Kurdish Studies
March 2024
Volume: 12, No: 2, pp.4324-4333 ISSN: 2051-4883
(Print) | ISSN 2051-4891 (Online)
www.KurdishStudies.net

Received: December 2023 Accepted: Febrary 2024
DOI: https://doi.org/10.58262/ks.v12i2.321

Farmer's Perceptions of Agricultural Insurance and Production Risk on the Determinants of Production Risk in Java

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Abstract

Not all commodities and farming hazards are eligible for agricultural insurance. Despite being created in 1982, agricultural insurance in Indonesia has not been fully optimised. The government is anticipated to provide safeguarding and empowerment to farmers who contribute to the advancement of the agricultural sector, with the aim of establishing a food ecosystem, achieving food self-sufficiency, and ensuring sustained food security. The study was carried out in Kudus and Kebumen in Central Java, Bojonegoro in East Java, and Bandung in West Java. There are a total of 220 farmers in the sample. The used data analysis approach involves the utilisation of the Cobb-Douglas production function to examine the risk variables affecting productivity, alongside the coefficient of variation (CV) to assess the amount of risk encountered by farmers. Additionally, descriptive narrative is employed to depict farmers' perspectives about agricultural insurance. The objectives of this study are:
(1) to assess the amount of risk associated with rice farming and the corresponding cost implications, (2) to identify the variables that influence the risk in rice farming in Java, and (3) to evaluate the perception of agricultural insurance among farmers. The findings of this research indicate a significant production risk, with a coefficient of variation of 0.704 or 70.4%. This implies that rice farmers face a substantial risk in their agricultural operations. The primary production risk variables that impact rice cultivation are seed quality and availability, as well as labour constraints. The survey reveals that 88% of farmers had a favourable view of agricultural insurance. This elucidates the farmer's perspective on the presence of an agricultural insurance programme as a safeguard for farmers against potential crop failure.

Keywords: *farming risk, the factors of influence risk, farmer response, agricultural insurance*

Introduction

In the third quarter of 2022, agriculture accounted for 12.91% of the gross domestic product (GDP), making it the third largest sector contributing to the GDP. During times of crisis and epidemic, the agricultural sector remains a pillar of support for the economy due to its capacity to accommodate the highest number of workers, specifically exceeding 27% (BPS - Statistics Indonesia, 2022).

Every action that takes place within the agricultural sector, including the agribusiness sector, is constantly confronted with scenarios that include risk and uncertainty. There is a correlation between the farmer's mentality and the degree to which they are ready to take significant risks. It will be determined by the level of pleasure or utility that farmers acquire from each result

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reasonably big amounts that the approach that is applied will be used. When it comes to carrying out agricultural operations, the primary objective of farmers is to maximize utility in relation to the limits faced by revenue availability (Debertin, 1986). Moreover, according to Bachev (2022), drawing upon statistical data, official reports, field surveys, and evaluations by a panel of leading experts and stakeholders, an agricultural knowledge and innovation system holds the potential to circumvent challenges such as limited resource availability and efficiency, the prevalence of outdated public institutions and underdeveloped private sectors, inadequate dissemination of knowledge and innovations, slow and uneven adoption of modern technologies, varieties, production and management techniques, and digitalization across various farm types, agricultural subsectors, and regions.

Pertiwi (2015) asserts that businesses operating in the agriculture sector are a sort of enterprise that is fraught with high levels of risk and unpredictability. Sources of risk and uncertainty that are external in nature (cannot be controlled by farmers) come from the socio-economic environment, particularly in relation to the market behavior of agricultural inputs and outputs, the dynamics of business relations between the agricultural and non-agricultural sectors, policy inconsistencies in the economic sector, social conflicts, and the natural environment, particularly climate, natural disasters, or the explosion of plant pests (OPT). These sources of risk and uncertainty are sources that farmers cannot control. In response to this, the government then enacted Law Number 19 of 2013 as a means of safeguarding agriculture by implementing agricultural insurance.

Risk is a situation in which the person making the decision is aware of the various possible outcomes as well as the probability associated with each of those outcomes. It was stated by Bachus et al. (1997) that the natural conditions that farmers are subjected to can be considered a risk if it is possible to determine the likelihood of their occurrence and the outcomes that could be obtained. Within the context of farming systems, McConell and Dillon (1997) identified the various sources of risk that farmers face.

According to Jaffee et.al (2008) cited in FAO (2011), the agricultural sector supply chain is exposed to eight categories of inherent hazards. These risks include weather-related risks, natural disasters, environmental risks, market risks, logistical risks, operational risks, policy risks, and political risks. According to Jaffee et.al (2008) cited in FAO (2011), the agricultural sector supply chain is exposed to eight categories of risks: weather, natural catastrophe, environmental, market, logistical, operational, policy, and political risks. In addition to these risks, there are six factors that contribute to uncertainty in the agricultural sector. These factors include: 1) natural elements such as drought, pest attacks, and disease; 2) disasters such as floods, fires, landslides, and volcanic eruptions; 3) price fluctuations in both input and output; 4) technological limitations leading to low productivity and production; 5) actions taken by external parties such as sabotage, confiscation, and changes in regulations; and 6) the conditions of farmers and their families, including death and serious illness (Pasaribu, 2010).

The agricultural industry is exposed to a variety of hazards, each of which has the potential to influence the consistency of revenue for farmers. Increasing the income of farmers, the majority of whom own less than half a hectare of land per person, is one of the significant issues that the agricultural industry faces. Within this framework, it is anticipated that the state, via the government, would be present in order to provide protection and empowerment to farmers who play a part in the development of the agricultural sector in order to achieve food sovereignty, food independence, and sustainable food security. When it comes to protecting the income or wellbeing of farmers, agriculture insurance is one sort of protection.

Not all commodities and farming hazards are eligible for agricultural insurance coverage. Strategic agricultural companies, often involving the cultivation of staple food crops, are given priority in most nations that have implemented agricultural insurance. In Indonesia, the full potential of crop insurance has not been achieved, despite the formation of the Preparatory Working Group for the Development of Harvest Insurance three times between 1982 and 1998 (in 1982, 1984, and 1985). The implementation of agriculture insurance was reintroduced in 1999. Despite extensive deliberations, transitioning to the execution phase requires meticulous contemplation. Policies, plans, programs, initiatives, and institutional instruments that align with development goals need a range of inputs (Sumaryanto and Nurmanaf, 2007).

Senjawati (2008) conducted a study on the production risks of rice-based farming in different regions with varying productivity levels. The research compared irrigated and rain-fed rice fields using 177 samples of farmers. Through statistical analyses such as Barlett's test, f-test, and coefficient of variation, as well as a multiplicative heteroscedastic model that maximized the likelihood function, it was determined that the production risk was higher in rain-fed rice fields compared to irrigated ones. This was evidenced by a high coefficient of variation. The study identified labor, seeds, and urea as significant factors influencing production risk.

National food stability will be disrupted without special efforts to help farmers increase agricultural commodity production. Moreover, in the current situation and conditions, it is very necessary to achieve a level of food security at a certain level of sufficiency to meet national needs (Pasaribu, 2010). The insurance program itself certainly requires a security guarantor in its implementation, agricultural insurance. The Financial Services Authority (OJK) then officially appointed a State-Owned Enterprise (BUMN), PT Insurance. Jasindo (Persero), as the sole insurance guarantor for farmers who experience crop failure.

In 2019, the three provinces on the island of Java with the greatest level of participation in Rice Farming Insurance were Central Java, East Java, and West Java (Directorate General of Agricultural Infrastructure and Facilities, Ministry of Agriculture, 2019). Fundamentally, agricultural insurance is incapable of fully mitigating the whole of the risks associated with farming. For instance, this research will be conducted in Java, specifically in provinces prone to crop failure and susceptible to cathotropic natural disasters. The objective is to assess farmers' response to agricultural insurance and quantify the risks they encounter.

1. Literature Review

According to the findings of Adetya and Suprapti's research (2021) on the production, income, and dangers associated with shallot farming, the level of shallot production in the Sokobanah District is relatively low, with an average output of 5.6 tons per hectare. When it comes to shallot production, the component that has the most important impact is land area. On the other hand, pricing variables, seed prices, and fertilizer costs do not have a large impact on shallot output.

Shallot farmers have a relatively good revenue, with an average of IDR 161,636,775 per hectare per metric ton. Land leasing prices are the determining element for shallot revenue. The coefficient of variation (CV) for production risk is 0.283, while for income risk it is 0.386. These values indicate that the shallot firm has relatively low levels of both production risk and income risk. The insignificant risk encountered by farmers is attributed to the timely cultivation of shallots, most notably during the months of April or May.

According to Kumbhakar (2002), there is a connection between production risk and production options, as well as production choice and production efficiency. utilizing data collected from farming in Borwegia, the investigation was carried out utilizing cross-section methodologies. Although fish feed has the potential to increase production risk, human labor has the ability to reduce production risk. Furthermore, when viewed from the perspective of technical efficiency, it is discovered that fish feed increases the level of technical inefficiency, whereas labor reduces the level of technical inefficiency. The findings of the research indicate that the majority of fishermen have a risk-averse nature. Eggert and Tveteras (2004) also described the usage of the Just and Pope model to examine risk. In their study, a stochastic revenue function was generated and used to forecast the average and standard deviation of revenue for each sea voyage. Eggert and Tveteras (2004) also published some of the findings of their study.

According to the findings of research that Ghozali and Wibowo (2019) conducted on the subject of the risk of shallot farming production in Petak Village, Bagor District, they discovered that the risk level of shallot farming production outside the season or off-season was based on a variance value of 2.10, a standard deviation of 1.45, and coefficient variation of 1.01, indicating that it has a high production risk. In the meanwhile, according to the production risk map, the dangers that shallot growers experience outside of the season or during the off-season are also included in the category of high risk. It is the liquid pesticide factor that has a significant impact on the risk of shallot farming production occurring outside of the season or off-season. On the other hand, the factors of seeds, fertilizer, solid pesticides, and labor do not have a significant impact on the risk of shallot farming production occurring outside of the season or off-season.

According to the findings of Khasanah et al. (2020), when farmers' reactions to the AUTP programme were evaluated from the perspectives of comprehension, acceptance, and implementation, it was discovered that farmers' replies fell into the category of strongly disagreeing. Because the vast majority of farmers who responded to the survey had not taken part in the programme, just a few of them were in the group of agreeing with the statement.

A response may be interpreted as the way in which a person responds via their ideas, attitudes, and actions respectively. In general, a response may be understood as the outcome or impression that is gained from an observation. In this particular instance, what is meant by the term "response" is an observation about the topic, events that are acquired by drawing conclusions from information and interpreting the message (Chaplin, 2006).

Farmers' reactions to the AUTP programme may be influenced by a variety of factors, including their age, level of formal and non-formal education, income, personal experience, the amount of land they cultivate, and their access to mass media. In spite of this, the majority of the categories fall into the very low category, the only category that falls into the middle middle category is age, income falls into the low category, and access to mass media falls into the never category. The factors that have a significant influence on the responses of farmers are age, non-formal education, income, personal experience, area of cultivated land, and access to mass media.

Ali, et al (2019) found that the insurance program implementation is successful, but socialization is lacking and claim settlement remains challenging for farmers. Farmers' cognitive, affective, and conative responses are all in the agree category. A hypothesis was formulated suggesting that farmers responded positively to the AUTP program due to the program's potential to provide many advantages for the sustainability of crop production.

2. Materials and Methods

2.1. Time and Location of Research

The research was carried out during the first planting season of 2021, located in Kudus and Kebumen in Central Java, Bojonegoro in East Java, and Bandung in West Java, Indonesia. The sampling method used in this study was purposive, and 220 selected farmers were participants in the Agricultural Insurance Program (AUTP).

Figure 1: Map of Java Island.
Source: Primary Data Processed, 2021.

The sample area is classified into three parts, including:

a) Kudus Regency (Mejobo District) represents an area with a flood disaster with a sample size of fifty farmers, and Kebumen Regency (Mirit District) represents an area with a plant pest attack catastrophe, namely stem rot, with a sample size of thirty-six farmers. Both of these regions are representative of the province of Central Java.
b) East Java Province is represented by the Bojonegoro Regency, which is located in the Baureno District. This regency is comprised of 52 farms and represents places that have been affected by flood catastrophes.
c) Bandung Regency, which includes the Selokan Jeruk District and the Paseh District, is the representative for West Java Province. This regency is comprised of 82 farms and represents places that have been affected by flood catastrophes.

2.2. Procedures

Determine the risk level of rice farming production

To determine the production risk in rice cultivation, compute the coefficient of variation.

$$CV = \frac{\sigma}{\bar{X}}$$

$$\sigma = \sqrt{\frac{\sum x^2}{n}} \qquad x = X - \bar{X}$$

Explanation: CV = the coefficient of variation; σ = production standard deviation (variance); $\bar{X}$ = production mean; n = total sample.

If the coefficient of variation (CV) is less than or equal to 1, the farm has a low risk. Conversely, if the CV is more than or equal to 1, the farm has a high risk. A higher CV number implies a higher degree of risk in the farm's output, and vice versa (Elton and Gruber, 1995). For the purpose of determining the impact that the utilization of production inputs has on production risk, multiple linear regression analysis using the heteroscedastic approach is used to investigate the factors that have an impact on production risk. The following is the regression model that represents the effect of input utilization on the productivity and risk of rice cultivation at the farm level:

$$\ln Y = \ln\alpha 0 + \alpha 1\ln X1 + \alpha 2\ln X2 + \alpha 3\ln X3 + \alpha 4\ln X4 + \alpha 5\ln X5 + \alpha 6\ln X6 + \alpha 7\ln X7 + \alpha 8\ln X8 + d1D1 + d2D2 + \varepsilon 1$$

Maximize the likelihood function to derive the production risk function.

$$\varepsilon_1^2 = \ln\beta o + \beta_1\ln X_1 + \beta_2\ln X2 + \beta_3\ln X3 + \beta_4\ln X4 + \beta_5\ln X5 + \alpha_3\ln X6 + \varepsilon_2$$

Explanation: Y = Production Risk; ε_1^2 = Rice production risks (residual); α0β0 = Intecept; α1-8, β1-8 = Regression coefficient; ε_2 = Error term (residual); X1 = land area (ha); X2 = seeds (Kg); X3 = urea fertilizer (Kg); X5 = labor (person days worked)

Analyzing rice farmers' reactions to the sustainability of involvement in crop insurance programs

The purpose of this study is to use narrative descriptive analysis to investigate the responses of rice farmers about the viability of participating in the agricultural insurance program. In order to collect the first data, a questionnaire was sent out to rice farmers, and subsequently interviews were conducted to collect more information. In the next step, the data is converted into tabular format. Therefore, this is done in order to make the data that is received simpler to read and comprehend. The following descriptive formula is used to determine farmer responses:

$$\%) = \frac{Score\ Obtained}{Total\ Score} X\ 100\%$$

Binary logistic analysis with the Guttman scale or scalogram scale approach is used to determine the factors that are related to the responses of farmers. This method is very effective in persuading researchers about the unity of the dimensions and attitudes or traits that are being studied, which is why it is frequently referred to as universal attributes.

Table 1: Dependent Variable Answer Value.

Score	Explanation
0	Not Continuing
1	Yes, Continuing

3. Results and Discussion

3.1. Determine The Production Risks Encountered by Farmers

A technique based on the coefficient of variation is used in this study in order to compute the production risks that are encountered by farmers. For these computations, the coefficient of variation (CV) was used as the appropriate statistical tool. When the coefficient of production variation is insignificant, the variability of the average production value will also be limited, and vice versa.

Table 2: Production Risks.

Description	Production Risk
The Production average (Kg)	6165
Standar deviasi	4343,606
Koevisien Variasi (CV)	0,704558962
CV (%)	70%

Source: Primary Data Processed, 2021.

Crop failure, which is caused by production failures, is the production risk that farmers confront. This risk derives from production shortcomings. There are a number of causes that contribute to a drop in agricultural productivity. These factors include natural catastrophes, insect assaults, changes in temperature and weather, and mistakes in human resources. When compared to the non-agricultural sector, the agricultural sector is more susceptible to the risk of production. This is due to the fact that the agricultural industry is significantly impacted by natural factors, including weather, pests, temperature, drought, and floods. Due to the fact that agricultural operations are dependent on nature, there is a risk associated with agricultural production. There is a possibility that the negative impact of nature will have an effect on the overall agricultural output. According to the findings of the study that was carried out by researchers, the coefficient of variation was determined to be 0.704, which is equivalent to 70.4%. This indicates that the possibility of farmers engaging in rice farming operations is associated with a high level of production risk. Where the high production risk is caused by natural disasters, floods, and pests that attack rice farming, which ultimately leads to the failure of rice farming production.

This study found that natural catastrophes and insect infestations are the most common causes of crop failures that farmers experience, which might lead to production concerns. In Kudus Regency, Bojonegoro Regency, and Bandung Regency, the failure of crops was brought on by the natural catastrophe of floods. On the other hand, in Kebumen Regency, the failure of crops was brought on by insect infestations, namely stem rot. To a greater extent than seventy-five percent, this is the reason why farmers experience crop failure. A number of elements, including as the amount of land, the seeds used, the amount of fertilizer used, the amount of labor, and others, are considered to be production factors. The variables that are considered to be production factors are being measured in this study as elements that impact production risk.

Table 3: Results of Multiple Linear Regression Analysis.

Koefisien	Beta In	t	Sig.	Partial Correlation	Tolerance	VIF	Minimum Tolerance
Area	-,846[b]	-,313	,755	-,023	3,430E-6	291516,177	3,430E-6
Seeds	2,999[b]	3,078	,002	,225	2,506E-5	39901,119	2,506E-5
Urea	-,846[b]	-,313	,755	-,023	3,430E-6	291516,177	3,430E-6
Labor	3,026[b]	2,260	,025	,167	1,359E-5	73586,159	1,359E-5
Noted: R^2 = 99%; Durbin Watson = 1,507; F Hitung = 3,927							

Source: Primary Data Processed, 2021.

In this particular instance, the dependent variable (Y) is the result of rice production that is influenced by the independent variable, where (X1) is explained by land area, (X2) is explained by the use of seeds, (X3) is explained by the use of urea, and (X4) is explained by the use of labor. The results of multiple linear regression analysis are presented in Table 3, which reveals that the coefficient of termination (R2) using four variables demonstrates that the model has explained 99% of the dependent variable. According to the findings of the regression analysis that was carried out, the variables that had a beneficial impact on the risk of production were the use of labor and the utilization of seeds. A probability value that is less than 5% is considered significant. Due to the fact that seeds are the production component that has the greatest impact on rice output, this demonstrates that seeds have a substantial impact on rice production. Labor is another component that has a considerable influence, in addition to seeds influencing the outcome. It would seem from this that an increase in manpower might lead to a decrease in rice yield as well as an increase in production risk.

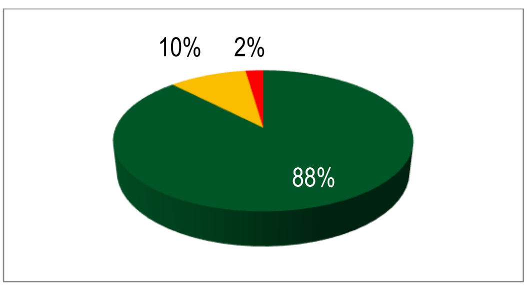
3.2. Farmers' Response to Re-Participate in the Agricultural Insurance Program (AUTP) as Protection Against Crop Failure

According to the findings of a study that investigated the reaction of farmers to re-enter the agricultural insurance program (AUTP) as a means of protection against crop failure (*puso*), the following is the conclusion that can be drawn:

Table 4: Results of Farmers' Responses to the Sustainability of the Insurance Program.

Category	Interval	F	%
Tinggi	103-110	193	88%
Sedang	96-103	22	10%
Rendah	89-96	5	2%

Source: Primary Data Processed, 2021.



Graph 1: Results of Farmers' Responses to the Sustainability of the Insurance Program.
Source: Primary Data Processed, 2021.

According to the statistics, 88% or 193 farmer respondents opted to maintain the crop insurance scheme. This demonstrates the significant advantages of the agricultural insurance program, particularly the rice farming insurance (AUTP), in safeguarding farmers from crop failure (*puso*). This insurance policy enables farmers to resume their agricultural operations in the next planting season by providing reimbursement for production expenditures incurred during farming activities.

Conclusion & Recomandation

The coefficient of variation for production risk is 0.704, which is equivalent to 70.4%. This indicates that the risk that farmers face while engaging in rice farming operations is considered to be of a high production risk. a situation in which the high risk of production is brought on by natural disasters, floods, and pests and diseases that attack rice farming, which ultimately leads to the failure of rice farming, which means that the cost risks that farmers face in rice farming are also significant. There are situations in which the cost hazards that farmers are exposed to are brought about by rises in the costs of urea fertilizer and pesticides. The use of labor and seeds are two production risk variables that have an impact on rice cultivation. 88% of the farmers that participated in the survey, or 193 of them, decided to keep participating in the agricultural insurance program. The fact that this is the case demonstrates that the agricultural insurance program, and more specifically the rice farming insurance (AUTP), is very advantageous to farmers since it offers protection against crop failure (*puso*).

For the purpose of providing a solution to protect against risks that farmers in the agricultural sector face, as well as a reference for the Ministry of Agriculture in the process of implementing insurance programs based on the level of risk that is faced by rice farming, it is anticipated that this research will provide information (input) regarding the use of agricultural insurance programs that have been implemented by the command.

Acknowledgements

Our heartfelt gratitude goes to Mac Arif Hamdanas Ph.d for his warm and kind encouragement in this project. If the article has any clarity, the credit must go to him who is our most ruthless and loving editor. We would like also to express out greatest gratitude to Education Ministry for The Support Grant Funds, Universitas Muhammadiyah Bandung, and Universitas Gadjah Mada.

JEL Classification: Q10, Q14, Q15, Q56, Q57, Q58

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