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Production and Income Risk Analysis for the Development of Rice Farming Insurance in Baruga District, Kendari City

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Abstract

This research aims to determine the production risk and income risk in lowland rice farming and how the production risk compares with the basis for determining premiums for the development of lowland rice farming insurance in Baruga District, Kendari City. This research uses descriptive methods and a quantitative research approach using Variance coefficient analysis.The sampling method in this research is using a purposive sampling method, where the sampling technique takes certain considerations based on the fact that the sample for this research only selected all participants in lowland rice farming insurance, a total of 40 farmers. The results of this research show that (1) the average of rice farming production in Baruga District, Kendari City is 9.020 Kg/Ha/Year and the income risk is IDR 27.602.214 IDR/Ha/Year. The coefficient of variation of production risk is less than 0.5 (0.15 < 0.5) and the coefficient of variation of income risk is less than 0.5 (0.0.3 < 0.5) which indicates that the risk faced is low and the lower limit result is > 0 (6.274) > 0 so this result shows that farmers will always make a profit. (2) Comparison between production risk and the basis for determining premiums for developing agricultural insurance in determining the total premium which remains the same in each planting season even though the level of production risk is different in each planting season. Farmers receive full protection of IDR6,000,000/Ha/MT if there is a risk that causes crop failure.

Keyword: ***paddy field, Premium, income, production risk***

INTRODUCTION

Rice is a strategic commodity because it is a staple food for most Indonesians. Fluctuations in rice production and prices can pose a significant risk to food security and farmers' incomes.

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These risks are generally caused by pest attacks, climate change, and other external factors such as government policies related to exports and imports (Lubis, 2009; Isminiarti, 2017). To address this issue, the government has developed the Rice Farming Insurance (AUTP) program as a measure to protect against production risks in rice-producing centers.

The risks faced by rice farmers include production risks, market risks, financial risks, and policy risks. Production risks are generally related to the frequency of flooding, drought, and attacks by plant pests (Suharyanto et al., 2015). Market risks arise due to fluctuations in agricultural commodity prices, while financial risks are related to farmers' ability to meet their payment obligations. The protection strategy offered through AUTP aims to minimize losses due to crop failure so that farmers remain motivated to continue their farming activities.

In Southeast Sulawesi Province, paddy rice is one of the main commodities that contributes carbohydrates to the community. Rice paddy production is spread across several districts, with Konawe District being the largest contributor, followed by East Kolaka, South Konawe ( ), and Kolaka (BPS Southeast Sulawesi, 2023). Although Kendari City is not the largest rice-producing area, the AUTP program is currently only implemented for rice farmers in this region. This indicates a gap between high-production locations and access to agricultural insurance.

The development of rice farming insurance in Indonesia still faces various problems. High production risks due to climate change, flooding, drought, and pest attacks are major challenges. In addition, farmers' low understanding of the benefits and mechanisms of insurance has resulted in limited participation. The claim process, which is considered complicated, and dependence on government subsidies are also obstacles to the effectiveness of AUTP. Thus, protection efforts through insurance are very important to maintain the sustainability of rice farming and farmers' income.

Previous studies have emphasized the importance of risk analysis in rice farming and other commodities. Saragih et al. (2018) examined rice farmers' participation in addressing production risks through insurance and found that high insurance acceptance thresholds tended to result in low farmer participation, even though the actual risk of loss was only around 30-40%. Suharyanto et al. (2015) analyzed the risk of rice production in Bali using the coefficient of variation and multiple linear regression methods and found that production risk was higher during the rainy season and on land that was not owned by the farmers. Zainuddin et al. (2017) examined risks in the sugar industry using the Failure Mode and Effect Analysis (FMEA) method to assess losses and their impact on production, while Novianti (2018) used the House of Risk method to identify sources of risk in hydroponic lettuce farming.

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Research on other commodities, such as corn, also shows the importance of understanding production and income risks. Nura (2021) found that the level of corn production risk in East Trumon District was relatively high, influenced by factors such as seeds, pesticides, and fertilizers. Kaban (2023) analyzed corn farming income and risks in South Minahasa and found that production risks were related to pests, diseases, weather, and input availability, while income risks were relatively low.

Based on this background, it is important to conduct a risk analysis of rice farming in Kendari City, which includes production risks, farming costs, income, and risk management strategies applied by farmers. This study aims to provide a comprehensive understanding of the risks faced by rice farmers, the effectiveness of agricultural insurance, and mitigation strategies that can be applied to improve the sustainability of rice farming.

METHOD

This study was conducted in Baruga District, Kendari City, from February to December 2025, because this area has about 60% of the population working as farmers and there are problems related to production risks and the implementation of the Rice Farming Insurance program. The research population consisted of all rice farmers who participated in the insurance program, totaling 40 people, and the sample was determined using the census method, in which the entire population was used as respondents. The data used included primary and secondary data; primary data was obtained through direct interviews using questionnaires to obtain information related to farmers' experiences, responses, and strategies in dealing with risks, while secondary data was obtained from the Kendari City Statistics Agency.

Data collection techniques were carried out through participatory observation, where researchers were directly involved in rice farming activities to obtain more complete data, interviews with members and heads of farmer groups using written questionnaires, and literature studies to collect secondary data from relevant documents and agencies. Data analysis in this study was as follows:

The first objective of this study, namely the magnitude of production risk and income risk, was analyzed using the Coefficient of Variation formula, as follows:

$CV = \frac{v}{Xi}$ Hernanto, (1996)

Explanation:

CV = Coefficient of Variation

v = Standard deviation

Xi = Average value of rice paddy production (Rp/Ha/MT)

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The coefficient of variation is a measure used to determine systematic income risk, formulated as follows:

$$CV = \frac{v}{Y}$$

Explanation:

CV = Coefficient of variation

v = Standard deviation

Y = Average income (Rp/Ha/MT)

The criteria for measuring the coefficient of variation are as follows: If CV > 0.5, then the risk borne by farmers in their farming activities is greater; and if CV < 0.5, then farmers will always make a profit or break even. According to Hernanto (1996), to estimate the possibility of a s that may occur in relation to the lowest income and production during rice farming, a calculation of the lower limit in terms of production and income is carried out. The calculation formula is as follows:

$$L = e - 2v$$

Explanation:

L = Lower limit

e = average amount (profit or production)

v = Standard deviation

The value of the coefficient of variation and lower limit simultaneously indicate whether the invested capital is safe from all possible losses. This shows that if CV<0.5 or L>0, farmers will always make a profit; conversely, if CV>0.5 and L<0, farmers may suffer losses, and farmers will break even if CV=0 and L=0.

The second objective of this study, a comparison between the magnitude of production risk and the amount of insurance premiums for the development of rice farming insurance in Baruga District, Kendari City, was analyzed descriptively and quantitatively:

- The method for determining the amount of insurance premiums is described based on the results of interviews with rice field insurance owners in Baruga District.
- Table analysis (tabulation) is used to show a quantitative comparison between the magnitude of production risk and the amount of insurance premiums charged to farmers participating in rice field insurance in Baruga Subdistrict.

The difference between the amount of production risk and the amount of insurance premiums for the development of rice field insurance in Baruga Subdistrict is described based on the results of the table analysis.

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RESULTS AND DISCUSSION

In Baruga Village, Baruga District, Kendari City, farmers cultivate Inpari and Ciherang rice varieties, which are known to have high productivity and resistance to several types of pests and diseases. Therefore, the selection of varieties has a significant effect on production risk, where pest-resistant varieties tend to reduce production risk compared to susceptible varieties (Suharyanto et al., 2015; Ministry of Agriculture, 2021). Farmers plant two crops per year, relying on irrigation and rainfall, so that during the dry season, some fields experience drought, which increases the risk of crop failure (Ambarawati et al., 2018).

Production inputs come from government assistance and personal expenses, while the main challenges in rice farming are pest attacks such as planthoppers and rats, as well as blast disease, which can significantly reduce yields (Saragih et al., 2018). In addition, farmers face fluctuations in rice prices, for example, in 2023 the lowest price reached IDR 5,500/kg, which has an impact on income, while labor comes from families and farmer groups.

Income from Rice Farming

Rice farming income can be obtained from total revenue minus total costs in the rice production process. The level of income can be influenced by fixed costs, variable costs, total production costs incurred, production yields, and selling prices. Based on research findings on fixed costs, the fixed costs of rice farming in Baruga Village are dominated by tractor depreciation of IDR 956,541/Ha/MT, due to high purchase prices and a shorter economic life compared to manual tools such as hoes and sickles (Soekartawi, 2002). Many farmers purchase tools individually, resulting in higher depreciation costs, unlike the rental or tool-sharing system which, according to Saragih (2019), can reduce fixed costs, but this system has not been widely implemented.

Meanwhile, the highest variable cost of rice farming in Baruga Village is the cost of seeds, which is Rp1,515,250 per planting season, followed by Phoska fertilizer at Rp1,503,250 and urea at Rp1,342,250. These variable costs are influenced by land area, seed type, fertilizer availability, and government subsidy policies, whereby the larger the land area, the greater the need for seeds and fertilizers (Soekartawi, 2002). In addition, the use of fertilizers that tends to exceed recommendations in anticipation of low yields also increases fertilizer costs (Nasution, 2020).

Table 1. Total Production Costs of Rice Farming in Baruga Subdistrict, Kendari City , 2025

No.	Type of Production Cost	Average Total Production Cost (Rp/Ha/MT)
1	Fixed Costs	956,541
2	Variable Costs	6,800,388

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Total	7,756,929

Table 1 shows that the average total cost of rice farming per planting season in Baruga Village is IDR 7,756,929, with the largest variable cost being IDR 6,800,388 ( ), mainly due to the high demand for seeds and fertilizers. Land area has a direct effect on the amount of costs incurred, because the larger the land area, the greater the need for means of production. This is in line with Riwayadi (2006), who states that variable costs only arise in accordance with production process activities.

Table 2. Average Rice Farming Income in Baruga District, Kendari City, , 2025

No.	Description	Average		Average per Year
		MT 1	MT 2	
1.	Total Production (Kg/Ha)	4,110	4,910	9,020
2.	Rice Price (kg/ha)	6,500	6,500	6,500
3.	Yield (kg/ha)	26,715,000	31,915,000	58,630,000

Note: MT = Planting Season

The income from rice farming in Baruga Village is greatly influenced by the amount of production, selling price, and cultivation efficiency, with an average production of 9,020 kg/year and a selling price of Rp6,500/kg, resulting in a total income of Rp58,630,000 per year. The results of this study indicate that rice production is quite high, which means that farmers in Baruga Village have a good level of productivity. According to Suwarto and Susanto (2019), high productivity is usually influenced by the use of high-quality seeds, proper fertilization, and adequate water availability. However, Hidayat et al. (2021) found that even with high productivity, farmers' income is not always maximized if the selling price is unstable or production costs are too high. In this study, the selling price of rice is quite stable, but production cost efficiency still needs to be considered because income is derived from total revenue minus total costs, so high costs can reduce profits even if total revenue is large. The income of farmers in Baruga Village, Baruga District, Kendari City can be seen in Table 3.

Table 3. Average Rice Farming Income per Planting Season in Baruga District, Kendari City Year 2025

No.	Description	Average (Rp/Ha/MT)		Average per Year
		MT 1	MT 2	
1	Revenue	26,715,000	31,915,000	58,630,000

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2.	Total Expenses	7,756,929	7,756,929	15,513,857
3.	Insurance Cost	50,175	50,175	100,350
4	Revenue	11,201,107	16,401,107	27,602,214

Table 3 shows that the total income of farmers in Baruga Village is greatly influenced by production yields and production costs, which depend on environmental factors such as weather, climate conditions, availability of production facilities, and pest and disease attacks. The results of the study show variations in income between the first planting season (MT1) and the second planting season (MT2), where income in MT1 is lower than in MT2, indicating the importance of environmental factors and production inputs in determining agricultural yields. Water shortages, pest attacks, fluctuations in grain prices, and the efficiency of production input use are the main factors affecting income. According to Soekartawi (2002), farmers' income is influenced by land productivity, input efficiency, and the selling price of agricultural products, so that high production does not always result in maximum income if production costs are high. This is in line with the findings of Hidayat et al. (2021), who stated that farmers with better access to water and agricultural technology support earn higher incomes, while inequality in access to water causes differences in production and income among farmers.

Risks in Rice Farming

The success of rice farming is largely determined by how farmers manage their production systems to minimize risks that could cause losses, as risks in rice farming include the possibility of lower-than-expected yields due to factors that cannot be fully controlled. These risks, including production costs, extreme weather and climate, pest and disease attacks, and the availability of water, fertilizers, seeds, and medicines, can affect crop yields, income, and the sustainability of farming businesses, where high production costs have the potential to reduce farmers' income (Musta'inah et al., 2017).

This study analyzes rice production per year or two planting seasons, namely MT1 (January–June 2025, dry season) and MT2 (July–December, rainy season), with income calculated from the production of Dry Unhusked Rice (GKP) multiplied by the selling price, so that the higher the production and selling price, the greater the income obtained by farmers. The total rice production output can be seen in Table 6.

Table 4. Average Rice Production of Farmers Receiving Rice Farming Insurance (AUTP)

No	Planting Season	Average Production Output (kg/ha)	Percentage
1	MT1	4,110	46

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2.	MT2	4,910	54
Total		9,020	100

Based on Table 4, the highest average rice production was in planting season 2 (MT2) with a contribution of 54% compared to planting season 1 (MT1) which was only 46% or an average of 4,110 kg/ha. This difference in production was influenced by weather factors, water availability, pest and disease attacks, and cultivation techniques. MT1 faces greater challenges due to drought, which causes dryness and irrigation difficulties, as well as pest attacks such as planthoppers, rats, and blast disease. Sayaka et al. (2022) state that rainfall shortages during El Niño disrupt plant physiological processes such as grain filling and photosynthesis, thereby reducing crop yields. Water availability is also crucial, as water shortages can inhibit rice growth and even cause plant death (Rizal et al., 2014). Conversely, MT2 yields better results because rainfall is more evenly distributed, supporting irrigation, and farmers' experience from MT1 enables more effective management, including the use of superior varieties and more precise pest control, making MT2 a more profitable planting season in 2025. The production risk analysis for rice farming in Baruga Village can be seen in Table 5.

Table 5. Risk Analysis of Rice Farming Production in 2025

No.	Description	Rice Production (Kg/Ha/MT)		Rice Production in 1 Year (kg/ha/MT)
		MT 1	MT 2	
1	Average Production Yield	4,110	4,910	9,020
2.	Standard Deviation	794	776	1,373
3.	Coefficient of Variation	0.19	0.16	0.15
4	CV in (%)	19	16.00	15.00
5	Lower Limit	2,522	3,359	6,274

The results of the study in Table 5 show that the production risk of rice farming in planting season 1 (MT1) is lower than in planting season 2 (MT2), in line with Ghani (2013), who states that high production risk will affect rice farming yields. Sources of production risk include crop failure, low productivity ( ), damage caused by pests and diseases, differences in climate and weather, human error, and other factors (Yamin, 2012). In MT2, the highest production was achieved because balanced rainfall supported more optimal plant growth compared to MT1, which experienced drought. From the calculations, the standard deviation of rice production was 1,373 kg/Ha/Year and the coefficient of variation (CV) was 0.15, with a lower production limit of 6,274 kg/Ha/Year, indicating low risk and farmers still making a profit. These findings are in line with

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Hernanto's (1996) theory that CV < 0.5 indicates low risk or that farmers always make a profit, and are consistent with Saragih et al. (2018), who concluded that the probability of damage >75% to rice production is rare, so the level of risk is classified as low.

Table 6. Risk analysis of rice farming income in Baruga District, Kendari City, 2025

NO	Description	Average Income Risk		
		MT 1	MT 2	Year
1	Average Income (Rp/Ha/MT)	11,201,107	16,401,107	27,602,214
2	Standard deviation (V)	5,502,327	6,173,952	10,598,345
3	Coefficient of Variation (CV) CV in %	0.4 40.0	0.3 30	0.3 39.0
4	Lower Limit	2,082,130	3,033,781	6,287,781

Based on Table 6, the average income of rice farmers in Baruga District, Kendari City, was analyzed with a standard deviation of Rp27,602,214/Ha/Year. The coefficient of variation (CV) obtained was 0.3, indicating that for every rupiah of profit earned by farmers, there is a risk of 0.3, and because CV < 1 (0.3 < 1), the income risk is classified as low. This risk mainly stems from weather factors and pest and disease attacks. It can be mitigated through the use of pesticides or medicines appropriate to the source of risk, as well as proper plant maintenance and care to minimize the possibility of loss.

Comparison between Production Risk and the Basis for Determining AUTP Premiums ( )

In AUTP, the insured price of rice is set at IDR 6,000,000/Ha/MT, which is the basis for calculating premiums and maximum compensation limits, with a total premium of IDR 180,000/Ha/MT, where government assistance is IDR 144,000/Ha/MT and the rest is farmer self-help IDR 36,000/Ha/MT; premiums and compensation are calculated proportionally if the land area differs from 1 ha, and the policy is valid for one planting season from the estimated planting to harvest (Ministry of Agriculture, 2017). The level of risk in rice farming in Amohalo Village, Baruga District, Kendari City, is indicated by a production standard deviation of 2,421 kg/year in 2025, with a coefficient of variation of 0.3 (<0.5) and a lower limit of 6,274 > 0, indicating low risk so that farmers are expected to always make a profit.

Based on these risk levels, a comparison between production risk and the basis for determining rice farming insurance premiums (AUTP) can be seen in Table 7.

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Table 7. Comparison between Production Risk and the Basis for Determining Rice Farming Insurance Premiums (AUTP) 2025

	HP (Rp/Ha)	TP (Rp/Ha/MT)	BPP (80%) (Rp/Ha/MT)	PSP (20%) (Rp/Ha/MT)	NTR
MT 1	6,000,000	180,000	144,000	36,000	0.19 (Low)
MT 2	6,000,000	180,000	144,000	36,000	0.16 (Low)
Per 2 MT	6,000,000	180,000	144,000	36,000	0.15 (Low)

Note:
HP: Coverage Price
TP (Total Premium)
BPP (Government Premium Assistance)
PSP (Farmer Self-Help Premium)
NTR (Risk Value and Level)

Table 7 shows that the price of farmer insurance is set at Rp6,000,000/ha per planting season as the maximum compensation limit in the event of crop failure due to risks such as flooding, drought, and pest attacks. The total premium of IDR 180,000/ha/MT is covered by the government at 80% (IDR 144,000) and farmers at 20% (IDR 36,000). The level of production risk varies each planting season, with MT1 at 0.19, MT2 at 0.16, and an average of 0.15, indicating a relatively stable risk for insurance protection. The fixed premium rate for each planting season provides cross-subsidies, so that farmers pay lower contributions than the protection they receive, in line with Saragih et al. (2018), which states that large production risks can be transferred to insurance. AUTP provides coverage for damage caused by floods, droughts, and plant pests (OPT) under certain conditions, such as damage intensity ≥75% and rice age of at least 10–30 days (Ministry of Agriculture, 2017). In the field, farmers in Baruga Village use a conventional irrigation system, with the main risks coming from drought and Pests, including rat attacks and blast disease, which significantly affect rice production.

The losses due to production risks in Baruga Village, Baruga District, Kendari City can be seen in Table 8

Table 8. Losses due to production risks in Baruga Village, Baruga District, Kendari City 2025

	Average Rice Paddy Production Yield	Production Risk		GKP Selling Price (Rp/kg)	Production Risk Value (Rp/Ha)
	Average (kg/ha)	%	Kg/Ha		
MT 1	4,110	0.19	780	6,500	5,070,000

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MT 2	4,910	0.16	785	6,500	5,102,500

Table 8 shows that farmers' rice production in planting season 1 (PS1) was 4,110 kg/ha lower than in planting season 2 (PS2), indicating that PS2 was more stable in terms of yield. The highest risk occurred in PS1 at 0.16% due to weather changes during the dry season that caused drought, limited irrigation water, and pest and disease attacks. The risk value in MT1 was lower at IDR 5,070,000/ha because the average farmer production was high, while in MT2 the environmental conditions were better, more stable, and pest control was more effective. This is in line with Gunawan et al. (2024), who stated that drought not only reduces agricultural productivity but also affects economic stability, which is exacerbated by limited access to technology and adequate irrigation, thereby increasing production risk.

Table 9 Losses Due to Income Risk in Baruga Village, Baruga District, Kendari City, 2025

	Average Income (Rp/Kg/Ha)	Income Risk (%)	Income Risk Value (Rp/Kg/Ha)
MT 1	11,201,107	0.4	4,480,442
MT 2	16,401,107	0.3	4,920,332

Based on Table 9, the income risk of rice farming in Baruga Village in 2025 differs between the first (MT1) and second (MT2) planting seasons, with MT1 having an average income of IDR 11,201,107/ha and an income risk of 0.4% or IDR 4,480,442/ha, indicating a relatively high potential for losses due to unstable weather, unpredictable rainfall, and pest and disease infestations. In contrast, MT2 has a higher average income of IDR 16,401,107/ha with a lower income risk of 0.3% or IDR 4,929,332/ha, indicating less production uncertainty. This difference shows that MT2 is more stable, supported by sufficient irrigation water availability, farmer experience, and better cultivation technology application, thus providing a higher level of economic security for farmers.

One of the main risks faced by farmers is damage to rice crops caused by extreme weather, pest attacks, plant diseases, and pests. Insurance (AUTP) explains that coverage will be provided when production damage reaches 75% of the amount of production loss equivalent to the amount of premium covered, as shown in Table 10.

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Table 10 Rice Production Loss Values in Baruga District, Kendari City, 2025

Planting Season	Average Production Yield (kg/ha)	Paddy Price (Rp/kg)	Production Loss Value (IDR/Ha)
MT1	4,110	6,500	5,070,000
MT2	4,910	6,500	5,102,500
Maximum	9,020	6,500	9,379,500

Table 10 shows that the risk of significant production loss is particularly high when compared to the coverage value provided by insurance. Based on the applicable policy, insurance coverage is provided at Rp6,000,000/ha/MT when the damage level reaches 75%. The difference between production loss and compensation can be seen in Table 11.

Table 11 Percentage of Rice Coverage in Baruga District, Kendari City, 2025

Planting Season	Production Loss Value (Rp/Ha)	Coverage (Rp/Ha)	Coverage Percentage (%)
MT1	5,070,000	6,000,000	1.18
MT2	5,102,500	6,000,000	1.17
Maximum	9,379,500	6,000,000	6.39

Table 11 shows that the insurance coverage covers 1.18% - 6.39% of the total production loss incurred from the total losses experienced by 75%. Even though insurance provides financial assistance, the amount received is not equal to the losses incurred. In AUTP insurance, even though it does not fully cover losses, with insurance, farmers can have security that can help them reduce the impact of losses due to crop failure.

CONCLUSION

Based on the research findings, it can be concluded that the average production yield of rice farming in Baruga Village, Baruga District, Kendari City, reached 9,020 kg/ha/year. The low production risk indicates that farming continues to be profitable. The average income from rice farming in Baruga Village, Baruga District, Kendari City is IDR 27,602,214/ha/year. Low income risk indicates that the business remains profitable. The total premium is fixed for each planting season even though the level of production risk differs each season, namely IDR 36,000/ha/MT and coverage of IDR 6,000,000/ha/MT. The protection received is much higher than the contribution.

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This premium value is lower than the production risk, and the production risk faced by paddy farmers is lower than the coverage.

Several suggestions can be given. First, farmers are expected to continue participating in the Rice Farming Insurance Program (AUTP) because the protection provided is greater than the risk value faced, making AUTP an effective measure to reduce the impact of losses due to crop failure. Second, local governments and related agencies need to increase socialization, education, and assistance related to AUTP, especially for farmers who do not yet understand the benefits of agricultural insurance, as well as simplify the claim submission process. Third, for future researchers, it is recommended to conduct more in-depth research on production and income risk analysis for the development of rice farming insurance in Baruga District, Kendari City.

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