UDC 633

INFLUENTIAL FACTORS AND BREAK EVEN POINT IN THE CULTIVATION OF PARE (MOMORDICA CHARANTIA L.)

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ABSTRACT
Farmers generally cultivate rice, vegetables and plantations. The bitter melon vegetable commodity is one that is widely grown by farmers in Tabanio Village, Takisung District, Tanah Laut Regency. It is hoped that by carrying out this research the aim is to analyze the existence of farming activities, both technically and economically, and will reveal the influencing factors and the break even point (BEP) for bitter melon crop production. This research used a census method (all members of the population were used as samples. There were 30 farmers who carried out bitter melon cultivation activities (as respondent farmers). Bitter melon farming with a TR value was greater than the TC value. Based on this data, it can be seen from the average value The average TR is IDR 23,040,000/farmer with a production output of 4,608 kg/farmer which is greater than the average BEP value, a value of IDR 4,696,486/farmer or if you look at the production volume, the average BEP value for bitter melon production is 939.30 Kg/farmer. The results of the variance analysis show that there is a real relationship between bitter melon production (Y) and looking at the use of land area (X1), labor (X2), and capital (X3). This is shown by the Fcount value (11.036) which is greater than Ftable at the 5% confidence level (Ftable 2.96), thus indicating that there is a real relationship between bitter melon production and the production factors used.

KEY WORDS
Production, farming, melon, area.

As an agricultural country (Indonesia) it is characterized by quality agricultural products. The agricultural sector plays a very important role compared to other factors in fulfilling the national economy. This can be seen from the quantity of population and workforce who live/work in agriculture or from national products which are generally the result of rural agriculture (Mubyarto, 1989). Overall, the role of agriculture in Indonesia plays an important role in the progress of national development. According to data from the Indonesian Ministry of Agriculture, the government offers various programs that function so that farmers are able to produce high production and have competitiveness (Sulaiman et al, 2018).

Some of the workforce in Indonesia in the agricultural sector do not have good quality, especially in planning and implementing agricultural activities with technology using the latest innovations or modern technology. This low quality also generally results from graduates at a low level of education and only having a small amount of land for their farming activities. Most of the population who are active as farmers are in South Kalimantan Province. Farmers generally cultivate rice, vegetables and plantations. The bitter melon vegetable commodity is one that is widely grown by farmers in Tabanio Village, Takisung District, Tanah Laut Regency. It is hoped that by carrying out this research the aim is to analyze the existence of farming activities, both technically and economically, and will find out about the factors that influence and about the break even point on the production of bitter melon plants.

METHODS OF RESEARCH

This research was carried out in Tabanio Village, Takisung District, Tanah Laut Regency, South Kalimantan Province, for three (3) months starting in May 2023 until completion, namely from the preparation stage to the preparation of the research report.

The data analyzed in this research includes primary data and secondary data. Primary data was obtained by interviewing respondent farmers with a questionnaire. Secondary data was collected from library materials, government agencies and related agencies related to research activities.

This research uses a census method (all members of the population are used as samples). The farmers who carry out bitter melon cultivation activities are 30 respondent farmers.

This research uses two analyzes namely:

- Break Event Point (BEP);
- Cobb-Douglas Function Model.

The data obtained was processed in tabulated form with financial analysis involving costs to calculate the amount of revenue and profits from bitter melon farming in Tabanio Village, Takisung District, Tanah Laut Regency, South Kalimantan.

In this research, the components of farming costs that are calculated according to their nature are classified into:

- Fixed Cost:

Costs are costs that do not change even though the number of products changes (always the same) or their nature is not influenced by the size of production. Such as taxes, equipment depreciation, capital interest, and land rent, and others (Hernanto F, 1994).

- Variable Cost:

Variable costs are costs whose nature changes according to the size of production. Such as seeds, fertilizer, wages for workers outside the family, medicines, and others (Hernanto F, 1994).

In farming there are costs that are paid in cash and some are paid in kind. Apart from that, there are costs that are not paid which are actually farming costs. In this research, the costs taken into account are the costs paid, which consist of prices, purchases of fertilizer, lime, tools and equipment, taxes, labor wages, etc. Unpaid costs such as use of labor in the family, interest on capital, depreciation of capital.

The depreciation costs for long-lasting production equipment contain a number of use values (potential) that are not used up during one production process. The amount of shrinkage for each production process is only an estimate, because it cannot be determined precisely. To calculate depreciation costs, the straight line method is used, with the following formula (Soekartawi, 2003):

$$P = \frac{Nb - Ns}{n}$$

Where: P = Shrinkage (Rp); Nb = New value (Rp); Ns = Residual value (Rp); n = Economic life span (years).

To find out the total cost, you can use the following formula (Soekartawi, 2003):

$$TC = FC + VC$$

Where: TC = Total Cost (Rp); FC = Fixed Cost (Rp); VC = Variable Cost (Rp).

To determine the amount of revenue, the following formula is used (Soekartawi, 2003):

$$TR = P \times Q$$

Where: TR = Total Revenue (Rp); P = Price (Rp/Kg); Q = Quantity (Kg).

To determine net income (profit) the following formula is used (Soekartawi, 2003):

$$\pi = TR - TC$$

Where: π = Profit (Rp); TR = Total Revenue (Rp); TC = Total Cost (Rp).

Break-even analysis or cost, volume, profit analysis is carried out to determine the sales volume of a business that can cover costs without suffering losses.

By using this analysis you will get the following benefits:

- Respondents can find out whether the chances of breaking even are better/worse;
- Respondents can find out whether the addition of products has good/bad consequences or whether the production of bitter melon farming brings the business to break even;
- It can be seen whether the production facilities can bring bitter melon farming to a higher level of profit.

To find out the break-even point (BEP) can be seen in Figure 1:

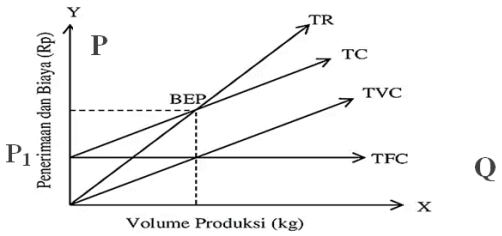

Figure 1 – Break-even point curve (BEP)

From Figure 1 it can be seen that the intersection between the total cost line (TFC + TVC) and the revenue line (TR) occurs at a break even point and the vertical downward perpendicular line will show high production, while the results from that point a horizontal line drawn to the left will show high sales results.

To determine the break event point (BEP) in bitter melon farming based on production and sales volume in rupiah, mathematically as follows (Andoko and Harmono, 2005):

$$BEP\ (Q) = \frac{FC}{P - VC}\ in\ units\ of\ production\ volume(kg)$$

$$BEP\ (Rp) = \frac{FC}{1 - \frac{VC}{P}}\ in\ rupiah\ units\ (Rp)$$

Where: BEP = Quantity (Rp or unit); FC = Fixed Cost (Rp); P = Price (Rp/ kg); AVC = Average variable cost (Rp); VC = Variable cost (Rp).

The Cobb-Douglas function is an equation or equation that involves two or more variables, one variable is called the dependent variable, which is explained, (Y), and the other is called the independent variable, which explains, (X). Resolving the relationship between Y and):

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_n^{bn} e \qquad (1)$$

If the Cobb-Douglas function is expressed by the relationship Y and (Soekartawi, 1989):

$$Y = f(X_1, X_2, X_3, X_4) \qquad (2)$$

Where: Y = Explained variables; X = symbolize each production factor or explanatory variable; a, b = the quantity/constant to be estimated; e = error (disturbance term).

To make it easier to estimate equation I, the equation is changed to double linear by naturalizing the equation. More clearly the equation can be seen as follows (Soekartawi, 1989):

$$Y = f(X1, Xn),\ Ln\ Y = Ln\ a + b_1\ Ln\ X_1 + b_2\ Ln\ X_2 + b_3\ Ln\ X_3 + e \qquad (3)$$

Where: Y = Bitter melon production (ton/ Ha); X_1 = Cultivated Land Area (Ha); X_2 = Labor; X_3 = Capital (Rp); a = Intercept (production function constant); b = The regression

parameters that will be estimated are also the output elasticities of each input; Ln = Natural logarithm.

The regression coefficient values above were estimated using the least squares method. Testing of all regression coefficients was carried out to determine whether all production factors which were thought to be independent variables together had an effect on the production of bitter melon as a dependent variable.

Testing the accuracy of the model is carried out using the F-test, namely if the value of Fcount ≥ Ftable at level = 5%, then the model is thought to be appropriate enough to be used as a prediction model, with the test hypothesis being:

- H0: bi = 0;
- H1: b1 ≠ 0.

Where: b = column matrix of the parameters tested, namely:

$$b = \begin{bmatrix} b1 \\ b2 \\ b3 \\ b4 \end{bmatrix}$$

The statistical test used to test this hypothesis is carried out with Fcount, namely:

$$F_{count} = \frac{JKR/k}{JKS/(n-k-1)}$$

Where: JKR = Sum of regression squares = b'X'Y – nY2; JKS = Sum of remaining squares = Y'Y – b'X'Y; n = Number of respondent farmers; k = number of independent variables.

The decision criteria are:

F_{count} — ≤ F_{table} (a/2) (n-k-1) → accept Ho; > F_{table} (a/2) (n-k-1) → reject Ho

Next, to find out whether these production factors separately influence bitter melon production, a t-test is carried out, with the testing hypothesis:

- Ho = b = 0;
- H1 = b ≠ 0; where: I = 1, 2, 3, 4.

The statistical test used to test this hypothesis is:

$$T_{count} = \frac{bi}{Sbi}$$

Note: bi = the size of the i-th regression coefficient; Sbi = Standard error of the ith regression coefficient.

The decision making criteria are:

T_{count} — ≤ F_{table} (a/2) (n-k-1) → accept Ho; > F_{table} (a/2) (n-k-1) → reject Ho

Meanwhile, to determine the magnitude of the proportion of the relationship between the four dependent variables, it can be seen from the magnitude of the coefficient of determination (R2), with the following formula (Supranto, 1983):

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

Where: JKR = Sum of Regression Squares; JKT = Total Sum of Squares; R2 = Ranges between 0 < R2 ≤1.

R2 means, the greater the R2 value, the more diversity in the dependent variable is explained by the independent variable. In other words, every additional independent variable in the regression model will always increase the R2 value.

The fee for land tax is in accordance with the provisions in force in Tabanio Village at that time; the tax calculation step in one year is IDR 1.5,-/wholesale/year. The total tax fee is IDR. 4,162,-/farmer.

Estimated depreciation value using the straight line method. The straight line method is the new value reduced by the residual value then divided by the economic life of the tool multiplied by the useful life. The cost for depreciation is IDR 31,976,500/farmer or an average depreciation of IDR 1,065,883/farmer.

Rental costs are calculated to provide the value of each investment that plays a role in farming. It is considered that the land belongs to someone else or is rented. The valid land rent in Tabanio Village is IDR 10,000/rent/year. The total land rent for bitter melon farming is IDR 2,880,000 per year with an average of IDR 96,000 per farmer/farmer.

Calculation of capital interest includes variable costs plus land tax, equipment depreciation, and land rent multiplied by the amount of capital interest valid for a certain time, usually capital interest is always based on the predetermined interest rate at BRI-KUR Bank (6% in one year) then multiplied by the length of farming. So that the average interest on capital spent is IDR 763,879/farmer/planting season.

In agricultural business activities in Tabanio Village, labor costs in the family by farmers are not calculated. However, in economic calculations matters regarding wages for labor in the family must still be taken into account.

The total labor used in farming is 1,707 HKO with the total costs that farmers must incur to pay for labor in the family amounting to Rp. 119,490,000,- with an average of Rp. 3,983,000,-/farmer.

Based on the calculation results, it is known that the total cost of non-family labor used is IDR 51,240,000,- with an average cost of IDR 1,708,000,-/farmer. The total labor costs incurred were IDR 170,730,000,- with an average cost of IDR 5,691,000,-/farmer. Meanwhile, the total fixed costs used by farmers are IDR 228,627,718,- or IDR 7,620,924,-/farmer.

Total costs are the total of all costs incurred by farmers in bitter melon farming, including fixed costs and variable costs. The total fixed costs that must be incurred are IDR 22,627,718,- or an average fixed cost of IDR 7,620,924,-/farmer. The total variable costs paid are IDR 227,468,160,- or an average variable cost of IDR 7,582,272,-/farmer. The total cost of the bitter melon farming business in Tabanio Village is IDR 456,095,878,- or an average total cost of IDR 15,203,196,-/farmer.

The production obtained by bitter melon farmers/planting season from 30 respondents with an average land area of 0.28 Ha or 9.60 per year was 4,608 Kg, with the price set for the 2021 planting season, namely IDR 5,000/Kg. The income received by farmers per planting season is IDR 691,2000,000,- with an average of IDR 23,040,000,-/farmer.

The average profit obtained was IDR 235,104,122,- with an average of IDR 7,836,804,-/farmer.

In bitter melon farming in Tabanio Village, it turns out that the TR value is greater than the TC value. It can be seen from the average TR value of Rp. 23,040,000,-/farmer and the production output of 4,608 Kg/farmer is greater than the average BEP value, with a value of Rp. 4,696,486,-/farmer or if you look at the production volume, the average value The average BEP for bitter melon production is 939.30 kg/farmer.

The following is an equation obtained from calculations using the Cobb-Douglas type model:

$$\text{Ln } Y = 47{,}332 + 0.442\ (\text{Ln Land Area}) + 0.214\ (\text{Ln Labor}) + 0.263\ (\text{Ln Capital})$$
$$R2 = 0.560 \text{ and } Fcount = 11.036$$

or

$$Y = 47{,}332 + 0.442\ (\text{Land Area}) + 0.214\ (\text{Labor}) + 0.263\ (\text{Capital})$$

Based on variance analysis, there is a real relationship between bitter melon production (Y) and use of land area (X1), labor (X2), and capital (X3). This can be seen in the Fcount value (11.036) which is greater than Ftable at the 5% confidence level (Ftable 2.96). So it can be concluded that there is a real connection between bitter melon production and the production factors used.

The step to find out the proportion of the contribution of the independent variables simultaneously to the fluctuation of the dependent variable (bitter melon production), can be seen from the coefficient of determination (R2) which is worth 0.560. This means that 56% of production factors are influenced by land area, labor and capital. Meanwhile, the remaining 44% is the influence of external factors.

Based on the regression coefficient test, there are variables that are very significant at the T table level of 2.052 for estimating bitter melon production, namely the variables of land area (X1), labor (X2), and capital (X3) at the 5% level. This is because the regression coefficient value shows that the land area (X1), labor (X2) and capital (X3) factors have positive values. In the production of the Lipa F1 bitter melon variety, it can be seen that the results of the analysis using the production function can be seen in more detail in Appendix 15, presented in Table 1.

Table 1 – Regression Coefficient Values and R2 Statistics from Estimators of Bitter Gourd Production Factors in Tabanio Village in 2021

Variables and Statistics	Regression Coefficients	t_{count}	t_{table}
Intercept (Ln b_0)	47,332		
Land area (b_1)	0,442	2,160	2,052
Labor (b_2)	0,214	0,562	2,052
Capital (b_3)	0,263	2,198	2,052
F_{count}	11,036		
F_{table} (0,05)	2,96		
R^2	0,560		

Source: Primary Data Processing.
*Note: ** is very significant at the 0.05 level.*

The estimated production factor for the Lipa F1 bitter melon variety using the regression coefficient in Table 1, with Fcount = 11.036 > Ftable (0.05) = 2.96 is real at the 5% level, so that the estimated production factor for the Lipa F1 bitter melon in Tabanio Village can be used to be calculation benchmark. Based on these results, the value of the coefficient of determination (R2) = 0.560 means that all the independent variables in the equation can explain 56% of the variation in production, while the remaining 44% is due to other variable factors that are not in the equation.

If we look at the production factors used, there are only two variables that have a significant influence on bitter melon production factors, including:

1. Land area production factor (X1), using regression coefficient (b1) = 0.442. This explains that there is a production elasticity with tcount = 2.160 > ttable (0.05) = 2.052, meaning it is significantly different at the tcount level of 5%, meaning that land area has a real influence on production. So the elasticity of production from land area is 0.442. This shows that with an additional 10% land allocation, Lipa F1 bitter melon production can be increased by 44.2% if other factors are considered constant;

2. Labor factor (X2), with regression coefficient (b2) = 0.214 and also explains that the production elasticity with tcount = 0.562 < ttable (0.05) = 2.052 is not significantly different at the 5% tcount level. This means that labor has not had a real effect on production. So the production elasticity obtained from this factor is 0.214, which means that increasing the number of workers by 10% can reduce the production of Lipa F1 bitter melon by 21.4% if other factors are considered constant;

3. Capital production factor (X3), with regression coefficient (b3) = 0.263. This explains that the production elasticity with tcount = 2.198 > ttable (0.05) = 2.052 is significantly different at the tcount level of 5%, meaning that capital has a real influence on bitter melon

production. So it can be concluded that with additional capital of 10%, it can increase the production of F1 cockroach bitter melon by 26.3% if other factors are considered constant.

CONCLUSION AND RECOMMENDATIONS

Production of bitter melon plants obtained from 30 respondent farmers in one planting season with a total land area in 2021 of 8.32 Ha or 228 units, and an average area of 0.28 Ha or 9.60 units/farmer.

The amount of costs that must be incurred by farmers from 30 respondents during one planting season is IDR 456,095,878,- with an average of IDR 15,203,196,-/farmer. The income obtained by farmers per planting season from 30 respondent farmers with an average land area of 0.28 Ha or 9.60 wholesale is 4,608 Kg/Ha, where the price applicable in the 2021 planting season is an average of IDR 5,000,-/ Kg, so the total income obtained by farmers/planting season is IDR 691,200,000,- with an average of IDR 23,040,000,-/farmer. The overall profit obtained by the 30 respondent farmers in one planting season in 2021 was IDR 235,104,122,- with an average of IDR 7,836,804,-/farmer.

The TR value is greater than the TC value. It can be seen from the average TR value of IDR 23,040,000,-/farmer and the production volume of 4,608 Kg/farmer and the average TC value of IDR 15,203,196,-/farmer. So an average profit value of IDR 7,836,804/farmer is obtained. If we look at the average BEP price, it is IDR 4,696,486/farmer or the average BEP volume for bitter melon production is 939.30 Kg/farmer. In this way, bitter melon farming has been able to exceed the break even point (BEP), because if we look at the average value of income or production in farming during one planting season in Tabanio Village, it has been able to generate profits because the income obtained is greater than the costs incurred. issued.

The results of calculations using the Cobb-Douglas type model obtained the following equation:

$$\text{Ln } Y = 47.332 + 0.442 \text{ (Ln Land Area)} + 0.214 \text{ (Ln Labor)} + 0.263 \text{ (Ln Capital)}$$

$R2 = 0.560$, and calculated $F = 11.036$

or

$$Y = 47{,}332 + 0.442 \text{ (Land Area)} + 0.214 \text{ (Labor)} + 0.263 \text{ (Capital)}$$

Based on the results of the variance analysis, it can be seen that there is a real relationship between bitter melon production (Y) and looking at the use of land area (X1), labor (X2), and capital (X3). This is indicated by the Fcount value (11.036) which is greater than Ftable at the 5% confidence level (Ftable 2.96). Thus, it shows that there is a real relationship between bitter melon production and the production factors used.

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