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THE EFFICIENCY OF PRODUCTION FUNCTION ALLOCATION TURMERIC FARM ACEH BESAR DISTRICT

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Graphical abstract

Abstract

The objectives of this research is to find the factors impacted of turmeric farm and the efficiency of production factor allocation was efficient or not. The research location in Aceh Besar district. This research used survey method. The research was tested by Cobb Douglass production function analysis. The result of research shows that area factor allocation 0,30 hectare not efficient. Showing that area factor necessary to increased anyway the income of the farmer increasing. And the allocation of labor factor 17,43 man days per season be decreased cause not efficient and can be high the labor, over production and marginal production value lower.

Keywords: Efficiency, production function, turmeric

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1.0 INTRODUCTION

Turmeric is a spice plant very broad market prospects, especially for the purpose of export to India, Pakistan and some Middle East countries. Therefore, the development prospects of Turmeric cultivation is still quite bright. One cause of low farm income Turmeric is the low quantity and quality of results. This occurs partly because the inefficient allocation of production factors utilization. To address this problem, it conducted a study of farming Turmeric. Turmeric area production in Aceh is in the district of Aceh Besar. Some districts which became the center of the sub-district Lampanah Turmeric is Lengah, Seulimum and seulawah Valley. 2014 planting area reached 682 ha with a production of 2,180 tons per year (Department of Agriculture Aceh, 2015). This production is much lower than the number of potential production reached 20 tons /ha (Institute for Agricultural Technology and Development, 2009) [1,2].

Low productivity is inseparable from the constraints that occur in managing Turmeric farming, such as the implementation and post-harvest technology, especially in the availability and quality of seeds, quality of intensification, inefficient farming production systems, weak institutional support, institutional extension, and marketing systems. Diversity issues are not independent, but interrelated with each other despite different constribution.

According to Gomez (1977) one of the factors that influence agricultural production is the level of technology use. Technology which is intended, among others, the use of quality seeds, fertilizers, agricultural input. Another factor that also influences the production is extensive arable land and intensive farming management. The maximum profit is reached when all factors of production has been allocated optimally, at which time the value of marginal production of inputs equal to the marginal cost of sacrifices or the relevant input prices. The question is what factors affecting farming Turmeric, Turmeric and whether farmers have been able to allocate efficiently all factors of production used in farming activities [3].

To assess the efficiency of farming Turmeric can be done with the production function approach. Doll and Orazem (1984) revealed that the production

function reflects a combination of various factors of production used to produce the production. While analysis tools used are Cobb-Douglas production function (Soekartawi, 1994). If the ratio of the value of the marginal product (NPM) with the input price is equal to one, then the condition is said to have allocated farming production factors efficiently [4].

Turmeric is organizing farm production factors include the nature, labor, and capital managed by the farmer to obtain the production. The ability of farmers to achieve a certain level of production will affect revenue. Production is a set of procedures and activities that occur in the creation of products and services (Downey and Erickson, 1992) [5].

To be able to analyze a production process then created a production function. Soekartawi (1993) revealed that the production function as a physical connection between the inputs to the outputs. While Pappas and Hirschey (1995) revealed that the production function as a descriptive statement linking inputs with outputs. The production function reflects a combination of various factors of production used to produce the product (Doll and Orazem, 1984). Mathematically the production function can be expressed as follows:
Y = f (X1, X2, X3, ..., Xn). Where Y = output, or as a dependent variable and X = a factor of production, or as an independent variable.

The production function that is often used by researchers as an analytical tool is the Cobb-Douglas production function. Cobb-Douglas production function is a function or equation that involves two or more variables (Soekartawi, 1994). One variable called the dependent variable (Y) or variables described and the other is called the independent variable (X) or a variable that explains [6].

Farmers in manage farming objectives Turmeric is to make a profit. Maximum profitability is closely related to efficiency in production. The production process is inefficient because of technically inefficient and allocation at a certain level of input and output is not optimum use of production factors (Sumaryanto *et al*., 2003).

One way to measure the success of a farm is through farming efficiency ratings (Santoso, 1990). Efficiency is a situation to be achieved by the manager (farmer) in producing a product or production factor in the production process (Amiruddin, 2004). In studying the process of production, the role of the relationship inputs (factors of production or inputs) and output (production) is a major concern [7].

In relation to the concept of efficiency, known as the concept of technical efficiency, price efficiency and the concept of economic efficiency (Yotopoulus and Nugent 1976). Technical efficiency would be achieved if farmers are able to allocate the factors of production such that high production will be achieved. Price efficiency will be achieved if the farmers get a huge advantage in the allocation of factors of production due to high prices. Economic efficiency would be achieved if farmers are able to increase production, gain factor prices are relatively cheap and sell their products relatively expensive.

Technical efficiency is a measure of production levels achieved at the level of the use of certain inputs. A farmer is technically said to be more efficient than other farmers if the use of the type and the same number of inputs obtained higher output than other farmers.

Farm efficiency research results mentioned above there is a difference as a result of different types of land, land, biological technology (seed), chemical technology (fertilizers, insecticides), climate, and the use of labor in managing the farm.

The research objective is (a) to determine the factors that influence the production of Turmeric farming and (b) whether the levels of use of production factors have been efficient or not.

2.0 LITERATURE REVIEW

To determine the level of efficiency of the use of factors of production can be done with the production function approach. Research on the efficiency of farming, especially vegetable commodities have done among them, Niniek *et al*. (2002) has conducted research on the cabbage farm economic efficiency Malang with profit function approach. Results of the study revealed that the rate of farm efficiency cabbage per hectare not achieve efficient due to the low selling price of cabbage due to excessive production [8].

Furthermore, Irawan and Rachman (1987) have conducted research use rice production factors in semi technical irrigated land in West Java with the approach of Cobb-Douglass. The research results revealed that the factors of production acreage, seed, fertilizer urea, TSP labor and insecticides inefficient. This is due to the use of factors of production is already too high. Purwoto research results (1990) in Central Java showed different results, in which the use of production factors of rice farming in rainfield show inefficient, because the use of factors of production are low [9].

In this study, to measure the level of efficiency of use of production factors used in farm production function Cobb-Doglass. The approach to these functions has advantages compared to production function. Irawan (1990) reveals that excess Cobb-Douglass can be done directly using the parameters obtained. This is because the parameters of the Cobb-Douglass implied elasticity.

3.0 METHODOLOGY

Research locations in Aceh Besar district in District Lampanah Lengah, Seulimum, and Valley seulawah. This turmeric production centers located in 27 villages. The number of villages were selected as sample 3 villages intentionally (purposive sampling)

which is a village which has extensive crop top Turmeric in Electoral districts are determined randomly sampled farmers (random sampling) to farmers who grow turmeric in the 2005/2006 rainy season. The number of samples is determined as many as 34 people, who were taken 10 percent of the total population of 338 farmers Turmeric.

Analysis model used in this study is the Cobb-Douglas production function. Chosen model of Cobb-Douglas production function is because it has some advantages, namely (Soekartawi, 1994, Henderson and Quandt, 1980) [10].

a. Completion of the Cobb-Douglas function is relatively easy when compared with other production functions, because it can be easily transferred into logarithmic form.

b. Line estimation results through this function will generate a regression coefficient which is also showing the amount of elasticity of each independent variable in question.

c. The magnitude of the elasticity indicates the level of magnitude of returns to scale. In mathematical form of the Cobb-Douglas production function can be written as follows (Soekartawi, 1994)

$$Y = a\, X_1^{b1}\, X_2^{b2}\, X_3^{b3}\, X_4^{b4}\, X_5^{b5}\, X_6^{b6}\, X_7^{b7} e^{u}$$

The above model can be transformed into a linear form, is as follows:

Log Y = b0 + b1 log log X2 X1 + b2 + b3 + b4 log log X3 X4 + X5 + b6 b5 log log X6 + b7 log X7 + e

where: Y : Turmeric production per growing season
X1: Land
X2: Seed
X3: Fertilizer urea
X4: TSP Fertilizer
X5: Fertilizer KCL
X6: NPK
X7: Labor
b0 : intercept (constant)
b1, ..., b6: parameters to be suspected
E : error (disturbance term) or natural logarithm, e = 2.718

To test the hypothesis 1 is the influence of factors of production land size, seed, fertilizer Urea, TSP, KCl, NPK and the use of labor to the production of Turmeric simultaneously used F test with the formula: (Supranto, 1983)

$$F = \frac{R^2/k}{(1 - R^2) - (n - k - 1)}$$

and t test:

$$t_{hitung} = \frac{b_i}{S_e(b_i)}$$

If the value of t <t table value (a, n - k - 1), then Ho is accepted, and vice versa if the value t count> t table value (a, n - k - 1), then Ho is rejected. If Ho is rejected means of the independent variables affect the dependent variable.To measure the proportion (percentage) contribution of the independent variables (Xn) to variable dependent (Y) used the analysis of the coefficient of determination (R^2) with the formula:

$$R^2 = \frac{JK\ reg}{JK\ (total)}$$

R^2 value between zero and 1 ($0 < R^2 < 1$)

The level of efficiency of use of production factors in the farm Turmeric is achieved, if the value of the marginal product is equal to the price of production factors (Soekartawi, 1994). Mathematically can be formulated:

MPV = Px

Where MPV = marginal product value

Px = Price of input

According Soekartawi (1994) when (MPVx) / Px> 1, means that the use of factors of production of X is not efficient. To achieve efficient, factor X need to be added. If (NPMx) / Px <1, mean that the use of production factors X inefficient. To achieve efficient, the use of production factors X needs to be reduced.

4.0 RESULTS AND DISCUSSION

Production factors used by farmers on the farm Turmeric include land, seed, fertilizer urea, TSP, KCL fertilizer, NPK fertilizer, and labor. To facilitate production of factor analysis are presented in Table 1.

Table 1 Production factors used by farmers on the farm Turmeric

No.	Input	Average per Farmer	Using Per Ha
1	Land	0,29	1
2	Labour	17,5	60,3
3	Tuber	530	1.827,6
4	Urea	40,5	139,7
5	TSP	35	120,7
6	KCl	71	244,8
7	NPK	49	169,0
8	Product	4355	15.017,2

Table 1 shows that the use of factors of production in farming Turmeric compared with the area under cultivation is still relatively low. As in the use of fertilizers have not yet reached the recommended amount. Turmeric results achieved are still below the average of the results of research that is 15,017 kg/ha. Furthermore, when compared with the productivity of the results achieved at the Center for Technology Assessment and Development of Agriculture, in 2009 ranging between 19.500 - 20.000 kg/ha, the yield obtained in the study area is still far from the potential results may still be obtained.

The level of production, costs of production, value of production and farm income Turmeric can be presented in Table 2.

Table 2 The level of production, costs of production, value of production and farm income Turmeric

No.	Input/Output	Average per Farmer	Using Per Ha
1	Cost of Production	7.418.050	25.579.483
2	Product	4.355	15.017
3	Price	3.000	10.345
4	Total Revenue	13.065.000	45.051.724
5	Income	5.646.950	19.472.241
6	R/C	1,76	1,76
7	RoI	0,76	0,76

Table 2 shows that net income of Turmeric farmer obtained Rp 19.472 million per hectare. These include relatively low income because farm productivity is still low due to the low level of use of resources.

To analyze the relationship between the use of land, seed, fertilizer, and labor used multiple linear regression statistical analysis. Results of the analysis of Cobb-Douglas production function shows the multiple linear regression equation which is a function of Turmeric production as follows:

$$\text{Log } Y = 8{,}342 + 0{,}823 \text{ Log } X_1 - 0{,}063 \text{ Log } X_2 + 0{,}127 \text{ Log } X_3 + 0{,}001 \text{ Log } X_4 + 0{,}031 \text{ Log } X_5 - 0{,}031 \text{ Log } X_6 + 0{,}233 \text{ Log } X_7$$

For ease of discussion, the results of production function analysis are presented in Table 3.

Table 3 Estimated Production function Cobb-Douglass Turmeric farm in 2014.

Uraian	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	8,342	0,418		8,817	0,000
Log_ Lahan	0,823	0,224	0,740	3,668	0,001
Log_ Benih	- 0,063	0,049	- 0,65	-1,287	0,209
Log_ Urea	0,127	0,169	0,122	0,748	0,461
Log_ TSP	0,001	0,090	0,001	0,015	0,988
Log_KCL	0,031	0,079	0,031	0,389	0,701
Log_ NPK	-0,031	0,143	- 0,030	- 0,219	0,829
Log_TK	0,233	0,129	0,190	1,800	0,084

Dependent Variable : Log-Prod

F_{hit} = 261,203

$F_{.05\,(7;\,26)}$ = 2,39 $t_{.05\,(19)}$ = 1,75

$F_{.10\,(7;\,26)}$ = 3,43 $t_{.10\,(19)}$ = 2,08

R^2 = 0,986

Results of this regression model analysis showed that F count larger than F table both at the level of error 10% and 5%. This means that this model can be used as a probe to analyze the influence of each production to farming Turmeric. F count larger than F table means that the factors of production such as land, seed, fertilizer urea, TSP, KCl fertilizer, NPK fertilizer, and labor jointly significant effect on the production of Turmeric.

According to t test results showed that the factors of production that significantly affect production are land and labor. The regression coefficient of 0.823 arable land showed that the addition of 100% of arable land will increase production by 82.3%. Labor regression coefficient of 0.233 indicates that the addition of the labor of 100% will reduce the production of 23.3%. This happens because the management system that uses redundant workforce has led to labor become so high that production becomes excessive.

From the analysis it was found that the elasticity of the production model is equal to 1.121. Technically means that the increase in results, that Turmeric is achieved today is the scale of the increase is the result of increasing because bi>1, so need no additional factors of production.

Efficient Use of input Production

Results of the analysis of the efficiency of the allocation are presented in Table 4 shows that the use of production factors land, yet efficient (optimal) while the use of labor is not efficient anymore, while other factors of production: Seeds, Urea, TSP, KCL, NPK is no longer included in the table because of , the results of the regression analysis of the fifth factor of production has no real effect on the production of turmeric.

In Table 4 shows that the ratio between Marginal Production Value (NPM) of the factors of production land with the land rental prices per season per hectare is greater than one. This shows that economically, the allocation of factors of production at a rate of 0.29 ha when it is not efficient. Arable land area could still be improved further so that the vegetables Turmeric at the study site can obtain greater profits again.

Table 4 Analysis of Allocation Efficiency of Production Factors Turmeric Farming, in 2014

Variable	Coef. of Elasticitas	Ave.	PM	Py	PMV	Px	PMV/ Px
Land	0,823	0,29	0,23867	2000	477,34	20000 000	0,00
Labour	0,233	17,5	4,0775	2000	8155	50000	0,16
Turber	-0,063	530	-33,39	2000	-66780	4000	(16,70)
Urea	0,127	40,5	5,1435	2000	10287	2100	4,90
TSP	0,001	35	0,035	2000	70	3200	0,02
KCl	0,031	71	2,201	2000	4402	3500	1,26
NPK	-0,031	49	-1,519	2000	-3038	5000	(0,61)

The ratio between NPM factor Turmeric seed production at a price per kg of seeds is greater than 1, shows that is economically allocation of factors of production workers at a rate of 17.5 man days is not efficient, because the labor force used is too much, so that efforts can be used to increase the return benefit farmers is to reduce the use of labor.

5.0 CONCLUSION

The allocation of production factors at a rate of 0.29 ha land has not been efficient. This allows the land needs to be added, so that the income of vegetable growers Turmeric increases. While the use of labor at a rate of 17.5 HKP per growing season, should be reduced because it is not efficient and will cause the workforce becomes excessively high so that production at the sites.

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