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Floating Nurseries as an Agronomic Technology for Improving Rice Production in Lebak Swamplands: A Structural Equation Modeling Approach

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Abstract. Rice productivity in lowland rice fields is critical to feeding the national food estate and warrants researchers' attention. This paper investigates the impact of input provision, floating rice cultivation, local wisdom knowledge, and local wisdom strategy on the productivity of floating rice cultivation in lowland rice fields in Ogan Ilir, Indonesia. This study analyzes how institutional support and floating rice land typology influence input provision, floating rice cultivation, local wisdom knowledge, local wisdom strategy, and floating rice cultivation productivity. The researchers employed a survey questionnaire to gather primary data from selected participants. The researchers employed smart-PLS to examine the association between factors. Structural Equation Modeling (SEM) and field measurements were used to examine data from 250 farmers. The results of the research indicate that input provision, floating rice cultivation, local wisdom understanding, and local wisdom strategy all contribute to increased floating rice cultivation productivity. The findings show that institutional support has a substantial influence on the link between input provision, floating rice cultivation, local wisdom knowledge, local wisdom strategy, and floating rice cultivation productivity. This study advises policymakers on local and national policies to increase floating rice cultivation productivity by implementing efficient input provision, effective floating rice cultivation, local wisdom knowledge, and the use of long-term local wisdom strategies.

Keywords: floating nursery; local wisdom; *lebak* swampland; rice productivity; structural equation modeling

1. Introduction

South Sumatra is one of the provinces that contributes considerably to Indonesian rice production; yearly output fluctuates from 2.55 to 3.59 million tons of dry milled rice from 2018 to 2025. This situation underlines the importance of agricultural land management for sustaining regional production (Januarti et al., 2022; Wandayantolis et al., 2024). However, annual oscillations are impacted by a variety of factors, including changes in climate variability and cropping patterns. The El Niño-Southern Oscillation impacts planting season patterns, plant growth, and harvestable land area, leading to variability in yearly rice production (Alam et al., 2017; Ismail et al., 2013).

Ogan Ilir Regency in South Sumatra is primarily agricultural, with swampy rice terraces that are inundated annually. This frequently causes crop failure or prevents farmers from growing rice. This is due to the fact that Ogan Ilir is affected by tides due to its location between two huge rivers, the Ogan and Komering Rivers, and its proximity to the Musi River mouth. Swampy environments are also known as wetlands, lowland, peatland, inland, and deepwater land. A wetland is an area that is wet all year, with an average rainfall of 2000 mm and 5-7 rainy months (Coleman et al., 2008; Roulet & Woo, 1986).

The swampy rice fields of Ogan Ilir are underwater for 5-7 months of the year. Because of these natural conditions, farmers usually cultivate their rice fields only once a year, from April to September. Outside of these months, the land in the swampy rice fields is typically left unused. However, prior to the 1980s, Ogan Ilir was recognized for producing high-quality rice, also known as "pegagan rice". This rice came from a native variety that is now almost extinct (Bidarti et al., 2020). The lack of extensive rice cultivation is owing to a lack of understanding of the swampy flooding patterns. For example, in 2017 and 2018,

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heavy floods lingered into April, preventing farmers from preparing their ground until the end of April and leaving them unable to plant twice each year.

Farmers in Ogan Ilir use the floating rice cultivation method to overcome the difficulty of cultivating rice in lowland marshes, even when flooding or inundation is deep. The floating rice cultivation technology, which farmers have traditionally used to adjust to variations in water levels, can aid in boosting plant development in flood-prone areas and was developed by lowland swamp farmers in Ogan Ilir, South Sumatra, as a climate change adaptation. Floating rice cultivation is a rice cultivation method that uses rafts as a planting medium. The rafts act as supports, preventing the plants from falling in windy conditions or from sinking in wet areas. The rafts used are built of bamboo to facilitate floating. The center of the raft is made of bamboo cut in half and placed like a fence, which is then filled with straw and coconut fiber waste combined with organic compost, while the top is covered in netting. The floating rice raft media is suitable for up to six planting seasons (3 years) (Siaga et al., 2019; Wu et al., 2013).

Floating rice cultivation techniques in swampy locations used for rice fields can only be implemented once per year. The residents of Ogan Ilir, South Sumatra, cultivate rice using a floating method that involves swamp grass species called "*berondong*" and freshwater algae called "*reamon*". These plants thrive in lowland and arid environments. The floating rice cultivation technique is carried out on a raft built of "*berondong*" plants, which is then joined with "*reamon*" to make a raft, ensuring that the growing rice does not sink and floats on the water surface (Sulaiman et al., 2019; Syuhada et al., 2020). Although the floating rice cultivation system is said to have numerous benefits and positive effects in addressing ecological issues in lowland swamp rice fields, its development in the Ogan Ilir region of South Sumatra demonstrates that its productivity has not yet reached its peak, and its sustainability must be investigated. Another factor influencing floating rice productivity in Ogan Ilir is the region's susceptibility to flooding during the rainy season. As a result of climate change, the water levels in the region's Ogan and Komering rivers have risen, causing widespread flooding in the lowland marsh rice fields.

Flooding caused by increased water levels and river overflows has a negative impact, with salinity levels in lowland marshy rice fields reaching 7 ds/m (Clermont-Dauphin et al., 2010; Marcos et al., 2018). Furthermore, while floating rice production is increasingly acknowledged as a climate adaptation approach, empirical data on its efficacy as an agronomic practice across a range of flood intensities is scarce (Granata & Di Nunno, 2026). Furthermore, previous studies have frequently addressed the floating rice issue using traditional methodologies (Dumaresq et al., 2020; Karmaker et al., 2023), such as investigating biophysical factors and farmers' capabilities in floating rice cultivation separately rather than combining them into a coherent analytical framework. As a result, this study used Structural Equation Modeling (SEM) to investigate the factors influencing successful technology adoption in floating rice production in lowland swamp rice fields. Other issues emerge, such as how water infrastructure management and farmer group assistance affect rice output. This Structural Equation Modeling approach is also appropriate for evaluating the influence of applying agronomic systems on floating rice cultivation practices among lowland swamp rice producers in Ogan Ilir (Sari et al., 2025).

The indirect processes that influence the productivity of floating rice cultivation through these parameters, as identified using SEM models, remain very limited. However, this study is significant because it emphasizes empirical evidence on floating rice production in marshy rice fields as a mediating variable in translating environmental constraints and farmer ability

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into agronomic performance and yields, which is currently limited (Handayani et al., 2026; Zhang et al., 2025). These findings are expected to provide a comprehensive framework for understanding how adaptive agronomic technology might improve floating rice yields in flood-prone lowland swamp environments by integrating field data and system-level modeling. They can also help to construct climate-resilient floating rice production systems by emphasizing crop establishment as an important driver of productivity growth. As a result, the purpose of this research is to investigate the feasibility of constructing a floating rice cultivation in sustainable lowland rice fields, which is intimately tied to the ability of all subsystems to support one another.

Based on this, to design an agronomic system for floating rice cultivation in lowland swamp rice fields, a sustainable model must be built using a systems approach. This approach is strategic in all subsystems, including the input, farming, floating rice cultivation, processing, and marketing, and supporting subsystems. This is to ensure that the goal of improving the agronomic performance of floating rice production in lowland swamp rice fields is met more effectively and ideally, increasing food security while supporting sustainable agriculture.

2. Materials and Methods

This study was conducted in South Sumatra Province, in the lowland rice fields of Ogan Ilir Regency, located at 3°00'-3°45' South Latitude and 104°20'-104°55' East Longitude. This region has a humid tropical climate with an average annual rainfall of 2,500-3,000 mm, an average air temperature of 26-32°C, and high relative humidity year-round, necessitating the development of floating rice technology to address the high environmental pressures caused by flooding. Rainfall patterns in this region are seasonal, with the highest flooding occurring between November and March, when fluctuations in water levels have a significant impact on rice production methods. These seasonal hydrological dynamics support the findings of Pan et al. (2022) and Anurethaa et al. (2024), as they directly impact rice farming patterns in swampy areas, planting timing, and successful plant growth in swamp environments.

To generate more representative results, this study was carried out across the 2024-2025 and 2025-2026 growing seasons, duplicating the growth seasons while accounting for seasonal variations in hydrological conditions. Observations were made during the rainy and transition seasons to reduce temporal bias induced by seasonal environmental changes. The research objectives were addressed using a Structural Equation Model (SEM) analysis. Prior to data analysis, SEM requires that the data collection method (e.g., questionnaire) be validated and reliable. This study investigates the effect of the input provision subsystem, the floating rice cultivation technique subsystem, and local knowledge of floating rice natural resources on the development of sustainable floating rice production in lowland swamp rice fields. This article also investigates the moderating effect of government institutional assistance and local wisdom strategies on these variables.

The researchers employed a survey questionnaire to gather primary data from selected participants. The questionnaire utilized in this investigation was adapted from existing literature. The input provision section had five questions, the floating rice cultivation section had four questions, the local wisdom knowledge section had four items, the local knowledge strategies section of floating rice cultivation had three questions, the institutional support part included five questions, and the floating rice land typology part included three questions (Grilli & Notaro, 2019; Wiesinger, 2007).

Primary data for this study were gathered from floating rice cultivation in Ogan Ilir via field observations, agronomic parameter measurements, and farmer interviews. The

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sample approach was created based on farmer population statistics obtained from the local Agricultural Extension Center (BPP). Farmers were selected using a simple random sampling procedure. Farmers were given surveys during in-person visits. Only 250 legitimate responses were received from the 400 questionnaires issued by the researchers, yielding a response rate of approximately 62.50%. Furthermore, the researchers employed smart-PLS to examine the correlations between factors.

Smart-PLS is a statistical technique that is frequently used to evaluate primary data. This tool is very useful for working with massive datasets and sophisticated frameworks (Sarstedt & Cheah, 2019). This study included three predictors: input provision (IP), floating rice cultivation techniques (CT), and local wisdom knowledge in floating rice natural resources (LK). This study also includes moderating variables, such as local knowledge techniques of floating rice cultivation (KS) and government support (IS), as well as a predictive construct, increased lowland rice production (IC). In this study, SEM analysis and population estimation were performed to determine the extent to which the independent variables influence the dependent variables and to compare the suitability of the designed research model to the actual model using SEM analysis, computed with smart-PLS.

SEM's major components are the structural equation model and the measurement model. To simplify data processing and analysis, a hypothetical structural equation model is first built using the conceptual framework. This hypothetical structural equation model depicts the flow of influence between exogenous latent variables (X1, X2, X3, X4, and X5) and endogenous latent variables (Y1 and Y2), as well as latent variables (both exogenous and endogenous) and their indicators. Based on the path diagrams of the hypothetical structural equation models 1 and 2, two models can be recognized as the foundation for data analysis, which are then broken down into two structural equations (Y1 and Y2). In addition, a path diagram is created, usually employing visualization to help researchers and readers comprehend. Path diagrams are extremely effective for determining the causal links between exogenous and endogenous factors.

3. Results and Discussion

The Barlett test yielded a P-value of 0.407 for the combined answer. If the P value exceeds 0.05, the residual varieties are met. A combined analysis of variance (ANOVA) for the yield of two planting seasons with floating rice technology in lowland swamp rice fields, using six indicators of floating rice success (seedling survival, transplantation success, plant uniformity, plant height, number of tillers, and rice production). Furthermore, nine controls were planted in three sites based on the lowland swamp rice field typology to assess interactions and main effects between and within sources of variation Table 1. In addition, genotype-environment interaction effects were discovered.

The F-value of the blocks (typology of swampy rice fields, environment, and typology-environment interaction showed significant differences ($P \leq 0.01$) for crop yields. The combined analysis showed that the environment contributed 24.30% to the total number of squares, the influence of land typology contributed 12.89%, and the influence of land typology-environment interaction contributed 37.25% Table 1. Furthermore, this study also assessed construct reliability using composite reliability (CR) and alpha. The results revealed that the obtained value exceeded the threshold of 0.70. These findings suggest a substantial link between items. The results are shown in Table 2.

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Table 1. Combined ANOVA analysis for floating rice grain yields in three typologies of swampy land locations

Source of Variance	DF	SS	MS	F-value	Pr > F	SS. Proportion (%)	Criteria
Environments (E) planting seasons I	9	180.45	20.05	15.42**	0.00001	24.30	Significant
Replication E (RE) of planting seasons II	6	38.72	6.45	4.96**	0.00018	5.22	Significant
Block Typology (B)	12	95.66	7.97	6.13**	0.00009	12.89	Significant
Interaction (A x B)	108	276.54	2.56	1.97**	0.00004	37.25	Significant
Error	115	135.02	1.17	-	-	18.19	-
Total	250	742.39		-	-	100.00	-

Table 2. Convergent validity of floating rice productivity in a swampy rice field

Constructs	Items	Loadings	Alpha	CR	AVE
Floating rice productivity	Y^{2}	0.782	0.775	0.848	0.520
Input provision	$X^{1.1}$	0.690	0.852	0.902	0.718
	$X^{1.2}$	0.655			
	$X^{1.3}$	0.608			
	$X^{1.4}$	0.782			
	$X^{1.5}$	0.860			
Floating rice cultivation	$X^{2.1}$	0.882	0.892	0.920	0.662
	$X^{2.2}$	0.650			
	$X^{2.3}$	0.900			
	$X^{2.4}$	0.912			
Local wisdom knowledge	$X^{3.1}$	0.882	0.912	0.932	0.678
	$X^{3.2}$	0.675			
	$X^{3.3}$	0.926			
	$X^{3.4}$	0.750			
Local wisdom strategy	$X^{4.1}$	0.872	0.850	0.888	0.712
	$X^{4.2}$	0.820			
	$X^{4.3}$	0.830			
Institutional support	$X^{5.1}$	0.802	0.878	0.878	0.774
	$X^{5.2}$	0.830			
	$X^{5.3}$	0.920			
	$X^{5.4}$	0.912			
	$X^{5.5}$	0.816			
Floating rice land typology	$Y^{1.1}$	0.922	0.780	0.875	0.684
	$Y^{1.2}$	0.870			
	$Y^{1.3}$	0.715			

Based on Table 2 above, the factor loadings for all constructs in Convergent Validity are above 0.60. The lowest value is for item X1.3 (0.608) and the highest is for X32 (0.926). All indicators/items meet the minimum threshold (> 0.50), indicating each item is valid for measuring its respective construct. Meanwhile, the Average Variance Extracted (AVE) for all constructs is above 0.50. The highest value is achieved by institutional support (0.774). This demonstrates that convergent validity at the construct level has been well established.

According to the analysis results in Table 2, all indicators of the seven constructs (floating rice productivity, input provision, floating rice cultivation, local wisdom

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knowledge, local wisdom strategy, institutional support, and floating rice land typology) met the criteria for convergent validity. All factor loadings exceed 0.50, as does the AVE. The five constructs are not only valid but also highly reliable, with Cronbach's Alpha and Composite Reliability (CR) consistently above 0.70. Thus, this data is ready for the next stage of structural analysis (hypothesis testing).

Next, the variables' discriminatory validity and correlations were assessed. The Heterotrait Monotrait Ratio (HTMT) was employed for analysis. The results showed that the HTMT ratio value was less than 0.90. This result suggests a low correlation between the variables. The results are shown in Table 3.

Table 3. Discriminant validity of swampy rice fields in the lowland

	Y1	X1	X2	X3	X4	X5	Y2
Floating rice productivity (Y1)							
Input provision (X1)	0.818						
Floating rice cultivation (X2)	0.660	0.754					
Local wisdom knowledge (X3)	0.450	0.412	0.292				
Local wisdom strategy (X4)	0.622	0.324	0.420	0.460			
Institutional support (X5)	0.552	0.380	0.286	0.448	0.782		
Floating rice land typology (Y2)	0.872	0.668	0.496	0.780	0.388	0.760	

Structural Equation Modeling (SEM) employs HTMT analysis to examine whether a concept is empirically distinct from other constructs (Henseler et al., 2015). Table 3 discriminant validity results indicate that all HTMT ratio values are below the 0.90 threshold. According to the magnitude of the HTMT value, the association is quite strong (potential concept closeness): The link between floating rice productivity (Y1) and floating rice land type (Y2) (0.872), as well as floating rice productivity (Y1) and input provision (X1) (0.818), is fairly strong (approaching 0.90). This suggests that the indicators of floating rice productivity have a very close conceptual relationship with the conditions of floating rice land typology and the use of floating rice cultivation techniques in the field. Meanwhile, for moderate correlations, relationships such as input provision (X1) and floating rice cultivation (X2) (0.758), as well as institutional support (X5) and floating rice land typology (Y2) (0.760) are at a medium-strong level. This implies a logical synergy, such as between institutional support and the floating rice land typology. Meanwhile, the lowest value (0.286) in the association between institutional support (X5) and floating rice cultivation (X2) indicates a poor correlation. This suggests that the internal support factor for floating rice cultivation operates independently of the external support element, institutional support, in respondents' perspectives.

The results of the discriminant validity test utilizing the Heterotrait-Monotrait (HTMT) ratio technique in Table 3 show that all ratio values between variables are less than the threshold of 0.90. The greatest value was reported in the connection between floating rice productivity (Y1) and floating rice land type (Y2), at 0.872, which is still within safe limits. These results prove that there are no problems of multicollinearity or overlap between latent constructs. Thus, it can be argued that the five study variables have high discriminant validity and meet the criteria for further structural model testing.

According to Figure 1, the loading factor calculations for each latent variable are, on average, greater than 0.5, with many exceeding 0.7. Loading factor results greater than 0.5 do not need to be reserved. Thus, each signal is appropriate for explaining each latent variable, namely the

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subsystem typology of floating rice fields in swampy lowlands (Y_2) and the sustainability of organic rice farming. The loading factor not only indicates the validity of each indicator, but also shows how much each indicator contributes to its component. For the input subsystem factor, the indicator with the highest loading factor is $X_{2.1}$ Selection of floating rice varieties, followed by $X_{1.3}$ Crop uniformity index and $X_{1.5}$ local wisdom psychomotor skills. Meanwhile, the floating rice cultivation subsystem (X_2) has the highest loading factor for $X_{2.1}$ selection of floating rice types and $X_{2.3}$ adoption of floating raft technology.

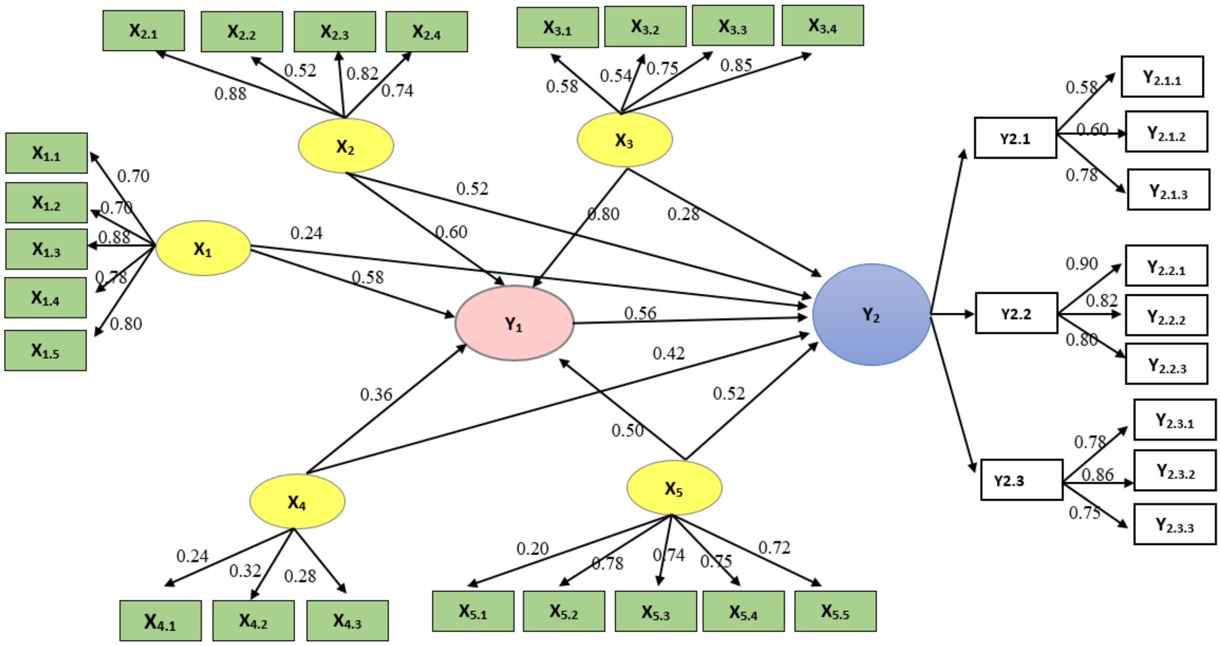

Figure 1. Standardized loading factor inner and outer model

Table 4. The impact of land typology subsystems and floating rice cultivation on increasing rice production

Variables	Performance	Statistics	Status
Influence on the Land Typology Variable (Y2)			
X1 = Input provision subsystem	Medium	2.082	Significant**
X2 = Floating rice cultivation subsystem	Medium	1.912	Significant**
X3 = Local wisdom knowledge subsystem	Medium	3.126	Significant**
X4 = Local wisdom strategy subsystem	Medium	1.140	Not significant*
X5 = Institutional support subsystem	Medium	3.475	Significant**
Y1 = Changes in lowland rice production	Medium	1.704	Significant**

Note: (**) Significant at the 95% confidence level (t-table 1.979); (*) Significant at the 90% confidence level (t-table 1.657).

The highest loading factor for the floating rice sustainability variable in the shallow lowland typology ($Y_{2.1}$) is found in $Y_{2.1.3}$, the social dimension of floating rice farmers' empowerment. Furthermore, the largest loading factor for floating rice sustainability in the middle lowland typology ($Y_{2.2}$) is $Y_{2.2.1}$ community socio-cultural support. In the deep lowland typology's floating rice sustainability dimension ($Y_{2.3}$), has the highest loading factor. $Y_{2.3.3}$ water usage efficiency.

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According to the analysis results in Table 4, policymakers and academics must prioritize strengthening Institutional support (X5) with the highest statistical value of 3.475 and integrating Local wisdom knowledge (X3) with a statistical value of 3.126 (Significant) into modern cultivation systems. Interventions in farmer group governance and extension will have the greatest impact in this system. Next, a path analysis was used to evaluate hypotheses H1, H2, H3, H4, H5, and H6 as independent variables influencing floating rice productivity. Furthermore, a path analysis was used to evaluate hypotheses H7–H11 as moderating variables on floating rice productivity.

Table 5. Structural model results and hypothesis testing of factors affecting floating rice productivity

Relationships	Beta	Standard deviation	T statistics	P values
Input provision → Floating rice productivity (H1)	0.342	0.058	6.082	0.000
Floating rice cultivation → Floating rice productivity (H2)	0.212	0.468	2.682	0.006
Local wisdom knowledge → Floating rice productivity (H3)	0.920	0.048	2.132	0.034
Local wisdom strategy → Floating rice productivity (H4)	0.824	0.042	2.210	0.032
Institutional support → Floating rice productivity (H5)	0.782	0.046	2.182	0.026
Floating rice land typology → Floating rice productivity (H6)	0.628	0.044	12.220	0.000
Floating rice land typology x Input provision → Floating rice productivity (H7)	0.218	0.048	4.668	0.000
Floating rice land typology x Floating rice cultivation → Floating rice productivity (H8)	0.208	0.125	2.824	0.010
Floating rice land typology x Local wisdom knowledge → Floating rice productivity (H9)	0.124	0.042	2.788	0.008
Floating rice land typology x Local wisdom strategy → Floating rice productivity (H10)	0.328	0.048	2.812	0.007
Floating rice land typology x Institutional support (X5) → Floating rice productivity (H11)	0.008	0.052	0.182	0.852

Based on this, ten of the eleven hypotheses provided in the study were found to be significant (accepted) since they met the required statistical values. Only one hypothesis (H11) was rejected: land typology plays a moderating influence in the link between institutional support and floating rice productivity. This means that the findings of the SEM path analysis based on Table 5 above show that the most important factor driving improving floating rice productivity in swampy areas in Ogan Ilir, Indonesia, is the local wisdom strategy, followed by floating rice cultivation and input provision.

Farmers' knowledge of how to store and package their products contributes significantly to the performance of the local wisdom knowledge subsystem in enhancing floating rice yield in lowland swamp rice fields. Prior to farmers focusing on the market, there was an excess of floating rice in the lowland swamp rice fields, resulting in a drop in the price of lowland rice. Several

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farmer groups have worked with agricultural extension workers and the Logistics Agency (BULOG) to solve this problem by seizing all available production and raising the price at the local level. These farmers' experience and knowledge enable the local wisdom knowledge subsystem to perform competently. Although farmers continue to face various challenges in the development of the floating rice cultivation, the fact remains that the production volume of the floating rice cultivation in the lowland swamp rice fields cultivated by farmers is increasing, which may have an impact on the system's sustainability.

4. Limitations and Future Directions

Although the SEM model established in this study successfully supported the bulk of the offered hypotheses, numerous crucial gaps still exist, restricting the investigation. These include insufficient institutional support and a continuing reliance on local socio-cultural elements. Another weakness of this study is the cross-sectional nature of the data. Although the SEM study was based on data collected over two growing seasons, the yearly hydrological cycle continues to have a significant impact on the lowland swampland's highly dynamic and variable characteristics. Another constraint is the absolute dominance of the land typology variable, with floating rice land typology having a significant direct impact on productivity (Beta = 0.628, T-statistics = 12,220). This suggests that floating rice productivity in this study is still heavily influenced by nature and land conditions, putting the efficacy of other agronomic technology treatments at risk of being eclipsed by this biophysical element.

To refine this research and contribute more broadly to the literature on floating rice cultivation in lowland swamp rice fields, the following are some suggested future directions for this study: reconstruction of institutional policy models based on land zoning, formalization and scientification of local wisdom, and the use of longitudinal analysis and climate risk mitigation.

5. Conclusion

The floating rice cultivation technology performed well in the lowland swamp rice fields of South Sumatra. The floating rice cultivation in South Sumatra produces an average of 8.72 tons per hectare, suggesting a high level of production sustainability in the lowland marshes. In terms of sustainability, the floating rice cultivation dimension performed well, while the institutional dimension performed poorly.

More research should be conducted to develop floating rice cultivation that is more widely applicable, sustainable, and adaptable to climate change. Studies on the utilization of ecologically friendly raft materials, Internet of Things (IoT)-based water and nutrient management, mechanical transplantation techniques, and testing rice cultivars that are more resistant to flooding and drought stress are critical. Future research should also include long-term socioeconomic evaluations, such as farmer technology adoption, cost-benefit analysis, and the development of integrated aqua-agronomy systems, to gain a better understanding of the practical feasibility and sustainability of floating rice cultivation technology in swampy agricultural systems.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the author used AI to help with proofreading, grammar correction, and to improve the readability of the manuscript. This tool is not used to generate research data, conduct analysis, or determine results and conclusions. After using the tool, the author carefully reviews, verifies, and revises the manuscript as needed and takes full responsibility for the accuracy and integrity of the final publication.

Authorship Contribution Statement

Eka Mulyana contributes to conceptualization, methodology, investigation, formal analysis, data curation, writing original draft, and interpretation of results. Furthermore,

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Sriati's conceptualization, Muhammad Yamin, and Yunita contributed methodology to formal analysis, writing review & editing, and interpretation of results. Then two people contribute to conduct the investigation, data curation (data tabulation), writing, review & editing, and report writing/documentation, namely Susilawati and Agustina Bidarti.

Declaration of Competing Interest

The authors state that they have neither competing financial interests nor known personal relationships that could influence the work reported in this article. Any support/funding received does not affect the research design, data collection, analysis, interpretation, or decision to publish.

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