

A Comparative Risk Analysis of Semi-Organic and Inorganic Shallot Farming in Sukorejo Village Rejoso District Nganjuk Regency

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ABSTRACT

The purpose of this research is to examine the production, pricing, and income risks as well as the distinctions between semi-organic and inorganic shallot farming in Sukorejo Village, Rejoso District, Nganjuk Regency. The study was carried out between November and December of 2024. This study was conducted using a survey of 75 shallot farmers selected through stratified random sampling. This study employed the Independent Sample T-test and Analysis of Risk (CV). The result indicate that production, price and income risk for both farming systems were generally low. The factors contributing to the risks in production, price, and income included severe weather, pests and diseases, variable selling prices, and elevated farming costs. Statical testing showed no significant differences in production, price and income risks between semi organic and inorganic farming systems. The lack of difference was attributed to the similarity in land and irrigation practices for both semi-organic and inorganic forms, along with farmers' insufficient awareness regarding pure organic farming.

Keywords: *Shallot Farming, Coefficient Variation, Semi-organic, Holtriculture*

BACKGROUND

Shallots are a horticultural commodity that is quite strategic considering their function as a staple food in Indonesia (Pusdatin, 2022). According to data from the Badan Pusat Statistik shows that national shallot production from all provinces in Indonesia has nearly reached 2 million tons. East Java Province ranks second after Central Java Province contributing approximately 478,393 tons or 24% of national production, with a harvest area around of 51 thousand hectares. Within East Java, Nganjuk Regency is the largest producer contributing with 38.72% of the province's total shallot production (Darmawan, 2023).

Rejoso District, which is the object of the study, is a superior district that produces shallots in Nganjuk Regency. However, recent production trends indicate increasing uncertainty. In 2023, shallot production reached 64,699 tons with a harvested area of 5,219 Hectars and productivity of 12.40 tons/Ha. In 2024, shallot production decline to 56,617 tons despite an increase in harvested area to 5,263 Hectras, resulting in lower productivity of 10.76 Tons/Ha (BPS Kabupaten Nganjuk, 2025). The condition reflects not only production risk but also inefficiencies in farming performance. Furthermore shallot price in Rejoso District fluctuated in 2023 where the highest price was obtained

in June at Rp. 24,566 then decreased drastically in October at Rp. 10,096 and increased rapidly in December at Rp. 19,887 (Siskaperbapo, 2023). These fluctuations increase income uncertainty for farmers.

Previous studies have consistently shown that shallot farming is exposed to various risks, including production risks caused by pests, diseases and climate variability as well as price risks driven by volatile market conditions (Fauzan, 2016; Mutmainah et al., (2022) Several studies have also examined income risks as a consequence of production instability and price fluctuations. However, most existing research tends to analyze these risks separately or focus on single farming system. Moreover, empirical studies comparing different farming systems particularly semi organic and inorganic systems within the same geographical context remain limited.

Sukorejo Village in Rejoso District represents a relevant case study because shallot farmers in this area apply both semi organic and inorganic farming systems. Semi organic farming is characterized by partial adoption of organic inputs, such as organic fertilizers and botanical pesticides, combined with conventional practices. This transitional system is expected to influence risk profiles differently compared to fully inorganic farming. Nevertheless, empirical evidence regarding whether semi organic practices actually reduce or alter production, price and income risks compared to inorganic system in the same location is still lacking. According Wang et al. (2025) excessive application of mineral nitrogen fertilizers soil organic matter availability, reduces soil fertility and negatively affects crop yields, thereby confirming that intensive use of chemical inputs can lead to a decline in long term soil productivity.

This study lies in its simultaneous of production, price and income risks between semi organic and inorganic shallot farming systems within the same location and agroecological conditions. After obtaining the data, this research aimed to analyze the differences in risk in the production process, price fluctuations, and income potential in semi organic and inorganic shallot farming. The main objective of this analysis is so that farmers in the future have a better understanding of the magnitude of the risks that may arise due to the use of different types of fertilizers and pesticides. Based on the research objectives the hypotheses formulated in this study are as follows there is significant difference in production price and income risks between semi organic and inorganic shallot farming system. In the future, farmers can make more informed decisions in choosing and applying fertilizers and pesticides as one of the important elements that affect their shallot harvest.

RESEARCH METHODS

The research took place during November and December 2024 in Sukorejo Village, Rejoso District, Nganjuk Regency (Figure 1). Two categories of data formed the backbone of this study, those are primary and secondary. Primary data came directly from fieldwork which involved observations, interviews, and distributing questionnaires to selected farmers. For the secondary data, sources included literature, various references, journals, earlier research, and documents from relevant government institutions.

In this study, the target population comprised shallot farmers from Sukorejo Village in Rejoso District, Nganjuk Regency, a total of 298 farmers. For sampling, researchers applied the Slovin formula, setting a 10% margin of error, which led to a sample size of 75 farmers. To ensure accuracy

and fair representation, it used Proportional Stratified Random Sampling. This approach makes sense when the population isn't homogeneous, allowing the sample to reflect the various subgroups within the population. So 15 samples of semi-organic shallot farmers and 60 samples of inorganic shallot farmers were obtained.

The data analysis used is risk analysis (Coefficient of Variation), and Independent Sample T-test. According to Asminar et al. (2021) and Ramadhani et al. (2025) to calculate the standard deviation the following formula. Here is the formula for calculating the coefficient of variation (Equation 1):

$$Va = \sqrt{\frac{\sum_{i=1}^n (Q-Qi)^2}{n-1}} \quad \dots\dots\dots (1)$$

Where Va is Standard Deviation, Q is production or price or income of shallot farming, Qi is the average of production or price or income of shallot farming, and n is the number of shallot farming samples.

Next, the standard deviation will be entered into the variation coefficient formula (Equation 2).

$$CV = \frac{Va}{Qi} \quad \dots\dots\dots (2)$$

Where CV is Coefficient Variation, Va is standard deviation, and Qi is the average of production or price or income of shallot farming. The measurement criteria used in calculating the coefficient of variation are as follows:

CV ≤ 0.5 then the risk of production/price/income of shallot farming is low

CV > 0.5 then the risk of production/price/income of shallot farming is high

Comparative analysis is similarly income comparisons across farmers group using the Independent Sample T-test have been applied in income studies. The formula used for the independent sample T-test (Utami et al., 2024) is (Equation 3):

$$t = \frac{\bar{X1} - \bar{X2}}{\sqrt{\left(\frac{(n1-1)S1^2 + (n2-1)S2^2}{n1+n2-2}\right)\left(\frac{1}{n1} + \frac{1}{n2}\right)}} \quad \dots\dots\dots (3)$$

Where t is Independent Sample T-test, $\bar{X1}$ is the average of production or price or income of semi organic shallot farming, $\bar{X2}$ is the average of production or price or income of inorganic shallot farming, S1 is standard deviation of production or price or income of semi organic shallot farming, S2 is standard deviation of production or price or income of inorganic shallot farming, n1 is the number of samples of semi organic farmers, and n2 is the number of samples of inorganic farmers. Determination of the null hypothesis (H0) and alternative hypothesis (Ha) as follows:

H0: The production/price/income risk of semi-organic shallot farming and inorganic shallot farming are the same (not significantly different).

Ha: The production/price/income risk of semi-organic shallot farming and inorganic shallot farming are not the same (significantly different).

The test was conducted using a significance of 0.05 (5%), which was then compared to the t table with a significance level of 95%. So that it has a decision-making criterion, namely, if t count < t table then H0 is accepted; if t count > t table then Ha is accepted.

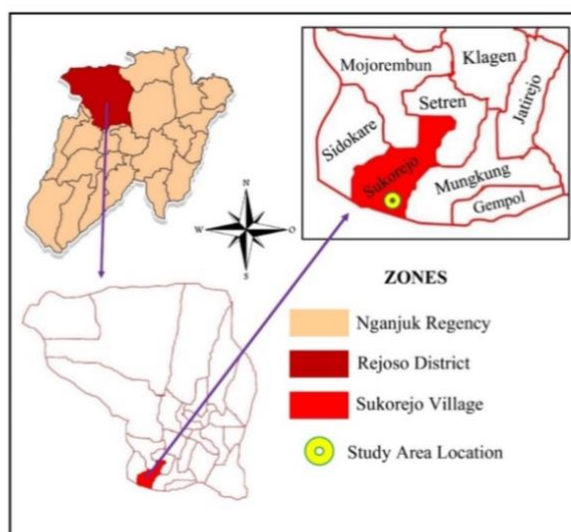


Figure 1. Site Locatin Map

RESULT AND DISCUSSION

In this study risk is measured using the coefficient of variation (CV) which reflect the degree of variability relative to the mean. A lower CV value indicates more stable outcomes, whereas a higher CV reflects grater uncertainty. Consistent with previous studies, a CV value below 0.5 is intepreted as indicating low risk. This general inteptrtation is applied unifromly across production, price and income risks; therefore, subsequent discussions focus on comparative intepretation and underlying causes rather than repeating definitions or numerical desriptions. The results of the coefficient of variation of production, price and income can be seen in Table 1 as follows.

Table 1. Risk Level of Semi-Organic and Inorganic Shallot Farming Production, Price and Income per season

Description	Semi Organic	Inorganic
Production	3.672	4.670
Avarage Production	182.609,3	1.366.257,1
Variance (V ²)	427,328	1.168,870
Standard Deviation (Va)	0,116	0,250
Coefficient Variation (CV)		
Price		
Avarage Price	10.725	11.100
Variance (V ²)	61.678,7	450.535,8
Standard Deviation (Va)	248,325	671.219
Coefficient Variation (CV)	0,023	0.061
Income		
Avarage Income	22.184.123	31.129.679
Standard Deviation (Va)	4.980.437,9	7.939.097,2
Coefficient Variation (CV)	0,225	0,259

Source: Primary Data, 2025

Risk Level of Shallot Farming Production

Production risk is a risk that is described by the production results received not being in accordance with what is expected by farmers, so it is necessary to know how big the production risk is so that in the future anticipatory steps can be taken to overcome it (Nurlinda et al., 2020). Production risk is often evaluated using the coefficient of variation. This metric compares the standard deviation of production to the mean production value. A lower coefficient of variation indicates that production outcomes are relatively stable, suggesting less risk.

Based on the table, it shows that the calculation results of the average production obtained a standard deviation of 427.328 Kg for inorganic shallot farmers. While for semi-organic farmers, the standard deviation value was 1,168.870 Kg. Both the value of CV for inorganic and semi organic shallot farmers is 0.116 and 0.250. This shows that the production risk faced by semi-organic and inorganic shallot farmers is still relatively low. According to Winahyu et al., (2025), greater variability in semi organic farming leads to higher risks compared to inorganic shallot farming

Causes of production risks faced by shallot farmers in Sukorejo Village include extreme weather and pests and diseases. Extreme weather, such as high rainfall and long dry seasons, can reduce shallot production. This is in line with research conducted by Anggraini et al., (2021) seasonal extremes including flooding during during the rainy season and water shortages in prolonged dry periods, along with pest and disease attacks contribute to production risks in Sukorejo Village. Yasa et al., (2022) previous studies indicate that pest and disease attacks are major sources of production risks in shallot farming leading farmers to intensify pesticides in semi organic system.

Risk Level of Shallot Price

Price is one of the factors that will determine the income of shallot farmers from their production. If the selling price obtained by farmers is expensive, it can benefit farmers, but if the selling price falls, it can reduce farmers' income. In agriculture, especially shallot commodities, there will often be fluctuations in commodity selling prices. The occurrence of fluctuations in selling prices can be a source of shallot price risk that can occur at the middleman level or in the market area.

Table 1 indicates that price risk among semi organic shallot farmers is higher than that of inorganic farmers are reflected by a higher coefficient of variation. Nevertheless the CV values for both farming system remain below the accepted threshold, indicating that price risks is relatively low in Sukorejo Village. This condition suggests that price fluctuations are still manageable for both groups of farmers, which is consistent with Annisa and Agustina (2024) who reported that low shallot price risks maybe influenced by agreed selling prices at the farmer level.

Risk Level of Shallot Farming Income

The income in this research area was obtained from the result of subtracting the income from the total cost of the shallot farming owned by the respondent farmers during one planting season. The income generated by the respondent farmers will certainly vary because the total costs incurred and the income obtained will differ from one another. The results of the coefficient of variation of income can be seen in the table. The table shows that income risk among semi organic farmers is slightly higher than that of inorganic farmers, as indicated by a higher coefficient of variation. However, the

CV values for both farming system remain below the accepted threshold, suggesting that income risks sukorejo village is generally low for both semi organic and inorganic shallot farming system. This is in line with the research of Adetya and Suprpti (2021), the risk of red onion income in their research was also relatively low. The low risk of income faced by time to plant red onions in the dry season.

Based on interviews high farmer costs particularly labour expenses are identified as a major source of income risks for shallot farmers. Fitri et al., (2023) Income risks is also driven by rising total farming costs, particularly labor wages with maintenance activities requiring the highest labor input and costs intensity.

Comparison of Semi Organic and Inorganic Shallot Farming Risks

This study conducts a comparative analysis to examine the differences in production risk, price risk, and income risk between semi-organic and inorganic shallot farmers in Sukorejo Village, Rejoso District, Nganjuk Regency. To assess these factors, the independent t-test is utilized as the main analytical tool and the results are presented in table 2.

Table 2. Differences in Production, Price, and Income Risks of Semi Organic and Inorganic Shallot Farming

Description	Production Risk	Price Risk	Income Risk
t count	0,967	0,620	0,802
t table (α 5%)	1,993	1,993	1,993

Source: Primary Data, 2025

Referring to the t-test results presented in Table 2, the calculated t values for production risk, price risk, and income risk specifically 0.967, 0.620, and 0.802 are all less than the t-table threshold of 1.993. In other words, none of these factors reached statistical significance. Consequently, the H_0 is accepted, while the alternative hypothesis is rejected indicating that there are no statistically significant differences in production, price, or income risks between semi-organic and inorganic shallot farming systems. The absence of significant differences in risks maybe attributed to the lack of a clearly differentiated agricultural system separating semi organic and inorganic farming practices in Sukorejo Village, resulting in similar land characteristics, irrigation sources and cultivation management across both systems.

In line with the regulation of the Minister of Agriculture No. 64 of 2013 organic farming requires land that is free from chemical contamination and supported by controlled irrigation system equipped with filtration mechanisms however these requirements have not yet been fully implemented in the study area. As a result, the partial adoption of organic inputs in semi organic farming has not been sufficient to substantially alter the overall risk profile compared to inorganic farming. The suitability of land for organic rice field farming must have a boundary between the land, altitude, rainfall, water sources, and irrigation channels (Andrea et al., 2021). Therefore, the risks posed by semi organic and inorganic shallots show no difference.

In addition to structural factors, farmers awareness and mindset also contribute to the absence of risk difference. According to Firdaus et al., (2024) farmers who have a high level of education will tend to be able to carry out organic farming. However, farmers who have longer farming experience will tend not to want to implement an organic farming system. Although most of the semi-organic

farmer respondents in Sukorejo Village have a high school education level, they also have quite a long farming experience. So that farmers have been aware of switching to organic farming, but because of the inorganic farming mindset that has been passed down from generation to generation, farmers still implement semi-organic farming, which actually has a higher risk than inorganic farming. Consistent with by Hasanah et al., (2018) This study suggests that longer and more consistent implementation of organic farming practices is necessary to effectively reduce production, price and income risks. Therefore, maintaining semi organic cultivation while gradually transitioning toward fully organic shallot farming, supported by appropriated technical and institutional assistance is expected to minimize future risks and potentially create more distinct risks differences between organic and inorganic shallot cultivation.

CONCLUSION AND SUGGESTION

The study finds, the coefficient of variation on production, price, and income of semi-organic and inorganic shallot farming in Sukorejo Village Rejoso District Nganjuk Regency is less than 0.5, as indicates the resulting risk is relatively low. The t-test result in the t-test Difference Test is lower than the t-table between the two farming system, suggesting that partial adoption of semi organic practices has not yet created a distinct risk profile under similar farming conditions.

Farmers are advised to limit excessive use of pesticides and chemical fertilizers to maintain soil quality and reduce a long-term risk. Future studies should incorporate longer time series data, farmer behaviour analysis and policy related interventions such as price stabilization on institutional support to better understand and manage risks in shallot farming.

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