# Farmer Behavior on the Risk of Garlic Farming on the Slopes of Mount Lawu, Karanganyar Regency, Central Java

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**Abstract.** Garlic farming is faced with various risks, such as production failure and price fluctuations, which affect farmers' behavior in dealing with these uncertainties. Generally, farmers tend to be reluctant to take risks with these potential risks. Socio-economic factors impact the risk-taking farmers behavior. This research aims to (1) identify the financial risks associated with garlic cultivation, (2) analyze farmers' behavior to these risks, and (3) examine the socioeconomic factors that influence farmers' behavior to the risk of garlic cultivation. The study was conducted in Karanganyar Regency, Central Java. A coefficient of variation was used to analyze the degree of risk associated with farming income. Quadratic utility functions were employed to analyze farmers' behavior in response to risk. Multiple linear regression was applied to examine socioeconomic factors that affect farmers' behavior regarding farming risks. The results showed that most farmers were reluctant with garlic risk farming, The land size, farmers' age, and the number failures all contribute to aversion to risk. Farmers with higher levels of education, greater experience in garlic cultivation, larger household sizes, and higher farming incomes tend to be less risk averse. The availability of information on planting time will provide greater benefits.

## 1 Introduction

In the horticultural subsector, garlic is the most grown vegetable. Taxonomy of Garlic (*Allium Sativum* L.) Classification of garlic, in particular: Class: Monocotyledonae, Division: Angiosperm, Subdivision: Spermatophyta, Nation: Liliales Tribe: Liliaceae, Genus: Allium, Type: Allium Sativum [1]. Intense garlic farming is believed to increase farmers' profits because garlic is a horticultural product that the public, especially housewives, always needs as a seasoning for food. Although it is not a staple food, every home needs garlic to flavor food because it is one of the ten essentials for a healthy family.

Garlic yields vary by region, both in terms of quantity and quality. This is since garlic must adjust to the soil, climate, and topography of each area, causing variances in various places. [2]. This garlic product's exceptional economic value is what makes it superior. Given the number of employees needed, the costs incurred, and the profits generated, garlic farming has a high economic value.

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Meeting the country's demand for garlic has proven to be a difficult problem for agricultural development over the last thirty years. The increasing annual trend in garlic consumption is not in line with the more or less stagnant national trend in garlic production. Since 1998, the average national consumption has increased to 383,248 tons per year, but the average national production has only increased to 34,946 tons per year. [3]. Due to a lack of technological expertise, the farming system is inefficient, which reduces the potential for productivity. [4].

The high risk of growing garlic exacerbates the ineffective farming practices and lack of technological advancements. Risk is the possibility of a measurable loss. [5]. Farmers must manage the following risks: production, price and market, institutional, human resource, and financial risks. [6,7,8]. It can be skewed to blame farming risks, which are frequently disregarded, for a drop in productivity. [9].

Garlic farming is susceptible to both price fluctuations and production failure due to the unstable and fluctuating prices. When there are risks, most prudent farmers are reluctant to take them. [10,11,12]. Decisions will be influenced by individual variances in risk aversion [13, 14]. Risk-taking behavior among farmers is impacted by socioeconomic factors. [15]. Among these socioeconomic factors are land area, farmer age, education, experience, amount of farming failures, and farmer income.

The problem formulation and background serve as the foundation for the research objectives. (1). to assess the degree of risk associated with growing garlic on Mount Lawu's slopes in the Karanganyar Regency of Central Java. (2). Understanding how farmers behave in relation to the dangers of growing garlic on the slopes of Mount Lawu in the Karanganyar Regency of Central Java, and (3) Examine the social elements that affect farmers' attitudes toward these dangers.

## 2 Research Method

To perform the research, a descriptive analysis method was employed. [16, 17, 18, 19]. The Karanganyar Regency in Central Java served as the study's site. Blumbang Village and Kalisoro Village, two villages in the Tawangmangu District, were chosen to serve as the hubs for garlic production, there were fifty responders per village. Data was collected through interviews and observation with the use of questionnaires. The data processing method draws a conclusion based on empirical facts at the research site by applying inductive techniques and concretely known facts and events.

### 2.1 Risk Analysis

The degree of risk related to shallot farming income is examined using the magnitude of the coefficient of variation. Income risk can be measured using the standard deviation and variance magnitude. according to Chen et al. [20]. The coefficient of variation in mathematics can be written like this:

$$KV = \frac{\sigma}{\overline{X}} \tag{1}$$

where $KV$ was coefficient of income variation; $\sigma$ was standard deviation of income; and $\bar{x}$ was average revenue.

When the coefficient of variation is small, the average value in the distribution has low variability, demonstrating that the average risk (income risk) is small on average.

## 2.2 Analysis of Farmer Behavior Against Risk

A quadratic utility function model technique is used to determine how farmers behave in relation to the risk involved in growing garlic:

$$U = b_0 + b_1 M + b_2 M^2 \tag{2}$$

where, $U$ was value utility; $M$ was the acceptance obtained at the equilibrium point of the alternative option is filed; $b_0$ was intercept; $b_1$ was regression coefficient; and $b_2$ was risk preference coefficient.

As determined by Bernoulli's principle and the Neumann-Morgenstern technique enhanced with neutral probability, the equilibrium value is a condition of equilibrium between values under definite conditions and values under uncertain conditions. (50:50). The profit from growing onions is represented by this equilibrium value, which is called the certainty equivalent, or CE. Connecting the utility's scale yields utility functions. Every farmer will have a different utility curve because they each have a different CE value and a different source of income.

## 2.3 Analysis of Factors Influencing Farmer Behavior on Risk

To determine how farmers behaved with regard to garlic risk as influenced by land area, age, education, experience, number of family members, failure frequency, and farmer income, multiple linear regression models were employed. The risk coefficient is the dependent variable; the independent variables are land area, age, education, experience, number of family members, frequency of failure over the preceding five years, and farmer income from farming for a year.

$$b_2 = \alpha_0 + \sum_{i=1}^{7} \alpha_i X_i + \mu \tag{3}$$

Information:
$b_2$ = risk preference coefficient
$X_1$ = land size (hectare)
$X_2$ = farmer age (year)
$X_3$ = farmer education (year)
$X_4$ = farmer experience (year)
$X_5$ = number of members of the peasant family (person)
$X_6$ = failure frequency
$X_7$ = farmer income from farming (IDR/year)
$\alpha_0$ = intercept
$\alpha_1$ = land area regression coefficient
$\alpha_2$ = farmer age regression coefficient
$\alpha_3$ = regression coefficient of farmer education
$\alpha_4$ = regression coefficient of farmer experience
$\alpha_5$ = regression coefficient of the number of members of the peasant family
$\alpha_6$ = failure frequency regression coefficient
$\alpha_7$ = regression coefficient of farmer income from farming
$\mu$ = confounding variables

Ordinary least square (OLS) testing of the analysis model consists of two steps: (1) examining the traditional presumptions and (2) evaluating the appropriateness of the model [21,22]. The conventional assumption test employed in this study is the multicollinearity and heteroscedasticity test. This is because the data are either cross-sectional or single point in time. [22]. The model used to determine whether the examined model is free of interference from classical assumptions is obtained through ordinary least square (OLS) analysis. The model has been improved to remove both heteroscedasticity and multicollinearity disorders if they exist.

To determine whether heteroscedasticity disorders existed in the Shazam data analysis program, the heteroscedasticity test employed a number of tests, such as the Harvey, Glesjer's, Koenker, and Breusch-Pagan tests. If at least one of the four tests shows a heteroscedasticity disorder, the model is adjusted using the heteroscedasticity model and the Feasible Generalize Least Square (FGLS) method of analysis. [23]. To enhance the model for heteroscedasticity disorders, four distinct kinds of heteroscedasticity models were employed. [24]. The multiplicative model mult, the standard deviation model stdlin (a linear function of an exogenous variable), the variance model varlin (a linear function of exogenous variables), and the dependent variable they represent (model depvar) are the names given to these models. To identify the factors influencing the risk preference coefficient, one of the four heteroscedasticity improvement models was chosen as the best (most appropriate) model.

## 3 Results and Discussion

### 3.1 Risk of Garlic

The risk associated with the income from garlic farming was determined using a coefficient of variation analysis. The analysis of the coefficient of variation looked at the amount of variation coefficient that farmers received from growing garlic. The analysis of the coefficient of variation in garlic farming revenue is shown in Table 1.

According to the study's findings, the income variation for garlic farming is the lowest at IDR 135,500,000 per hectare and the highest at IDR 235,750,000 per hectare. The amount of money farmers make from farming is directly influenced by two factors: production and price. The risk of income from garlic farming that farmers may have to face is increased by the variation in price (ranging from IDR 17,500 per kilogram to IDR 23,000 per kilogram) and production (ranging from 15,000 kg per hectare to 20,000 kg per hectare). The variation in production is due to farmers planting garlic at different times. The results of this study corroborate several other studies that show how dangerous vegetable farming is [8, 25, 26, 27, 28,29,30,31].

**Table 1.** shows the average, standard deviation, and coefficient of variation for the income per hectare from garlic farming in 2024.

| Farm Income | Garlic |
|---|---|
| Average (IDR) | 207,930,500 |
| Standard Deviation | 85,810,534 |
| Coefficient of Variation | 0.413 |

Planting garlic during the rainy season, around December, when rainfall is especially high, will unavoidably result in low production because garlic is extremely sensitive to weather and climate. Similarly, garlic grows and harvests differently depending on when it is planted, which results in differences in the quantity of production. On the other hand, because there is less rainfall during that time of year, farmers who plant garlic at the beginning of the rainy season will surely get larger yields. A closer look at the differences in garlic production shows that the farmers' differing quality output, which varies in terms of both price and income, is what causes the differences in crop income.

### 3.2 Farmers' Behavior Toward Risks

To determine how farmers behave in regard to the risks involved in growing garlic, the quadratic utility function is employed. The utility function of each farmer is estimated using the Bernoulli-Morgenstern principle, which is reinforced by a neutral probability (50:50), and in compliance with the research method's recommended protocol.

The utility function of every garlic farmer was used to calculate the determination coefficient ($R^2$), which ranged from 0.955 to 0.995. This suggests that variations in 99.50 percent of garlic farming revenue and variations in other factors not included in the model are the causes of the variation in the utility value of garlic farming, respectively, for farmers with the lowest determination coefficient value ($R^2$). However, for farmers whose determination coefficient value ($R^2$) indicates that the reasons for the variation in the utility value of garlic farming are variations in 95.50 percent of the revenue from garlic farming as well as variations in other factors that are not included in the model. Meanwhile, the highest score was 1,015,100, and the lowest was 87,551.

Table 2 shows that 12 farmers have a negative risk coefficient ($b_2$), meaning that out of 100 farmers, 78, or 78 percent, have a negative and significant risk coefficient ($b_2$), implying that they behave reluctantly in light of the dangers associated with garlic cultivation. and 10 exhibit a positive but negligible risk coefficient ($b_2$), suggesting that they all act in a neutral manner toward the dangers of garlic farming and that none of them risk anything. The results of the study show that the majority of farmers react reluctantly to the risks involved in garlic cultivation. The results of this study are in line with several others that show farmers are reluctant to assume the risks involved in vegetable farming. [8, 10, 20, 32, 33].

Given that most farming households face a significant financial challenge, it is not surprising that many farmers display risk aversion. Rural farmers are unable to use the formula for calculating farming's maximum profits because their lives are frequently very close to subsistence level, and they must constantly deal with unpredictable weather. To avoid failure and low profits, farmers will try to reduce risk. Most farmers behave in this manner, which is referred to as "safety first" or "putting safety first."

**Table 2.** Distribution of garlic farmers' behavior towards risk, 2024

| Behavior | Sum | Presented % |
|---|---|---|
| Averter | 78 | 78 |
| Neutral | 22 | 22 |
| Lover | 0 | 0 |
| ($R^2$) Lowest | 0.955 | |
| ($R^2$) Highest | 0.995 | |
| Lowest F-count | 87.550 | |
| Highest F-count | 1,015.100 | |

Farmers who grow garlic are driven to boost their profits because it grows quickly and sells for a high price. However, most farmers have not dabbled in commercial garlic production because of the high risks, such as pest infestations and unstable market prices. These farmers also have limited or no capital. Due to a lack of reasonably priced supplies to meet their basic needs, small farmers or farmers with limited capital are forced to sell their produce at both high and low prices when harvest time comes. Whether the price is good or high, farmers with more capital usually sell everything when harvest time comes. They usually sell some to cover their capital if the price is low, and then they resell it when the price is high, which gives them enough money to cover their living expenses. Because it lowers the chance of failure, most garlic farmers cultivate their crops using an alternating and intercropping system. They hope to succeed with other plants if they are unable to grow garlic. Of the 100 farmers, 67 percent planted carrots, shallots, garlic, and carrots in that order. Garlic is planted in May and is expected to be harvested in early October, or around mid-July, when it is 55 days old and planted with carrots. Garlic will be harvested after 135 days; the carrot plant will be 70 days old by then, and harvesting is expected to take place in December.

### 3.3 Socioeconomic Factors Influencing Farmer Behavior Towards Risk

Socioeconomic factors that are believed to affect farmers' risk-taking behavior include land area, age, education, experience, number of family members, frequency of failures during the previous five years, and income from farming for a year. In this case, the dependent variable is the risk coefficient ($b_2$) of the quadratic utility function analysis. Thus, it is thought that farmers' risk management is influenced by seven factors. The findings of a multiple linear equation model used to examine the variables influencing farmers' propensity for taking risks are shown in Table 3. Out of the seven independent variables, Table 3 shows that three of them—farmers' age, income, and education—have a significant effect on the non-independent variables, like the risk coefficient, which shows how they act in risky situations.

**Table 3.** Regression coefficients and t-calculation of the function of garlic farmers' behavior towards risk, 2024

| Independent Variables | Regression Coefficient | T-Count |
|---|---|---|
| Intersep | 0,515E-04$^{***}$ | 12,139 |
| Land ($X_1$) | -0,668E-09$^{NS}$ | -0,865 |
| Farmer Age ($X_2$) | -0,237E-06$^{*}$ | -2,321 |
| Farmer Education ($X_3$) | 0,775E-07$^{**}$ | 2,454 |
| Farmer Experience ($X_4$) | 0,476E-06$^{NS}$ | 1,223 |
| Number of Family Members ($X_5$) | 0,654E-07$^{NS}$ | 0,286 |
| Failure Frequency ($X_6$) | -0,322E-05$^{NS}$ | -0,133 |
| Farmer Income ($X_7$) | 0,266E-10$^{**}$ | 2,277 |
| Coefficient of Determination ($R^2$) | 0,7765 | |
| F-count | 9,753$^{***}$ | |
| DW | 1.801 | |

Information: *** was significant on α: 1%; ** was significant on α: 5%; *was significant on α: 10%; and NS was insignificant on α: 10%

- T-table (with df = ∞) at α: 1%= 2.576; α: 5% = 1.960; and α: 10% = 1.645
- F-table, at α: 1% = 2.510; α: 5% = 1.940; and α: 10% = 1.670

To find out if the multiple linear regression model departs from its conventional assumptions, the next step is to search for indications of heteroscedasticity and multicollinearity. Multicollinearity is the term used to describe a perfect or obvious linear relationship between some or all of the variables that explain the regression model. The presence of a multicollinearity problem in the estimator model is assessed using an indicator of the correlation coefficient between independent variables. Since the correlation coefficient between the independent variables is relatively low, it can be inferred from the analysis results that the multiple linear regression model used for the analysis does not have a multicollinearity issue.

When the elements of the disturbance are different from one another, heteroscenidism takes place. One of the most common issues with cross-sectional data is heteroscedasticity. [33]. To find the heteroscedasticity problem, this study used the Harvey Test, Glesjer's Test, Koenker Test, and Breusch-Pagan Test techniques. The results of the analysis show that there is a heteroscedasticity problem with the estimator model. The enhanced models that were used to remove the influence of heteroscedasticity were the depvar model (heteroscedasticity correction with dependent variables), the mult model (heteroscedasticity correction with multiplicative), the stdlin model (heteroscedasticity correction with standard deviation is a linear function of exogenous variable), and the varlin model (heteroscedasticity correction with variance is a linear function of exogenous variable). Table 4 presents the outcomes of these models.

**Table 4.** Regression analysis between risk coefficients and seven independent variables that have eliminated the influence of heteroscedasticity, 2024

| Independent Variables | Regression Coefficient | Heteroscedasticity Free Regression Coefficient | | | |
|---|---|---|---|---|---|
| | OLS | DEPVAR | MULT | STDLIN | VARLIN |
| Intercept | 0.515E-04$^{***}$ (12.139) | 0.568E-05$^{***}$ (11.33) | 0.864E-05$^{NS}$ (0.854) | 0.731E-05$^{NS}$ (0.678) | 0.155E-06$^{***}$ (3.249) |
| Land ($X_1$) | -0.668E-09$^{NS}$ (-0.865) | -0.324E-09$^{***}$ (-9.52) | -0.695E-10$^{*}$ (-1.657) | -0.477E-10$^{NS}$ (-1.519) | -0.344E-10$^{NS}$ (-0.111) |
| Farmer Age ($X_2$) | -0.237E-06$^{*}$ (-2.321) | -0.637E-06$^{***}$ (-10.93) | -0.176E-06$^{NS}$ (-1.272) | -0.155E-06$^{NS}$ (-0.876) | -0.124E-08$^{*}$ (-1.661) |
| Farmer Education ($X_3$) | 0.775E-07$^{**}$ (2.454) | 0.256E-07$^{***}$ (11.92) | 0.142E-07$^{***}$ (2.622) | 0.144E-07$^{NS}$ (1.2756) | 0.543E-08$^{***}$ (2.667) |
| Farmer Experience ($X_4$) | 0.476E-06$^{NS}$ (1.223) | 0.727E-06$^{***}$ (7.55) | 0.134E-06$^{NS}$ (0.528) | 0.387E-06$^{NS}$ (1.335) | 0.477E-07$^{NS}$ (0.2854) |
| Number of Family Members ($X_5$) | 0.654E-07$^{NS}$ (0.286) | 0.135E-07$^{***}$ (7.44) | 0.665E-07$^{NS}$ (0.744) | 0.165E-07$^{NS}$ (0.712) | 0.732E-07$^{NS}$ (1.556) |
| Failure Frequency ($X_6$) | -0.322E-05$^{NS}$ (0.133) | -0.543E-05$^{***}$ (-7.66) | -0.844E-06$^{NS}$ (-0.873) | -0.188E-06$^{NS}$ (-0.154) | -0.156E-06$^{*}$ (-1.778) |
| Farmer Income ($X_1$) | 0.266E-09$^{**}$ (2.277) | 0.232E-09$^{***}$ (6.57) | 0.654E-09$^{***}$ (3.130) | 0.685E-09$^{NS}$ (1.285) | 0.765E-09$^{*}$ (1.645) |
| F-count or LR | 9.753$^{***}$ | 24.356$^{***}$ | 24.356$^{***}$ | 24.356$^{***}$ | 24.356$^{***}$ |
| R² | 7.765$^{***}$ | 7.765$^{***}$ | 7.765$^{***}$ | 7.765$^{***}$ | 7.765$^{***}$ |

Information:
- OLS : *Ordinary least square*
- *Depvar* : Improved heteroscedasticity with *dependent variables*
- *Mult* : Improvement of heteroscedasticity with *multiplicative*
- *Stdlin* : Improvement of heteroscedasticity with *standard deviation is a linear function of exogenous variable*
- *Varlin* : Correction of heteroscedasticity with *variance is a linear function of exogenous variable*
- *** was significant on α: 1%; ** was significant on α: 5%; *was significant on α : 10%; and NS was insignificant on α: 10%
- The number in parentheses is t-count
- T-table (with df = ∞) at α: 1% = 2.576; α: 5% = 1.960; and α: 10% = 1.645
- F-table, at α: 1% = 2.510; α: 5% = 1.940; and α: 10% = 1.670
- Chi-Square, at α: 1% = 20.090; α: 5% = 15.510; and α: 10% = 13.360

Based on the analysis results in Table 4, it is known that the heteroscedasticity model has a determination coefficient ($R^2$) value of 0.7765. This suggests that up to 77.65 percent of the variation in the value of the risk coefficient or farmer's behavior toward risk can be explained by differences in land area, age, education, experience, number of family members, frequency of failures over the previous five years, and farming income, while 22.35 percent can be explained by other variables that also determine but are not included in the model.

The independent variables collectively have a significant influence on the dependent variables, as indicated by the likelihood ratio (LR) value of 24.356. This value is higher than the chi-square value of ($X^2$-*table* 20.090). In other words, how farmers respond to risks is influenced by their collective socioeconomic characteristics, including land area, age, education, experience, number of family members, frequency of failures during the past five years, and farming income. Table 4 shows that the *depvar* model, which improves heteroscedasticity with dependent variables, is the most effective of the four models used to lessen the influence of heteroscedasticity because, in comparison to the other three models, it has the most independent variables with a real effect, meaning that every independent variable has a real effect. To identify the factors influencing farmers' risk-taking behavior, the *depvar* model—an improvement on heteroscedasticity with a dependent variable—was chosen. According to the *depvar* model (improvement of heteroscedasticity with dependent variables), each independent variable is known to have a real, albeit partial, impact on the dependent variable.

The results of the examination of socioeconomic variables that affect farmers' decisions about the dangers of garlic cultivation are shown in Table 4. The following is a summary of the findings:

### 3.3.1 Land

The average farmer owns 0.1450 hectares, which is a comparatively small area. Increasing the land area will significantly lower the ceteris paribus risk coefficient, as shown by Table 4, which shows that the land area has a significant negative regression coefficient. This result is consistent with studies that demonstrate that farmland's reluctance to accept the risks associated with farming increases with its size [14], However, contrary to the results of other studies [12].

Garlic planting is actually a risky choice for farmers because of this uncertainty. When dealing with a large area, the likelihood of failure is even greater if only a small area is at risk. In addition to the uncertainty factor, the state of the no longer fertile soil also affects the failure risk. Some farmer-owned properties are saturated, which means that water absorption is difficult for the soil. Garlic may initially grow on planted land, but it eventually wilts and dies, and the tubers deteriorate. Many experts think this is due to the excessive use of inorganic fertilizers and pesticides, which pollute the soil with chemicals. Consequently, farmers are less likely to cultivate garlic on a large area of land.

### 3.3.2 Farmer Age

The average farmer is 39 years old, with the youngest being 28 and the oldest being 73. The risk coefficient of ceteris paribus will drop dramatically with age, according to the regression coefficient of age, which is negative and significant. In other words, as farmers age, their reluctance to accept the risk of failure decreases, while their reluctance to accept the risk increases. This makes sense because older farmers tend to be more conservative and easily fatigued, but some are more experienced and skilled than others. Despite having less experience and skill, younger farmers are physically stronger and exhibit more progressive behavior toward new innovations. Because of this progressive trait, which tends to shape their behavior, young farmers are more willing to take risks. This is being shown by a few young farmers who are bold enough to change the way production factors are used. For example, they are beginning to use fewer chemical pesticides, only using them when absolutely necessary because of the presence of pests and diseases, and they are moving from chemical fertilizers to organic fertilizers. Farmers have historically sprayed chemical pesticides once a week, regardless of the presence of pests and diseases. These findings are consistent with previous research that showed older farmers were less susceptible to farming risks. [14], Even so, in other studies [12] The tendency is the same, meaning that, although age is not significant, there is still an inverse relationship between age and risk coefficient. These results contradict research that shows young farmers take more risks than older farmers [30].

### *3.3.3 Education*

The duration of formal education for farmers ranges from 15 to 23 years, with an average of 17 years. Thus, the typical farmer has a high school diploma. The regression coefficient for the farmer education variable is positive and significant, indicating that, under the assumption that other factors remain constant, an increase in education will result in a significant increase in the risk coefficient. That is, the more educated a farmer is, the more willing they are to take chances. This is possible because most farmers have completed high school, and educated farmers are typically risk-takers. These results are consistent with studies that demonstrate farmers with greater education levels exhibit greater risk-taking bravery. [14], although in other studies [12] education it doesn't have much effect, the trend remains the same.

### *3.3.4 Experience*

Farmers' experiences with growing garlic vary greatly. Farmers have an average of 35 years of garlic farming experience, with a range of 10 to 45 years. The experience of garlic farmers has a positive and significant regression coefficient, meaning that the risk coefficient of ceteris paribus will rise noticeably as experience increases. In other words, the more experience a farmer has growing garlic, the less risk averse they are. This finding is in line with past research showing that farmers who have more farming experience are less afraid to take chances. [14], Although in other studies [12] No, experience has no effect, but the trend is the same.

Through observation and experience, farmers learn how to grow garlic by taking into account the environment, past generations' experiences, and their own observations. Experienced and receptive farmers are highly skilled and cognizant of the possible outcomes of their choices, including those related to price and productivity. Some farmers who are members of farmer groups serve as examples of this. When these farmers decide to grow garlic, they always consider previous experiences or events. Furthermore, they research other areas that cultivate comparable crops because harvest prices will surely decline if other areas cultivate the same crop, requiring the use of substitute plants. Farmers will try to plan ahead in order to avoid making the same mistakes again, and they will learn a lot from their past mistakes.

### *3.3.5 Number of Family Members*

Family size ranges from 0 to 4, with the average farmer having two family members. The number of family members has an elasticity with a positive and significant value, meaning that an increase in family size will significantly raise the risk coefficient, assuming that all other factors stay constant. This suggests that the more family members a farmer has, the less risk averse they will be.

This is because the number of family members and the availability of labor are strongly correlated. Please note that garlic requires a lot of work to grow. Most farmers hire family members to do everything from seed preparation to soil tillage, planting, weeding, fertilizing, watering, harvesting, and post-harvest work. The results of the study also show that a large family size requires more work from the household head to meet the needs of the family and attain high performance levels. This encourages farmers to be bolder and take calculated chances. These results are in line with research showing that farmers who have more family members are less likely to be risk averse. [14], Although in other studies [12]the number of family members was not significant, the trend remained the same and went against the study's findings [30].

#### *3.3.6 Failure Frequency*

The primary cause of the majority of garlic farmers' failures is seasonal uncertainty, which gives rise to pests and diseases. In addition to the high cost of garlic farming, unstable pricing factors also play a role in its failure. Failure rates have averaged 0.06 times over the last five years, with a range of 0 to 1 time. Because the elasticity of the frequency of garlic farming failures has a negative and significant value, an increase in the frequency of failures will significantly lower the risk coefficient if other factors remain constant. In other words, farmers who have more failures are generally less willing to take chances. This result is in line with the study's conclusions, which show an inverse relationship between the risk coefficient and failure frequency—that is, the more failures, the less willing farmers are to take on the risk. [10,12].

#### *3.3.7 Income*

Farmers make between IDR 35,750,000 and IDR 105,500,000 a year on average, but the average is IDR 45,450,000. Most of this income is produced by growing garlic, onions, and carrots; a lesser amount comes from mustard greens, cabbage, loncang, chiles, and chickpeas. Since farmers' yearly income from farming has a positive and significant elasticity, an increase in farming income will significantly raise the risk coefficient of ceteris paribus. In other words, as farmers' incomes increase, they will take greater risks. The study's results are in line with past research showing that farmers' risk aversion will decrease as income rises [14], Although in other studies [12] not statistically significant, but the trend remains the same: the risk coefficient is directly correlated with income.

Making a lot of money is the main reason why farmers grow garlic, so this makes sense. Garlic cultivation is also costly, so a high income is required. Some farmers even earn enough money to start growing garlic on a larger scale. They don't mind taking a chance on failure because they can live comfortably with the supplies they have on hand.

## 4 Conclusion and Policy Implication

### 4.1 Conclusion

The results of the study and the discussion that followed allow for the following deductions to be made:

a. The results of the study indicate that garlic farming carries a reasonable degree of variation or income risk.
b. When it comes to the dangers of growing garlic, most farmers act hesitantly.
c. The farmer's reluctance to take risks increases with the size of the land, his age, and the frequency of his failures. There is a positive correlation between a farmer's willingness to take a risk and their level of education, garlic farming experience, family size, and farming income.

### 4.2 Policy Implications

The variation in production is explained by the fact that garlic is not planted at the same time. Timely garlic planting will benefit farmers, while delayed planting will result in less-than-optimal harvesting. A government policy governing the timing of garlic planting is necessary in situations like this. Counseling provides farmers with information on when to plant garlic.

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