JALOW
Journal of Agribusiness and Local Wisdom

ANALYSIS OF RICE FARMING USING JAJAR LEGOWO AND CONVENTIONAL PLANTING SYSTEMS IN MARO SEBO DISTRICT, MUARO JAMBI REGENCY

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ABSTRACT

This research aims to: (1) describe the general characteristics of lowland rice farming under the *jajar legowo* and conventional planting systems in Maro Sebo District, Muaro Jambi Regency; (2) determine farmers' income under both planting systems; and (3) analyze the income differences between the *jajar legowo* and conventional systems. The research employed a survey method, with primary data collected through interviews with respondent farmers. Descriptive analysis was used to illustrate the conditions of lowland rice farming under both planting systems, while quantitative analysis was conducted to examine farmers' income levels.

The results show that: (1) the *jajar legowo* system requires greater production inputs—including seeds, fertilizers, pesticides, and labor—compared with the conventional system, yet it yields a higher volume of harvested dry grain (GKP). (2) Farmers' income under the *jajar legowo* system is higher than that under the conventional planting system. (3) Based on the results of the ANOVA test, there is a statistically significant difference in farmers' income between the two planting systems, indicating that the *jajar legowo* system provides a higher income than the conventional system. Overall, the findings suggest that although the *jajar legowo* planting system demands more intensive input use, it delivers higher production and income, making it a more advantageous option for lowland rice farmers in Maro Sebo District.

Keywords: Farming, Lowland Rice, *Jajar Legowo*, Conventional System, Income

INTRODUCTION

The agricultural sector plays a crucial role in Indonesia's economy, as a large portion of the population depends on it for their livelihood. Agriculture not only serves as a provider of food but also functions as a major source of income, a significant absorber of labor, and a foundation for national economic stability. Agricultural development is a national priority due to its contribution to the Gross Domestic Product (GDP) and its essential role in maintaining food security. One of the most strategic commodities is rice, which serves as the staple food for most Indonesians and holds substantial social and economic importance. Therefore, improving rice productivity and farmers' income is a key focus in achieving sustainable food security.

Jambi Province is one of the regions with strong potential for developing lowland rice farming. According to data from the Office of Food Crops, Horticulture, and Livestock of Jambi Province (2024), Muaro Jambi Regency recorded a harvested area of 4,984 hectares with a total production of 17,978 tons. However, its productivity remains relatively low at 3.60 tons per hectare, below the provincial average of 4.34 tons per hectare. This condition is attributed to the predominance of traditional farming practices and the limited adoption of modern agricultural technologies. Most farmers continue to use conventional planting systems passed down through generations, resulting in suboptimal yields.

One innovation promoted by the government to increase rice productivity is the *jajar legowo* planting system. This method arranges planting distance in rows with empty spaces between certain rows, allowing plant populations to increase by up to 33% compared with the conventional system. It also improves air circulation and sunlight penetration, enhances photosynthesis, and facilitates maintenance activities such as fertilizing, weeding, and pest control. Previous studies have shown that the *jajar legowo* system can increase yield and improve grain quality.

However, adoption of the *jajar legowo* system among farmers—including those in Maro Sebo District, Muaro Jambi Regency—remains low. Many farmers still prefer the conventional system because it is perceived as easier to implement, requires less labor, and incurs lower production costs. Limited knowledge and skills in applying new technologies also contribute to slow adoption.

Differences between the *jajar legowo* and conventional planting systems may affect input efficiency, productivity, and farmers' income. Therefore, this study was conducted to analyze and compare lowland rice farming under the *jajar legowo* and conventional planting systems in Maro Sebo District, Muaro Jambi Regency, and to assess the differences in input use, yield, and farmers' income. The findings are expected to provide valuable scientific information for farmers, agricultural extension workers, and local governments in their efforts to improve productivity and support sustainable farmer welfare.

RESEARCH METHOD

This research was conducted in Maro Sebo District, Muaro Jambi Regency, Jambi Province. The location was selected purposively based on the consideration that the area is one of the main lowland rice production centers in Muaro Jambi Regency and implements two planting systems, namely the *jajar legowo* and conventional systems. The study took place from February to June 2025, coinciding with the main planting season for lowland rice farmers in the region.

The research employed a survey method, using both primary and secondary data. Primary data were collected through direct interviews using structured questionnaires administered to respondent farmers, while secondary data were obtained from relevant institutions such as the Office of Food Crops, Horticulture, and Livestock of Muaro Jambi Regency, as well as the Agricultural Extension Center (BPP) of Maro Sebo District.

The sampling technique used was simple random sampling, in which each farmer in the population had an equal chance of being selected as a respondent. The total sample consisted of 70 farmers, including 33 farmers who applied the *jajar legowo* system and 37 farmers who used the conventional planting system. The sample size was determined based on the availability of active farmers and the relative uniformity of land characteristics and planting patterns in the study area.

The data collected included land area, seed quantity, fertilizer use, pesticides, labor, production costs, revenue, and farm income. Data were analyzed using two approaches: descriptive analysis and quantitative analysis. Descriptive analysis was used to describe farmer characteristics and provide an overview of lowland rice farming in the study area.

Meanwhile, quantitative analysis was used to calculate production costs, revenue, income, and farming efficiency. Income differences between the two planting systems were analyzed using a one-way ANOVA to determine whether there were significant differences between the systems. In addition, the R/C Ratio (Revenue–Cost Ratio) was used to assess the financial feasibility of farming. An R/C Ratio greater than 1 indicates that the farming activity is profitable and feasible to develop, whereas a value below 1 indicates the opposite.

RESULT AND DISCUSSION

GENERAL OVERVIEW OF LOWLAND RICE FARMING

Maro Sebo District is one of the areas in Muaro Jambi Regency with significant potential for developing lowland rice farming. Most of the local population relies on agriculture as their primary source of livelihood, particularly lowland rice cultivation using two different planting systems: the *jajar legowo* system and the conventional system. According to data from the Agricultural Extension Center (BPP) of Maro Sebo in 2024, the number of lowland rice farmers in the district reached 1,058 individuals, consisting of 341 farmers who applied the *jajar legowo* system and 707 farmers who used the conventional planting system. This indicates that the conventional system remains more widely practiced than the *jajar legowo* system in the study area.

There are several differences between the *jajar legowo* and conventional cultivation methods, starting from land preparation to the harvesting stage. The table below presents the key differences between the two planting systems.

Table 1. Differences in Rice Farming Cultivation Techniques Between the Jajar Legowo and Conventional Planting Systems at the Research Site, 2025.

Operations	jajar legowo rice cultivation system	Conventional rice cultivation system
Land Preparation	Land preparation is carried out two or more times, with harrowing applied to achieve a finer and softer soil texture	It is performed only once, and generally no harrowing is applied, so the soil in the conventional planting system tends to remain coarse.
Nursery	The seeds are soaked to select viable seeds, then planted in seedbeds, with a higher seed requirement	Seeds are also soaked to select good-quality seeds. The seed requirement is generally lower.
Planting	Planting is assisted with tools such as strings to achieve proper spacing. In the *jajar legowo* system, a maximum of two seedlings are transplanted per hole, and the process demands higher labor input	No planting tools are required, more seedlings are planted per hole (3–5 seedlings per hole), and the planting process is completed more quickly
Fertilization	Basal fertilization is applied using organic fertilizer, followed by a second and third application of urea. The second application occurs 14–21 days after transplanting (DAT), and the third at 35–40 DAT. Fertilization is facilitated by the spaces between the rows of plants	Although the fertilization schedule is generally similar, the process is more challenging because of the narrow row spacing and reduced efficiency in fertilizer application
Crop Maintenance	Replanting is performed to replace damaged plants, and pest and disease management is facilitated by the gaps between the rows of plants.	Replanting is performed, though less often than in the *jajar legowo* system. Crop maintenance is more challenging due to the dense arrangement of plants, and susceptibility to pests is higher owing to reduced light penetration and poor air circulation
Harvesting	The process is simpler and requires less time to complete.	The operation requires more time to complete because of the close spacing between plant rows

Based on the study results, there are technical differences in cultivation between the *jajar legowo* and conventional planting systems at each stage of production. The *jajar legowo* system requires more intensive land preparation, a higher seed requirement, and greater precision during planting because plant spacing must be arranged using string tools, with only 1–2 seedlings per hole. However, the presence of gaps between rows facilitates fertilization, weeding, and pesticide application, while improving air circulation and light penetration, thereby reducing the risk of pest and disease attacks. In contrast, the conventional system is simpler and faster to implement because precise spacing is not required and 3–5 seedlings are planted per hole. However, fertilization and pest control are more difficult due to the dense plant rows and higher humidity. Overall, the *jajar legowo* system excels in ease of maintenance and efficiency in crop management, whereas the conventional system is advantageous in terms of simplicity and speed of implementation.

Farmers in Maro Sebo District cultivate land ranging from 0.25 to 1 hectare. Most farmers are of productive age, with an average farming experience of 10–20 years. The survey results indicate that the *jajar legowo* system requires higher production inputs, including seeds, fertilizers, pesticides, and labor, compared to the conventional system. Nevertheless, the *jajar legowo* system produces higher dry grain yield (GKP) per hectare. This yield improvement aligns with Sirrappa (2011), who stated that the *jajar legowo* planting system can increase the number of productive tillers and light intensity for plants at the edge rows.

ANALYSIS OF FARMING INCOME

Farm income is defined as the difference between total revenue from crop sales and all production costs, both fixed and variable. The greater this difference, the higher the farmers' income. Therefore, farm income serves as an important indicator for assessing the efficiency of resource use and the sustainability of agricultural operations.

1. Farming Costs

The calculation of lowland rice farming costs in this study includes both fixed and variable costs. Fixed costs remain constant regardless of production volume, such as equipment depreciation and land taxes, while variable costs change according to production needs, including seeds, fertilizers, labor, and pesticides. The total of these costs forms the basis for determining farm income from lowland rice cultivation.

- **Fixed Cost**

Fixed costs are expenses that remain relatively constant and are incurred regardless of the level of production. In this study, fixed costs were calculated based on the depreciation value of agricultural tools and equipment used continuously throughout the farming process. The details of fixed costs for rice farming in the study area are presented in the following table.

Table 2. Details of Agricultural Equipment Depreciation Costs for One Planting Season Under the Jajar Legowo System in the Research Area, 2025.

Type of Equipment	Number of Units	Purchase Price	Residual Value	Economic Life	Depreciation
Sabit	3	50.000	7.500	5 Years	14.250,0
Hand Sprayer	1	500.000	25.000	5 Years	47.500,0
Cangkul	3	75.000	11.250	5 Years	21.375,0
Parang	2	100.000	10.000	5 Years	19.000,0
Total					**102.125,0**

Source: processed data, 2025

Depreciation of agricultural tools and machinery—such as sickles, hand sprayers, hoes, and machetes—in lowland rice farming under the *jajar legowo* system was recorded at IDR 102.125,0. Meanwhile, depreciation for the conventional planting system is presented in the following table.

Table 3. Details of Agricultural Equipment Depreciation Costs for One Planting Season Under the Conventional System in the Research Area, 2025.

Type of Equipment	Number of Units	Purchase Price	Residual Value	Economic Life	Depreciation
Sabit	2	50.000	5.000	5 Years	9.500,0
Hand Sprayer	1	500.000	25.000	5 Years	47.500,0
Cangkul	3	75.000	11.250	5 Years	21.375,0
Parang	2	100.000	10.000	5 Years	19.000,0
Total					**97.375,0**

Source: processed data, 2025

The depreciation cost of agricultural tools and machinery—such as sickles, hand sprayers, hoes, and machetes in lowland rice farming under the conventional planting system amounted to IDR 97.375,-.

- **Variable Cost**

Variable costs comprise expenditures on seeds, fertilizers, pesticides, and labor wages throughout the production process. The average variable costs in the study area are summarized in the following table.

Table 4. Breakdown of Variable Costs for the February–June 2025 Planting Season in the Research Area.

Description	**Jajar Legowo**		
	Average Amount	**Price (IDR)**	**Cost (IDR)**
Inpari 32 Seedskg/ha)	28,2	16.000	451.878,8
Fertilizers (kg/ha)			
- Organic	874,5	1.000	874.494,9
- Urea	87,7	12.000	1.052.727,3
Pesticides (ltr/ha)			
- Insecticides	0,7	70.000	47.904,0
- Herbicides	1,1	100.000	108.080,8
TK (HOK/ha)	77,3	70.000	5.408.737,4
TVC			**7.943.823,2**
Keterangan		**Konvensional**	
Local Seeds (kg/ha)	25,0	13.000	325.133,8
Fertilizers (kg/ha)			
- Organic	513,5	1.000	513.545,7
- Urea	53,4	12.000	641.200,8
Pestiscides (ltr/ha)			
- Insecticides	0,6	70.000	39.031,5
- Herbicides	0.9	100.000	88.240,0
TK (HOK/ha)	72,4	70.000	5.070.292,8
TVC			**6.677.444,7**

Source: processed data, 2025

The table shows that the total variable costs for lowland rice farming under the *jajar legowo* system amounted to IDR 7,943,823.2 per hectare, which is higher than the conventional system at IDR 6,677,444.7 per hectare. Thus, the *jajar legowo* system requires greater variable costs compared to the conventional system.

- **Total Cost**

Total costs represent the sum of fixed and variable costs. The details of total costs are presented in the following table.

Table 5. Breakdown of Total Costs for the February–June 2025 Planting Season in the Research Area.

Description	**Jajar Legowo (IDR/ha)**	**Konvensional (IDR/ha)**
Fixed Cost	102.125,0	97.375,0
Variable Cost	7.943823,2	6.677.444,7
Total Cost	**8.045.948,2**	**6.774.819,7**

Source: processed data, 2025

The table above indicates that the total cost of lowland rice farming under the *jajar legowo* system amounted to IDR 8.045.948,2 per hectare, which is higher than that of the conventional system at IDR 6.774.819,7 per hectare. Therefore, the *jajar legowo* system incurs higher total costs compared to the conventional system.

2. Farm Revenue

Farm revenue is calculated by multiplying the production yield by the selling price, which is IDR 6,500 per kilogram in Maro Sebo District. The details of revenue for the *jajar legowo* and conventional planting systems are presented in the following table.

Table 6. Production Volume, Price, and Farm Revenue for the February–June 2025 Planting Season in the Research Area.

Description	Production (kg/ha)	Selling Price (IDR)	Revenue (IDR)
Jajar Legowo	2986.8	6.500	19.414.096,9
Konvensional	2348.9	6.500	15.267.813,3

Source: processed data, 2025

The table shows that the average production under the *jajar legowo* system reached 2.986,8 kg/ha, which is higher than the conventional system at 2.348,9 kg/ha. With a grain price of IDR 6.500 per kilogram, the farm revenue under the *jajar legowo* system amounted to IDR 19.414.096,9, which is higher than the revenue from the conventional system at IDR 15.267.813,3.

3. Farm Income

Farm income is calculated as the difference between total revenue and total costs within one planting season. The details are presented in the following table.

Table 7. Lowland Rice Farming Income for the February–June 2025 Planting Season in the Research Area.

Description	Jajar Legowo (IDR/ha)	Konvensional (IDR/ha)
Revenue	19.414.096,9	15.267.813,3
Total Cost	8.045.948,2	6.774.819,7
Income	**11.368.148,7**	**8.492.993,6**

Source: processed data, 2025

The table shows a comparison of revenue, total costs, and farm income between the jajar legowo and conventional planting systems. The average revenue under the jajar legowo system is higher (IDR 19.414.096,9/ha) compared to the conventional system (IDR 15.267.813,3/ha). Although the total cost of the jajar legowo system is also higher (IDR 8.045.948,2/ha) than that of the conventional system (IDR 6.774.819,7ha), its net income remains greater, reaching IDR 11.368.148,7/ha compared to IDR 8.492.993,6/ha. Thus, the jajar legowo planting system provides higher profitability than the conventional system.

COMPARISON OF FARM INCOME

This analysis compares the farm income of lowland rice farming between the jajar legowo and conventional planting systems using a one-way ANOVA test. Before conducting the ANOVA, the data were first tested for normality and homogeneity.

1. Normality Test

Before conducting the normality test, the standard deviation of farm income for both planting systems was calculated to describe the distribution of data within each group and to support the interpretation of the normality test.

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
Pendapatan Petani (RP)	33	7937500.00	17433000.00	11685363.61	2506429.386
Pola Tanam Padi	33	1.00	1.00	1.0000	.00000
Valid N (listwise)	33				

a. Pola Tanam Padi = Jajar Legowo

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
Pendapatan Petani (RP)	37	4345250.00	12229000.00	8609395.032	1860419.445
Pola Tanam Padi	37	2.00	2.00	2.0000	.00000
Valid N (listwise)	37				

a. Pola Tanam Padi = Konvensional

The descriptive statistics show that the jajar legowo planting system has 33 samples with an income range of IDR 7,937,500–17,433,000, an average income of IDR 11,685,363.61, and a standard deviation of IDR 2,506,429.386. In the conventional system (37 samples), income ranges from IDR 4,345,250 to 12,229,000, with an average of IDR 8,609,395.03 and a standard deviation of IDR 1,860,419.445. The higher standard deviation in the jajar legowo system indicates greater income variability. This difference in variability highlights the importance of conducting a normality test before performing mean comparison analysis. Normality testing is essential to determine whether the data meet the assumptions of parametric tests or require the use of non-parametric methods**.**

The results of the normality test show that the significance values in both the Kolmogorov–Smirnov and Shapiro–Wilk tests are above 0.05, indicating that the income data for both planting systems are normally distributed. With the normality assumption fulfilled, the analysis of mean differences can be continued using parametric tests. This normality also confirms that although income variability differs between the two systems, the data distribution still meets the requirements for further statistical analysis.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Pola Tanam	Statistic	df	Sig.	Statistic	df	Sig.
Pendapatan	Jajar Legowo	.105	33	.200*	.960	33	.264
	Konvensional	.139	37	.068	.963	37	.254

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

2. Homogenity Test

The homogeneity of variance test was conducted using Levene's Test at a 5% significance level to ensure that the income variances of the jajar legowo and conventional planting systems are homogeneous.

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Pendapatan	Based on Mean	.022	1	68	.884
	Based on Median	.012	1	68	.913
	Based on Median and with adjusted df	.012	1	56.348	.914
	Based on trimmed mean	.002	1	68	.963

The results of Levene's Test show a significance value of 0.884 (> 0.05), indicating that the income variances of the two groups are homogeneous. The tests based on the median, adjusted median, and trimmed mean also produced significance values greater than 0.05. With the homogeneity of variance assumption fulfilled, the one-way ANOVA analysis can be appropriately continued.

3. One – Way ANOVA Test

This study employed a one-way ANOVA test to determine whether there is a significant difference in the average income between farmers who use the jajar legowo planting system and those who apply the conventional system.

ANOVA

Pendapatan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.665	1	1.665	31.416	<.001
Within Groups	3.604	68	.053		
Total	5.270	69			

The ANOVA results show an F-value of 31.416 with a significance level of < 0.001, indicating a significant difference in income between farmers using the jajar legowo system and those using the conventional system. Thus, H_0 is rejected and H_1 is accepted, confirming that the planting method has a significant effect on farmers' income.

R/C RATIO ANALYSIS

The analysis of farming profitability was carried out using the R/C ratio, which represents the comparison between total revenue and total costs in one cropping season. The details of revenue and costs for both planting systems are presented in the following table.

Table 8. Revenue, Total Costs, and R/C Ratio for One Planting Season in the Study Area, 2025

Description	Jajar Legowo	Konvensional
Revenue	19.414.096.9	15.267.813.3
Total Cost	8.045.948,2	6.774.819,7
RC/Ratio	**2,41**	**2,25**

Source: processed data, 2025

The calculation of the R/C ratio shows that the jajar legowo planting system has a value of 2.41, derived from a total revenue of IDR 19,414,096.6 and total costs of IDR 8.045.948,2. In the conventional system, the R/C ratio is 2.25, with revenue of IDR 15,267,813.3 and costs of IDR 6.774.819,7. Both values are greater than 1, indicating that the farming activities are financially feasible. However, the jajar legowo system provides higher profitability compared to the conventional system. This finding is consistent with the ANOVA results, which showed a significant difference in farmers' income between the two planting systems, confirming that the jajar legowo method is more profitable and more feasible to implement.

CONCLUSION

Based on the results of the study on lowland rice farming using the jajar legowo and conventional planting systems in Maro Sebo District, several important conclusions can be drawn. The jajar legowo system shows clear differences compared to the conventional system, particularly in the use of production inputs such as seeds, fertilizers, pesticides, and labor, which are required in larger quantities from land preparation to harvesting. Despite the higher input requirements, the jajar legowo system produces a higher yield of harvested dry grain (GKP). This increased productivity leads to higher farm income, as the additional output is sufficient to offset the higher production costs. The ANOVA results further confirm that the difference in income between the two planting systems is statistically significant, indicating that the jajar legowo system is more profitable and feasible to implement. Thus, it can be considered a more advantageous alternative for improving farmers' welfare.

ACKNOWLEDGMENTS

The author extends sincere gratitude to the Dean of the Faculty of Agriculture, University of Jambi, Dr. Forst Bambang Irawan, S.P., M.Sc., the Head of the Agribusiness Department, Dr. Mirawati Yanita, S.P., M.M., and the Head of the Agribusiness Study Program, Ardhiyan Saputra, S.P., M.Sc. Special appreciation is conveyed to Supervisor I, Prof. Dr. Ir. Edison, M.Sc., and Supervisor II, Riri Oktari Ulma, S.P., M.Si., for their guidance and support throughout the research process. The author also expresses heartfelt thanks to her parents for their moral and financial support.

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