Cabbage Farm Analysis

Evita Soliha Hani

***Abstract*—**Generally, Indonesian farmer has been doing cabbage farm (Brassica Oleracea L) from generation to generation, so the use of production factors cannot be measured exactly. This condition caused the use of production factors not efficient. Inefficiency also caused by the high of fertilizer and pesticide price, in fact the capital of farmer limited. The price of horticultural crops, including cabbage is fluctuative. Certainly, it will influence the farmer's income. The maximum benefit can be received by the allocation of production factors right. The research purposes to (1) analyze production factors that influence cabbage production, (2) assess the allocative efficiency of use of cabbage production factors, (3) assess the feasibility of cabbage farming. Research was done purposively in the Panti District, Jember Regency, East Java Province, Indonesia. Research method used was descriptive and analytic. The total of samples were 38 cabbage farmers that determined by proportional random sampling. The analytical tools used were Cobb-Douglass, linear regression, allocative efficiency and the R/C ratio. Research results produced a model Cobb-Douglass production function is $Y=3.483X_1^{0.680}X_2^{-0.081}\ X_3^{0.025}X_4^{0.015}X_5^{0.024}X_6^{0.410}$, with value of $F_{test}=45.178 > F_{table}$ (1,945; $\alpha=0.10$). It means that the overall factors of production being together such as land (X_1), seeds (X_2), Urea (X_3), NPK (X_4), pesticide (X_5), and labour (X_6) are affect the production of cabbage on the significance of 10%. The partial, factors that significantly affect the production of cabbage are land, urea, pesticides and labour, while the factors that insignificantly affected the production of cabbage are seeds and NPK. Use of land, urea, pesticides, and labour have not reached allocative efficiency. The value of R/C ratio is 2.43. It means that cabbage farm is efficient in the use of cost; cabbage farm deserves to be continued.

***Keywords*—**cabbage, cost efficiency, allocative efficiency, production factors.

I. Introduction

CABBAGE (Brassica Oleracea L.) is one of the horticultural crops in a group of vegetables that have economic value, can be cultivated without growing season at any time [8], and it grows well at height 1000-2000 above sea level [7]. Indonesia is one country producing cabbage, even as country exporting cabbage in Singapore, Malaysia and Thailand. However, cabbage production levels are still relatively low. It is caused by the soil nutrient was poor, the number of plant pests are much, and unbalanced fertilization [2]. Not applied a balanced fertilizer because the farmers of Indonesia use of production factors not exactly measured. This is caused by the high price of fertilizer and agricultural medicines [8], while capital is low and limited for farmers to buy fertilizers and pesticides in adequate amounts. As a result, inefficient use of production factors [5]. Inefficient use of production factors showed the use of production factors is not optimal that causes the maximum product is not reached. If farmers use of excessive inputs, which means excessive input costs, while the product is not the maximum, then the farmer will not earn a profit.

Efficiency is the best use of inputs in producing the goods. There are three concepts of efficiency, namely technical efficiency, allocative efficiency and economic efficiency [6]. Technical efficiency measures the ability of farmers to achieve maximum output with a given and acquired technology, whereas allocative efficiency are trying to capture the ability of farmers to apply inputs in optimal proportions at each price [12]. Price efficiency is achieved when the value of the marginal productivity of each input (VMPxi) is the same as the price of inputs (P_{Xi}) [6].

Panti is one of the subdistrict as the center of cabbage production in Jember District, East Java, Indonesia. Although as a regional center for cabbage, but the production decreased from 2011 through 2013, which is a row of 8540 kw, 8310 kw and dropping to 7001 kw in 2013 [9]. Obviously this condition if it continues so it will be an impact on the sustainability of the availability of cabbage in the area as a regional center for cabbage. It also provide a loss in income of farmers if the cost of cabbage factors is high. This research aims to (1) analyze the factors that influence the production of cabbage, (2) assess the allocative efficiency of use of production factors cabbage, (3) assess the feasibility of a cabbage farm.

II. Research Method

The research was carried out in the sub-district of Panti, Jember District, East Java, Indonesia, with the consideration that this area is one of the centers cabbages. The research was carried out in the sub-district of Panti, Jember District, East Java, Indonesia, with the consideration that this area is one of the centers cabbages. This type of research is quantitative, descriptive and correlational. The unit of analysis is a cabbage farmer in 2015. Total samples were 38 farmers from 70 farmers (54%), which were taken by random sampling [4]. Data sourced from primary and secondary data. Primary data were taken by interview and observation. Cobb-Douglass (C-D) is used to determine the factors that affect the production, which then models were analyzed using linear regression model [6]. To determine the goodness of fit regression can be shown by F_{test} value, while to know how independent variable variants can explain the dependent variable can be seen from the value of R^2. Further t_{test} was used to determine each of the

Evita Soliha Hani: Department of Agribusiness, Faculty of Agriculture, University of Jember, Indonesia.

independent variables that affect the dependent variable [3]. Model C-D in this research is:

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}e^u \quad (1)$$

The C-D model is converted to forms of multiple linear regressions by logarithm become:

$$LogY = loga+b_1logX_1+b_2logX_2+b_3logX_3+b_4logX_4+b_5logX_5+b_6logX_6+uloge \quad (2)$$

Where: Y=the production of cabbage (kg); a=intercept; X_1=land (ha); X_2=seed (kg); X_3=Urea (kg); X_4=NPK (kg); X_5=pesticide (lt); X_6=labor; e=error, and b_1 ... b_6 is a parameter of each of the factors of production. Factors of production together influence the production of cabbage if the value $F_{test}>F_{table}$ (α, 010), otherwise if $F_{test}\leq F_{table}$ (α, 010) has no effect. Furthermore, the t_{test} to determine each factor of production that significantly affect the production of cabbage. Xi production factors significantly affect the product cabbage when $t_{test}>t_{table}$ (α, 010), otherwise if $t_{test}\leq t_{table}$ (α, 010) had no significant effect. To assess the use of production factors cabbage reached the level of allocative efficiency using the formula:

$$\frac{MVP_{x1}}{P_{x1}} = \frac{MVP_{x2}}{P_{x2}} = \frac{MVP_{x3}}{P_{x3}} = \frac{MVP_{x4}}{P_{x4}} = \frac{MVP_{x5}}{P_{x5}} = \frac{MVP_{x6}}{P_{x6}} = 1 \quad (3)$$

Where: $MVPx_i$ is the marginal value product for factor X_i, P_{Xi} is the price of factor X_i. Cabbage production factors X_1 ... X_6 are respectively land, seed, urea, NPK, pesticides, and labor. $MVPx_i$ is the multiplication of Marginal Physical Product to X_i ($MPPx_i$) at a price of cabbage production. If ($MVPxi/P_{Xi}$) = 1, means the use of production factor X_i has achieved allocative efficiency; if $MVPx_i/P_{Xi}>1$ means the use of production factor X_i has not reached allocative efficiency, and if $MVPx_i/P_{Xi}<1$ means the use of production factor X_i is not allocative efficiency. To determine the feasibility of a cabbage farm use R/C ratio [11]. The formula in this studi is

$$R/C\ ratio = Total\ Revenue / Total\ Cost \quad (4)$$

Where: total revenue is obtained by multiplying the total production of cabbage at a price of cabbage. Total cost obtained from the sum of fixed costs and variable costs, which each cost derived from the number of inputs used multiplied by the price. Cabbage farming can be said to be feasible if the value of R/C ratio>1, otherwise if the value of R/ C ratio ≤1 is not feasible.

III. Result of Research

A. Factors that influence the production of cabbage

Results of multiple linear regression analysis of the factors affecting the production of cabbage as listed in Table 1.

TABLE I: A Result of C-D Analysis of Factors Influenching Cabbage Production

Variables	Coefficients	T_{test}	Sig.
Constant	3.483	7.293	.000
X1 (Land)	.680	2.866*/	.007
X2 (Seed)	-.081	-.407	.687
X3 (Urea)	.025	1.959*/	.059
X4 (NPK)	.015	1.478	.150
X5 (Pesticide)	.024	2.144*/	.040
X6 (Labour)	.410	1.750*/	.090

F_{test} = 54.156; F_{tabel} (α,010) =1,945 ; Adjusted R^2 =0.896
Note: */ statistical significance of the 0.010 level
Source: Calculated from the survey data

The results of the regression analysis (see Table 1) can be transferred to a model of the Cobb-Douglass (CD), namely

$$Y= 3040.89X_1^{.680}X_2^{-.81}X_3^{.25}X_4^{.015}X_5^{.024}X_6^{.410} \quad (5)$$

Based on table 1, land, urea, pesticide and labor are the factors of production are significantly positive on the production of cabbage on a confidence level of 90%, while the seed and NPK had no significant effect.

B. The allocative efficiency

The allocative efficiency is used to estimate the level at which farmers can allocate resource inputs to maximize profit. To determine the allocative efficiency of use of production factors of cabbage used the formula $MVPxi=P_{Xi}$. The cabbage production factors is allocative efficiency if the $MVPxi/P_{Xi}=1$. The $MVPxi/P_{Xi}>1$ means it is not allocative efficiency. Production factors assessed are the factors that significantly affect the production of cabbage (Table 1). Comparison of the value of the marginal product of cabbage with the price of each factor as shown in Table 2.

Table 2 shows that all the factors of production of cabbage has a value of MVP/P>1, namely land =12.34; urea=3.83; pesticides=22.17; labour=4.08. This means that the use of land, urea, peticides, and labor has not reached allocative efficiency. Conditions of use of the seed and labor on the farm cabbage allocative inefficiency is the same as the research results of [10].

TABLE II: A Result of Allocative Efficiency Analysis of Cabbage Production

Variables	Coefficients	Y	P_y	X_i	P_{xi}	MVP_{xi}	MVP_{xi}/P_{xi}
X1 (Land)	.680	12375	1746	.49	2439475.00	30098028.03	12.34
X3 (Urea)	.025	12375	1746	82.50	1710.53	6547.49	3.83
X5 (Pesticide)	.024	12375	1746	.03	11538.46	255833.97	22.17
X6 (Labour)	.410	12375	1746	79.00	27500.00	112136.30	4.08

Note: Y=product of cabbage; P_y=price of cabbage; X_i=input-i; P_{xi} = price of input-i; MVP_{xi}=marginal value product
Source: Calculated from the survey data

C. The feasibility of farming

Cabbage farming feasibility assessed by the ratio of R/C. Cabbage farming is feasible if the value of the R/C ratio>1. The components necessary to calculate the ratio of R/C are the average total revenue and average total cost in hectares. Results of calculation of the R/C ratio for cabbage farming as shown in Table 3.

TABLE III: A RESULT OF FEASIBILITY ANALYSIS OF CABBAGE FARMING

Components	Total (Rp/ha)	R/C
The average total revenue	48584461	2.43
The average total cost	19978897	

Source: Calculated from the survey data

Referring to Table 3, the value of R/C ratio is 5.8. Therefore, value is more than 1, it can be said that the cabbage farm is efficient from the aspect of cost. This means cabbage farm has a business feasibility of the cost aspect. This condition is the same as the research results of both [10] and [1], which is a cabbage farm is feasible to be developed.

ACKNOWLEDGMENT

I would like to express our sincere gratitude to Faculty of Agriculture who has given me the opportunity to carry out this research. Thank you for Istin Khoifah and Asti Margaretha who have helped me work in the field.

REFERENCES

[1] A. A. Sa'diyah and R. E. Muljawan. Kajian Ekonomi Usahatani Kubis di Kecamatan Sukapura Kabupaten Probolinggo. PS Agribisnis Fakultas Pertanian Universitas Tribhuwana Kabupaten Probolinggo. Buana Sains Vol. 11 No. 2 [Online]. Pp. 103-108. 2011. Available: jurnal.unitri.ac.id/index.php/buanasains/article/download/161/162

[2] Artikel Seputar Pertanian. Cara Menanam Kubis atau Budidaya Kol. Tips Petani. Artikel Seputar Pertanian Indonesia. Available: http://tipspetani.blogspot.co.id/2013/08/cara-menanam-kubis-atau-budidaya-kol.html

[3] D. N. Gujarati, Basic Econometric, Second Edition, McGraw-Hill Book Company, New York, 1988

[4] M. Nasir, Metode Penelitian, Ghalia Indonesia, Indonesia, 1988

[5] M. Nurung. 2002. Estimasi fungsi keuntungan dan efisiensi alokatif usahatani padai sawah pada petani pemilik lahan dan penyakap di Desa Kemuwu Kecamatan Argamakmur Kabupaten Bengkulu Utara. Jurnal Penelitian UNIB, vol VIII No.1. Pp. 19-23

[6] P. A. Yotopoulus and J. B. Nugent, Economics of Development Empirical Investigations, Harper & Row, Publisher, Inc, New York, 1976

[7] Polengs. Budidaya Tanaman Sayur Kubis (Kol.). Budidaya New: Referensi Usaha Perianan, Peternakan, dan Pertanian. Available: http://budidayanews.blogspot.co.id/2011/06/budidaya-tanaman-sayur-kubis-kol.html

[8] Pringati Singa. Analisis Usaha Kubis/Kol. Panduan Budidaya Tanaman. Available: http://menanam-tanaman.blogspot.co.id/2013/05/analisa-usaha-kubis-kol.html

[9] Profil Kecamatan Panti, Kecamatan Panti Dalam Angka, Jember, 2012

[10] R. U. Sari, I. A. Wicaksono and D. P. Utami. Analisis Efisiensi Usahatani Kubis (Brassica oleracea) Di Desa Sukomakmur Kecamatan Kajoran Kabupaten Magelang. Program Studi Agribisnis Fakultas Pertanian Universitas Muhammaddiyah Purworejo. SURYA AGRITAMA Volume 2 Nomor 1 Maret 2013 [Online]. Pp. 1-10. Available: http://ejournal.umpwr.ac.id/index.php/surya-agritama/article/view/336/357

[11] Soekartawi, Analisis Usahatani, Universitas Indonesia, Indonesia, 2002

[12] T. V. Coelli, D. S. Prasada Rao, C. J. O'Donnel, and G. E. Battese, An Introduction to Efficiency and Productivity Analysis, Second Edititon, Springer Science+Business Media, In., New York, 2005