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KICSS2024

Kedah International Conference on Social Sciences:

https://kicss2024.wixsite.com/kicss2024

e-IPH e-International Publishing House Ltd., United Kingdom

BizFame 2024: 3rd International Conference on Business Finance Management & Economics
Suan Sunandha Rajabhat University, Bangkok, Thailand, 24 & 25 October 2024

Organised by: Universiti Teknologi MARA, Kedah, Malaysia

Exploring The Sustainable and Highest-Best Use (SHBU) Model in Rural Land Management in Malaysia

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Abstract
Rural land management in Malaysia needs to embrace innovation to overcome global challenges. Therefore, this paper intends to explore sustainability using the highest and best-use (SHBU) model in managing rural land development. The SHBU conceptual model consists of five dimensions: i) Landuse, ii) Business Element, iii) Agropreneur, iv) Residential compound element, and v) Organisation management. Multicriteria Decision Making Analysis (MCDM) was used to determine the suitable land use for the case study in the FELDA settlement. The analysis indicates that the SHBU model assists in determining the sustainable and highest-best use of the land in that area.

Keywords: Rural, land management, sustainable, highest-best use, FELDA

DOI: https://doi.org/10.21834/e-bpj.v10iSI28.6967

1.0 Introduction

Rural land development focuses on settlements and agricultural areas, which are crucial for efficient management. The model for sustainability and the highest-best use (SHBU) integrates the elements of the best use of land that produces the highest profits with the elements of sustainable rural development.

1.1 Study Backgrounds

FELDA has become an established organisation that manages both the rural settlements and the crop areas. The scheme has changed the lives of landless residents by providing housing, employment, income from agribusiness shareholders, and the ownership of valuable land titles. Improving productivity and the quality of rural settlement and crop area plantation operation is one of the most difficult challenges and groundwork. Studies show that FELDA still needs comprehensive support to ensure sustainability and the highest-best use (SHBU) for cropland development (Mokhtar S. et al., 2022). There are concerns that FELDA only focuses on profitability but neglects the community's wellbeing, thus affecting sustainability (Johan, Z. J. et al., 2022). There are the needs to investigate issues and challenges, and the findings postulate that immediate resolution is vital to ameliorating settlers' wellbeing and sustaining them (Johan, Z. J. et al., 2023). For this reason, this research paper focuses on monitoring and managing the current crops and finding solutions for

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DOI: https://doi.org/10.21834/e-bpj.v10iSI28.6967

the fundamental issues and prospects of land development and the well-being of FELDA communities that rely on the cropland development-based economy. The study shall fill the gap by exploring the highest and best use of land and ensuring the sustainability of the development needs to be catered for. The paper aims to improve rural land management through the SHBU model. To achieve the aim, the objectives are: i.to explore the elements of the conceptual framework for SHBU, ii. to evaluate the rural settlement according to the SHBU elements, and iii to estimate profits (returns) for each alternative of feasible developments in the selected case study.

2.0 Literature Review

The literatures discussed and defined the terms of the highest and best use in the production of agricultural lands development. This section also identify the factors that contribute to improving agricultural development and explore some examples of successful projects that generate higher incomes for this industry sector. In a simple understanding, agricultural land development's highest and best use (HBU) is defined as the highest profit (value) or satisfaction gained from productive lands at a specific time. According to *AgAmerica Lending* (2022), the highest and best use of agricultural land emphasizes income generation and multifunctional productivity. It is income-based and measurable, generated from increased land value, multifunctional uses of lands with higher potential products and productions and market price, and other relevant elements with value attributes. Hence, to optimize the available land utilization and value, it is necessary to find the best designation and produce the highest land value by evaluating several aspects, namely, physical, legal, financial, and maximum productivity (Laena & Raflis, 2023)). According to The Appraisal Institute HBU is defined as the reasonably probable and legal use of vacant land or an improved property that is physically possible, appropriately supported, financially feasible, and that results in the highest value (Ratterman, 2022). It includes: i. Legal Acceptance Analysis (private restriction, zoning, building codes, and environmental regulation), ii. Physically possible (size, shape, terrain, and the availability and capacity of public facilities), iii. Financial acceptance (cost of land preparation, construction costs (building costs and fixed equipment costs), professional service fees, administration fees, and other costs), and iv. Maximum productivity analysis (value of land was determined based on gross development value, total development value, and minimum profit requirements). Meanwhile, according to Walacik M. et al. (2020), the concept of sustainable development involves much more than the "green" issue. "Sustainable value" can reflect not only economic issues (reflected directly by property value) but can exceed its meaning to a broader sense, including sustainable development issues (social, political, environmental directions) at the same level. Thus, it can add value to real estate analysis (mainly based on "highest and best use" assumptions).

3.0 Methodology

This study includes these research approaches:

3.1 Systematic Literature Review and Focus Group Discussion to develop the SHBU Conceptual Framework

The systematic literature review focuses on the concepts and approaches of sustainable and contemporary land development and best practices of the highest-best-use rural land management including three identified reports or documents, namely Dasar Perancangan Fizikal Negara (DPFN), Dasar Pembangunan Luar Bandar (DPLB) and FELDA's Kertas Putih. Additionaly the FGD results also incorporated to streghtened the conceptual framework. All related information was then transformed into themes and interpreted accordingly to validate the formulation of the SHBU framework. FGD comprises of the first and second generation of FELDA settlers, and division officer from the FELDA headquarters. Figure 1 demonstrates a proposed conceptual framework of the Sustainability and Highest-Best Use (SHBU) approaches based on five dimensions: FELDA industries-based crops (FLAC) and SHBU plan management (SPM) from the HBU domain. The remaining FELDA business centre (FBC), FELDA residential compound (FRC), and FELDA Agropreneur (FAgP) are from the sustainability domain.

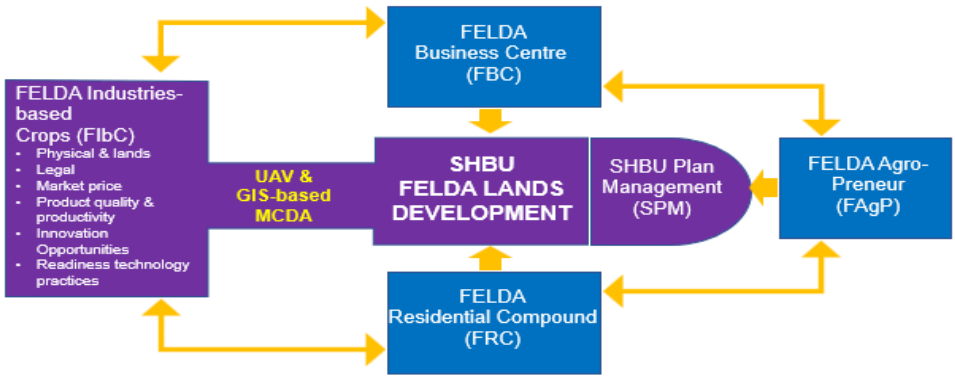

Figure 1: Five-Dimensions based SHBU Framework for FELDA Lands Development (Mokhtar S. et al., 2022).

3.2 Developing the GIS-MCDA for SHBU of Land or Crops

This research applies the GIS-based Multi-Criteria Decision Analysis Making (MCDM) approach to conduct geospatial analyses for evaluating potential land levels.

Stage 1- Assessment for Crops Available Lands by Potential Levels. The process in Figure 2 indicated the process to identify land availability for future crops or physical development.

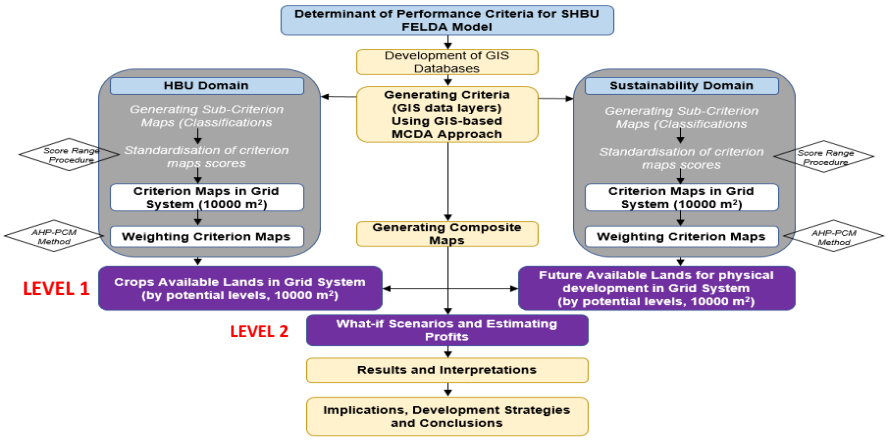

Figure 2: An entire process of executing the SHBU model based on a GIS-based MCDA approach. (Rashid M.F.A et al., 2021)

Stage 2 -Recommendations using "What-if Scenarios for Feasible FELDA Lands Development and Estimating Profits".Figure 3 is the final execution process for generating the SHBU model by working on the results obtained from Figure 2. The approach in Level 2, which creates the what-if scenarios for optimising the development of FELDA lands and gaining higher returns (net profit).

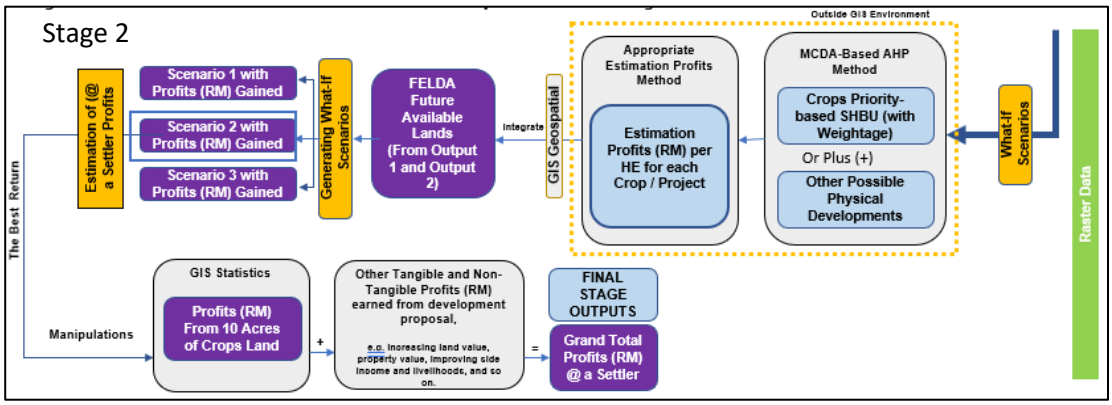

Figure **Error! No text of specified style in document.**3. A process of generating what-if planning scenarios for feasible FELDA land development and estimating profits (Rashid M.F.A et al., 2021)

3.3 Case Study Analysis based on SHBU Conceptual Framework

Furthermore, in-depth interview has been conducted in one of the case study areas which is Tanah Rancangan Bukit Rokan, Negeri Sembilan in order to proposed strategies for the model. The interview was conducted so that the the researcher can understand the scenario that currently exist in FELDA settlement within the context of the conceptual SHBU model. The interview conducted with the Manager of FELDA Bukit Rokan, the Head of Settlers and community representatives for their views, suggestions, and the challenges in adopting the SHBU model for crop plantation and future development in the area.

4.0 Findings and Discussions.

4.1 Case Study: Bukit Rokan SHBU Five-Dimensions Analysis based on an FGD

The FGD session was conducted with the representatives of FELDA Bukit Rokan. The discussion relied upon the five dimensions of the SHBU to ask for their views, suggestions, and the challenges of adopting the SHBU model for crop plantation and future development in the area. Table 1 shows the critical summary of the FGD session in Bukit Rokan.

Table 1. FGD Summary Findings on SHBU Elements at FELDA Bukit Rokan

FELDA Industries-based Crops	FELDA Business Centre	FELDA Agropreneur	FELDA Residential Compound	SHBU Management Plan
• Agreed with this dimension. • Major crops -Rubber trees and palm oil. • Propose papaya plantation for 30 acres of vacant land. • The oil palm plantation areas are flood-risk areas requiring mitigation plans.	• Agreed with FELDA Business Centre proposed in the area. • However, the location should be in the FELDA region area to cater to all FELDA settlements in the region • Focuses on business activities and the market for PPP agricultural products. • The residents also need public facilities such as a school.	• Focuses on the project to attract youth involvement to generate extra income. • Have issues to create job opportunities for the next generation • 43 residents are involved in the side income project. • Suggestion to diversify the economic clusters such as ecotourism, Homestay, flying fox, archery, kayaking and shooting	• Agreed with this dimension. • There is a housing demand from the 3rd and 4th generations. • FELDA has provided 100 units in the FELDA region, but more units are still needed to meet the demand.	• 92% of the estate area is under FELDA management, so it is easy to decide on the plantation and other related matters. • FELDA provides many initiatives and assists in ensuring the welfare of settlers and workers. • Facing a shortage of labour.

4.2 Analysis of GIS-MCDA for SHBU for Crops and Physical Land Development

The capability of the SHBU model in producing a composite map of croplands' potential significantly helps FELDA optimise the uses of lands for crop plantation. Additionally, the SHBU model provides some information (attributes), such as the size and distribution of areas relevant to crop plantation management and cost or profit estimation. The MCDM GIS is capable of producing the following; Areas that have the potential for the main crop (palm oil trees), areas that have potential for interim crops/ integrated agricultural (if applicable), and constraint areas for crops. Figure 4 shows the cropland suitability by potential levels for Bukit Rokan. Four potential levels (or areas) were generated to demonstrate the croplands' suitability, namely: (a) the most potential, (b) potential, (c) less potential, and (d) the areas with constraints.

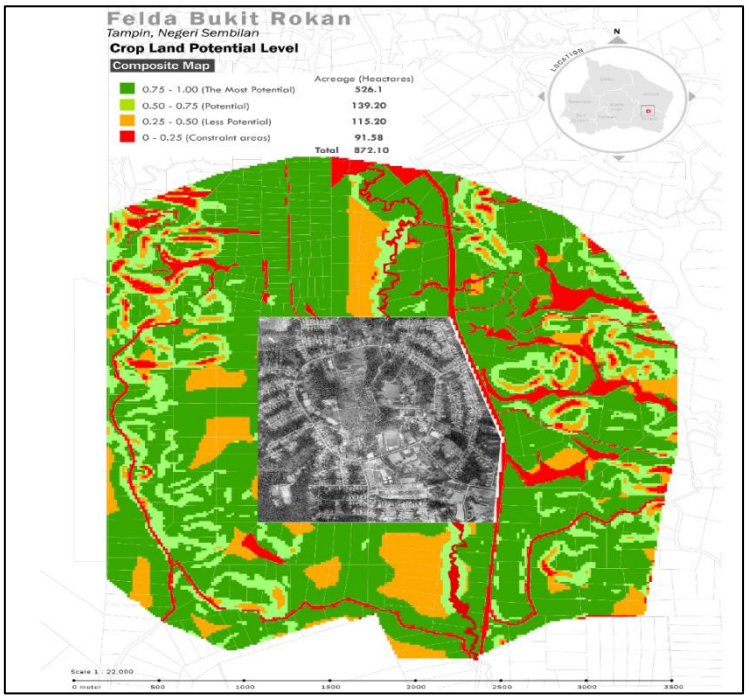

Figure **Error! No text of specified style in document.**4. Croplands suitability by potential levels in Bukit Rokan

Table 2. The Generated Size of Crop Areas by Their Potential Levels and Intervention Strategy for Bukit Rokan

The Existing Crop Planted Area (H)	The Generated Size by Potential Levels		Crop Areas Intervention Strategy (General)
	Potential Levels	Size (H)	
860.50	The most potential	526.10	It is the most productive area for oil palm trees and includes interim crops (e.g., cili merah, cili hijau, jagung manis) planted within the oil palm trees, particularly in replanting areas.
	Potential	139.20	This area remains for oil palm plantation with better mitigation for managing the trees, production, and harvesting support.
	Less Potential	115.20	
	Constraint areas	91.58	The highly land area has the potential to be created for plantation tourism-based recreation and extreme sports for adventure and fun, such as mountain biking, ATV off-roading, etc.
Total		872.10	

Table 2 shows the existing size of crop plantation areas compared to the generated size by their potential levels. It shows that approximately 525 hectares (60%) of the total areas were identified as the most potential areas for crops (based on performance criteria, such as existing productive lands, suitable slopes, higher accessibility for crop management, and nearby sources of water). 92 hectares or 11% is identified as a constraint area due to its steep slope. Mitigation plans can be appropriately designed to cater to the areas with less potential while avoiding the constraint areas for crop planting.

Another useful MCDM-GIS SHBU model is for identifying suitable locations for future physical development. The expected outcomes to be produced from a composite map of future physical development are outlined as areas that have the potential for residential units or a business centre (mini-RTC including FELDA Agro-Preneur centre) and other areas with no potential

Figure 5 shows the result of future-physical development land suitability by potential levels for Bukit Rokan. Four potential levels were generated to demonstrate the suitability of future physical development lands. Out of those four, only the areas with the most potential (10.95 hectares) and potential levels (36.15) will be considered for future physical development that focuses on the three elements of the SHBU, which are a business centre, a residential compound, and an agropreneur hub.

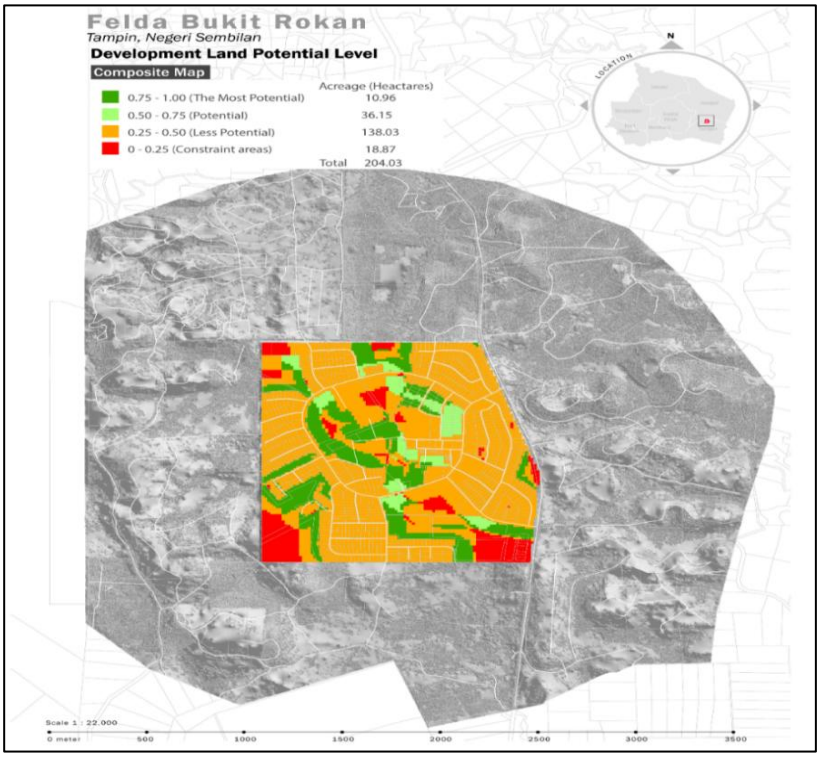

Figure **Error! No text of specified style in document.**. Future-physical development lands by potential levels in Bukit Rokan

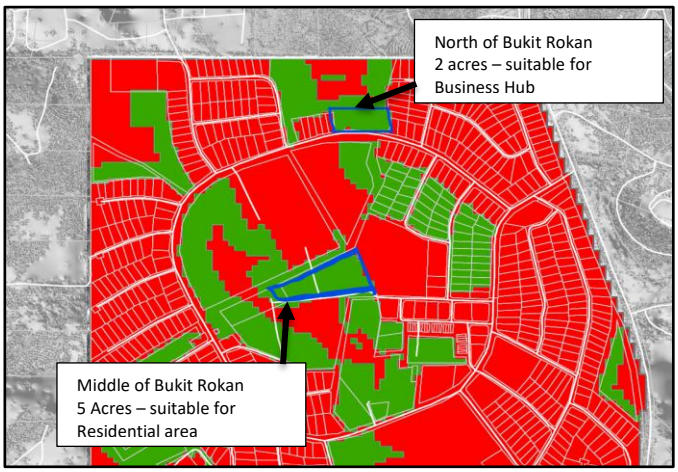

Figure 6. Suitable area for Future Physical Development

4.3 Discussion on Scenario Planning and Profit Estimation.

Refer to Figures 5 and 6. These sections display the estimation of profits from the suitable site scenario with feasible crops and land development.

Table 3. Profit estimation based on what-if scenario 1 – with interim crops

Locations	What-if Areas	Proposed Project/ Programme	Size of Areas (H)	Average Profit per Ha Year	Total Profit
Croplands	The most potential	a. Oil palm tree	10 acres – 4 hectares	FELDA management	
		b. Interim crop (Papaya)	500 trees per hectares	After the 8th month the harvesting per week with 500 kg per week	RM2.50 per kg Monthly RM10,000 per ha
	Constraint areas	Recreation activities such as Extreme sports and Plantation Tourism	NA	NA	Benefits of attractions generating more economic activities

Table 4. Profit estimation for Settlement/Land use development

Locations	What-if Areas	Proposed Project/ Programme	Size of Areas	Total Profit
Settlement areas	The most potential	Small-scale residential project (5 acres) Agro-preneur hub (2 acres)	Refer to Figure 6	
	The existing development	Program – training, knowledge sharing, and upskilling on agro-preneur and business for youth.		The catalyst for economic development
		Projek Penjenaan Pendapatan - Fertigasi Cili (productivity 3- 4 times a year)	0.5 acres Can produce 4,700 kg , 1kg = RM15 (Gross) =RM4 (net).	RM18,000 approximately for each harvesting period

The green area in Figure 6 above has the best potential for development in the settlement area. Therefore, as depicted above, two areas have been selected for residential and business areas. The detailed distribution for development and profits calculation are displayed in Table 5 below.

Table 5. Example of Profit Calculations.

i. Proposed Semi-D Housing (5 acres)			**ii. Proposed Shops (2 acres)**		
Proposed Distribution of Land Use Development - Semi D Housing Scheme					
Land use distribution	Acres	Square feet		Acres	Square feet
Overall area	5	217,800	Area	2	87,120
30 % for Road		65,340	45 % for Road & Parking lot		39,204
10% for Open Space		21,780	10% for Open Space		8,712
60% for Housing		130,680	45% for Shops		39,204
Density per acre	10 houses per acre	Therefore, 50 houses overall			
saiz lot (30' x 80')	2400sqf	120000	Number of Shops		Total = 20 shops
building size (20' x 50')	1000 sqft				
Gross Development Value, GDV = Construction Cost= Market Value = ROI =	RM 21 million RM 3 million RM 12 million 15%	Estimated profits for the area if the land is developed. = RM18 m	Gross Development Value, GDV = Construction Cost= Market Value = ROI =	RM23.5 million RM2.6 million RM 13 million 20%	Estimated profits for the area if the land is developed. = RM20.9 m

5.0 Conclusions and Recommendations

Considering the results, particularly from the SWOT analysis of the case study of five dimensions of the SHBU model and the MCDM-GIS composite maps of crops and future-physical development, Table 6 summarises the r*ecomendations of proposed specific guidelines and strategies for Bukit Rokan.* This will be the basis for recommendations and intervention strategies specific to FELDA Bukit Rokan. The various initiatives were comprehensive and covered multiple aspects. As the conclusions the study has unravels the objective, i. to explore the elements of the conceptual framework through Five dimensions of SHBU, ii. to evaluate the rural settlement through case study of Bukit Rokan (refers table 1 and table 2), and iii to estimate profits (returns) for each alternative (refers Table 3, Table 4 and Table 5). This research contributes to both new knowledge and practice through methodology enhancement by proposing a mixed methods approach, which integrates interviews and GIS-based MCDA within the SHBU framework. The study demonstrated the suitability of the SHBU approach for land development and determined the potential areas for future development in spatial form. Practically, the proposed strategy can provide valuable input to relevant parties to enhance the study area. This research has no intention of generalizing its findings. Nonetheless, it is believed that the findings of this research have the potential to be implemented

in other FELDA schemes. Even though this paper highlights a study on FELDA, the outcome from strategies and initiatives can also benefit other rural land management in Malaysia. Nonetheless, this research has some limitations. due to time and budget constraints, the application of GIS-based MCDA was limited to calculating spatial data within a two kilometre radius from the centroid points. Furthermore, detailed data for the cropland criterion map, such as land fertility and land type, were also limited. Questionnaiers to community also was not conducted due to Covid 19 movement control during the time of research. Hence, future research could focus on improving these aspects accordingly especially on community perspectives of SHBU elements and their willingness to participates in empowerment programmes identified by the SHBU strategies. This would enable the crafting of a better implementation strategy for the future SHBU approach.

Table 6. Proposed projects and intervention strategies addressing the existing problems and advanced planning for Bukit Rokan

Elements	Recommendations/ Intervention Strategies
Crops	● Interim crops *cili merah, cili hijau,jagung manis*. papaya, pineapple or roselle
Site location and the existing development (including surroundings)	● Low accessibility to the nearest town. This creates the potential to have lower-order services (commercial) in the study area, such as hardware and agricultural shops. FBC should be in the FELDA Regional area and unsuitable in FELDA Bukit Rokan due to a small threshold.
Residents' Socio-demographic profiles	● It can provide future human resources because FELDA Bukit Rokan has a high percentage of youth. It can increase the demand for housing by the third and fourth generations. They are the catalysts for the local economy. ● Housing scheme and centre of business for the neighbourhood (low density – approximately 5 acres) ● Recreation activities such as Extreme sports and Plantation Tourism
D1:Felda Industries-based crops (FIbC)	● There are potential areas for interim farming as side income projects. It should be managed by Koperasi planting with cili merah, cili hijau and jagung manis. ● Potential to create plantation tourism that is suitable for recreation activities. FELDA Bukit Rokan has water bodies and topography constraints but based on slope analysis, the potential for extreme sport (mountain biking or hiking) ● Preparedness for interim farming requires new technologies, a sufficient budget, and knowledge and skills.
D2: FELDA business centre (FBC)	● Maintaining the existing population will increase the population threshold so that new generations can live and work in the study area. The nearest small town (Pekan Tampin & Gemencheh) is almost 20km away. These opportunities may create centrality activities in the study area and trade activities to fulfil people's basic daily needs.
D3: FELDA residential compound (FRC)	● Suitable for small neighbourhoods comprised of housing and shop lots. (Reserve land available @ 5 acres within the development of the future-physical land)
D4: FELDA agro-preneur (FAgP)	● Suggest creating a market for the interim product (PPP) by developing a market chain from supplier to end-user using the KOPERASI platform and online marketing
D5: SHBU plan management	● 50% of plantation areas are unproductive due to being currently managed by settlers (less fertilisation, lack of tree maintenance and care). Suggest return to FELDA and KOPERASI the so-called SHBU Plan management to ensure the plantation productivity increases. ● Enforce the implementation of the SHBU Management Plan by ensuring crop plantation and management with FELDA and not isolated or self-cultivation. ● Provide continuous training, knowledge sharing, and upskilling for agro-preneurs and businesses for FELDA youth.

Acknowledgement

This paper is part of the project funded by the National Real Estate Research Coordinator (NAPREC), National Institute of Valuation (INSPEN), Ministry of Finance, Malaysia Reference: INSPEN 600-4/10/4 (2)

Paper Contribution to Related Field of Study

This study can assist in determining the highest and best use of the available land. The findings can be implemented in other rural areas within other agencies that manage and develop rural and regional areas, such as RISDA, FELCRA, UDA, and others.

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