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Analysis of Scale of Soybean Farming in Irrigation Land in West Lombok District Indonesia

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Abstract:- This study aims to analyze: the scale of soybean farming in irrigation land in West Lombok Regency Indonesia, which was carried out in Gerung Village, Gerung District and Kediri Village, Kediri District, West Lombok Regency Indonesia. Location determination is done in stages (two stages) on the basis of the widest soybean planting area. The number of samples used was 60 respondents who were determined by non-proportional random sampling and data analysis using the Cobb-Douglas function analysis, followed by F and T tests. The results of the research show that: 1). Soybean farming in irrigation land in West Lombok Regency is on an increasing production scale (increasing Return To Scala). It is proven that the production elasticity is greater than one, namely (i = 2.427) > 1, which means that if input use is increased, the proportion of additional production will be greater than the proportion of additional inputs. 2). Integrated, the factors of production (land area, fertilizers, pesticides) have a significant effect on the level of production. This can be seen from the results of model testing using the Cobb-Douglas production function obtained F hit (33.726) > F tab (Z 0.05 = 1.645). and the coefficient of determination (R2) is 0.922 which means that the influence of the independent variable on the dependent variable is 92.2%, while the remaining 17.8% is influenced by other factors outside the model, 3). Partially, the production factors of land area, fertilizers (urea, TSP36, NPK) and pesticides significantly affect the level of production, while for seeds and labor, although they have an effect on production, they are not significant. From the research results it is suggested to: 1). Farmers to increase the use of land area, fertilizers and pesticides at a certain rate according to the recommendation of the local extension worker, because they can still increase production, 2). Other researchers, that this research has limitations because it does not succeed in providing information about how much change in the level of use of factors of production, so further research is still needed about the optimum level of use of factors of production. and inpu use efficiency.

Keywords:- *Scala Farming, Soybean, Irrigation Land.*

I. INTRODUCTION

A. Background

Soybean is one of the horticultural crops developed in Indonesia, because it has benefits besides being able to be consumed directly, it can also be used as a raw material for home industries and large industries such as tempe, tofu, soy sauce, soy milk and others [1].

From the aspect of supply, the level of domestic soybean production is still low. Currently, soybeans are a trade commodity product with insufficient supply for domestic needs. The government is still carrying out a policy of importing soybean commodities to meet domestic needs. This opportunity is a promising opportunity for soybean farming. [2].

In line with what was stated by [3],that in several decades, the soybean commodity in Indonesia has always received the spotlight, because there is often an imbalance between domestic production and people's needs. Efforts made by the Indonesian government to meet domestic demand for soybeans so far have been by importing soybeans from abroad.

Data from the Central Statistics Agency show that Indonesia's soybean imports throughout Semester I/2020 reached 1.27 million tonnes or a value of US$ 10.2 million (around Rp. 7.52 trillion). A total of 1.14 million tons came from America. However, if you look at previous years, the development of soybean imports has fluctuated in the last three years, namely in 2017 Indonesia imported soybeans of 2.6 million tons to 2.58 million tons in 2018 and in 2019 again to 2.67 million tons[4].

The government is targeting soybean self-sufficiency in 2018 through a special effort program (Upsus) with other food commodities such as rice and corn self-sufficiency. This targeted soybean self-sufficiency is to meet the national soybean demand of 2.2 million per year [5].

[6], stated that the government continues to work to increase national soybean production with the target of self-sufficiency by 2020. For the expansion of the soybean harvest area, 3.7 million hectares of rainfed landare available, of which around 40,000 hectares rainfed landhave the potential

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to be planted with soybeans in West Nusa Tenggara. but so far it has not been achieved.

According to [7], the average productivity of soybeans at the farm level is still low, around 1.1 tons/hectare, in fact most farmers reach below 1 ton per hectare, even though the results achieved based on the results of their research have reached 2-3 tons per hectare.

As an illustration in West Nusa Tenggara, in the 2020 figures it is reported that in the last three years, namely from 2018 to 2020 the soybean harvested area in West Nusa Tenggara has shown a significant decline with productivity also decreasing every year. Detailed data on harvested area and productivity per hectare are presented in Table 1.

Table 1. Harvested Area, Soybean Productivity per Hectare in West Nusa Tenggara Province Indonesia2018-2020 years

No	Regency/City	2018 year		2019 year		2020 year	
		Large Harvest (Ha)	Productivity per Hectare (KU/Ha)	Large Harvest (Ha)	Productivity per Hectare (KU/Ha)	Large Harvest (Ha)	Productivity per Hectare (KU/Ha)
1	West Lombok	1,375	11.57	1,691	13.34	1,069.10	12,07
2	Central Lombok	16,265	10.40	10,835	12.10	5,367.30	15,00
3	East Lombok	2,967	8.94	637	13.20	1,478,90	14,50
4	Sumbawa	15,256	9.88	1,009	12.96	442.40	14,31
5	Dompu	8,403	15.85	9,507	17.16	10,575.00	14,01
6	Bima	16,035	9.80	5,512	11.22	3,143.30	16,71
7	West Sumbawa	4,178	10.51	22	14.55	45.10	16,75
8	North Lombok	-	-	132	12.88	-	-
9	Mataram	146	8.49	7	15.71	5.80	16,74
10	Bima City	810	14.20	351	12.96	130.30	11,55
West Nusa Tenggara		65,435	99.64	70,933	136,08	22,256.20	131,64
Average per district		6,543.50	9.964	7,039.30	13.61	2,225.62	13.164
Development				549.80 8,4%	3.64 36,57%	-4,867.68 (68.62%)	-0.44 (3.26%)

Source: West Nusa Tenggara BPS. in numbers, 2018, 2019, 2020 processed
Note: Figures in brackets indicate a decrease

From Table 1 above it can be seen that the soybean harvested area in West Nusa Tenggara province Indonesia from 2018 to 2019 has increased by 8.5%; then in 2019 to 2020 decreased by 68.62%. Yield productivity per hectare which was achieved increased, in 2018 to 2019 it was 36.57% and from 2019 to 2020 it decreased by 3.26%.

[8]stated that the increase in soybean productivity was influenced by other technological components such as micro-water management, pest/disease control, harvest and post-harvest. He further said that in order to optimize the increase in productivity and the development of soybeans in the future, it is necessary to pay attention to the existence of supporting facilities, especially quality seeds, production facilities in the form of inorganic fertilizers, organic fertilizers, dolomite, pesticides, herbicides on time, in quantity and in the right type.

B. Formulation of The Problem

The average soybean productivity achieved by farmers in West Lombok Regency Indonesia is still low. The average productivity per hectare in 2020 reached 12.07 ku or 1.207 tons per hectare, lower than the productivity of West Nusa Tenggara Province, which reached 1.37 tons per hectare, even lower than the national soybean productivity which reached 1. 57 tons per hectare. (BPS Indonesia, 2021). The low soybean productivity per hectare that has been achieved may have something to do with the use of production factors that are not yet optimal. Because efforts to increase soybean production are not only determined by the availability of land, but are also determined by the production technology that is available and can be applied correctly by farmers. In other words, agricultural production results from a combination of production factors in the form of land, labor, capital (fertilizers, seeds and medicines). In agricultural development, the technology of using production factors plays an important role because the inaccurate number and combination of factors of production results in low production.

In general, the obstacles faced by soybean farmers in West Lombok Regency Indonesia in farming are almost the same as the problems faced by most farmers, namely limited land, lack of capital, so that the ability to use production factors is limited in terms of determining the right amount and combination to achieve soybean productivity per hectare.

C. Research Objectives and Benefits

This study aims to analyze: the scale of soybean farming in irrigation land in West Lombok Regency Indonesia and the benefits of this research, it is hoped that it will be used as a material consideration for policy makers in the framework of developing soybean production and for farmers to increase the scale of farming to increase production.

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II. FOUNDATION OF THEORY

Business scale is needed to find out whether a business under study follows the principle of incereasing, constant or decreasing returns to scale [9]. Business scale can be known from the value of production elasticity.

Business scale can be divided into three possibilities [10]as follows:

- Decreasing return to scale. If the value of production elasticity (Ep) < 1. This condition can be interpreted that the proportion of additional production inputs exceeds the proportion of additional production output.
- Constant return to scale, if the value of production elasticity (Ep) = 1. This condition means that additional production output results from additional production inputs in the same proportion.
- Increasing return to scale, if the value of the elasticity of production (Ep) > 1. This condition means that the proportion of production output produced is greater than the proportion of additional production inputs. Definition Business scale is often directly related to output, so that it can be said to be a measure of the change in output caused by changes in all inputs proportionally.

[10]further said that diseconomies of scale occur when the proportion of changes in output is lower than the proportion of changes in input. The opposite condition is when the proportion of changes in output is equal to or greater than the proportion of changes in input, then economies of scale occur.

III. RESEARCH METHOD

A. Types of Research

This research is a descriptive research, namely research that focuses on current problems, by collecting data, compiling, explaining, analyzing, interpreting and drawing conclusions [11].

B. Research Place

This research was conducted in Gerung Village, Gerung District and Kediri Village, Kediri District, West Lombok Regency. Location determination is done in stages (two stages) on the basis of the widest soybean planting area. The selection mechanism is to first select the sub-district with the widest soybean planting area, then from the selected sub-districts the village with the largest soybean planting area is determined.

C. Sample Determination

The number of respondents taken was carried out by qwota sampling, each village as many as 30 respondents, so that the total number of respondents was 60 people.

D. Data Types and Data Sources

This study uses qualitative data and quantitative data. Qualitative data is not in the form of numbers, but in the form of narratives or sentences such as the education of respondents, description of the age of the research area and others, while quantitative data is data in the form of numbers such as the age of the respondent, the use of production facilities and so on. -other, which comes from primary data and secondary data[12].

E. Data Collection Technique

Data collection techniques use interviews, observation and documentation, and data collection tools use questionnaires [12].

F. Identification of Variables, Variable Definitionsand Means of Measurement

The variables and how they are measured in this study are as follows:

1. The production referred to in this study is the amount of physical yield of soybeans obtained by farmers in one growing season expressed in kilograms
2. Factors of production, namely the types and quantities of production factors used by farmers in soybean farming: land area (are), seeds (Kg/ha), Urea (Kg/ha), TSP 36 (Kg/ha), NPK (Lt/ha) , pesticides (Lt/ha), Labor (HKO/ha).

G. Data Analysis

➢ *Input Usage Allocation*

To analyze the allocation of input usage, the Cobb-Douglas function analysis [9] is used mathematically as follows:

$$\text{Log } Q_i = \log C + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + \log eui$$

Information: C = constant, X1 = land area, X2 = seed, X3 = urea fertilizer, x4 = TSP 36 fertilizer, X5 = NPK fertilizer, X6 = pesticide, X7 = labor

➢ *Farming Scale*

To analyze the scale of soybean farming, by looking at the amount of elasticity (i), with the following conditions:

- -If (i) > 1, then the soybean farming scale is in a condition of increasing returns to scale
- -If (i) = 1, then the soybean farming scale is in a condition of constant return to scale
- -If (i) < 1, then the soybean farming scale is in a decreasing to scale condition.

To find out whether the value (i) is significantly different from one or not, the F test and t test are used as follows:

$$F = \frac{R^2/_{k-1}}{(1-R^2)/_{(n-k)}} \qquad [13]$$

$$t = \frac{i}{se\,(i)}$$

$$se\,(i) = \sqrt{var\,(i)}$$

Information:
K = Number of independent and dependent variables
n = number of samples

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se (i) = measure of the error rate of the regression coefficient to 1 and so on.

IV. RESULTS AND DISCUSSION

A. Characteristics of Respondents

Respondent characteristics which include age, education, number of family dependents and land area can be presented in Table 2.

Table 2 can be explained, bringing the average age of respondent farmers in the study area, the most were farmers aged between 45-51 years as many as 25 people (38.33%) and the least aged between 59-65 years were 3 people (5%), with an average farmer age of 42.4 years (43 years), the youngest is 24 years old and the oldest is 63 years old.

Table 2. Characteristics of Respondents of Soybean Farmers in West Lombok Regency Indonesiain 2022 year

	Description	Number (People)	Percentage (%)
1	Age		
	24-30	4	6,67
	31-37	7	11,67
	38-44	14	25,00
	45-51	25	38,33
	52-58	8	13,33
	59-65	3	5,00
	Total	60	100,00
	Average	43 year	
2	Education		
	Elementary School is not finished	5	8,33
	Finished Elementary School	31	51,67
	Completed Junior High School	15	25,00
	Finished High School	7	11,67
	Not Graduated from College	2	3,33
	Total	60	100,00
3	Number of Family Members		
	2-3	14	23,33
	4-5	35	58,34
	6-7	11	18,33
	Total	60	100,00
	Average	4,6 people =5 people	
4.	Garage area	The narrowest 15 acres Widest 80 acres Average 42 acres	

Source: Primary Data Processed 2022

Judging from the education of the respondents, most of them, namely 36 people (56.67%) had secondary education from those who graduated from junior high school, high school and university did not graduate and the remaining 34 people (43.33%). basic education, namely elementary school did not finish and graduated from elementary school. The table above can also be explained that the average number of family members is 4.6 people (5 people). The largest number of respondent members in the study area were farmers with a family size range of 4-5 people, 38 people (58.34%) and the least with 6-7 family members, 11 people (18.33%).

B. Allocation of Input Use and Determination of Business Scale

To analyze the use of inputs and determine the business scale can be seen in Table 3.

The F-Statistic test is used to determine the significance of the independent variables simultaneously on soybean production. The results of testing the model using the Cobb-Douglas production function obtained F hit (33.726) > F tab (Z 0.5/2 = 1.645). Thus it can be said that in an integrated manner the model can be used to explain the effect of inputs (land area, seeds, fertilizers, pesticides and labor on production. The findings illustrate that all production inputs simultaneously have a significant influence on the production of soybean farming in Lombok Regency West. This finding is in line with the research of [14],showing that all production factors of soybean farming simultaneously have a significant influence on soybean production. This is reinforced by the value of the coefficient of determination (R^2) of 0.922, which means that the magnitude of the influence the independent variable to the dependent variable is 92.2%, while the remaining 17.8% is influenced by other factors outside the model.

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Table 3. Relationship Between Production Factors and Production Results in Soybean Farming Irrigation LandinWest Lombok Regency Indonesia in 2022 year

Variable	Coefficient Regression	T count	P-Value	Conclusion
Intercept	3,138			
Land area (X1)	5.142	13,057	0,000	Significant
Soybean seeds (X2)	-0,213	-1,881	0,283	Non Significant
Urea fertilizer(X3)	2,725	2,151	0,027	Significant
TSP 36 fertilizer (X4)	1,957	1,764	0,038	Significant
NPK fertilizer (X5)	1,119	1.824	0.011	Significant
Pesticide (X6)	1,282	2,151	0,024	Significant
labour (X7)	-0,128	-0,093	0,241	Non Significant
F count	=33,726			
R^2	=0, 922			
F tab = F (Z 5%/2)	= ± 1,645			
(*i*)	=2,427			
n	= 60			

Source: Processed Regression Results

The T-test was conducted to see the partial effect of each independent variable on soybean production variables. In Table 3 it can be explained that the variable area of soybean land has a statistically significant effect on soybean production. These results are evidenced by the p-value of 0.000, this value is smaller than the significance level of 0.05. The variable land area has a regression coefficient value of 5.142, meaning that the effect of land area on soybean production has a unidirectional effect. If the land area increases by 100%, while the other production factors are the same, then soybean production will also experience an increase in production by 514.2%. This means that land use is not yet optimal, so that the land can still be expanded so that it becomes optimal to increase production. The findings in this study are in line with the results of research [15], [16]and [17], which shows that soybean production is influenced by land area factor.

The seed variable was stated to have no statistically significant effect on soybean production. By looking at the p-value of the seed variable of 0.283. This value is greater than the significant level value of 0.05. The seed variable has a regression coefficient of -0.213. This means that the influence of the use of soybean seeds on soybean production has a non-unidirectional effect. If the use of soybeans increases by 100%, while other production factors remain the same, soybean production will decrease by 21.3 kg per hectare. The results of this study are supported by research by [3], which states that 40% of farmers use seeds not as recommended. The use of soybean seed per hectare is 40-50 kg, but 40% of farmers use it in the range of 30-60 kg/hectare. So there is an excess of using soybeans. Excessive use of soybean seeds is related to the way of planting where 35% of farmers cultivate by spreading. By spreading it causes the excess use of seeds. By spreading the growth of soybeans unevenly, there is competition for nutrients and sunlight. So that the fruit is not optimal. Then the type of seed used is 60% of farmers using soybean seeds stored in the previous planting results and 40% using yellow labeled Breeder seeds or white labeled Foundation seeds.

The urea fertilizer variable was stated to have a statistically significant effect on soybean production. This finding can be explained by looking at the p-value of the urea fertilizer variable of 0.027, this value is smaller than the significant level of 0.05. These findings indicate that if there is an increase in the use of urea fertilizer at a certain level, while other production factors remain constant, soybean production will increase. Urea fertilizer has a regression coefficient value with a positive sign of 2.725, meaning that if urea fertilizer is increased by 100 percent, it will have an impact on increasing the production of soybean farming by 272.5%. This finding is supported by research results [15], and [18], where his research shows that the amount of use of urea fertilizer has a significant effect on the production of soybean farming. These findings also indicate that the use of urea fertilizer is still needed in the production process of soybean farming. This is because the availability of nutrients in the soil is often a problem. Where the nutrient recovery process on the land is experiencing a slowdown, even some of the nutrients in the soil are lifted after the increase in production during harves.

The TSP 36 fertilizer variable was declared to have a statistically significant effect on soybean production. This finding can be explained by looking at the p-value of the TSP fertilizer variable of 0.038, this value is smaller than the significant level of 0.05. These findings indicate that if there is an increase in the use of TSP 36 fertilizer at a certain level, while other production factors are constant, soybean production will increase. Urea fertilizer has a regression coefficient value with a positive sign of 1.957, meaning that if the TSP 36 fertilizer is increased by 1%, it will have an impact on increasing the production of soybean farming by 19.57%.

The NPK fertilizer variable was stated to have a statistically significant effect on soybean production. This finding can be explained by looking at the p-value of the TSP fertilizer variable of 0.011, this value is smaller than the significant level of 0.05. These findings indicate that if there is an increase in the use of NPK fertilizer at a certain level, while other production factors remain constant, soybean

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production will increase. NPK fertilizer has a regression coefficient value with a positive sign of 1.119, meaning that if NPK fertilizer is increased by 1%, it will have an impact on increasing soybean farming production by 11.19%.

The pesticide variable was stated to have a statistically significant effect on soybean production. This finding can be explained by looking at the p-value of the pesticide variable of 0.024, this value is smaller than the significant level of 0.05. These findings indicate that if there is an increase in the use of pesticides at a certain level, while other production factors remain the same, soybean production will increase. The use of pesticides has a regression coefficient value with a positive sign of 1.282, meaning that if the NPK fertilizer is increased by 1%, it will have an impact on increasing the production of soybean farming by 12.82%. These findings are supported by the results of research conducted [19], in Beringin sub-district, Deli Serdang Regency and research [20],which states that pesticide variables have a significant effect on farm production. These findings illustrate that pesticides have an important role in the production process of soybean farming, where pesticides contain several active substances needed by plants to overcome pests, diseases and weeds.

The labor variable is stated to have no statistically significant effect on soybean production. By looking at the p-value of the workforce variable of 0.241. This value is greater than the significant level value of 0.05. The labor variable has a regression coefficient value of -0.128. This means that the influence of the use of labor on soybean production has a non-unidirectional effect. If the use of labor increases by 1%, while other factors of production remain the same, soybean production will decrease by 1.28 kg per hectare.

The results of the t-test analysis of the regression coefficients show that land area, fertilizers (urea, TSP36, NPK) and pesticides have a significant effect on production levels, while for seeds and labor, although they have an effect on production, they are not significant.

Furthermore, in the table above it can also be seen that (i) = 2.427 > from 1. Thus it can be said that soybean farming in lowland rice fields in West Lombok Regency is in a condition of increasing returns to scale, which means that if all inputs are changed by 1% it will cause production change of 24.27%

V. CONCLUSIONS

Based on the results of the study it can be concluded as follows:

- Soybean farming in paddy fields in West Lombok Regency Indonesia is on an increasing production scale (increasing Return To Scala). It is proven that the production elasticity is greater than one, namely (i = 2.427) > 1, which means that if input use is increased, the proportion of additional production will be greater than the proportion of additional inputs.
- Integratedly, the factors of production (land area, fertilizers, pesticides) have a significant effect on the level of production. This can be seen from the results of model testing using the Cobb-Douglas production function obtained F hit (33.726) > F tab (Z 0.05 = 1.645). and the coefficient of determination (R2) is 0.922 which means that the influence of the independent variable on the dependent variable is 92.2%, while the remaining 17.8% is influenced by other factors outside the model.
- Partially, the production factors of land area, fertilizers (urea, TSP36, NPK) and pesticides significantly affect the level of production, while for seeds and labor, although they have an effect on production, they are not significant.

SUGGESTIONS

From the research results it is recommended to:

- Farmers to increase the use of land area, fertilizers and pesticides at a certain rate according to the recommendation of the local extension worker, because they can still increase production.
- Other researchers, that this study has limitations because it does not succeed in providing information about how much change in the level of use of factors of production, so further research is still needed about the optimum level of use of factors of production. and input use efficiency.

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