Selling Paddy or Rice: A Logistic Regression Analysis of Farmers' Decision in East Kolaka

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Abstract: Rice is the most important food crop in Indonesia and plays a crucial role in maintaining national food security. This study aimed to explore the factors influencing farmers' decisions on selling their rice harvest as either paddy or milled rice in Lere Jaya Village, East Kolaka, Southeast Sulawesi. The population comprised 174 farmers selling paddy and 56 selling milled rice. From these, 53 paddy sellers and 17 milled rice sellers were selected as respondents. Logistic regression analysis was employed to understand the decision-making factors. The study found age, education level, and production significantly influenced these decisions, while farming experience and family size did not. Recommendations include targeted educational programs and strategies to enhance production efficiency, potentially guiding farmers towards more profitable selling practices.

Keywords: decision, logistic regression, paddy, rice, marketing.

1. Introduction

Rice, as the most important food crop in Indonesia, plays a critical role in ensuring the nation's food security [1]. It is a staple for 97% of the Indonesian population [2], making its availability a matter of national importance. The Indonesian government has initiated various programs to enhance rice production and productivity, acknowledging its significance in sustaining the economy and generating employment [3]. Despite these efforts, domestic production often falls short of meeting the growing demand, leading to reliance on rice imports [4], [5]. In 2013, Indonesia produced 67.4 million tons of rice, yet still imported 71,403 tons, underlining the challenges faced in maintaining self-sufficiency [6]. This situation highlights the vital role of rice in both the dietary sustenance and economic stability of Indonesia.

In Southeast Sulawesi, rice cultivation holds a special place, contributing significantly to the region's agricultural profile [7], [8]. East Kolaka, a regency within this province, is distinguished by its unique agricultural practices, characterized by diverse ecological conditions favorable for rice production. This region is known for its substantial contribution to the province's overall rice output. It is the second-largest producer of paddy rice in Southeast Sulawesi after Konawe, with a production of 87,867 tons in 2019, increasing to 89,392 tons in 2020. The district has 16,358 hectares of existing rice fields across 12 sub-districts. In 2020, this area produced 128,187 tons of dry paddy, with a productivity rate of 4.636 tons per hectare [7]. These figures underscore not only economic importance of

rice but also its cultural significance, further cementing rice as a cornerstone of livelihood and tradition in East Kolaka.

Despite the importance of rice, the rice agribusiness faces numerous challenges. One of the primary issues is the lack of capital, which hinders farmers from adopting modern agricultural techniques and thus limits productivity and quality [9]. Additionally, farmers often find themselves in a low bargaining position when selling their produce, primarily due to fragmented market structures and limited access to market information. This situation results in farmers receiving less value for their produce, impacting their income and sustainability [10], [11]. These challenges underscore the need for strategic interventions to improve the rice agribusiness sector, ensuring it can meet the growing demands efficiently and profitably.

The significant demand for rice allows farmers to earn a reasonable income from their harvest [12]. Anticipating price drops during the harvest season, some farmers delay selling their crop as a strategy to increase income [13]. Research by Coulter and Poulton, cited in Onumah's work [13], indicates that agricultural commodity prices can rise up to 80% six months post-harvest. However, traditionally, farmers often struggle with delaying sales, even when market prices are low. Many experience losses due to falling rice prices, leaving them with no choice but to sell their paddy immediately to meet living expenses and to fund the next planting season [14] .

In the context of East Kolaka, farmers are faced with the decision of selling their rice either as paddy or in its milled form. Despite the lower financial returns, the majority opt to sell as paddy. This preference is influenced by several factors, including immediate cash needs, limited access to milling facilities, and a lack of market knowledge. Selling paddy, however, often results in lower income compared to selling milled rice. This choice, seemingly driven by short-term necessities, has long-term implications for the farmers' economic stability and the overall efficiency of the rice supply chain in the region. Understanding these decision-making dynamics is crucial in devising strategies to enhance farmers' income and the sustainability of rice farming.

The necessity of this research arises from the complexities and challenges faced by rice farmers in East Kolaka. This study aims to understand the underlying factors influencing farmers' decisions to sell rice either as paddy or in milled form. By

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employing logistic regression analysis, the research seeks to uncover the demographic, educational, and production-related variables that significantly impact these decisions. The ultimate goal is to provide insights that can guide policy-making and support interventions, enhancing the economic well-being of farmers and the efficiency of the rice agribusiness sector in the region.

2. Materials and Methods

This study was conducted in Lere Jaya Village, East Kolaka, from May to December 2022, focusing on the decision-making process of rice farmers. The population consisted of 174 farmers selling paddy and 56 selling milled rice. Using the Slovin formula, a sample of 70 farmers was selected, proportionally divided between the two groups. The study employed both primary and secondary data, with primary data collected through interviews. These interviews gathered information on respondent demographics, such as age, education, farming experience, and family dependents, as well as farming specifics like land size and production. Secondary data was sourced from institutional publications and local agricultural offices, providing supplementary information.

Logistic regression analysis was the primary analytical tool used. The dependent variable was the farmers' decision to sell as paddy or rice, coded as a binary variable. The independent variables included age, education, farming experience, family dependents, and production. The logistic regression model was evaluated for its fit using the G-test and the Hosmer and Lemeshow Goodness of Fit Test, while the Nagelkerke R Square was used to assess the model's explanatory power. Wald's test determined the significance of the individual predictors. A 10% significance level will be used to assess the validity of the findings [15], [16]. The regression equation modeled was:

$$\text{Logit}(P) = \beta_0 + \beta_1(\text{Age}) + \beta_2(\text{Education}) + \beta_3(\text{Farming Experience}) + \beta_4(\text{Family Dependents}) + \beta_5(\text{Production})$$

where $\text{Logit}(P)$ is the logarithmic odds of the decision to sell as paddy or rice, and β_0, β_1, β_2, β_3, β_4, β_5 are the coefficients to be estimated. This comprehensive methodological approach was designed to robustly analyze the factors influencing farmers' selling decisions in this region.

3. Results and Discussion

A. Socioeconomic Characteristics of Respondents

The socio-economic characteristics of the respondents in this study reveal diverse backgrounds. The majority of respondents were within the productive age bracket of 14-64 years. Educational attainment varied, with a significant number of paddy sellers having primary education and rice sellers predominantly having high school education. Most farmers, regardless of their product type, had extensive farming experience, often exceeding 10 years. In terms of household size, paddy sellers typically had larger families with 4-6 dependents, while rice sellers had smaller households. The land size managed by these farmers also varied, with many operating on more than 0.5 hectares, and a substantial portion working on land areas exceeding 2 hectares. This profile highlights the varied demographic and economic factors influencing the farming community in East Kolaka.

B. Factors Influencing Decisions to Sell Either Paddy or Rice

The methodology of the study involved an application of logistic regression analysis to analyze the factors influencing farmers' decisions in selling rice as paddy or milled. The logistic regression model was validated using the Hosmer and Lemeshow Test, which yielded a value of 9.850 with a significance probability of 0.276. This result affirmed the model's appropriateness, as it showed no significant deviation from the hypothesized model. Further, the Nagelkerke R Square value stood at 0.884, indicating a strong explanatory power of the model, as it accounted for 88.4% of the variance in the dependent variable, with the rest attributed to external factors not included in this model.

The overall model's significance was ascertained through the likelihood ratio test, which produced a G-value of 62.755 with a significance level of 0.000 at a 10% error margin. This outcome showed that the selected independent variables – age, education, farming experience, number of dependents, and production – collectively exert a significant influence on the farmers' decision-making process. The partial test, or Z/Wald test, was utilized to evaluate the individual impact of each independent variable. The logistic regression model estimations, detailed in Table 1, provide a comprehensive view of the influencing factors and their respective contributions.

Table 1
Logistic regression model estimates

No.	Variables	Estimate	S.E.	Wald	Sig.
1	Age	-0,436	0,243	2,230	0,072*
2	Educational level	0,824	0,421	3,834	0,050*
3	Farming experience	0,0068	0,199	0,116	0,734[ns]
4	Number of family dependents	0,469	0,749	0,392	0,531[ns]
5	Production	0,000	0,000	4,418	0,036*
	Constant	9.611	6,044	2,529	0,112

Notes: *denotes significance at 10 percent level; ns denotes non-significance

The regression coefficient estimation using a logistic model for six independent variables in Table 1 indicates that only three independent variables significantly influence farmers' decisions to sell their harvest as paddy or milled rice. These variables are age (X_1), education level (X_2), and production (X_5). The variables of farming experience and the number of family dependents were found to be not significantly impactful.

1) Age

The logistic regression analysis in this study reveals how farmers' age significantly impacts their decision-making regarding the sale of their harvest. The negative correlation, indicated by a regression coefficient of -0.436 and a significance value of 0.072, suggests that older farmers are more likely to sell their harvest as paddy, rather than milled rice. This trend may be attributed to the physical and cognitive demands associated with processing rice into its milled form.

Younger farmers, characterized by better physical health and cognitive abilities, are better equipped to handle these demands and thus more likely to engage in selling milled rice. This decision aligns with their capacity to undertake the additional stages of rice processing, which older farmers might find more challenging due to the required effort and associated costs. As a result, older farmers often opt for the less labor-intensive route of selling paddy.

The findings of this study align with Nyaupane and Gillespie's research [17], which found a tendency among older farmers to prefer direct marketing to processors. However, the results of this study disagrees to findings of Gilg and Battershill [18] that age is not a significant factor in influencing decisions regarding direct marketing. Likewise, Adanacioglu's research [19] also concluded that the age of cherry growers does not markedly affect their tendency to participate in direct marketing.

2) Educational level

The analysis, using the partial Wald Test, reveals that the education level of farmers significantly influences their marketing decisions. With a significance level of 0.050 and a regression coefficient of 0.824, the data suggests that higher educational attainment correlates positively with the choice to sell harvested rice in milled form. This finding is particularly noteworthy at a 90% confidence level, indicating a robust association between education and marketing strategy among farmers.

Further examination of the results indicates that farmers who opt to sell milled rice typically possess higher education levels compared to those selling paddy. This distinction may be attributed to a more informed understanding of the value-added process. Educated farmers recognize that by engaging in post-harvest processing, they can potentially secure greater profits than by selling unprocessed paddy. This perspective is supported by research from Nurfadillah et al. (2018), who assert that while selling rice in either form is profitable, milled rice sales yield higher returns. This correlation underscores the critical role of education in enhancing farmers' decision-making capacity, leading to more profitable outcomes.

The outcomes of this study was supported by Gilg and Battershill that education significantly influence decisions about direct marketing. However, a different perspective was found in Adanacioglu's research [19], which concluded that the educational level of cherry growers does not significantly influence their marketing decisions, namely their tendency to participate in direct marketing. The research by Wulandari et al. [20] also concluded that the education level does not significantly influence rice farmers' decisions in marketing their products.

3) Farming experience

Experience is a pivotal factor in a farmer's decision-making process, shaping their ability to evaluate alternatives and make informed choices. As proposed by Soekartawi (2016), it is generally anticipated that with extended farming experience, farmers' decision-making becomes more rational, leading to enhanced agricultural success. However, empirical evidence from the Wald Test, indicating a significance value of 0.734 for the farming experience variable, challenges this assumption. This value, exceeding the 0.1 threshold, suggests that the length of farming experience does not significantly affect farmers' decisions regarding the sale of rice as paddy or milled rice.

The study reveals a nuanced understanding of experience in agriculture. Although the regression coefficient for farming experience (0.068) implies a positive correlation with marketing decisions, the majority of farmers in Lere Jaya, with over a decade of experience, do not necessarily translate this extensive experience into more effective decision-making. This finding underlines the complexity of agricultural decision-making, where factors beyond individual control, such as weather and climate, play a significant role. Moreover, the impact of adverse experiences, which can instill fear and hesitation, cannot be overlooked. These insights suggest that experience in farming, while beneficial, is intertwined with a multitude of external and psychological factors that influence decision-making in ways not always aligned with the expected outcomes of increased rationality and success.

The findings of this study contrast with Adanacioglu's research [19], which found that farming experience significantly influences farmers' likelihood of engaging in direct marketing. According to Adanacioglu, more seasoned cherry farmers tend to sell directly to consumers, driven by their extensive experience in cherry marketing and the necessity to explore alternative marketing channels. This need arises from their historical acceptance of lower prices in indirect markets, leading them to seek more profitable selling options.

4) Number of family dependents

The study's findings reveal that the number of family dependents, with a significance value of 0.531, does not play a significant role in influencing farmers' decisions regarding the sale of their rice harvest in either paddy or milled form. This is indicated by the value exceeding the 0.1 significance threshold, suggesting that factors other than family size are more pivotal in these decisions. The positive relationship indicated by the regression coefficient of 0.469 for this variable, however, suggests some level of influence, albeit not decisive.

In the practical context of these farming households, decision-making predominantly involves the primary stakeholders - typically the husband and wife. They do not generally seek the opinions of children or other dependents; despite the potential labor contribution these family members might provide. This dynamic underscores a more centralized decision-making process within the farming household, focused on those directly engaged in agricultural activities, rather than a broader family-based consensus. This approach reflects the operational realities of small-scale farming where immediate stakeholders play a critical role in strategic decisions.

The findings in this study contrast with research by Wulandari et al.[20] that the number of family dependents has a positive and significant effect at a 90% confidence level on rice farmers' decision to market their products after engaging in delayed selling. Furthermore, Suhartatik and Batubara [21] reported that the number of family members positively and significantly affects farmers' decisions to sell their harvest as

paddy to middlemen. They noted that larger family needs and the urgency for quick income lead farmers to choose selling paddy for its faster monetary returns. This choice is driven by the imperative to avoid risks associated with drying and handling paddy, which can lead to reduced prices for both paddy and rice. Likewise, Munandar et al. [22] and Sobichin [23] also reported that farmers' need for quick cash to cover living expenses and capital for the next planting season, along with a reluctance to increase workload and costs, are reasons they tend to sell their harvest as dry harvested paddy.

5) Production

The analysis of the production variable's significance in farmers' marketing decisions reveals a noteworthy trend. With a significance value of 0.036, falling below the conventional alpha threshold, production emerges as a significant determinant in the decision to sell the harvest in either paddy or milled rice form. The positive nature of the regression coefficient (0.000) suggests that as production increases, farmers demonstrate a greater propensity to sell their harvest as milled rice. This trend can be attributed to the increased feasibility and economic viability of processing higher volumes of paddy into milled rice, thereby maximizing potential revenue. High production yields provide farmers with enough volume to justify the additional processing costs and efforts, making the sale of milled rice a more attractive and profitable option. This relationship underscores the direct impact of production levels on farmers' strategic choices in crop marketing.

This study's findings are consistent with those reported by Pranoto [24] that production volume significantly influence farmers' decision to engage in delayed selling. However, the results disagree with those reported by Suhartatik and Batubara [21] regarding the influence of production volume on farmers' decisions to sell their harvest as paddy to middlemen. Farmers in their study did not base their selling decision on the quantity of the harvest. Instead, they emphasized the quality of the paddy. This perspective highlights the importance of product quality over quantity in influencing farmers' marketing choices.

4. Conclusion

The study reveals that factors such as age, education level, and production significantly influence farmers' decisions on whether to sell their rice harvest in the form of paddy or milled rice in Lere Jaya Village. Interestingly, variables like farming experience and the number of family dependents do not significantly influence this decision. This insight calls for strategic interventions, particularly in educational and production enhancement areas. Recommendations include educational programs for farmers about the economic benefits of selling milled rice and supporting measures to increase production efficiency. These interventions could potentially encourage more profitable and informed selling practices among the farmers.

Acknowledgment

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