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Factors Affecting Vegetable Farmers' Income in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency

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Abstract

This study aims to analyze the factors influencing the income of vegetable farmers in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency. The research employed a quantitative approach with a sample of 75 respondents selected through simple random sampling from a population of 306 farmers. Data were collected through observation, interviews, and documentation, and analyzed using multiple linear regression. The results show that, partially, land area, production quantity, and production costs have a significant effect on farmers' income. Meanwhile, farming experience and age do not significantly affect income levels. The coefficient of determination (R^2) reached 91.7%, indicating that the independent variables in the model explain most of the variation in income. The findings highlight that although experience and age are often assumed to impact productivity, they are not decisive in this context. Instead, practical factors such as land ownership, crop yield, and efficient cost management are more influential. These results offer important implications for agricultural development strategies, especially in remote areas like Papua, where infrastructure and socio-economic challenges differ from more developed regions. The study recommends targeted support in land access, production efficiency, and input affordability to enhance farmer income and welfare.

Keywords: Factors, income, farmers

INTRODUCTION

Indonesia is an agrarian country, which has consequences for the growth of virtually all segments of its society; therefore, government attention to a strong and

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resilient agricultural sector is required. One of the sectors that supports economic growth is agriculture. Agriculture was one of the first cultures developed by humans in response to the necessity of sustainable life, as sources of food in the wild began to dwindle due to the rapid growth of the human population (Nurmala, 2012).

Indonesia's identity as an agricultural nation means that farmers play a crucial role in the country's overall economy. This is reflected in the large proportion of the population or workforce involved in the agricultural sector. Farmers and agriculture constitute the main basis of Indonesia's economy. If this agribusiness system could receive proper government attention, we could achieve self-sufficiency in meeting the population's food needs. Therefore, the development of the agricultural sector should not be neglected; in fact, it requires focused government attention. Indonesia could become a developed country, even if it must be based on agriculture.

The agricultural sector is one of the largest contributors to Gross Domestic Product (GDP). It is also one of the fields of work that absorbs the highest number of workers, with an average contribution of 32.21 percent. In contrast, other sectors contribute less than 19 percent. Based on these two indicators, it can be concluded that agriculture has a strategic role in the national economy (Ramiayu, 2021).

Agriculture plays an important role in economic development, especially in providing food, creating employment, and increasing rural incomes. One sub-sector that is growing rapidly and has high economic value is horticulture, particularly vegetable cultivation. In Mimika Regency, Central Papua Province, Naena Muktipura Village (SP6) in Iwaka District has become one of the centers for vegetable production. Vegetable farming activities in this village are carried out by most transmigrant and local communities, who rely on harvest yields to meet daily needs and improve their standard of living.

However, field reality shows that vegetable farmers' incomes in Naena Muktipura Village remain highly volatile and tend to be low. Several factors—such as limited capital, access to agricultural inputs, extreme weather, suboptimal cultivation techniques, and dependence on intermediaries—are considered to influence their income levels. Therefore, it is important to identify the key factors that significantly affect vegetable farmers' incomes, in order to formulate targeted empowerment policies.

Research on factors affecting farmers' income has been widely conducted. For example, Rahmawati et al. (2018), in their study in Sleman Regency, identified that land area, labor quantity, and access to agricultural extension services influence chili farmers' income. Meanwhile, Simanjuntak and Sitorus (2020), studying tomato farmers in North

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Sumatra, found that selling price, production costs, and farming experience are significant variables affecting income.

However, most of those studies were conducted in regions where infrastructure, market access, and agricultural technology are more advanced than those in eastern Indonesia, especially Papua. Moreover, no empirical studies specifically examine the unique socio-economic and geographical context of Naena Muktipura Village, where agricultural challenges differ—such as post-harvest transportation, availability of inputs, and the capacity of local institutions.

The main gap in the literature is the lack of research that considers Papua's regional characteristics—such as geographic isolation, ethnic diversity, limited facilities and infrastructure, and reliance on government assistance—in influencing vegetable farmers' incomes. Most farmer income analysis models still use general approaches that do not account for local contextual conditions. Therefore, a study is needed that not only measures quantitative factors but also understands the social and structural dimensions influencing farmers' income in an area like Naena Muktipura Village.

This research aims to identify and analyze the factors affecting the income of vegetable farmers in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency. The primary contribution of this study is to provide new empirical data-based insights into the dynamics of vegetable farmers' income in eastern Indonesia, especially Papua. The results of this research are expected to serve as a basis for formulating localized agricultural development policies, strengthening farmer institutions, and designing more effective government interventions to improve farmers' welfare. Thus, this study will enrich knowledge in the field of agricultural economics and inclusive rural development.

LITERATURE REVIEW

Income Theory

Income is the total revenue received during a specific period. A firm seeking maximum profit will make decisions on a marginal basis, where it can adjust controllable variables to achieve maximum profit (Gratio, 2013).

Income is divided into gross income (revenue) and net income (profit). Gross income represents the productivity measure of resources produced by the farming enterprise, while net income is gross income minus total operating costs (Soekartawi, 2001). Profit (gain) or loss of an enterprise is determined after deducting product prices, marketing costs, and general expenses from sales revenue.

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Income greatly influences the continuity of an enterprise; the greater the income, the greater the capacity to finance all expenditures and activities to be carried out (Humaerah et al., 2014). When calculating gross income, all unsold product components must be valued at market prices. The calculation of gross income should also include all changes in added value in the field between the beginning and the end of the accounting period. Such changes are especially important for perennial crops (Soekartawi et al., 1986 in Erwan Purnomo, 2001).

Vegetables

Vegetables are horticultural commodities and form part of the Indonesian family diet (Rahardi et al., 1993). Indonesia, as a tropical country, is rich in vegetables and fruits, yet vegetable and fruit consumption among Indonesians remains relatively low compared to other countries that have fewer resources as vegetable and fruit producers (Astiawan, 2012). Vegetables are plant-based foods containing vitamins and minerals needed by the human body (Sandjaja, 2010). According to Sediaoetama (2012), parts of a plant that can be made into vegetables include leaves, stems, fruits, and tubers; thus, it can be concluded that every part of the plant can be used as food.

Vegetables are widely cultivated throughout Indonesia, both in lowlands and highlands, depending on the climate suitable for each vegetable type. In lowlands, commonly grown vegetables include water spinach, spinach, bean sprouts, mustard greens, lettuce, and long beans. In highlands, vegetables like potatoes, carrots, cabbage, tomatoes, and green beans are predominant.

Vegetable production has always experienced an increasing trend, yet still falls short of meeting public demand. Farmers, as producers of agricultural commodities, seek not only high production yields but also high income. According to Asrol (2001), the most appropriate and least risky food policy is one that increases domestic production by utilizing existing comparative advantages.

Factors Affecting Farmers' Income

Land Area and Production

Land area is an important factor affecting farmers' income. A study by Gobel et al. (2024) in Gorontalo Regency shows that a 1 percent increase in land area can increase corn farming income by 0.843 percent. Similarly, Rahmah and Wulandari (2021) found that land area, production quantity, and selling price of potatoes significantly affect potato farmers' income in Bandung Regency.

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Production Costs and Labor

Production costs—including fertilizer and pesticide expenses—and labor costs also play roles in determining farmers' income. Lubis (2020), in his study in Karo Regency, North Sumatra, found that fertilizer costs, pesticide costs, and vegetable prices significantly affect vegetable farmers' income. However, labor costs and education levels were not significant.

Selling Price and Market Access

Selling price and good market access can increase farmers' income. Wehfany et al. (2022), in their study in Dobo City, found that the selling price of bird's eye chili significantly affects farmers' income. However, research by Imaduddin et al. (2022) in Muaro Jambi Regency showed that selling price did not significantly affect vegetable farmers' income, possibly due to price fluctuations and limited market access.

Capital and Credit

Access to capital and credit can increase farmers' productivity and income. Aini (2020), in her study in Nganjuk Regency, found that credit utilization positively affects shallot farmers' income. A study by Jimi et al. (2020) in Bangladesh also showed that credit access increased rice farmers' productivity by 14 percent—11 percent from technological changes and 3 percent from increased technical efficiency.

Social Factors and Education

Social factors such as farming experience and education level also influence farmers' income. However, research results vary. Rahman and Puryantoro (2022), in their study in Bondowoso Regency, found that experience and education did not significantly affect mango farmers' income. Conversely, other studies indicate that education can improve farmers' ability to manage farming enterprises and adopt new technologies.

External Factors: Climate and Infrastructure

Climate change and limited agricultural infrastructure can affect farmers' income. Ortiz-Bobea et al. (2020) found that anthropogenic climate change has reduced global agricultural productivity by 21 percent since 1961, with greater impacts in tropical regions. A study by Hariyati et al. (2022) in Waiheru Village showed that external factors such as climate and limited agricultural infrastructure affect fluctuations in vegetable farmers' income.

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RESEARCH METHODS

Types of Research Data and Data Sources

This research uses both qualitative and quantitative data. Qualitative data consist of words or descriptions rather than numbers. Qualitative data can be obtained through data collection techniques such as interviews, documentation, discussions, observations, and analysis. Quantitative data are measurable or countable numerical variables.

Data sources are divided into two types: primary data and secondary data. Primary data are obtained through direct interviews with vegetable farmers in Naena Muktipura Village (SP6) using a questionnaire as the data collection tool. Secondary data consist of information already collected to address the research problem. This data is easy to obtain quickly. In this study, secondary data sources include books and other materials concerning the geographic and demographic conditions of Naena Muktipura Village (SP6), Iwaka District, Mimika Regency.

Techniques for Determining Respondents

A population is the aggregation of all elements forming events, things, or people with similar characteristics that become the focus of research because they are viewed as the universe of the study (Ferdinand, 2006). The population in this research is all vegetable farmers in Naena Muktipura Village (SP6). An initial survey determined that there are 306 vegetable farmers.

A sample is a part of the population's number and characteristics (Sugiyono, 2011:81). The author narrowed down the population by calculating sample size using the Slovin formula according to Sugiyono (2011:87). The Slovin formula is used because in sampling, the number must be representative so results can be generalized, and the calculation does not require a sample size table but can be done with simple formulas.

The Slovin formula for determining sample size is as follows:

$$n = \frac{N}{1 + Ne^2}$$

Explanation:

n = Sample size/number of respondents
N = Population size
e = Allowable margin of error
e = 0.1

In the Slovin formula, the following criteria apply:

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e = 0.1 (10 percent) for a large population
e = 0.2 (20 percent) for a small population

Therefore, the sample range that can be taken using the Slovin technique is between 10 and 20 percent of the research population.

Because the population in this study is 306 farmers, the allowable margin of error used is 10 percent, and the calculation results can be rounded to achieve conformity. Thus, the sample size was calculated as follows:

$$n = \frac{306}{1 + 306(0.1)^2} = \frac{306}{1 + 3.06} \approx 75 \text{ respondents}$$

Based on the calculation, the number of respondents in this research is 75 people, or about 24.5 percent of all vegetable farmers in Naena Muktipura Village (SP6). This was done to facilitate data processing and to obtain better test results.

Sample determination was conducted using a simple random sampling technique by preparing a sampling frame, then establishing the number of samples, and finally selecting by drawing names from the population.

Data Collection

Data collection aims to obtain data related to the research. Three data collection techniques are used: observation, interviews, and documentation. Observation is data collection by directly observing the research object's environmental conditions that support the research, thereby obtaining a clear picture of the research object (Siregar, 2013). Interviews involve asking questions directly to the research sample in Naena Muktipura Village (SP6). Additionally, the researcher used tools such as questionnaires containing questions provided to the sample to obtain answers corresponding to the required data. Documentation in this research uses secondary data from the study area, such as information on vegetable crops, monographs of the research location, and photographs that support the research activities.

Data Analysis

The data analysis used to answer the third research objective is multiple regression analysis. According to Iqbal (2008), multiple linear regression is linear regression involving more than two variables: one dependent variable (Y) and two or more independent variables (X_1, X_2, X_3, X_4, X_5, …, X_n). Linear regression is a statistical analysis tool used to measure relationships among variables. The relationship between the

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dependent variable and independent variables in this study is expressed by the following equation:

$$Y=a0+b1X1+b2X2+b3X3+b4X4+b5X5+e$$

Where:

Y = Farmers' Income (IDR/year)
a_0 = Constant
X_1 = Land area (m²)
X_2 = Farming experience (years)
X_3 = Age (years)
X_4 = Production quantity (kg/year)
X_5 = Production cost (IDR/year)
e = Error term (residual)

The significance level used in this research is 5 percent. The criteria for the F-test are:

- If $F_{hat} \geq F_{table}$, then H_0 is rejected, and H_a is accepted, indicating that land area, farming experience, age, production quantity, and production costs simultaneously have a significant effect on vegetable farmers' income in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency.
- If $F_{hat} < F_{table}$, then H_0 is accepted, and H_a is rejected, indicating that those variables do not simultaneously have a significant effect.

The t-test is used to determine whether each independent variable in the regression model individually affects the dependent variable. If an independent variable significantly influences the dependent variable, we then identify which variables among them have the most dominant effect. The t-test hypotheses are:

- H_0: There is no partial effect of land area, farming experience, age, production quantity, or production costs on vegetable farmers' income in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency.
- H_a: There is a partial effect of one or more of land area, farming experience, age, production quantity, or production costs on vegetable farmers' income in Naena Muktipura Village (SP6), Iwaka District, Mimika Regency.

The decision rule for multiple regression analysis is based on the significance value (Sig.) from the SPSS output:

- If Sig. < 0.05, then H_0 is rejected, and H_a is accepted (indicating a significant effect).
- If Sig. > 0.05, then H_0 is accepted, and H_a is rejected (indicating no significant effect).

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RESULTS

The influence of independent variables (X) on farmers' income (Y) is demonstrated through the income received by the farmers. A person's income is influenced by multiple factors or variables; likewise, farmers' income is affected by various factors. These factors determine the extent of farmers' income and are the variables included in this study.

To analyze the factors suspected of influencing income (as the dependent variable, Y), multiple regression analysis was performed. In this study, Farmers' Income was used as the dependent variable (Y). The independent factors (X) included in the multiple regression analysis are land area, farming experience, age, production quantity, and production costs.

F-Test

Analysis was conducted on the factors influencing income. To determine whether the multiple regression equation is valid, two tests were used: the F-test (simultaneously) and the t-test (partially). Simultaneous and partial results can be seen in the following table:

Table 1. ANOVA Table

Model	F	Sig.
Regression	141.429	.000a
Residual		
Total		
Regression	53.071	.000a
Residual		
Total		
Regression	151.760	.000a
Residual		
Total		
Ftable : 2,13 (at α = 5 percent)		

Source: Primary Data, processed in 2025

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At confidence levels from 95 percent to 99 percent, all variables simultaneously have a significant effect. The estimation results show that, together, land area, farming experience, age, production quantity, and production costs influence income. This is indicated by the F_{hat} value (151.760) being greater than F_{table} (2.13). Partially, some of these variables have a significant effect, while others do not.

Coefficient of Determination Test (R^2)

The coefficient of determination (R^2) measures how much the regression model explains the variation in the dependent variable. The values of the regression coefficient can be seen in the following table:

Table 2. Coefficient of Determination (R^2)

Variable	R	R Square
Income (Y)	0,957	0,917

Source: Primary Data, processed in 2025

The regression results show that the R Square value is 0.917. This means that the independent variables (X) in the regression model explain 91.7 percent of the variation in the dependent variable (Y), while the remaining 8.3 percent is explained by other variables not included in the model. According to Sugiyono, an R Square value approaching 1 indicates a strong influence.

Regression Coefficients

Regression coefficient analysis is used to determine the relationship between two or more independent variables (X) and the dependent variable (Y) simultaneously. This can be seen in the following regression coefficient table:

Table 3. Regression Coefficients

Model	Regression Coefficients	t-value
(Constant)	–10,193,840	–0.617
Land area (X_1)	–916,632,206	–7.707
Farming experience (X_2)	–568,206	–0.830
Age (X_3)	298,159	0.466

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Model	Regression Coefficients	t-value
Production quantity (X_4)	19,312	5.591
Production cost (X_5)	1.7	8.557
Dependent Variable: Farmers' Income (IDR)		

Source: Primary Data, processed in 2025

The regression model derived from this study is as follows:

$Y = -10.193.840 - 916.632.206X_1 - 568.206X_2 + 298.159X_3 + 19.312X_4 + 1,7X_5$

Interpretation of the regression coefficients: The constant (a_0) is negative (–10,193,840), meaning that if land area, farming experience, age, production quantity, and production costs are all zero, the income would decrease by IDR 10,193,840. The coefficient for land area (X_1) is –916,632,206, indicating that land area has a negative effect on income. The coefficient for farming experience (X_2) is –568,206, indicating that farming experience has a negative effect on income. The coefficient for age (X_3) is 298,159, indicating a positive effect of age on income. The coefficient for production quantity (X_4) is 19,312, indicating a positive effect of production quantity on income. The coefficient for production cost (X_5) is 1.7, indicating a positive effect of production cost on income.

t-Test

The t-test is used to determine how far each independent variable (land area, farming experience, age, production quantity, and production costs) individually affects the dependent variable (farmers' income).

To determine which factors influence vegetable farmers' income, the significance value (Sig.) is compared to the probability value of 0.05. The analysis results are presented in the following table:

Table 4. t-Test Results: Factors Affecting Vegetable Farmers' Income

Model	Sig.
(Constant)	0.540
Land area (X_1)	0.000

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Model	Sig.
Farming experience (X_2)	0.410
Age (X_3)	0.643
Production quantity (X_4)	0.000
Production cost (X_5)	0.000

Source: Primary Data, processed in 2023

Based on the analysis data presented in Table 4, among the five variables included in the estimation, three have a significant effect: land area (X_1), production quantity (X_4), and production cost (X_5). Meanwhile, farming experience (X_2) and age (X_3) do not have a significant effect at the 10 percent error level.

Effect of Land Area on Income

The first factor affecting farmers' income is land area. Land is the physical and biotic environment related to its carrying capacity for human life and welfare. The physical environment includes relief or topography, climate, soil, and water, while the biotic environment comprises humans, animals, and plants. Logically, land area will have a significant effect on farmers' income. The larger the land area owned, the greater the income that farmers can obtain. Hence, variable X_1 is land area.

The regression analysis results in this study show a significant effect (Sig. 0.000 < 0.05) between land area and vegetable farmers' income.

Effect of Farming Experience on Income

The second factor affecting farmers' income is farming experience. Farming experience is the length of time a person has been working or engaging in farm management, measured in years. Logically, if farming experience is high, income obtained will also be higher because of the accumulated knowledge farmers possess. Therefore, variable X_2 is farming experience.

The regression analysis results show that there is no significant effect (Sig. 0.410 > 0.05) between farming experience and income. This means that farming experience is not a determinant of income magnitude. According to field findings, length of experience does not influence income; farmers can learn by observing other farmers' experiences, including innovations in farming practices.

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This finding aligns with the research by Nita Antari (2019), which states that work experience does not significantly affect seaweed farmers' income in Nusa Penida District. It is also supported by Erla Yukesma's (2017) research, indicating that work experience does not significantly affect rubber farmers' income in Sijunjung Regency.

Effect of Age on Income

The third factor affecting farmers' income is age. Age is one factor influencing income (Cahyono, 1998). Productive age ranges from 15 to 60 years, which is considered the ideal age for workers. In the productive age, generally, as age increases, income will increase, depending on the type of work performed. A person's physical strength to carry out activities is closely related to age, because if someone passes the productive age, their physical strength declines, productivity decreases, and income also declines. Therefore, variable X_3 is farmers' age.

The regression analysis results show that there is no significant effect (Sig. 0.643 > 0.05) between age and farmers' income. A farmer's income does not automatically depend on being of productive age. According to farmers, income depends on production quantity and production costs incurred to grow vegetable commodities.

This aligns with research by Dwi Susanti (2019), which states that farmers' age significantly affects production yield and income. Productive-age farmers have better physical strength and mindset to absorb new innovation information and apply it.

Effect of Production Quantity on Income

The next factor affecting farmers' income is production quantity. The quantity of vegetable production depends on seeds, fertilizer, pest disturbances, land area, and other influences. Logically, vegetable production quantity greatly influences farmers' income. The higher the production, the greater the income. Therefore, variable X_4 is vegetable production quantity (in kg/year).

The regression analysis results show a significant effect (Sig. 0.000 < 0.05) between production quantity and income. This study is also supported by Aditya Purnomo, Muhammad Fathorrazi, and Sebastiana Viphindrartin, who state that production yield significantly influences farmers' income, using a 5 percent significance level to determine a positive and significant effect on farmers' income. Based on field findings, the production quantity generated by farmers influences the income obtained.

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Effect of Production Cost on Income

The final factor affecting farmers' income is production cost. According to Mulyadi (2000), production costs are the expenses incurred to process raw materials into finished products ready for sale. Logically, production costs have an inverse or non-significant effect on farmers' income. The higher the production costs, the lower farmers' income. Therefore, variable X_5 is production cost.

Based on data analysis, production cost has a significant effect on income. This is shown by the significance value of production cost (X_5) being 0.000 < 0.05, which means that production cost (X_5) has a significant effect on income (Y).

This finding is relevant to previous research by Novita Sari on the effect of price, land area, and production cost on rubber farmers' income in Betung District, Banyuasin Regency. It states that cost significantly affects income. It also aligns with the theory by Moehar Daniel, which posits that production cost is a crucial factor that must be considered when a farming enterprise aims to produce. Production cost can also be defined as all expenses made by a company to obtain factors of production and raw materials used to create the goods produced by that company.

Based on research results, it can be concluded that farmers' vegetable farming income in Naena Muktipura Village (SP6) is influenced by production costs. Theoretically, production costs constitute the compensation received by factors of production or the costs incurred by farmers in the production process, both in cash and in kind.

Production cost impacts farmers' income because the revenue from vegetable sales must still be deducted by the costs farmers incur to purchase seeds, fertilizer, pesticides, depreciation expenses, and labor costs. This means that the higher the production costs incurred by farmers, the smaller the income they receive, and conversely, the lower the production costs, the higher the income the farmers receive. This is because the higher production costs farmers incur, the lower the net income they will receive.

CONCLUSION

In partial terms, the factors affecting vegetable farmers' income in Naena Muktipura Village (SP6) are land area, production quantity, and production costs. Meanwhile, farming experience and farmers' age do not significantly affect vegetable farmers' income in Naena Muktipura Village.

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