International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

Analysis Of Factors Affecting Lowland Rice Production In Mekar Sari Village, Tongauna Subdistrict, Konawe Regency

Alamsyah Nur Prasetyo[1], Azhar Bafadal[2], Normal Bivariant Padangaran[2]

[1] Alumnus of Agribusiness, Faculty of Agriculture, Halu Oleo University, Kendari City, Indonesia
[2] Lecturer, Faculty of Agriculture, Halu Oleo University, Kendari City, Indonesia

Corresponding Author: alamsyah.nur.prasetyo@gmail.com

Abstract

This study aims to identify the factors that influence lowland rice production and to analyze the differences in the effects of using the Tabela and Tapin planting systems on lowland rice production in Mekar Sari Village, Tongauna District, Konawe Regency. The sampling technique used in this research is snowball sampling, with a total of 65 farmers as respondents, consisting of 40 farmers using the Tabela system and 25 farmers using the Tapin system. The analytical method employed in this study is linear regression analysis in the form of a natural logarithm (Ln). (1) The results show that the cost of seeds, fertilizers, pesticides, labor, land area, farming experience, age, and planting system simultaneously have a significant effect on rice production in Mekar Sari Village, Tongauna District, Konawe Regency. Partially, the cost of seeds, the cost of fertilizers, land area, and farming experience have a significant effect on rice production, while the cost of pesticides, labor cost, and farmer's age do not have a significant effect. (2) The dummy variable (planting system) indicates that there is no significant difference in rice production between farmers who use the Tabela system and those who use the Tapin system in Mekar Sari Village, Tongauna District, Konawe Regency.

Keyword: influence factors, lowland rice, production, tabela, tapin.

INTRODUCTION

The agricultural sector holds a strategic role in Indonesia's economic development, particularly in ensuring food availability, generating employment, and supporting rural livelihoods. With its vast arable land, tropical climate, and diverse agroecosystems, Indonesia has significant potential to strengthen national food security.

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

Konawe Regency in Southeast Sulawesi is widely recognized as the province's primary rice production center. According to Badan Pusat Statistik (Badan Pusat Statistik, 2025), in 2024 Konawe contributed 216,342.48 tons of rice, representing 39% of total rice production in the province. This achievement places Konawe ahead of other regencies such as East Kolaka and South Konawe, with overall provincial production reaching 482,371.05 tons. Within Konawe, Tongauna District has emerged as one of the strategic production areas, with Kelurahan Mekar Sari frequently highlighted for its high productivity, which reached 10 tons per hectare in 2021.

Despite this achievement, rice farming in the region faces challenges. Population growth continues to increase demand for rice, while agricultural land conversion, labor shortages, and the declining involvement of younger generations in farming threaten sustainability. In addition, planting practices have not always been efficient, creating variation in productivity levels. Farmers generally employ two cultivation systems: transplanting (tapin) and direct seeding (tabela). The transplanting method requires nursery preparation and manual replanting, while the direct seeding system allows germinated seeds to be sown directly in the field (Ahmadia, Christoporus, & Tondi, 2022). The latter has been increasingly adopted in Mekar Sari, particularly in the form of broadcast seeding, as it reduces labor requirements and shortens the planting process. However, not all farmers have shifted to this system, and differences in outcomes remain.

This condition raises important questions regarding the factors that determine rice production and the extent to which planting systems contribute to productivity differences. Accordingly, this study aims to analyze the influence of production inputs and farmer characteristics on rice production and to compare the outcomes of the transplanting and direct seeding systems in Mekar Sari, Tongauna District, Konawe Regency.

METHOD

This research was conducted in Mekar Sari Village, Tongauna District, Konawe Regency, from January to July 2025. The location was deliberately selected (purposive sampling) since Mekar Sari is one of the areas where farmers apply both transplanting (tapin) and direct seeding (tabela) systems, and it has frequently been designated as a site for mass harvest events.

The study population comprised all rice farmers in Mekar Sari, totaling 260 individuals across 11 farmer groups. Following the sampling guideline of Veronica et al. (2022), when the population size ranges from 100 to 300, 25% of the total can be taken as the sample. Accordingly, this study selected 65 farmers. Respondents were identified using the snowball sampling

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

technique, as there was no official record distinguishing the number of farmers adopting the tabela or transplanting systems in the study area.

The collected data were tabulated and analyzed using multiple linear regression with a natural logarithm transformation (double log model). The regression equation is specified as follows:

$$Ln\ Y = \beta 0 + \beta 1\ Ln\ X1 + \beta 2\ Ln\ X2 + \beta 3\ Ln\ X3 + \cdots + \beta 7\ Ln\ X7 + \beta 8\ D + \varepsilon$$

where: Ln Y = production (tons); LnX1 = seed cost (IDR); LnX2 = fertilizer cost (IDR); LnX3 = pesticide cost (IDR); LnX4 = labor cost (IDR); LnX5 = land area (ha); LnX6 = farming experience (years); LnX7 = farmer's age (years); D = dummy variable for planting system (1 = tabela; 0 = tapin); β0 = constant; β1,…, β8 = regression coefficients; ε = error term.

RESULTS AND DISCUSSION

Respondent Characteristics

To provide an overview of the respondents in this study, several characteristics were identified, namely farm size, farming experience, and farmers' age distribution across the two planting systems. The detailed characteristics are presented in Table 1.

Table 1. Characteristics of Respondents by Planting System

Characteristic	Planting System			
	Tabela		Tapin	
	Frequency (persons)	Percentage (%)	Frequency (persons)	Percentage (%)
Farm Size (ha)				
<1	8	20	-	-
1-2	29	72,5	24	96
>2	3	7,5	1	4
Farming Experience (years)				
< 5 (less experienced)	1	3	-	-
5–10 (moderately experienced)	3	8	-	-
> 10 (experienced)	36	90	25	100
Age (years)				
15–55 (productive)	33	82,5	12	48
> 55 (less productive)	7	17,5	13	52

Source: Research Data, 2025

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

Most farmers in both systems operate on land areas of 1–2 ha. In the Tabela system, 72.5% of respondents fall into this category, followed by farms smaller than 1 ha (20%) and larger than 2 ha (7.5%). Similarly, Tapin farmers are highly concentrated in the 1–2 ha group (96%), with only a small proportion cultivating more than 2 ha. This indicates that both planting systems are predominantly adopted by small- to medium-scale rice farmers.

Farming experience among respondents is generally high. The majority of Tabela farmers (90%) and all Tapin farmers (100%) have more than 10 years of farming experience, suggesting that the choice of planting system is largely made by experienced farmers with sufficient knowledge of rice production practices.

Differences are more evident in terms of age. Most Tabela farmers (82.5%) are within the productive age group (15–55 years), whereas Tapin farmers are relatively older, with 52% aged above 55 years. This suggests that younger farmers are more inclined to adopt the Tabela system, while older farmers tend to maintain the conventional Tapin system.

Table 2. Factors Affecting Lowland Rice Production

Variable	Coefficient	Partial Test	
	B	t-value	Sig.
(Constant)	-4.725	-4.014	0.000
Seed Cost (LnX1)	0.208	4.008	0.000
Fertilizer Cost (LnX2)	0.124	2.332	0.023
Pesticide Cost (LnX3)	0.103	1.641	0.106
Labor Cost (LnX4)	0.022	0.985	0.329
Farm Size (LnX5)	0.549	6.755	0.000
Farming Experience (LnX6)	0.061	2.479	0.016
Age (LnX7)	0.048	0.695	0.490
Planting System (D)	0.098	1.868	0.067
F (Simultaneous Test)	650.987		0.000
R^2	0.989		
R	0.995		

Source: Research Data, 2025

The estimated regression equation can thus be written as:

$$Ln\ Y = -4{,}725 + 0{,}208LnX1 + 0{,}124LnX2 + 0{,}103LnX3 + 0{,}022LnX4 + 0{,}549LnX5 + 0{,}061LnX6 + 0{,}048LnX7 + 0{,}098D + \varepsilon$$

Coefficient of Determination (R^2)

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

The coefficient of determination (R^2) of 0.989 indicates an excellent model fit, suggesting that 98.9% of the variation in lowland rice production is explained by seed cost, fertilizer cost, pesticide cost, labor cost, land area, farming experience, farmer age, and planting system. This high explanatory power implies that the selected input and farmer-related variables adequately capture the main determinants of rice production. The remaining 1.1% of variation is attributable to other factors not included in the model, such as climatic conditions, soil characteristics, and farm management practices.

F-test

The F-test results further confirm the robustness of the model. The significance value of 0.000 ($p < 0.05$) indicates that all independent variables jointly have a statistically significant effect on lowland rice production, both under direct seeding (Tabela) and transplanting systems. These findings emphasize that rice production is influenced by the combined effects of production inputs, farmer characteristics, and planting system choices rather than by individual factors alone.

t-test

The t-test assesses the statistical significance of each independent variable in explaining variations in the dependent variable. Based on the estimation results of the double-log regression model presented in Table 4.8, four variables have a statistically significant effect on lowland rice production, namely seed cost (LnX1), fertilizer cost (LnX2), land area (LnX5), and farming experience (LnX6). In contrast, pesticide cost (LnX3), labor cost (LnX4), farmer age (LnX7), and the planting system dummy variable (D) do not exhibit a significant influence on rice production.

Seed Cost (LnX1)

The regression results show that seed cost has a positive and statistically significant effect on lowland rice production, with a coefficient of 0.208 and a significance level of 0.000. This indicates that a 1% increase in seed cost is associated with a 0.208% increase in rice output, assuming efficient seed use.

Higher seed expenditure reflects greater seed requirements and the use of improved varieties, which contribute to higher yields due to better germination and resistance to pests and diseases. This result is consistent with previous studies (Karim & Paman, 2023; Murdani,

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

Alam, & Sulaeman, 2020; Sari, Edison, & Nurchaini, 2019). In this study, seed cost serves as a proxy for input intensity, capturing both the quantity and quality of seed used by farmers.

Fertilizer Cost (LnX2)

The regression results indicate that fertilizer cost has a positive and statistically significant effect on lowland rice production, with a significance value of 0.023 ($p < 0.05$) and a coefficient of 0.124. This implies that a 1% increase in fertilizer cost leads to a 0.124% increase in rice output.

Fertilizer application improves soil fertility and supports plant growth, making its positive contribution to production expected. Farmers in Mekar Sari typically apply fertilizer two to three times per growing season, allocating a substantial share of their production costs to fertilizer inputs, reflecting their importance for achieving optimal yields.

This finding is consistent with previous studies (Karim & Paman, 2023; Maksum, Noer, & Dulbari, 2023; Murdani et al., 2020; Pirngadi et al., 2023; Sari et al., 2019), which also report a significant effect of fertilizer use on rice production. Although fertilizer input is measured in monetary terms, fertilizer cost can be considered a proxy for fertilizer quantity, given relatively uniform prices. Proper fertilizer type, dosage, and timing are therefore crucial for improving rice productivity.

Pesticide Cost (LnX3)

Pesticide cost does not have a statistically significant effect on lowland rice production, as indicated by a significance value of 0.106. Although the coefficient is positive, the effect is not statistically meaningful.

This result may be explained by the high variability in pesticide brands, prices, and application practices among farmers. Differences in effectiveness and inconsistent usage patterns weaken the link between pesticide expenditure and production outcomes. This finding is consistent with Maksum et al. (2023) and Pirngadi et al. (2023), who also report that pesticide use does not significantly influence rice production, as pesticides primarily function to protect yields rather than increase output.

Labor Cost (LnX4)

The regression results indicate that labor cost has a positive coefficient of 0.022 but is not statistically significant, with a significance value of 0.329. This suggests that increases in labor cost do not have a meaningful effect on lowland rice production at the 5% significance level.

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

In the direct seeding (Tabela) system, the use of mechanized tools enables faster and more efficient planting, thereby reducing the need for manual labor without compromising yield levels. Farmers adopting the Tabela system, particularly those using broadcasting methods with blowers, require less labor compared to the conventional transplanting system, while achieving comparable production outcomes.

This finding is consistent with previous studies (Maksum et al., 2023; Sari et al., 2019), which also report that labor input does not significantly affect rice production. Although earlier studies measured labor in physical units, labor cost in this study serves as a proxy for labor intensity, given relatively uniform wage rates within the study area.

Land Area (LnX5)

The regression results show that land area has a coefficient of 0.549 with a significance value of 0.000, indicating a strong and statistically significant effect on lowland rice production. A 1% increase in cultivated land area leads to a 0.549% increase in output, making land area the most influential factor in the model.

This result is intuitive, as land area directly determines production scale. Larger farm sizes allow greater application of production inputs and result in higher total output compared to smaller holdings. This finding is consistent with previous studies (Karim & Paman, 2023; Maksum et al., 2023; Murdani et al., 2020; Pirngadi et al., 2023; Sari et al., 2019), which also report a positive and significant relationship between land area and lowland rice production.

Farming Experience (LnX6)

The regression analysis shows that farming experience has a positive and statistically significant effect on lowland rice production, with a coefficient of 0.061 and a significance value of 0.016 ($p < 0.05$). This indicates that a 1% increase in farming experience is associated with a 0.061% increase in rice output.

Although the magnitude of its effect is smaller than that of physical inputs such as land area or seed cost, farming experience remains an important determinant of production. More experienced farmers tend to make better decisions regarding variety selection, input allocation, and the management of pests, diseases, and climatic variability. This finding is consistent with Machmuddin, Kusnadi, & Jafar (2019), who also report a significant positive relationship between farming experience and rice production.

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

Farmer Age (LnX7)

The regression results indicate that farmer age has a positive coefficient of 0.048 but is not statistically significant, with a significance value of 0.490. This suggests that age does not have a significant effect on lowland rice production at the 5% significance level.

This finding implies that farmer age is not a determining factor in rice production outcomes, as both older and younger farmers are capable of achieving similar production levels. This result is consistent with Machmuddin et al. (2019), who also report that farmer age does not significantly influence rice production, indicating that production performance is more closely related to farm management practices and input use rather than age.

Planting System (D)

The planting system is included in the model as a dummy variable, where a value of 1 represents the direct seeding system (Tabela) and 0 represents the transplanting system (Tapin). The regression results show a positive coefficient of 0.098 with a significance value of 0.067, indicating that the Tabela system has the potential to increase rice production compared to Tapin. However, since the significance level exceeds 0.05, the effect is not statistically significant, suggesting insufficient evidence to confirm a significant difference in production between the two planting systems.

The Tabela system applied in the study area mainly uses the broadcasting method with blowers, which offers advantages in terms of labor efficiency and planting speed. Nevertheless, its effectiveness depends heavily on proper seed distribution and weed management. Variations in farmers' management practices and land characteristics, such as sandy soils that limit root development, may explain the insignificant effect of the planting system variable.

Empirically, the Tabela system produces an average yield of 8 tons with a shorter harvesting period (90–100 days after planting), while the Tapin system yields an average of 8.6 tons with a longer harvesting period (100–110 days). Although Tabela yields are slightly lower, it requires lower average input costs (approximately 22% less than Tapin), highlighting its advantage in cost and time efficiency. This finding is partly consistent with Sahardi et al. (2021), who emphasize that broadcast Tabela is efficient in time and labor but may suffer from uneven crop growth and weed pressure if not optimally managed.

CONCLUSION

Seed cost, fertilizer cost, land area, and farming experience have a positive and statistically significant effect on lowland rice production, while pesticide cost, labor cost, and

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

farmer age do not significantly influence production in Mekar Sari Village, Tongauna District, Konawe Regency. Moreover, no significant difference in rice production is observed between farmers adopting the direct seeding (Tabela) system and those using the transplanting (Tapin) system.

Based on these findings, farmers are encouraged to optimize the use of key production inputs, particularly seeds and fertilizers, which have a direct impact on yield, and to consider alternative direct seeding methods such as row seeding and the jajar legowo system to improve efficiency. In addition, policy efforts should prioritize agricultural subsidies for inputs that directly enhance rice production, especially seeds and fertilizers.

REFERENCE

Ahmadia, A., Christoporus, & Tondi, K. M. (2022). Analisis Komparatif Pendapatan Usahatani Padi Sawah Sistem Tabela dan Tapin di Desa Siwalempu Kecamatan Sojol Kabupaten Donggala. *Agrotekbis: Jurnal Ilmu Pertanian (e-Journal)*, *10*(4), 485–491.

Badan Pusat Statistik. (2025). *Provinsi Sulawesi Tenggara dalam Angka 2025*. Kendari: Badan Pusat Statistik Sulawesi Tenggara.

Karim, R., & Paman, U. (2023). Faktor-Faktor yang Mempengaruhi Produksi Padi Sawah di Nagari Balai Panjang Kecamatan Lareh Sago Halaban Kabupaten Lima Puluh Kota, Provinsi Sumatera Barat. *Jurnal Dinamika Pertanian*, *1*, 105–112.

Machmuddin, N., Kusnadi, N., & Jafar, R. (2019). Social Economic Factors Affecting Organic Rice Production in Tasikmalaya. *Jurnal Ekonomi Pertanian Dan Agribisnis (JEPA)*, *3*(4), 730–737. https://doi.org/10.21776/ub.jepa.2019.003.04.8

Maksum, S., Noer, I., & Dulbari. (2023). Analisis Faktor-Faktor Produksi yang Mempengaruhi Produksi Padi Sawah di Desa Dayamurni Kecamatan Tumijajar Kabupaten Tulang Bawang Barat. *Prosiding Seminar Nasional Pembangunan Dan Pendidikan Vokasi Pertanian*, *4*(1), 567–576. Lampung: Politeknik Pembangunan Pertanian Manokwari. https://doi.org/10.47687/snppvp.v4i1.680

Murdani, N., Alam, M. N., & Sulaeman. (2020). Faktor-Faktor yang Mempengaruhi Produksi Padi Sawah Sistem Tabela di Desa Kasimbar Palapi Kecamatan Kasimbar Kabupaten Paragi Moutong. *Agrobisnis*, *5*(8), 986–993.

Pirngadi, R. S., Utami, J. P., Siregar, A. F., Salsabila, S., Lubis, W., & Intan, D. R. (2023). Analisis Pendapatan Petani Serta Faktor Yang Mempengaruhi Produksi Padi Sawah Di Kecamatan Baktinya Kabupaten Aceh Utara. *JURNAL AGRICA*, *16*(1), 1–14. https://doi.org/10.31289/agrica.v16i1.7423

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

Sahardi, Rauf, A. W., Nappu, M. B., Idaryani, Fauziah, K., Nurlaila, … Syam, A. (2021). Prospects for the Development of Direct Seed Planting Technology (Tabela) in Indonesia. *E3S Web of Conferences*, *306*, 1–11. Makassar: EDP Sciences. https://doi.org/10.1051/e3sconf/202130604014

Sari, A. W., Edison, & Nurchaini, D. S. (2019). Analisis Faktor-Faktor yang Mempengaruhi Produksi Usahatani Padi Sawah Program Upsus Pajale di Kecamatan Kumpeh Ulu. *JISEB*, *22*(2), 113–122. https://doi.org/10.22437/jiseb.v22i2.8708

Veronica, A., Ernawati, Rasdiana, Abas, M., Yusriani, Hadawiah, … Zulkarnaini. (2022). *Metodologi Penelitian Kuantitatif*. Padang: PT. Global Eksekutif Teknologi.

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.