt with in a sufficient manner. The analyses were based on the example of 15 selected land consolidation projects carried out in disparate regions of Poland and different time periods (Fig. 2.1.).

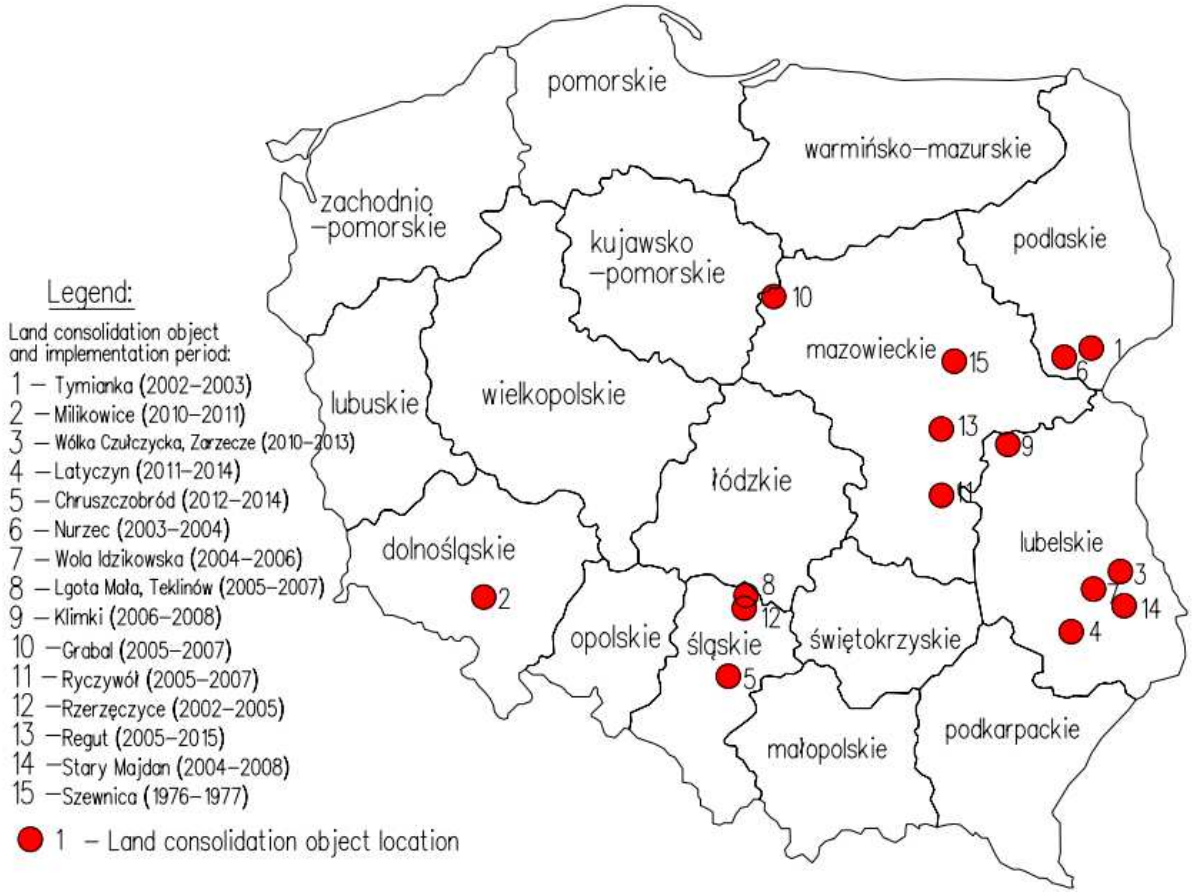

Fig. 2.1. Indicative location of test sites in Poland
(Source: Own elaboration)

Analysed applications were grouped according to 3 groups of effects of land consolidation works, performed within the multifunctional and sustainable development:

– economical and technical effects (the improvement of farming efficiency in agricultural holdings),

– environmental effects (the protection and preservation of environment and natural landscape, inter alia water and soil protection, the realization of agriculture–forest boundaries, introduction of trees, shrubs and buffer zones and landscape shaping),

– social effects (the social influence of land consolidation).

3. RESULTS

Results of research works were presented in tabular forms, following 3 types of effects of land consolidation works (Tables 3.1, 3.2 and 3.3).

Tab. 3.1. The scope of implementation of land consolidation design solutions affecting economic and technical aspects

ECONOMIC AND TECHNICAL EFFECTS	Land consolidation object														
Design solutions possible to implement	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Reduction of the number of parcels (the increased size of an average parcel)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Improvement in the field expanse and shapes of parcels	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Elimination of the patchwork of arable and forest parcels	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Elimination of land communities	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Creating opportunities to increase the size of farms for interested farmers	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Ensuring the access to a public road for every plot; elimination of redundant roads and balks	–	+	+	+	+	+	+	+	+	–	+	+	+	+	+
Development of a functional networks of agricultural roads	–	+	+	+	+	+	+	+	+	–	+	+	+	+/–	+
Improvement of technical conditions of the existing system of melioration ditches	+	+	+	+	+	–	–	+	–	+	–	–	–	–	–
Restoration or reconstruction of the existing water melioration system	+	+	+	–	+	–	–	+	–	+	+	–	+/–	–	–
Reconstruction of the basic water melioration installations	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Key: *+ implemented operation* *– unimplemented operation* *+/– operation not completed at the sufficient level*															

Source: Own elaboration

Tab. 3.2. The scope of implementation of land consolidation design solutions affecting environmental aspects

ENVIRONMENTAL EFFECTS	Land consolidation object														
Design solutions possible to implement	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Maintaining the high biodiversity and the high natural value areas in natural conditions	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Maintaining and protection of existing, inter-field trees	+	+	+	+	+	+	+	+	+/–	+	+	+	+	+	+
Introduction of trees and bushes along transportation routes (along existing roads)	+/–	+/–	–	–	–	–	+/–	–	–	–	–	–	–	–	–
Introduction of rows or belts of woodlots on balks, between neighbouring parcels	+/–	–	–	–	–	–	–	–	–	–	–	–	–	–	+
Forestation and regulations of borders between fields and forests	–	–	+	–	+	+	–	+	–	+	+/–	+	+	+	+
Protection of soils, anti-erosion works	–	–	–	–	–	–	+/–	–	–	–	–	–	–	+	–
Maintaining or introduction of "natural" roads ("ecological" roads of natural pavements)	+/–	–	–	–	–	–	–	–	–	–	–	–	–	+	–
Re-cultivation of fallows, management of wastelands	–	–	–	–	–	+	+/–	+/–	–	–	–	+/–	+/–	–	+/–
Introduction of buffer zones along streams	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Regulation of water conditions on periodically flooded or periodically dry lands	–	+	–	–	+	–	–	+	–	+	+	–	+/–	–	–
Construction of small water retention reservoirs, construction of fish ponds	–	+	–	–	–	–	–	–	–	+	–	–	–	–	+
Flood protection	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Key: *+ implemented operation* *– unimplemented operation* *+/– operation not completed at the sufficient level*															

Source: Own elaboration

Tab. 3.3. The scope of implementation of land consolidation design solutions affecting social aspects

SOCIAL EFFECTS	Land consolidation object														
Design solutions possible to implement	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Actions directed on development of tourism and different forms of active and passive recreation, including: – cultural and recreational development (planning tourist and cyclists routes, viewpoints) – ensuring sites for location accommodation and services related to tourism	– A)	+ B) –	–	–	–	– A)	–	–	–	–	–	–	–	–	–
Planning sites for organisation of open-air events	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–
Destination of lands for investment and public services: – increase of size of urban areas/destination of lands for development of existing urban areas – planning special areas for the needs of the social and technical infrastructure – increasing the areas for food production and processing, for services and craftsmen	–	+ – –	+ D) – –	+ + E) –	– + F) –	–	–	+ G) + H) –	–	–	– + I) + J)	–	– – + K)	–	– + L) –
Renovation of villages through: – re-enactment of traditions and increasing the attractiveness of the cultural landscape – renovation of abandoned and empty buildings	–	+ C) –	–	–	–	–	–	–	–	–	–	–	– +	–	– + M)
Creation of new places of job	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Key:
+ implemented operation
– unimplemented operation
+/– operation not completed at the sufficient level

A) Despite the potential, there was nothing done that could contribute to the development of tourism and various forms of active and passive recreation.
B) Walking trails, bike paths and viewpoints were planned.
C) Creation of avenues of fruit trees increased the attractiveness of the cultural landscape.
D) Land bank for the development of houses was designated in accordance with the local development plan.
E) Land for the construction of school and sports field was designated.
F) Area for parking at the cemetery and parking at the health center was designated.
G) Large plots along the county road were designated for future investments of service and industrial developments.
H) Land for the construction of full–size sports field, sports and recreation playground and land for the sewage pumping station were designated.
I) Area for parking at the parish cemetery was designated.
J) Approximately 23 hectares of land for manufacturing and processing activities were allocated.
K) Industrial areas and areas for service and crafts service development were designated (in total approximately 4 ha).
L) Area for enlargement of school plot was designated.
M) Outbuildings of distillery and infrastructure of railway station were arranged.

Source: Own elaboration

4. CONCLUSIONS

Results of research based on 15 test sites works suggest that – according to the binding definition of land consolidation – land consolidation works were correctly performed for all objects. But did those works encourage to perform changes in the entire village? The shift from 'agricultural restructuring' to 'comprehensive land reallocation' has not been fully made. In any analysed case land consolidation has not become a part of a wider process such as, for example, the increased multi–functionality of a given area. For all object land consolidation works were considered as the final operation aiming at the improvement of conditions in the sphere of the spatial structure of farms and forest households.

In all analysed cases the land consolidation project has not arranged the rural landscape. Environmental and landscape solutions were only partially considered. For 10 objects there were implemented operations aiming at the increased woodiness and regulations of borders between forests and arable fields. Remaining landscape creating operations (such as introduction of trees and bushes, buffer zones, construction of small retention reservoirs) were seldom performed. However, environmental–and–landscape conditions were not deteriorated as a result of any land consolidation processes. The landscape of villages was remained unchanged in all analysed cases. It is not possible to state whether this resulted from the attempts to maintain the natural landscape characteristics or from the general reluctance to undertake any operations in this field. Besides, some test sites, such as Nurzec, were characterised by picturesque and natural landscape which did not require any landscape creating operations; in this case only activities aiming at preservation and protection of existing environmental–and–landscape values were required.

Selection of project solutions in the field of water management in the land consolidation process for analysed objects was mainly justified by economic criteria. Operations connected with restoration and reconstruction of the water melioration system were mainly performed. Solutions concerning the small water retention and flood protection were not introduced to the land consolidation projects.

For all analysed objects satisfactory economic results were obtained; they were connected with improvements in expanse of fields and with the rational development of the functional networks of the agricultural transport roads. Obtained economic results indirectly influence the social effects. The increased economic effectiveness of farms results in improvement of the quality of life of inhabitants, their activity and acceleration of the further development of rural areas. Social effects connected with mental–and–emotional changes and activity of the rural society, resulting from the land consolidation process, may be considered in this context.

Besides, setting the legal status of real properties, elimination of co–ownership and reduction of the patchwork of fields influences the acceleration of economic transformations and the increased real estate trade. All analysed land consolidation works created the possibility to liquidate ineffective farms, and, therefore to increase other farms; this influences the change of the professional structure of the owners. The land consolidation process might also be the opportunity to implement social initiatives which lead to improved functioning of the civil society. The activity and initiatives of inhabitants, presented during the land consolidation works, help to undertake further, common actions even when the land consolidation process is completed.

In Poland there is no one legal basis concerning the idea of multifunctional development of rural areas. This term appears in Rural Areas Development Programmes, but – to the contrary of many European Union countries (such as Germany, the Netherlands) – its legally binding definition does not exist in Poland. Besides, there are no directions and guidelines, which would

suggest how the idea of multifunctional development of rural areas could be implemented in practice. For the appropriate implementation of this idea in Poland it seems necessary to enact the legal act on development of rural areas which would institutionalise the land consolidation process in the complex approach, considering land consolidation together with environmental protection, landscape management, water management and restoration of villages. This would allow for creation of appropriate organisational–and–administrative structures and coherent sources of funds, and, therefore, generation of a tool for implementation of the multifunctional development of rural areas. The current organisational status (many decision–making organisational units, not mutually connected), as well as financial aspects (many sources of funds for particular activities) are limiting the possibilities to implement operations connected with the multifunctional development of rural areas in the land consolidation process.

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Land Consolidation in China

Yuanyu Zhang, P.R.China

Key words: land consolidation; development course; typical patterns; case study

SUMMARY

China’s land consolidation concept and function have been continuously enriched and expanded since 1997. In the past 20 years, land consolidation work has played an important role in the protection of national food security, speeding up the modernization of agriculture, promotion of industrialization and urbanization process and the realization of urban and rural areas’ coordinated development as well as the promotion of the harmonious development of economy and society. This paper reviews China’s land consolidation development courses, typical patterns both at national level and local level, agency construction and main achievements in the past years. Two cases study with one of land rearrangement in Yunnan Province and the other of low-carbon land consolidation in Hunan Province are also introduced in the paper. Based on China's land consolidation work under the new situation, the problems existing in the current land consolidation work in public participation, the legal building of land consolidation, ecological development, land engineering education and the corresponding counter measures are presented.

SUMMARY (optional summary in one other language in addition to English, e.g. your own language)

摘要：中国土地整治自 1997 年发展至今，内容不断丰富、功能不断拓展。在过去的 20 多年发展中，土地整治工作在保障国家粮食安全、加快农业现代化、推进工业化和城镇化进程及实现城乡统筹发展、促进经济社会和谐发展方面发挥了重要作用。本文全面介绍了中国土地整治的发展历程、国家层面和地方层面的土地整治典型模式、机构建设以及开展土地整治以来所取得的成就，并重点介绍了云南省永胜县三友村土地整治项目和湖南省低碳土地整治项目。基于我国土地整治工作在新形势下面临更加严峻挑战的背景，提出了当前土地整治工作在公众参与、土地整治法律建设、土地工程教育以及生态发展等方面存在的问题及相应对策。

关键词：土地整治　发展历程　典型模式　案例研究

Land Consolidation in China

Yuanyu Zhang, P.R.China

1. Introduction

Current Land consolidation in China at national level started in the late 1980s. In 1999, *The Law of Land Administration of the People's Republic of China* was issued and since then land consolidation in China entered a stage of rapid development, from spontaneous, disorderly, no stable investment into the organized, regulated and a stable input transformation. Looking back over the past years of development, China's land consolidation not only has taken place great changes in the aspects of category, goal task, scale and management pattern, but also has played an important role in the protection of national food security, speeding up the modernization of agriculture, promotion of industrialization and urbanization process and the harmonious development of economy and society.

2. China Land Consolidation Review

2.1. Land consolidation development course

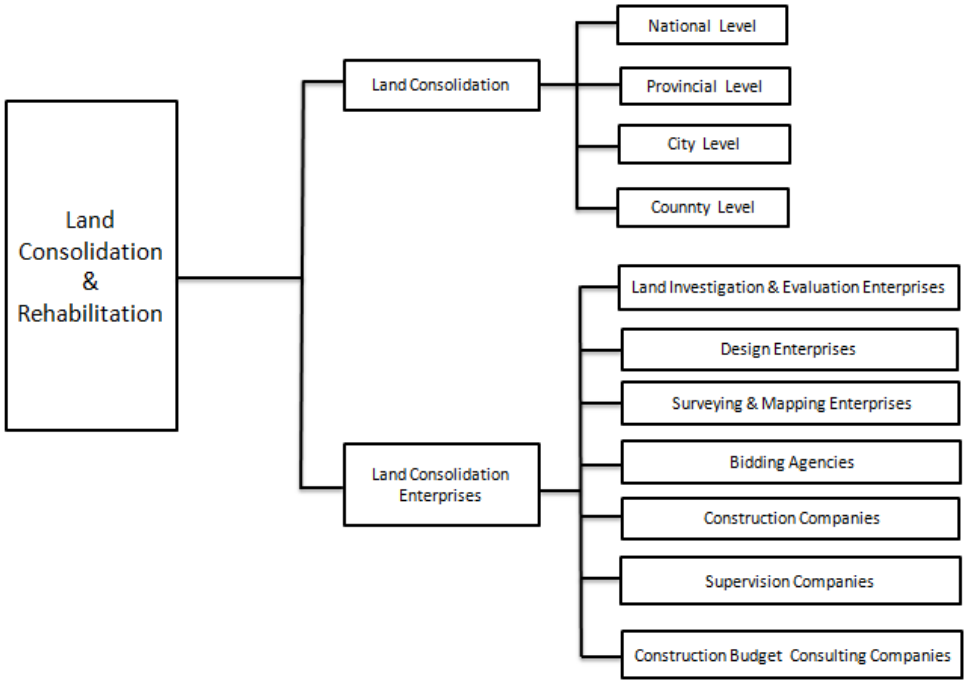
Land consolidation is an inevitable choice to solve the land utilization problems in China. In the early stages, land consolidation in China was simply classified as farmland consolidation and non-farmland consolidation types by the main way of unused land development and some land consolidation. Up to the end of 1997, more than 400 counties have conducted land consolidation programs. From 1998 to 2007, land consolidation mainly focused on supplementing the amount of farmland, and about 2.7 million hectares farmland was complemented through the way of land consolidation at national level. With the promotion of land consolidation work, the social impact has been expanding, a large number of scholars began to pay attention to the study of land consolidation. In 2006, 116 capital farmland preservation zones for demonstration at national level were defined which means land consolidation from unused land development gradually shifted to improve the existing farmland and the quality of arable land. At the meantime, village renovation and inefficient urban land redevelopment programs were conducted. Land consolidation at this time was divided into farmland consolidation, urban land consolidation, village renovation, ecological restoration with integrated and multi-objectives. From the year of 2008, the goal of land consolidation is more diversified with the purposes of comprehensive effect of economic, social and ecological landscape. The main characteristic is the green land consolidation, such as ecological farmland construction, damaged land restoration, etc., and ecological landscape construction has been one of the key directions of land consolidation in the future.

In the new historic times, land consolidation is a kind of governance activity about inefficient

land utilization, unreasonable and unused land utilization as well as the activity to improve the recovery of land utilization damaged by production, construction and natural disasters, which mainly includes three aspects of land consolidation, land reclamation and land development. From its development process, the connotation and extension of land consolidation has gradually expanded from the traditional single and low level objective to the multi-objective, high level change, from the early agricultural production and working conditions improvement, rural development promotion to the current natural environment and ecological landscape protection, especially the regional ecological security maintenance and land ecosystem reconstruction.

2.2. Institution Building

Since the Land Consolidation & Rehabilitation Center of Ministry of land & resources was established in 1998, 2229 land consolidation management agencies have been formed at State, provincial, municipal and county levels and there are totally more than 21,000 staff members, specializing in the basic research of land management, project management and other related work till the end of 2013. Besides the management agencies, there are also a large number of professional enterprises which engage in service, professional, practical land consolidation work. The specialized land consolidation agencies and enterprises have become the main force to promote land consolidation in China. The ability to serve the land consolidation institutions was significantly enhanced.



Land Consolidation & Rehabilitation Industry

2.3. Typical patterns of land consolidation

Since 2001, China has carried out land consolidation 33.33 million hectares with nearly RMB 800 billion investment and obtained additional arable land about 3.6 million hectares, which

has not only played an important role in stabilizing the comprehensive grain production capacity, strengthening the foundation of modern agriculture development and safeguarding the economic and social development, but also formed some typical patterns in the propulsion of land consolidation work.

2.3.1. National Level Patterns

At the early stage, the potential of new arable land was considered in the preliminary arrangement of the land consolidation project, and generally the scale was small with dispersed layout and low scale merit. In order to realize the state targets and give full play to the supporting role to the regional economic development of land consolidation, the Chinese government has deployed at national level to carry out major land consolidation engineering projects, rural land consolidation demonstration province construction projects, rural collective-owned construction land consolidation pilot projects since 2008 to realize whole region planning and consolidation for linked pieces of conserved lands, which set an exemplary demonstration.

Major land consolidation projects. In *the National Land Consolidation Planning*, some key areas are zoned for land consolidation, such as east central major grain producing areas for carrying out capitalfarmland consolidation, key coal bases for land reclamation, the Three Gorges Reservoir area for the resettlement of land development and consolidation, western ecological construction areas for farmland consolidation, etc. Since 2008, based on the planning and the development goals of different regions, the national government has implemented 14 major land consolidation projects covering 5.14 million hectares in 12 provinces including Heilongjiang, Jilin and Henan and so on with a total investment of RMB 61.8 billion and 0.79 million hectares arable lands were gained.

Rural land consolidation demonstration province construction projects. Since 2010, Chinese government has invested RMB 57.1 billion in the construction of 10 land consolidation demonstration provinces led by Hebei, Jiangsu and Shandong, covering a consolidation area of 1.95 million hectares, and 1.55 million hectares well-facilitited capital farmlands and 120 thousand hectares new arable lands are successfully constructed, and additional grain productivity of 3.35 billion kilogram is gained; meanwhile, to promote overall urban-rural development, 8000 hectares collective-owned construction land has been consolidated of which 3000 hectares for rural construction land use and 5000 hectares for urban construction land use. Throughout the implementation of the overall integration of various types of agriculture-related funds jointly invested in construction demonstration provinces, the role of gathering and amplification effects of central funds are better played.

Rural collective-owned construction land consolidation pilot projects. In the process of industrialization and urbanization, many farmers rush into urban areas, which leads to the emergence of “hollow village.” Since 2006, China has launched the pilot projects of construction land consolidation in rural collective-owned residential areas. Pilot projects for the consolidation of rural collective-owned construction land are launched in over 20

provinces including Shandong, Anhui, Jiangsu and Sichuan, and 240,000 hectares land has been consolidated, in which, 86,000 hectares is for new rural land, and 154,000 hectares is for the construction of urban infrastructure, industrial agglomeration areas and new urban area, and a land saving rate of 62% is hereby achieved. By that, the problems of fund shortage in new rural construction and land shortage in industrialization and urbanization are solved.

2.3.2. Local Level Patterns

According to the difference of regional natural resource conditions and economic and social conditions, while in the long-term practices of land consolidation, a number of land consolidation typical patterns with regional characteristics has formed creatively and played an exemplary and leading role.

Farmers independent consolidation, financial budget subsidize pattern. Fiscal subsidies are given to independent construction by farmers. Uniform planning and design is carried out for the independent constructions by rural collective economic organizations, modern agricultural enterprises, agricultural professional cooperatives, large-scale growers and farmers; upon the completion, subsidies will be granted by government according to related policies, therefore, different subjects are encouraged to participate in the land consolidation, the use of funds and the progress of the project construction are efficiently improved. At present, the “Construction before Getting Subsidy” pilot project has carried out in Guangxi, Chongqing and Hubei etc., and "Combine Lots into Parcel" of Sanchuan township in Yunnan province as its key representative.

Main features:

- Sanchuan township has Sanyou Village and ZhongzhouVillage. Before land consolidation project, the total farmland area in Sanyou Village was about 230 hectares with 6323 plots; and the total farmland area in zhongzhou Village was about 98.7 hectares with 2916 plots.
- After land consolidation project, the total farmland area in Sanyou Village increased to 252 hectares with 1150 parcels; and the total farmland area in zhongzhou Village increased to 130.7 hectares with 1025 parcels.
- Practice shows that land consolidation plays a key role to break the conflict of land use, to improve the life of farmers and to develop the countryside.

Shanghai countryside park pattern. In May 2012, *Planning of Shanghai Basic Ecological Network* was approved by Shanghai Municipal People’s Government, and 21 countryside park sites were initially selected. Seven pilot countryside parks including Jiabei and Pujiang covering 130 km^2 were selected. And RMB 4.2 billion is invested by the municipal government with supporting investment by relevant districts and counties for coordinated use. Through the comprehensive consolidation of farmlands, water, roads, forest and villages for consolidation of human and natural resources, the urban ecological corridor is constructed to form an ecological park with beautiful idyllic scenery, abundant vegetation and good natural scenery, adding sightseeing, recreation and culture functions for countryside parks. After consolidation, 327.53 hectares construction land was reduced, accounting for 78.35% of the

existing construction land. 126 high-investment, high energy-consuming and high-polluting companies were relocated, and centralized residence of 1,673 households of farmers and yearly sewage discharge decrement of 990,000 tons were realized.

Main features:

- Rural land consolidation and construction land consolidation are carried out simultaneously;
- Well-facilitied farmlands are constructed with functions of urban green space and sightseeing;
- Coordination between beautiful countryside and livable city realized balance between rural life and city life.

Hunan Province low-carbon land consolidation Pattern. Low-carbon land consolidation refers that the low-carbon engineering technology is adopted in the comprehensive consolidation of farmland, water, roads, forest and villages, so as to save energy, reduce cost and carbon emission, protect the carbon cycle of farmland ecological system, and promote efficient and sustainable utilization of land resources. The Land Consolidation Project for Cultivated Land Ecological Protection of Jianshan Village in Jinjing Town, Changsha County, Hunan Province has a construction area of 277 hectares, including the capital farmland of 237 hectares, and with a total investment of RMB 14.18 million. Compared with traditional projects, the project reduces 400t carbon dioxide emission, with an average emission reduction of 6.43 kg per hectare of land.

Main features:

- Recycle use of recourses to reduce the consumption of raw materials. Decrease the use of cement and steel to indirectly lessen the emission of carbon. Improve aquatic plants survival rate and use it to solid slope and earth.
- Transform method and initiate low-carbon idea. The ecological land, ditch forestry network and field water clarification can promote the amelioration of ecological environment and improve the bio-diversity.

2.4. Technical Standard

In 2000, the Ministry of Land & Resources published three industrial standards such as *Guideline of Land Rearrangement Planning for Land Development and Land Consolidation*, which not only filled up the blank, but also promoted the consolidation work and established solid basis for the later technical standards. Up to now, more than 20 technical standards for the entire process of land consolidation have been issued including 4 national, 22 industrial standards, 1 formal ministry document and a series of local supplementary standards, which strongly promote the land consolidation work of standardized, scientific and rapid development.

Issued National and Industrial Standards

Number	Code	Name	Note
1	GB/T 28405-2012	Regulations for Classification on Agriculture Land	In replace of TD/T 1005-2003

2	GB/T 28406-2012	Regulations for Valuation on Agriculture Land	In replace of TD/T 1006-2003
3	GB/T 28407-2012	Regulation for Gradation on Agriculture Land Quality	In replace of TD/T 1007-2003
4	GB/T 30600-2014	Well-facilitied Farmland Construction —General Rules	
5	TD/T 1011-2000	Guideline of Land Rearrangement Planning for Land Development and Land Consolidation	Abandoned
6	TD/T1012-2016	Specification for Planning and Design for Land Consolidation and Rehabilitation Project	In replace of TD/T1012-2000
7	TD/T1013-2013	Acceptance Specification for Land Consolidation and Rehabilitation Projects	In replace of TD/T1013-2000
8	TD/T1031-2011	Regulation on Compiling Land Reclamation Plan	
9	TD-T1032-2011	Guideline for Designation of Capital Farmland	
10	TD/T1033-2012	Standard for Well-facilitied Capital Farmland Construction	
11	TD/T1034-2013	Guideline for Municipal Land Rearrangement Planning	
12	TD/T1035-2013	Guideline for the County-level Land Rearrangement Planning	
13	TD/T1036-2013	Completion Standards on Land Reclamation Quality	
14	TD/T1037 -2013	Regulation on Compiling Feasibility Study Report of Major Land Consolidation Projects	
15	TD/T1038 -2013	Regulation on Compiling Design Report of Land Consolidation and Rehabilitation Projects	
16	TD/T1039 -2013	Rules of Engineering-quantity Calculation for Land Consolidation and Rehabilitation Projects	
17	TD/T1040 -2013	Specifications of the Design Drawing for Land Consolidation and Rehabilitation Projects	
18	TD/T1041-2013	Specification on Inspection and Assessment for Construction Quality of Land Consolidation and Rehabilitation Projects	

19	TD/T1042-2013	Standardization of Construction Supervision for Land Consolidation and Rehabilitation Projects	
20	TD/T1043-2013	Technical Regulation on Subsurface Drainage and Desalination Soil	
21	TD/T1044-2013	Acceptance Specification for Land Reclamation of Production Project	
22	TD/T1045-2013	Regulation on Compiling Construction Standard for Land Rearrangement Engineering	
23	TD/T1046-2013	Standardization of Land Tenure Readjustment for Land Consolidation and Rehabilitation	
24	TD/T1047-2016	Regulation on Compiling Implementation Plan of Major Land Consolidation Projects	
25	TD/T1048-2016	Technical Specifications for Stripping and Using of Plow Layer Soil	
26	TD/T1049-2016	Surveying Standards of Basic Information of Land Reclamation in Mining Area	

3. Current Problems and Measures

With the rapid development, the effect of land consolidation on economic and social development becomes more obvious; and the pattern with planning guidance, standard, science and technology support, supervisory platform, organization promotion and financial support for land consolidation is formed. However, some unsatisfactory issues still exist.

3.1. Farmland Quality

According to the natural conditions, farming system, infrastructure, agricultural production technology and input factors, China's farmland quality is divided into 15 grades with 1 as the best quality grade, 15 as the worst quality grade. The national farmland with 1-4 grade, 5-8 grade, 9-12 grade, 13-15 grade represent excellent, high, medium and low quality area of the country. The average quality of farmland is 9.80, the overall quality is low. The proportion of excellent, high, medium and low land area to the total farmland assessment area is 2.67%, 29.98%, 50.64% and 16.71% respectively, i.e., the sum of excellent and high is less than 1/3 of the total area of farmland, while the middle and low areas together account for 2/ 3 or more of the total farmland area. Overall, farmland area reduces rapidly due to industrialization, urbanization, the acceleration of industrial pollution, construction occupancy and other factors; and farmland quality accelerates degradation due to the soil impoverishment, fragmentation, acidification, salinization and other issues.

Farmland is the material basis of human survival and development, its quality and pollution prevention directly influenced the sustainable development of agriculture and quality and safety of agricultural products. Aiming at the problems of farmland resources and their utilization in China, national survey on farmland quality should be carried out at regular intervals firstly; secondly, low-medium-yield farmland improvement and polluted soil remediation project should be implemented; thirdly, well-facilitied capital farmlands construction project should be vigorously push forward; and finally salinization and contaminated farmland recovery and utilization Project should be carried out.

3.2. Eco-Land Construction

Besides soil erosion, land desertification, land salinization, soil pollution and land ecological decline in the region, there are also many ecological problems caused by some inappropriate measures in land consolidation and rehabilitation activities，such as the improper ways of land levelling，roads and ditches hardening，unreasonable land classification，and excessive man-made interference.

At present, Eco-land consolidation is an important content of the current construction of harmonious new countryside. Ecological civilization is the new target of land consolidation, and land consolidation is a promoting factor in ecological civilization. Aiming at problems existing in the traditional land consolidation, ecological landscape factors should be introduced in all levels of *the Land Consolidation Planning* and take land use, infrastructure construction, rural landscape, the historical and cultural heritage protection, ecological network, soil and water security, rural leisure tourism as a whole for consideration so as to promote the integration of urban and rural green infrastructure construction and land ecological security. In 2015, the state started pilot projects of the comprehensive improvement of land and rivers, the Ministry of Land and Resources put forward the green mining demonstration area projects and the comprehensive land improvement projects. With the land ecological landscape construction science and technology support, to develop different levels ecological landscape construction planning and design is particularly important.

3.3. Public Participation

Since the late 1980s, large-scale land consolidation and rehabilitation activities in China have been widely carried out, some local farmers have been involved in by different forms, but the participation in the overall level is not enough. China's current national investment in land consolidation and rehabilitation projects tends to the top-down mode of operation with the main role of government leading. While in the activity process from project selection, planning and design, construction to the check and acceptance, the farmers are little involved in which directly cause project infeasibility, planning and design out of practice, low-quality project construction, abused use of funds, inefficient project-after management, and unsustainable benefits as well.

Land consolidation projects are of vital interests to the farmers. Creative public participation platforms and channels should be provided to the farmers to encourage them be involved in the whole process of land consolidation and rehabilitation projects. At the same time, the public participation mechanism with legal basis for land consolidation and rehabilitation activities should be established to ensure the dominant position of the rural collective economic organizations and farmers, legally define public participation channels, ways, contents and procedures, etc. so as to improve public participation and promote the sustained and in-depth development of the land consolidation and rehabilitation work.

3.4. Legal Construction

Land consolidation is not only complicated technology engineering, but also a complicated social governance project, involving the relationship reconstruction among national and the local government, intermediary agencies, as well as the land rights of different stakeholders. At present, there are relatively few laws and regulations concerning about land consolidation and rehabilitation activities, in which the relevant provisions of the land consolidation and rehabilitation activities are scattered in *The Constitution of the People's Republic of Chin*a, *Law of the people's Republic of China on Land Administration*, *Implementation Regulations of the Land Administration Law of the People's Republic of China*. All these provisions are in simple and principle ways. Thus, its legal construction far lags in practice.

In addition to the above principles of the law, the administrative departments of land and resources at all levels are mainly based on normative documents issued by the Ministry of Land and Resources and local laws and regulations to conduct the land consolidation and rehabilitation activities. In recent years, in order to promote the development of land consolidation and rehabilitation work of the local area, Hunan, Guizhou, Shanxi, Zhejiang and other provinces have already enacted provincial land consolidation and rehabilitation regulations. Nowadays, land consolidation and rehabilitation activities have risen to the national level of strategic deployment, its legal construction is of priority. A national land consolidation and rehabilitation regulation is in formulating by the Land Consolidation & Rehabilitation Center of the Ministry of Land and Resources.

3.5. **L**and Engineering Education

Early in the 1950s "land planning and consolidation course" was introduced from the former Soviet Union. In 1956, Northeast Agricultural University (formerly the Northeast Agricultural College) established the land use planning course. In the 1960s, Huazhong Agricultural University, Nanjing Agricultural University gradually set up professional land planning and engineering courses. In 1986, with the establishment of the State Bureau of land management and the issue of the " Law of the people's Republic of China on Land Administration ", the concern about the scope of land gradually focused on the content about the land system and policy, land property right and cadastral management. In 1998, the National Education Ministry combined the land planning and utilization course and land management course into land resources management course. This made colleges and universities shift the focus to the

land system and policy education, but lost sight of the importance of land consolidation engineering and technology education. Now more than 70 colleges and universities have land resources management majors. Land engineering is a comprehensive discipline, covering agriculture, soil science, ecology, engineering, surveying, information science and other natural science and engineering technology. Its theoretical support system has not yet formed and its basic discipline theory needs to constantly improve.

With the gradual deepening of the land consolidation practice, land consolidation professionals are in great demand. A number of famous land scientists and experts have given great concern over the land consolidation discipline construction and basically reached a consensus -- land consolidation independently as a part of the land science discipline. In 2011 China University of Geosciences (Beijing) started Excellent Engineer Education Training Program on land consolidation engineering aspect, approved by the Ministry of Education. In 2015, land consolidation engineering technician was chosen as one of the Green Careers into the National Occupational Classification System.

4. Prospects

As an important means of land use, land consolidation and rehabilitation activities, both in China and other countries, have become the focus of the community and have a long way to go. In the 13th Five-Year, there are four main tasks on land consolidation and rehabilitation.

4.1. **Farmland consolidation.** 26.67 million hectares well-facilitited capital farmlands will be completed and 40 million hectares well-facilitited capital farmlands will be tried to conduct. 1.33 million hectares arable land will be increased through land consolidation activities and 20 million hectares low-medium-yield farmlands will be improved.

4.2. **Rural construction land consolidation.** The "hollow village" and "dangerous & old houses" rebuilding will be renovated to promote the coordinated development of urban and rural areas.

4.3. **Land readjustment of industrial and mining construction in cities and towns.** The old city, villages in the city, shantytowns, old factories, old industrial areas will be transformed and redeveloped so as to reduce the size of the Unit GDP construction land 30%.

4.4. **Land reclamation and ecological restoration.** Reclamation rate of historical damage lands will reach to 45%. Meanwhile, important waterhead areas and natural ecological areas will be in strong protection, and land ecological restoration and building will also be made on water systems like rivers, lakes, reservoirs, major traffic lines, natural forests, grasslands and so on.

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Renewing the impact assessment of land consolidation: the contribution of ecosystem services

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Key words: ecosystem services, indicators, stakeholders, participation, land consolidation

SUMMARY

The Strategic Environmental Assessment (SEA) is the cornerstone of the land consolidation (LC) project process. In the Walloon context, SEA has to be renewed for technical and legal reasons. The concept of ecosystem services (ES) offers promising perspectives for more multifunctional and stakeholders-oriented LC projects. In the context of the LC pilot project of Forville, a new methodology of SEA integrating ES was tested. ES were integrated within all steps of SEA (i.e. scoping, baseline, impact assessment, measures of avoidance, reduction and mitigation, monitoring).

The results from this ES analysis show that, thanks to the LC project, the ES relative value associated to agriculture production would increase due to the improvement of the accessibility of parcels. The soil loss would decrease by 20.5%. Eighteen kilometres of walking paths could be restored throughout the project area increasing outdoor leisure offer. Finally, landscape connectivity would increase thanks to the restoration, of grass strips, buffer strips and fishway setting up.

The integration of ES in the SEA process led to a more dynamic approach thanks to participation and the use of various scenarios. This new methodology is a tool to debate about the added value of the LC. The method can be used, as well, for ex-ante and ex-post assessments of LC projects.

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Renewing the impact assessment of land consolidation: the contribution of ecosystem services

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1 INTRODUCTION

After the end of WWII, in Western Europe, land consolidation (LC) has been used as a tool to facilitate the introduction of the engine in farming in order to increase productivity (Ambroise, 2013). For a few decades, the farming area has been developed in a monofunctional way generating spatial uniformity and landscape simplification. Land consolidation became a policy in itself corresponding to social demands and a shared vision of progress (Perspective Consulting et al., 2011). By the turn of the 1980's and 1990's, land consolidation took into account other spatial issues affecting the rural areas such as flooding and erosion mitigation, development of biodiversity, historical heritage, and tourism. Land consolidation has become a spatial planning tool able to design multifunctional landscapes.

In that perspective, promoted by European directives, impact assessment becomes the cornerstone of the land consolidation process. Thus impact assessment allows:

- A reduction of environmental impacts.
- The comparison of options and the research for win-win solutions.
- A better involvement of stakeholders from the beginning of the project (Slootweg et al., 2009;Andre et al., 2009).

In Wallonia (southern part of Belgium), the impact assessment methodology needed to be adapted to technical needs and the evolution of legislation. The former methodology was based upon an impact matrix listing potential impacts by environmental compartments. However it didn't deliver the advantages of impact assessment cited before. This "silos approach" was mainly based on bibliography and did not encourage public participation. It was mainly focused on potential threats and didn't reveal opportunities or alternatives solutions. More over in 2014, the new Walloon Code of Agriculture officially broadened the scope of actions of LC. Article 266 of this code states that "land consolidation aims to create regular parcels brought closer to farms ensuring to preserve or even improve the landscape value and **environmental services** including the development of biodiversity". The concept of environmental services very closed to ecosystem services appeared for the first time in a Walloon legal text and with it the obligation to demonstrate the impact on ES.

In this context, a methodology of impact assessment using ES was developed based upon a LC pilot project (Forville). This methodology was elaborated to answer the question "what is the contribution of LC to the multifunctionality of a territory?" It intends to be participatory,

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robust and transparent for consultants and local stakeholders. Biotope Consultants designed this methodology in association with Gembloux Agrobiotech and the University of Namur. Throughout this article, we will go from the conceptual framework to the operational results (Lairez et al., 2015) and will end with the first conclusions and perspectives.

2 CONCEPTUAL FRAMEWORK

2.1 Ecosystem services: a brief reminder

"Ecosystem services are the benefits people obtain from ecosystems" (MEA, 2005).

Four types of ES have been identified according the MEA methodology:

- Provisioning services
- Regulating services
- Cultural services
- Supporting services

The first three of them correspond to human needs. The latter, the supporting services correspond to the maintenance of natural systems. ES are part of an anthropocentric vision of the flows between mankind and nature. They offer a reading grid of interactions between local stakeholders (SE demand) and ecosystems (SE offer).
The SE demand and offer have to be clearly identified, measured using indicators and mapped.

Hence ES are a concept to be used (Baptist, 2016):

- For rising people awareness about the dependence from ecosystems.
- For project design and decision help (impact assessment, cost-benefits analysis and ecological compensation).
- For mediation and conflict resolution.

The multifunctionality of a territory is its ability to provide several ES that will interact synergistically.

2.2 Modelling the interactions between LC and its area of action

The DPSIR (Driving forces, Pressures, State, Impact, Responses) model is a causal diagram developed by the European Environmental Agency (Smeets and Weterings, 1999). Based on a feedback loop, it shows how human activities (the Driving forces) generate Pressures, how ecosystems react and evolve (physical changes of State and ES delivery), how people are impacted by the changes in ecosystems in terms of well-being. In response of the degradation of quality of life, people try to find solutions and react (the Responses) by acting on Driving forces, Pressures and States of ecosystems.

In our case, the DPSIR model was adapted on the basis of the works of Albert et al. (2016) and Gobin et al. (2004).

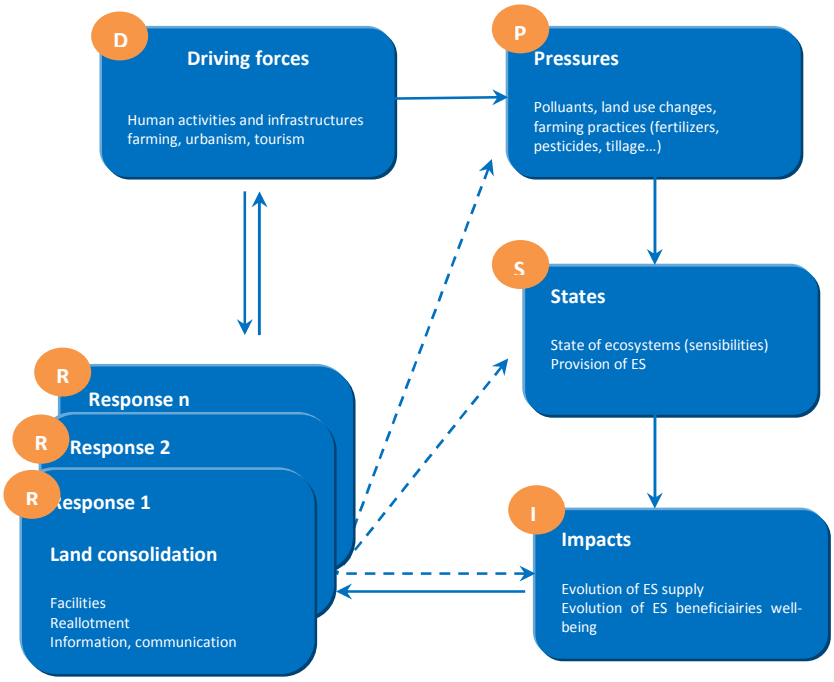


Figure 1: Diagram of DPSIR model adapted to land consolidation (adapted from Albert et al., 2016).

In this model, the way LC is considered changed. In the traditional impact matrix, LC was seen only as series of pressures generating problems. In that DPSIR model, LC is considered as one of the responses to manage the natural resources of a territory with positive and negative impacts on ecosystems. The DPSIR model is widely used to define indicators for environmental monitoring. It offers a merged vision of project design and impact assessment. The integration of ES in the DPSIR framework therefore adds a more dynamic and interactive perspective than the usual impact matrix.

2.3 The impact assessment of LC in Wallonia

In Wallonia, LC is considered as a plan. That is to say: a planned land management strategy for a specific area, adopted by a public authority and based upon a legal framework (EU, 2001).

So the impact assessment of LC must be realized thanks to a strategic environmental assessment (SEA). Following the transposition of the SEA directive, the first impact assessments of LC projects were seen more as an additional administrative constraint than a technical tool. Now, SEA is fully part of the LC process.

The reform engaged with the Walloon Code of Agriculture will generate a two-part SEA. The first part will consider the LC project in a global way (public works and general considerations). The second part will be especially dedicated to reallotment.

2.4 Integration of ES within the impact assessment process of LC

The works of Geneletti (2012) and Landsberg et al. (2011) structured the methodology. As proposed by these authors; ES are integrated at each stage of the SEA process (cf. table 1). This approach can be used for both parts of the SEA of LC projects (cf. section 2.3).

SEA stage	ES analysis stage	Stakeholders participation
Scoping	Step 1. Identification of potential ES offer	
Context, baseline	Step 2. Ranking of ES demand by stakeholders Step 3. Assessment and mapping of selected ES	Focus-group 1
Impact assessment and alternatives (project vs. no project)	Step 4. Impact assessment of the draft LC project on ES	Focus group 2
Avoidance, minimization, mitigation and compensation	Step 5. Maximisation of ES delivery (improved LC project)	
Monitoring	Step 6. Monitoring of ES	

Table 1: Integration of ecosystem analysis and stakeholders participation in the SEA process (adapted from Geneletti, 2012 and Landsberg et al., 2011).

Local stakeholders are involved throughout the organization of two focus groups.

During the focus-group 1, stakeholders select and hierarchize five key ES considered as a priority and which can be impacted (positively or negatively) by LC.

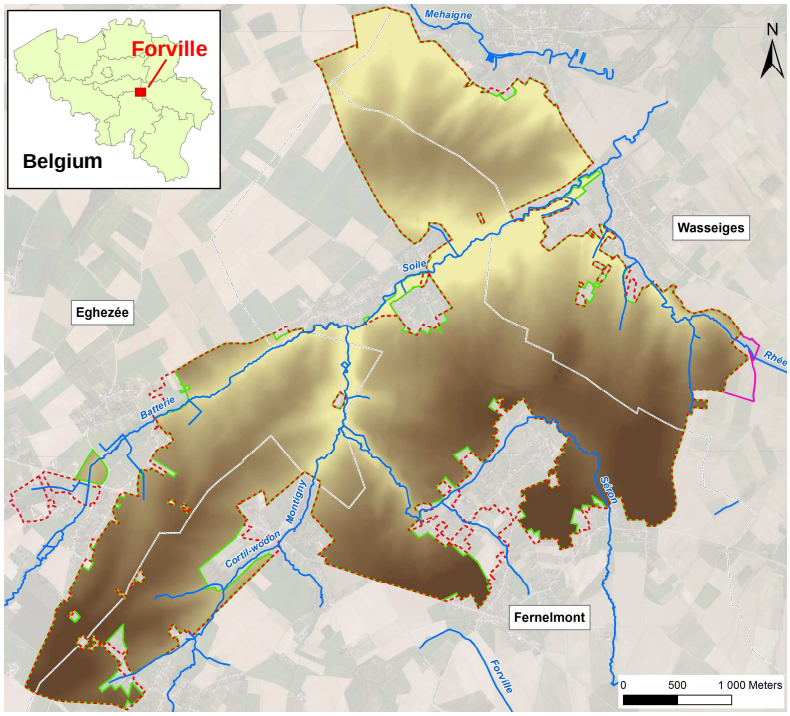
During the focus-group 2, local actors :

- Validate the valuation and mapping of each key ES.
- Validate the impact assessment of LC upon ES.
- Propose measures of avoidance, minimization, mitigation and compensation.
- Validate the improved LC project.

These different steps were tested on the draft plan of facilities of the LC of the area of Forville during the year 2015. The context of this LC project and the methodology are described in section 3.

3 OPERATIONAL RESULTS: TEST OF THE METHODOLOGY WITHIN THE PILOT LC PROJECT OF FORVILLE

3.1 The context of the LC project of Forville



The LC project in a nutshell

- 3 municipalities / 2 provinces
- 1 533ha
- Plateau with deep loamy soils
- Intensive farming (crops)
- Villages located in the valleys
- 501 parcels in 2015
- 84% of the perimeter under croplands
- 13% of the perimeter covered by grasslands (riversides)

Legend

Perimeters
- Study area validated (1533 Ha)
- Acosse area (11 Ha)
- Former study area (1620 Ha)
- Municipalities boundaries

Hydrographical network
- Waterways

Altitude (in meters)
- Maximum 175m
- Minimum 129m

Map 1: Map of the perimeter of the LC project of Forville (Biotope, 2016).

The land consolidation was asked by local farmers at the beginning of the 2000's to improve conditions of productions. The first draft project for facilities was carried out in 2010.

The planned facilities consist in:

- The improvement and creation of rural roads.
- The implementation of flood and erosion mitigation infrastructures (straw fascines, artificial wetlands, buffer strips along riversides).
- The development of the ecological network (grass strips along roads and parcels).
- The creation of picnic areas and paths dedicated to soft mobility.

The first part of the SEA was then achieved in 2012 by CSD Engineers. It was done in a "classical" way. This study establishes a biophysical diagnostic of the area and proposes recommendations for the reallotment and improvements for the planned infrastructures. On the whole, the project was considered positively for its potential contribution to erosion mitigation and recreation.

3.2 Implementation of the methodology step by step

Within this section, the methodology presented in table 1 is described step by step.

3.2.1 Step 1. Identification of potential ES offer

The Wal-ES classification[1] was simplified. Some ES were suppressed because LC could not influence them, others were gathered. This typology was used as a common and understandable language for all stakeholders. On the basis of this standardized nomenclature, the potentially impacted ES by LC were identified thanks to a literature review and the diagnostic of the SEA. Based on the simplified Wal-Es classification, 30 key stakeholders were identified.

3.2.2 Step 2. Ranking of ES demand by stakeholders

In March 2015, these key stakeholders were invited to attend the first focus group. This meeting aimed to select priority ES (i.e. ES demand by stakeholders).

A top of five ES emerged (cf. table 2).

Ranking	Ecosystem services	Type of ES
1	Food production	Provision
2	Water quality	Regulation and provision
3	Erosion control	Regulation
4	Recreation activities	Cultural
5	Biodiversity	Cultural

Table 2: ES considered as relevant by local stakeholders.

3.2.3 Step 3. Assessment and mapping of selected ES

To evaluate ES offer on the project area, four out of five previous ES were quantified and mapped using indicators. The ES "water quality" could not be mapped because of the settings of the hydrological model. A semi-quantitative approach facilitated comparisons and the aggregation of indicators. Their values were linked to a value scale from 1 to 5 (very weak to very strong) and a colour code (blue to red) for mapping.

[1] CICES classification adapted to Wallonia

The table presents how the ES were quantified.

Ecosystem service	Indicator	Quantification system	Spatialization
Food production	Composite indicator: ▪ Accessibility of parcels (10%) ▪ Distance parcels to farm (10%) ▪ Shape of parcels (10%) ▪ Soil quality (70%)	Calculation Soil assessment	Yes
Water quality	▪ Average nitrate rate at roots level ▪ Average nitrate rate in groundwater	Modelling	No
Erosion control	▪ Soil loss (diffuse erosion) ▪ Concentrated flow erosion (size of water catchment of erosion axis)	Modelling	Yes
Recreation activities	Assessment of the quality of the soft mobility road network	Identification and location of relevant aesthetic, patrimonial and landscape elements+expert opinion	Yes
Biodiversity	Valuation of the quality of the ecological network	Expert opinion	Yes

Table 3: Quantification of priority ES.

Trade-offs and synergies between each ES were analysed with a paired comparison matrix.

The ES approach confirmed the conclusions of the SEA and highlighted a series of issues. The LC perimeter presents symptoms of intensive farming areas with:

- A parcel structure that can be improved (14% of parcels have no access and 35% have inconvenient shapes)
- A substantial soil erosion (44% of the farmed surface is concerned by a high or very high risk)
- A significant nitrate rate (40,4 mg/l at ground water level)
- A sparse ecological network mainly located along rivers (7,1% of the area of the LC perimeter)

3.2.4 Step 4. Impact assessment of the draft LC project on ES

Step 4 and 5 were addressed during the second focus group organized in October 2015.

The step 4 consisted in assessing the impact of the planned facilities on the value of each selected ES. The supply of each ES was calculated and mapped in two situations: without and with LC. As the reallotment plan was not ready. Its environmental impact could not be assessed.

The main results showed that:

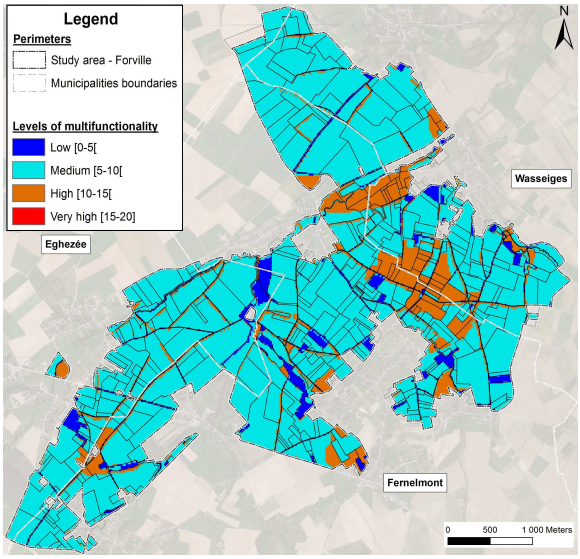
- ES relative value associated to agriculture production would increase due to the improvement of the accessibility of parcels (8% of parcels have no access and the length of hardened roads was increased by 17%).

- The soil loss would decrease by 20.5% (from 0.39 t/ha/year without LC to 0.31t/ha/year with LC).
- Eighteen kilometres of walking paths could be restored throughout the project area, increasing outdoor leisure offer.
- Landscape connectivity would increase thanks to the restoration of grass strips, buffer strips and fishway setting up.

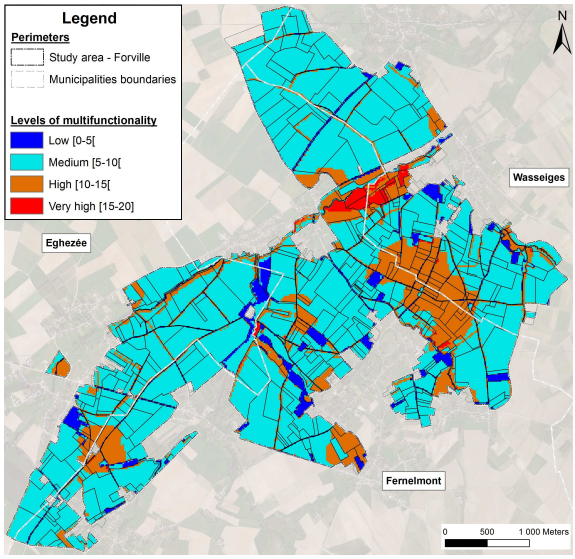
For water quality, a business-as-usual scenario without LC was tested with the help of a hydrological model. In that case, the nitrate rate at ground water level would increase by 14%. In the case of LC, the nitrate rate should be mastered thanks to grass-strips and a regulation of the evolution of the size of the parcels.

The multifunctionality of the LC perimeter was evaluated using 2 synthetic spatial indicators at the pixel size (20m×20m). The first is quantitative. It is a “multifunctional score” obtained by the sum of the value of the 4 mapped ES. This score varies from 4 to 20 (map 2, 3 and 4). The second is qualitative and indicates the total number of ES with a value between 3 and 5 (not shown). For these two indicators, differential maps can be produced by comparing before and after the LC project (map 4 and 5).

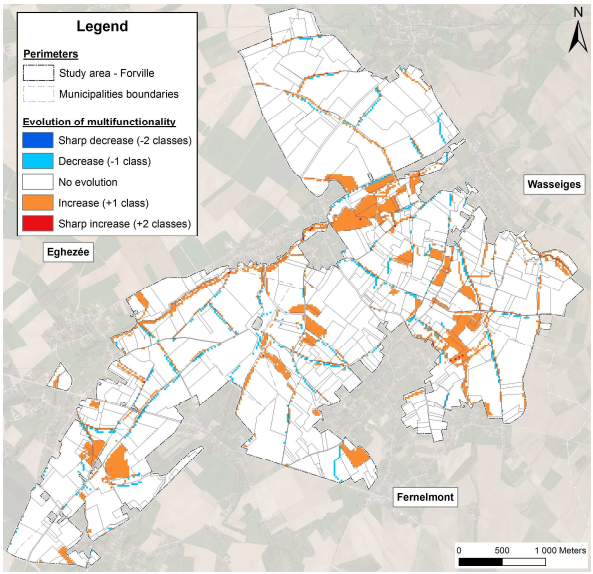
For map 2 and 3, colours indicate the expression level per pixel of the four selected ES (value between 1 and 20).



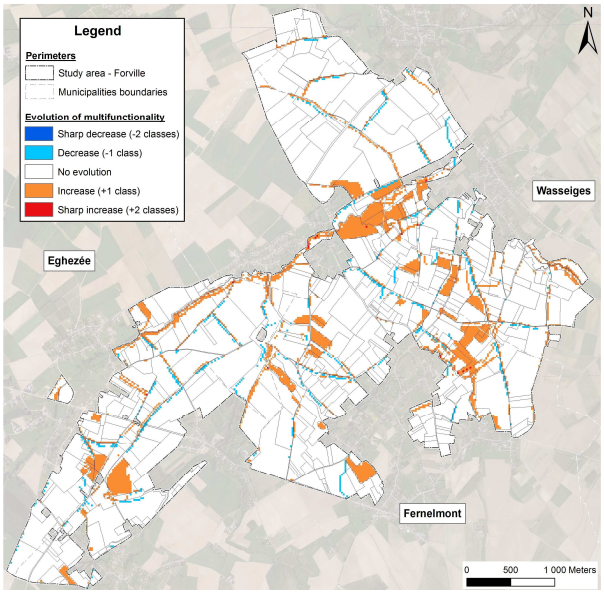
Map 2: “Multifunctional score” without LC (Biotope, 2016).



Map 3: “Multifunctional score” with LC (Biotope, 2016).



Map 4: Difference of the "multifunctional score between the LC LC scenario and the current situation 'Biotope, 2016).



Map 5: Difference of the number of ES in the situation of LC compared to the current situation (Biotope, 2016).

In the case of the implementation of LC, the “multifunctional score” increased over 362ha and decreased over 95ha mainly due to the construction of hardened roads. The increase of multifunctionality is homogenously distributed. The value of the 4 mapped ES has increased of 1 or 2 levels (cf. map 5) over 150ha representing 10% of the LC perimeter. The most multifunctional areas (valleys and an archaeological site) are strengthened.

3.2.5 Step 5. Maximisation of ES delivery (improved LC project)

As the draft project of LC was quite mature and responding to local demands, few modifications were added to the improved LC project. The discussion with local actors led to new projects (new paths, a fish pass and spawning areas). A GIS model was developed to optimize the implementation of buffer strips and straw fascines. It will be used during the negotiations of reallotment.

3.2.6 Step 6. Monitoring of ES

Once the project is implemented, the ES will be monitored using a scorecard. This scorecard contains indicators related to territorial issues (ES indicators, Table 3) and indicators of achievement for the implementation of facilities.

4 FIRST LESSONS AND NEXT STEPS

Regarding the evolution of LC policy in Wallonia, the goal of this study was to assess the contribution of LC to the multifunctionality of the territories, that is to say promoting jointly socioeconomic and environmental components.

The conception of this tool was based upon the ES framework. It consisted first in confronting ES offer on the project area and ES demand by stakeholders. Based on this diagnostic, the LC project was built and its incidences assessed on the different socioeconomic and environmental components. This tool allowed testing various scenarios. Finally, indicators were proposed in order to follow the incidences of the selected LC project.

The results obtained indicate that the integration of ES in the SEA generated a more dynamic approach than a traditional SEA. In that way, project conception and impact assessment are closely related and could even be merged. The integration of ES at each step of the life-cycle of the project also promotes a co-construction approach which garners stakeholders.

Thanks to the ES framework, territorial issues were considered on the same level without pointing out particular uses or stakeholders. This aspect was important to work in a constructive atmosphere. As the services concept is a people-oriented concept, the identification of stakeholders and their involvement were crucial throughout the whole process. In this context, meeting facilitation in the LC process becomes clearly a key competence that mustn't be neglected.

This ES based methodology has proved to be an interesting communication tool both for structuring and evaluating the project. Planned facilities were clearly linked with the local issues. The ES mapping and the comparison of ES offer with and without LC facilitated discussion and decision. The multifunctional score gave a rapid evaluation of LC potential outcomes.

Indicators allowed modelling and mapping while scenarios provided opportunities to improve the project design and the impact assessment. Nevertheless, indicators must be seen as tools with their limits and constraints. A good indicator must be scientifically relevant, technically feasible, useful and clear for all stakeholders (Lairez et al., 2015). Food production and cultural services were the most difficult ES to characterize. Besides, the negative impacts of the project or even some generated ecosystem “disservices” should not be ignored or avoided (Lairez et al., 2015).

Some improvements will be necessary. To be fully efficient, this methodology will have to be tested in another type of agrosystem (e.g. cattle breeding or a mountainous area) and during the impact assessment of a reallotment plan. The ES water quality should be estimated using a more robust technique.

Finally and as shown by the works of Gerwing et al. (2011), this evaluation system of LC consolidation could also be used:

- In an ex-ante assessment, to identify the opportunity to launch a LC.
- In an ex-post assessment, to assess a concluded LC.

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This section presents only the biographical notes and contacts of the main contributors of this article.

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Multi Discipline Land Consolidation in Turkey with ICT Support (September 2016)

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***Abstract*—In Turkey, agricultural Lands have been divided into many pieces because of inheritance traditions and other reasons. These small parcels belong to a large number of persons. Therefore, parcels as well as agricultural enterprises have become smaller. To correct this unfavourable situation, Turkey has implemented necessary legislative regulations and initiated Land Consolidation activities for 1 million hectare per year. Within this program, consolidation has been completed for 6 million hectare land area, however the program of 1 million hectare per year continues.**

In the first years of the program inheritance legislative regulations were not perfectly organized, therefore applications encountered some issues. By means of land consolidation activities, all of the parcels are reorganized to include transportation and irrigation facilities. As inheritance regulations are not exactly set up, lands continued to be divided and the number of shared use and ownerships have not decreased, enterprises have not been sufficiently developed. In 2014 legislative regulations about inheritance were completed and new regulations were put into force. This has prevented land division but did not yet have a beneficial effect on the development of enterprises. It has to be ensured for the development of enterprises and the proprietors of the small lands that there will be compensation for their land value when they move away. Land Banking applications are needed for the enterprises to be developed. Turkey is working on Land Banking practices according to its own structure for over 2 years. Works in the rural area of Turkey showed that applications similar to Land Banking are implemented by farmers. These practices are indicative evidences that a Land Bank facility is necessary for successful Land Consolidation.

The Ministry of Food, Agriculture and Livestock developed a GIS based web portal named "TVK" to track and monitor all of the activities performed during the management of Land Consolidation Projects. TVK ensures following content to be executed:

- **Contract Management**
- **Project Management and Monitoring**
- **Schedule Planning and Monitoring**
- **Operation Management and Monitoring**
- **Data Management (Textual and Geographical)**
- **Estimated Cost Calculation for a LCP by using unit price pool**
- **Progress Payment Management and Monitoring**
- **Final Account Calculation**
- **Interim and Final Acceptance Procedures**
- **Official Letters**
- **Official Reports**
- **Project Statistics**
- **Mapping**
- **Geographical Data Marking, Correction, Comparison**
- **Redlining**
- **Mobile applications**
- **E-government integration**

TVK has instant and online access to the government Land Registry and Cadastre Information System, Central Population Information System, Address Registration System, Agricultural Information System and Agricultural Parcel Information System. TVK is developed with open source technologies and compatible with OGC (Open Geospatial Consortium) and ISO standards.

I. Introduction

We performed a study on consolidation of fragmented lands, what is the most important problem of Turkish agriculture.

When the land becomes smaller, income obtained from agricultural activities decreases and input expenses decreases when the land becomes larger. Hence Land Consolidation is indispensable for Turkish Agriculture.

Land Consolidation can be expressed as the process of combining, shaping and reorganization of the fragmented, disintegrated, bad shaped -for various reasons- parcels for which economically impossible to perform agricultural activities, based on modern agriculture business management and most appropriate irrigation services.

Our objective in this study is to reorganize agricultural businesses owning small, fragmented and dispersed lands according to modern agricultural business management principles, thus to ensure less use of time, labour force and funds, take advantages of production factors and increase in productivity of agricultural businesses, increase agricultural production and ameliorate life standards of inhabitants in rural area.

II. PROBLEMS IN TURKEY

By Turkey's inheritance legislation, shares of agricultural land subject to inheritance are fragmented. 400 shareholders can occupy 1 parcel. The area of one parcel can decrease to 7

decare. In this situation, agriculture is not sustainable in Turkey. Agricultural lands are registered for 40 million individuals while actually only 3 million is farming. [1]

37 million proprietors cannot use their lands. If an individual has a share of 200-300m^2 from a land of 7-8 decare, he can neither sell this area nor rent. In this case peasants let the lands to each other so that it would be cultivated. 3 million people suffer from not being the owner of the land. They cannot benefit from credit or subsidy for the land and cannot carry out a project or make an investment.

37 million landowners can not use their lands. Everyone is upset. There are no roads in the existing parcels and they are not suitable for irrigation. The physical structure of the parcels is inappropriate also.

In Turkey due to inheritance and other factors, agricultural businesses holding lands decreases day by day. In 1950 there were 2.2 million businesses and average business size was 100 decare, but in 2000 despite businesses increased to 3.02 million, average business size decreased to 61 decare (Table I). [2] When the business scale decreases, the number of fractions increases. Today there is an average of 7 fraction of land per business.

Cultivable agricultural land area is 25 million hectare however economically irrigable land area is 8.5 million hectare in Turkey. Considering data of the year 2010 approximately 5,3 million hectare area became irrigable including public irrigation. Thus 62% of economically irrigable agricultural land finds opportunity of irrigation. In the coming years, the irrigable area is expected to be 3.2 million hectare. In irrigable areas irrigation rates differ based on regions and irrigation facilities between 20% and 80%. Low irrigation rates cause a significant loss of revenue for the national economy. [3]

According to studies performed using satellite data and latest calculation technologies in Turkey land that can be consolidated is calculated as 14 million hectare area, constituted by 8.5 million hectare wetland and 5.5 million hectare dryland. [4]

In irrigation network, the one of the most important cause of low irrigation rates and irrigation efficiency is irrigation projects are constructed without considering land consolidation and internal farm development services.

III. EFFICIENT SOLUTIONS

There are two methods to prevent fertile soil loss due to land fragmentation. The first method is Land Consolidation Legislation [5] for the current fragmented lands to be consolidated. The second one is Inheritance Legislation [6] to prevent future potential fragmentations. The first one tackles agricultural land selling processes as well. We first constructed our legal basis and then started to implement it with a deterministic approach.

TABLE I
NUMBER OF BUSINESSES VS
AVERAGE CULTIVABLE AREA

Year	Number of Businesses (million)	Average Cultivable Area (decare)
1950	2.2	100
2000	3.02	61

Fig. 1. Basic Features of TVK

To manage, track and monitor land consolidation activities, Turkey created its own land consolidation database and a GIS based ICT Tool named TVK has been developed. (Fig 1) By means of this tool, Land Consolidation projects of the whole country are managed centrally, and GIS data topology is controlled prior to being stored in the database. TVK ensures management of the following features: Contract Management, Project Management and Monitoring, Schedule Planning and Monitoring (Fig 2),

Fig. 2.Land Consolidation Project Schedule from TVK

Operation Management and Monitoring, Data Management (Textual and Geographical), Estimated Cost Calculation for a Land Consolidation Project by using unit price pool, Progress Payment Management and Monitoring, Final Account Calculation, Interim and Final Acceptance Procedures, Official Letters, Official Reports, Project Statistics (Fig 3),

Fig. 3. Statistical Data from TVK.

Mapping, Geographical Data Marking, Correction, Comparison, Redlining (Fig 4),

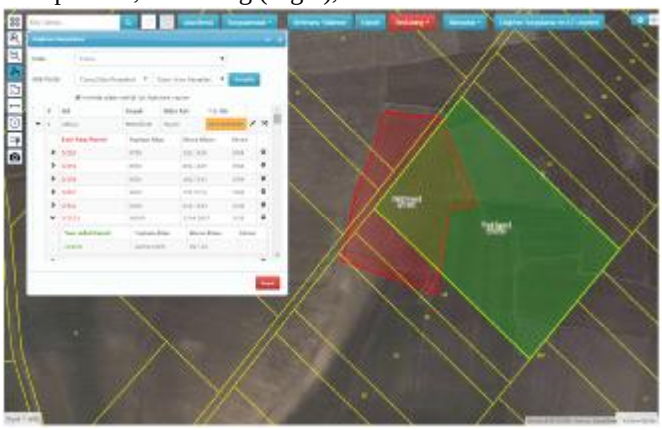


Fig. 4. Redlining, Correction on map from TVK.

Mobile applications (Fig 5),

Fig. 5. TVK Mobile Application

E-government integration. TVK has instant and online access to the government Land Registry and Cadastre Information System (Fig 6),

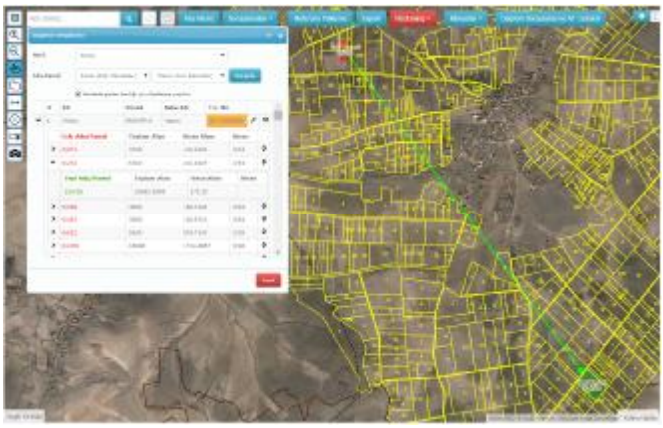


Fig. 6. Cadastre Data on TVK

Central Population Information System, Address Registration System, Agricultural Information System and Agricultural Parcel Information System. It is developed with open source technologies and compatible with OGC (Open Geospatial Consortium) and ISO standards.

If anyone has more than one piece of land within the frontier of a single village they are consolidated in one piece as much as possible. We have to contact the business, review the village, explore the village parcel structure, and their ownership. In the scope of land consolidation one should determine the problems that could be resolved for this village. Besides, we ask for a report including internal farm development works such as the village's sanitation infrastructure, inner village roads, parcel size and share distribution, parcel road status, drainage, contour, stone picking, and land improvement. All these studies are managed and tracked by TVK-GIS based ICT tool that we have developed.

TVK has the ability to show Government Subsidies, Blocks, Soil Survey, Parcelling, Cadastre, Roads, Engineering structures, Watercourses, Drainage systems, Pipes, Potable water, Waste water, Satellite images, Base maps, Soil analysis, Hydrology and Topography data layers on the same map (Fig 7).

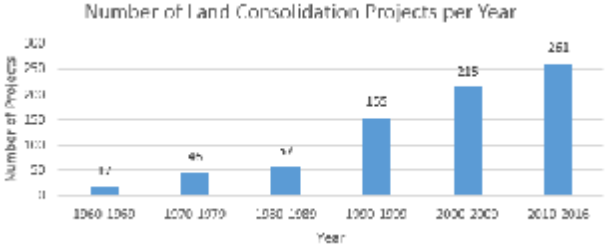
Fig. 7. TVK Map Layers

Via our ICT Tool, we can perform Cost Analysis by calculating production costs considering land shape.

Agricultural processes are determined according to the product that will be cultivated. Production costs as fuel and labour costs, and time influence final product cost. Newly created parcels are tested on map to be convenient geometrically for ploughing. Productivity is related to parcel geometry. Parcel slope is also an important factor. If a parcel has a short edge perpendicular to the slope line of the parcel, the farmer has to change the plough direction very often. The area of the parcel corners that could not be ploughed and total parcel corners are calculated. Parcels are also tested by their closeness to the road, proximity to the village centre, access to irrigation sources. Route analysis is performed for each parcel to calculate their distance to the village in order to have a minimum deviation between beeline and real roads. Ponding and drainage controls are simulated considering land shapes. Geometrically suitable parcel shapes are identified according to production accommodation by TVK. Finally, cost analysis results before and after consolidation are discussed with farmers so that they can have a better understanding of the process. Through Land Consolidation, plough distance decreases, plough costs decreases, irrigation agents became accessible, drainage canals are built, ponding is prevented and production became fertile. Farmers spend less and profit more.

TVK has been integrated with Turkish e-government portal. Citizens can login to the e-government portal and access TVK data to see Land Consolidation project borders on map and details including project status, project engineers, related companies, part of projects that have been finished and their schedules. Citizens can also track published notices about land distribution with their shares. Parcel owners can query which old parcels before the consolidation belonged to them and which new parcels will become theirs. Thus, they will be able to submit an objection letter to the ministry. In classical method before TVK, all printed lists that include the ownership distribution were published in villages. In accordance with relevant laws, other public services as Ministry of Energy, General Directorate of Highways, General Directorate for State Hydraulic Works etc. working on the same project area can have online access to TVK data.

By means of Land Consolidation Legislation one should obtain less shared and less fragmented land parcels. Thus investors can easily buy a single piece of land from one seller. (Fig.7)



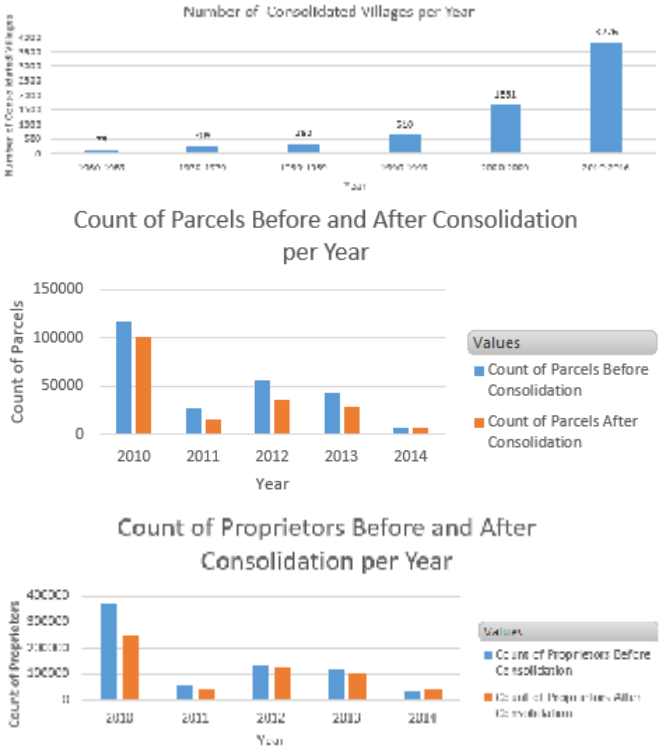


Fig. 7. TVK Land Consolidation Data Per Year.

By means of Inheritance Legislation family businesses will be founded. Some of the inheritors can buy the other inheritors' shares and cultivate all of the land by themselves or an investor will agree with inheritors and buy all the shares or government will release it for other investors to buy, or when there is a conflict with the inheritors, the government will expropriate the land to sell it for the investors who would cultivate. Inheritance Legislation prevents the land to be fragmented; businesses are responsible for a certain amount of people, and instead of sharing the land area, the company's shares will be distributed among inheritors. Laws prevent selling of the parcels by fragmentation. When the land yield is less than businesses' sufficient income, these parcels can neither be fragmented nor sold.

We are currently working on a new ICT tool that will manage inheritance processes. This tool will track land sales and inheritance practices. That will consolidate dispersed lands and meet with investors. This process of legally and physically regulated agricultural lands matching with investors is called Land Banking. In this way, if there is a good investor who will seriously be engaged in cultivation, transfer by inheritance process immediately turns into a selling process.

IV. Conclusion

Land Consolidation activities comprise significant benefits for farmers as well as public investments.

Current fragmented parcels are consolidated and the potential fragmentation is prevented in Turkey by land consolidation and inheritance legislation.

In Turkey, legislative regulations and ICT solutions applied for Land Consolidation has become effective and land will be

strictly protected, therefore implemented methods can be carried onto the international platform to protect the soils in the world towards corrective actions and improving opportunities in the global scale.

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He is the author of three books, more than 150 articles, and more than 70 inventions. His research interests include Land Consolidation, Land Management, Land Banking and Agricultural Reform Applications.

Mr. Küsek was a recipient of the Best Symposium Paper Award in 2011.

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Land consolidation and readjustment experiences & challenges in Slovenia

Anka LISEC, Tomaž PRIMOŽIČ, Boštjan PUNČUH, Marjan ČEH, Miran FERLAN, Jernej TEKAVEC, Barbara TROBEC, Slovenia

Key words: land consolidation, land readjustment, rural areas, urban areas, Slovenia

SUMMARY

The paper aims to present the Slovenian experiences in the fields of land consolidation in rural areas and land readjustment in urban areas. In the today's Slovenian territory, the first land consolidation projects were carried out already in the beginning of the 20th century but in a small scale. After the WWII, the government (at the federal Yugoslav as well as at the republic Slovenian level) tried to cope with the problem of agricultural land fragmentation more systematically. The most intensive land consolidation period was 1976–1990. The political changes in the beginning of 1990s and transition to market economy brought modifications of land consolidation procedures. The Slovenian government has been supporting the implementation of new land consolidations in the framework of the rural development program since 2007. Anyhow, the approaches to land consolidations have changed considerably in the past decades, where non-agricultural aims have been included. In addition to the efforts aimed at making agriculture and forestry more competitive through a comprehensive reallocation process, improvement of road and drainage networks, landscaping, environmental management, conservation projects, and other functions may be implemented by land consolidations. While Slovenia has a long tradition in agricultural land consolidation, the urban land readjustment is a novelty, which was legally introduced in 2002. Despite limited experiences in this field, there have been good practices developed in the past decade.

Land consolidation and readjustment experiences & challenges in Slovenia

Anka LISEC, Tomaž PRIMOŽIČ, Boštjan PUNČUH, Marjan ČEH, Miran FERLAN, Jernej TEKAVEC, Barbara TROBEC, Slovenia

1. INTRODUTION

Land has long been considered as the elementary source of human existence, but its use has always been a subject to change: it was either developed into arable land or cultivated forests, or it was adapted to settlement, industrial, commercial, recreational or infrastructural purposes. In the past centuries, land use has been individualized through division into real property units in many countries, but continuous spatial changes and the development of the society in general require changes in real property division. While countries experienced different land reforms in the past, there are also other much softer approaches to adjust real property units to the needs of the modern society. Land consolidations and land readjustment might be the key contributions to sustainable land management and spatial development by providing suitable "real property conditions".

The aim of the paper is to present the Slovenian experiences in the fields of land consolidation in rural areas and land readjustment in urban areas. Here it has to be mentioned, that Slovenia, like the other countries from the past socialist planned economy, faced two remarkable socio-economic changes in a period of less than 50 years, i.e. after the introduction of a centrally planned economy in the middle of the 20th century, which was often exemplified by the restrictions of private ownership of land in urban and rural areas, a relatively fast transition to the market economy took place in the 1990s and in the beginning of the new millennium. While the land needed for urban development projects was compulsory purchased or nationalized after the WWII, there was a particularity regarding nationalization of rural land in Slovenia, where only big farms were nationalized; the prevailing traditional Slovenian small farms (with approximately 10 ha of arable land) were never fully nationalized and most of them survived also under the socialist regime (Lisec et al., 2008; Hartvigsen, 2014).

Nevertheless there is a huge demand to adjust the real property units to the planned land use in rural as well as in urban areas. While Slovenia has a long tradition in agricultural land consolidation, the urban land readjustment is a novelty, which was legally introduced in 2002.

2. Rural land consolidation in Slovenia

Land fragmentation of the Slovenian agricultural holdings as well as soil, topographic and water conditions unsuitable for agricultural production are serious obstacles to agricultural development with adverse effects to rural and regional development in general. Here, it has to be emphasized, that nearly 90 % of the Slovenian territory lies at altitudes exceeding 300 m, while plain areas in the shape of contiguous valleys and basins represent only about 20 % of the entire territory. Consequently, the predominant part of the country is covered by forests (over 60%), while agricultural land represents less than 30% of the total territory (see also Fig. 1). Characteristic of agricultural land is the high share of absolute grassland and pastures (57%), and relatively low shares of arable land (37%) and perennial crops (6%) (PRP 2014–2020).

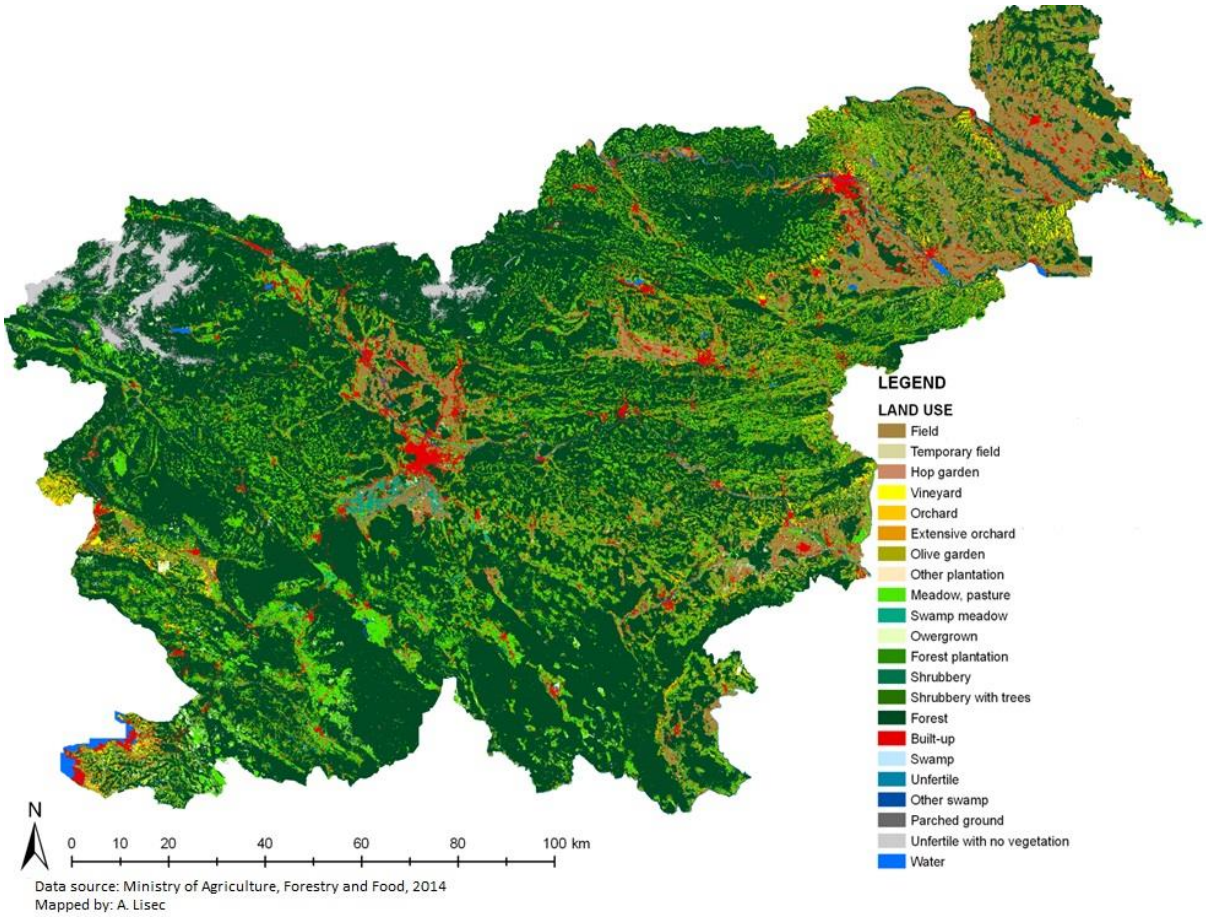

Figure 1: Land use in Slovenia (Data source: Ministry of Agriculture, Forestry and Food, 2014).

In spite of the concentration process in the last decade the average size of Slovenian prevailing private agricultural holdings with 6.3 ha of utilized land and 22 agricultural land plots is still nearly three times smaller than the EU average. Additionally, with 0.08 ha arable land per capita, Slovenia is at the bottom of the European scale (Lisec et al., 2011).

2.1.1 Rural land consolidation before transition to market economy

The Slovenian land consolidation legislation has its roots in the Austrian legislation, since the territory used to be part of the Habsburg Empire and later, until the early 20th century, of the Austrian-Hungarian State. The first legal framework was provided by the federal Agriculture Act of 1883, which was the base for the provincial legislation and later on also for the legislation in the first Yugoslav state. Before WWII, land consolidation, along with the associated meliorations, was carried out in a small scale, despite the problematic rural land fragmentation, which was the consequence of the historical rural overpopulation, solutions of the common land problems in the 18th and 19th centuries, and the subdivisions of farms due to inheritance. Over the decades, the problem of fragmentation of farm holdings got worse (Lisec et al., 2012).

After the WWII, the government (at the federal Yugoslav as well as at the republic Slovenian level) tried to cope with the problem of agricultural land fragmentation more systematically.

In the first period, i.e. till 1973, land areas of a total of 1333 ha were consolidated. The Farmland Act from 1973 and later from 1979 brought changes in the financing of land consolidation. The most intensive land consolidation period was 1976–1990 when almost 55,000 ha of agricultural land were included into land consolidation (Lisec et al., 2012).

In 1990 the moratorium on agrarian operations, including land consolidation, was introduced in Slovenia, due to the often enforced land consolidation projects and negative environmental consequences of the parallel melioration projects. In that period, the political changes brought a new vision of the economic development and public participation in spatial and rural development projects (Lisec et al., 2012). In 1995, the Ministry of Agriculture prepared a program for rehabilitation of unfinished land consolidation projects. Today, there are still some land consolidated areas, where the process remains unfinished. The extent of new land consolidation projects in the 1990s was very limited. One of the reasons was also the negative connotation of land consolidation among land owners, which was based on past experiences and unsolved projects.

2.1.2 Modern rural land consolidation

In 1996, the new legislation regulating rural land consolidation came into force, which is, with some amendments, still valid. The organization and procedures did not change a lot in comparison with the legislation from 1970s – the main difference was that the land owners who owned at least 80 % (from 2011 this share is 67 %) of the acreage of the land consolidation area had to agree with the land consolidation according to the new legislation. However, the approach changed considerably – the main guidelines have become *'active participation of land owners to meet their needs*' and *'reconciliation of different interests/sectors to provide the basis for sustainable development'* (Lisec et al., 2014). It has to be emphasized, that also non-agricultural land (forests, building land with the objects etc.) can be the subject of land consolidation according to the legislation, which regulates rural land consolidations.

The important change of legislation was in June 2011, when the new approach has been introduced – beside the traditional administrative ("compulsory") land consolidation with prescribed level of concordance of parties involved, the so called contracting land consolidation has been introduced, where all parties have to agree with the project (also simplified land consolidation). Anyhow, there are very limited experiences with the contracting rural land consolidation in Slovenia.

The extent of new land consolidation projects in the 1990s was very limited. One of the reasons was also the negative connotation of land consolidation among land owners, which was based on past experiences and unsolved projects. Based on a few successful land consolidation projects, the government finally decided to find financial resources and support land consolidations. An important step towards systematic funding of land consolidation projects was the Rural Development Program for the period 2007–2013 (RDP 2007–2013). In the framework of the RDP 2007–2013, 51 land consolidation projects on 10,370 ha, and 21 agro-melioration projects on 3671 ha was funded (Fig. 2). Additionally, 7 new irrigation systems (1753 ha), 2 renovations of irrigation systems (396 ha) and numbers of small irrigation systems were funded within the RDP 2007–2013.

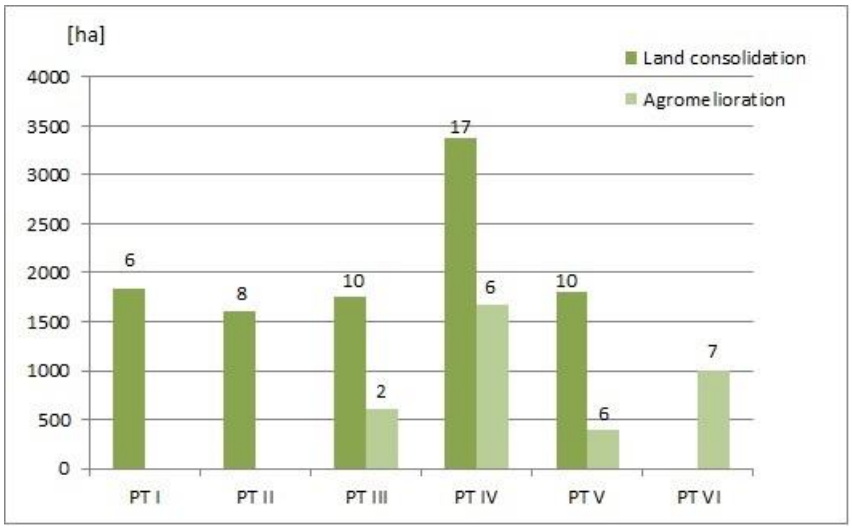

Figure 1: Land consolidation and agro-melioration areas with the number of projects supported within six public tenders (PT) in the framework of the RDP 2007-2013 (Data source: Ministry of Agriculture, Forestry and Food, 2015).

In the new Rural Development Program for the period 2014–2020 (RDP 2014–2020), there is a financial support for agro-meliorations and land consolidation foreseen. There is still no land consolidation project currently going on within this new funding scheme, in particular due to undefined procedures regarding required permissions from different sectors, which are nowadays the commitment of all funded measures within the EU projects that might have impact on nature, environment, culture heritage etc. Modern approaches to land consolidations are already trying to consider the needs of the agricultural sector, while also trying to conserve natural ecosystems and consider other spatial requirements (Fig. 3), therefore this new requirements shouldn't be an obstacle.

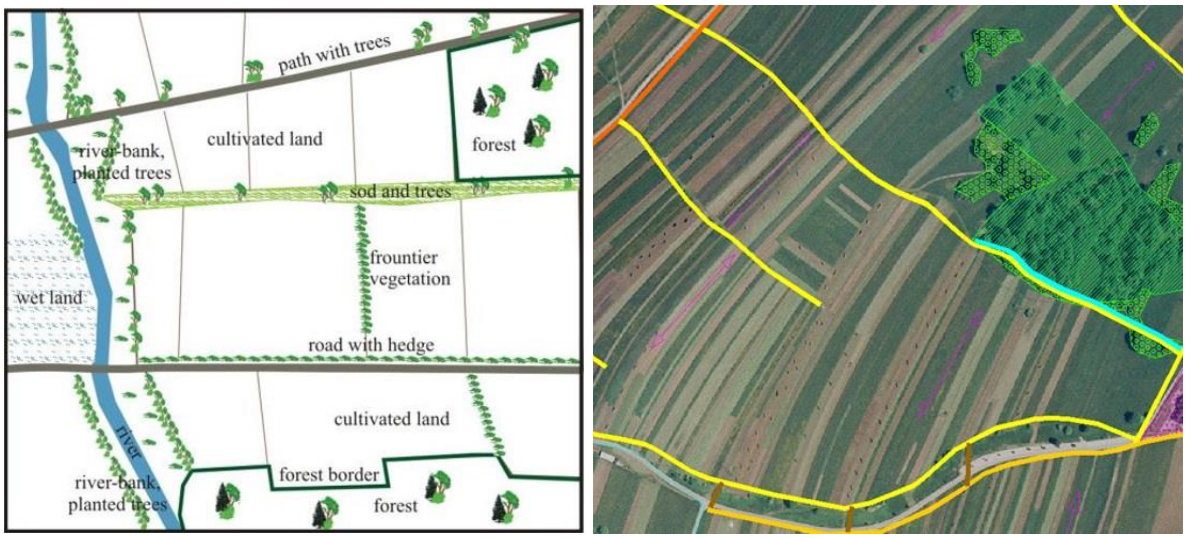

Figure 2: Land consolidation have had to consider different restriction in the space from the early 1990s in Slovenia: draft of landscape plan (left) and an example of real land consolidation plan with the areas of protected habitats (right).

However, over the past decades, land use conflicts and competition between different sectorial requirements and restrictions have increased remarkably. A special challenge is the possibility of planning and implementing land consolidations in protected areas and safeguard zones, where different, sometimes contradictory, sectorial interests of protection are in place. Here, land consolidation should not be seen just as an agricultural measure considering different requirements in the space; they should rather be recognized and funded also as environmental, conservation projects.

3. Urban land readjustment in Slovenia

The need for the urban land consolidation (readjustment) has increased significantly with the transition to the market economy. While the private ownership was often neglected in the past socialist planning economy in the urban areas, the privatization and denationalization process required a solution for legal formation of real property units in the urban areas. The first legal framework brought the Spatial Management Act from 2002, where urban land consolidation was defined as "*merging of land plots in the area of detailed spatial planning act and their reallocation among landowners in this area in accordance to the spatial plan*". Similar to the rural administrative land consolidation, the level of concordance of parties involved is defined, where the owner who owned at least 67 % of the acreage of the land consolidation area have to agree with the land consolidation.

The main problem of this new defined administrative land consolidation of urban land is, that a land consolidation process should be leaded by the municipality (and not by the state administrative unit like for the rural land consolidation). Due to lack of competences and knowledge, there have been limited experiences with this kind of urban land consolidation (except of some small cases). However, there is a huge demand for rural land consolidation – not only for new building sites but also for already built-up areas from the past socialist era (Fig. 4).

Figure 4: A case of successful urban land consolidation in the area with the detailed spatial plan (left), and problem of unsolved ownership of urban land in the neighborhood from the former Yugoslavia, where the land re-adjustment of built-up area is needed (right).

In addition to the administrative urban land consolidation, the contracting urban land consolidation is defined in the Slovenian legislation (Construction Act, 2002). In this case, the process of land consolidation is simplified in comparison to the administrative land consolidation. Land consolidation is performed on the basis of a contract between owners (contractual consolidation), where the spatial regulations (spatial plans) have to be considered – the adjustment of the new land division to the spatial plans is the requirement for the final decision about land consolidation.

4. Conclusion

In the Slovenian legislation, two approaches are known to implement land consolidation (for rural areas according to the Agricultural Land Act as well as for urban areas according to the Spatial Planning Act and Construction Act): (1) the administrative land consolidation with prescribed level of concordance of parties involved; and (2) contracting land consolidation where all parties have to agree with the project; this is a relatively new approach with no practice in the rural areas to this date. In both cases, public participation and high level of agreement of involved parties are required.
The land consolidation of rural land is successfully used in Slovenia for decades. An important milestone was transition to the market economy in the 1990s, where the active participation of land owners and other local residents became important aspect of land consolidation projects. Additionally, approaches have changed considerably as the consequence of widely accepted guidelines of sustainable development. Although non-agricultural aims have been included in the land consolidation planning in Slovenia, there are still many challenges with regards to the land consolidation measures in the protected and special safeguarded zones. Additional challenge is related to the urban land readjustment, which is a relatively new instrument and still needs to be promoted in the practice.

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Jernej Tekavec has graduated at the University of Ljubljana, Faculty of Civil and Geodetic Engineering and is currently doctor candidate, supervised by prof. Anka Lisec. The topic of his thesis is spatial data modelling and spatial data support for decision making.

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Land Consolidation as a Tool in Reshaping Natural Resources Governance to Achieve Long -Term Sustainability and Accountability in BiH -White Paper

Fahro BELKO, Bosnia and Herzegovina

Key words: Accountable natural resource management, Land consolidation, Public property rights to land, Knowledge based economy

Summary

Particular concern for governments in Bosnian agriculture and the country's foreign trade with the world is its positioning in a way that would give it a competitive edge over the neighboring countries. This, coupled with low productivity on many properties, lack of knowledge and poor care for soils, force a significant strain on land with no dramatic changes in the country's position in its foreign trade. Making a problem more complex is a significant occurernce of land abandonment in many communities.

Land consolidation in the past yielded significant results that are sustained to these days. These past experiences, coupled with latest findings could be a toolbox that might help governments achieve a goal of asserting public property rights to land, with governing bodies taking the role of trustees. This could lead to better protection of land as a common natural inheritance, bearing in mind that concept elaborated in this paper is based on the premise that its implementation follow in the path of knowledge based new economy with hopes that it would help the country improve its foreign trade score eventually.

Introduction

Bosnia and Herzegovina is a country of diversity with a rich and colorful geography and even more so, history, that until recently made headlines of the world's broadcasters. The country's economy struggles to get back on path that was torn by the war.

In 2011, contribution of agriculture to the country's BDP was 8.7% and the sector employed 19.6 of the total labor force (Tanić, year of publication unknown).

Judged by the number of people living in rural areas (more than 51%), BiH is predominantly a rural country, with agriculture having been traditionally a sanctuary for people who, having no better options, turn to subsistence farming, with a few producers making it to the market.

Total agricultural output is estimated to be below the needs of country's population and food processors, and is seen as contradictory to the orientation of BiH foreign trade to export as much as possible, thus putting both the country's economy and agricultural land under a strain.
Significant burden for recovery of BiH agriculture is fragmentation of holdings that makes it dificult at times for both individual producers and big farms, as well as is detrimental for a more intensive progress. Although fragmentation takes excessive forms sporadically, it does

not stop at that, since many farmers are in the process of either contemplating or already doing even furter division of their properties by leaving some bits to each of their sucessors..

Great potential, poor delivery

Although agroeconomists are unisone in their opinion that BiH has a great potential to produce a variety of foodstaffs, when it comes to delivery, figures are not enlivening. Yields of major crops are rather modest from one year to another, and do not compare too well with competiition (Table 1.).

Table 1.: BiH, Average yields of some of major crops in 2007.

Crop	**Average yields (Tones/ha)**
Wheat	3.5
Maize	3.2
Barley	2.9
Rye	2.8
Oats	2.5

Source: Agricultural Report for BiH, 2007.

These crops, although prioritised and subsidised, are still modest as compared with the average within the EU 27 (Table 2.).

Table 2.: Compariosn of average yields of wheat and maize between BiH and EU 27.

Country	**Wheat, average yields (Tones/ha)**	**Maize, average yields (Tones/ha)**
EU27	4.8	5.7
BiH	3.5	3.2

Source: Agricultural Report for BiH, 2007.

What goes for wheat and maize, goes for a majority of other crops, too.

Striving for more, going abroad

Export of agricultural produce is one of top priorities of BiH foregn trade policy and each year, grand plans are made so that the export score gets bette and better. It trully does, but trade deficit is associated with many efforts almost every year. Good illlustration is given by table 3.:

Table 3.: Trade of agricultural products between BiH and CEFTA (2005-2011).

Year	Import (mil. KM)	↓↑ Import (%)	Export (mil KM)	↓↑ Export (%)	Balance (mil KM)	↓↑ Balance (%)	Export-Import Ratio (%)
2005.	851.36	/	154.42	/	-696.93	/	18,14%
2006.	891.81	4.75%	178.75	15.75%	-713.06	2.31%	20,04%
2007.	1,136.61	27.45%	229.10	28.17%	-907.51	27.27%	20,16%
2008.	1,240.00	9.10%	304.38	32.86%	-935.62	3.10%	24,55%
2009.	1,198.00	-3.39%	315.24	3.57%	-882.76	-5.65%	26,31%
2010.	1,281.20	6.94%	361.36	14.63%	-919.84	4.20%	28,20%
2011.	1,344.14	4.91%	446.16	23.47%	-897.98	-2.38%	33,19%

Source: The Impact of Foreign Trade in Agricultural Products of Bosnia and Herzegovina Within the Framework of CEFTA 2006 (Čejvanović *et al*., 2014).

Hoping to improve its foreign trade position, BiH enters hurriedly every trade association in sight of the sector's strategists and is working actively to get full membership in the WTO. For the time being, the country is likely to stay in the minor league, though, and that, unfortunately, reflects on its trade with the world, same as it does with CEFTA (Table 4.).

Table 4.: Trade in agricultural products (1-24CT) between Bosnia and Herzegovina and the World in the period 2005-2011.

Year	Import (mil. KM)	↓↑ Import (%)	Export (mil KM)	↓↑ Export (%)	Balance (mil KM)	↓↑ Balance (%)	Export-Import Ratio (%)
2005.	1,981.63	/	223.30	/	-1,758.32	/	11.27%
2006.	1,944.94	-1.85%	258.76	15.88%	-1,686.18	-4.10%	13.30%
2007.	2,238.99	15.12%	324.88	25.55%	-1,914.12	13.52%	14.51%
2008.	2,620.15	17.02%	410.10	26.23%	-2,210.05	15.46%	15.65%
2009.	2,389.03	-8.82%	452.77	10.40%	-1,936.26	-12.39%	18.95%
2010.	2,502.40	4.75%	553.08	22.16%	-1,949.32	0.67%	22.10%
2011.	2,769.95	10.69%	612.20	10.69%	-2,157.74	10.69%	22.10%

Source: As above.

Not only does BiH get beaten in foreign trade with the world and CEFTA countries, but also, by its main foreign trade partner, Croatia (Table 5.).

Table 5.: Coverage of import by export in agricultural products trade between Bosnia and Herzegovina and Croatia.

Year	2005.	2006.	2007.	2008.	2009.	2010.	2011.	2012.
Coverage (%)	18,93	19,74	20,69	25,10	25,82	28,68	30,73	31,13

Source: As above

To be more specific, it is Croation export to BiH that makes a major contribution to the volume of trade between the two countries, increase in total BiH export nevertheless (Table 6.).

Table 6.: Export of agricultural products from BaH to Croatia.

Year	2005	2006	2007	2008	2009	2010	2011	2012
Export (mil. KM)	86,51	91,45	125,05	157,58	156,35	175,24	201,22	213,53

Source: Agency for Statistics of Bosnia and Herzegovina.

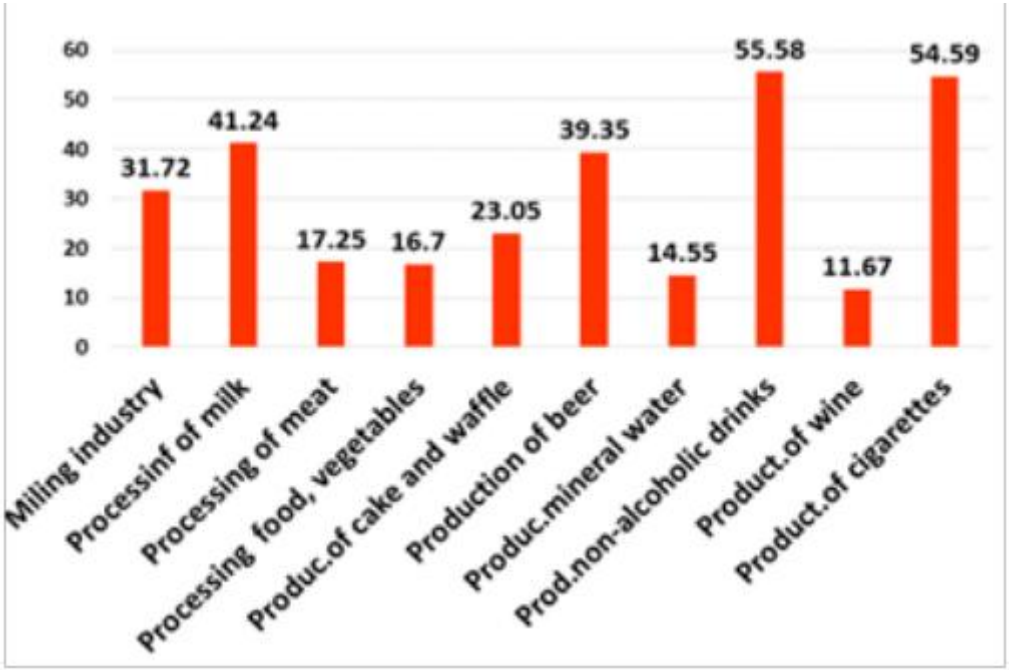
As the economists put it, explanation for these data rests with the fact that BiH is a net importer of agricultural commodities and its domestic agriculture does not produce enough to satisfy the country's needs. Although it seems rather strange, this situation looks likely to be a reality for a longer while now.

As we travel abroad, our home turf gets undernourished

One of mantras in circulation within the foreign expert flock on service in BiH has it that agriculture will make more sense if you put more value to it, i.e., value added agriculture is a way to go. So going we do.

Food processors in BiH are in chronic need of agricultural produce so that they could meet a requirement of bare minimum of economically reasonable manufacture. The processing industry runs on empty more often than not, for BiH agriculture cannot feed it with enough raw staff. Figure 1. says it all.

Figure 1.: Percentage of total capacity in use by food processors in BiH.



Source: The share of Food Products in Foreign Trade of Bosnia and Herzegovina, (Radosavac *et al*., 2015).

Once again, we have to quote agro-economists here: One of reasons why agro-food processing sector does not satisfy at least domestic market is due to a very low level of use of their capacity with the average of 44-88%, which contributes to low competitiveness in global trade (Cited from the same source as above, pp 436).

Agriculture does not make one feel so well, so what shall one do?

For a long time now, agricultural statistics has not favored Bosnian agriculture and for the esthetics sake, data on agricultural land have been omitted from this paper. But, things are very interesting there, nevertheless.

Agriculture in general puts a great deal of strain on land everywhere, causing degradation and a loss of fertility (Think about what happens to chernozem in the last, say, 50-70 years). For a long time it has been a sector where big players rake in a big cash, but, mainly thanks to the advance of chemical industry, genetics and machinery, and probably a great deal of muddling as well combined with a crafty use of scientific advancement. Although a big progress is made every decade, things seem not to be promising in terms of spectacular growth in times to come. This all has strong links with galloping changes in the environment and heavy use of agricultural enhancers. Additional difficulty is in that the soils are becoming sodden with a nasty stuff and so do the waters. Consequence is that the very essence of food produce is thus getting sawn off at an alarming rate.

Modern agriculture practiced in many places around the globe is exerted also on fragile Bosnian resources as well, so no wonder statistics are a bit tart. Should it go on like that with the configuration of Bosnian terrain and climate specifics, it looks not likely to work for a long, though, so the said statistics would rather turn sour instead of making it feel just a bit tart.

Slow progress and low competitiveness call for a change in the way agricultural policy making is done. Should one look around anywhere in BiH, they can see so many properties, once cultivated and reportedly choke full with fruits and all sorts of other produce, now laying in complete abandon. This is what happens not only to just individual parcels, but to the whole villages, too. Sadly, no accurate data can back up this statement, since statistics has not fared very well with this phenomenon so far.

Good thing is, mother Nature took things in her hands and these properties turned into charming little forests, now choking full with all sorts of creatures.

On the other side, people dealing with agriculture, i.e., farmers themselves struggle with property fragmentation and poorly adjusted practices, hoping they would make it a bit bigger on a somewhat weird Bosnian market. But even when they do, they most usually cannot sell their produce. So how come is it, when the processors themselves cannot fetch enough stuff for their own needs? Well, some analysts would say, answer can be retrieved from the intricacies of Bosnian politics and economy.

We have a growing rate of land abandonment in BiH that is coupled with diminishing number of big solid blocks of agricultural land that can be tilled with a prospect of making a thin profit margin, due to a number of reasons, one of which is road and residential buildings.

Abandoned lands, according to the analysts, are the outcome of desperate economic and social circumstances their owners lived in before they gave up and left. Although the land is private, it does not make a big difference, for it is often just a burden to the owners. At the same time, municipal authorities try to come up with a solution for poor rate of economic growth in their communities and finding some work to the growing army of underprivileged and unemployed.

Abandoned lands, with the state they are in, are a sort of self-made natural reservations, with a great diversity and wild life. Problem is, it is often hard to reach them, which is where the story from the beginning of this paper comes in handy.

The abandoned properties are great natural resources that can be beneficial both to the soil and water, not to mention the wildlife. They are also could be a great source of things that may be good for improving either domestic or foreign trade score. What can municipal authorities do about these properties? Firstly, they have to be proactive and have a vision. Assuming a role of trustees and forming a nature trust might be just one way to go. Doing consolidation of these properties is a path towards achieving a huge part of this goal.

People in BiH know too well that consolidation never goes without struggle, though. Then, one may wonder why not to do it asymmetrically, as the military strategists would call it. Asymmetric would probably do in a country as unusual as BiH. As for the other side of the coin, i.e., loss of agricultural land, that is a sort of post-war folklore in the country

If it ever happened that the municipal or other level of authorities assumed the role of governing bodies over nature trusts (Or any other sort of trusts for that matter), which is a role they might want to take if found necessary, that might be likely to both guarantee a better governance of land and create a fertile ground for employing some people. Agriculture is only one of sectors that compete with the others for resources. Basic economic logic has it that if agriculture fares well in terms of minimized impact on the environment, as well as revenues it generates, than it most certainly stands very good chances of getting consolidated land for food or feedstock produce. On the other hand, economic analysis, or practice itself, might prove that a positive change happens in a recreational business, agro forestry, rural development, or investment enterprises, for with trusts, it could be bigger complexes that money could be planted in. That hopefully would grow into a profit once the investment is ripe for harvesting.

It is always a role of the state that by default guarantees certain things, be it a banking business, property value or rights. If the state bodies assumed a role of guardian and guarantor over municipal trusts, that should, by default again, make it possible for the land and other resources to be cared for with much more accountability. One may ask why would not let private business do it? Theoretically it might work out, but it is rather difficult at this stage to put the essence of society into the hands of those whose major drive is a profit and profit again.

Consolidation, usual or asymmetric. What then? (Instead of conclusion)

To answer this question, one must turn to the gloomy statistics from the beginning of this paper. As it happens, no matter how much BiH struggles to stay on treacherous turf of foreign markets, it is not very likely to make it big in terms of agricultural produce, at least in the short run.

Instead of acting as if they were selling their own kitchenware abroad just to buy it all over again at a steeper price, Bosnian trade strategists should turn to their own yard and figure out how to meet demands of domestic markets for staples and all sorts of stuff necessary for processing industry. That would probably at least minimize a trade deficit and leave more money for other things, such as land consolidation. Land consolidation alone, is a powerful toolbox for those who know how to use it, and can reap huge benefits. To be able to use it,

though, it takes a great deal of knowledge and all sorts of expertise. But, this should start from the very basic level, i.e., the municipal one, for it is out there where the life happens, and in this case, it is municipalities in BiH that can be a shop floor for making big changes.

The land that is available to municipalities is a great resource for producing certain sorts of stuff that is not something big players in agriculture commodities markets are good at, or they might be not interested in.

Let's talk about the niche markets. The niches are usually small, but so is BiH. The way to go might be agro ecology and harvest of things that fit easily into niches on the world market scene. That is where foreign export ambitions of some could be satisfied and, with great hope and hard work, bring some hard cash home.

As for concrete use of consolidation, land banking could play a vital role, but this also could be tweaked a little bit so as it gets adjusted to Bosnian experience. That way, players in this concept would act like real banks (The role of municipalities) and land owners could play the role of clients who commission their land to them (i.e., municipalities turned banks) the same way as if they put the money in the bank, so that the land itself acts as a real currency. Sure enough, this would include the risks of banking and both interests paid to the owners and profit left to the banks, just to make it more interesting for all.

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Biographical notes

Fahro Belko was born in Sarajevo on January 27, 1965 and got his education from University of Sarajevo. He holds a master's degree in agricultural land management. His career started at Faculty of Agriculture, Sarajevo, where he held a position of assistant professor at Pedology department. He spent the recent war years in Sarajevo as a BiH Army soldier.

After the Bosnian war was over, he worked for more than 12 years as an interpreter, liaison and translator for NATO forces. He also worked on aid programs for BiH, as a senior advisor for agriculture, spent more than 6 years on two World Bank projects and is now a freelancer, always on a lookout for good working opportunities. He holds a position of FAO national correspondent that is pending contract co-signing.

He is married and is a father of 2 children. He wrote a certain number of publications, but it was a painstaking task to list them here, so they eventually got omitted.

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Does Estonia need land consolidation for the implementation of Rail Baltic?

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Key words: land consolidation, land acquisition, Rail Baltic, Estonia

SUMMARY

The construction of objects of infrastructure introduces different disruptions, including changes in the present land use. The changes depend on the size of the object. If it is a highway or high-speed railway, then the disruption will be more comprehensive. Today the construction of a new railway route (Rail Baltic) is under discussion in Estonia. It has generated many ideas. Landowners whose activity will be harmed in the future are dissatisfied. There are some options for acquiring land for the infrastructure object. One option is voluntary buying and selling. Second, if the landowner does not agree to the first option, it is possible to use expropriation. There is also the option to use land consolidation. This paper outlines the impact on land use and ownership which occurs with the building of the new railway route. There is additional discussion about the option to use land consolidation as a tool for mitigating the obstacles for land ownership and use.

Does Estonia need land consolidation for the implementation of Rail Baltic?

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1. INTRODUCTION

Each country needs new development, including new infrastructure. Objects of infrastructure need land. Generally, the landowners own the land and there is the need to acquire land from them. Land can be obtained in different ways: *i*) it can be purchased voluntarily, or *ii*) it can be expropriated compulsorily. A new object of infrastructure brings about changes in land ownership and use, as well obstacles for present land use. Voluntary purchase and expropriation usually do not facilitate the finding of a solution for this situation. If the tool of land consolidation is used, it will contribute to a wider solution for the affected area.

The question of land fragmentation is not new for Western European countries. Many Western and Northern European countries have decades of experience in land consolidation (Hartvigsen, 2015, 2014; Thomas, 2006; van Dijk, 2007; Vitikainen, 2004). For example, land consolidation can: *i*) be used to increase the competitiveness of agriculture and forestry by increasing plot sizes and thus make the use of heavy machinery possible; *ii*) help the organisation of environmental management and its amelioration; and *iii*) improve access to plots. Some countries, e.g. Denmark, Germany or the Netherlands, use land consolidation as a measure to encourage rural development (Haldrup, 2015; Hartvigsen, 2015; Lisec et al., 2014; Pašakarnis and Maliene, 2010; Thomas, 2014). Land consolidation can be used for land acquisition for large infrastructure (Hendricks and Lisec, 2014; Pašakarnis and Maliene, 2010).

Formerly socialist countries generally have less experience with land consolidation tools. However, many of these countries introduced land consolidation instruments at the beginning of the transition from centrally planned economies towards market economies during the early 1990s (Hartvigsen, 2015; Lisec et al., 2014; Pašakarnis and Maliene, 2010).

After Estonian's independence in 1991, land consolidation was not considered an important issue. The first priority was the implementation of land reform. This action brought about land fragmentation. Land plot fragmentation is even greater than it was in 1940 (Jürgenson, 2016). However, the Land Consolidation Law adopted in 1995 had provisions for land consolidation. Consolidation could only involve "real properties", i.e. those that had already been through the land reform process. Provisions for land consolidation during land reform were added to the Law in 1999. Nevertheless, the use of land consolidation remained rare. Only 26 land consolidation projects were implemented from 1998 to 2001, which covered 3,050 land plots. No projects were implemented thereafter (Jürgenson, 2016).

The construction of a new railway route (Rail Baltic) is under discussion in Estonia. It will bring about changes in land ownership and use. Landowners who will be harmed from the new route are dissatisfied. They can lose all or part of their property or the property can be fragmented after the implementation of the new railway route. The building of Rail Baltic in Estonia and landowners' dissatisfaction with the new route has highlighted the question of whether Estonia needs land consolidation as a tool for land acquisition. The aim of this paper is to outline the impact on land ownership and use which occurs with the implementation of a

new railway route and discuss the options for using the tool of land consolidation for mitigating the obstacles of land ownership and use.

2. RAIL BALTIC

Rail Baltic is an international rail connection that will connect Estonia with Central and Western Europe and its neighbours (Rail Baltic, 2015). Passenger trains will travel at a speed of up to 240 km/h. The maximum speed of freight trains will be 120 km/h. Rail Baltic is an international project that connects the three Baltic States (Figure 1), and Finland and Poland are involved as partners.

Rail Baltic will be a north-south railway route meant to serve as a connecting link between Scandinavia and Western Europe. The projected Rail Baltic route is presented in Figure 1. The total length of the route is approximately 700 kilometres. The Estonian part is approximately 200 kilometres. In Estonia, the route runs through three counties (Harju, Rapla, and Pärnu) and through 22 municipalities. The railway has no level crossing, meaning it will be safer than current Estonian railways, but at same time it is more disruptive for landowners and land users. The work will be performed in two stages: planning/design and public procurements/construction. The planned time of completion is around 2022 to 2025.

Figure 1. Projected route of Rail Baltic (New Europe Investor, 2015)

Under discussion were several options for possible track corridors. The following aspects were primarily considered when elaborating the route options: *i*) location with regards to inhabited areas (a buffer zone of at least 500 meters); *ii*) locations with regard to Natura 2000 areas, protected areas and the habitats of protected species; *iii*) location with regards to cemeteries, heritage conservation areas and objects protected under heritage conservation; *iv*) technical suitability of the route; and *v*) expenses and socioeconomic impact. On the basis of the assessment criteria, route options were chosen to create the smallest the negative impact for all the assessed impacts (Rail Baltic, n.d).

However, the construction of Rail Baltic highlights influences in the patterns of land ownership and land use. Rail Baltic affects properties, cadastral units, land holdings and administrative units such as municipalities and counties. Rail Baltic will create different kinds of impact.

3. PRELIMINARY INVESTIGATION: THE IMPACT OF RAIL BALTIC ON LAND OWNERSHIP AND USE

A preliminary investigation was made to show how the implementation of Rail Baltic will influence land tenure. It was only a preliminary investigation because there is only a corridor for the 66-metre route (33 metres on both sides); the technical project will fix the real route inside this corridor. However, this investigation offers a preliminary overview of the route's disruption capabilities.

The map of the planned location of Rail Baltic, the map of property boundaries and the map of arable land parcels from the Agricultural Registers and Information Board were used. The Estonian Basic Map and orthophoto maps were used as background information. Data analyses were made with ArcMap 10.1 GIS software, where overlay and data management toolsets were used.

The direct impact is presented in Figure 2. In the two first cases the route will split the parcels. In the third case, the route will decrease the size of the parcel. The last case may be most preferable if the remaining land plot is still sufficient for farming.

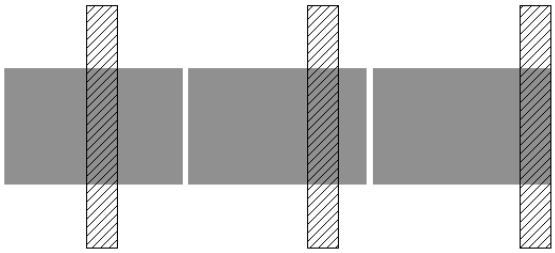

Figure 2. Different scenarios of direct impact

Indirect impact and a combination of direct and indirect impact is presented in Figure 3. The route crosses one real property (part A), whereby one real property consists of three separate cadastral units. The use of separate land plots will be disrupted after the route splits them. The cost of future land use depends on the length of the bypass. A combination of direct and indirect impact is described in Part B. The route will separate one property that consists of many cadastral units. Additionally, the route will split one cadastral unit.

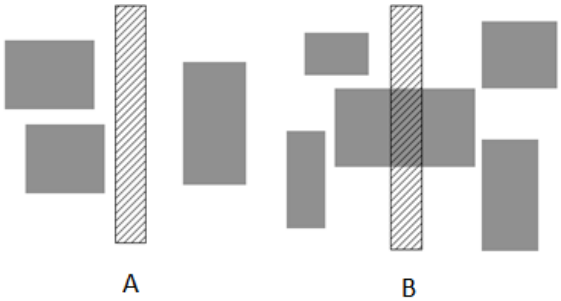

Figure 3. Indirect impact and a combination of direct and indirect impact

Parcels were divided according to their status: registered or not registered in the title book. Ordinarily, cadastral units are registered in the title book. There has been no need to register in the title book those cadastral units which belong to the state. There are additional land plots which have not yet been reformed and for which cadastral units have not been formed. Such land areas are excluded because borders of plots are missing and it is not possible to count this kind of plot.

Intended use comes from the cadastre and is based on the Estonian Government's regulation number 155 "Intended use of cadastral units and bases for determination" of 23 October, 2008 (Vabariigi Valitsus, 2008). According to this regulation, there are 12 classes of intended use. This work names only three of them: profit yield land, transportation land and residential land. Other intended uses are grouped together.

Table 1 gives an overview of the distribution of directly affected parcels by intended use. The total number of directly affected plots is 798. Most (491) are agricultural and forest land plots. More than 60% of land plots belong to this group. The next group covers the land plots with transportation land as their intended use. Subsequently is the group of residential land plots, whereby nine have buildings. There are 61 land plots which belong in the group of other intended uses.

Table 1. Distribution of directly affected parcels by intended use

Intended use		**Parcels in title book**	**Parcels not in title book**	**Total number of parcels**
Profit yield land (agricultural land + forest land)		437	54	491
Transportation land		92	54	146
Residential land		93	7	100
	Residential land without buildings	84	6	90
	Residential land with buildings	9	1	10
Other intended uses		55	6	61
Total		**677**	**121**	**798**

Table 2 consists of the information for the number of affected properties and parcels. The numbers of affected properties and parcels are different because one property can consist of many parcels. The number of affected properties is 683. The number of affected parcels is 1,265. It consists of both those parcels which are registered in the title book and those which are not registered.

There are 617 properties which are directly affected. The total number of parcels affected is 798. Mostly the route will split them or the parcel area will be decreased. Additionally, there are 66 properties which are affected indirectly. These 66 properties consist of 467 parcels. Therefore, these properties do not lose area, but the parcels which belong to the one property will be situated on different sides of Rail Baltic.

Table 2. Number of properties and parcels affected by Rail Baltic

Description					Quantity
Number of properties affected					683
	Number of properties affected directly				617
		Number of parcels affected (both in the title book and not in the title book)			1,265
			Parcels affected directly		798
				Parcels split	451
				Parcels with only reduction	325
				Parcels totally in the RB route	22
	Number of properties affected indirectly				66
		Parcels affected indirectly			467

Table 3 gives an overview of the situation of land use. The table shows the information about the number of affected landholdings and arable land parcels. The number of affected landholdings and arable land parcels is different because one landholding consists of many arable land parcels. The total number of landholdings affected is 179 and the total number of arable land parcels affected is 5,286. The number of landholdings affected directly is 63 and consists of 132 arable land parcels. The route will split 95 arable land parcels and 37 arable land parcels will lose some area. The number of landholdings affected indirectly is 116 and consists of 5,154 arable land parcels. This means that those landholdings do not lose area, but arable land parcels belonging to one landholding will be situated on a different side of Rail Baltic.

Table 3. Number of landholdings and arable land parcels affected by Rail Baltic

Description				Quantity
Number of landholdings affected				179
	Number of landholdings affected directly			63
		Number of arable land parcels affected directly		132
			Parcels split	95
			Parcels with only reduction of area	37
	Number of landholdings affected indirectly			116
		Parcels affected indirectly		5,154

4. DISCUSSION

Large-scale infrastructure projects require the acquisition of land. These projects create land fragmentation, which has an impact on the structure of land ownership and use. As was indicated, the implementation of Rail Baltic generates different kinds of impact on land ownership and land use. The impact can be direct, indirect or combined.

There is a need for space for the implementation of Rail Baltic. One option is to use voluntary transaction, simply buying and selling. The second option, if the landowner does not agree to the first option, is to use land expropriation. Voluntary transaction may be suitable in some cases. Meanwhile, the first two options may create land fragmentation. If there is the need only for part of the parcel, then the land parcel will be divided; it is possible that the landowner will own separate land plots on both sides of the route. This kind of result is not economically viable.

There are some examples for the construction of a highway where the Estonian Road Administration has used voluntary transactions for land acquisition. The situation is presented in Figure 4. The former situation is presented in Picture A, where properties 1 and 2 are shown. The new highway track will divide these properties. The latter situation is presented in Picture B. After the building of the highway, the owner of the first property owns two separate parcels (1.1 and 1.2) and the owner of the second property owns two separate parcels (2.1 and 2.2) as well. Usage of land is disrupted for both landowners. They have to go to the other side of the highway to access their second parcel; moreover, they must use special crossings.

A B

Figure 4. Example of highway construction in Estonia.

The use of land consolidation for the acquisition of land is possible as well. The tool of land consolidation is more comprehensive if we compare it with voluntary transactions and expropriation. It can provide better structure of land ownership and use after the implementation of the object of the infrastructure. It can, in particular, reduce the negative effects which come with large infrastructure projects. Land consolidation provides concentration of the land which belongs to one owner on one side of the railway track, preventing the need to drive to the other side of the railway track. It helps find the proper solution for access. Additionally, land consolidation, compared to other compensation methods, takes into account the situation where land area will not be allocated for Rail Baltic but land use conditions will be changed. This is the case if there is only indirect impact on land ownership and future land use.

The implementation of land consolidation requires proper regulation. The Land Consolidation Law in Estonia went into effect in 1995. Unfortunately, land consolidation has rarely been used in Estonia. It has been discussed whether this law should be repealed due to its lack of usefulness. Fortunately, the Land Consolidation Law is still valid. However, some challenges will be faced if the Land Consolidation Law is to be used in the context of Rail Baltic. This law was adopted in 1995 and only minor changes have been made since then. These regulations are not appropriate for today's context. Therefore, theoretically, it is possible to use this law as it was written, but doing so is questionable because it is too complicated, some regulations are too bureaucratic and some essential regulations are missing (Jürgenson, 2016). For example, land consolidation is under the authority of the local government. However, the acquisition of land for Rail Baltic is in the state interest. The route of Rail Baltic is one integrated object which passes through 22 local government districts. According to the Land Consolidation Law, at least 22 separate land consolidation areas must be made; meanwhile, these separate land consolidation areas would not be functional in that context. Some problems are not restricted

to following the borders of local government districts. One example of how the route of Rail Baltic passes through local government districts is presented in Figure 5. According to this situation, the formation of three different land consolidation areas following the local government borders is not an effective solution.

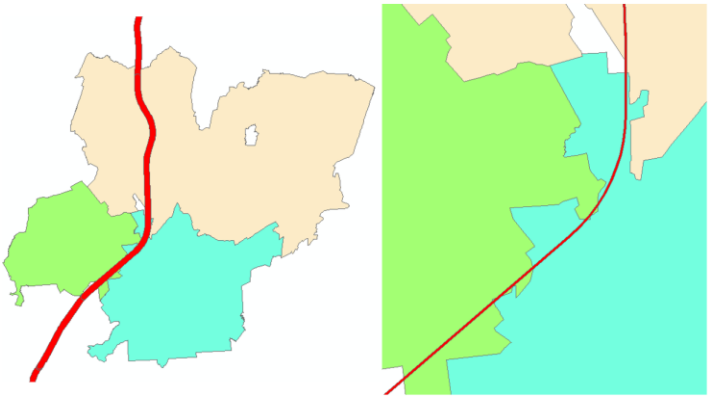

Figure 5. Rail Baltic passes through different local government districts

Today, there is understanding on the state level that Estonia needs the tool of land consolidation at least for the implementation of large infrastructure objects. The Land Board has made some amendment proposals for making the Land Consolidation Law more effective for this kind of project. The idea is to bring the responsibility of the land consolidation project to the state level if there is a need for a new large infrastructure object. The Ministry of Economic Affairs and Communication has sent these proposals to the Government. Different ministries and authorities will consider these amendments and after that, the amendments will be sent to the Parliament.

The question is whether these amendments will be adopted in time. According to the plan of action for Rail Baltic, land acquisition has to be realized by 2016-2018 (Rapla maakonnaplaneering Rail Baltic raudtee trassi koridori asukoha määramine, 2016). The process of law modification takes time. In addition to the improvement of the Land Consolidation Law, land consolidation projects also take time.

5. CONCLUSION

Implementation of objects of infrastructure, including Rail Baltic, need land. Land acquisition for a new infrastructure object influences land ownership and land use. This study demonstrated that many properties will be affected when Rail Baltic is built. The impact on the properties and land use will be different. In some cases, if there is a need for land acquisition, voluntary buying and selling can be appropriate. However, in some cases, after the transaction, the land use pattern may be worse than it was before the land acquisition. There is an understanding on the state level (the Ministry of Economic Affairs and Communication, the Land Board) that the use of the tool of land consolidation can help solve this complicated situation. Unfortunately, the Land Consolidation Law needs modification; amendments have been sent to the Government. Hopefully, the ministries will work quickly and there is the ability to send these amendments to the Parliament very soon. Otherwise, the use of land consolidation for the building of Rail Baltic will be unrealistic because according to the action plan of the Rail Baltic, the period of land acquisition is 2016-2018.

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