International Journal of Technology and Education Research

https://e-journal.citakonsultindo.or.id/index.php/IJETER

E-ISSN: 2986-0733

Factors Influencing The Decision Of Siam Orange Farmers To Use Semi-Organic Fertilizer In Alebo Village, Konda Subdistrict, South Konawe Regency

Nurbaya[1] , Samsul Alam Fyka[2] , La Ode Kasno Arif[2]

[1] Alumnus of Agribusiness, Faculty of Agriculture, Halu Oleo University, Kendari City, Indonesia
[2] Lecturer, Faculty of Agriculture, Halu Oleo University, Kendari City, Indonesia

Corresponding Author: nurbayanur1205@gmail.com

Abstract

This study aims to analyze the implementation of semi-organic fertilization in Siamese orange farming and to identify the factors influencing farmers' decisions to use it. The research method employed was a quantitative approach using a survey technique involving 35 Siamese orange farmers selected using a saturated sampling method. Data were analyzed using descriptive analysis and multiple linear regression. The results showed that Siamese orange farmers in Alebo Village have implemented semi-organic fertilization by combining the use of organic and inorganic fertilizers according to crop needs. This implementation is reflected in the adjustment of fertilizer composition, dosage, frequency, and timing in farming activities. Regression analysis results indicate that, collectively, age, land area, income, access to extension services, and fertilizer availability influence farmers' decisions regarding the use of semi-organic fertilizers. These findings highlight the importance of improving access to information through extension activities and ensuring the availability of production inputs to support the sustainable use of semi-organic fertilizers in Siam orange farming.

Keywords: ***Siamese oranges, semi-organic fertilizers, farmer decisions, production factors***

INTRODUCTION

Indonesia's agricultural sector plays a strategic role in improving public welfare through the food, horticulture, plantation, livestock, and fisheries subsectors. As an agrarian country, Indonesia has great potential for developing horticultural commodities with high economic value. One such commodity is the Siamese orange, which accounts for approximately 80% of the

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nation's orange cultivation. This commodity is a leading crop due to its high production and broad market prospects. Hariyadi (2020) notes that the Siamese orange is the most popular variety among farmers because its yield is higher than that of other orange varieties.

Despite its great potential, the main challenge faced in horticultural cultivation—including that of Siamese oranges—is the high reliance on chemical fertilizers. Excessive and continuous use of chemical fertilizers can reduce soil fertility, degrade groundwater quality, and lower plants' resistance to pests and diseases (Pahlepi et al., 2023). This situation aligns with the findings of a study by Rahni et al. (2025) in Anggaberi Subdistrict, Konawe Regency, which found that farmers' heavy reliance on chemical fertilizers has led to unhealthy soil, declining productivity, and soaring farming costs. In fact, local organic waste is abundant and can be utilized as an environmentally friendly fertilizer that has been proven to improve soil fertility and promote sustainable agriculture.

To address these issues, an approach that is now being developed is the semi-organic fertilization system. This system combines organic and chemical fertilizers in appropriate proportions, with an emphasis on using organic materials to maintain soil health while reducing dependence on chemical inputs. Yaqin (2021) states that the semi-organic system is an ideal transitional step toward fully organic farming, which is more environmentally friendly. This approach has been shown to improve the chemical, physical, and biological properties of the soil, as well as increase the quality of pomelo fruit by up to 20% while reducing production costs. However, in reality, the widespread adoption of this system remains very limited (Peapa, 2024).

In Southeast Sulawesi Province, South Konawe Regency is one of the most promising production centers for Siam oranges and makes a significant contribution to the local economy. The upward trend in production in this region is shown in Table 1.1 below.

Table 1. Siam Orange Production in Southeast Sulawesi Province by Regency/City

No.	Regency/City	2023 Production (kg)	2024 Production (kg)
1	Buton	2,541.00	2,673.37
2	Muna	11,438.00	21,877.00
3	Konawe	20,811.00	33,058.00
4	Kolaka	12,399.00	29,486.00
5	South Konawe	37,954.00	49,214.50
6	Bombana	533.00	554.50
7	Wakatobi	10.00	15.59
8	North Kolaka	6.00	12.00

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E-ISSN: 2986-0733

9	North Buton	782.00	1,523.00
10	North Konawe	700.00	6,578.00
11	East Kolaka	311.00	1,526.36
12	Konawe Islands	357.00	204.70
13	West Muna	1,749.00	2,253.50
14	Central Buton	1,656.00	96.52
15	South Buton	259.00	446.00
16	Kendari City	12,064.00	4,766.95
17	Baubau City	1,261.00	935.50
Total	Southeast Sulawesi	104,831.00	155,221.49

Source: Central Statistics Agency (2025)

According to Table 1, South Konawe recorded the highest production in Southeast Sulawesi in 2024. One of the centers for the development of this commodity is located in Konda Subdistrict, specifically in the villages of Alebo and Morame. Although they are in the same subdistrict, there are striking differences in their cultivation practices. Morame Village has a land area of approximately 20 hectares; however, farming practices there are still dominated by the use of inorganic fertilizers due to considerations of growth rate and the limited availability of organic fertilizers. In contrast, Alebo Village, with a land area of 13 hectares and a population of approximately 5,200 trees (Agricultural Extension Agency, 2024), exhibits a different phenomenon. Based on initial observations, most Siamese orange farmers in Alebo Village have begun implementing a semi-organic fertilization system. This demonstrates that the competitiveness of an orange-producing region is determined not only by land area but also by the patterns of production resource management.

The adoption of semi-organic fertilization in Alebo Village presents an intriguing phenomenon for study. According to Glorial (2024), horticultural crops are highly sensitive to soil quality, meaning that fertilization practices have a direct impact on production costs, crop stability, and the sustainability of farming operations. Although there is an abundance of local organic materials, there remains a gap in understanding regarding the factors that actually drive and influence farmers' decisions in Alebo Village to adopt a semi-organic fertilization system compared to neighboring villages.

To date, previous research on horticultural commodities in Southeast Sulawesi has generally focused on technical production factors. For example, a study by Setiadi (2023) found that the number of trees and the age of the plants had a significant effect on the production of

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honey pomelo, while factors such as fertilizers and pesticides were not examined from the perspective of farmers' decision-making behavior. Most studies on farmer behavior also place greater emphasis on food crops such as rice and corn (Adnan, 2023), so research on horticultural farmers' decisions—particularly regarding the transition to semi-organic fertilization—remains very limited.

Based on these phenomena and the existing research gap, this study aims to examine the application of semi-organic fertilizers and identify the factors influencing farmers' decisions to use semi-organic fertilizers in Siamese orange farming in Alebo Village, Konda Subdistrict. The novelty of this study lies in the analysis of the determinants of the decision to adopt semi-organic fertilizers specifically for Siamese oranges at the rural level in Southeast Sulawesi. The results of this study are expected to provide an academic contribution and serve as a basis for practical recommendations for local governments in formulating sustainable agricultural policies.

METHOD

This study was conducted from January to June 2026 in Alebo Village, Konda Subdistrict, South Konawe Regency, Southeast Sulawesi Province. The research location was selected purposively, considering that Alebo Village is a major center for Siamese orange production with an active farmers' group, where farmers apply a variety of fertilizer practices, particularly the adoption of a semi-organic fertilization system. The population in this study consisted of all Siamese orange farmers in Alebo Village who had practiced semi-organic fertilization, totaling 35 people. Given the relatively small population size, the sampling technique used— —was saturation sampling (census). Thus, all 35 farmers in the population were designated as research respondents.

This study uses a quantitative approach to examine the factors that influence farmers' decisions numerically and statistically. The research data consists of primary and secondary data. Primary data was obtained directly from the field through observation and in-depth interviews with respondents using a structured questionnaire. Meanwhile, secondary data was collected through documentation techniques sourced from literature and reports from relevant agencies, such as the Agricultural Extension Center and the Central Statistics Agency, to support and supplement the field data.

To address the research questions, the collected data were analyzed using two methods: descriptive analysis and multiple linear regression analysis. Descriptive analysis (Sugiyono, 2019) was used to address the first research objective, namely to determine the application of semi-organic fertilizer on Siamese orange trees, covering aspects such as composition, timing of

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E-ISSN: 2986-0733

application, frequency, and dosage. In addition, this analysis was applied to map the trends in respondents' answers, which were measured using a Likert scale (related to the variables of access to extension services, fertilizer availability, and farmers' decisions). These assessments were calculated based on the mean using the following equation:

$$X = \frac{\sum X}{N}$$

Explanation

X = mean

∑X = the total accumulated score of all respondents

N = the number of respondents.

To classify these average results into assessment categories, a class interval approach was used by dividing the difference between the highest and lowest scores by the number of categories. Based on this interval calculation, a range value of 0.8 was obtained, which served as the basis for grouping the average respondent answers into five interpretation categories, as presented in Table 2.

Table 2. Interpretation Categories for Average Scores of Variables

Average Score Range	Rating Categories
4.20–5.00	Strongly Agree
3.40–4.19	Agree
2.60–3.39	Somewhat Agree
1.80–2.59	Disagree
1.00–1.79	Strongly Disagree

Next, to address the second objective of the study—namely, to identify the factors influencing Siamese orange farmers' decisions to use semi-organic fertilizers—the data were analyzed using multiple linear regression with the Statistical Package for the Social Sciences (SPSS). This analysis aimed to test the magnitude of the influence of the independent variables, both partially and simultaneously. The independent variables tested included age (X1), land area (X2), income (X3), access to extension services (X4), and fertilizer availability (X5), with respect to the dependent variable, namely farmers' decisions (Y). The mathematical equation for

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multiple linear regression used in this study is formulated as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Notes

(Y) = farmers' decision to use semi-organic fertilizer

(a) = constant

(b_1, b_2, b_3, b_4, b_5) = regression coefficients for each independent variable

(X_1, X_2, X_3, X_4, X_5) = independent variables used in the study

(e) = error term

RESULTS AND DISCUSSION

Application of Semi-Organic Fertilization to Siamese Orange Crops in Alebo Village

The application of a semi-organic fertilization system in Siamese orange farming in Alebo Village was studied to comprehensively describe actual field practices. This study describes the implementation of fertilization activities, including the composition, timing, frequency, and dosage applied by farmers. A summary of the fertilization application profile is presented in Table 3.

Table 3. Details of the Application of Semi-Organic Fertilizer for Siam Oranges in Alebo Village

Application Components	Description of Application
Type of Organic Fertilizer	Cow manure and chicken manure
Type of inorganic fertilizer	NPK Phonska, Urea, Mutiara, and Dolomite
Fertilization System	Integrated combination of organic and inorganic fertilizers (semi-organic)
Timing of organic fertilizer application	Before the active growth period or after harvest
Timing of inorganic fertilizer application	Just before the fruit enlargement phase
Frequency of organic fertilizer application	Once a year
Frequency of inorganic fertilizer application	Twice a year (at the beginning and end of the rainy season)

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E-ISSN: 2986-0733

Organic fertilizer dosage	±50 kg (one sack) per tree
Inorganic fertilizer dosage	±1 kg per tree for each application

Source: Processed Primary Data (2026)

Based on Table 3, it can be explained that semi-organic fertilization practices in Alebo Village are carried out through integrated nutrient management, with the following details:

1. Fertilizer Composition

Siamese orange farmers in Alebo Village consistently combine inorganic fertilizers (such as NPK Phonska, urea, Mutiara, and dolomite) with organic fertilizers (cow and chicken manure). Inorganic fertilizers are used to provide fast-release nutrients—specifically nitrogen (N), phosphorus (P), and potassium (K)—which are crucial for supporting vegetative growth and fruit enlargement. On the other hand, manure serves as a slow-release agent to maintain the soil's biological and physical fertility over the long term. This practice aligns with the findings of Sutriadi et al. (2019) and Pratama et al. (2017), who confirmed that a combination of compound fertilizer, dolomite, and organic matter not only improves the efficiency of nutrient uptake by plants but also sustainably improves soil pH and structure.

2. Fertilizer Application Timing

Farmers determine the timing of fertilizer application by carefully considering the plant's physiological stages and weather conditions. Organic fertilizers are applied earlier—that is, before the plant's active growth period or immediately after harvest. This is because organic matter requires time to undergo decomposition and mineralization by microorganisms before its nutrients become available to the plant (Bhatia & Sindhu, 2024). Conversely, inorganic fertilizers are applied just before the fruit formation and enlargement phases, since during this period the plants require a large amount of immediate nutrients.

3. Fertilization Frequency and Rates

There is a significant difference in application patterns between the two types of fertilizer. Inorganic fertilizer is applied twice a year (at the beginning and end of the rainy season) in limited amounts, namely ± 1 kg per tree. This restriction is a precautionary measure taken by farmers to prevent chemical residues from damaging the physical properties of the soil (Murnita, 2023). Furthermore, the nature of chemical fertilizers—which are easily soluble and rapidly absorbed (or leached away)—requires farmers to reapply them (Panjaitan et al., 2023). In contrast, organic fertilizer only needs to be applied once a year but in a massive dose, reaching approximately 50 kg (one sack) per tree. The ability of organic fertilizer to persist in the soil for a long time makes it the primary foundation for maintaining long-term nutrient reserves without

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causing land degradation.

Factors Influencing Farmers' Decisions

Multiple linear regression analysis was used to determine the effects of age (X1), land area (X2), income (X3), access to extension services (X4), and fertilizer availability (X5) on the decision to use semi-organic fertilizer (Y). Based on the results of data analysis using SPSS, the following regression equation was formulated:

$$Y = 5.703 + 0.005X1 + 0.062X2 - 1.136X3 - 0.486X4 + 0.362X5 + e$$

This equation shows a constant value of 5.703, which means that if all independent variables are zero or constant, the farmer's decision to use semi-organic fertilizer is 5.703. A summary of the results of the partial (t-test) and simultaneous (F-test) statistical tests is presented in Table 4.

Table 4. Summary of Multiple Linear Regression Test Results

Independent Variables	Regression Coefficient	t-value	Significance (Sig.)	Notes
Constant	5.703	4.045	0.000	-
Age (X_1)	0.005	0.476	0.638	Not Significant
Land Area (X_2)	0.062	1.462	0.155	Not Significant
Income (X_3)	-1.136	-1.507	0.143	Not Significant
Access to Extension Services (X_4)	-0.486	-4.332	0.000	Significantly Negative
Fertilizer Availability (X_5)	0.362	6.614	0.000	Positive Significant
Calculated F	24.528	Sig. F = 0.000		Simultaneously Significant
R-Square (R^2)	0.809			

Source: Processed Primary Data (2026)

Based on Table 4, the analysis and discussion of each variable are outlined as follows:

1. The Effects of Age, Land Area, and Income

   The results of the statistical tests show that the variables age (X_1), land area (X_2), and

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income (X_3) have no significant effect on farmers' decisions. The significance values for these three variables are above the 0.05 significance level.

Regarding the age variable, these results indicate that age is not a primary determinant of the adoption of semi-organic fertilizers. Both younger and older farmers exhibit the same tendencies, as their decisions are based more on empirical practices in the field. This is consistent with the findings of Lubis et al. (2021), who stated that age does not always correlate linearly with the level of acceptance of agricultural innovations. The same applies to land area; whether the land they own is large or small does not change the mindset of farmers in Alebo Village. They continue to apply fertilizer according to the actual needs of their crops. Saeri (2018) supports this finding by explaining that the use of production inputs is more determined by technical cultivation considerations.

Regarding the income variable (with a negative direction coefficient), field findings show that all respondents, regardless of their financial capacity, continue to use a combination of semi-organic fertilizers. This decision is driven more by past successful harvest experiences than by the mere availability of capital—a finding also confirmed by Azizah's (2025) study.

2. The Effect of Access to Extension Services (X4)

The extension access variable yielded very interesting results: it had a significant effect but with a negative relationship (Coefficient: -0.486; Sig. 0.000 < 0.05). This means that an increase in the intensity or frequency of extension activities currently attended by farmers is actually inversely related to—rather than encouraging—their decision to use semi-organic fertilizer.

Based on further investigation during field interviews, this anomaly occurred because the extension materials that farmers in Alebo Village had received thus far were still heavily focused on conventional cultivation techniques and the use of chemical inputs. Specific education regarding the transition to semi-organic fertilization, the processing of waste into manure, or the ideal combination of these methods for Siamese orange cultivation has never been comprehensively conveyed by extension workers. As a result, farmers' knowledge of semi-organic fertilization is derived solely from trial and error and informal information exchange among fellow farmers. This affirms the statement by Davis and Sulaiman (2020) that the effectiveness of extension interventions depends heavily on the relevance of the content to the specific problems farmers are facing in the field.

3. The Effect of Fertilizer Availability (X5)

The fertilizer availability variable was found to have a significant and positive effect (Coefficient: 0.362; Sig. 0.000 < 0.05). The easier it is to access fertilizer production inputs, the

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higher the tendency for farmers to adopt a semi-organic system. The village of Alebo benefits from an adequate agricultural support ecosystem; inorganic fertilizers are readily available at local agricultural stores, while raw materials for organic fertilizers are abundant and can be obtained directly from local livestock farmers or from the farmers' own livestock. This smooth access to upstream inputs is the primary driver of farmers' decisions, in line with the postulate by Hanafi et al. (2023), which states that guaranteed availability of production inputs is an absolute prerequisite for the modernization and sustainability of agricultural technology.

4. Simultaneous Effects and Coefficient of Determination

In the simultaneous analysis (F-test), the calculated F-value was 24.528 with a significance level of 0.000. Since the calculated F-value far exceeds the table F-value (24.528 > 2.55) and the significance level is below 0.05, it can be concluded that the five independent variables collectively have a significant effect on farmers' decisions.

Furthermore, the results of the Model Summary analysis show a coefficient of determination (R-squared) of 0.809. This figure indicates excellent model fit, as 80.9% of the variation in farmers' decisions to adopt semi-organic fertilizer in Alebo Village , is explained by the five factors in this study (age, land area, income, access to extension services, and fertilizer availability). The remaining 19.1% is influenced by other independent variables not included in this model specification (such as the role of farmer groups, intrinsic motivation, fertilizer prices, or climatic factors).

CONCLUSION

Based on the results of an analysis of Siamese orange farmers' decisions regarding the use of semi-organic fertilizers in Alebo Village, Konda Subdistrict, South Konawe Regency, the following conclusions can be drawn: First, the application of semi-organic fertilizers is carried out through integrated nutrient management that combines organic fertilizers (cow and chicken manure) and inorganic fertilizers (NPK, urea, Mutiara, dolomite). This practice is applied proportionally, taking into account the composition, timing, frequency, and dosage according to the plants' needs. Second, when analyzed individually, the variables of access to extension services and fertilizer availability have a significant effect on farmers' decisions to use semi-organic fertilizers, whereas age, land area, and income do not have a significant effect. Simultaneously, all independent variables had a significant effect on farmers' decisions, with a very strong coefficient of determination (R-squared) of 80.9%.

Based on these findings, farmers are encouraged to maintain the proportion of semi-organic fertilizers used to preserve soil health. Local governments, through the relevant

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agencies, need to be more proactive in providing specific extension materials on semi-organic fertilizers while ensuring the availability of production resources in the field. For future researchers, it is recommended to examine additional variables beyond this model, such as farming experience, education level, fertilizer prices, and farmer motivation.

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