

Economic Efficiency and Scale of Rice Production in Bogor District

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ABSTRACT

Setting cropping patterns in the use of paddy fields is one of the important steps that determine the income, use and distribution of farmer's labor. This research is a descriptive research which is carried out by utilizing secondary production data, cost analysis in Bogor Regency. Analysis using regression equations, scale of business and economic efficiency by determining the area of rice fields and farmer's labor with other production factors. the added value of the regression coefficient of the production factors is $0.84 < 1$. This indicates that rice farming in Bogor Regency follows the rule of Reduction to scale, which means that the addition of production factors exceeds the proportion of additional production yields. Therefore, it must reduce the average farming costs so as to increase profits. The results of the analysis of the economic efficiency of farming that the comparison value between the value of the marginal product and the price of each production factor is 0.83 for the land area production factor, 0.28 for the labor production factor, 20,98 for urea fertilizer, and 4.36 for KCl fertilizer which has more value from 1 is already efficient.

Keywords: lowland rice, farming, production factors, business scale, and economic efficiency

1. INTRODUCTION

1.1. Background

Population development accompanied by human efforts to improve their welfare often results in the worsening of the carrying capacity of the region, which is often exacerbated by the existence of increasingly sharp land use conflicts. Land resources are becoming increasingly important along with the increasing population at a high rate and as a result of the development of economic activities. This situation brings the consequence that the demand for land for various purposes is increasingly diverse, such as for the expansion of agricultural land, production forest plantations, settlements/housing, mining as well as for locations for trade/business and industrial activities as well as infrastructure development needs (roads, irrigation, and land use) other public infrastructure.

Land use is a form of farmers' efforts to utilize their land, namely managing land by determining and regulating plant types according to a certain area and turn so that optimal results can be obtained for certain purposes [1].

Along with increasing population growth, the demand for food, especially rice staple food, also increases. One of the efforts that can be done to meet this demand is by farming rice commodities. The development of rice production in Indonesia during the 2007-2012 period showed a positive growth trend, increasing from 57,157 million tons of GKG in 2007 to 68.956 million tons of GKG in 2012, or grew by an average of 3.86 percent every year and in 2012 it reached 3.86 percent highest production rate. The achievement of rice production in 2012 was caused by an average productivity increase of 2.79 percent (1.39 ku/ha) from 49.80 ku/ha in 2011 to 51.19 ku/ha in 2012, as well as an increase in harvested area of 2.03 percent (268,010 ha) from 13,204 million ha in 2011 to 13,472 million ha in 2012 [2].

West Java Province is one of the national food buffer provinces which is one of the centers of rice production. Therefore, rice farming activities in West Java Province are dominated by rice farming, with lowland rice production in 2013 amounting to 11.54 million tons. Supplier of national food crops with a national rice contribution of 15% with a harvested area of 1.90 million hectares.

Apart from rice, paddy fields can be planted with various other potential crops. One of the commodities that are suitable for planting in paddy fields other than rice is horticulture. Setting cropping patterns in the use of paddy fields is one of the important steps that determine farmers' income. Efforts made by farmers in farming are expected to obtain optimal income. In addition, the arrangement of cropping patterns will determine the use and distribution of farmer labor.

Based on this phenomenon, the author wants to examine the problem of Economic Efficiency of Rice Field Farming in Bogor Regency. This study was conducted to determine what factors affect rice production and the efficiency of using production factors. Thus, it is hoped that the productivity of lowland rice farming can be increased through knowledge of production factors that affect rice production and the number of production factors that must be used so that farmers can obtain maximum income.

1.2. Research purposes

This study aims to (1) analyze the effect of production factors (land area, labor, seeds, fertilizers, pesticides) on lowland rice production in Bogor Regency, (2) analyze the scale of lowland rice farming in Bogor Regency, and (3) Analyzing the allocation of the use of production factors in fulfilling the requirements of economic efficiency

2. RESEARCH METHOD

2.1. Research design

The basic method used in this research is descriptive method in which the researcher collects data, compiles, explains and then analyzes. Determination of the location of the sample in the study was taken purposively, namely the way of sampling by selecting the research area based on the characteristics or reasons that are considered to have a relationship with the problems studied [3]

The determination of the sample was carried out by layered random (multi-stage) with the consideration that the character of lowland rice farming in Bogor Regency had a homogeneous character. The first stage of determining the sample sub-districts is purposively, based on the sub-districts of lowland rice production centers in Bogor Regency which have the largest harvested land area. The second stage, with the selection of four sub-districts, the number of samples was determined using the Quota Sampling method. The size of the sample is set at 400 people.

2.2. Analysis Method

2.2.1. Analysis of the Relationship of Production Factors to Production Results

Analysis of production factors that affect production used regression equations, to see the effect of independent variables on dependent variables, so that it can be seen how much influence the production factors have on production results. The relationship between production factors in the form of land area, labor, seeds, fertilizers and pesticides used in rice farming can be known by performing multiple linear regression.

2.2.2. Business Scale and Economic Efficiency

The condition of the scale of business can be seen from the magnitude of the regression coefficient (b1, b2,bn). The magnitude of the regression coefficient obtained from the Cobb Douglas production function also shows the elasticity of its production, which is greater than one, smaller than one, equal to one, or greater than one. There are three possible alternatives, namely:

- a. Increasing return to scale (IRC), if (b1 + b2 ++ bn) > 1, means that the proportion of additional production factors will result in a larger proportion of additional production.
- b. Constant return to scale (CRC), if (b1 + b2 ++ bn) = 1, it means that in such circumstances the addition of production factors will be proportional to the increase in production results obtained.
- c. Decreasing return to scale (DRC), if (b1 + b2 ++ bn) < 1, it means that the proportion of additional production factors exceeds the proportion of additional production output.

The condition of the business scale can be seen from the magnitude of the regression coefficient (b1, b2,....b5). Values of b1, b2,....b5 which are analyzed to examine the use of production factors to achieve the highest level of economic efficiency using the formula:

$$\frac{NPM_{x1}}{Px1} = \frac{NPM_{x2}}{Px2} = \frac{NPM_{x3}}{Px3} = \frac{NPM_{x4}}{Px4} = \frac{NPM_{x5}}{Px5} = 1$$

Information :

NPM_{xi} : The value of the marginal product for the factor of production Xi. Where the value of NPM_{xi} is the product of the marginal physical product (PFM) with the price of production (P_{xi})

P_{xi} : Factor price Xi

The criteria used are as follows:

- a. $(\frac{NPM_{xi}}{P_{xi}}) = 1$; it means that the use of Xi's factors of production has achieved economic efficiency

- b. $\left(\frac{NPM_{xi}}{P_{xi}}\right) > 1$; This means that the use of Xi's production factors has not yet reached the highest economic efficiency, so Xi's input needs to be increased
- c. $\left(\frac{NPM_{xi}}{P_{xi}}\right) < 1$; This means that the use of Xi's production factors is inefficient, so the use of Xi's inputs needs to be reduced.

Obtained from the Cobb Douglas production function as well as showing the elasticity of production. The amount of elasticity is greater than one, smaller than one, equal to one, or greater than one.

3. RESULT AND DISCUSSION

The return to scale condition of rice farming in Bogor Regency can be seen from the sum of the regression coefficients of each production factor. The equation formed based on the Cobb-Douglas function and the magnitude of the regression coefficient of each variable is:

$$Y = 0.97 X_1^{0.28} X_2^{0.31} X_3^{0.08} X_4^{0.30} X_5^{0.01} X_6^{0.10} X_7^{0.02} X_8^{0.02}$$

$$Y = 0.97 + 0.28X_1 + 0.31X_2 + 0.08 X_3 + 0.30X_4 + 0.01X_5 + 0.10X_6 + 0.02X_7 + 0.02X_8$$

In the equation, it can be seen that the values of b1, b2, b3,...b8 are constant even though the variables involved have been logarithmic. This is because b1, b2, b3,...b8 in the Cobb-Douglas function shows the elasticity of X to Y, and the total elasticity is a return to scale [4].

Based on the sum of the regression coefficients of the production factors is 0.84 or $b_1 + b_2 + b_3 + \dots + b_8 < 1$. This indicates that rice farming in Bogor Regency follows the Decreasing return to scale rule, which means that the proportion of additional factors of production exceed the proportion of additional production. Therefore, it is better to reduce the average farming costs so as to increase profits.

The results of the analysis of the economic efficiency of farming that the comparison value between the value of the marginal product and the price of each production factor is 0.83 for the land area production factor, 0.28 for the labor production factor, 20.98 for urea fertilizer, and 4.36 for KCL fertilizer.

The value of NPM_{xi}/P_{xi} for the production factor of land area is less than one (0.83), which means that economically the allocation of the use of the production factor of land area at the level of 2.1 ha is not efficient. In terms of efficiency, the wider the area of land cultivated, the higher the production and income per unit area [5]. The area of land will determine the scale of the business which in turn will affect efficiency.

However, the increase in production and income must take into account the cost of land rent and labor capacity. The cost of renting paddy fields in Bogor Regency is relatively expensive, namely Rp. 4,200,000, so the incremental benefit is not that big. In addition, the capacity of the workforce must also be taken into account, among others, in terms of the level of knowledge and the age factor. Therefore, to increase the efficiency of land use by increasing land productivity, it can be done by adopting agricultural technology that has been developed. This is in line stated that the development of agricultural technology is a strategic step for increasing agricultural productivity [6].

In addition, farmers need to seek agricultural intensification to increase their rice production, namely with five farming businesses which include the use of superior seeds, irrigation, fertilization of the right type, dose, time and method, optimal eradication of pests and diseases and correct cultivation techniques.

The value of $\left(\frac{NPM_{xi}}{P_{xi}}\right)$ of labor production factors is less than one (0.28) which means that the use of labor in rice farming in Bogor Regency is not economically efficient. An efficiency value that is less than one indicates that the use of production factors in the form of labor is not efficient and to achieve economic efficiency so that maximum profits are obtained, so that labor needs to be reduced.

The average use of labor to work on 1 ha of rice fields in Bogor Regency is 72 HOK with a wage of Rp. 50,000 per HOK. The high wages of labor in rice farming in Bogor Regency are due to the lack of workers who are interested in the agricultural sector and the large number of industrial developments in Bogor Regency so that many agricultural workers turn to industrial employees.

The use of labor in the lowland rice farming system involves male and female workers both from within the family and from outside the family. The labor time during the production process begins with land preparation, seed extraction and planting, irrigation, fertilization, weeding, pest control and post-harvest processing (grain threshing). At certain stages of work, the role of workers outside the family is needed because of the insufficient time that is chosen by the workers in the family, namely in the activities of tillage, removing seeds, planting and harvesting. It is necessary to consider the use of agricultural technology that can save the use of labor. The use of labor that can be reduced is when cultivating the land, with the help of a tractor to plow the land. The use of tractors will save the use of labor and even the time needed to cultivate the land is shorter. This is in accordance with research which states

that the use of tractors can increase productivity, speed up processing time and be more economical [7]. The use of labor from nursery to planting seeds can also be reduced by using a rice transplanting machine (transplanter). The transplanter machine in addition to functioning to fill the shortage of human labor and increasing expensive wages, the use of a transplanter machine can increase farm efficiency through saving energy, time and production costs and with a transplanter machine can save yields and increase productivity. quality of agricultural products [6]. Rice farming by using a transplanting machine for transplanting rice seeds (transplanter) can make working time efficient as much as 14.12 male working days and 23.79 female working days at the nursery to planting stage so that the cost that can be streamlined by using a transplanter machine is Rp. 220,000 per hectare[6]. The use of agricultural technology that can save labor requires large capital, so it is necessary to consider providing capital assistance to farmers.

The value of $\left(\frac{NPM_{xi}}{P_{xi}}\right)$ of urea fertilizer production factor is more than one (20.98). An efficiency value of more than one is an indicator that the use of urea fertilizer production factors is quite efficient and to achieve the highest economic efficiency it is necessary to increase its use. The average use of urea fertilizer in the study area is 200.75 kg/ha, while the recommended recommendation is 250 kg/ha. Stated that the efficiency of the use of N fertilizer is carried out by giving N fertilizer in accordance with the recommendations with the leaf color chart method that can be adjusted to the right dose and time of N fertilizer application[8]. Insufficient use of urea fertilizer will result in poor rice plant growth and affect the number of grains of grain per panicle.

The value of $\left(\frac{NPM_{xi}}{P_{xi}}\right)$ of KCI fertilizer production factors is more than one (4.360) which means its use is not efficient and to achieve the highest economic efficiency it is necessary to increase its use. The average use of KCI fertilizer in rice farming in Bogor Regency is 94 kg/ha, still below the recommendation of 100 kg/ha.

4. CONCLUSION

Based on the results above, it can be concluded that the sum of the regression coefficients of the production factors is 0.84 or $b_1 + b_2 + b_3 + \dots + b_8 < 1$. This indicates that rice farming in Bogor Regency follows the Decreasing return to scale rule, which means that the proportion of additional production factors exceeds the proportion of additional production output. Therefore, it is better to reduce the average farming costs so as to increase profits.

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