



DETERMINANTS OF PRODUCTION OF AGRICULTURAL COMMODITIES OF FOOD CROPS IN BOJONEGORO REGENCY (CASE STUDY OF FARMERS ACCESSING TANI CARD AND NON- ACCESSING TANI CARD)

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ABSTRACT

The Agricultural economy becomes an important issue in developing Bojonegoro's Regency economy through the agriculture development program. Therefore, research dealing with the agriculture economy is still needed. This research aims to find out the influence of Labor, Land Area, Modal, fertilizer, and Farming Card to increase agriculture commodity production of crops in Bojonegoro Regency. This research uses quantitative descriptive research, the source of data used comes from primary data. The number of samples used in this research was 100 respondents. The technique of analyzing data was the ANCOVA method – multiple linear regression by using software EvIEWS 9. The results of the study showed simultaneously labor variables, land area variables, capital variables, fertilizer variables, and farming card variables had a significant effect and positively related to increased production of crop commodities. Partially, labor, land area, and capital significantly and positively correlated to the production of the crops. Meanwhile, fertilizer and Farming Card positively correlated but did not influence significantly the production of the crops. The Proportion of independent variable calculation explains the variance of crop production improvement in Bojonegoro Regency was 78.27%. Meanwhile, 21.28% explained by other variables outside the research. Thus, it is expected that the roles of related stakeholders to improve the agricultural economy.

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ABSTRAK

Ekonomi pertanian menjadi isu penting dalam pembangunan ekonomi Di Kabupaten Bojonegoro dengan adanya program pembangunan pertanian. Oleh karena itu riset tentang ekonomi pertanian masih sangat di butuhkan. Penelitian ini bertujuan untuk mengetahui seberapa besar pengaruh Tenaga Kerja, Luas Lahan, Modal, Pupuk, dan Kartu tani terhadap peningkatan produksi komoditas pertanian tanaman pangan di Kabupaten Bojonegoro. Penelitian ini menggunakan jenis penelitian deskriptif kuantitatif, sumber data yang digunakan berasal dari data primer. Jumlah sampel yang digunakan dalam penelitian ini adalah sebanyak 100 responden. Teknik pengolahan data yang digunakan adalah regresi linier berganda metode ANCOVA dengan menggunakan software EvIEWS 9. Hasil penelitian menunjukkan secara simultan variabel tenaga kerja, variabel luas lahan, variabel modal, variabel pupuk, dan variabel kartu tani berpengaruh signifikan dan berhubungan positif terhadap peningkatan produksi komoditas tanaman pangan. Secara parsial variabel tenaga kerja, variabel luas lahan, dan variabel modal berpengaruh signifikan dan berhubungan positif terhadap produksi komoditas pertanian tanaman pangan, sedang-



kan variabel pupuk dan variabel kartu tani berhubungan positif tetapi tidak berpengaruh signifikan terhadap produksi komoditas tanaman pangan. Proporsi penghitungan variabel independen menjelaskan variasi peningkatan produksi tanaman pangan di Kabupaten Bojonegoro sebesar 78,72% sedangkan sisanya sebesar 21,28% dijelaskan oleh variabel-variabel lain diluar penelitian. Sehingga diharapkan peran stakeholder terkait sangat diperlukan untuk peningkatan ekonomi pertanian.

Kata Kunci: Produksi, Tanaman Pangan, Kartu Tani, ANCOVA

JEL: Q10; C10

Introduction

Sustainable development aims to improve people's welfare, to meet human needs and aspirations (Salim, 1990). Every development is expected to have a positive and sustainable impact on economic and non-economic based development. Almost all developments carried out by the relevant agencies have economic goals and positive effects after the development is realized. Sustainable-based development is essentially looking for equal distribution of development between generations, both now and in the future.

In the economic sector, sustainable development will directly impact the production side, both in the production of goods and in the production of services. Production activities are input processing processes to be processed into outputs that have added value from the previous inputs. The production process must be carried out efficiently and the production results obtained are optimal (Sulferi, 2016). Determine the combination of factors used in the production process. Individuals or groups own every aspect of products contained in the economy. The owner of the production factor will sell it to the entrepreneur and, in return for his services, namely, earn income, and the amount of income obtained from various aspects of production used to produce something equal to the price of the item (Sukirno, 2009).

Production activities have a broad scope not limited to the industrial sector but every sector that uses inputs to obtain the output. The agricultural sector is vital in production activities. Almost every input of production materials is produced from the sector's production output. The agricultural sector is listed in the concept of national income by business field in a broad sense in Indonesia. The agricultural sector is divided into 5 (five): food crops sub-sector, plantation sub-sector, forestry sub-sector, livestock sub-sector, and fishery sub-sector. Of the five sub-sectors, the food crops sub-sector is the one that provides the most significant contribution (Sulferi, 2016).

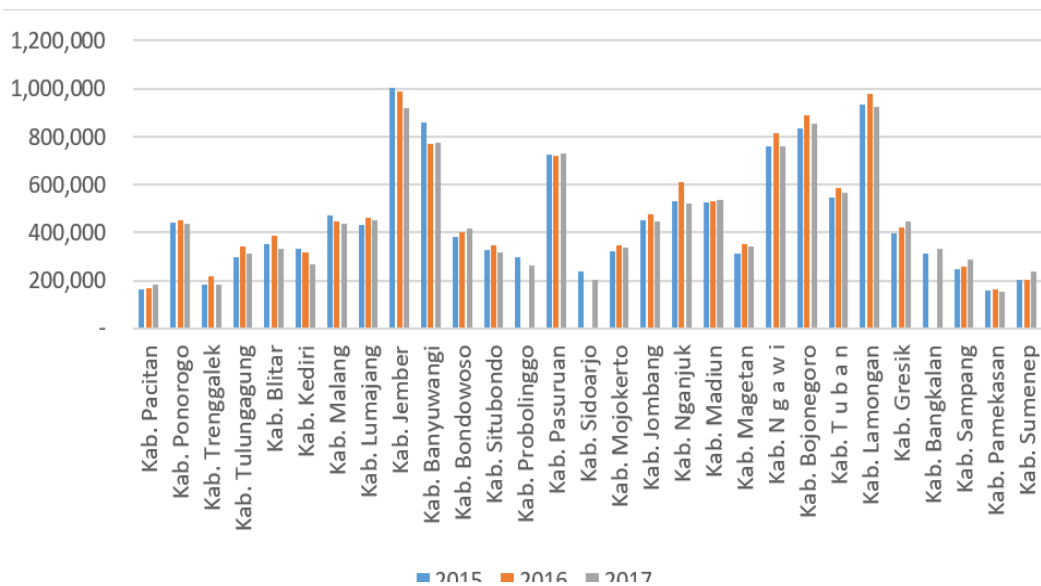
The food crop sub-sector has an essential role in economic development considering the current condition that the food crop sub-sector is a producer of raw materials (Hayati, 2018). Apart from being a producer of raw materials for the food crop sub-sector, it can expand employment opportunities to increase income, aiming to improve the community's welfare, especially farmers. The intensity of food crop production is directed at increasing the production of rice, corn, and sweet potatoes. Rice is an essential commodity in the lives of Indonesian people. Apart from acting as a staple food source for millions of people, rice is also a source of income for farmers. In addition to rice, several regions in Indonesia also use corn and sweet potatoes as staple foods to replace rice and a source of income. Therefore, the availability of essential food ingredients must always be maintained, sustainable and accessible to all levels of society, and even increased (Indriyati & Mustadjab, 2016).

Indonesia is an agrarian country, where the majority of the people depend on farming for a living; therefore, the development of the agricultural sector is a sector that drives the rate of economic growth. Apart from being a driving force for the economy, the agricultural sector is also a pillar that is expected from the growth process of the agricultural sector to be able to meet the needs of public consumption, which tends to continue to increase. It is indicated by the large number of people or workers who depend on the agricultural sector for their living and work. National products originating from agriculture play an essential role in

all national economic activities (Mubyarto, 1991).

The agricultural sector has a vital role in providing food, especially food crops. The progress of the agricultural sector is needed to ensure that the availability of food for the Indonesian population remains sufficient. The creation of food security from the agricultural sector is not only to avoid famine but also to support the development of other business sectors' development. Another hand, the essential thing from food security is how food crop farmers can increase the productivity of existing production factors so that the production process results can meet the needs of family life. Thus, the increased productivity of the agricultural sector, especially food crops, causes an increase in farmers' income, which helps farmers get out of the shackles of poverty (Sugiarto, 2008).

East Java province is one of the largest food suppliers for the Indonesian people. The food supply is produced from the advanced agricultural sector in each city district in the region. Bojonegoro Regency is the third-largest food supplier of all regencies and cities after Jember Regency.



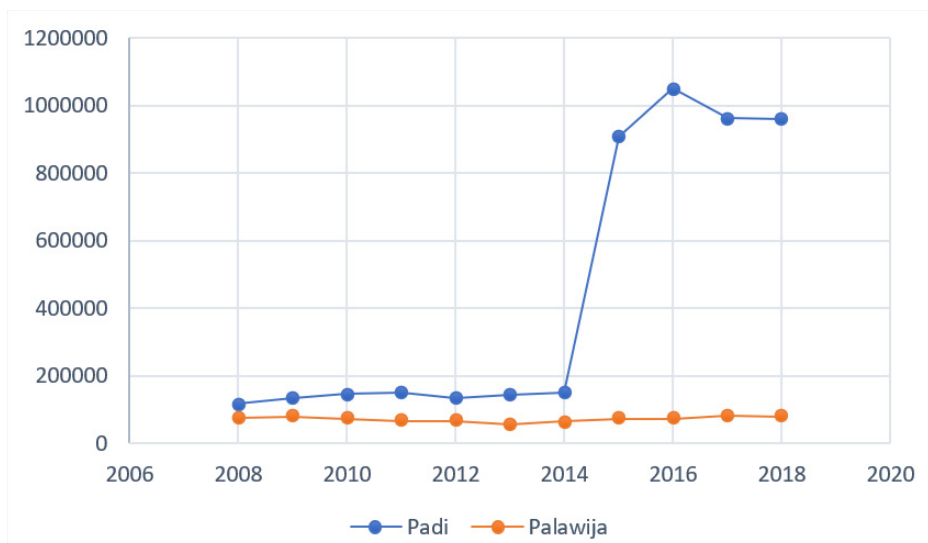
Source: BPS East Java Province 2018

Figure 1: Diagram of Rice Production by District in East Java Province (Tons) 2015-2017

As shown in Figure 1, The diagram of agricultural production of rice commodities in East Java Province shows that agricultural production in Bojonegoro Regency occupies the third position in the total amount of production in East Java after Lamongan Regency and Jember Regency. In contrast to Jember Regency, which continued to decline for three years, the condition of rice production in Lamongan Regency was as follows the case in Bojonegoro Regency. It may be because the geographical conditions are almost the same, only differing from the coastline owned by Lamongan Regency. Production of rice commodities in Bojonegoro Regency tends to fluctuate, and the highest production in 2016 was 890.767 tons and then decreased in 2017, although the decline was not as slight as in 2015.

To increase food crop production in Bojonegoro Regency. Government intervention is needed to support success. In the food crop agriculture sector, the government of Bojonegoro Regency continues to strive for the welfare of farmers through programs that are needed by the farming community. One farmer's welfare support program through increasing food crop production is the farmer card program. The farmer card is a program that will make it easier for farmers to get subsidies, fertilizers, pesticides, as well as sales of agricultural products that will be accepted by State-Owned Enterprises (BUMN) or Logistics Affairs Agency (BULOG) (Mulyanto, 2018). In 2017, the Bojonegoro Regency agriculture office distributed 11,000 thousand farmer cards to farmers in 28 sub-districts in Bojonegoro. The program launched

through the farmer card is quite diverse as a priority scale, namely, farmers who hold farmer cards because farmers who do not get farmer cards do not get subsidies. Although not yet fully distributed, the level of food crop production is emphasized to continue increasing and improving farmers' welfare.



Source: Bojonegoro Regency in Figures for 2008–2018

Figure 2: Rice and Palawija Production in Bojonegoro Regency in 2008 – 2018

In Figure 2, The graph of rice and secondary crops production in Bojonegoro Regency shows that rice and secondary crops production from 2008 to 2014 was relatively stable even though the increase and decrease were still within the standard threshold. From 2015 to 2016, rice production experienced a considerable boost. The increase was caused by the use of idle land by farmers.

Production of rice and secondary crops continued to decline until 2018. In 2017 rice production, which previously reached one million tons, fell to 963,137 tons, and in 2018, rice production continued to decline to 960,231 tons. The fluctuating production of rice and secondary crops experienced a sharp increase and a decline that was relatively inseparable from the factors that affected the production itself. Even though the government has made efforts to increase production, if farmers are less active in developing their production factors, the possibility of production increasing is relatively more minor.

The decline in food crop production in Bojonegoro Regency from 2017 to 2018 was caused by the development of oil and gas mining which the Bojonegoro Regency Government is intensively carrying out. During the development process throughout 2017, around 77,000 hectares of agricultural land experienced shrinkage, 600 hectares of agricultural land were converted into Banyu Urip field, Cepu Block, and 25,317 square meters for housing development for employees and investors for the oil and gas industry (Mulyanto, 2018).

Land or land is one of the factors of production in the agricultural sector in the Bojonegoro district. In contrast to other production input factors, the land is a production factor whose amount is constant and even tends to decrease along with the development of a region. The higher and denser the economic activity of an area, the greater the need for land for the industrial sector. The rapid development of the industrial sector encourages rapid economic growth, but on the other hand, agricultural land is also getting narrower because it is used for industrial sector inputs.

The agricultural sector's land area was caused by the opening of new land for farmers in the area around state forests. The administrative area of the state forest is used as land for cultivation. not only for rice production but also for several other food crops such as corn,

sweet potatoes and so on. Because apart from being easy to plant, it also does not require a lot of maintenance. The increasing number of farmers clearing land in state forest areas indicates that they do not have a place to grow crops or that the land they already own is insufficient to meet the needs of their families.

As experts explain, land inputs are different from labor inputs. Suppose the law of labor input applies Diminishing Return (the added value is decreasing). In that case, the law does not apply to land input; namely, the more significant the input, the greater the output produced because the land is a fatal input factor for all sectors (Sukirno, 2009). If the input factor of land or land does not contribute to food crop production, then other factors affect the production.

Thus, there are still phenomena that cannot be explained by theory from experts, and there are other determining factors for the amount of rice production and other food crops. The incompatibility of rice and secondary crops expected by farmers at harvest can also be caused by factors other than land. The distribution of farmer cards to farmers has also been carried out to increase farmer production and welfare. But the minimal number of farmers who have access to the program has triggered a gap between farmers who receive cards and those who do not receive farmer cards in terms of income and others. With various potentials and problems related to food in Bojonegoro Regency, it is exciting to do further observations. Seeing the need for food is very important, which continues to increase. The area of land that continues to increase should spur an increase in rice and other food crops in Bojonegoro Regency.

Based on these problems, the authors are interested in analyzing what factors affect the production of food crop commodities in the Bojonegoro Regency? What is the role of the factors that influence the production of food crop agricultural commodities in Bojonegoro Regency?

Literature Review

Production Function

The minimum amount of input needed to produce a certain level of output. The production function is a function that relates inputs to outputs and determines the optimum level of output that can produce with a certain number of inputs or vice versa. The production function is determined by the technology used in the production process. Therefore, the relationship between output and input for a production system is a function of the level of factory technology, equipment, labour, raw materials and others used in a company (Arsyad, 2003).

Hernanto (1995) explains that the notion of the production function is to show how much output can be obtained by using several different input variables. The production function can be seen as the relationship between the number of factors of production used to obtain a certain amount of production and as a tool to show the productivity of these results.

Sukirno (2009) explains that the production function shows the nature of the relationship between the factors of production and the level of products produced. Factors of production are also known as inputs, and the amount of production is always referred to as output. The production function is always expressed in the form of a formula, which is as follows:

$$Q = f(K, L, R) \quad (1)$$

A mathematical equation means that an item's production level depends on the amount of capital, labor, and the amount of natural wealth that is simultaneously owned in a production. Where K is the capital stock, L is the number of workers, including educated and

skilled workers, and R is a natural wealth owned. In comparison, Q is the production produced by various production factors simultaneously.

Suppose a production function in empirical research is not much different from the production function. The difference is in inputs that affect two factors, namely K and L, which connects the number of outputs from the sum of the two inputs, namely capital and labor, called the Cobb-Douglas production function. The function also puts the amount of production as a function of capital and labor. Thus it can also explain that the output with a certain quantity can produce a certain level of income. In simple terms, the Cobb-Douglas production function can be written as follows:

$$Q = AL^{\alpha}K^{\beta} \quad (2)$$

Where Q is the output of L and K is labour and capital, respectively. A (constant), α (alpha) and β (beta) are positive parameters which in each case are determined by the research data. The parameter α measures the percentage increase in Q due to a one percent increase in L while K is held constant. Likewise, the parameter, measures the percentage increase in Q resulting from a one percent increase in K while L is held constant. So, α is the output elasticity of capital and labor, respectively. If $\alpha + \beta = 1$, then there is a constant increase in yield on the scale of production, if $\alpha + \beta$ is more than one, there is an increase in yield that increases on the scale of production, and if $\alpha + \beta$ is less than 1, it means that there is an increase in yield that decreases on the scale of production. On the Cobb-Douglas production function (Salvatore, 2008).

Previous Study

[Sulferi's study \(2016\)](#) with the research title "Analysis of Factors Affecting Rice Production in Soppeng Regency". This study aims to analyze the factors that influence rice production in Soppeng Regency. The research method used in this research is quantitative descriptive using secondary data. Secondary data were obtained from the Central Statistics Agency and related agencies. Then the data is processed and analyzed using the multiple linear regression analysis methods.

The results of this study indicate that the labor variable (X1) has a positive and significant effect on the rice production variable (Y). It means that every increase or decrease in the number of workers significantly affects increasing or decreasing rice production in Soppeng Regency. The variable area of land (X2) positively and significantly impacts the variable rice production (Y). It means that every increase or decrease in the land area significantly affects increasing or decreasing rice production in Soppeng Regency. The agricultural technology variable (X3) has a positive but not significant effect. It means that any increase or decrease in agricultural technology has no significant impact on increasing or decreasing rice production in Soppeng Regency.

[Rosdianah \(2017\)](#), in her study, aims to find out how significant the influence of land area, production costs, grain prices, technology, and farmer group participation is on efforts to increase rice production in Pude Village Kajuar District, Bone Regency. The research was conducted using quantitative descriptive research. The data obtained were processed with the required model—data obtained from interviews, observations and questionnaires. The study results showed that simultaneously the variables of land area, production costs, grain prices, technology, and the participation of farmer groups had a significant and positive effect on increasing rice production. And partially land area, fertilizer costs, grain prices, farmer group participation have a significant and positive relationship. In contrast, technology vari-

ables have no significant and negative effects, and pesticide costs have an important but negative impact on efforts to increase rice production. It carried out calculations were to measure the proportion and percentage of the total variation of the dependent variable that the regression model could explain. Based on the regression results, the R squared value of 0.756 shows the independent variable explaining the variation in the increase in rice production in Pude Village, Kajuara District, Bone Regency by 75.6%. In comparison, the remaining 24.4% is explained by other variables outside the scope of the study.

[Hafidh \(2009\)](#) analyzed the effect of labor, capital and land area on lowland rice farming in Rowosari District. The population of this study amounted to 3,489 rice farmers in Rowosari District, Kendal Regency. The sampling technique used to obtain 98 farmers was carried out using a purposive cluster area random sampling technique. The variables in this study were labor (L), capital (M), land area (LL) and lowland rice agricultural production (PUP). The method of data collection is by questionnaire interviews and documentation. Using the Descriptive Percentage Analysis method and the Multiple Linear Regression Model, the average percentage score of the labor variable in lowland rice farming in Rowosari District in 2009 had few criteria. Namely, the category included a few labor usage indicators and working hours indicators. The average score of the capital variable in lowland rice farming in Rowosari District in 2009 is relatively high, with indicators for the use of labor costs.

On the other hand, the [Miftakhuriza study \(2011\)](#) analyzes the effect of land area, capital, labor, and technology on agricultural rice production. The population in this study amounted to 4,300 rice farmers in Batang District, Batang Regency. The sampling technique used to obtain a sample of 97.72 rounded up to 100 farmers was carried out by stratified random sampling. The variables in this study are land area, capital, labor, technology and agricultural rice production. Data collection methods used are interview questionnaires and documentation. The data obtained were processed using multiple linear regression analysis. The multiple linear regression analysis results on the empirical model obtained the regression coefficient values of each independent variable on rice farming in Batang District. Namely, the Variables of Land Area, Capital, Labor, and Technology had a positive effect on Rice Farming Production. The results of the partial t-test hypothesis test obtained that the land area, capital, and labor were significant while the technology was not. The joint F test of 134,854 with a significance of 0.00 together, rice farming production is influenced by land area, capital, labor, and technology by 85%.

[Pamuncak et al. \(2019\)](#) analyzes the portion of fertilizer costs in the total cost of food crop production the effect of fertilizer use on food crop production performance in Indonesia. The data used in this study are time-series data obtained from the Food and Agriculture Organization (FAO) FAOSFAT and the Central Statistics Agency (BPS) publications. The first objective was analyzed using descriptive statistics, and the second objective was analyzed using econometric techniques: linear production function, logarithmic function, and quadratic function. The study results indicate that the percentage of fertilizer costs to the total cost of food crop production is relatively small. The considerable level of each fertilizer for the food crop production process is different. It is distinguished from the maintenance and land rent cost, which is 10.40 percent for lowland rice, 7.80 percent for upland rice, 12.00 percent for lowland rice—corn, and 4.80 percent for soybeans. The application of fertilizer use has a significant role in the performance process of rice, corn, and soybean production. This research provides input so that the policies issued by the government are even better to ensure the availability of fertilizers to the basic level of farmers to improve the performance of food crop production in Indonesia.

Framework

A land area or land is the primary resource. The area of land dramatically affects the production of food crops. If the land area for food crop production is more expansive, the production of food crops will also increase. The framework of thought below can explain that labor production factors assume that all residents work in the food security sector with other production factors. If they can use them optimally, they can increase production to the maximum.

Agricultural technology is inseparable from the role of technology which is currently still being developed. With advances in technology, the idea arises to apply technology in agriculture. However, technology cannot be reached by all levels of farming society. Capital concerning the production of food crops is very influential on its capacity. But it is slightly different from the agricultural sector because most farmers are small farmers whose capital is spent to finance other factors besides labor. The higher the capital, the faster the production process because if you think there are more workers, the faster the production process and vice versa.

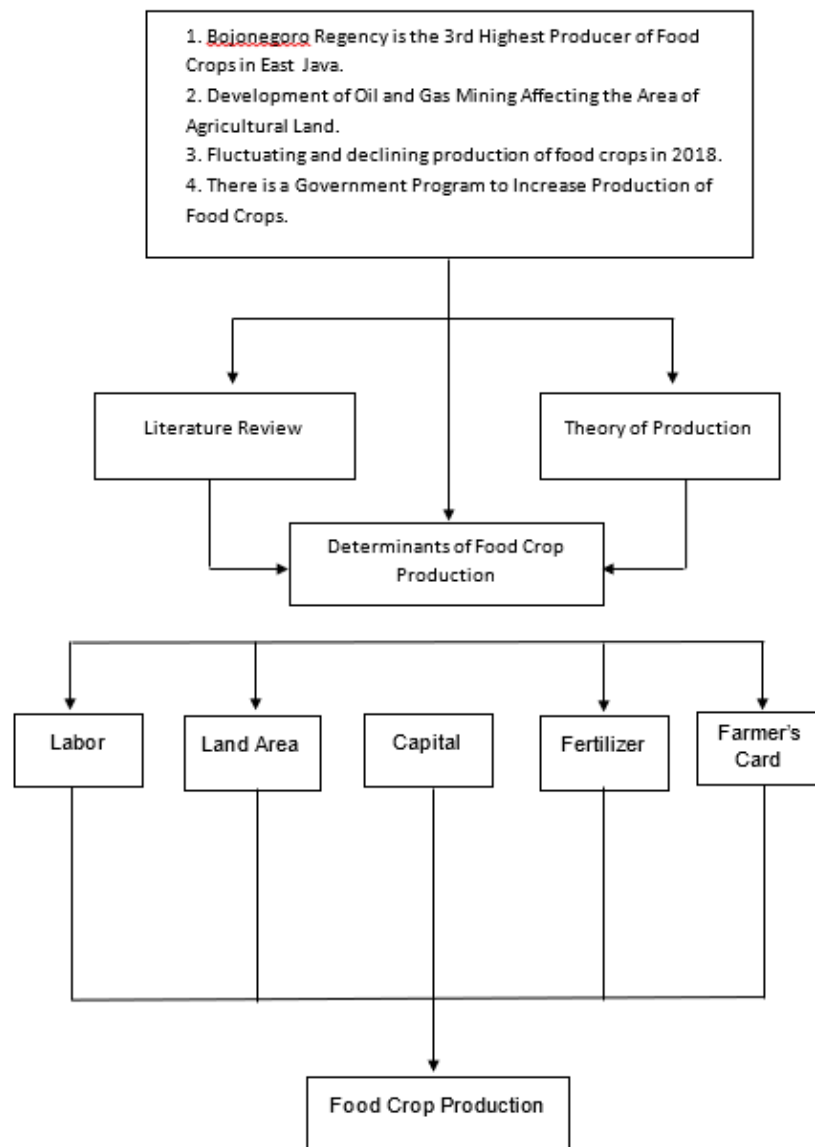


Figure 3: Framework

Furthermore, fertilizers in the agricultural sector are essential, as is the food crop sub-sector. Fertilizers can support the quality and quantity of the production of each food crop. If the required dose uses the fertilizers, then production can increase and have good quality fertilizers in this case, including organic and inorganic fertilizers. From the theoretical review, there is a relationship between each variable which can be seen in the following framework:

The explanation of the framework of thought is food crop production as the dependent variable. Meanwhile, labor, land area, capital, fertilizer, and farmer's card are independent variables that will affect food crop production. The farmer card on the independent variable describes the ownership pattern of a program from the government, namely the farmer card program. In the distribution process and its application, not all farmers get or get the farmer card program because there are farmers who can access it. Some farmers cannot access it.

Methodology

The research approach used is a quantitative descriptive research approach. In analyzing the magnitude of the influence between the dependent variable on the independent variable, an econometric estimation model can be used, namely, a scientific approach model in the use and development of mathematical methods statistics to estimate the relationship between variables in proportion to the data obtained.

The population in this study was 11,000 farmers spread over several sub-districts and could represent other sub-districts based on production results and environmental conditions. In addition, sampling also pays attention to farmers who get access to farmer cards from the Bojonegoro district government and samples from farmers who do not get access to farmer cards for comparison.

The research was conducted in Bojonegoro Regency, East Java Province. The study was conducted from December 2018 to April 2019. The research location was chosen purposively (deliberately). Bojonegoro Regency is one of the largest food crop-producing districts after Jember Regency in East Java Province. It carried out the research location in sub-districts that had received farmer card distributions from the Bojonegoro district government. The sub-districts taken as research objects represent all other sub-districts in terms of geographical conditions and food plant products produced. Based on the mapping of the Bojonegoro district area, namely the 2017 Food Crops and Horticultural Agriculture Service, the production of food crops in Bojonegoro Regency is in all sub-districts. However, the highest production of food crops is rice and corn commodities.

Empirical Model

The empirical model used in this study will estimate the determinants of increased production of food crop agricultural commodities in the Bojonegoro Regency. The model was estimated using multiple linear regression analysis. The empirical model used is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon_i \quad (3)$$

To estimate the regression coefficient, use the logarithmic function to calculate the value of each independent variable on the dependent variable, where there is an unequal unit of measure between the independent variable and the dependent variable if it is entered into the model so that the following equation is obtained:

$$\text{Log}Y = \beta_0 + \beta_1\text{Log}X_1 + \beta_2\text{Log}X_2 + \beta_3\text{Log}X_3 + \beta_4\text{Log}X_4 + \beta_5X_5 + \varepsilon_i \quad (4)$$

Where:

Log	: Logarithm
$\text{Log} Y$: Rice production (Kg)
$\text{Log}X_1$: Total labor
$\text{Log}X_2$: Land area (ha)
$\text{Log}X_3$: Capital (IDR)
$\text{Log}X_4$: Fertilizer (Kg)
X_5	: Farmer's card (ownership)
β_0	: Constant
$\beta_{1,2,3,4,5}$: Coefficient
ε	: Error term

Variable Operational Definition

The research variable is the object of research or what is the point of attention of a study in this study consisting of two variables, namely the independent variable (free) and the dependent variable (bound) (Arikunto, 2002). The independent variables in this study are labor (X1), land area (X2), amount of capital (X3), amount of fertilizer (X4), and Farmer's Card (X5), while the dependent variable is a variable that is influenced by other variables. The dependent variable in the study is the amount of food crop production (Y). Each research variable is described as follows:

- Production of food crops (Y) is the total production or yield of superior commodities from farmers' land during one harvest season, measured in kilograms (kg).
- Labor (X1) is the amount of labor used by farmers during one harvest season.
- Land area (X2) is the land used by farmers, rice fields and fields to cultivate food crops, measured in one hectare (ha) per the last harvest.
- Capital (X3) is the total cost used to process agricultural inputs measured from maintenance costs, planting costs, and harvesting costs used for one job in one harvest season in rupiah (Rp).
- Fertilizer (X4) is a material with chemical elements used for the input process. To get better results, fertilizer can be measured from organic and inorganic fertilizers used in one harvest season in kilograms (kg).
- Farmer's Card (X5) is a program from the government in the form of a card system that is useful for farmers to get government assistance through agencies that the government has appointed.

Analysis Method

ANCOVA Analysis

ANCOVA is an analytical technique that can increase the precision of an experiment because it has adjusted the influence of other uncontrolled variables. ANCOVA analysis is used when the independent variables include variables that cannot be calculated or qualitative

(dummy variables) and quantitative variables. The ANCOVA analysis aims to determine the effect of treatment on the response or qualitative variables by controlling other quantitative variables.

ANCOVA analysis there are two types of decomposition of the number of squares commonly used, namely SS Type I and SS Type III. In this study, the type used is SS Type I. The process is carried out by entering the covariate into the equation first, and it is assumed that the covariate has a linear relationship with the independent variable. So hypothesis testing is only done once to determine the effect of different treatment categories on the independent variables.

The dummy variable in this study is the independent variable, namely the farmer card, where cannot quantify the farmer card because of ownership status. If it is included in the equation model, the following hypothesis is obtained:

H_0 = Farmers without farmer cards

H_1 = Farmer receiving farmer card

By making the following decisions:

H_0 = Accepted if the significant value degree of error 5% (0.05)

H_1 = Accepted if the significant value degree of error 5% (0.05)

Multiple Linear Regression Analysis

Multiple linear regression analysis is a linear relationship between two or more independent variables (X_1, X_2) with the dependent variable (Y). This analysis aims to determine the direction of the relationship between the independent variable and the dependent variable, whether each independent variable is negatively or positively related, and helps predict the value of the dependent variable if the value of the independent variable increases or decreases (Mansuri, 2016).

To test whether the proposed hypothesis is about how much influence between variables or factors is used in influencing the level of food crop production, the authors use multiple linear regression analysis models. Systematically the variables are entered into the form of equations, namely:

$$Y = (X_1, X_2, X_3, X_4, X_5) \quad (5)$$

Results and Discussion

Multiple Linear Regression Analysis With Ancova Method

The multiple linear regression equation can be seen from the table of coefficient test results based on the output of the Eviews version 9 application on six variables, namely the production variable, the labor variable, the land area variable, the capital variable, the fertilizer variable, and the farmer card variable. Linear regression analysis will show the relationship between the independent and dependent variables. The relationship that will show is positive and negative. If the relationship is positive, the dependent and independent variables are in the same direction. If it is negative, then the dependent and independent variables are in the opposite direction. The results of multiple linear regression are shown in the following table:

Table 1: Results of Multiple Linear Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Konstanta	3.483814	0.970665	3.589101	0.0005
Labor (X1)	0.314200	0.112903	2.782929	0.0065
Land Area (X2)	0.418933	0.081847	5.118501	0.0000
Capital (X3)	0.206185	0.079792	2.584043	0.0113
Fertilizer (X4)	0.094888	0.096273	0.985611	0.3269
Farmer's Card (X5)	0.042578	0.069622	0.611566	0.5423

Based on Table 1, can be seen in the results of the regression coefficient (β) above, it can be obtained a linear equation model as follows:

$$\text{Log}Y = \beta_0 + \beta_1 \text{Log}X_1 + \beta_2 \text{Log}X_2 + \beta_3 \text{Log}X_3 + \beta_4 \text{Log}X_4 + \beta_5 X_5 + \varepsilon_i \quad (6)$$

$$Y = 3.483 + 0.314X_1 + 0.418X_2 + 0.206X_3 + 0.094X_4 + 0.042X_5 + \varepsilon_i \quad (7)$$

The regression equation results above can be interpreted as follows: (1) The value of the coefficient β_0 is 483 and is positively correlated if the variables of labor X1, land area X2, capital X3, fertilizer X4 and farmer cards X5 are constant $X = 0$. The production of food crop commodities is 438. (2) The value of coefficient β_1 is 0.314 and is positively correlated. It means that if the labor variable increases by 1% while the variables of land area, capital, fertilizer, and farmer cards are constant, the production of food crop commodities increases by 0.314%. (3) The coefficient value of β_2 is 0.418 and is correlated. It means that if the variables of labor, capital, fertilizer, and farmer's cards are constant, and the variable of land area increases by 1%, the production of food crops will increase by 0.418%. (4) The value of coefficient β_3 is 0.206 and has a positive correlation. If the variables of labor, land area, fertilizer and farmer's cards are constant while the capital variable has increased by 1%, then food crop production will increase by 0.206%. (5) The value of coefficient β_4 is 0.094 and is positively correlated. If the fertilizer variable increased by 1% while the labor variable, land area variable, capital variable and farmer's card were constant, then food crop production increased by 0.094%. (6) The coefficient value of β_5 is 0.042 and is positively correlated. It means that if the labor variable, land area variable, capital variable, and fertilizer variable are constant and the farmer card variance has increased by 1%, the production of food crops will increase by 0.042%.

After the econometric statistical test, the study results showed that the labor variable had a significant positive effect on food crop production in Bojonegoro Regency. Because in the agricultural sector, labor has an important role, the need for labor is not only in the planting process but also in the maintenance process up to harvesting for one harvest. In practice in the field, the labor used comes from external households and prefers the use of the family as labor in the production input process.

Workers who come from farming families themselves are defined as family contributions to agricultural production as a whole and are never valued in rupiah (Mubyarto, 1991). So in this study, the calculated workforce is workers who come from outside the farmer's family. In agricultural practice, workers also get wages calculated in hours or days. The labor used by farmers is adjusted to the area of arable land. If the labor used is excessive, it will result in the law of diminishing returns.

The significant labor variable on food crop production is also by research conducted by [Hafidh \(2009\)](#) and research ([Hayati, 2018](#)), which measures the effect of the use of labor on rice production. It shows that in the use of labor, the farmers do according to simple calculations but have a relatively good level of accuracy. If using excessive or insufficient labor, the input of labor will be a burden for farmers.

Land or arable land has an essential point in the agricultural production process; without land, the production process cannot be carried out; therefore, land placement is the primary basis for the agricultural production process. The research results on the land area variable can be seen in Table 1, which shows that the land area variable has a significant effect on food crop production. It shows that the land managed by farmers is a narrow area, whereas if farmers want to increase agricultural production, they must increase the area of land managed ([Budiasa, 2011](#)). In Bojonegoro Regency, the land area managed by farmers is on average 0.25 hectares.

The study results are supported by [Sugiartiningsih \(2012\)](#) that the land area shows a positive direction towards agricultural production. It means that an increase will follow an increase in land area in production. Land area is the main factor in the production process of the agricultural sub-sector. Still, it cannot be separated from the planting model and the planting season of each commodity. Research conducted by [Andrias et al. \(2017\)](#) shows that the area of arable land has a positive and significant impact on farm production. The influence of land area will not only impact the farm's production. Still, it will also affect the technology transfer process and its application in agricultural development. If the land controlled by the farmers is still in the form of boxes and narrow, then the technology transfer process will take longer; therefore, a joint movement is needed to fulfil the technology transfer.

The land cultivated by farmers in Bojonegoro Regency is on paddy fields, and farmers manage forest land or land owned by Perhutani. Besides that, farmers who have a large area of arable land on average have the capital to rent the land to be managed by themselves. So basically, farmers can increase the land area by minimizing capital, namely renting land or with total capital, namely buying new land. The use of capital will have a positive effect on increasing land area. Still, back to the condition of farmers in the research area, on average, they will be at the end of non-productivity, and farmer regeneration is needed to manage land better.

On the other hand, the capital variable has a positive and significant effect on food crop production in Bojonegoro Regency. Capital has an essential role in supporting the production function in the production function. In contrast, if the capital owned is small, the input to be given will also be limited. On the other hand, the capital variable has a positive and significant effect on food crop production in Bojonegoro Regency. The farmers in the research area have an average capital of 5 million rupiahs. In the agricultural production process, the capital is relatively minimal, and farmers must adjust to the inputs to be used.

This research is supported by [Kartikasari \(2011\)](#), which shows the results of the capital variable have a positive and significant influence on agricultural production. So the greater the amount of capital used, the greater the production produced. However, this applies to the law of diminishing returns. If the capital used continues to be increased while other variables are constant, the first will increase the amount of production. If it continues, then the amount of production will reach a point of decreasing yield. Therefore, capital that continues to rise must be followed by additional land that continues to increase.

the fertilizer variable was positively related but did not affect farmers' production. Fertilizer is a supporting factor in the agricultural production process. The use of fertilizers, in general, can provide additional production results because fertilizers contain chemicals that can stimulate plant growth. However, fertilizers can also be a disaster for farmers if used long-term, mainly inorganic chemical fertilizers. In the long term, inorganic fertilizers can damage

soil nutrients, reducing soil fertility (Budiasa, 2011). In addition, fertilizers that are not in the correct dose and time will also affect the development of plants that are more focused on leaves and reduce the amount of fruit produced.

This research is supported by Gunawan (2018), showing the results of the study on the fertilizer variable are not significant. Fertilizers variable is not significant are caused by farmers who apply fertilizers excessively and not on time. According to Suriadikarta & Simanungkalit (2006), balanced fertilization is the application of fertilizer into the soil with the appropriate amount and type of nutrients according to the level of soil fertility and the needs of plants to achieve optimal results. Research by Nabilla (2016) showed the same results. Namely, the fertilizer variable did not significantly affect farmers' production. Excessive use of inorganic fertilizers will decrease soil fertility, and the land will become dry and difficult to cultivate at a particular time.

Fertilization that is not by the time and dose given and the lack of organic sources for plants and soil will affect plant development. Research by Silvira et al. (2012) shows that fertilizer does not significantly affect farmers' production. Farmers who fertilize on a large scale at the age of more than 25 days will cause plants to feel the need for food sources is being met. It will result in green plant leaves while flowers will experience a slowdown in fruiting, and after fruiting, the results are less than optimal because the nutrients obtained by plants has been transferred to the leaves, not to the fruit.

The farmer card is a program or policy from the Bojonegoro Regency government to increase food crop production. Table 1 shows that the farmer card variable is positively related but has no effect on farm production. The farmer card program does not affect farmers' production due to external and internal factors of the program.

Internal factors come from the farmer's card program. Namely, the distribution and supervision of the program are still less effective. Of the research respondents who received farmer cards, as many as 15% were not members of farmer groups. Of course, it would be an obstacle because of all forms of assistance and notifications about the program through farmer groups. In terms of supervision, there is a lack of supervision on program sustainability. Supervision can be in the form of program effectiveness and counselling on using the card.

The external factor that causes the farmer card program not to increase farmers' production is the lack of farmer knowledge about the procedures for using and functioning the card. The lack of education obtained by research respondents resulted in technological backwardness. The farmer card program is closely related to internet technology. On the other hand, most farmers have graduated from elementary school, and some have never had an education. It makes farmers not understand the use of the card and the absence of counselling on how to use the card from the department or local government.

Government policies or programs that are not supported by supervision and notification will result in ineffective implementation (Arifin, 2001). Supervision and counselling are also needed so that the program implementation process can run according to what is expected and the budget that has been disbursed can be appropriately used (Rusli, 2010). On the other hand, policies or programs that are not by the medium-term and long-term plans will only make the budget not correctly absorbed. The farmer card program can help farmers carry out the production process if the program goes according to plan and can be accounted for.

Conclusion

Based on the results of the analysis of the factors that affect the production of food crop agricultural commodities in Bojonegoro Regency and the results of the discussions described in the previous chapter, we can draw the following conclusions: (i) Based on the results of the analysis and discussion that the variables of labor (X1), land area (X2), capital (X3), fertilizer (X4), and farmer cards (X5) simultaneously have a significant effect and have a

positive correlation to the increase in variables (Y) production, namely the production of food crop commodities in Bojonegoro Regency; (ii) Based on the individual analysis results, the labor variable has a significant and positively correlated effect on food crop production; (iii) Based on the partially analyzed variable land area, there is a significant and positively correlated effect on food crop production; (iv) Based on the results of a partial analysis of the capital variable, there is a significant and positively correlated effect on food crop production; (v) Based on the partial analysis results, the fertilizer variable is positively correlated and has no significant effect on food crop production; (vi) Based on the partial analysis results, the farmer card variable is positively correlated and has no significant effect on food crop production.

Based on the conclusions that have been drawn, here are some suggestions from the author that can be given based on the results of this study are as follows: (i) To increase the production of agricultural commodities for food crops, the government and related parties are expected to provide farmers with appropriate technology, production land, and light capital assistance because it plays an essential role in increasing farmers' production. (ii) In launching programs to increase production and farmers' welfare, the government must be targeted and effective. The government should know the conditions directly before assisting in the program. In addition, farmers need help in the form of socialization, direct monitoring, and gradual coaching. (iii) The Government of Bojonegoro Regency, especially the Department of Agriculture, is expected to make policies by the needs and conditions of farmers. Especially policies that are pro-small farmers and empower farmers not only to enable farmers to use farmers as consumers of agricultural medicines for related parties. (iv) To earn sufficient income to meet their daily needs, farmers should form farmer cooperatives or make good use of existing farmer groups by adding multifunctional value as farmer groups and cooperatives. So that it can assist farmers in obtaining information about agriculture, capital loans, assisting production marketing, and no less important is the transfer of knowledge, technology and information so that farmers can be more independent. (v) To obtain optimal production results, farmers use an efficient workforce of as many as 24-26 people, while inefficient use of capital, farmers can spend as much as Rp. 3,000,000 – Rp. 3,300,000. The use of labor and capital applies to farmers with a land area of 0.25 hectares.

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