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The Effect of Production Costs and Selling Prices on the Income of Orange Farmers in Bandar Meriah Village, Munte District, Karo Regency

A. Monica S Meliala[1], Dina Sarah Syahreza[1]

[1] Universitas Negeri Medan, Indonesia

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ABSTRACT

This study aims to analyze the influence of production costs and selling prices on the income of citrus farmers in Bandar Meriah Village, Mute District, Karo Regency. The method used is a quantitative approach with data collection through questionnaires. A sample of 60 farmers was selected using a purposive sampling technique from a population of 150 people based on the Slovin formula. The data were analyzed using multiple linear regression with the help of SPSS 26, including validity, reliability, classical assumption test, partial test (t test), simultaneous test (F test), and determination coefficient (R^2). The results of the study showed that production costs had a positive and significant effect on the income of citrus farmers with a t-value of 4.194 and a significance of 0.000. The selling price also has a positive and significant effect with a t-value of 2.430 and a significance of 0.018. Simultaneously, the two variables had a significant effect with F counting 13.632 and a significance of 0.000. The Adjusted R Square value of 0.300 indicates that production costs and selling prices are able to explain 30% of the variation in income of citrus farmers, while 70% is influenced by other factors. It was concluded that efficient production cost management and optimal selling price strategies are the key to increasing the income of orange farmers in Bandar Meriah Village.

Corresponding Author:
A. Monica S Meliala
Universitas Negeri Medan, Indonesia; angelmonicameliala@gmail.com

1. INTRODUCTION

Indonesia is one of the developing countries with the agricultural sector as a source of livelihood and the majority of the population. The existence of the agricultural sector has been proven to be able to improve people's living standards, although this has not evenly touched the countryside as a whole. The ability of the agricultural sector itself can be shown by activities in increasing farmers' income. Indonesia is an agrarian country which means that most of its territory consists of agricultural land and most of the population makes a living as farmers, the agricultural sector plays an important role in the

national economy. (Maria Kristina Sara:2021).

Agriculture is an important sector in the Indonesian economy, especially in rural areas. This sector not only provides food, but is also a major source of income for most rural communities. One of the agricultural commodities that has high economic potential is oranges. In Karo Regency, especially in Bandar Meriah Village, Mute District, orange cultivation is the mainstay of the community in improving family economic welfare (Rahmawaty, et., al 2023). According to Sri Rahayu (2020), agriculture is an activity that utilizes biological resources carried out by humans to produce food, industrial raw materials or energy sources, and activities that aim to manage their environment. Agriculture is also a national economy, which cannot be separated from fields that reflect needs and support life activities. One of the sectors that supports the Indonesian economy is the agricultural sector. Agriculture plays a very important role in the development of the Indonesian economy.

Production costs are one of the main factors that affect the profits obtained by farmers. Farmers often face various challenges in reducing production costs, such as the cost of seeds, fertilizers, pesticides, labor, and plant care (Yuliana, et al., 2024). The inability to manage production costs efficiently can have a negative impact on the income earned by orange farmers in Bandar Meriah Village.

In addition to production costs, the selling price of oranges in the market also plays an important role in determining farmers' income (Martiningsih & Sukanteri, 2024). Fluctuating selling prices, influenced by the harvest season, product quality, and market competition, often make it difficult for farmers to earn stable profits. Low selling prices will have a direct impact on the decline in farmers' income (Anam, et al., 2024).

Previous research by (Saragi et al., 2021) shows that production costs and selling prices have a significant influence on farmers' incomes. For example, research conducted in other agricultural areas shows that effective management of production costs and proper selling price strategies can significantly increase farmers' incomes. This finding is relevant to be further studied on citrus commodities in Bandar Meriah Village.

Table 1. 1 Total Citrus Production in North Sumatra in 2019–2024

Year	**Production (Tons)**
2019	2.969.344,00
2020	3.374.279,00
2021	4.482.111,00
2022	4.003.912,00
2023	4.413.536,00
2024	3.796.377,77

Source: BPS Data for North Sumatra Province (2019–2024)

Based on Table 1, citrus production in North Sumatra during the period 2019–2024 shows quite real fluctuations, where there was an increase in production from 2019 until it reached its peak in 2021, then decreased in 2022, increased again in 2023, and decreased again in 2024. This fluctuation pattern indicates that citrus production is greatly influenced by various factors, such as production costs, weather conditions, pest and plant disease attacks, as well as selling prices at the farmer level, which ultimately has a direct impact on the income of citrus farmers, including in Bandar Meriah Village, Munte District, Karo Regency.

Table 1. 2 Siamese Orange/Tangerine Production by Regency/City in North Sumatra Province

Regency/City	Production (Quintal)
Nias	275,85
Christmas Decorations	74.701,70
South Tapanuli	67.544,70
Central Tapanuli	60,00
North Tapanuli	196.461,89
Toba Samosir	72.330,00
Labuhan Batu	2.347,20
Expect	1.245,00
Simalungun	1.198.800,00
Düsseldorf	43.567,00
Surgery	1.990.963,65
Deli Serdang	2.255,00
Stuttgart	7.065,00
South Nias	95,89
Humbang Hasundutan	132.486,80
Pakpak Bharta	3.407,20
Samosir	167,50
Serdang Bedagai	435,00
Coal	116,59
North Padang Lawas	1,50
Padang Lawas	–
South Batu Harbor	–
North Batu Harbor	–
North Nias	–
West Nias	2,00
Sibolga City	–
Tanjung Balai City	–
Pematang Siantar City	–
Tebing Tinggi City	48,30
Medan City	–
Binjai City	–
Padang Sidimpuan City	2.000,00
Gunungsitoli City	–
North Sumatra	3.796.377,77

Source: BPS Data for North Sumatra Province in 2024

Based on Table 2, the production of chayote/tangerines in North Sumatra Province shows considerable inequality between districts/cities, where Karo Regency and Simalungun Regency are the main production centers with the highest production contribution compared to other regions. Karo Regency is recorded as the largest producer of oranges, which reflects the strategic role of this region as the center of citrus agribusiness in North Sumatra, supported by suitable agroclimatic conditions and farmers' experience in citrus cultivation. Meanwhile, most other districts/cities have relatively little or even no recorded production, indicating that citrus cultivation activities are still concentrated in certain areas, so that changes in production costs and selling prices in central areas such as Karo Regency have the potential to have a significant impact on the income of citrus farmers, including in Bandar Meriah Village, Mute District.

Table 1. 3 Siamese Orange/Tangerine Production by Sub-district in Karo Regency

Districts	Production (Quintal)
Mardingding	114.991,90
Laubaleng	258.450,00
Tigabinanga	16.785,00
Maple	9.050,00
Mountain	322.880,00
Kutabuluh	72.060,00
Payung	28.359,00
Tiganderket	3.572,50
Simpang Empat	11.225,00
Naman Teran	116.900,00
Independence	3.795,00
São Paulo	6.415,00
Berastagi	1.450,00
Three-Dimensional	301.050,00
Dolat Rayat	31.383,25
Brands	629.597,00
Barusjahe	63.000,00
Karo Regency	1.990.963,65

Source: BPS Data of Karo Regency (2024)

Table 1. 4 Land Area and Sweet Orange Production in Munte District in 2019–2023

Year	Land Area (Ha)	Production (Tons)
2019	2.009	45.435
2020	2.002	39.627
2021	1.989	80.505
2022	1.980	85.336
2023	1.806	98.354
Total	6.025	349.257

Source: Karo Regency Agriculture Office Data, 2023

Based on Table 4, the area of sweet orange land in Munte District during the 2019–2023 period tends to decrease, but orange production actually shows a significant increase, especially from 2021 to 2023. This condition indicates an increase in land productivity, which can be caused by improved cultivation techniques, more efficient use of production inputs, and more intensive plant care by farmers. The increase in production in the midst of a decrease in land area shows that production cost factors and land management efficiency play an important role in determining crop yields and ultimately affecting the income of citrus farmers in Munte District.

Table 1. 5 Data on Siamese Orange Production, Price, and Income by Sub-district in Karo Regency in 2022

Districts	Production (kg)	Average Price (Rp/Kg)	Average Income (Rp)
Mardingding	12.860.400	7.000	90.022.800.000
Laubaleng	18.752.500	6.000	112.515.000.000
Tigabinanga	3.174.000	6.000	19.044.000.000
Maple	1.090.000	6.500	7.085.000.000
Mountain	85.335.800	7.500	640.018.500.000

Kutabuluh	3.138.000	7.000	21.966.000.000
Payung	11.362.500	6.300	71.581.875.000
Tiganderket	2.608.000	6.000	15.648.000.000
Simpang Empat	1.185.100	6.700	7.934.170.000
Naman Teran	2.250.000	6.000	13.500.000.000
Independence	776.000	5.500	4.268.000.000
São Paulo	396.000	6.000	2.376.000.000
Berastagi	155.500	6.500	1.010.750.000
Three-Dimensional	26.535.000	7.000	185.745.000.000
Dolat Rakyat	3.781.600	6.800	25,714,880,000.
Brands	23.012.900	7.000	161.090.300.000
Ginger Bark	7.100.000	6.000	42.600.000.000

Source: Karo Regency Horticultural Crops Office 2023.

Based on Table 5, it can be seen that the production, average price, and income of chayote oranges in Karo Regency in 2022 show significant variation between sub-districts. Munte District is the largest contributor to production and revenue, reaching 85,335,800 kg with revenues of around IDR 640 billion, followed by Tigapanah and Brand with revenues of IDR 185.7 billion and IDR 161 billion, respectively. Meanwhile, the sub-districts with the lowest production and income are Berastagi and Kabanjahe which only generate revenues of around IDR 1 billion and IDR 2.37 billion, respectively. This variation in income is mainly influenced by the amount of production that varies between regions, where average prices tend to not differ too much. Thus, it can be concluded that production volume is the dominant factor that determines the amount of income of Siamese orange farmers in Karo Regency.

Table 1. 6 Research Gap Effect of Each Variable on Farmers' Income

Variabel	**Researcher**	**Research Results**	**Research Gap**
Production Costs	Bakhtiar (2025)	It does not have a significant effect on the income of clove farmers	Shows that production costs don't necessarily increase revenue; It is likely that high costs are not followed by increased productivity.
	Suhartini et al. (2021)	Significant effect on shrimp pond cultivation income	Different from Bakhtiar; Production costs are an important factor in determining income in certain sectors.
Selling Price	Bakhtiar (2025)	Have a positive & significant effect on farmers' income	Showing selling price as a direct factor that affects the receipt of farm products.
	Suhartini et al. (2021)	No significant effect on income	Contrary to Bakhtiar's theories and findings; The selling price can be insignificant if the price is controlled by the cooperative or does not change even though production increases.

The results of the analysis showed that there was a difference in empirical findings (*research gap*) in the two main variables. The variable production cost showed different results, where in the study Bakhtiar (2025) did not have a significant influence, while in the study Suhartini et al. (2021) it had a significant influence on income. This shows that the cost-effectiveness of production is greatly influenced by the conditions, type of commodity, and level of cultivation efficiency. Similarly, the

selling price variable showed inconsistencies: in Bakhtiar's study it had a significant effect, but in Suhartini et al.'s study it had no significant effect. This difference indicates that market structure, pricing mechanisms, and business characteristics can cause selling price variables to not always be a determining factor in income. With this inconsistency, new research on citrus commodities in Bandar Meriah Village becomes relevant to provide additional evidence and clarify the role of the two variables.

Orange farmers in Bandar Meriah Village face problems related to high production costs and unstable selling prices. This causes farmers' income to be suboptimal and affects their welfare. External challenges such as competition with imported oranges also exacerbate this condition (Sihombing, 2023).

To overcome these problems, the right strategy is needed in managing production costs and increasing the competitiveness of local citrus products in the market. Support from the government and related parties, both through cost management training and wider market access, is expected to help farmers increase their incomes.

2. METHODS

This study uses a quantitative method with a descriptive approach. Where this research was carried out in Bandar Meriah Village, Munte District, Karo Regency. The selection of the location was due to the consideration that Bandar Meriah Village, Karo Regency. The implementation time for this research is from April to May 2026. Data collection was carried out over a period of 1 year, which included field observations, interviews with farmers, and secondary data collection from the agency. Population of 150 and Sample 60 used purposive sampling. In this study, there are independent variables (X) of production costs, x1 and selling price of x2 and dependent variables (Y) of farmers' income. The Research Instrument with a Questionnaire uses a Likert scale with five alternative answers as follows: strongly disagree (1), disagree (2), hesitate (3), agree (4) and strongly agree (5). Data Analysis Method with Descriptive Analysis, Validity Test, Feasibility Test. Normality Test, Multicollinearity Test, Heteroscedasticity Test, Multiple Linear Regression Analysis, Hypothesis Test (t test, F test) and Coefficient of Determination (R^2)

3. FINDINGS AND DISCUSSION

Based on descriptive analysis, it was used to describe the distribution of respondents' answers to the statements contained in the research questionnaire. In this study, a descriptive analysis was carried out on the variable of Production Cost (X_1) which consisted of several statement indicators. The distribution of the frequency of respondents' answers is presented as follows.

A. Variable Production Cost (X_1)

Table 4. 1 Frequency Distribution of Respondent Answer Variable Production Cost (X_1) Statement 1 "The cost of buying fertilizer is the biggest expense in my orange farming business."

Answer	Frequency	Percentage (%)
Disagree	3	5,0
Hesitation	11	18,3
Agree	26	43,3
Strongly agree	20	33,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.5, it is known that the majority of respondents agreed that the cost of purchasing fertilizer is the largest expenditure in orange farming, which is 26 people or 43.3%. Respondents who strongly agreed were 20 people or 33.3%, while respondents who expressed hesitation were 11 people or 18.3%, and 3 people or 5.0% disagreed. This shows that the cost of fertilizer is one of the main

components in the production cost of citrus farming business.

Table 4. 2 Frequency Distribution of Respondent Answer Variable Production Cost (X_1) Statement 2 "The cost of buying pest drugs and caring for citrus plants is quite high."

Answer	Frequency	Percentage (%)
Strongly Disagree	2	3,3
Disagree	12	20,0
Hesitation	8	13,3
Setuju	20	33,3
Strongly agree	18	30,0
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.6, it is known that the majority of respondents agreed that the cost of purchasing pest drugs and citrus plant care is quite high, which is as many as 20 people or 33.3%. Furthermore, 18 respondents who strongly agreed or 30.0%, respondents who stated that they did not agree as many as 12 people or 20.0%, respondents who expressed hesitation as many as 8 people or 13.3%, and respondents who stated that they strongly disagree as many as 2 people or 3.3%. This shows that the cost of plant care and pest control also contributes to the high production costs of citrus farming businesses.

Table 4. 3 Distribution of Respondent Answer Frequency Production Cost Variable (X_1) Statement 3 "The cost of buying orange seeds affects the total production cost of my farm."

Answer	Frequency	Percentage (%)
Strongly Disagree	1	1,7
Disagree	5	8,3
Hesitation	8	13,3
Setuju	21	35,0
Strongly agree	25	41,7
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.7, it is known that the majority of respondents stated that they strongly agreed that the cost of purchasing orange seeds affects the total production cost of farming businesses, which is as many as 25 people or 41.7%. Respondents who agreed were 21 people or 35.0%, respondents who expressed doubt as many as 8 people or 13.3%, respondents who stated that they did not agree as many as 5 people or 8.3%, and respondents who stated that they strongly disagreed as many as 1 person or 1.7%. This shows that the cost of purchasing seeds is one of the important factors that affect the amount of production costs of citrus farming businesses.

Table 4. 4 Frequency Distribution of Respondent Answer Variable Production Cost (X_1) Statement 4 "The cost of labor wages has a big influence on the expenditure of orange farming."

Answer	Frequency	Percentage (%)
Strongly Disagree	1	1,7
Disagree	8	13,3
Hesitation	10	16,7
Setuju	18	30,0
Strongly agree	23	38,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.8, it is known that the majority of respondents stated that the cost of labor wages has a major effect on the expenditure of citrus farming businesses, which is as many as 23 people or 38.3%. Respondents who agreed were 18 people or 30.0%, respondents who expressed hesitation were 10 people or 16.7%, respondents who said they did not agree were 8 people or 13.3%, and respondents who stated that they strongly disagree were 1 person or 1.7%. This shows that labor costs are one of the important components in the production cost of citrus farming.

Table 4. 5 Frequency Distribution of Respondent Answer Variable Production Cost (X_1) Statement 5 "Miscellaneous costs (transportation, agricultural equipment, and other supporting needs) quite affect production costs."

Answer	Frequency	Percentage (%)
Disagree	4	6,7
Hesitation	4	6,7
Setuju	27	45,0
Strongly agree	25	41,7
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.9, it is known that the majority of respondents agreed that other costs such as transportation, agricultural equipment, and other supporting needs affect production costs, which is as many as 27 people or 45.0%. Respondents who strongly agreed were 25 people or 41.7%, while respondents who expressed disagreement and hesitation were 4 people or 6.7% each. This shows that other supporting costs also affect the overall production cost of citrus farming businesses.

B. Variable Selling Price (X_2)

Table 4. 6 Frequency Distribution of Respondent Answers Selling Price Variable (X_2) Statement 1 "The selling price of oranges I received is in accordance with the quality of the oranges produced."

Answer	Frequency	Percentage (%)
Strongly Disagree	1	1,7
Disagree	3	5,0
Hesitation	10	16,7
Setuju	20	33,3
Strongly agree	26	43,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.10, it is known that the majority of respondents stated that they strongly agreed that the selling price of oranges received was in accordance with the quality of the oranges produced, which was 26 people or 43.3%. 20 respondents who agreed or 33.3%, respondents who expressed hesitation were 10 people or 16.7%, respondents who said they did not agree as many as 3 people or 5.0%, and respondents who stated that they strongly disagree as many as 1 person or 1.7%. This shows that most farmers judge the quality of the oranges produced to affect the selling price received.

Table 4. 7 Frequency Distribution of Respondent Answers Selling Price Variable (X_2) Statement 2 "The selling price of oranges often increases according to market conditions."

Answer	Frequency	Percentage (%)
Disagree	1	1,7
Hesitation	15	25,0
Setuju	29	48,3
Strongly agree	15	25,0
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.11, it is known that the majority of respondents agreed that the selling price of oranges often increases according to market conditions, which is as many as 29 people or 48.3%. Respondents who strongly agreed were 15 people or 25.0%, respondents who expressed hesitation were 15 people or 25.0%, and respondents who said they did not agree were 1 person or 1.7%. This shows that the selling price of oranges tends to be influenced by market conditions and changes in consumer demand.

Table 4. 8 Distribution of Respondent Answer Frequency Selling Price Variable (X_2) Statement 3 "The price of oranges at the farmer level is not much different from the price of oranges in the market."

Answer	Frequency	Percentage (%)
Disagree	4	6,7
Hesitation	8	13,3
Setuju	37	61,7
Strongly agree	11	18,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.12, it is known that the majority of respondents agreed that the price of oranges at the farmer level is not much different from the price of oranges in the market, which is as many as 37 people or 61.7%. Respondents who strongly agreed were 11 people or 18.3%, respondents who expressed hesitation were 8 people or 13.3%, and respondents who said they did not agree were 4 people or 6.7%. This shows that most farmers consider the price difference between the farmer level and the market to be not too large.

Table 4. 9 Distribution of Respondent Answer Frequency Selling Price Variable (X_2) Statement 4 "The selling price of oranges that I receive is able to compete with the price of oranges from other regions."

Answer	Frequency	Percentage (%)
Disagree	1	1,7
Hesitation	15	25,0
Setuju	29	48,3
Strongly agree	15	25,0
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.13, it is known that the majority of respondents agreed that the selling price of oranges received was able to compete with the price of oranges from other regions, which was 29 people or 48.3%. Respondents who strongly agreed were 15 people or 25.0%, respondents who expressed

hesitation were 15 people or 25.0%, and respondents who said they did not agree were 1 person or 1.7%. This shows that the selling price of oranges in Bandar Meriah Village is considered quite competitive compared to other orange-producing areas.

Table 4. 10 Distribution of Respondent Answer Frequency Selling Price Variable (X_2) Statement 5 "The price of oranges I receive is profitable and does not harm farmers."

Answer	**Frequency**	**Percentage (%)**
Disagree	1	1,7
Hesitation	2	3,3
Setuju	55	91,7
Strongly agree	2	3,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.14, it is known that the majority of respondents agreed that the price of oranges received was beneficial and not detrimental to farmers, namely 55 people or 91.7%. 2 respondents who strongly agreed or 3.3%, respondents who expressed doubt were 2 people or 3.3%, and respondents who stated that they did not agree were 1 person or 1.7%. This shows that most farmers feel that the selling price of oranges received still provides benefits for their farming business.

C. Income Variables of Orange Farmers (Y)

Table 4. 11 Distribution of Respondent Answer Frequency of Orange Farmer Income Variable (Y) Statement 1

"The income from the orange farming business that I receive every year is enough to meet my family's living needs."

Answer	**Frequency**	**Percentage (%)**
Disagree	3	5,0
Hesitation	6	10,0
Setuju	29	48,3
Strongly agree	22	36,7
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.15, it is known that the majority of respondents agreed that the income from orange farming every year is sufficient for the family's living needs, which is 29 people or 48.3%. Respondents who strongly agreed were 22 people or 36.7%, respondents who expressed doubt were 6 people or 10.0%, and respondents who said they did not agree were 3 people or 5.0%. This shows that the income of orange farming is considered quite helpful in meeting the living needs of farmer families.

Table 4. 12 Distribution of Respondent Answer Frequency of Orange Farmers' Income Variables (Y) Statement 2

"My orange farming income is relatively stable from year to year."

Answer	Frequency	Percentage (%)
Strongly Disagree	1	1,7
Disagree	8	13,3
Hesitation	14	23,3
Setuju	14	23,3
Strongly agree	23	38,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.16, it is known that the majority of respondents stated that they strongly agreed that the income of orange farming business was relatively stable from year to year, namely as many as 23 people or 38.3%. Respondents who stated agreed and hesitated were 14 people or 23.3% each, respondents who stated that they did not agree as many as 8 people or 13.3%, and respondents who stated that they strongly disagreed as many as 1 person or 1.7%. This shows that most farmers consider the income of citrus farming to be quite stable even though it is still influenced by market conditions and crop yields.

Table 4. 13 Distribution of Respondent Answer Frequency Orange Farmer Income Variable (Y)
Statement 3
"I often experience income fluctuations due to changes in the price of oranges in the market."

Answer	Frequency	Percentage (%)
Strongly Disagree	6	10,0
Disagree	14	23,3
Hesitation	21	35,0
Setuju	11	18,3
Strongly agree	8	13,3
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.17, it is known that the majority of respondents expressed doubts about income fluctuations due to changes in orange prices in the market, namely 21 people or 35.0%. Respondents who disagreed were 14 people or 23.3%, respondents who said they agreed were 11 people or 18.3%, respondents who strongly agreed were 8 people or 13.3%, and respondents who stated that they strongly disagreed were 6 people or 10.0%. This shows that changes in market prices do not always have the same impact on the income of individual orange farmers.

Table 4. 14 Distribution of Frequency of Respondent Answers Variable Income of Orange Farmers (Y)
Statement 4
"The income from the orange farming business is able to meet the family's primary needs (food, clothing, shelter)."

Answer	Frequency	Percentage (%)
Strongly Disagree	5	8,3
Disagree	10	16,7
Hesitation	17	28,3
Setuju	21	35,0
Strongly agree	7	11,7
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.18, it is known that the majority of respondents agreed that the income from orange farming was able to meet the primary needs of families, which was 21 people or 35.0%. Respondents who expressed hesitation were 17 people or 28.3%, respondents who stated that they did not agree as many as 10 people or 16.7%, respondents who stated that they strongly agreed as many as 7 people or 11.7%, and respondents who stated that they strongly disagree as many as 5 people or 8.3%. This shows that the income of orange farming is considered quite helpful in meeting the basic needs of farming families.

Table 4. 15 Distribution of Respondent Answer Frequency of Orange Farmer Income Variable (Y)
Statement 5
"The income from the orange farming business is able to meet the family's secondary needs (motorcycles, television, telephone)."

Answer	Frequency	Percentage (%)
Strongly Disagree	2	3,3
Disagree	12	20,0
Hesitation	21	35,0
Setuju	12	20,0
Strongly agree	13	21,7
Total	60	100,0

Source: Primary Data Processed, 2026.

Based on Table 4.19, it is known that the majority of respondents expressed doubts that the income from orange farming was able to meet the secondary needs of the family, which was as many as 21 people or 35.0%. Respondents who strongly agreed were 13 people or 21.7%, respondents who agreed and disagreed were 12 people or 20.0%, and respondents who strongly disagreed were 2 people or 3.3%. This shows that the income ability of citrus farming businesses to meet the secondary needs of families still varies from farmer to farmer.

4.3.2 Test Research Instruments

The test of the research instrument was carried out to find out whether the research instrument used was feasible and trustworthy as a data collection tool. In this study, the instrument test consisted of a validity test and a reliability test on the variables of Production Cost (X_1), Selling Price (X_2), and Income of Orange Farmers (Y).

1. Validity Test

The validity test is used to determine the extent of the ability of a statement item to measure the research variable. The validity test is carried out by comparing the calculated r value with the r table. The number of respondents in this study was 60 respondents, so that a table r value of 0.2542 was obtained at a significance level of 5%. A statement item is declared valid if the value r is calculated > r of the table and the significance value < 0.05.

Table 4. 16 Results of the Validity Test of Research Instruments

Variabel	Statement Items	r Count	r Table	Remarks
Production Cost (X_1)	X1.1	0,767	0,2542	Valid
	X1.2	0,840	0,2542	Valid
	X1.3	0,785	0,2542	Valid
	X1.4	0,810	0,2542	Valid
	X1.5	0,524	0,2542	Valid
Sale Price (X_2)	X2.1	0,492	0,2542	Valid
	X2.2	0,778	0,2542	Valid
	X2.3	0,489	0,2542	Valid
	X2.4	0,778	0,2542	Valid
	X2.5	0,087	0,2542	Invalid
Income of Orange Farmers (Y)	Y1	0,597	0,2542	Valid
	Y2	0,725	0,2542	Valid
	Y3	0,780	0,2542	Valid
	Y4	0,766	0,2542	Valid
	Y5	0,623	0,2542	Valid

Source: Primary Data Processed, 2026.

Based on Table 4.20, it is known that most of the statement items in the research variable have a calculated r value greater than the table r of 0.2542 so that it is declared valid. In the Cost of Production (X_1) variable, all statement items are declared valid. In the Selling Price (X_2) variable, there is one invalid item, namely item X2.5 because it has a calculated r value of 0.087 smaller than the r of the table. Meanwhile, in the Orange Farmer Income variable (Y), all statement items are declared valid. Thus, the majority of research instruments are suitable for use in the collection of research data.

2. Reliability Test

Reliability tests are used to determine the consistency level of the research instrument. The research instrument is said to be reliable if it has a Cronbach's Alpha value of > 0.60.

Table 4. 17 Results of the Reliability Test of Research Instruments

Variabel	Cronbach's Alpha	Reliability Standards	Remarks
Production Cost (X_1)	0,782	0,60	Reliabel
Sale Price (X_2)	0,701	0,60	Reliabel
Income of Orange Farmers (Y)	0,777	0,60	Reliabel

Source: Primary Data Processed, 2026.

Based on Table 4.21, it is known that all research variables have a Cronbach's Alpha value greater than 0.60. The variable of Production Cost (X_1) has a Cronbach's Alpha value of 0.782, the variable of Selling Price (X_2) of 0.701, and the variable of Orange Farmer Income (Y) of 0.777. Thus, all research instruments are declared reliable or consistent so that they are suitable for use as a data collection tool in this study.

4.3.3 Classical Assumption Test

The classical assumption test was performed to find out whether the regression model used in the study met the requirements of multiple linear regression analysis. The classical assumption test in this study consisted of a normality test, a multicollinearity test, and a heteroscedasticity test.

1. Normality Test

The normality test aims to find out whether the residual data in the regression model is normally distributed or not. In this study, the normality test was carried out using the Kolmogorov-Smirnov test, histogram, and Normal P-P Plot.

Table 4. 18 Kolmogorov-Smirnov Normality Test Results

Remarks	Value
N	24
Test Statistic	0,167
Asymp. Sig. (2-tailed)	0,084
Monte Carlo Sig. (2-tailed)	0,082

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.22, it is known that the value of Asymp. Sig. (2-tailed) of 0.084 is greater than 0.05. This shows that the residual data in the study is normally distributed so that the regression model meets the assumption of normality.

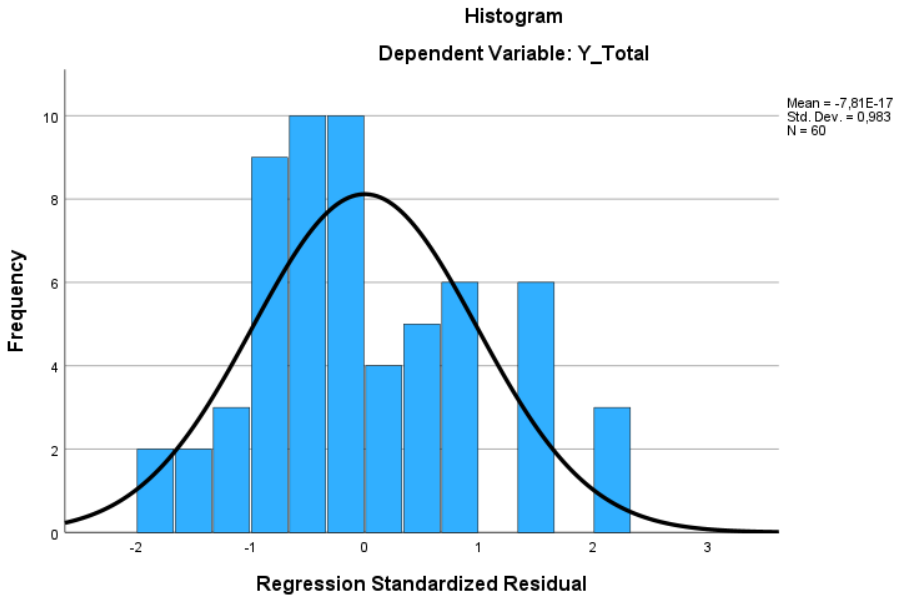

Figure 4. 1 Normality Test Histogram
Source: SPSS Output 26, 2026.

Based on the histogram results, it can be seen that the data distribution pattern forms a bell shaped curve and the data distribution follows a diagonal line. This shows that the residual data is normally distributed so that the assumption of normality in the regression model is met.

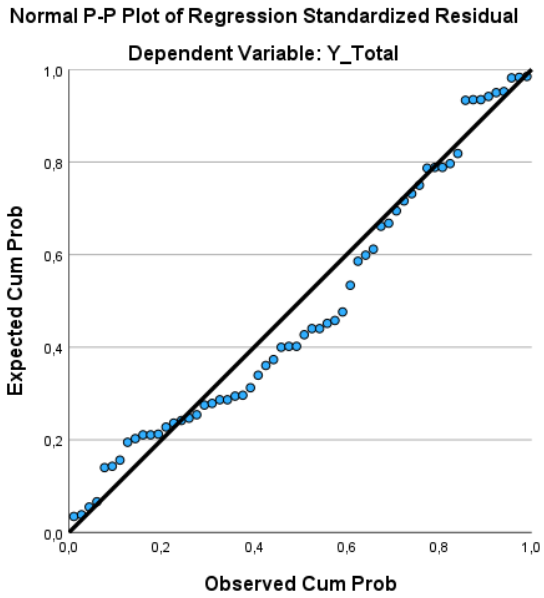

Figure 4. 2 Normal P-P Plot Test Normality
Source: SPSS Output 26, 2026.

Based on the Normal P-P Plot graph, it is known that the dots are spread around the diagonal line and follow the direction of the diagonal line. This shows that the residual data is normally distributed so that the regression model is feasible to use in the study.

2. Multicollinearity Test

The multicollinearity test aims to find out if there is a strong relationship between independent

variables in the regression model. A good regression model does not experience multicollinearity. The test was carried out by looking at the value of Tolerance and Variance Inflation Factor (VIF). If the Tolerance value is > 0.10 and the VIF value is < 10, then multicollinearity does not occur.

Table 4. 19 Multicollinearity Test Results

Variabel	Tolerance	VIVID	Remarks
Production Cost (X_1)	0,976	1,024	No Multicollinearity Occurs
Sale Price (X_2)	0,976	1,024	No Multicollinearity Occurs

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.23, it is known that the variables of Production Cost (X_1) and Selling Price (X_2) have a Tolerance value of 0.976 > 0.10 and a VIF value of 1.024 < 10. Thus, it can be concluded that the regression model in this study does not experience multicollinearity.

3. Heteroscedasticity Test

The heteroscedasticity test aims to find out whether there is residual variance inequality in the regression model. A good regression model is one that does not experience heteroscedasticity. The test was carried out using the Glejser test by looking at the significance value of each independent variable. If the significance value > 0.05, then heteroscedasticity does not occur.

Table 4. 20 Heteroscedasticity Test Results

Variabel	Sig.	Remarks
Production Cost (X_1)	0,182	No heteroscedasticity occurs
Sale Price (X_2)	0,805	No heteroscedasticity occurs

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.24, it is known that the variable Production Cost (X_1) has a significance value of 0.182 > 0.05 and the variable Selling Price (X_2) of 0.805 > 0.05. Thus, it can be concluded that the regression model in this study does not experience heteroscedasticity so it is suitable for multiple linear regression analysis.

4.3.4 Multiple Linear Regression Test

Multiple linear regression analysis was used to determine the influence of independent variables, namely Production Cost (X_1) and Selling Price (X_2) on dependent variables, namely Orange Farmer Income (Y). The results of multiple linear regression analysis can be seen in the following table.

Table 4. 21 Multiple Linear Regression Test Results

Variabel	B	Std. Error	t	Sig.
Constant	-4,331	4,611	-0,939	0,352
Production Cost (X_1)	0,418	0,100	4,194	0,000
Sale Price (X_2)	0,492	0,202	2,430	0,018

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.25, the following multiple linear regression equations are obtained:

$$Y = -4{,}331 + 0{,}418X1 + 0{,}492X2 + e$$

The regression equation can be interpreted as follows:

1. A constant value of -4.331 indicates that if the variables of Production Cost (X_1) and Selling Price (X_2) are considered constant or zero, then the Income of Orange Farmers (Y) will be worth -4.331.
2. The regression coefficient of the variable Production Cost (X_1) of 0.418 shows that every increase in Production Cost by one unit will increase the income of Orange Farmers by 0.418 units assuming

that other variables are fixed. This shows that the production costs incurred for citrus farming have a positive effect on farmers' income.

3. The regression coefficient of the Selling Price variable (X_2) of 0.492 shows that every increase in the Selling Price by one unit will increase the Income of Orange Farmers by 0.492 units assuming that other variables are fixed. This shows that the higher the selling price of oranges, the income of orange farmers will also increase.

4.3.5 Hypothesis Test

The hypothesis test was carried out to determine the influence of independent variables, namely Production Cost (X_1) and Selling Price (X_2) on the dependent variable, namely Orange Farmer Income (Y). The hypothesis test in this study used a partial test (t test), a simultaneous test (F test), and a determination coefficient test (R^2).

1. Partial Test (t-test)

The t-test is used to determine the influence of each partially independent variable on the dependent variable. The test is carried out by comparing the calculated t value with the t table or looking at the significance value. The t-value of the table in this study with the number of respondents 60 and the significance level of 5% was 2.002.

Table 4. 22 Partial Test Results (t-test)

Variabel	t Count	t Table	Sig.	Remarks
Production Cost (X_1)	4,194	2,002	0,000	Positive and Significant Effect
Sale Price (X_2)	2,430	2,002	0,018	Positive and Significant Effect

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.26, it is known that the variable Production Cost (X_1) has a calculated t-value of 4.194 > 2.002 and a significance value of 0.000 < 0.05. This shows that Production Costs have a positive and significant effect on the income of Orange Farmers.

The Selling Price variable (X_2) has a calculated t-value of 2.430 > 2.002 and a significance value of 0.018 < 0.05. This shows that the Selling Price has a positive and significant effect on the Income of Orange Farmers.

2. Simultaneous Test (F Test)

The F test is used to determine the influence of independent variables simultaneously on dependent variables. The test is done by comparing the value of the F calculation with the F of the table or looking at the significance value.

Table 4. 23 Simultaneous Test Results (F Test)

Remarks	Value
F Calculate	13,632
F Table	3,16
Sig.	0,000

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.27, it is known that the calculated F value is 13.632 > 3.16 and the significance value is 0.000 < 0.05. Thus, it can be concluded that the variables of Production Cost (X_1) and Selling Price (X_2) simultaneously have a positive and significant effect on the Income of Orange Farmers (Y).

3. Coefficient of Determination Test (R^2)

The determination coefficient test is used to find out how much the ability of independent variables to explain dependent variables.

Table 4. 24 Determination Coefficient (R^2) Test Results

Remarks	Value
R	0,569
R Square	0,324
Adjusted R Square	0,300
Std. Error of the Estimate	3,172

Source: Primary Data Processed with SPSS 26, 2026.

Based on Table 4.28, it is known that the value of the Adjusted R Square is 0.300 or 30.0%. This shows that the variables of Production Cost (X_1) and Selling Price (X_2) are able to explain the variable of Orange Farmer Income (Y) of 30.0%, while the remaining 70.0% is influenced by other variables outside of this study.

Discussion

The Effect of Production Costs on Orange Farmers' Income

Based on the results of partial hypothesis testing (t-test) that has been carried out in this study, the variable production cost (X_1) shows a calculated t-value of 4.194 with a significance level of 0.000. The significance value is much smaller than the set error tolerance limit, which is $\alpha = 0.05$ ($0.000 < 0.05$), so the first hypothesis in this study is acceptable. Thus, statistically it can be concluded that production costs have a positive and significant effect on the income of citrus farmers in Bandar Meriah Village, Mute District, Karo Regency. A positive direction of influence indicates that any increase in production costs incurred by farmers will be followed by an increase in income received, assuming other variables under constant conditions.

This research is in line with research conducted by Rahayu (2020) which examined the influence of production costs and selling prices on the income of corn farmers in Sumalata District, North Gorontalo Regency, where the results showed that production costs have a significant effect on the income of corn farmers. Similarly, research by Winda Reskiyan Putri (2022) conducted on corn farmers in Benteng Paremba Village, Pinrang Regency, consistently found that production costs have a significant effect on farmers' incomes. In addition, research by Hardiansyah and Hamid (2025) conducted on tobacco farmers in East Lombok Regency also confirms the same thing, where production costs have a positive and significant influence on farmers' income with a significance value of 0.000 and a contribution of 49.9% to the variation in farmers' income.

This research is also in line with the findings of Rika Widianita (2023) who studied potato farmers in Buntul Village, who concluded that production costs together with other variables have a significant effect on farmers' income. The consistency of the results between this study and various previous studies on different agricultural commodities shows that the relationship between production costs and farmers' income is a universal phenomenon in the context of agricultural economics. Investment in the production process, regardless of the type of commodity, will generally provide a commensurate return if managed properly and efficiently. Therefore, citrus farmers in Bandar Meriah Village need to understand that the right and proportionate expenditure of production costs is the key to achieving an optimal level of income from the orange farming business they are engaged in.

The Effect of Selling Prices on the Income of Orange Farmers

The results of partial hypothesis testing for the selling price variable (X_2) showed that the calculated t-value obtained was 2.430 with a significance level of 0.018. This significance value is smaller than the value of $\alpha = 0.05$ ($0.018 < 0.05$), so the second hypothesis in this study is accepted, namely that

selling prices have a positive and significant effect on the income of citrus farmers in Bandar Meriah Village, Munte District, Karo Regency. The direction of positive influence means that any increase in the selling price of oranges in the market will directly increase the income received by farmers, according to the mathematical relationship between the selling price and the total receipts which are the products of the price and quantity sold.

This research is in line with research conducted by Rahayu (2020) which found that selling prices have a significant effect on the income of corn farmers in Sumalata District. Likewise, Nisa and Suprayitno's (2020) research conducted on corn farmers in Semanding Village, Ponggok District, Blitar Regency, which consistently found that selling prices partially have a positive and significant effect on farmers' income. Furthermore, research by Mardiah Dabutar (2020) who studied red chili farmers in Indonesia also found that selling price is one of the determinant factors that significantly affects farmers' income. The consistency of these results reinforces the belief that selling price is a strategic variable in determining the level of income of farmers, regardless of the type of commodity being cultivated.

In addition, Oktavia's (2023) research which examines the influence of production costs and selling prices on the income of sweet potato farmers from an Islamic perspective also confirms that prices have a significant effect on farmers' income. This strengthens the argument that the relationship between selling price and income is a universal relationship in the context of agricultural economics. Thus, efforts to increase selling prices through various strategies, both in terms of improving product quality, diversifying marketing channels, and strengthening farmer group institutions, are very relevant to improve the welfare of citrus farmers in Bandar Meriah Village.

4. CONCLUSION

Based on the results of the analysis and discussion that has been stated, several conclusions can be drawn that production costs (X_1) have a positive and significant effect partially on the income of citrus farmers in Bandar Meriah Village, Mute District, Karo Regency. This is evidenced by a calculated t-value of 4.194 with a significance level of 0.000 < 0.05, which means that the greater the production costs incurred by farmers precisely and efficiently, the higher the income obtained.

The selling price (X_2) has a positive and partially significant effect on the income of orange farmers in Bandar Meriah Village, Munte District, Karo Regency. This is evidenced by a t-value of 2.430 with a significance level of 0.018 < 0.05, which shows that the increase in the selling price of oranges in the market directly increases the income received by farmers. Production costs (X_1) and selling prices (X_2) simultaneously have a positive and significant effect on the income of citrus farmers in Bandar Meriah Village, Mute District, Karo Regency. This is evidenced by the calculated F value of 13.632 with a significance of 0.000 < 0.05. The Adjusted R Square value of 0.300 shows that the two independent variables are able to explain the variation in income of citrus farmers by 30%, while the remaining 70% is influenced by other variables outside of this study model.

Based on the above conclusions, some suggestions that can be submitted are as follows: 1. For orange farmers in Bandar Meriah Village, it is recommended to allocate production costs in a more planned and efficient manner, especially in the components of fertilizers, superior seeds, and labor, as well as increase access to market price information in order to determine a more profitable sales time and strategy. 2. For future researchers, it is recommended to expand the research model by including other variables that have not been studied in this study, such as land area, farmer experience, access to capital, and agricultural technology, so that the model's ability to explain farmers' income variations can be significantly increased.

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