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EFFICIENCY OF PRODUCTION FACTORS USED IN CARROT (*Daucus carota*) FARMING

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ABSTRACT

This study aims to determine several factors that affect the productivity of carrot farming and the most influential factors on the productivity of carrot farming. The method used in this research is the survey method. The technique of determining respondents was carried out by observation of as many as 30 carrot farmers. Data in the form of primary data and secondary data. Primary data were obtained from literature studies and other institutions related to this research. Data were analyzed using quantitative analysis using the Cobb Douglass model. The results of the study found that several factors that simultaneously affected the productivity of carrot farming in the Argo Ayuningtani Farmer Group, Senden Village, Selo District, Boyolali Regency, were the total area of land (X1), labour (X2), seeds (X3), organic fertilizer (X4), fertilizer Za (X5) used by farmers. The most influential production factor in the productivity of the Argo Ayuningtani Farmer Group, Senden Village, Selo District, Boyolali Regency is the number of seeds.

Keywords: factors of production, Cobb Douglass, productivity

Introduction

Indonesia is an agrarian country where most of the population is farmers[1]. This is because the territory of Indonesia is in the form of an archipelago with a mountainous topography, so it is very suitable for planting various kinds of plants (food, plantation, horticulture, and others). With this consideration, the agricultural sector is a very important sector in creating jobs so as to generate income for people living in rural areas[2].

The agricultural sector is one of the important sectors that must be developed. The development of the agricultural sector can be done by empowering the people's economy through an

agribusiness approach that will create advanced, efficient, and resilient agriculture[3]. The development of the agricultural sector includes various sub-sectors, including the sub-sectors of horticultural crops, food crops, fisheries, livestock, plantations, and forestry[4].

Horticulture is a commodity that has an important role in the agricultural sector, both in the contribution to the national economy, farmers' income, employment, and various aspects of community life. In addition, there are several benefits of horticultural commodities in people's lives, including food, benefits in the field of culture, benefits in the health sector and economic field. Carrot (*Daucus carota*) comes from a temperate region, namely East Asia and Central Asia. In Indonesia, carrot cultivation was initially concentrated in Lembang and Cipanas, West Java, and then spread to vegetable centres in Java and outside Java. As a result, the national carrot harvest area reaches 27,149 ha spread over 22 provinces.

The carrot is a biennial tuber vegetable (a plant that lives in two seasons) in the form of a shrub. This type of vegetable is easy to find in various places and can be grown throughout the year, both rainy and dry. Carrots have short stems that are barely visible. The roots are taproots that change shape and function to become round and elongated. Carrot plants can grow optimally in areas with cold temperatures or in the mountains with an altitude of about 1200 meters above sea level. Carrots have wet leaf stems in the form of a bunch of midribs on the petiole that emerges from the base of the upper tuber, which is similar to celery leaves [5].

Efficiency is related to the relationship between the output in the form of goods or services produced and the resources used to produce the output [6]. Meanwhile, Raharjo[7] suggests that efficiency is a condition or condition where completing a job is carried out correctly and with full capabilities. Mathematically, efficiency is a comparison between output and input or, in other terms, output per unit of input.

Carrot production in Boyolali Regency fluctuates every year. So that makes farmers a little confused with the price of carrots in the market. When the main harvest, carrots can reach the price of Rp. 2,000.00 per kg, but in the dry season, the price of carrots reaches Rp. 9.000,00 per kg. Along with changes in land area, which increases, the weather conditions are not stable. There is an increase in demand for other commodities such as chilies, tomatoes, etc. [8]. This study aimed to determine the number of production costs, revenues, and income obtained from carrot farming. Knowing what production factors affect the production of carrots. And knowing the level of efficiency of the use of production factors in carrot farming.

MATERIAL AND METHODS

The location of this research was determined purposively in the Argo Ayuningtani farmer group, Senden Village, Selo District, Boyolali Regency. This area was determined as a research area because the average productivity of carrots in the Argo Ayuningtani farmer group has not yet

reached the average productivity of carrots in the Boyolali Regency. The average productivity of carrots in Boyolali Regency is 15.98 tons/ha, while the productivity of carrots in the Argo Ayuningtani farmer group is 12.29 tons/ha[9]. In addition, the Argo Ayuningtani farmer group is a producer of organic vegetables. Therefore, the quality of carrots in the Argo Ayuningtani farmer group is of superior quality because of the good quality and quantity of carrots. This research was conducted in December 2020.

The analytical method used is the descriptive analysis method. The Cobb-Douglas production function is used to explain the relationship between production and the factors of production that influence it. The production factors that are thought to affect the amount of carrot production (Y) are the amount of land area (X1), the number of workers (X2), the number of seeds (X3), The amount of organic fertilizer (X4) and the amount of fertilizer Za (X5). Cobb-Douglas function equation:

$$Y = b0.\ X_1^{b1}.\ X_2^{b2}.\ X_3^{b3}.\ X_4^{b4}.\ X_5^{b5}.\ E$$

note :

Y = Carrot Production (Kg)

bo = intercept

X1 = Land area (M2)

X2 = Labor (HKO)

X3 = Seed (Kg)

X4 = Organic fertilizer (Kg)

X5 = Fertilizer Za (Kg)

b1-b5 = Regression coefficient

e = Error

Production factor efficiency analysis uses the formula for calculating price efficiency based on the use of the Cobb-Douglass production function technique[10]. The formula can be written as follows:

$$bi.\ Y.Py/Xi = Px$$

or

$$NPMxi = Pxi$$

or

NPMxi/Pxi = 1

Information :

Bi = i-th production factor (input) regression coefficient

Y = production (output)

Py = unit price of output

Xi = use of the i-th average factor of production (input)

Pxi = unit price of the i-th input

With the calculation criteria, if NPMx /Px < 1, then production factors (inputs) are not efficient. That is, the use of production factors (inputs) needs to be reduced, and if NPMxi/Px; = 1: The use of production factors (inputs) is efficient, that the use of production factors (inputs) has reached the optimal combination[11].

RESULTS AND DISCUSSION

A. Analysis of the production function of carrot farming

Production function analysis explains the relationship between production and production factors used in carrot farming[12]. The production factors in question are land area, labour, seeds, manure, and Za fertilizer. The model for estimating the carrot production function is a Cobb-Douglas function where this function is multiple non-linear regression so that to perform multiple linear regression analysis, it must be converted into a linear equation. For this reason, the existing equations must be logarithmic into a multiple linear regression model, namely as follows:

$$LnY = 7.6746 + 6.5497\ LnX1 + 3.9296\ LnX2 - 1.4630\ LnX3 + 3.1760\ LnX4 + 5.3826\ LnX5$$

The value of the coefficient of determination is a measure that shows the contribution of the independent variable to the dependent variable. In other words, the coefficient of determination shows the variation of the Y derivative, which is explained by the linear influence of X. If the value of the coefficient of determination given the symbol R2 is close to 1, the independent variable gets bigger. Approach the relationship with the independent variable so that it can be said that the use of the model can be justified [13]. The coefficient of determination (R^2) can be seen in the Model Summary table in the Adjusted R square column, which is presented in table 1. adjusted R square 0.484 means that the change in carrot production can be explained by 48.4% by factors of production of land area, labour, seeds, organic fertilizers, Z-fertilizers while other factors outside this research model explain the remaining 51.6%.

The simultaneous F test shows (table 1.) whether all independent variables or independent variables included in the model have a joint effect on the dependent variable. The F test is done by comparing the calculated F results with the F table, so we accept the alternative hypothesis, which states that all independent variables simultaneously and significantly affect the independent variables. The calculated F value of 0.011 is smaller than 5% so that all factors of Za fertilizer (X1), organic fertilizer (X2), seeds (X3), land area (X4), and labor (X5) simultaneously have a very significant effect on production.

A partial test or t-test aims to determine the effect of production factors (X) separately (partial) on carrot production (Y). If the significance level of p-value < 1%, the production factors used in the analysis have a very significant effect on carrot production (Y)[14,15]. If the p-value is > 1% and < 5%, then the production factors used in the analysis significantly affect carrot production (Y). However, if the p-value > 5%, the production factors used in the analysis have no significant effect on carrot production (Y). Find out the value of the t-count can be seen in column t, to know the level of significance in column Sig, and to know the value of the regression coefficient can be seen in table 2. The results of the t-test analysis showed that the land area factor had a t-count value (-0.918) with a significant value based on 0.369 > 0.05, meaning that land area had no significant effect on production. The regression coefficient value is negative 0.550, meaning that for every 5% increase in land area used, production decreases by 0.550%. Assuming other variables are considered constant (*ceteris paribus*). The results of the t-test analysis show that the labour factor has a t-count value (2.207) with a significance based on 0.039 <0.05, meaning that labour has a very significant effect on production. The regression coefficient value is positive at 1.481, meaning that for every 5% increase in labour used, production increases by 1.481%. Assuming other variables are considered constant (*ceteris paribus*). The results of the t-test analysis showed that the seed factor had a significant t-count (0.440) based on 0.664 > 0.05, meaning that the seed had no significant effect on production. The regression coefficient value is positive at 0.119, meaning that for every 5% increase in seeds used, the production increases by 0.119%. Assuming other variables are considered constant (*ceteris paribus*). The results of the t-test analysis showed that the organic fertilizer factor had a significant t-value (1.280) based on 0.214 > 0.05, meaning that organic fertilizer had no significant effect on production. The regression coefficient value is positive at 0.316, meaning that for every 5% increase in organic fertilizer used, the production increases by 0.316%. Assuming other variables are considered constant (*ceteris paribus*). The results of the t-test analysis showed that the Za fertilizer factor had a t-count value (-1.180) with a significance of 0.284 > 0.05, meaning that the Za fertilizer had no significant effect on production. The regression coefficient value is negative 0.372, meaning that for every 5% increase in Za fertilizer used, the production decreases by 0.372%. Assuming other variables are considered constant (*ceteris paribus*).

B. Analysis of the efficiency of using the production factors of carrot farming

According to table 3, it is found that the efficiency of land use (X1) has a value of -0.014 which means the value is less than one. This means that land area production factors are inefficient and

need to be reduced[16–18]. The efficiency of the use of labour (X2) has a value of 4.68 which means the value is more than one. This means that labour production factors are not efficient and need to be added. The efficiency of the use of seeds (X3) has a value of 12.39 which means the value is more than one. This means that the use of seed production factors is not efficient and needs to be added[19]. The efficiency of using organic fertilizer (X4) is 3.61, which means the value is more than one. This means that organic fertilizer production factors are not efficient and need to be added. Finally, the efficiency of using Za fertilizer (X5) has a value of -20.32 which means the value is less than one. This means that production factors for Za fertilizer are inefficient and need to be reduced[20].

CONCLUSION

Based on the research results of carrot farming in the Argoayuningtani Farmer Group in Senden Village, Selo District, Boyolali Regency in 2020 it can be concluded that the production factors in the form of land area (X1) the regression coefficient value of -0.550 has no significant effect, labor (X2) coefficient value regression coefficient of 1.481 has a very significant effect, seed (X3) regression coefficient value of 0.119 has no significant effect, organic fertilizer (X4) regression coefficient value of 0.316 has no significant effect, and fertilizer Za (X5) regression coefficient value of -0.372 has no significant effect. The use of production factors in carrot farming has not yet reached the maximum efficient level. Factors that are not efficient are land area (X1), labor (X2), seeds (X3), organic fertilizer (X4), and Za fertilizer (X5). The use of carrot production factors needs to be optimized by referring to the existing dosage standards.

References

1. Suswadi, Prasetyo A, Dwi Kartikasari R, Prasetyowati K. Internal Control System Adoption Rate for Organic Rice Certification. E3S Web Conf [Internet]. 2021;316. Available from: https://doi.org/10.1051/e3sconf/202131602008
2. Zanetti Pessôa Candiotto L. Chapter 13 - Toward the organic product certification: Participatory Guarantee System (PGS) in the certification process and the contribution of Ecovida Agroecology Network. In: Meena VS, Meena SK, Rakshit A, Stanley J, Srinivasarao CBT-A in OF, editors. Woodhead Publishing; 2021. p. 209–22. Available from: https://www.sciencedirect.com/science/article/pii/B9780128223581000134
3. Fitriani FS, Dayat D, Widyastuti N. Pemberdayaan Petani Terhadap Pengaplikasian Pupuk Organik Cair Mol Dari Limbah Sayur Pada Budidaya Wortel (Daucus Carota L). Jurnal Inovasi Penelitian. 2020;1(3):241–52.
4. Winarsih S, Wachid M, Saati EA. Karakteristik Kimia Tepung Wortel dan Stick Wortel Hasil Kreasi PengolahanBerbasis Wortel oleh Kelompok Pkk Desa Tawangsari. 2017;
5. Destiamayu W. FAKTOR-FAKTOR PENDORONG KECEPATAN ADOPSI INOVASI BUDIDAYA WORTEL SIBATA DI KELOMPOK TANI KATATA. 2017.
6. Junaidi M, Hindarti S, Khoiriyah N. Efisiensi Dan Faktor-Faktor Yang Mempengaruhi

Produksi Bawang Merah A . Tempat dan Waktu Penelitian B . Metode Pengambilan Sampel. Seagri. 2020;8(2):69–82.

7. Yulihastin C, Yudhoyono SB, Yudhoyono A, Young TJ, Yazgan ME, Yilmazkuday H, et al. Basic Econometrics. The American Economic Review. 2011;

8. Lucier G, Lin B-H. Factors affecting carrot consumption in the United States. USDA, Economic Research Service; 2007.

9. Salisu BA, Jokthan GE, HASSAN MR, ADAMU HY, YASHIM SM, Ikani E. Effects of inclusion levels of carrot (Daucus carota) leaf meal on performance of growing rabbits. World Journal of Life Sciences and Medical Research. 2012;2(2):65.

10. de Lima JSS, Neto FB, Gomes EG, de Negreiros MZ, Pontes FST, De Medeiros MA, et al. Agroeconomic evaluation of intercropping rocket and carrot by uni-and multivariate analyses in a semi-arid region of Brazil. Ecological indicators. 2014;41:109–14.

11. Hasanah PN, Mahananto, Prasetyo A. EFISIENSI PENGGUNAAN FAKTOR-FAKTOR PRODUKSI PADA (Studi Kasus di Kelompok Tani Prawoto Sari , Desa Munding , Kecamatan Bergas , Kabupaten Semarang). Jurnal Ilmiah Agrineca. 2020;20(2):77–87.

12. Vieira M do C, Zárate NAH, Gomes HE. The Peruvian carrot and lettuce yield and income in monocropping and intercropping systems, using nitrogen fertilization and chicken manure in cover. Acta Scientiarum-Agronomy. 2003;25(1):201–8.

13. Afifah AN, Marwanti S. Food security analysis based on the proportion of food expenditure and energy consumption of carrot farm households in Tawangmangu Karanganyar. In: IOP Conference Series: Earth and Environmental Science. IOP Publishing; 2021. p. 12052.

14. Laraia BA. Carrots, sticks, or carrot sticks?: using federal food policy to engineer dietary change. American Journal of Preventive Medicine. 2012;43(4):456–7.

15. Sangeetha S, Shanthakumar S. Carrot cultivation in India: A critical review. Shanlax International Journal of Arts, Science and Humanities. 2016;4(1):66–71.

16. Silva Jr AAD, Supriana T. Analysis of farmer's revenue and factors which affect carrot production in Surbakti Village. In: IOP Conference Series: Earth and Environmental Science. IOP Publishing; 2020. p. 12028.

17. Lee H, Goldstein R, Sumner DA. Demand for Food Attributes: Evidence from a Large Sample of Carrot Buyers. 2020;

18. Torales EP, Zárate NAH, Moreno LB, Vieira MC, Abrão MS. AGRO-ECONOMIC YIRLD OF CARROT CULTIVATED WITH TYPES AND WAYS OF ADDITION OF CHICKEN MANURE TO THE SOIL. Revista Agrotecnologia-Agrotec. 2016;

19. Lin B-H, Lucier G. Carrot Consumption Varies With Age, Income, and Race. 2008.

20. Fitria I. Analisis Pendapatan Usahatani Wortel di Desa Suban Ayam Kecamatan Selupu Rejang Kabupaten Rejang Lebong. Agribisnis Fakultas Pertanian Universitas Dehasen Bengkulu. 2018;

Table 1. The accuracy of the Multiple Linear Regression Model in Carrot Farming in the Argoayuningtani Farmer Group, Senden Village, Selo District, Boyolali Regency in 2020.

Model Summary	Nilai
R	0,696
R square	0,484
Adjusted R square	0,361
Std. Error of the Estimate	0,57651
F test	0,011

Table 2. Testing of Variables Affecting Production Factors of Shallot Farming in the Argoayuningtani Farmer Group, Senden Village, Selo District, Boyolali Regency in 2020.

Variable	Coefficient	T	Sig.
Land area (X1)	-0,550	-0,918	0,369
Labor (X2)	1.481	2,207	0,039
Seed (X3)	0,119	0,440	0,664
Organic Fertilizer (X4)	0,316	1,280	0,214
Fertilizer Za (X5)	-0,372	-1,100	0,284

Table 3. Efficiency Analysis of the Use of Carrot Farming Production Factors in the Argoayuningtani Farmer Group, Senden Village, Selo District, Boyolali Regency in 2020

Variable	NPMXi	Pxi	$\frac{NPMxi}{Pxi}$	
Land area (X1)	-16.841,30	1.185.000	-0,014	Not efficient
Labor (X2)	351.089,59	75.000	4,68	inefficient
Seed (X3)	3.489.850,04	281.666,67	12,39	inefficient
Organic Fertilizer (X4)	2.867,16	793,33	3,61	inefficient
Fertilizer Za (X5)	-45.994,54	2.263,33	-20,32	Not efficient

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