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Technical and Economic Efficiency of Arabica Coffee Farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency

Restu Aprianta Tarigan[1], Kelin Tarigan[2], Salmiah[2]

[1,2]Master of Agribusiness Study Program on Faculty of Agriculture of University of Sumatera Utara

Corresponding Author: Restu Aprianta Tarigan

ABSTRACT

This study aims to determine the factors that influence Arabica coffee production, to determine the technical efficiency of Arabica coffee farming and to determine the economic efficiency of Arabica coffee farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency. The method used in this research is descriptive quantitative. The results showed that partially the land area, the amount of labor, organic fertilizers and inorganic fertilizers did not have a significant effect on increasing coffee production, but the number of coffee trees had a significant effect on the increase in coffee production. The average level of technical efficiency in Arabica coffee farming in this village is 0.94 or 94 percent of the potential, this shows that Arabica coffee farming is approaching technical efficiency and there is still a 6 percent chance to increase it. Arabica coffee production in the study area. The use of production factors in coffee farming is not economically efficient in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency, meaning that arabica coffee farmers in this village have not allocated optimal input.

Keywords: Production Factor, Technical Efficiency, Economic Efficiency.

BACKGROUND

Coffee is an important plantation commodity in Indonesia. Indonesia is the fourth largest coffee producing country in the world. Coffee is a plantation crop that has excellent development potential given the high consumption of coffee. According to AEKI data for 2019, Indonesia's coffee production has reached 674,000 tons and more than 80% comes from smallholder plantations. Coffee is one of the assets of a well-known Indonesian product in the world. So far, many types of coffee cultivation have been carried out by farmers, ranging from conventional systems to organic coffee cultivation (Winarni et al, 2013). Coffee products in Indonesia are not only consumed by the local community, but now Indonesia can export coffee to other countries.

One of the coffee producers in Sumatera Utara is Simalungun Regency. The coffee commodity in Simalungun Regency is one of the mainstay commodities and has good prospects. One of the districts that produces a lot of Arabica coffee is Pamatang Sidamanik District, where the natural conditions are favorable for coffee plants, namely an altitude above 1,000 m above sea level. The problem faced by farmers is that they have not been able to produce the quality of coffee beans required for export and that plant productivity is still low (Indonesian Coffee and Cocoa Research Center 2005 and Arifin 2010). Another obstacle in the development of Arabica coffee is that 94% of the coffee is cultivated by the people with cultivation techniques that have not fully implemented good agriculture practice (GAP), low plant productivity due to using random seeds, farmer institutions are still weak, added value received by farmers coffee is still low

because some of the exports are still in the form of coffee beans or cherries, and there is limited capital (Director of Spice and Refreshing Plants 2012). Limited land (Arabica coffee requires cultivation above 1000 masl) is also an obstacle.

One of the production factors that influence the production of coffee farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency is the relatively narrow land used by farmers. The use of existing land for coffee farming is not easy to expand because farmers lack the courage to switch from commodities that they have cultivated previously. According to the Village Profile Data of Sait Buttu Saribu (2018). The area of the field / moor is 150 hectares which makes it possible to cultivate Arabica coffee in the area.

Labor is also an important factor in conducting a farm. The use of labor in coffee farming in Sait Buttu Saribu Village is mostly still using labor outside the family and some labor within the family. The use of labor in this family is carried out during the maintenance of coffee farming which is carried out by farmers. The use of labor outside the family and labor in the family is used during the season for fertilizing and harvesting coffee products. The labor used is the people living in the area around the land cultivated by the farmer.

The allocation of production factors for land, labor, and capital such as fertilizers is one of the main determinants of achieving optimum production. The use of these production factors will affect the level of profit a farmer can receive. But on the other hand, limited land and labor resources make farmers need to allocate input as efficiently as possible so that maximum benefits can be obtained. Therefore, it is necessary to know how efficient the use of these production factors is, whether they are at their maximum capacity. Knowledge of optimum input use allocation is expected to improve the technical and economic efficiency of community arabica coffee farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency.

Efficiency Theory

Efficiency in production allocation has two different views, namely technical efficiency and economic efficiency. Technical efficiency describes the optimum level of production that will be achieved from the use of production factors. Meanwhile, economic efficiency explains the use of inputs that are capable of producing maximum profit. Efficiency basically has a relative meaning, where a level of use of production factors is said to be more efficient than the level of use of other production factors. The indicator of technical efficiency is the achievement of the maximum average product, while the achievement of economic efficiency, namely the achievement of maximum profits, will encourage producers to allocate production factors optimally (Hariyati, 2007).

Technical Efficiency

Technical efficiency describes the highest probability of producing outputs with a single input usage package. Technical inefficiency is the opposite of technical efficiency: producing less than the highest possible use of the input combination. Technical efficiency can be caused by several reasons, some of which are natural conditions and beyond the control of the company management, others are influenced by management decisions. Technical efficiency is a problem for companies because company profits are the difference between revenue and costs. As the company pays and pays for inputs, this increases the firm's costs.

Price or Allocative Efficiency

Allocative efficiency shows the relationship between cost and output. Allocative efficiency is achieved if the company is able to maximize profits, namely equalizing the marginal product value of each production factor with its price. This allocative efficiency occurs when the company produces the most preferred output by consumers (Darwanto,

2010). Price efficiency or used to measure the success rate of farmers in their efforts to achieve maximum profit, where price efficiency is achieved when the product value of each input is equal to its marginal cost. The allocative efficiency test is intended to determine the rationality of farmers in carrying out farming activities with the aim of achieving maximum profit. Maximum profit will be achieved if all production factors have been allocated optimally. The situation is expected to occur if the farmer is able to make an effort if the marginal product value (MPV) for an input is the same as the price for that input, but in reality the farmer works in uncertainty about the input price and other external factors. The optimum use of input is sought by looking at the additional value of one unit cost of the input used with one unit of output produced (Shinta, 2011).

Economic Efficiency

According to Hariyati (2007), the achievement of economic efficiency shows the achievement of maximum profits which will encourage producers to allocate maximum production factors. This is because inefficient use of production factors will have an impact on reducing the output and income earned by farmers. According to Kusnadi et al., (2011), economic efficiency is the multiplication of technical efficiency and allocative efficiency. Economic efficiency is a measure of the relative ability of a company to use inputs to produce output on the use of certain inputs with certain technologies. Measurement of Economic Efficiency requires a must, namely the achievement of technical and allocative efficiency.

Economic efficiency or optimum input combination can be achieved if the following two conditions are met: (a) a necessary condition, namely a condition where the production of the same amount is impossible to produce using a smaller number of inputs, as well as a production in a higher quantity. it is impossible to produce large quantities using the same number of inputs, (b) sufficiency condition (sufficiency condition), this condition is needed to determine the location of the economic efficiency contained in the rational area, because by knowing only the production function, the location of the economic efficiency in the region cannot be determined. Determining the location of this economic efficiency requires a tool which is an indicator of choice, namely in the form of an input-output price ratio (Apsari and Hermawan, 2009).

Conceptual Framework

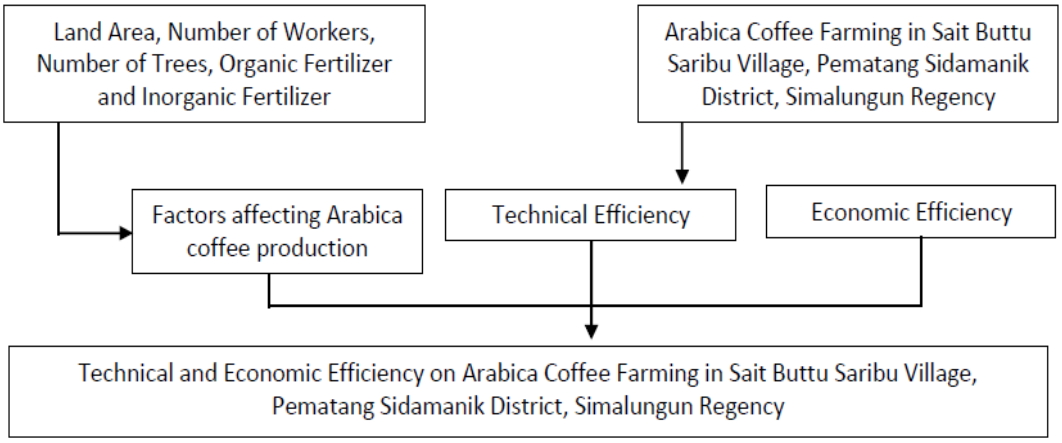

Figure 1: Conceptual Framework

According to Lau and Yotopoulos in Kurniawan (2012), the concept of efficiency can be divided into three, namely: (1) technical efficiency, (2) price efficiency, and (3) economic efficiency. Technical efficiency measures the level of production

that is achieved at a certain level of input use. A farmer is technically said to be more efficient than other farmers, if by using the same type and amount of input, a higher physical output is obtained. Through all these efficiency concepts, the people's Arabica coffee farming in Sait Buttu Saribu Village can be seen as efficient or not, technically or economically.

Hypothesis

H_0 = The factors that influence the people's Arabica coffee farming production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency are land area, number of trees, number of workers, organic fertilizers and inorganic fertilizers. All of these factors are thought to have a significant effect on Arabica coffee production either jointly or directly.

H_1= Arabica coffee farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency is not technically and economically efficient.

RESEARCH METHODS

The method used in this research is descriptive quantitative. In this study, researchers used probability sampling with sampling with the Cluster Random Sampling technique, which is a sampling technique that is applied when the population is found in groups that look uniform but internally remain different. From these clusters several samples were selected randomly or randomly. The research analysis of the cluster random sampling technique was taken from the sample data of these clusters. In this study, the total population of farmers who cultivate coffee in Sait Buttu Saribu Village, Pamatang Sidamanik District is 293 people. The sample used by the author was 75 coffee farmer respondents in Sait Buttu Saribu Village, Pamatang Sidamanik District. In this study, the data obtained are primary data, namely data obtained directly from coffee farmers in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency by using the interview method based on a list of questions that have been compiled. The data taken is in the form of information about the costs incurred to produce coffee and the factors that affect coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency. These factors include land area, number of trees, and number of workers, use of organic and inorganic fertilizers.

The first problem concerns the factors that influence coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency using the Cobb Douglas analysis tool. Through the Cobb Douglas analysis tool, it can be seen which factors affect coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency and how much influence it has on coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency. There are several factors that affect coffee production, including land area, number of trees, and number of workers, organic fertilizers and inorganic fertilizers.

The second problem regarding the technical efficiency of Arabica coffee in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency can be analyzed using the technical efficiency approach of a business. Technical efficiency testing is carried out using the Cobb - Dougglas equation with a frontier regression approach.

RESULTS AND DISCUSSION

Factors Affecting Coffee Production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency

Table 1.Factors Affecting Coffee Production in 2018 – 2020

Variable	Unit	Average per farmer	Average per Hectares
Land area	Hectares	0,62	
Number of trees	Trunks	1.247	2.011
Total manpower	Man	146	235
Organic fertilizers	Kg/ha	6.586	10.622
Inorganic Fertilizer	Kg/ha	905	1.459

The land area is calculated for the average farmer while other factors are calculated for the average per hectare. It can be seen that the average land area of farmers is 0.62 hectares. The number of trees averaged 2011 stems per hectare. The number of workers averaged 235 people per hectare. The average use of organic fertilizers is an average of 10,622 kg / ha and inorganic fertilizers per year 1,459 kg / ha.

Coefficient of Determination (R^2)

Table 2. Value of the Coefficient of Determination (R^2)

Model Summary[b]						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.993[a]	0,986	0,985	0,05330	0,986	929,891

a. Predictors: (Constant), Ln_X1, Ln_X2 , Ln_X3, Ln_X4, Ln_X5
b. Dependent Variable: Ln_Y

The coefficient of determination (R2) of 0.986 or 98.6 percent indicates that the diversity of coffee production can be explained by the factors of production Land area (X1), number of coffee trees (X2), labor (X3), Organic Fertilizer (X4) and Inorganic fertilizers (X5) in coffee cultivation, so the production function is good enough to predict the relationship between production factors and coffee farming production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency. While the remaining 1.4 percent is explained by other variables.

The Effect of Land Area on Coffee Production

The significance level of t X1 (land area) is 0.273, then the significance value of t (0.273)> 0.05, so it can be concluded that H0 is accepted and H1 is rejected, which means that partially the variable land area has no significant effect on coffee production.

This is not in accordance with the theoretical basis according to Yuwono (2011) which states that land is one of the production factors that has a significant contribution to farm production. Agricultural land is a determinant of the effect of agricultural commodity production and the area of agricultural land will affect the scale of business and the resulting production. The more land a farmer owns, it will increase the amount of coffee production. Farmers who have a larger land area do not automatically produce higher coffee production than farmers with a narrower land area. The application of technology and innovation by farmers in the area of coffee farming can also increase coffee production.

The Effect of Number of Trees on Coffee Production

The significance value of t X2 (number of trees) is 0.000 <α (0.05). This shows that H_0 is rejected and H_1 is accepted. This means that the independent variable number of trees has a significant effect on coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency. This is in accordance with Endang's research (2004) that land area, number of plants and fertilizers have a significant effect on coffee production. Thus the more the number of plants planted will increase the amount of Arabica coffee production. This is in accordance with the theory, namely the number of plants as one of the production factors that has a large enough contribution to farming. The level of production from farming, among others, is influenced by the number of plants used (Yunarto, 2008).

The Effect of Number of Workers on Coffee Production

The significance level of t X3 (number of workers) is 0.259, then the

significance value of t (0.259)> 0.05 so it can be concluded that H0 is accepted and H1 is rejected, which means that the variable number of workers partially does not have a significant effect on coffee production. In this case, farmers do not need to add labor input because the addition of labor will not always increase production. Labor used in Arabica coffee farming is labor within and outside the family. The use of labor outside the family is greater than that of the family. Outside the family labor is obtained from people who live around the Arabica coffee cultivation land.

Effect of Organic Fertilizers on Coffee Production

The significance level of t X4 (organic fertilizer) is 0.111, then the significance value of t (0.111)> 0.05, so it can be concluded that H0 is accepted and H1 is rejected, which means that partially the organic fertilizer variable does not have a significant effect on coffee production. The use of organic fertilizers must be considered. Excessive use of organic fertilizers can have a negative impact and can harm farmers. Some of what organic fertilizers have, among others, the quality of compost is inconsistent depending on the raw material. Moreover, if organic fertilizers are made from manure that is not ripe, it can actually harm plants (Anonymous, 2002). Excessive application of organic fertilizers will result in excess nutrients in the soil, an increase in electrical conductivity, and will result in poor soil conditions (Soepardi, 1983: 122). According to Rinsema (1986: 98) excess nitrogen will cause a decrease in boron absorption in plants, boron deficiency will inhibit fruit formation and the development of porous plant roots and stems.

Effect of Inorganic Fertilizers on Coffee Production

The significance level of t X5 (inorganic fertilizer) is 0.383, so the significance value of t (0.383)> 0.05, so it can be concluded that H0 is accepted and H1 is rejected, which means that the inorganic fertilizer variable partially has no significant effect on coffee production. The use of fertilizers must have the five right principles to succeed efficiently and effectively, namely the right type, the right amount, the right method, the right place and the right time. Thus the use of fertilizers must be effective and efficient, so the quality of the soil as a medium for growing coffee will provide the substances needed by plants to produce more optimal fruit production.

Efficiency of Coffee Farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency

Technical Efficiency

Based on data processing, it was obtained that the average technical efficiency reached 0.9429 (attachment 7). This means that the average technical efficiency achieved by coffee farmers in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency is 94 percent of the frontier, namely the maximum productivity achieved with the best processing system, so it can be said that Arabica coffee farming is approaching. technically efficient, considering that technical efficiency is the relationship between the input actually used and the resulting output whose maximum value is 1.

Price Efficiency

Table 3. The Result of Efficiency Analysis of Coffee Production Factor Prices

Production Input	NPM	Px	Efficiency Value	Information
Land area (X1)	938993,54	146972,9	6,389	Not efficient yet
Number of trees (X2)	66360,99	1038600,92	0,064	Not efficient
Labor (X3)	25191,82	2343163,40	0,011	Not efficient
Organic Fertilizer (X4)	-252,59	260344,58	-0,001	Not efficient
Inorganic Fertilizer (X5)	1194,67	169216,9	0,007	Not efficient
EH =		1,294		

Based on the calculation of price efficiency above, it is known that the efficiency of the use of production factors in the research area is 7.88. This shows that the use of production factors in the study area is not efficient in terms of price, because the value of the efficiency of the price is greater than 1, so it is necessary to add production input to make it more efficient.

Economic Efficiency

Economic efficiency is the product of all technical efficiency and price efficiency. With the formula:

EE = 0.943 x 1.294
EE = 1,220

From the results of the multiplication between the values of technical efficiency and price efficiency, it can be seen that the value of economic efficiency is 1,220> 1, this indicates that coffee farming in the study area is not economically efficient, meaning that arabica coffee farming in Sait Buttu Saribu Village has not allocated optimal input. The results of the analysis of economic efficiency also show the need for additional land area to produce coffee. Besides that, it is also necessary to reduce the number of coffee trees per hectare, labor input, organic fertilizers and inorganic fertilizers to reach the optimum point.

CONCLUTION

1. From the data analysis of the factors that influence coffee production in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency, it can be concluded that; Partially, land area, total labor, organic fertilizers and inorganic fertilizers do not have a significant effect on increasing coffee production, it's just that the number of coffee trees has a significant effect on increasing coffee production.
2. The average level of technical efficiency in Arabica coffee farming in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency is close to efficiency.
3. The use of production factors in coffee farming is not economically efficient in Sait Buttu Saribu Village, Pamatang Sidamanik District, Simalungun Regency.

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