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EXTENDED ABSTRACTS BOOK



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GIS-BASED MCDA APPROACH FOR FELDA LAND MODEL DEVELOPMENT

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ABSTRACT

Long-term development has been a top priority for planners in developed countries, as it is a process that requires resources that are compatible with the surrounding environment such as those in the physical, social, institutional, and economic aspects. FELDA plays a proactive role especially to plan, generate and implement land development strategy through plantation projects and poverty eradication programs in rural areas. The transformation of FELDA lands is a crucial and significant issue that must be addressed for the success of sustainability and resilient settlement programs. Hence, there is a need to find alternatives, planning, and solutions to enforce the potential of FELDA's lands towards the highest and best use and enhance the life quality of its settlers. This paper attempts to determine suitable land areas and produce alternative scenarios of feasible developments using the Geographical Information System (GIS)-based Multi Criteria Decisions-Making Analysis (MCDA) approach. In this study, a framework for FELDA land development was applied using an integrated approach of GIS and MCDA techniques as well as UAV technology for data collecting. GIS-based MCDA approach was used to conduct geospatial analyses for evaluating land potential levels and estimate High Best Use (HBU) returns based on what if scenarios. UAV technology was applied to acquire spatial data of FELDA Bukit Rokan areas with a very high-resolution image. The spatial data from UAV imagery was extracted according to a predefined classification. The data were divided into two groups, namely crop areas (plantation areas) and settlements, to get the required outcomes of the land model development. The analysis of GIS-based MCDA has produced the potential area for crops and land development of FELDA. The anticipated results form a composite map of physical growth in the future.

Keywords: FELDA; highest and best use; MCDA, GIS

1. INTRODUCTION

Multi-Criteria Decision Analysis (MCDA) analysis has been used with Geographical Information System (GIS) integration to analyze spatial issues. The combination of both GIS-MCDA creates a powerful analysis tool that enables the construction of a sizable database. MCDA is an approach to combine all the important spatial factors and produces a map with the best location. Spatial MCDA is the method to solve spatial decision-making deriving from multiple criteria (Otgonbayar et al., 2017). This approach has also been used to search the appropriate sites for residential areas based on multiple factors namely, sustainable development (Shaker et al., 2017), sustainable construction management (Erdogan et al., 2019), land suitability analysis for maize production (Habibie et al., 2021), determination of



agricultural land suitability (Everest et al., 2021), landfill site selection (Alkaradaghi et al., 2020), land-use planning (Masoudi et al., 2021) and land suitability method (Mugiyo et al., 2021). Generally, MCDA approach is used to develop a common suitability index which combines factors in the land analysis for potential land uses. Therefore, the aim of this study was to determine the model suitability of land development using integrated systems.

2. METHODOLOGY

2.1 Data Acquisition Using UAV Technology

Data acquisition was conducted on settlements and plantation areas of Bukit Rokan, using UAV technology. The preparation of flight planning was weighed in prior to flight missions. This process ensured that all parameters such as flight altitude, percentage overlapping of side and front, and coverage of study area had been configured before the data were acquired. In this study, the flight path of the site area was performed using stereo flying mode at 200m flying height. The image overlapping was set at 85% front overlap and 75% side overlap which covered the delineated areas.

2.2 Weighting the Criterion Map

The weighting criteria are an additional important step in generating the composite map of crop land suitability. It is because the five criterion maps of crop land suitability assessment have varying degrees of importance in the overall assessment. As a result, relative importance exercises are required by using the MCDA method.

2.3 Generating a Composite Map

The final stage is generating the composite map by applying the standardised scores for each sub-criterion of the five criterion maps (in the GIS raster system) and the weights for each criterion map. This process is a weighted linear combination (WLC) or scoring method that is based on the concept of a weighted average.

3. FINDINGS

Generating sustainability high-best use (SHBU) to advance FELDA toward resilient settlement plans, sustainable agriculture, and leadership in modern economic ventures is significant to bridge the divide between urban and rural areas (Figure 1). An excellent analysis process of a GIS-based MCDA approach in handling and managing spatial decision problems such as FELDA lands development for crops (HBU Domain) and future-physical potential projects such as business center, residential compound and agro-preneur centre (Sustainability Domain).





Figure 1 The Process of Generating SHBU's FELDA Lands Development Using a GIS-based MCDA Approach

4. CONCLUSION

It is important to highlight that this study adds to the process and offers perspectives on potential directions for FELDA development in the complex digital age. The ranking of alternative crop selection in this study is indeed applying the SHBU process implemented to achieve the objectives of the study. The market prices of fruit and vegetables in Malaysia have risen by 30 to 40% recently, owing to a wetter-than-usual monsoon season, labour scarcity, and higher production costs, among other factors. Therefore, cultivating alternative interim crops at existing areas and vacant land are highly encouraged. These alternative crops can further increase productivity and innovation to yield diversification for agro-preneurs. This situation encourages the second generation of settlers and keeps them from migrating: this indicates that more economic activities must be focused on them.

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