Towards UAV-based Land Tenure Data Acquisition in Rwanda: Needs Assessment and Technology Response

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SUMMARY

The domain of land administration is currently being challenged: conventional western-oriented land administration systems have mostly failed to supply their expected results. As a response to the urgent need to record the millions of unregistered land parcels, governments and the international development community are seeking to design appropriate policies and leverage innovative technologies. Amongst others, Unmanned Aerial Vehicles (UAVs) are emerging as a tool for alternative land tenure data acquisition. The advent of low cost, reliable and lightweight UAVs have created new opportunities for collecting timely, tailored and high-quality geospatial information. Even though UAVs appear a promising technology, it is not clear to what extent they meet the needs of communities and governments in the land sector. Furthermore, major bottlenecks are evident: cumbersome regulatory frameworks and undeveloped ground truthing strategies, amongst others, are issues currently impeding large-scale implementation. Thus, the question remains whether the application of UAVs can meet contemporary land administration requirements in developing countries.

This question creates the motivation of this paper and is considered in the context of Rwanda. Major land reform in Rwanda has been achieved through legal and policy reform. A large-scale Land Tenure Regularisation Program (LTRP) used a systematic and participatory approach to register over 10 million parcels of land, providing the country with (almost) complete cadastral coverage. Nonetheless, new challenges have emerged as greater awareness of the value of land in land-scarce Rwanda has fuelled an increase in land disputes: it remains uncertain as to what extent the land administration system established by the LTRP is sustainable.

A multi-disciplinary approach is employed. A comprehensive needs assessment with various stakeholders across different levels in Rwanda is undertaken: 22 groups/organisations across

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government, private sector, academia and local communities participated in field work activities. Data was collected through a series of workshops and local interviews. The outcomes of the needs assessment, as well as a large number of UAV test flight missions, provide the profound pre-requisites for the design of UAV workflows. A key undertaking is to insure that development is in service of societal needs, and not a mere consequence of the technology's characteristics. This study sheds light on the needs assessment and design process of UAV-based data acquisition workflows and reveals results of data collection activities and initial UAV tests in Rwanda. Insights into operational challenges and data quality measures will be presented. This research is associated with the EU H2020 project "its4land" that aims to develop an innovative suite of land tenure recording tools.