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SHALLOT FARMING PRODUCTIVITY AND FARMER INCOME AFFECTED BY WATER RESOURCES DISTANCE IN WANASARI

Btari Sukmastika Hemas[1], Siswanto Imam Santoso[1], Wiludjeng Roessali[1]

[1]Lecturer in Agribusiness Bachelor Study Program, Faculty of Animal Husbandry and Agriculture, Diponegoro University Email: btarishemas08@gmail.com, Email: sisdaris2005@yahoo.com Email: wroessali@gmail.com

ABSTRACT

Shallot farming productivity refers to the ecosystem supporting. This study aims to analyze the difference between productivity and income of shallot farming based on the distance from the water resources. Additionally, factors that affected the farmer's income were also studied with a survey approach by using purposive sampling in Wanasari District, Brebes Regency. The data collected through interviews with the questionnaire. The data were analyzed by using productivity analysis, income analysis, Kruskal-Wallis Test, and multiple linear regression analysis. The results showed that there was a difference in farmer's productivity and income based on the distance to the water resources. The productivity of shallot in Wanasari District amounts to 12,780 kg/ha/planting season. Meanwhile, the farmer's income in Wanasari District amounted to IDR 57,677,334/ha/planting season. According to the data analysis, factors that affect the shallot farmers' income were shallot price, productivity, the amount of TSP and NPK fertilizers, and the amount of pesticide applied.

Keywords: Cost, Income, Productivity, Revenue, Shallot.

INTRODUCTION

Indonesia is a country dominated by the agricultural sector and, therefore, is called an agrarian country (Santika et al., 2019). Shallot is a horticultural commodity that is included in the seasoning vegetable group. Shallots are used as cooking seasonings and ingredients of traditional medicines (Setyadjit & Sukasih, 2015; Siripong vutikorn, Thummarat wasik, & Huang, 2005). The average consumption of shallots per capita in a week reaches 0.493 ounces. The number of uses and consumptions of shallot causes shallot producers to meet consumer demand. Shallot-producing regions are widely spread in Indonesia, not only in Central Java Province but also in the regions of East Java, West Java, and West Nusa Tenggara.

Central Java Province is the largest shallot producer in Indonesia. The production reached 546,686 tons in 2016 (Indonesian Statistics Agency, 2017). Brebes Regency is the largest production center for shallots in Central Java and Indonesia. Shallot production in Brebes Regency reached 3,386,832 quintals in 2016. One of the regions in Brebes regency that produces the most shallot is in Wanasari District. Wanasari District is the district that has the highest production in Brebes Regency. Production of Wanasari Subdistrict was 906,750 quintals in 2016 (Central Statistics Agency of Brebes Regency).

Bima Curut is the common variety planted in Winasari District. It contributes to the highest productivity. Additionally, the region passed by Kumbang wind, so it has a cold temperature that is suitable for the growth of shallots. The production of shallots in Wanasari District is highest during the primary harvest season, which is in July ot August or the first dry season. The cultivation process in the dry season has a lack of water availability, particularly for villages that have great distances from water sources. Water availability is essential because shallot needs sufficient water, notably at the beginning of planting tubers (Esmaeil zadeh, Asghari pour, & Khoshnevisan, 2020; Munir, Kheirkhah, Baroutian, Quek, & Young, 2018). Lack of water will inhibit the growth of shallot and cause farmers not to dare to grow large amounts of shallots.

Shallot production in Wanasari District can be analyzed for productivity to find out how much the land's ability to produce shallot. Calculation of farmer costs can be done by conducting a farm analysis to find out in detail what are the costs incurred by farmers and how much income is received by farmers. Farmer shallot farming in Wanasari Subdistrict also needs to be analyzed the factors that influence income so farmers can know what factors need to be considered to support their income.

MATERIALS AND METHODS

We did a survey with aquestionnaire in a population in December 2018 to February 2019. The study sites were in the villages of Lengkong, Glonggong, and Tanjungsari in Wanasari District, Brebes Regency.

Determination of the location of the research carried out by means of purposive based on specific criteria, including the three villages growing shallots, having members of active farmer communities, the location of the village easily accessible and the distance of the village based on water sources categorized as nearby (Glonggong Village), medium (Lengkong Village) and far (DesaTanjung Sari).

The research sampling method uses simple random sampling - determination of the number of samples using the formula Slovin to obtain a total sample of 100 respondents. The sample size of each village was taken with a proportional allocation where 35 respondents in Glonggong village, 27 in Lengkong village, and 38 in Tanjung Sari village. An interview with a questionnaire was used to collect primary data. Interviews were conducted with farmer members who were members of farmer groups in Kelurahan Lengkong, Glonggong, and Tanjung Sari in Wanasari District, Brebes Regency.

The productivity calculation formula is as follows:

Productivity = production (kg)/area (m^2)

Income calculated as the formula below (Soekartawi, 2002).

$$Pd = TR – TC$$
$$TR = P \times Q$$
$$TC = TFC + TVC$$

where:
Pd = Farmer income (Rp/MT)
TR = revenue (Rp/MT)
P = Product price (Rp/kg)
Q = Quantity of procuct (kg)
TC = Total cost (Rp/MT)
TFC = Total fixed cost (Rp/MT)
TVC = Total variable cost (Rp/MT)

The hypothesis tested was the differences in productivity and income of shallot farmers based on the distance to water sources. The Kruskal-Wallis test was used to compare three or more samples (Kvam and Vidakociv, 2007). The statistical hypothesis from the Kruskal-Wallis test were: (i) H0: $\mu - \mu 0 = 0 \rightarrow$ there was no significant difference in productivity and income between villages that are near, medium and far to a water source; (ii) H1: $\mu - \mu 0 \neq 0 \rightarrow$ there was a significant difference in productivity and income between villages that are near, medium and far to a water source. If the sig 2 value was tailed ≤ 0.05 then H0 was rejected, H1 is accepted. If the sig 2 value was > 0.05 then H0 was accepted, H1 was rejected.

Multiple linear regression tests were performed to analyze the factors that influence income. The equation of the Cobb-Douglas production function is as follows:

$$\mathbf{Y = aX_1^{b1} X_2^{b2} X_3^{b3} \ldots\ldots X_n^{bn} e^u}$$

The Cobb-Douglas function is transformed into a linear regression form, so it can be written as follows:

$$\text{Ln Y} = \text{Ln a} + \text{b1 Ln X1} + \text{b2 Ln X2} + \text{b3 Ln X3} + \text{b4 Ln X4} + \text{b5 Ln X5} + \text{d1} + \text{d2} + \text{e}$$

where:

Ln Y = normalized shallot revenue (Rp /mt)
Ln X = normalized selling price (kg/mt)
Ln X2 = normalized productivity (kg/mt)
Ln X3 = Number of normalized TSP Fertilizers (kg/mt)
Ln X4 = normalized NPK fertilizers (kg/mt)
Ln X5 = normalized pesticides (kg/mt)
D1 = 1 for Lengkong village and 0 for Glonggong and Tanjung Sari villages.
D2 = 1 for Tanjung Sari Village and 0 for Glonggong and Lengkong villages
e = error.

The classic assumption test was calculated before the multiple linear regression test to find out whether the regression test was feasible. The classic assumption test includes the multicollinearity test in tolerance value or variance inflation factor (VIF). The tolerance value limit is 0.10 or the VIF value is 10, if VIF> 10 and the tolerance value <0.10, then there is multicollinearity) (Santoso, 2003). Autocorrelation test was done by using the Run Testwhich showed the probability or asymp sig. greater than the significance value of 0.05, implied theautocorrelation did not occur. Regression has a good model if homoscedasticity occurs where the residual variance from one observation to the other is constant. Normality test was done by using the Kolmogorov-Smirnov test by looking at the asymp. sig. value (Ghozali, 2016).

Table 1. Characteristics of shallot farmer respondents in Wanasari.

No.	Quiestion	Number of Respondents
1	Age	
	• 24-40	33
	• 41-50	36
	• 51-60	26
	• 61-70	5
2	Education	
	• Uneducated	7
	• Elementary	54
	• Junior high school	13
	• Senior high school	22
	• Bachelor	4
3	Farming experiences (year)	
	• <5	1
	• 5-15	28
	• 16-25	40
	• 26-35	23
	• 36-41	8
4	Land ownership	
	• ≤ 0,2 ha	60
	• 0,21-0,4 ha	30
	• 0,41-0,6 ha	6
	• 0,61-0,7 ha	4

Goodness of Fit test was performed to test the regression model consisting of the coefficient of determination test, F test and t-test The coefficient of determination is used to predict how much the contribution of the independent variable (X) to the dependent variable (Y). The F test is a simultaneous regression relationship testing. The t-test statistic shows how far the influence of one independent variable individually in explaining the variation of the dependent variable. (Ghozali, 2016).

RESULTS AND DISCUSSION

Respondent Characteristics. Respondent characteristics include age, education, farming experience and respondent farmer area.

A total of 36%, the highest percentage, of respondents age were in the range 41 to 50, which in the farmer is at a productive age. The productive farmers were in the age range between 15-54 (Nurmanaf, 2005). This age has a productive performance in conducting farming, so it is expected to increase productivity or the results of farming activities. A total of 54 people from 100 sample farmers were elementary school graduates. That is because rural communities were difficult to continue to the next level of education because of constraints in costs and facilities for school buildings that were far away or not yet available in the local village. The higher the education level of a farmer, the easier it will be to accept innovations in science and technology in agriculture and will influence the mindset and way of farmers in making decisions (Neonbota and Kune, 2016). Farming experiences of the respondents were most 16 to 25 years, as many as 40 people. The longer the farming experience of a person, the more experienced or competent in managing his farm so that the farm produced will also be high and profitable. The area of land owned by respondents ranged from 0.0875 ha to 0.70 ha. Land area will affect the yield and income of farmers because of the larger the land, the higher the income.

Shallot Productivity. Based on Table 2, the highest shallot productivity was in Glonggong, which can produce 14,007 kg ha-1. Kruskal-Wallis test showed a significant difference in the productivity of shallots based on the distance of the village from the water source. Glonggong village has a short distance from the water source so that the shallot water needs are always met. Lack of water will inhibit plant growth and can cause drought. The shallot variety used is Bima Brebes, which is susceptible to drought stress, which can result in reduced shallot weight (Swasono, 2012). Tanjung Sari village, the farthest distance from the water sources, had the lowest productivity. The farmers use groundwater using pumps where the amount is limited, which can inhibit the shallot tuber growth. The average shallot productivity was 12,780 kg ha-1, which is higher than the average productivity of Indonesian shallot, which is 9,310 kg ha-1 in 2017 (BPS, 2017).

Shallot Farming Income. The amount of income earned by shallot farmers during one growing season, namely from June to August 2018.

Table 2. Shallot Productivity in Wanasari.

	Villages			Average
	Glonggong	Lengkong	Tanjung Sari	
Harvested (kg)	4,146	2,737	2,713	3,199
Land owned (ha)	0.296	0.214	0.235	0.251
Productivity (kg ha^{-1})	14,007	12,790	11,545	12,780

Table 3. Production Costs of Shallot Farming in Wanasari (in rupiahs/ha/mt).

Cost	Village			Average
	Glonggong	Lengkong	Tanjung Sari	
Fixed cost				
Shrinkage Tool	154,456	200,156	200,675	185,096
Land rent	1,528,314	3,158,532	2,127,660	2,271,502
Land Tax	46,593	14,134	25,289	28,672
Credit Interest	190,888	269,533	139,794	200,072
Sub-Total	1,920,252	3,642,355	2,493,418	2,685,341
Variable Cost				
Seeds	45,752,896	45,690,550	45,688,690	45,710,712
Fertilizer	7,806,515	7,619,072	8,204,479	7,876,689
Pesticide	3,310,328	3,628,418	3,123,180	3,353,976
Labor	17,881,199	17,955,229	18,280,725	18,039,051
Irrigation	4,575,290	5,711,319	6,853,303	5,713,304
Sub-Total	79,326,228	80,604,589	82,150,378	80,693,731
Total cost	81,246,479	84,246,943	84,643,796	83,379,073

Table 4. Average Shallot Farmers' Income in Wanasari (in rupiahs/ha/mt).

	Village			Average
	Glonggong	Lengkong	Tanjung Sari	
Revenue	156,081,081	142,004,154	125,083,987	41,056,407
Total Cost	81,246,479	84,246,943	84,643,796	83,379,073
Income	74,834,602	57,757,211	40,440,191	57,677,334

Based on Table 3, the highest production cost was in Tanjung Sari, which was Rp. 84,643,796/ha/mt. Based on the distance of the village to the water source, Tanjung Sari Village has the highest irrigation cost because it is located far from the water source. In order to meet water needs, they use water pumps. Glonggong and Lengkong get irrigation from the Pemali River. The cost of irrigation by using a water pump was greater since it uses fuel, and farmers took irrigation water by the pump every three days.

Income Farmer revenues were obtained from the sale of shallots before deducting production costs. The sale transaction was carried out before harvested, and payment was made in cash. Farmers tend to prefer the sale system because farmers do not need to incur the costs of harvesting, transporting, and post-harvesting (Mayrowani and Darwis (2009).

Based on Table 4, the biggest revenue was in Glonggong, which was Rp 74,834,602/ha/mt since the production of shallots was higher, and the selling price of shallots was better than Lengkong Village and Tanjung Sari. Tanjung Sari has the lowest revenue, which affected by the production of shallots that are not as good as the other two villages. Therefore the selling price was not too high. The selling price of shallots was based on the agreement of the seller and buyer. Based on the Kruskal-Wallis different test, there was a difference in the income of the farmers in three villages assessed based on the distance to the water source. The income of Glonggong Village was highest because of its proximity to a water source where the water needs for shallots are always met so that the production and selling prices of shallots were also better compared to other villages. Additionally, the large of the land area also the main point. Farmers in Glonggong had 0.296 ha, which was higher compared to others. The land area can affect farmers' production because the large land area will produce higher production than narrow land (Andriyani, 2014). The average income of the three villages was also higher than the production costs incurred, thus indicating that shallot farming by farmers is profitable.

Factors Affecting Revenue. Based on Table 5, the significance value obtained in the F test of 0,000 is greater than 0.05, the results indicate the selling price, productivity, the amount of TSP fertilizer, the amount of NPK fertilizer, the number of pesticides and dummy areas 1 and 2 that simultaneously have a significant effect on income shallot farmer. Based on the test results, the coefficient of determination obtained Adjusted R Square value of 0.953. This shows that as much as 95.3% of the income variable (dependent) is influenced by the independent variables, namely the selling price, productivity, the amount of TSP fertilizer, the amount of NPK fertilizer, and the number of pesticides. In contrast, 4.7% is influenced by other variables.

Based on the results of the t-test in Table 5, partially the selling price, productivity, the amount of TSP fertilizer, the amount of NPK fertilizer, and the number of pesticides have a significant effect on the income of shallot farmers. The results of the regression equation above obtained by the regression coefficient constant -9.849. The selling price regression coefficient (X1) was 2.255, which states that for every 1% increase in selling prices, the income of shallot farmers will increase by 2.255%. Productivity (X2) had a coefficient of 2.356, which means that every increase of onion productivity by 1% will increase the income of shallots farmers by 2.356%. The coefficient on the amount of TSP fertilizer (X3) was 0.391, which means that each increase in the amount of TSP fertilizer by 1% will increase the income of shallots farmers by 0.391%. The NPK fertilizer coefficient (X4) had a value of 0.456, which means that every 1% increase in NPK fertilizer will increase the income of shallots farmers by 0.456%. The coefficient of the number of pesticides (X5) was 0.123, which means that every 1% increase in pesticides will increase farmers' income by 0.123%. The coefficient d1 was -0,026, and d2 is -0,021, which can be interpreted that Lengkong village had a Ln income 2.1% lower than Glonggong and Tanjung Sari villages had Ln income 1.9% higher than Glonggong village. However, a dummy variable is not statistically significant then does not have a significant effect on the dependent variable so that interpretation will only be useful if the variable is statistically significant (Ghozali, 2016).

Table 5. Factors Affecting the Income of Shallot Farmers in Wanasari.

Componentt-test	Regression Coefficient	t value	Significant
Constant	-9.849	-7.204	0.000*
Selling price	2.255	16.738	0.000*
Productivity	2.356	23.497	0.000*
Number of TSP Fertilizers	0.391	9.973	0.000*
Number of NPK Fertilizers	0.456	10.662	0.000*
Amount of Pesticides	0.123	2.271	0.025*
Dummy Region 1	-0.021	-0.558	0.578**
Dummy Region 2	0.019	0.459	0.647**
F test: F value = 287,713 , Significant =0,000			
Adjusted R Square = 0.953			

* = significant; **= notsignificant

CONCLUSIONS

Based on research that has been done, it can be concluded that there was a difference in the productivity of shallots based on the distance to the water source. Glonggong village productivity and the farmer income were higher compared to other villages since it closer to the water resource. Additionally, selling price, productivity, TSP fertilizer, NPK fertilizer, pesticide, dummy area 1, and dummy area 2 simultaneously affected the farmer's income.

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