ANALYSIS OF EFFICIENCY AND FACTORS AFFECTING THE PRODUCTION OF CABBAGE FARMING (*Brassica oleracea* L.) IN BELUNG VILLAGE, PONCOKUSUMO, MALANG, INDONESIA

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Abstract

The purpose of this research was to analyze the efficiency and the factors that affect the production of cabbage farm in the village of Belung, Poncokusumo, Malang, Indonesia. Samples taken by census the number of respondents 36 farmers. The analysis used is descriptive qualitative and quantitative. Quantitative analysis include analysis of costs, revenues, income, efficiency and Cobb-Douglas. Based on the analysis, known that farmer acceptance is Rp. 43,767,361 and generated revenues of Rp. 30,124,372/ ha. Result relevated that the Cabbage farm in the village of Belung, Poncokusumo, Malang was highly efficient and profitable with an efficiency of 3.2. Factors that effect significantly   on cabbage farming production are labors, lands, pesticides and seeds. Input combinations are already efficient and optimal pesticides and seeds.

Keywords: Adopter, Agroforest, Cocoa, Logit Model, Odds Ratio

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Introduction

Vegetables are not only beneficial for their contribution for the share of agriculture in the economy of swaziland, but also have a significan probability to compete where there are fewer government regulation and restriction in the economy. Curently, the local demand for vegetables is higher than local production and hence the gap is filled by imports from SouthAfrica. The factors that significantly affected productivity of vegetable farmers were access to credit, selling price, fertilizer, quantity, distance to market and gender of the farmer (Masuku, 2013).

Indonesia is an agricultural country that the majority of people working in agriculture, or working as farmer. The farmers in Indonesia in general did not have a record of good farming and regular, whereas the advanced agriculture is characterized either by the input-output recording of farming.

Geographically Belung Village is an area with soil conditions form of landscape that tend hilly because located on the west slopes of Mount Semeru, mostly productive land. The village is located at an altitude between 600-1200 meters above sea level with an average rainfall of between 2300mm to 2500mm per year and an average temperature of 21.7 derajat. The majority livelihood Belung village is petani. It is supported by soil farm factors. A land fertile for agricultural commodities in the village one is plant cabbage. Cabbages included in one type of leaf vegetable crop that has the potential to be developed, because in addition to meet domestic demand, cabbage also has potential as an export commodity. Planting cabbage in large Belung partially village by farmers who are local residents. The cropping pattern is done intercropping, usually cabbage plant extracted with chili or tomato plants. However, the cropping pattern is also adapted to the needs of the market, as a result of further farm will be sold to the regional market, domestic and international. Cabbage production process includes tillage, nursery, planting, maintenance and harvesting.

The problem that occurs is the existing practice in the use of farmers in farming production factors not dosed precisely and no recording, so farmers often did not attention to the costs incurred to manage production detail. Factors has resulted in the acquisition of the gains small farmers and even it was lose. It's made the researchers to conduct the research on the analysis of the efficiency and the factors that affect the production of cabbage farm in the village of Belung, Poncokusumo, District Malang, Indonesia. The purpose of this study were (1) to analyze the cost cabbage farm in the village of Belung, Poncokusumo, Malang, (2) analyze the efficiency of a cabbage farm in the village of Belung, Poncokusumo, Malang, (3) Analyze the factors that influence the production of cabbage production in the village Belung, Poncokusumo, Malang, Indonesia.

Methodology

This research was conducted in the village of Belung, Poncokusumo, Malang on 11 s / d 30 October 2014. The location determined of the grounds in the area is a commodity-producing area of vegetables, especially cabbage is high enough. Besides that, Belung village lies in the area of mountain slopes semeru with an altitude of almost 1000 meters above sea level make this place suitable for growing a wide variety of vegetables, especially cabbage.

Sampling was done by *propotional stratified random sampling* that the number of respondents as many as 36 farmers in the village of Belung. The analysis method conducted by an analysis of qualitative and quantitative descriptive. Descriptive qualitative analysis is used to describe or depict a condition related to the research problem that cannot be described quantitatively, covering the geography of the study, the characteristics of the farmers, the state of the population and the state of cabbage farming in the study area. Quantitative analysis in this study is used to determine the level of costs, revenues and cabbage farm income, as well as determine the factors that influence the production of cabbage farm. The formula - the formula used in the calculation is as follows:

1. Determining Variable Cost (VC), Fixed Cost (FC), Total Cost (TC), Total Revenue (TR), Income, and R / C ratio. Adapun TC calculation formula is as follows:

TC = FC + VC

The calculation formula Receipts (THR) is as follows:

TR = p x q

Description:

TR   : Reception
p   : Price
q   : The amount of goods

As for calculating the income that is by the formula:

π = TR − TC

Description:

π : Revenue
TR   : Reception
TC   : Total Cost

To calculate the R / C ratio, an analyzer to measure the cost of a production is as follows:

R/C ratio $= \dfrac{Total\ Revenue}{Total\ Cost}$

Criteria:

R / C Ratio > 1, the farming efficient and profitable
R / C Ratio < 1, the farming not efficient and profitable
R / C Ratio = 1, the farming is break event

2. Analysis of Factors Affecting Farming Cabbage

The factors that affect farm production of cabbage can be known from the magnitude of the elasticity of Cobb - Douglas by using a data analysis program SPSS version 16.0 (Gujarati, 2007). Form Cobb - Douglas:

$Y = \beta_0 X_1{}^{\beta_1} X_2{}^{\beta_2} X_3{}^{\beta_3} X_4{}^{\beta_4} e^u$

Where:

β_0 = intercept / constants
β_1 = coefficient of X1 Production
β_2 = coefficient of X2 Production
β_3 = coefficient Production of the X3
β_4 = coefficient of X4 Production
X1   = Labor (HOK)
X2   = Land Area (Ha)
X3   = Fertilizer (Kg)
X4   = Pesticides (Liter)
X5   = Seeds (Kg)
e   = Numbers
u   = Error *(Disturbance Term)*

In order for this production, function can be estimated, then the equation needs to be transformed into the form of a linear equation as follows:

$LnY = Ln\beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + u.$

Economic efficiency is achieved when the maximum profit is obtained. Profit obtained when the maximum is reached optimum combination of inputs, (Soekartawi, 2003). Requirements to obtain the maximum profit are as follows:

Px = Py.PM

Means if:

$$\frac{Py}{Px}.PM = 1\ Optimum\ input\ combination$$

$$\frac{Py}{Px}.PM > 1\ Optimum\ yet\ input\ combination$$

$$\frac{Py}{Px}.PM < 1\ Input\ combination\ is\ not\ optimum$$

Of function is Cobb - Douglass is known that:

$$PM_{Xi} = B_i \frac{Y}{Xi}$$

Then the maximum profit is achieved if:

$$P_{Xi} = B_i \frac{Y}{Xi}.P_y$$

Or optimum input combination, if:

$$B_1 = \frac{Y.Py}{Xi.PX_i} = 1$$

While each of the input (X_1) used for:

$$X_i = \frac{Bi.Y.Py}{P_{xi}} = 1$$

Where:

Xi	= Wide input
P_{xi}	= Unity input prices are concerned
Y	= Average production
Py	= Price per unit of output (production)
Bi	= Regression coefficient

Discussion

Analysis of farming

Cabbage farm analysis was conducted to determine the amount of costs incurred and determine revenue and efficiencies generated by cabbage farmer in the village of Belung, Poncokusumo, District Malang. The analysis used include cost analysis, revenue and income as well as R / C Ratio.

Variable cost

Variable costs are costs which changed according to the level of production. Variable costs on cabbage plants include seed, fertilizer, pesticides and labor. The following data on the variable cost of cabbage farm in the village of Belung, Poncokusumo, Malang, Indonesia.

Table 1. Variable costs

Variable costs	Amount (Rp)	Percentage (%)
Seeds	185.417	8.15
Fertilizer	614.028	27.02
Pesticide	171.194	7.54
Labor	1.302.063	57.29
Total	2.272.701	100

Source: Primary data, processed in 2015

According to Table 1, it can be seen that the use of the highest variable cost is labor cost of the percentage rate 57.29% for a total cost of Rp. 1,302,063. This is reasonable because labor costs include land preparation to cabbage harvesting. Labor costs calculated from the number of people working (HOK) multiplied by a given wage per effective HOK working hours for 6 hours in which workers usually start work from 06.00 am-12.00 noon. Average labor is worker outside the family wage labor for 30,000 men and women Rp. 25.000. The processing of land for planting, the maintenance usually done by male labor force while the process of planting and harvesting done by women workers. The type of seed used is a hybrid type. This is because the hybrid seed is

faster to harvest more resistant to pests and diseases, as well as its productivity is more than other types. Fertilizer types used include Cages fertilizer, Urea, NPK and TSP fertilizers. All of the fertilizer is used for fertilizing two times, namely when planting and planting maintenance. Pesticides used in farming cabbage to maximum growth and free from pests.

Fixed cost

Fixed costs are that the costs volume do not affect of the resulting output. This fixed cost covers the cost of taxes, depreciation of tools and irrigation.

Table 2. Fixed costs analysis

Fixed cost	Amount (Rp)	Percentage (%)
Land lease	10.000.000	87,98
Tolls depriciation	1.270.288	11,16
Irrigation	100.000	0,86
Total	11.370.288	100

Source: Primary data, processed in 2015

The use of higher fixed costs is land lease which percentage rate of 87.98%, or at a cost of Rp. 10.000.000. The land lease, including the medium category, because the land is still in rural region so the price are not too high. The region is very suitable land planted with various kinds of vegetables because it lies on the slopes of Mount Bromo region. Agricultural land can be distinguished by farmland. Agricultural land is land used for farming, such as rice paddies, fields or yard. While farmland is land that is not always cultivated by agricultural production (Soekartawi, 1993). The type of land used for cabbage in the village Belung, Poncokusumo, Malang is dry land. The tools used in the farming of cabbage include hoes, sickles and sprayer. The use of agricultural land based on the availability of irrigation, it illustrates the kinds of cultivated plants, emphasizing the planting pattern. The closer to the irrigation, the cost of land lease will also be more expensive.

Total cost

The total cost is the total overall costs incurred by farmers. The total cost is derived from the sum of the variable costs and fixed costs.

Table 3. Total cost analysis

Total Cost	Amount (Rp)	Percentage (%)
Variable cost	2.272.701	16,65
Fixed Cost	11.370.288	83,35
Total	13.642.989	100

Source: Primary data, processed in 2015

The total cost of cabbage farming around Rp. 13,642,989/ha. The total cost is derived from the sum of the variable costs and fixed costs. The variable cost of Rp. 2,272,701 and its fixed costs Rp. 11,370,288. The higher use of cost is the fix cost percentage rate of 83.35%.

Revenue

Revenue is the gross income earned by farmers. Receipts obtained from cabbage production quantity multiplied by the price the farmer to the wholesaler.

Table 4. Acceptance of farm cabbage

Acceptance	Amount
Production (kg)	43.750
Price (Rp)	1.022
Total	43.767.361

Source: Primary data, processed in 2015

The average production per hectare cabbage amounted to 43,750 kg, and farmers selling to traders with an average price of Rp. 1,022/kg, so the farmer acceptance Rp. 43,767,361/ha.

Revenues and revenue cost ratio

Revenue is the net proceeds received by cabbage farmers, while the R/C ratio is used to determine the efficiency of farming. The success of the cabbage farming can be seen from the economic efficiency which closely to the price of production. Efficient use of cost determined by using R/C ratio analysis which is the ratio between total gross revenue with total costs used during the production process takes place (Sya'diyah, 2011). Here are the results of the calculation of revenue and R/C ratio:

Table 5. Pendapatan dan R/C ratio

Revenues	Amount (Rp)
Acceptance	43.767.361
Total Cost	13.642.989
Total	30.124.372
R/C *Ratio*	3.2

Source: Primary data, processed in 2015

The calculation of revenues obtained by farmers' gross revenues derived from deducting the total cost incurred, so that the average income of farmers cabbage Rp. 30,124,372/ ha. Farming efficiency can be obtained by calculating Revenue Cost Ratio (R/C ratio) comparing the revenue that the total cost issued. Efficiency value in cabbage farming known of 3.2, resulting from the criteria used is if the R/C ratio > 1, means the cabbage farm run efficiently and profitably. R/C ratio illustrates that for every 1 Rupiah of expenditure in the cabbage farm will generate 3.2 Rupiah.

B. Analysis of cabbage farm production affecting factors

Before the regression analysis, data is transformed into the shape of the natural logarithm (ln). Based on regression analysis it can be seen that correlation (R) value is equal to 0.998 where the value is > 0.5 means that the relationship between the dependent variable (production) of the independent variable (labor, land, fertilizers, pesticides and seeds) is very strong. The coefficient of determination (R^2) was conducted to determine the level of influence the dependent variable percentage of the independent variables. Based on the analysis results generated using SPSS version 16, R^2 value of 0.995, meaning that 99.5% of the independent variables (labor, land, fertilizers, pesticides and seeds) effect on the dependent variable (production), while the remaining 0.5% affecting by others factor which not included in the research model.

F test is used to describe the relationship between production and the factors of production. Based on regression analysis performed, the value of F_{count} at 13.53 and F_{table} of 2.05 at 90% confidence level (α: 0:10). It means that factors of production (labor, land, fertilizers, pesticides and seeds) jointly significant effect on the production of cabbage in the village Belung, Poncokusumo, Malang Regency because $F_{count} > F_{table}$.

Based on partial t-test using SPSS version 16 can be seen as the result of the calculation is contained in Table 6.

Table 6. Coefficient

Model	B	Sig	T_{count}	T_{table}
Constant	10.541	0.000	39.658	0.13
LnX1 (Labor)	0.054	0.354	0.959	
LnX2 (Land Area)	0.957	0.000	20.568	
LnX3 (Fertilizer)	0.003	0.906	0.120	
LnX4 (Pestisides)	0.008	0.702	0.386	
LnX5 (Seed)	0.005	0.796	0.261	

Source: Primary data, processed in 2015

The multiple regression equation can be done by interpreting the numbers in the unstandardized Coefficients particular column B. Based on equation formula model, the model of the equation can be written as follows:

$LNY = Ln\beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + u.$

$LNY = 10,541 + 0.054X_1 + 0.857X_2 + 0.003X_3 + 0.008X_4 + 0.005X_5$

T-test is done by looking t_{count} and t_{table}. The confidence level used is 90% (α: 0.10) and the degrees of freedom (df) by n-k formula is 30, so that the value t_{tabel} 0:13. Results of the t-test showed that labor X1 significant, because t_{count}

(0.959)> t_{table} (± 0:13). Based on the value β1 (0.054) showed each additional 1% of the labor will be the addition of cabbage production in 0.054%. It is suspected because of labor in the study area has a good management in agribusiness management.

T-value in land area amounts to 20,568 means that the value is very significant, while based on the value β2 (0.957) showed each additional 1% of land area it would add production output amounted to 95.7%. This is because of the soil in the Belung village, Poncokusumo, Malang is very fertile and suitable for growing types of vegetables, so that more land under cultivation, the production will increase.

Value of fertilizer T_{count} is equal to 0.120, means that the fertilizer did not significantly affect the production of cabbage. This is reasonable because if the fertilizer given too much the plants growth will be less good. In addition farmers ignore the dose of fertilizer use. Other factors affecting the fertilizer had no significant effect due to rainfall is high enough so the fertilizer applied does not optimally absorbed by cabbage plants.

T_{count} on pesticides is equal to 0.386 > from t_{table}, means that pesticides have real impact on the production of cabbage, while the value of β4 (0.008) indicates that each additional 1% of pesticides will increase the production of cabbage by 0.8%.

T_{count} on the seed is at 0.261 > from t_{table}, means that the seeds have real impact on the production of cabbage, while the value β5 (0005) showed that each additional 1% seeds of cabbage production will increase by 0.5%. Good quality seed will produce a good product, too. Farmers in the area of research using hybrid seed because this seed types generate more production than in other types of seed.

C. Cabbage farm efficiency analysis

Efficiency is the effort to achieve the goal by using a minimum of resources or optimal use of resources to achieve the maximum (Sarpintono, 2009).

a. Labor (X1)

$$X_i = \frac{(0.054) x (30406.25) x (1022)}{(39) x (225000)} = 0.2$$

Based on the results of these calculations can be seen that the value is <1, so that the combination of the labor input is no longer optimum. While the optimal combination of inputs when employment reached 7, so that the average use of labor per hectare is 1 person/ ha.

b. Land Area (X2)

$$X_i = \frac{(0.957) x (30406.25) x (1022)}{(0.6) x (63194444)} = 7.2$$

Based on the results of these calculations can be seen that the value is > 1, so that the combination of input on land area optimum yet. While optimal combination of inputs when reached 4.71 ha land area.

Land use is highly dependent on the state of the environment and the land is located (Wibisono, 2011). The size of the land area of the traditional need to be understood in order to be transformed to the size of the land area represented by hectare (Soekartawi, 1993).

c. Fertilizer (X3)

$$X_i = \frac{(0.003) x (30406.25) x (1022)}{(103.9) x (6450)} = 0.1$$

Based on the results of these calculations can be seen that the value is < 1, so that the combination of the fertilizer input is no longer optimum. While the combination of optimal input when reaching 14.45 kg, so that the average use of fertilizer is 2,006 kg/ha.

d. Pesticides (X4)

$$X_i = \frac{(0.008) x (30406.25) x (1022)}{(1.2) x (160000)} = 1$$

Based on the results of these calculations can be seen that the value is = 1, so the combination inputs on pesticides already optimum.

e. Seeds (X5)

$$X_i = \frac{(0.005) x (30406.25) x (1022)}{(183.9) x (6450)} = 1$$

Based on the results of these calculations can be seen that the value is = 1, so the combination inputs on the seeds have been optimum.

Conclusion

The total cost issued by farmers is Rp. 13,642,989 this cost includes variable costs Rp. 2,272,701 and a fixed cost of Rp. 11,370,288. Acceptance of farmers is Rp. 43,767,361 and the revenues of Rp. 30,124,372/ha. Cabbage farm in the Belung village, Poncokusumo, Malang highly efficient and profitable with an efficiency level of 3,2. Production factors have very significant effect on cabbage farming is labor, land, pesticides and seeds. Input combinations are already efficient and optimal pesticides and seeds.

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