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Risk, Focus of Loss, and Minimum Income in Rainfed Lowland Rice Farming

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Abstract

This study aims to analyze the levels of production risk, cost risk, and revenue risk, as well as the tolerable risk of loss (focus of loss) and minimum income of rain-fed lowland rice farming in the Tanakeke Islands District, Takalar Regency. Primary data collection methods used direct interviews (questionnaires) and field observations. A sample of 82 farmers was selected for this study. Data analysis used descriptive analysis and the Coefficient of Variation (CV).

The results indicate that the highest risk of loss borne by rain-fed lowland rice farmers is cost risk, at 23.65 percent. Production risk, meanwhile, reached 13.74 percent and revenue risk, at 14.6 percent. Rain-fed lowland rice farming income is generated only in one planting season per year, averaging Rp 23,803,482.62 per hectare, with total farming costs of Rp 5,201,110.34 per hectare. The average household expenditure of rice farmers reaches Rp 16,423,225.61 per year. The minimum income earned by rain-fed rice farmers to continue farming and meet household needs is Rp 21,624,335.95 per year, with a tolerable or reasonable risk of loss accepted by rice farmers of Rp 2,179,146.67 per hectare. The focus of loss value or risk of loss that can be accepted by rice farmers is 9.15 percent, meaning that if the risk of loss occurs above this value, farmers will experience financial constraints in continuing farming and meeting their household needs.

Keywords: focus of loss, minimum income, risk, farming, paddy fields.

INTRODUCTION

One of the strategic agricultural development programs is food self-sufficiency. This self-sufficiency is called rice self-sufficiency because rice is the primary food ingredient in food self-sufficiency. Rice is a strategic food crop for achieving rice self-sufficiency in Indonesia (Sepfrian et al., 2022). To date, the government has played a role in efforts to increase rice production, starting with pre-production activities such as

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providing seeds, fertilizers, and pesticides, strengthening production systems, and providing farmer capital. Given the importance of rice as a commodity, increasing the productivity of this food crop needs to be prioritized (Zakir et al., 2023).

The agricultural sector frequently faces extreme situations, namely risk and uncertainty. Risk is an uncertain event that can lead to losses, and it can also be defined as a deviation from expected results. Uncertainty arises from natural factors that influence crop yields and price fluctuations that affect farmers' incomes. This uncertainty poses a risk or opportunity for losses for farmers. Farmers seek to avoid failure, not to achieve substantial profits by taking risks. Agricultural production risks impact variations in production and revenue (Arifin et al., 2023).

Rice fields are the primary land resource that supports rural communities' livelihoods by producing food crops, particularly rice. Irrigated rice farming carries a lower risk than rain-fed rice farming (Mardiyati et al., 2019). Rain-fed rice fields have the potential for food crop production, alongside irrigated rice fields (Trinugroho et al., 2023). Various obstacles in managing rain-fed rice fields include low soil fertility, erratic water availability and rainfall, and susceptibility to drought stress, which puts farmers at a high risk of crop failure (Sahara et al., 2022). Rain-fed rice fields are highly vulnerable to the impacts of climate change, especially drought stress and attacks by plant pests (Wihardjaka et al., 2020).

Agricultural production is inherently uncertain. A good rainy season brings a good harvest. Drought or excessive rainfall can damage crops. Production is inherently risky. Production risks can be seen when productivity fluctuates (Zakaria et al., 2023). The climate is highly dynamic and complex, so adaptation to the local climate is crucial. In addition to its highly dynamic and complex nature, the climate has also undergone long-term changes. Climate indicators such as air temperature and rainfall have changed due to global warming (Estiningtyas et al., 2018).

Common risks in rice farming include flooding, drought, pest and disease attacks, as well as unpredictable climate change. Most rice farmers fall into the subsistence category, as their farming activities are not solely for commercial purposes but also to meet household food needs. Farmers will seek to avoid failure rather than seek substantial profits by taking risks. The term risk is more commonly used in the context of decision-making, as it is defined as the chance of a negative outcome resulting from an action. The greater the uncertainty of an event, the greater the risk posed by that decision. Identifying sources of risk is crucial in the decision-making process (Suharyanto et al., 2015).

Takalar Regency, a region in South Sulawesi Province, had a rice paddy harvest area of 27,725.73 hectares in 2023, with a production of 126,551.43 tons and a productivity of 45.64 quintals per hectare (BPS, 2024). Most of the rice paddies in Takalar

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Regency are not yet technically irrigated, including in Pulau Tanakeke District, where the rice paddies are still rain-fed, thus exposing them to higher levels of risk and uncertainty due to climate change. This study aims to analyze the level of production risk, price risk, cost risk, and income risk, as well as to analyze the tolerable risk of loss or loss tolerance (focus of loss) and minimum income of rain-fed rice farming businesses to be able to continue their farming business.

RESEARCH METHODS

The research location was determined purposively in the Tanakeke Islands District, Takalar Regency, South Sulawesi Province, an archipelago with predominantly rain-fed rice fields.

The sampling method used purposive sampling, selecting rain-fed rice farmers who are more intensive in managing their farms. Primary data collection used direct interviews (questionnaires) and observation. The sample size for this study was 82 farmers.

To analyze the risk level (production risk, cost risk, income risk), the Coefficient Variation formula is used, namely:

$$CV = \frac{\sigma}{\overline{X}} x100\%$$

Where: CV = Coefficient of Variation
σ = Standard Deviation
$\overline{X}$ = Average (production, price, income)

To analyze rice farming income, the formula used is:

I = TR – TC
TR = P x Q
TC = FC + VC

Where:

I = income (Rp)
TR = total reveneu (Rp)
TC = total cost (Rp)
P = price of rice (Rp/kg)
Q = quantity (kg)
FC = fixed cost (Rp)
VC = variable cost (VC)

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RESULTS AND DISCUSSION

Respondent Characteristics

Farmer Age

The age of farmers has an important role in paddy farming activities. Young or productive farmers have a tendency to be more capable in increasing the productivity of their farming so that it is more profitable. In rice farming activities, farmers face challenges of progress, young farmers are also expected to be able to play an active role in its development, so that they are not dominated by elderly farmers. For more information, to find out the distribution of the age of the respondent farmers, it is presented in Figure 1.

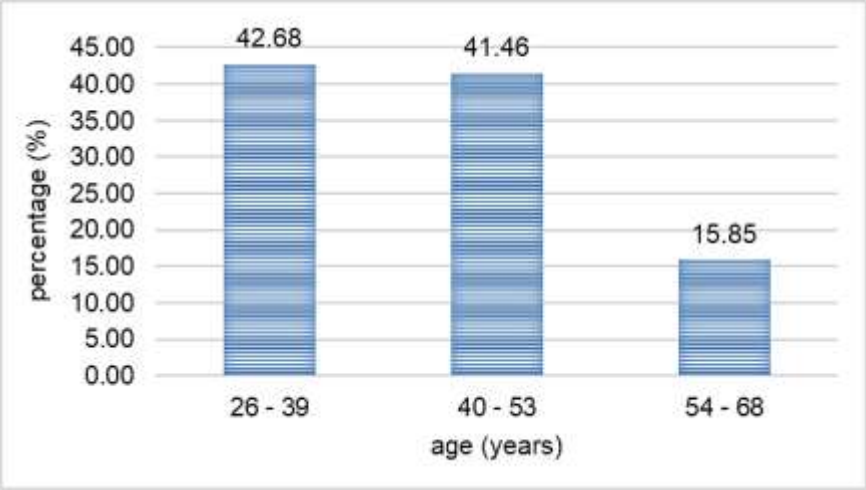


Figure 1: Distribution of Respondent Farmers by Age

The average age of the respondents as a whole is 42.49 years. The age of the respondent farmers was mostly in the range of 26-39 years, which was 42.68 percent, which shows a very productive age category (Figure 1). This indicates that a very productive age will greatly support the increase in profitability of sustainable rainfed rice farming.

Farmer Education

The level of education, especially formal education in general, is a reflection of the quality of human resources. Farmer education has a fairly important role and influence in farming activities, especially in rainfed rice fields. The level of education of farmers will be able to affect the success of their farming so that it can increase farmers' profits. The higher the level of education of farmers, it is hoped that the higher the level of performance in farming activities. In general, the level of education can improve the ability to accept or develop various technological innovations and other skills. To find out the distribution of the education level of the respondent farmers, it is presented in Figure 2.

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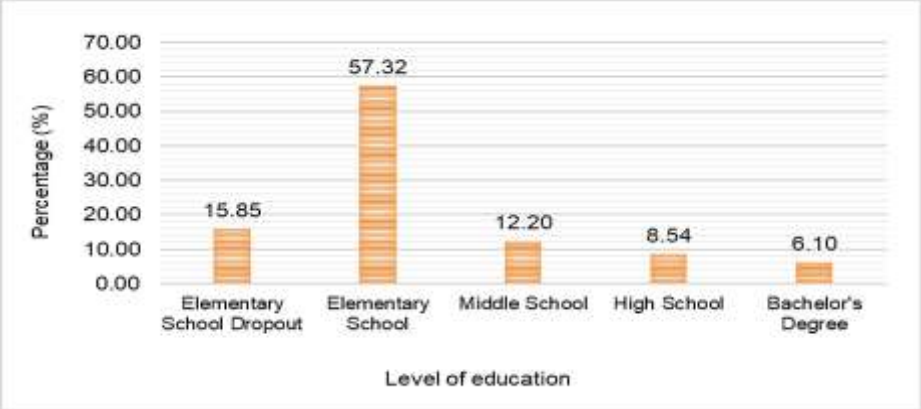


Figure 2: Distribution of Respondent Farmers by Education

The level of formal education of the respondent farmers is mostly only elementary school (SD) with the highest percentage, which is 57.32 percent. Thus, this situation does not support efforts to improve farmers' abilities in facing the challenges of progress in farming development. This is quite reasonable because in general the level of education can be positively correlated with the quality of human resources.

Farming Experience

Farmers' experience in farming can describe in general the level of farmers' ability to manage their farms. The longer the farmer has experience in his farming, the better the tendency of farmers to manage their farming. Farming experience will also be able to form attitudes as a process of increasing knowledge owned by farmers, including experience in the use of new technology. Thus, the experience of the farmer is one of the important factors to support the success of his farming.

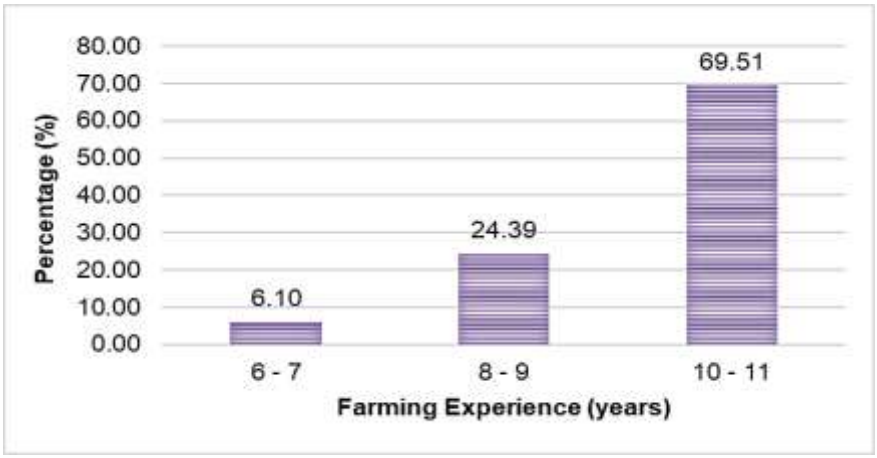


Figure 3: Distribution of Respondent Farmers by Farming Experience

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According to Figure 3, it can be seen that farming experience that has a range of between 10-11 years has the highest percentage, which is 69.51 percent. The average farming experience of the respondent farmers was 9.63 years. This condition is expected to be able to support the success of rainfed rice farming, considering the development of agricultural areas in this area is relatively new.

Family Dependents

The number of dependents is all people in one family who are dependents of the head of the family. The large number of dependents of farmer families, especially those of productive age, can contribute to the availability of labor for their farming. But on the contrary, this condition can also cause a higher economic burden in the family, which increasingly demands farmers to further increase their income.

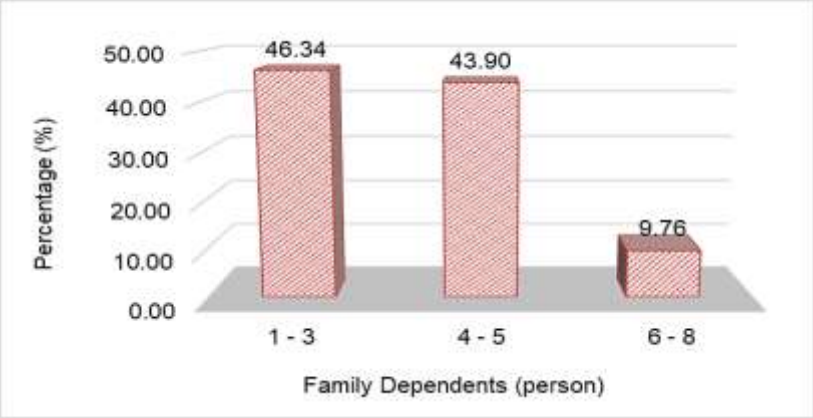


Figure 4: Distribution of Farmers by Number of Family Dependents

The number of family dependents is dominated (46.34%) in the range of 1-3 people per head of farmer families (Figure 4). This situation is still in the moderate category, so that if the age of the family members is productive, the burden of dependents can be light. Thus, the ability of farmers to meet food needs independently can be more affordable.

Land Area

The land area referred to in this study is the area of rice fields that are intensively cultivated in the rainy season. Land is a production factor that has a major influence on increasing rice production and income. To find out the distribution of land area of the respondent farmers, it is presented in Figure 5 below.

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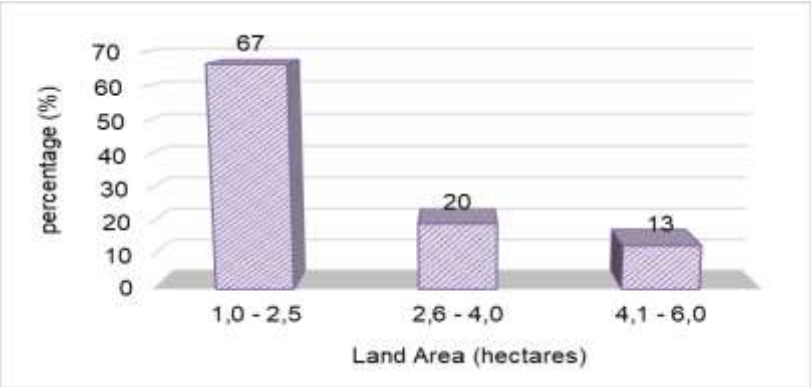


Figure 5: Distribution of Respondent Farmers by Land Area

Based on Figure 5, it can be seen that most (45.15%) farmers have cultivated land areas ranging from 0.7 – 1.0 hectares. This phenomenon implies that farmers should try to further improve efficiency in the production of rainfed rice farming, especially in the use of farming inputs.

The Risks of Rice Farming

Rainfed rice farming in Indonesia, particularly in lowland areas, faces significant production, cost, and income risks due to factors such as weather variability, pests, and limited irrigation. Studies in regions like Maros and Pangkajene Islands show that production risks are influenced by land area, fertilizer use, pesticide application, seed quantity, and farmer experience, with production variability often categorized as high risk (coefficient of variation > 0.5) (Arifin et al., 2021; Arifin et al., 2025; Kaleka et al., 2020).

The farming risks analyzed in this study include production risk, cost risk, and income risk (Table 1). The production of rainfed rice farming in Tanakeke Islands District has an average production of Rp 5,930.30 per hectare per planting season (once a year). The value of the coefficient of variation (CV) of agricultural production is 0.1374, meaning that the risk level of rice production losses so far has reached 13.74 percent. The average income of rice farming reaches Rp 24,242,009.43 per hectare per planting season, with a coefficient of variation value of 0.146, Thus, the risk level of rice farming income of 14.6 percent can still be categorized as low risk.

Table 1. Production Risks, Cost Risks, and Income Risks in Rainfed Rice Farming in Tanakeke Islands District, Takalar Regency

Description	Average	Standard Deviation	Coefficient of Variation
Production Risk	5,930.30	814.55	0.1374

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Cost Risk	5,526,861.88	1,307,037.92	0.2365
Profit Risk	24,242,009.43	3,538,122.99	0.1460

Source: Primary Data Analysis, 2025.

The average cost of rainfed rice farming in the Tanakeke Islands reaches Rp 5,526,861.88 per hectare per planting season, with a risk coefficient value of 0.2365. The highest risk borne by rainfed rice farmers is the cost risk, which reaches 23.65 percent. Cost risk is a manifestation of the production input price received and paid by rice farmers. This high cost risk is an indication of high input price fluctuations or low input price stability.

Income risk also fluctuates seasonally, with higher income variability typically observed during the rainy season compared to the dry season, as seen in Cangkringsari Village (Anggraeni et al., 2025). Despite these risks, rainfed rice farming can be technically efficient and profitable if farmers optimize input use and manage risks effectively (Fattah et al., 2023). Comparisons with irrigated rice farming indicate that rainfed systems generally have higher production and income risks, and farmers tend to be risk-neutral rather than risk-seeking (Zakaria & Indah, 2019). Risk management strategies recommended include improving farmer capacity, government support for price stabilization, and the use of agricultural insurance programs to mitigate external risks (Kaleka et al., 2020)

Minimum Income of Rice Farming and Focus of Loss

The concept of minimum income in farming focuses on ensuring that farm households earn enough to cover basic living standards, often benchmarked against regional minimum wages or living income thresholds. Studies show that many smallholder farmers, such as coffee and paddy farmers in Indonesia, earn incomes below these benchmarks, indicating a high risk of income loss and insufficient livelihood security (Yazidurrozaq et al., 2025; Junais et al., 2024). Income uncertainty in farming is often measured by the coefficient of variation, where a higher value signals greater risk of loss or income falling below a minimum acceptable level (Dewi & Artini, 2025). Agricultural insurance and technological progress can help reduce income risks and losses by stabilizing farmers' earnings and encouraging investment, though their effectiveness varies by region and insurance coverage density (Tan et al., 2022; Hou & Wang, 2025). Diversification into higher-value crops or off-farm employment is also recommended to improve income stability and reduce the risk of falling below minimum income thresholds (Waarts et al., 2021; Yazidurrozaq et al., 2025).

The minimum income is the minimum value of rice farming income that is acceptable or tolerable for farmers to continue their farming and support their families or

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households. This indicates that if the income of rainfed rice farming has a value below the minimum income, then farmers will experience difficulties or obstacles in continuing their farming and meeting basic needs that are important for their households. To find out the income of rainfed rice farming, minimum income, and focus of loss, can be seen in Table 2.

Table 2. Minimum Income, Focus of Loss, and Income of Rainfed Rice Farming in Tanakeke Islands District, Takalar Regency

Description	Value (Rp/ha/year)
The Income of Rice Farming	23,803,482.62
Total household expenditure	16,423,225.61
Total farming costs	5,201,110.34
Minimum income	21,624,335.95
Tolerable loss value	2,179,146.67
Focus of loss (percentage of loss tolerance)	9.15%

Source: Primary Data Analysis, 2025.

The average income of rainfed rice farming in the Tanakeke Islands reaches Rp 23,803,482.62 per hectare per planting season, with a total farming cost of Rp 5,201,110.34 per hectare per planting season. The total household expenditure per year averages Rp 16,423,225.61, so the minimum income obtained by rainfed rice farmers to continue farming and meet household needs is Rp 21,624,335.95 per year, with the risk of losses that can be tolerated or reasonably received by rice farmers of Rp 2,179,146.67 per hectare per planting season. The focus of loss value or risk of loss that can be accepted by rainfed rice farmers (loss risk tolerance) is 9.15 percent. This means that if the value of losses is above 9.15 percent, farmers will experience cost constraints in continuing farming and meeting their household needs.

CONCLUSION

The highest risk of loss borne by rainfed rice farmers in Tanakeke Islands District, Takalar Regency is the cost risk, which is 23.65 percent. Meanwhile, production risk reached 13.74 percent and revenue risk was 14.6 percent. The average income of rice farming reaches IDR 23,803,482.62 per hectare per planting season, with a total farming cost of IDR 5,201,110.34 per hectare per planting season.

The total household expenditure of rice farmers reaches an average of Rp16,423,225.61 per year. The minimum income obtained by rainfed rice farmers to continue farming and meet household needs is IDR 21,624,335.95 per year, with a risk of losses that can be tolerated or reasonably received by rice farmers of IDR 2,179,146.67

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per hectare per planting season. The focus of loss value or risk of loss that can be accepted by rainfed rice farmers is 9.15 percent, meaning that if the loss is above this value, farmers will experience cost constraints in continuing farming and meeting their household needs.

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