

Analysis of the Impact of Rebana Priority Areas on Phenomenon of Landuse Changes in Indramayu Regency

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Key words: Cellular Automata, Landuse Changes, Indramayu Regency

SUMMARY

The Government of Indonesia is committed to increasing national production and ensuring the adequacy of domestic food while at the same time contributing to the condition international food amid the threat of a global food crisis. In 2019, national rice production was consistent at 31.3 million tons with West Java Province being third with the highest rice production figures (indonesiabaik.id, 2022). In West Java Province itself, Indramayu Regency is the highest rice production producing area with a rice harvest area of 226,626 hectares (ha) with yields in 2020 of 1,363,312 tons of dry milled grain (GKG) which is equivalent to 782,132 tons of rice (BPS, 2020). This is what makes Indramayu Regency part of the National rice barns. Population growth is a phenomenon that cannot be avoided. This phenomenon is running rapidly accompanied by development activities in various fields which can lead to increased demand for land. The increase in demand for land has an effect on the conversion of agricultural land to non-agriculture (Lestari, 2009). If this cannot be controlled, it can threaten capacity in food supply (Iqbal and Sumaryanto, 2007). The conversion of agricultural land to the industrial sector in Indramayu Regency is increasingly inevitable with the Presidential Regulation of the Republic of Indonesia Number 87 of 2021 concerning the Acceleration of the Development of the Rebana Area and the Southern Part of West Java. Through the Presidential Decree it is explained that Indramayu Regency is part of the Rebana Priority Area. Where Indramayu Regency has a role in spatial structure as a Regional Activity Center (PKW) with a role to serve national scale activities, together with Patimban and Kadipaten-Kertajati. Indramayu Regency is planned to have 6 Industrial Allotment Areas (KPI), which include the Cages KPI, Patrol KPI, Losarang KPI, Balongan KPI, Tukdana KPI, and Cipali Indramayu KPI. Change data in Indramayu Regency is used to predict land cover in 2031 and find out how much change will occur in Indramayu Regency. The prediction was carried out using the Cellular Automata-Markov method with 4 land cover classes, namely built-up land, undeveloped land, vacant land, and bodies of water. The results of the land cover prediction will be compared with the Indramayu District Spatial Planning up to 2031, related to the spatial pattern plan to see how it fits with the government's desired plan. That way the research aims to determine the dynamics of land use change, especially on paddy agricultural land to support food self-sufficiency and on industrial land to support the success of Rebana Area Development.

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SUMMARY

Pemerintah Indonesia memiliki komitmen dalam meningkatkan produksi nasional dan menjamin ketercukupan pangan dalam negeri sekaligus memberikan kontribusi bagi kondisi pangan internasional di tengah ancaman krisis pangan global. Pada tahun 2019, hasil produksi beras nasional konsisten berada di angka 31,3 Juta ton dengan Provinsi Jawa Barat berada pada urutan ketiga yang memiliki angka produksi padi tertinggi (indonesiabaik.id, 2022). Di Provinsi Jawa Barat sendiri, Kabupaten Indramayu merupakan daerah penghasil produksi padi tertinggi dengan luas panen padi 226.626 hektar (ha) dengan hasil pada tahun 2020 yaitu 1.363.312 ton gabah kering giling (GKG) yang setara dengan 782.132 ton beras (BPS, 2020). Hal ini yang menjadikan Kabupaten Indramayu sebagai bagian dari lumbung padi Nasional. Pertumbuhan penduduk merupakan sebuah fenomena yang tidak dapat dihindari. Fenomena ini berjalan dengan cepat diiringi dengan aktivitas pembangunan dalam berbagai bidang yang dapat menyebabkan meningkatnya permintaan lahan. Peningkatan terhadap permintaan lahan berpengaruh terhadap terjadinya alih fungsi lahan pertanian menjadi non pertanian (Lestari, 2009). Apabila hal ini tidak dapat dikendalikan dapat mengancam kapasitas dalam penyediaan pangan (Iqbal dan Sumaryanto, 2007). Alih fungsi lahan pertanian ke sektor industri pada Kabupaten Indramayu semakin tidak bisa dihindari dengan adanya Peraturan Presiden Republik Indonesia Nomor 87 tahun 2021 tentang Percepatan Pembangunan Kawasan Rebana dan Kawasan Jawa Barat Bagian Selatan. Melalui Perpres tersebut dijelaskan bahwa Kabupaten Indramayu merupakan bagian dari Kawasan Prioritas Rebana. Dimana Kabupaten Indramayu memiliki peran secara struktur ruang sebagai Pusat Kegiatan Wilayah (PKW) dengan peran untuk melayani kegiatan skala nasional, bersama dengan Patimban dan Kadipaten-Kertajati. Kabupaten Indramayu direncanakan akan memiliki 6 Kawasan Peruntukan Industri (KPI) yang diantaranya yaitu KPI Kerangkeng, KPI Patrol, KPI Losarang, KPI Balongan, KPI Tukdana, dan KPI Cipali Indramayu. Data perubahan di Kabupaten Indramayu digunakan untuk memprediksi tutupan lahan pada tahun 2031 dan mengetahui seberapa besar perubahan yang akan terjadi di Kabupaten Indramayu. Prediksi dilakukan menggunakan metode Cellular Automata-Markov dengan kelas tutupan lahan sebanyak 4 kelas yaitu lahan terbangun, lahan tidak terbangun, lahan kosong, dan badan air. Hasil prediksi tutupan lahan tersebut akan dibandingkan dengan RTRW Kabupaten Indramayu sampai dengan tahun 2031, terkait rencana pola ruang untuk melihat seberapa sesuai dengan rencana yang diinginkan pemerintah. Dengan begitu dalam penelitian bertujuan untuk mengetahui dinamika perubahan guna lahan terutama pada lahan pertanian sawah untuk mendukung kemandirian pangan dan pada lahan industri untuk mendukung kesuksesan Pembangunan Kawasan Rebana

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1. Introduction

1.1 Background

The Indonesian government is committed to increasing national production and ensuring the adequacy of domestic food while at the same time contributing to international food conditions amid the threat of a global food crisis. In 2019, national rice production was consistent at 31.3 million tons with West Java Province being third with the highest rice production rate (indonesiabaik.id, 2022). In West Java Province itself, Indramayu Regency is the region that produces the highest rice production with a rice harvest area of 226,626 hectares (ha) with yields in 2020 of 1,363,312 tons of dry milled grain (GKG) which is equivalent to 782,132 tons of rice (BPS, 2020). This is what makes Indramayu Regency part of the National Rice Barn.

Population growth is a phenomenon that cannot be avoided. This phenomenon is running rapidly accompanied by development activities in various fields which can lead to increased demand for land. The increase in demand for land has an effect on the conversion of agricultural land to non-agriculture (Lestari, 2009). If this cannot be controlled, it can threaten capacity in food supply (Iqbal and Sumaryanto, 2007).

The conversion of agricultural land to the industrial sector in Indramayu Regency is increasingly inevitable with the Presidential Regulation of the Republic of Indonesia Number 87 of 2021 concerning the Acceleration of the Development of the Rebana Area and the Southern Part of West Java. Through the Presidential Decree it is explained that Indramayu Regency is part of the Rebana Priority Area. Where Indramayu Regency has a spatial structure role as a Regional Activity Center (PKW) with a role to serve national scale activities, together with Patimban and Kadipaten-Kertajati. Indramayu Regency is planned to have 6 Industrial Designated Areas (KPI), which include the KPI Cages, KPI Patrol, KPI Losarang, KPI Balongan, KPI Tukdana, and KPI Cipali Indramayu.

That way the research aims to determine the dynamics of land use change, especially on paddy agricultural land to support food self-sufficiency and on industrial land to support the success of the Rebana Area Development.

1.2 Problem Formulation

The problem of land conversion in Indramayu Regency has an influence on food security and the sustainability of industrial growth in Indramayu Regency to the National. From this incident, the formulation of the problem in this study is "The magnitude of the impact of land conversion on the availability of paddy fields and the presence of industry in Indramayu Regency is not known with certainty, even though this can be input in increasing the role of spatial planning policies in controlling spatial use in the Regency. Indramayu."

2. Literature Review

2.1 Rebana Priority Area

The Rebana area contains project plans and programs to be implemented in the 2021-2030 period. Located in 7 (seven) regencies/cities in West Java Province, including Subang Regency, Indramayu Regency, Majalengka Regency, Sumedang Regency, Cirebon Regency, Kuningan Regency, and Kota Cirebon. There are 13 (thirteen) development points for Industrial Designated Areas (KPI). There are 3 (three) area development points in Subang Regency, 6 (six) area development points in Indramayu Regency, 2 (two) area development points in Majalengka Regency, 1 (one) area development point in Sumedang Regency, and 1 (one) area development point in Cirebon Regency. The entire development of the area is based on eco-industry, which is carried out through the construction of an eco-industrial park or an environmentally sound industrial area.



Figure 1.2 Map of the Rebana Area Spatial Pattern

Source: Regulation of the President of the Republic of Indonesia Number 87 of 2021 concerning the Acceleration of the Development of the Rebana Area and the Southern Part of West Java

2.2 Utilization of Cellular Automata (CA) in Land Cover Modeling

Cellular Automata is a dynamic model in the form of a grid with spatial interactions between space, time and conditions. CA models have been widely applied in the simulation and prediction of urban expansion as well as research related to land use change (Baja, 2012). CA results can provide significant results to describe complex land use evolution. In the CA process, the state of each cell changes over time. This situation is determined by special provisions in the modeling (driving factors) where a number of cells will evolve from a dynamic system through interactions that occur between these cells (Yang, Su, Chen, Xie and Ge,; 2016

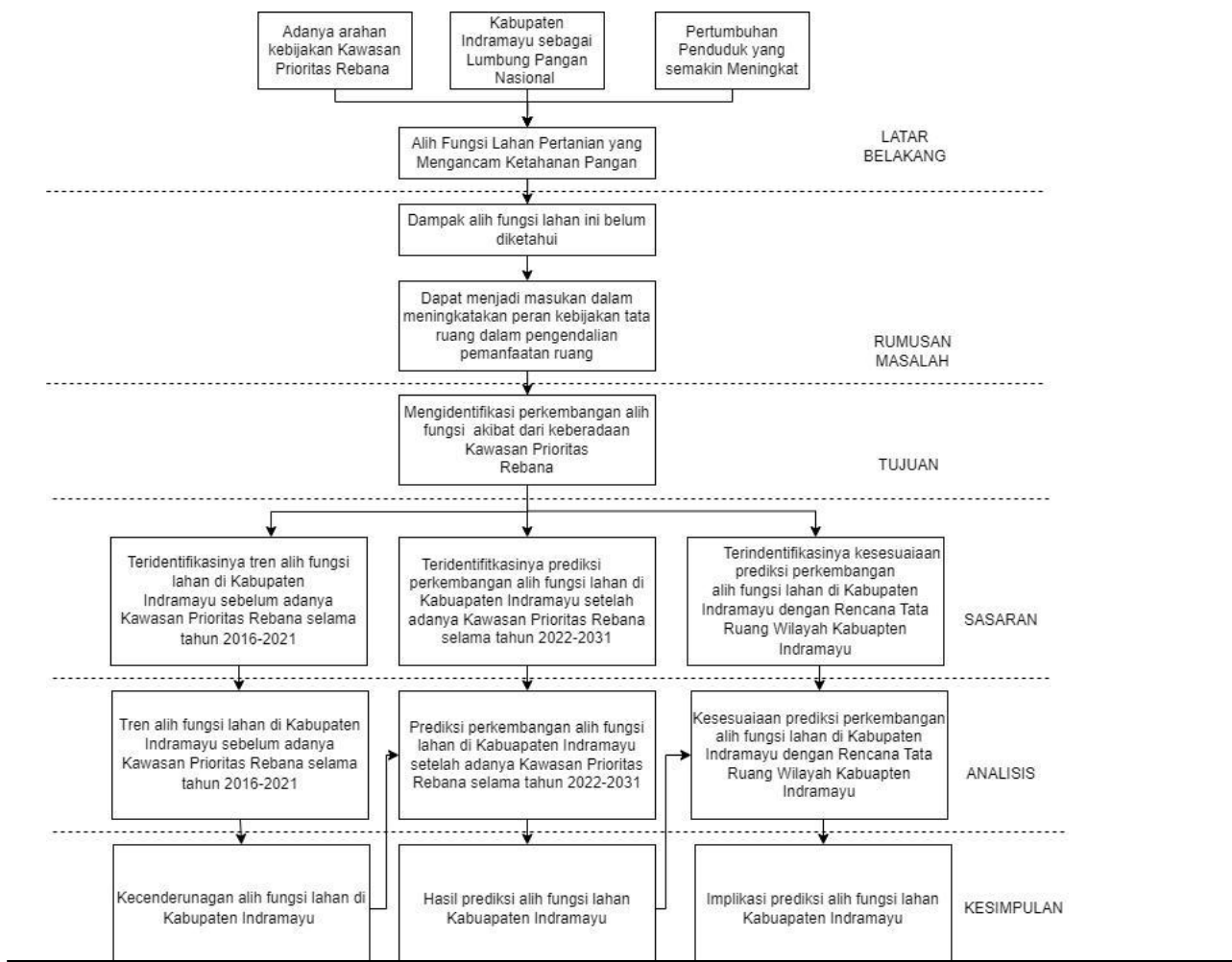
in Rashad, 2019). There are several elements in CA, namely, cells, conditions, tensions, transition rules and time steps:

- Cell (Cell): is a two-dimensional grid of cells arranged in spatial tessellation. The cell rooms are each square in shape representing an area ranging from 50 to 500m². However, these sizes will vary according to the application requirements.
- Condition (state): is a form of defining the attributes of a system where each cell can take one condition in a series of conditions at a certain time.
- Neighborhood : is a series of cells that interact with each other. Land use in one pixel will be affected by land use in neighboring pixels
- Transition rules define the cell's change response in response to the current state and its neighboring cells
- Time (time-step), is a time variable that needs to be defined in carrying out the calculation process in the CA model.

3. Research Method

3.1 Framework and Hypotheses

The following is the framework of this research.



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3.2 Stages of Data Analysis

The analytical method used to answer the formulated research objectives. The following is a description of the analysis used in the study

1. Descriptive Analysis

Descriptive analysis is used to display descriptions, systematic, factual and accurate images of the facts of the phenomenon under study.

2. Spatial Analysis

Spatial analysis was used to compare land use in 2016 and 2018 with the LandUseSim application.

3. Content Analysis

The analysis used to describe the RTRW of Indramayu Regency is coupled with the predicted results of land use.

4. Result and Discussion

4.1 Overview Research Areas

The scope of this research area is Indramayu Regency. Administratively, Indramayu Regency is in West Java Province, Indonesia. In this study, the administrative boundaries of Indramayu Regency will be used as a research delineation.

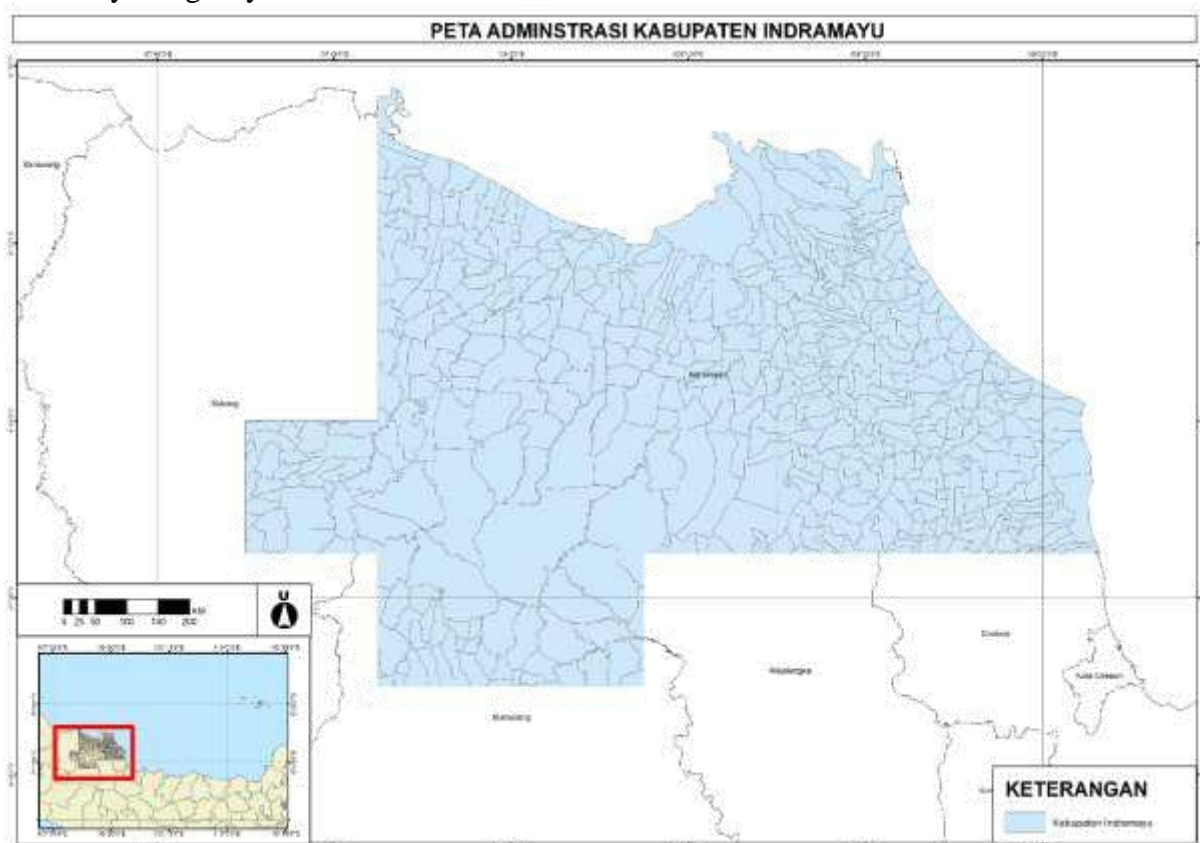


Figure 1.3 Delineation Map of Indramayu Regency

Source: tanahair.indonesia.go.id, 2022

4.2 Data Input and Extraction

On this research, the data used as input materials are land use data in 1994, land use data in 2008, and land use data in 2015. In addition, for spatial pattern maps it is also necessary to analyze the conformity of plans made with land use predictions in 2011 to 2031.

Table 1.1 Landuse Changes in Cirebon Regency

Table of Landuse Changes in Cirebon Regency (Ha)						
Year	Paddy Field	Water Bodies	Settlement	Plantation	Forest	Fields
1994	133176	18780	16627	14903	12649	7178
2008	132292	20592	18418	15234	10830	6947
2015	132097	20628	18625	15234	10776	6947

Source: Widiatmaka dan Wiwin Ambarwulan, 2017

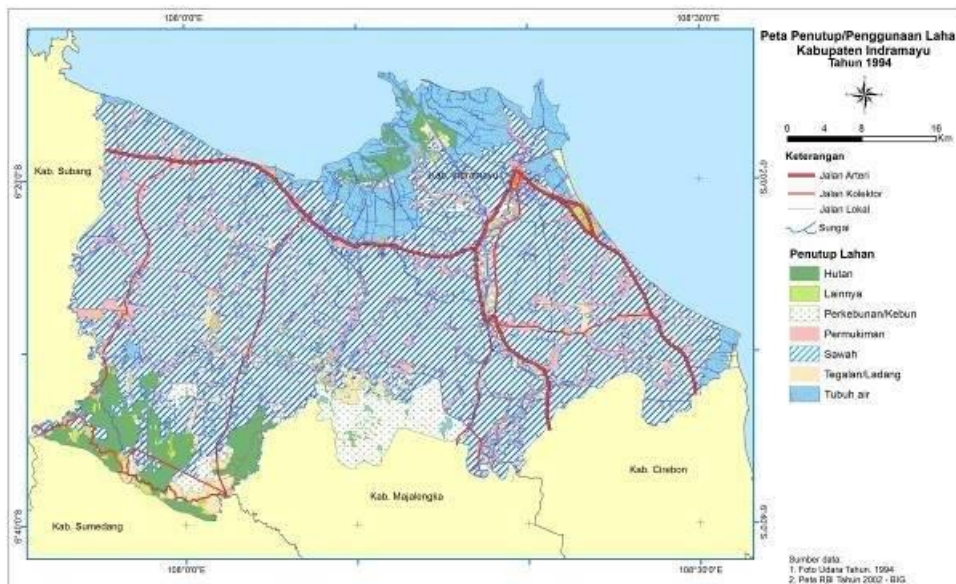


Figure 1.3 Map of land use in Indramayu Regency 1994

Source: Widiatmaka dan Wiwin Ambarwulan, 2017

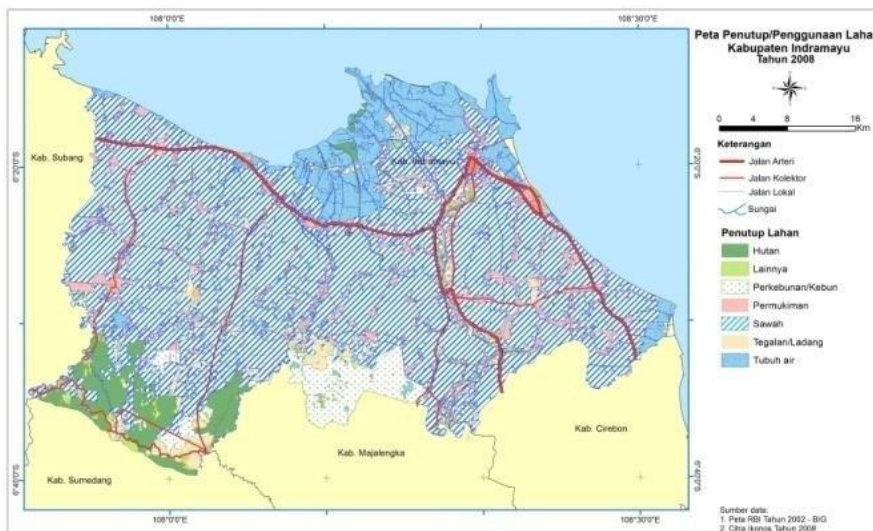


Figure 1.4 Map of land use in Indramayu Regency 2008
Source: Widiatmaka dan Wiwin Ambarwulan, 2017

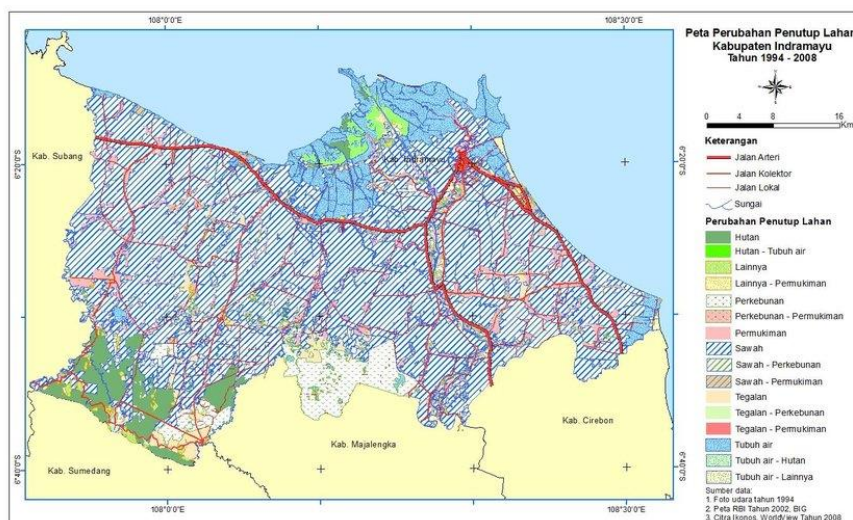


Figure 1.5 Map of land use change in Indramayu Regency 1994-2008
Source: Widiatmaka dan Wiwin Ambarwulan, 2017

4.3 Data Analysis

Trends and Predictions of Land Use Change in 2011-2031

Based on land use data in 1994, land use data in 2008, and land use data in 2015, the trend of land change from 1994-2015 was obtained using linear regression analysis. In the paddy field area, significance has experienced a quite extreme downward trend from year to year. It is

predicted that in 2011-2031 there will be an increasingly extreme decline threatening the availability of paddy fields in Indramayu

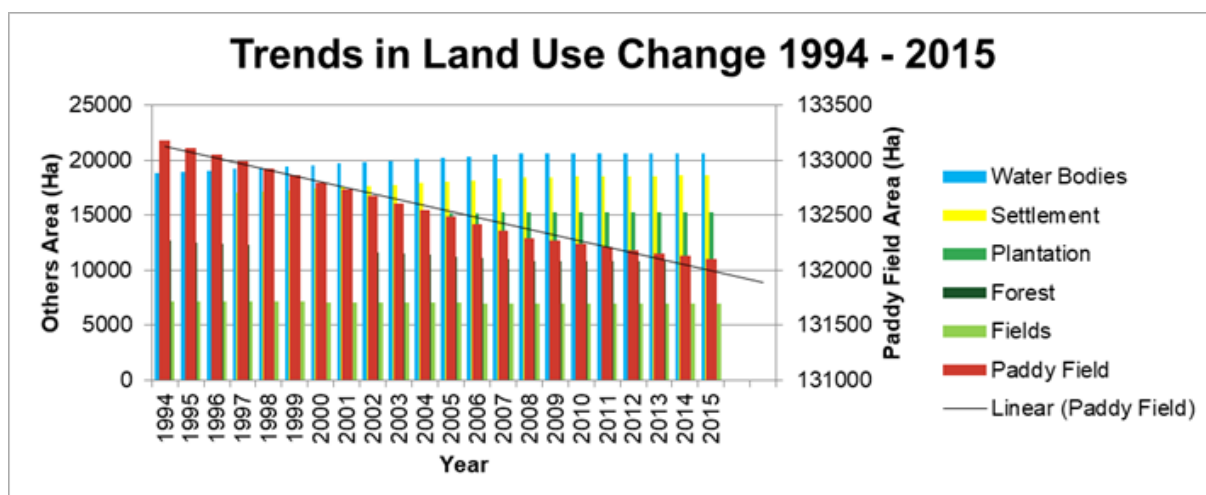


Figure 1.6 Trends land use change in Indramayu Regency 1994-2015

Source: Personal Analysis, 2023

5. Conclusion and Recommendation

The extreme decline in agricultural land can affect Indramayu's food security so that Indonesia becomes a national food barn. Even though the spatial pattern has been allocated agricultural land that cannot be changed, this needs to be of great concern so that the prediction of land change does not threaten food security.

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REFERENCES

- Rashad, I (2019). *Prediksi Perubahan Penggunaan Lahan pada Kawasan Segitiga Emas Rebana dengan Metode Cellular Automata*. Insitut Teknologi Bandung
- Peraturan Presiden Republik Indonesia Nomor 87 tahun 2021 tentang Percepatan Pembangunan Kawasan Rebana dan Kawasan Jawa Barat Bagian Selatan.
- Lestari, T. 2009. Dampak Konversi Lahan Pertanian Bagi Taraf Hidup Petani. Laporan Skripsi. Bogor: Institut Pertanian Bogor.
- Muttaqien et all. 2020. ANALISIS KESESUAIAN LAHAN TANAMAN PADI YANG BERKELANJUTAN DIKABUPATEN INDRAMAYU. Malang: Universitas Brawijaya

Muridianingsih et al. 2020. ANALISIS SPASIAL PERUBAHAN PENGGUNAAN LAHAN PERTANIAN UNTUK Mendukung Kemandirian Pangan di Kabupaten Indramayu. Bogor : Institut Teknologi Bandung

INDRIANAWATI, NADHIYA D. MAHDIYYAH. 2019. Dampak Pertumbuhan Penduduk Terhadap Alih Fungsi Lahan Pertanian di Kabupaten Cirebon Tahun 2010-2016. Bandung : - Institut Teknologi Nasional

Kamilya, Supreti. 2021. CELLULAR AUTOMATA: CHAOS,

CONVERGENCE AND UNIFICATION. SHIBPURHOWRAH : DEPARTMENT OF INFORMATION TECHNOLOGY INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY,

Widiatmaka dan Wiwin Ambarwulan, 2017. ANALISIS SPASIAL PERUBAHAN PENGGUNAAN LAHAN PERTANIAN UNTUK Mendukung Kemandirian Pangan di Kabupaten Indramayu.

BIOGRAPHICAL NOTES

Ayubella is currently completing an undergraduate degree program on Urban and Regional Planning at the Bandung Institute of Technology and is currently pursuing a master degree program on Urban Design at the Bandung Institute of Technology through the fast track program. Have an interest in research on public policy and regional planning using the use of GIS.

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