ANALYSIS OF THE INFLUENCE OF SEEDS, LABOR, AND FERTILIZER USE ON EDAMAME SOYBEAN PRODUCTION AT PT. TWESEVEN FARM PARTNERS IN JEMBER DISTRICT

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Abstract: The aim of the research is 1.) To test and analyze the influence of production factors, namely land area, seeds, labor, and partial use of fertilizer on edamame soybean production at PT Mitra Tani Dua Tujuh. 2.) To test and analyze the influence of production factors, namely land area, seeds, labor, and simultaneous use of fertilizer on edamame soybean production at PT Mitra Tani Dua Tujuh. This research uses quantitative descriptive methods. The types of data used are primary and secondary data, data collection techniques used are interviews, observation, questionnaires and documentation. The research was conducted at one of the edamame soybean producing centers in Jember Regency, namely PT Mitra Tani Dua Tujuh. In this research, cross section data is used, namely data that describes the situation at a certain time. The number of samples taken in this research was 46 foreman farmers who worked at PT Mitra Tani Dua Tujuh. The analytical tool used in the research is regression from the *Cobb-Douglas production function* which is calculated using a multiple linear regression equation. The research results that can be concluded are that in partial regression testing there is a positive and significant influence between the seed variable (X_2) and the labor variable (X_3) on edamame soybean production while the fertilizer use variable (X_4) has a positive but not significant influence on Edamame soybean production. In simultaneous regression testing, there was a significant influence between the seed variables (X_2), labor (X_3), fertilizer use (X_4) on edamame soybean production at PT Mitra Tani Dua Tujuh in Jember Regency.

Keywords: Production Factors, Edamame Soybeans, *Cobb-Douglas*

Abstract : This observation had several purposes, namely: 1) to examine and analyze the production factors that affect the object related, in this case the width of field, seed, human resource, and the partial use of fertilizer towards the Edamame at PT Mitra Tani Dua Tujuh 2) to examine and analyze the production factors that affect the object related, in this case the width of field, seed, human resource, and the simultaneous use of fertilizer towards the Edamame at PT Mitra Tani Dua Tujuh. This observation brought descriptive quantitative method on the table. Primary and Secondary data were involved while some techniques were incorporated as well, namely interviews, observations, questionnaires, and documentation. This observation was conducted at one of the Central Producers of Edamame Bean in Jember District, and took a place at PT Mitra Tani Dua Tujuh. In this process, cross section data was chosen to implement the observation, where a data would describe a condition at a certain period of time. There were 46 head farmers who worked at PT Mitra Tani Dua Tujuh took a part as an example to the observation. The analyzing method used was the regression of production function of *Cobb-Douglas* in which the calculation was determined in the doubled linear regression equality. The summary of this observation explained that partial regression examination remained positive and significant effect between Variable of Seed (X_2) and Variable of Human Source (X_3) towards the Production of Edamame Bean, while Variable of Fertilizer use (X_4) still contributed positive effect but not much significant in giving production of Edamame Bean. The examination of simultaneous regression remained a significant effect between Variable of Seed (X_2), Variable of Human Source (X_3), Variable of Fertilizer use (X_4) towards the production of Edamame Bean at PT Mitra Tani Dua Tujuh in Jember District .

keywords : Production factors, Edamame, *Cobb-Douglas* .

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INTRODUCTION

Indonesia is a country that has natural resources in the form of relatively large and fertile land. With climate, temperature and humidity that are suitable for the growth needs of staple food crops, almost all staple food crops (grains, tubers and nuts native to Indonesia) can grow relatively well. One type of food crop that is really needed by the majority of the Indonesian population is soybeans. Soybeans are one of the commodities whose supply in Indonesia is increasingly unlikely to be met from domestic production. Even if it can be grown in the simplest way, it is almost impossible for domestic productivity and production to meet the increasing demand (www.bi.go.id).

Edamame is a soybean from Japan, which is popular as a healthy snack in the Land of the Rising Sun (Japan). This type of soybean can grow well in the agricultural fields of East Java, Indonesia. The opportunity for Indonesian farmers to meet the needs of the international edamame market is still wide open. Since 1992, PT Mitratani Dua Tujuh (Mitratani) has succeeded in cultivating jumbo-sized soybeans of the *"Ryokkoha" variety* . Apart from being superior in quality and size, the protein content of soybeans, called edamame, is also higher than ordinary soybeans. Edamame is not a type of legume, but is included in the vegetable category (*green soibin vegetable*). In Japan, the country of origin of soybeans, edamame is a tropical plant and is used as a vegetable and health snack, soybeans are categorized as *healthy food* .

Every year, PT Mitratani exports edamame to Japan. The company, which is headquartered in Mangli, Jember, East Java, exports 3,000 tons of edamame in the form of fresh frozen products per year. The turnover of the company whose shares are owned by PT Mitratani (56%), PT Bahana Artha Ventura (26%), and PTPN X (18%), reaches USD 5 million (around Rp. 42.8 billion) per year. The edamame market is still wide open. Every year, the Japanese market needs a supply of at least 100 thousand tons. Of this amount, around 70 thousand tons were supplied from a number of countries such as China, Taiwan and Thailand. This means that PT Mitratani, which is the only edamame producer in Indonesia, is only able to supply 3% of market needs there (http://www.surabayapost.co.id).

Seeing the potential and market opportunities that are still large is an opportunity for PT. Mitra Tani Dua Tujuh to increase edamame soybean production to become a supplier of frozen edamame soybeans to the Land of the Rising Sun (Japan) and to meet domestic market demand, edamame cultivation is carried out by renting land and planting edamame soybeans as a means of production. In each edamame soybean planting area, it is headed by a manager. Up to now there are 8 managers who are in charge of the edamame soybean cultivation process in the Jember Regency

area and each manager has 8-9 foremen who are assigned to supervise and become technicians in the edamame soybean cultivation spread across in various regions in Jember Regency. Each foreman has his own share of seeds, depending on the size of his land. Seed requirements for one hectare of land require 110 kilograms/ha. but PT Mitratani's production capacity is still very limited. In a day, the edamame production capacity is only 25 tons. This is sometimes hampered by a lack of raw materials. Because of this, this company is only able to export 3,000 tons of frozen edamame per year.

Table 1.1 Edamame Production Data for 2004-2009 at PT Mitratani Dua Tujuh.

Year	Harvested Area(Ha)	Production (Tons)
2004	930	4200
2005	1005	4540
2006	1110	5370
2007	895	4380
2008	860	5250
2009	740	5220

Source: PT Mitratani Dua Tujuh *in* Dewi, 2011

Based on the background above, the researcher wants to conduct research using land area, seeds, labor and fertilizer as factors that influence the production of edamame soybeans at PT. Mitra Tani Dua Tujuh, that is why this research takes the title "Analysis of Factors that Influence Edamame Soybean Production at PT. Mitra Tani Dua Tujuh in Jember Regency"

The objectives of this research are 1.) Test and analyze the partial influence of land area, seeds, labor and fertilizer use on edamame soybean production at PT Mitratani Dua Tujuh in Jember Regency. 2.) Test and analyze the simultaneous influence (land area, seeds, labor, fertilizer use) on edamame soybean production at PT Mitratani Dua Tujuh in Jember Regency.

METHODOLOGY

The type of research used in this research is *quantitative descriptive research* , namely a research method that aims to create a systematic, factual and accurate description or picture of the properties, relationships and influences between the phenomena being investigated.

The population of this research is edamame soybean foreman farmers who work with PT Mitratani Dua Tujuh, totaling 46 foreman farmers spread across the Jember Regency area. In this research, the sampling method was carried out using a *simple cluster sampling technique* , meaning that the researcher groups the analysis units in the population into clusters which are the units from which the sample will be taken.

The research instrument used in this research is a data sheet (questionnaire), namely data on

planting results or input formulation (land area, seeds, labor, fertilizer use) and output results obtained by PT Mitratani Dua Tujuh edamame soybean farmers in Jember Regency. Determining the research location was carried out deliberately (*purposive methods*). The research location chosen was Jember Regency. The location determination was based on the consideration that Jember Regency is a center for export edamame production, namely at PT. Mitra Tani Dua Tujuh, whose address is Jl. Brawijaya No. 83 Jember. Data collection time starts from July 2012 to August 2012.

The analysis technique used in this research is multiple linear regression of the *Cobb-Douglas production function* . The calculation technique is assisted by using *SPSS 17 for Windows software* . The output value function for edamame soybean production that will be studied can be formulated using the *Cobb-Douglas production function regression* as follows:

$$LogY = \beta0 + \beta1 Log\ X1 + \beta2 Log\ X2 + \beta3 Log\ X3 + \beta4 Log\ X4 + e$$

Information :
Y   : Edamame Soybean Production Output Value
X_1 : Land area
X_2 : Seed
X_3 : Labor
X_4 : Fertilizer Use
β0   : Constant
β1   : Regression coefficient of factor X1
β2   : Regression coefficient of factor X2
β3   : Regression coefficient of factor X3
β4   : Regression coefficient of factor X4
e   : error

Classical assumption testing needs to be carried out in order to show a valid or unbiased relationship in regression analysis. The classic assumptions used in this research are multicollinearity testing, autocorrelation testing, and heteroscedasticity testing.

Hypothesis testing in this research uses the *Analysis of Variance* (ANOVA) tool for the F test and t test with a significance level of 5%.

RESULTS AND DISCUSSION

The results obtained from classical assumption testing, namely multicollinearity testing, show that the VIF value is:
Table 1.2 VIF Analysis Results

Variable	VIF	Information
X_1	23,853	Multicollinearity occurs
X_2	12,537	Multicollinearity occurs
X_3	4,478	Non Multicollinearity
X_4	10,965	Multicollinearity occurs

Source: primary data processed in 2012

the Collinearity Statistics analysis , it is known that multicollinearity will occur if the VIF (*Variance Inflation Factor*) is ≥ 10. The independent variable in this study has a VIF value of more than 10. This means that multicollinearity occurs in the regression equation. So corrective action is needed, namely by eliminating one of the independent variables that has a strong linear relationship (Widarjono, 2005: 139).

In this case, the variable removed from the equation is land area (X_1). The results of the multicollinearity test for the improved regression model from equation I are:
Table 1.3 VIF Analysis Results After Repairs

Variable	VIF	Information
X_2	7,837	Non Multicollinearity
X_3	3,700	Non Multicollinearity
X_4	7,296	Non Multicollinearity

Source: primary data processed in 2012

the Collinearity Statistical analysis , it is known that there is no multicollinearity in the model. This can be seen in the test results where the VIF value of each variable is less than 10. So the regression model that is suitable for further analysis is the regression model which is the result of improvements.

Autocorrelation means that there is a correlation between the confounding variable (e) and the dependent variable. In this test, to determine the presence of autocorrelation, the Durbin-Watson test is used by looking at the dL (lower limit value) and dU (upper limit value) values in the Durbin-Watson table. Based on the results of the Durbin-Watson test calculation, it is known that the DW value is 1.678 and this value is compared with the table DW value for n = 46, with *significance points of dL,* dU = 5%, so the dU value = 1.666.

In this autocorrelation test, it is known that the value d_U is < d < 4 - d_U or 1.666 < 1.678 < 2, 3 3 4, so according to (Widarjono, 2005: 182) there is no autocorrelation relationship. From the results of this test it can be concluded that in this study there is no autocorrelation, there is no correlation between one member of the observation and another observation at different times because this study used *cross section data* , namely the results of edamame soybean production in the planting season period 1 (October – March 2012) then the results of this production will not automatically correlate with the results of edamame soybean production in the planting season period 2. because there is no relationship that can influence it, because it is different in the planting season, if the research data uses *time series data* it is likely that autocorrelation will occur because Indirectly, the results of previous production will be used for subsequent production.
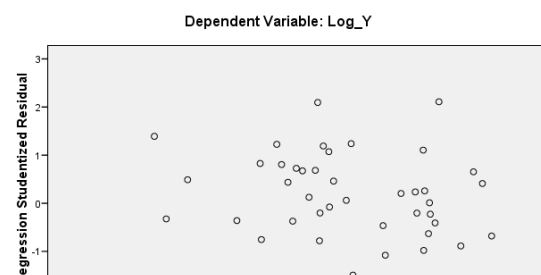

Dependent Variable: Log_Y

Figure 1 Heteroscedasticity Test Results

In the Heteroscedasticity test, namely to determine the value of the variance / spread of the residuals is constant. The results of this test show that in the *scatterplot diagram* the points spread above and below the number 0 on the Y axis, so heteroscedasticity does not occur. This test is only to see how the variance of the research residual values is spread because this will affect the regression results so that they can become BLUE (*best, linear, unbiased estimator*).

Table 1.4 Summary of Cobb-Douglas Production Estimation Results on Edamame Soybean Production Results at PT. Mitratani Two Seven

Variabel	Koef. Regresi	t_{hitung}	t_{tabel}	Sig.	Keterangan
(Constant)	1,232	4,282		0,000	
Log X_2	0,443	2,473		0,018	Signifikan
Log X_3	0,269	2,422	2,01	0,020	Signifikan
Log X_4	0,363	1,946		0,058	Tidak Signifikan
	R			0,928	
	Adjusted R^2			0,851	
	Std Error			0,050	
	F_{hitung}			86,534	
	F_{tabel}			2,83	
	Sig.			0,000	

Source: Primary data processed in 2012

Based on Table 1.4 above, the *Cobb-Douglas* production function model is obtained as follows:

$$Y = 1.232\ X_2{}^{0.443}\ X_3{}^{0.269}\ X_4{}^{0.363}$$

or can be changed in the function as follows:

$$Y = 1.232 + 0.443\ X_2 + 0.269\ X_3 + 0.363\ X_4$$

Testing the regression coefficients together (F Test) shows that: Seeds (X_2), labor (X_3) and fertilizer (X_4) simultaneously or simultaneous tests have a significant influence on edamame soybean production (Y). This is known from the calculated F value > F table , namely the test results show the calculated F value is 86,534 with a significance value of 0.000 and an F table value of 2.81.

The partial regression coefficient test (t test) shows that: the Seed variable (X_2) has a positive coefficient value of 0.443. This means that every additional 1% of seeds will increase edamame soybean production by 0.443 assuming other production factors are considered constant. The seed variable (X_2) has a calculated t value of 2.473 is greater than t table 2.01 then the hypothesis is accepted. This means that seeds (X_2) partially have a positive and significant influence on edamame

soybean production at PT Mitra Tani Dua Tujuh. This is because every increase in the number of seeds planted will increase the production of edamame soybeans because the seeds are the embryo that will produce the edamame soybeans themselves, so if the number of seeds is increased it will automatically increase the amount of production, because the plants planted will also increase and input from seeds planted from increasing the number of seeds, the output of edamame soybean production will also increase and increase. The quality of the seeds will also affect the amount of production, because the quality of the seeds will have an influence on the yield of edamame soybeans. For the seeds planted by PT Mitratani Dua Tujuh, namely the *Ryokkoh variety* , the seeds planted for edamame soybean production are produced in-house and have gone through strict selection. This is due to obtaining good quality edamame soybean production results.

Labor (X_3) has a positive coefficient value of 0.269, this means that every additional 1% of Man-Days worked will increase edamame soybean production by 0.269 assuming other production factors are considered constant. The labor variable (X_3) has a calculated t value of 2.422 is greater than t table 2.01 then the hypothesis is accepted. This means that labor (X_3) partially has a positive and significant influence on edamame soybean production at PT Mitra Tani Dua Tujuh. This is because each additional Man-Day in edamame soybean cultivation will increase the production of edamame soybeans, the addition of Man-Days has an effect on the production of edamame soybeans from a technical cultivation point of view, for example the need for Man-Days in weeding, less Man-Days needed will result in This has an effect on the growth of the edamame soybean plant itself because during Worker's Day weeding is needed less and the results from weeding are not optimal and there are still a lot of weeds left around the edamame soybean plant, this grass will also affect the edamame soybean's food intake because of this grass. will take food or fertilizer for the soybean plants and the growth of edamame soybeans will be disrupted and will also affect the production of edamame soybeans.

Fertilizer (X_4) has a positive coefficient value of 0.363, this means that every 1% addition of fertilizer will increase edamame soybean production by 0.363 assuming other production factors are considered constant. the fertilizer variable (X_4) has a calculated t value of 1.946 smaller than t table 2.01 then the hypothesis is rejected. This means that fertilizer (X_4) partially has a positive and insignificant influence on edamame soybean production at PT Mitra Tani Dua Tujuh. The application of fertilizer is intended to provide additional nutrients found in the soil as food intake for edamame soybean plants. This fertilizer is given

in accordance with a predetermined measure or dose to meet the nutrient needs needed by the plant so that it is able to produce well, from the data that has been obtained it can be It is known that the use of fertilizer has a positive effect, but the increase is not visible because the difference in the average fertilizer dose is the same and vice versa, if it is done with varying doses or with different doses, a significant increase in production will be seen because the use of fertilizer is very sensitive because if there is a shortage of fertilizer. So the edamame soybean plants will grow less well because they don't have enough food and if you use too much fertilizer it will also cause the soybean plants to die because there is too much fertilizer intake and when using this fertilizer you have to get the dose or dosage right because adding this fertilizer will not always increase. production results because in farming there is *the Law of Deminishing Return* , which means that if we increase input, output will decrease. So, there are cases where the fertilizer usage limit will reduce edamame soybean production if it exceeds the normal usage limit.

CONCLUSION

Based on the results of the data analysis and discussion carried out on the research sample data, the following conclusions can be drawn: partial regression testing concluded: There is a positive and significant influence between the seed variables (X2) and labor (X3) on the amount of edamame soybean production, it will However, the use of fertilizer (X4) has a positive and insignificant effect on the amount of edamame soybean production in Jember Regency.

The results of simultaneous regression coefficient testing concluded that the variables seed (X2), labor (X3) and fertilizer (X4) had a significant effect on edamame soybean production at PT Mitra Tani Dua Tujuh in Jember Regency.

THANK-YOU NOTE

The author expresses his thanks to:

Dewi Kurniawati, S.Sos, M.Si as Examiner

Editorial Team of the Journal of Agro-Industrial Management
(JUMA)

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