



Income Analysis and the Effect of Production Factors on the Productivity of Long Bean Farming in Tongkuno District, Muna Regency

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Abstract

This study aims to determine the income of long bean farmers in Tongkuno District, Muna Regency and to determine the effect of production factors on the productivity of long bean farming in Tongkuno District, Muna Regency. The determination of the research location was carried out by simple random sampling with a total of 46 respondents. Data analysis using income analysis and cobb-douglas production function, t test (partial), F test (simultaneous) and coefficient of determination (R^2). The results showed that the income of long bean farming was Rp131,106,076/planting season with an average total of Rp2,850,131/planting season. For the production function, it simultaneously shows that the variables of land area, seeds, urea fertilizer, NPK fertilizer, pesticides, labor, and capital have a significant effect on the productivity of long bean farming with a sig of $0.000 < 0.1$, a calculated F value of 16.158, a correlation coefficient (R) of 0.865 and a determination coefficient value (R^2) of 0.749. Partially, the variables of land area, pesticides, and labor have a significant effect on the productivity of long bean farming, while the variables of seeds, urea fertilizer, NPK fertilizer, and capital do not have a significant effect on the productivity of long bean farming.

Keywords: Long Beans, Production Factors, Income, Productivity.

INTRODUCTION

Indonesia as an agrarian country shows that the agricultural sector has a significant role in the national economy. This can be observed from the large number of people or workers involved in agricultural activities or the production of agricultural products. The agricultural sector contributes substantially to Indonesia's national income and most of Indonesia's exports come



from this sector. Therefore, the agricultural sector plays a crucial role in attracting labor and meeting people's food and clothing needs (Yuniarto, 2008). This factor reflects the high amount of employment and the role that the agricultural sector plays in the country's economy.

The horticulture sector is part of the agricultural sector that is related to increasing consumption needs, industrial resources, increasing exports, and replacing imports. The government provides support to increase food consumption by limiting imports of fruits and vegetables. This effort is done with the aim of supporting the production of vegetables and fruits in order to dominate the Indonesian market.

Muna Regency, located in Southeast Sulawesi, is one of the areas that grow long bean crops. This district has a variety of businesses from the agricultural sector to the industrial sector. One of the agricultural sectors in Muna Regency is horticultural crops consisting of various crops, one of which is long beans. This area has considerable potential to develop the long bean farming business. Long bean (*Vigna sinensi* L) is a horticultural crop that is highly utilized by the Indonesian people, both as a vegetable and fresh vegetables. This plant belongs to the fabaceae family and is one type of vegetable that is rich in nutrients. Long beans have a higher phenolic content when compared to other legume varieties (Arianti, 2018).

Table 1 Production of Long Bean Crops in Muna Regency in 2020 and 2021 in Data Year 2022

District	Land Area (Ha)		Production (Ton)		Productivity (Ton/Ha)	
	2020	2021	2020	2021	2020	2021
Tongkuno	6	6	158	143	26,33	23,83
South Tongkuno	23	21	362	530	15,73	25,23
Parigi	4	12	104	317	26	26,41
Bone	5	9	175	235	35	26,11
Marobo	7	16	259	354	37	22,12
Kabawo	13	26	304	746	23,38	28,69
Kabangka	38	23	1456	974	38,31	42,34
Kontu Kowuna	42	15	1235	537	29,40	35,8
Kontunaga	4	2	95	70	23,75	35
Watopute	5	7	99	176	19,8	25,14
Katobu	5	7	164	144	32,8	20,57
Lohia	19	12	364	261	19,15	21,75
Duruka	5	2	118	50	23,6	25
Batalaiworu	9	8	307	136	34,11	17

Napabalano	16	4	303	126	18,93	31,5
Lasalepa	4	1	90	15	22,5	15
Towea	10	6	120	78	12	13
Wakorumba South	4	3	263	180	65,75	60
White Sand	11	7	209	156	14,18	22,28
Pasi Kolaga	2	7	51	132	25,5	18,85
Maligano	6	6	108	109	18	18,16
Batukara	10	8	565	348	56,5	43,5
Total	248	208	6.909	5.997	617,72	602,28

Source: BPS Muna Regency, 2022

Table 1. shows that the productivity of broad bean crops in Muna Regency in 2021 reached 602.28 tons/ha, the largest production of broad beans in Muna Regency is in Kabangka District with a land area of 23 ha and production reached 974 tons with a productivity of 42.34 tons/ha. Meanwhile, there are several sub-districts that have experienced a decrease in both production and productivity levels, one of which is Tongkuno Sub-district, which has decreased every year.

Tongkuno sub-district is one of the sub-districts in Muna Regency. Tongkuno sub-district has several agricultural crops in the form of food crops, plantations and horticulture. One of the crops cultivated in Tongkuno Subdistrict is horticultural crops. One of the horticultural crops in Tongkuno Sub-district is long bean. The production of long bean plants in Tongkuno District in the last few years has continued to decline where in 2020 the production reached 158 tons with a land area of 6 ha with a productivity of 28.83 tons / ha and in 2021 long bean production has decreased with a production of 143 tons with a land area of 6 ha with a productivity of 23.83 tons / ha (BPS Muna 2022).

Based on data from the Central Bureau of Statistics of Muna Regency in 2022, it was recorded that the land area of long bean plants in Tongkuno District remained at 6 ha but the production and productivity of long bean plants decreased starting in 2020-2021. In addition, the production and productivity of long bean plants in Tongkuno District also continued to decline every year starting from 2019-2022 where the land area in 2019 reached 11 ha for 2020-2022 decreased to 6 ha (BPS Tongkuno District, 2023).

Productivity is the ability to use resources effectively in the production of large areas of land, in this case the production process carried out is the production of long beans with as few resources as possible. Farming can be said to be good if the productivity or efficiency is high. By

increasing productivity, production yields can be increased as high as possible, so that with a large volume of production it can increase marketing competitiveness and also meet needs and increase profits. Decreased productivity is influenced by several reasons such as the many pests that attack long bean plants so that they can cause crop failure. In addition to pests that attack production factors can also be an influence so that productivity decreases.

The use of inappropriate production factors can result in a decrease in production so that it can result in low income and productivity of the farm also decreases and if the use of efficient production factors such as the use of land area, fertilizer, seeds, pesticides, capital and labor appropriately and efficiently can provide benefits for farmers. The use of appropriate and efficient production factors can increase production and productivity and increase income so as to maintain the sustainability of long bean farming (Amane *et al.*, 2019).

Farmers achieve efficiency when they clearly know the production factors that affect the yield of long beans. Although efforts to increase productivity are important in agriculture, such efforts must consider the profit-oriented business performance of farmers as managers so that they can obtain maximum income. Some of the obstacles faced by farmers in increasing agricultural production are the difficulty of overcoming pest control, the high price of pesticides and fertilizers, and the unstable selling price of farmers. This can have an impact on the yield and productivity of long beans and the results obtained by farmers will have an impact on the income and profits obtained. Based on the description that has been described, the authors are interested in conducting research with the title "Income Analysis and the Influence of Production Factors and Productivity of Long Bean Farming in Tongkuno District, Muna Regency".

METHOD

The population in the study were long bean farmers in Tongkuno District, totaling 87 farmers. Sampling was done using the *simple random sampling* method. The method used to determine the number of samples is using the slovin formula 46 long bean farmers. Types and sources of data in this study using primary data and secondary data. Data collection techniques are done by observation, interviews, and literature studies. Data analysis in the study is as follows:

1. Income, to calculate income, the following formula can be used:

$$\pi = TR - TC$$

Description:

π = Long bean farming income (Rp)

TR = Total Revenue (Total Revenue) of long bean farming (Rp)

TC = Total Cost of long bean farming (Rp)

To calculate the total cost, the following formula is used:

$$TC = FC + VC$$

Description:

TC: Total cost of long bean farming (IDR)

FC: Fixed costs of long bean farming (IDR)

VC: Variable cost of long bean farming (IDR)

To calculate revenue, you can use the following formula, (Soekartawi 1995):

$$TR = Y \cdot P_y$$

Description:

TR: Total revenue of long bean farming.

Y: Production gained

P: Y price

2. *Cobb Douglas* analysis, the second objective of the study used the *Cobb-Douglas* analysis method. *Cobb Douglas* is a function or equation involving two or more dependent variables that are affected (Y) and independent variables that affect (X). To determine the factors that affect the production of long beans, the analysis method used in this study is the *Cobb-Douglas* production function (Soekartawi 2003) which can be expressed in the following mathematical equation:

$$Y = a \cdot X_1^{b_1} \cdot X_2^{b_2} \cdot X_3^{b_3} \cdot X_4^{b_4} \cdot X_5^{b_5} \cdot X_6^{b_6} \cdot X_7^{b_7} \cdot e^u$$

To perform the estimation, this model can be transferred into a logarithmic function, as follows:

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + u$$

Description:

Y: Productivity (Kg/Ha)

X₁ : Land area (Ha)

X₂ : Seeds (Kg/Ha)

X₃ : Urea Fertilizer (Kg/Ha)

X₄ : NPK Fertilizer (Kg/Ha)

X₅ : Pesticides (Liter/Ha)

X₆ : Labor (HKP)

X₇: Capital (Rp)

a,b: Magnitudes to be estimated

$b_1 \dots b_6$: Regression coefficient for each independent variable $X_1 \dots X_7$

u : Error term

e : Natural logarithm ($e = 2.178$)

The expected sign of the estimated parameters is as follows:

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 > 0$$

The regression coefficient is an estimated value that describes the relationship between the independent variable and the dependent variable in a regression model. The regression coefficient is estimated using the least squares method. To test the accuracy of the model, the coefficient of determination (R^2) is calculated with the following formula:

$$R^2 = \frac{JKR}{JKT}$$

Description:

R^2 : Coefficient of Determination

JKR : Sum of Squares of Regression

JKT : Total Kudrat

Meanwhile, to determine the simultaneous influence of the independent variables ($X_1, X_2, X_3, X_4, X_5, X_6, X_7$) together on the independent variable (Y) is done with the F test, namely:

$$F_{hitung} = \frac{KTR}{KTS}$$

Description:

KTR : Central Square of Regression

KTS : Least Squares

This study uses the F test with the indicators used are:

- If the significant F value $>$ real level $\alpha = 0.1$ indicates that simultaneously the independent variable (X) does not have a real effect on the dependent variable (Y).
- If the F value is significant $<$ the real level $\alpha = 0.1$, it indicates that simultaneously the independent variable (X) has a real effect on the dependent variable (Y).

If the independent variables simultaneously or together have a real effect on the independent variable, it is necessary to conduct further testing to determine the partial effect of each independent variable (X) on the dependent variable (Y) by conducting the t test, the formula used is as follows:

$$t_{hitung} = \frac{bi}{sbi}$$

Description:

b_i : t th Regression Coefficient

sbi : Standard deviation of t th regression coefficient

- $H_{b_{0:i}} = 0$

- $H_{b_{1:1}} \neq 0$

Description: if H_0 is accepted and H_1 is rejected, the independent variable has an effect on the dependent variable. Conversely, if H_0 is rejected and H_1 is accepted, the independent variable has a real effect on the dependent variable.

By using the following decision-making criteria:

- If the significant value of t count $>$ real level $\alpha = 0.1$ indicates that partially the independent variable (X) has no real effect on the dependent variable (Y).
- If the significant value of t count $<$ the real level $\alpha = 0.1$ indicates that partially the independent variable (X) has a real effect on the dependent variable (Y).

RESULTS AND DISCUSSION

Cost

Cost is the amount of money spent by farmers for their farming activities which directly has an important role in farmer decision making. The costs referred to in this study are the costs incurred by long bean farmers. Costs used include fixed costs and variable costs. Fixed costs are costs whose size does not depend on the production produced. While variable costs are costs whose size depends on the production produced so that its nature changes depending on the size of the desired production.

Table 2 Average Fixed and Variable Costs of Long Bean Farming in Tongkuno District, Muna Regency.

Cost	Description	Average (IDR)
Stay	Hoe	81.447
	Atomizer	289.399
	Machete	89.189
	Tembilang	74.562
	Total	534.597
Variables	Seeds	5.600.000
	Urea Fertilizer	30.500.000
	NPK Fertilizer	38.250.000
	Pesticides	8.662.500

	Labor	6.450.00
	Total	

Source: Primary Data After Processing Year, 2024

Based on the table above, it can be explained that;

1. There are four types of tools used by respondent farmers in long bean farming with a total cost of Rp534,597. The high and low cost of tool depreciation is due to the use and length of tools used by farmers. The table above explains that the average cost of using a hoe is Rp81,447, the average use of a sprayer is Rp289,399, the average use of a machete is Rp89,189, and the average use of a tembilang is Rp74,562. Depreciation costs are obtained from the initial price value minus the final price divided by the length of use. Depreciation costs are costs incurred due to a decrease in the value of a tool due to an increase in the age of use.
2. The lowest variable cost in long bean farming is the use of seeds at a cost of Rp5,600,000/growing season while the highest variable cost is the use of NPK fertilizer at a cost of Rp38,250,000/growing season so that the variable cost of long bean farming incurred is Rp89,462,500/growing season.

Revenue

Business income is the result obtained by farmers from the use of production factors or inputs. Opinions are obtained from the total business revenue minus the cost of using production factors during the farming process. The amount of income earned by each farmer depends on the output produced and the prevailing selling price. The amount of costs used during the production process will have an impact on the size of the income to be obtained. The income referred to in this study is the result obtained from long bean farming. The average income of long bean farming can be seen in Table 3.

Table 3 Long Bean Farming Income in Tongkuno District, Muna Regency

No.	Description	Amount (Rp)
1.	Total Revenue (<i>TR</i>)	245.160.000
2.	Total Cost (<i>TC</i>)	114.053.924
	Total Revenue (<i>TR-TC</i>)	131.106.076

Source: Primary Data After Processing Year, 2024

Table 3 shows that the income of long bean farming in Tongkuno Subdistrict is Rp131,106,076/growing season with total revenue (*TR*) of Rp245,160,000/growing season while the total cost (*TC*) is Rp114,053,924/growing season.

Data Analysis

Model testing in regression analysis is carried out to see several values, namely the correlation coefficient (*R*), the coefficient of determination (R^2), and the *F* value. The *R* value shows the closeness of the relationship of the independent or independent variable (*X*) to the independent variable (*Y*), the *R* value² shows the level of fit of the model and the *F* value to see and determine the effect of the independent variable (*X*) simultaneously or together on the dependent variable (*Y*). *R* and R^2 values can be found through variant analysis and the *F* value is known based on the *F* test in the SPSS program at the 90% confidence level or $\alpha = 0.1\%$. *R* value, R^2 and *F* value can be seen in the following table:

Table 4 Estimation Results Affecting Long Bean Farming Production Using Regression Analysis Coefficient of Determination, Partial Test (T Test)

No.	Variables	Regression coefficient		Partial test
		<i>B</i>	<i>T</i>	<i>Sig</i>
1.	Constant	8.971	3.302	0,002
2.	Land Area (<i>X</i> ₁)	0,688	4,581	0,000
3.	Seeds (<i>X</i> ₂)	0,036	0,393	0,696
4.	Urea fertilizer (<i>X</i> ₃)	-0,334	-0,994	0,327
5.	NPK fertilizer (<i>X</i> ₄)	-0,456	-0,990	0,328
6.	Pesticides(<i>X</i> ₅)	-0,510	-1,946	0,059
7.	Labor(<i>X</i> ₆)	0,175	1,863	0,070
8.	Capital (<i>X</i> ₇)	0,829	0,963	0,342
	<i>F</i> (Simultaneous Test)	16,158		0,000
	Coefficient of Determination (R) ²	0,749		
	<i>R</i> -value	0,865		

Source: Primary Data After Processing Year, 2024

Table 4 above presents the estimation results that affect farm production using a number of analyses, the following is the explanation;



1. That the results of spss output can be seen the significant value of the constant, land area, seeds, urea fertilizer, npk fertilizer, pesticides, labor, and capital, can be arranged with the regression model equation by looking at the value in column *B* the model formed is: $Y = 8.971. X_1^{0,688} . X_2^{0,036} . X_3^{-0,334} . X_4^{-0,456} . X_5^{-0,510} . X_6^{0,175} . X_7^{0,829}$
2. The magnitude of the influence of the eight independent variables on the dependent variable can be shown by the coefficient of determination (R^2). the results of the data analysis coefficient R^2 0.749 while the correlation coefficient (R) value of 0.865. This indicates that 74.9% of the variable productivity of long beans in the study area can be explained by the variable land area (X_1), seeds (X_2), urea fertilizer (X_3), npk fertilizer (X_4), pesticides (X_5), labor (X_6), and capital (X_7).
3. That the calculated F value is 16.158 with a significant value of $0.000 < \alpha$ value of 0.1 (10%) so it can be concluded that the variable land area (X_1), seeds (X_2), urea fertilizer (X_3), npk fertilizer (X_4), pesticides (X_5), labor (X_6), and capital (X_7) together affect the productivity of long bean farming in Tongkuno District.
4. The production factors that have an effect and do not affect the level of productivity of long bean farming in Tongkuno District are:
 - a) Land area (X_1), showed a positive and significant effect at the 0.1% level on the productivity of long bean farming. The regression coefficient of land area is 0.688 with a significant level of 0.000. Where the significant value is smaller than the real level (0.1) this means that the land area has a significant influence on the productivity of long bean farming. The positive coefficient direction means that the more the amount of land area will increase the production of long beans. So every 1% increase in land area will increase productivity by 0.688%. Cultivation land area has a close relationship with other inputs, thus the more land area used for plant cultivation, the greater the input provided so that the resulting output is also higher.
 - b) Seed (X_2), the regression coefficient on the seed variable is 0.036 and has a positive effect with a significant value of $0.696 > \alpha$ 0.1. This indicates that the seed variable has no effect on the productivity of long bean farming (Y). The direction of the positive coefficient means that the more the number of seeds will increase the production of long bean farming. Where the addition of 1% of seeds will increase the amount of productivity by 0.696%. seeds are the main means of production in crop cultivation because the use of high quality seeds can increase production. Quality seeds economically provide additional value/benefit to the community/farmer.





- c) Urea fertilizer (X_3), the regression coefficient on the urea fertilizer variable is -0.334 with a significant value of 0.327. Where the value is > from the real level (0.1) this means that the urea fertilizer variable has no effect on the productivity of long bean farming. The direction of the negative coefficient means that the more urea fertilizer used will reduce the production level of long beans. The use of fertilizers that are not in accordance with the dosage can reduce land productivity so that production decreases. To reduce the decline and increase the productivity of sustainable results, it is necessary to use adequate organic fertilizer in terms of quantity, quality, and continuity (Hartatik *et al.*, 2015).
- d) NPK fertilizer (X_4), the regression coefficient on the NPK fertilizer variable is -0.456 with a significant value of 0.328. Where the value is > from the real level (0.1) this means that the NPK fertilizer variable has no effect on the productivity of long bean farming. The negative direction of the coefficient means that the more urea fertilizer used will reduce the production level of long beans.
- e) Pesticides (X_5), the regression coefficient on the pesticide variable is -0.510 with a significant value of 0.059. Where the value is > from the real level (0.1) this means that the pesticide variable affects the productivity of long bean farming. The direction of the negative coefficient means that the more urea fertilizer used will reduce the production level of long beans. The use of pesticides can suppress pest attacks so that yield losses can be minimized. Unwise use of pesticides can cause various negative impacts both for humans and the environment.
- f) Labor (X_6), the results of testing labor show that the variable has a regression coefficient of 0.175 with a significant value of 0.070. where the significant value is greater than the level (0.1), this means that labor has an influence on the productivity of long bean farming. The direction of the positive coefficient means that the more the amount of labor will increase the production of long beans. Labor consists of the labor force and non-labor force. The labor force is the entire population aged ten years and over who have the most activities working and looking for work (Cahyo 2020).
- g) Capital (X_7), the results of testing the capital variable show that the variable has a regression coefficient value of 0.829 with a significant value of 0.342. where the significant value is greater than the level (0.1) this means that the capital variable does not have a significant effect on the productivity of long beans. The direction of the positive coefficient means that the more capital used will increase the production of long beans. Capital in farming is goods or money that together with the production





factors of land and labor produce new goods, namely agricultural products. In farming capital has an important position so that in the process a farm will have a profit depending on the amount of capital contribution issued in the production process (Cahyo 2020).

- h) Land area shows a positive and significant effect at the 0.1 level on the productivity of long bean farming. Based on table 18, it can be seen that the regression coefficients and significant at the <0.1 level are land area, pesticides and labor while the regression coefficients of urea fertilizer, NPK fertilizer, have no effect on long bean farming. Meanwhile, seeds and capital have a positive influence and have no effect on the productivity of long bean farming in Tongkuno District, Muna Regency.

CONCLUSION

The revenue of long bean farming obtained by farmers is an average of Rp5,329,565/growing season which is obtained from the amount of production and selling price. While the income earned by respondent farmers amounted to Rp131,106,076/growing season with an average total of Rp2,850,131/growing season.

The results of the productivity of long bean farming in Tongkuno District, Muna Regency which is influenced by several production factors have been estimated to have a significant effect on the production of long bean farming, namely land area (Ha), pesticides (Liters), and labor. While the variables of seeds (Kg), urea fertilizer (Kg), NPK fertilizer (Kg), and capital have no significant effect on the productivity of long bean farming in Tongkuno District, Muna Regency.

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