

Risk Analysis of Welshaw Rice (*Oryza Sativa L.*) Farming Case Study in Waitonipa Village, North Seram, East Kobi District, Central Maluku Regency

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ARTICLE INFO

Keywords: Lowland Rice Farming, Production Risk, Income Risk, Farm Income

Received : 5 February 2026

Revised : 22 March 2026

Accepted: 24 April 2026

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ABSTRACT

The research aims to (1) Determine the level of rice production and income and (2) What are the causes of farming risks in Waitonipa Village, Seram Utara Timur Kobi District (3) Assess production and income risk faced by rice farmers in the study area. A census sampling technique was applied, involving all 45 rice farmers, using a non-probability sampling approach. The study employed quantitative data analysis based on both primary and secondary data sources. Analytical tools included farm income analysis and risk analysis using the coefficient of variation (CV). The results indicate that the average rice production reached 1,836 kg per farming season, with an average selling price of IDR 6,853 per kilogram. The production risk analysis yielded a coefficient of variation of 90.90%, indicating a very high level of production risk. Meanwhile, income risk analysis showed an average income risk value of IDR 249,240, with a CV of 3.80%, suggesting a high level of income risk during the first planting season of 2025. These findings highlight the vulnerability of lowland rice farming to production variability and income uncertainty, emphasizing the need for improved risk management strategies to enhance farm stability and sustainability

INTRODUCTION

The agricultural sector in Indonesia is a major contributor to the national economy, contributing to economic growth, employment, food security, foreign exchange earnings, and industrial raw materials. The agricultural sector plays a crucial role in creating a stable Indonesian economy, both directly and indirectly; agricultural development serves as a benchmark for community welfare (Soekarwati, 2002). Wetland rice farming not only supports national food security but also serves as a primary source of income for most farmers in various regions, including in eastern Indonesia, such as Maluku Province.

Despite Maluku's promising potential, lowland rice farming is not without challenges, particularly those related to farming risks. Farming risks arise from uncertainty in harvest yields caused by both natural and technical factors (Kiswondo, 2011). Climate change, such as erratic rainfall, flooding, and drought, often affects the growth process and harvest yields. Furthermore, pest and disease attacks, limited production facilities, and the use of rudimentary cultivation technology are also major causes of yield uncertainty (Reflis, et al., 2011). These conditions cause fluctuating rice productivity in Maluku Province, directly impacting farmers' incomes and the sustainability of their farming businesses.

Rice production occurs in five regencies or cities in Maluku Province: Buru Regency, Central Maluku Regency, East Seram Regency, West Seram Regency, and Tanimbar Regency, with the highest total rice production in three regencies: Buru Regency, Central Maluku Regency, and East Seram Regency. The data can be seen in Table 1.

Table 1. Lowland Rice Production in Maluku Province by Regency/City, 2020-2024.

Regency	Production Rice (Thousand Tons Gkg)				
	2020	2021	2022	2023	2024
Buru	45.914,31	60.572,67	45.450,84	38.741,59	43.943,91
Maluku Tengah	50.374,78	39.819,30	33.435,21	27.777,99	35.730,15
Seram Bagian Timur	10.899,36	11.364,52	10.085,35	8.294,26	7.687,05
Seram Bagian Barat	3.075,66	4.637,86	3.335,63	4.282,54	2.929,25
Kepulauan Tanimbar	174,64	400,47	293,50	861,53	834,99
Tual	-	-	0,53	0,43	-
Maluku Tenggara	8,33	8,28	-	-	-
Kepulauan Aru	-	-	-	-	-
Maluku Barat Daya	0,22	0,57	-	-	-
Buru Selatan	-	-	-	-	-
Ambon	-	-	-	-	-
Maluku	110.447,30	116.803,67	92.601,06	79.958,34	91.125,35

Source: Central Statistics Agency, Maluku Province by Regency/City 2023/2024

Table 1 shows that each district had different production figures from 2020 to 2024. Central Maluku Regency had the highest rice production after Buru Regency. However, the amount of rice production in Central Maluku Regency fluctuates annually, with the highest production in 2020 at 50,374.78 thousand tons and the lowest production in 2023 at 27,777.99 thousand tons (Central Statistics Agency of Maluku Province 2020-2024).

Wetland rice farming is a crucial sector in supporting food security, particularly in rural areas like Waitonipa Village, North Seram Timur Kobi District. Most residents in Waitonipa Village depend on wetland rice farming as their primary source of family income. However, in practice, wetland rice farming often faces various natural factors such as climate change, pest and disease attacks, and other factors

Based on the background above, the research questions to be examined are as follows:

1. What is the production and income of lowland rice farming in Waitonipa Village, North East Seram District, Kobi?
2. What are the causes of farming risks in Waitonipa Village, North East Seram District, Kobi?
3. What are the levels of production and income risks of lowland rice farming in Waitonipa Village, North East Seram District, Kobi?

Based on the problem identification, the objectives of this study are as follows:

1. To analyze the production and income of lowland rice farming in Waitonipa Village, North East Seram District, Kobi.
2. To analyze the causes of farming risks in Waitonipa Village, North East Seram District, Kobi.
3. To analyze the level of production and income risks of lowland rice farming in Waitonipa Village, North East Seram District, Kobi.

LITERATURE REVIEW

The agricultural production process is inextricably linked to risk and uncertainty. Risk is an event with a known probability. One such risk in rice farming is production risk. If rice farming is exposed to production risk, income will be affected by that risk. Risk coverage is a cost element or cost drain that is difficult to estimate in any business activity, including the risk of decreased production and the risk of a decrease in product value or net income. Rice farming production risks can be caused by climate change, pest and disease attacks, and incorrect application of cultivation techniques. Common risks in farming include production risk and price or market risk, which can impact income (Setyowati, 2021).

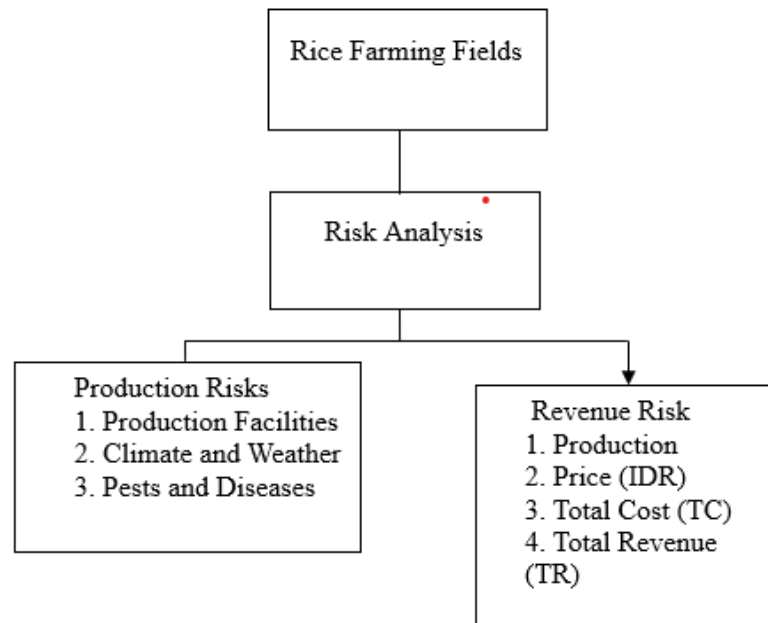


Figure 1. Framework for Thinking about Risk Analysis of Rice Farming in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency.

METHODS

Data Types

Data in the form of numbers that allow for statistical or mathematical analysis. In the context of research on rice farming income risk analysis, quantitative data includes:

- a. Production Quantity (Kg)
- b. Selling Price (Rp)
- c. Total Costs (Fixed and Variable Costs)
- d. Total Revenue (Rp)

Data Analysis Techniques

According to Soekarwati (2003), to calculate the amount of farm income, it can be calculated using the following formula:

$$I = TR - TC$$

Description :

- I = Income
TR = Total Revenue
TC = Total Cost

According to Suratiah (2015), to calculate the amount of production costs that farmers must pay in farming, the following formula can be used:

$$TC = TVC + TFC$$

Description :

- TC = Total Cost
TVC = Total Variabel Cost
TFC = Total Fixed Cost

The identification of risk sources for rice farming in Waitonipa Village was analyzed using descriptive analysis, while the risk level of rice farming in Waitonipa Village was analyzed using risk analysis. The Coefficient of Variance (CV) is a measure of relative risk obtained by dividing the standard deviation by the average value. Systematically, production risk and income risk can be written as follows:

Description:

CV = Coefficient of Variation

V = Standard Deviation

Q^- = Average Production Value

Y^- = Average Income Value

According to Hernanto (1996), the criteria for measuring the coefficient of variation (CV) are: if $CV > 0.5$, the risk in farming will be borne by the farmer more; and if $CV < 0.5$, the farmer will always make a profit.

This research was conducted using descriptive analysis and quantitative statistical analysis methods. The sampling method used was Non-Probability sampling, a census sampling technique with 45 respondents as respondents. The data used in this study were primary and secondary data. Primary data were obtained through observation, recording, and interviews using interview guides with rice farmers in Waitonipa Village. While secondary data were obtained from the Central Statistics Agency of Central Maluku Regency, research journals, and various other sources. Data collection techniques were carried out through: 1) Observation, 2) Interviews, 3) Questionnaires, 4) Documentation.

RESULTS

Rice Production

Production is an activity involving the integration or combination of various production factors (capital, labor, and land) to produce output, or an activity that combines production factors to add value to goods and services (Soekarwati, 2002). Based on research conducted through interviews with respondents, the average production volume in Waitonipa Village, North Seram Timur Kobi District, was 1,836 kg.

Production Costs

Costs are all activities carried out in a business that require physical and non-physical sacrifices, both direct and indirect. Production costs in farming can include cash, labor wages, fertilizer, seed, pesticides, and so on.

Table 2. Analysis of Average Costs and Income of Respondent Farmers in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency 2025.

No	Description	Average Amount (Rp)/MT
1.	Revenue (TR) = P x Q	
	A. Production (Q)	1.836
	B. Price (P)	6.853
	Total Revenue	12.582.719
2.	Costs Paid	
	A. Variabel Coast (VC)	
	• Seed	586.666
	• Fertilizer	1.335.777
	• Pesticide	1.371.000
	• Labor Costs	5.242.333
	• Harvest	2.766.666
	B. Total Fixed Costs (FC)	
	• Tool Depreciation	354.493
	• Tax	22.333
	• Land Rental	1.928.571
	C. Total Biaya	
	• Biaya Variabel	11.302.444
	• Biaya Tetap	975.715
	TOTAL	12.278.160
3.	Income I= TR - TC	278.129

Source: Primary Data After Processing 2025

DISCUSSION

Farming Risk Analysis

Risk is something rice farmers face in farming, but it can still be controlled. Hanwood (1999) in Iin. (2019) explains several risks that frequently occur in agriculture and can reduce farmers' income levels.

The very high production risk experienced by farmers in Waitonipa Village is caused by crop failure due to pest and disease attacks and extreme weather, because the planting season was carried out in early 2025 where the planting season coincided with the rainy season, triggering an explosion of brown planthopper pests on rice plants due to high humidity and temperatures that support the breeding of planthoppers. Wet conditions, frequent rain at night, and excessive use of nitrogen fertilizers make rice stalks succulent, triggering attacks that can cause hopperburn (dry rice as if burned) and crop failure. In addition to being caused by planthopper pests, the high production risk is also caused by several other things such as stem borers that cause the sheaths to turn yellow and break, thus reducing yields, and snails that damage plants in the early vegetative phase.

Table 3. Analysis of farming business risk levels in 2025.

Description	Production (Kg)	Income (Rp)
Average	1.836	278.129
Standard Deviation	166.896	859.029
CV (%)	90,90	3,08

The coefficient of variation analysis of rice farming income in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency was used to determine the level of risk in rice farming production and income. The smaller the coefficient of variation, the lower the risk faced by farmers. Conversely, the larger the coefficient of variation, the greater the risk faced by farmers. (Hernanto, 1996)

To further examine the risks faced by rice farmers in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency, see Table 3. The average rice production is 1,836 kg, with a standard deviation of 166,896, and a coefficient of variation (CV) of 90.90%. This means that for every kg of rice produced by farmers, the risk faced is 90.90 kg. This indicates that the production risk of farmers in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency is classified as very high.

And for the average income of farmers in Waitonipa Village, Seram Utara Timur Kobi District, Central Maluku Regency, it is IDR 249,240 with a standard deviation of 859,029, the coefficient of variation is 3.08%, which means that the income obtained by farmers experiences a risk of IDR 3.08 or the risk of farmer income is classified as high.

The analysis results show that the level of production risk in farming is quite high, indicated by a production Coefficient of Variation (CV) value of 90.90%. A CV value approaching 100% indicates that production fluctuations are very large and unstable, so farmers face high uncertainty in obtaining harvest results (Hernanto, 1996). This inconsistent production indicates that farming is very easily affected by changes in field conditions.

The high risk to production is primarily caused by climate change or unpredictable weather, such as excessive rainfall and inconsistent planting seasons, which disrupt growth. In addition to climate factors, risks are also triggered by attacks by several types of pests, such as 1) brown planthoppers, which damage plant tissue and can lead to crop failure; 2) stem borers, which cause leaf sheaths to turn yellow and break, reducing yields; and 3) snails, which damage plants during the early vegetative phase. This is evident in the low average rice yield achieved by farmers, which is 1,836 kg/ha.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis and discussion, the following conclusions can be drawn:

1. The average production volume of farmers in Waitonipa Village was 1,836 kg, with an average selling price of IDR 6,853/kg, and an average farmer income of IDR 278,563 in the first harvest season of 2025.

2. The very high production risk is caused by crop failure due to pest and disease attacks and extreme weather. The rainy season triggers an outbreak of brown planthoppers (BPHs) on rice plants due to high humidity and temperatures that favor their reproduction. In addition to BPHs, the high production risk is also caused by stem borers, which cause sheaths to break, and snails, which damage rice plants during the early vegetative phase. Meanwhile, income risk is caused by low productivity due to crop failure, price fluctuations, and high costs. Costs exceed revenues, resulting in losses for farmers.
3. Based on the coefficient of variation value, the production risk level is very high at 90.90% and the income risk level is 3.08%, which means the coefficient of variation is classified as high.

FURTHER STUDY

This study still has limitations, so further research on Risk Analysis of Welshaw Rice (*Oryza Sativa* L.) Farming Case Study is needed to refine this study and enhance the insights of readers and the authors.

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