RJOAS: Russian Journal of Agricultural and Socio-Economic Sciences
ISSN 2226-1184 (Online) | Issue 10(142), October 2023

UDC 633; DOI 10.18551/rjoas.2023-10.15

ANALYSIS OF ALLOCATIVE EFFICIENCY OF SHALLOT FARMING IN BENDOSARI VILLAGE OF PUJON DISTRICT, MALANG REGENCY, INDONESIA

Hindarti Sri*, **Saputro Arief Joko**, **Rianti Titis Surya Maha**
Study Program of Agribusiness, Faculty of Agriculture, University of Islam Malang, Malang, Indonesia
*E-mail: srihin@unisma.ac.id

ABSTRACT
The aim of this research is to determine the allocative efficiency of shallot farming in Bendosari Village, Pujon District, Malang Regency. This research was carried out purposively in Bendosari Village, Pujon District, Malang Regency, this is because Bendosari Village is one of the shallot producing villages in Malang Regency. The sampling for this research used census sampling, where the sample was taken from all members of the existing population, namely 65 shallot farmers. The analytical method used in this research is stochastic frontier analysis and Data Envelopment Analysis (DEA). Research Results Based on the results of the research above which was carried out in Bendosari Village, Pujon District, Malang Regency, the cost function that has a real influence on shallot farming in Bendosari Village, Pujon District, Malang Regency is the variable C_1 (seed), C_2 (manure), C_4 (fertilizer phonska), and C_6 (labor). The average allocative efficiency value is 0,773 on average shallot farmers have not yet achieved allocative efficiency.

KEY WORDS
Efficiency, shallot, stochastic frontier, DEA.

Shallots are a strategic horticultural commodity with high economic value and have quite large demand (Siregar & Supriana, 2018). Shallots are a commodity that is really needed as a spice in Indonesian cooking after chilies (Suswadi & Prasetyo, 2022). This can be seen from the high demand for shallots in Indonesia. Data on shallot consumption by households in Indonesia shows an upward trend. Consumption of shallots by the household sector in 2022 will reach 831.14 thousand tons, an increase of 5.12% (40,51 thousand tons) from 2021 (BPS, 2022).

Shallots are produced in almost all regions of Indonesia. In 2022, the highest shallot production will occur in April, reaching 199,11 thousand tons with a harvest area of 19.59 thousand hectares. The provinces with the largest shallot production are Central Java, East Java and West Sumatra. East Java itself contributed 24,13% with production reaching 478.39 thousand tons and a harvest area of 51,61 thousand hectares (BPS, 2022). In East Java itself, shallot production is supported by several districts/cities such as Nganjuk Regency, Malang Regency, Probolinggo Regency, Sampang Regency and Bojonegoro Regency. These five districts are able to contribute more than seventy-five percent of the total shallot production in East Java Province in 2021. Of these five districts, the contribution from Malang Regency alone is around 10.10% or 59,59 thousand tons (BPS, 2021). Shallot farming can be financially and economically profitable, the highest financial profits are found on dry land in Malang district with an average income of IDR 60,56 million/planting season (Saptana et al., 2021).

Shallot productivity is still relatively low, namely between 9 tons/ha, although it could potentially reach 17 tons/ha (Suswadi & Prasetyo, 2022). Production capabilities are still low, causing Indonesia to still import shallots. This is because shallot production in Indonesia is still seasonal and efforts to maintain the stability of availability and market prices are carried out through imports. Apart from being seasonal, shallot production requires high production costs, especially for seeds, labor and pesticides (Suminartika et al., 2022). According to Fauzan (2016) t the total cost of producing shallots is Rp. 46.229,103/ha, labor is the highest proportion of costs, with 46.94% of the total costs that must be incurred by farmers, seed costs are the second highest cost in cost components, and next are the costs of fertilizer and pesticides with around 4-9% of the total cost of shallots in Bantul Regency.

The high production costs have an impact on the selling price of local shallots which is higher than the price of imported shallots (Suminartika et al., 2022). As explained in research (Suminartika et al., 2022) the price of local shallots is higher than the price of imported shallots and causes a lack of competitiveness and a strategy that can increase the competitiveness of shallots is to increase technical, allocative and economic efficiency. Allocative efficiency is obtained by ordinary minimization at a given level of output. This means that in increasing economic efficiency it is necessary to pay attention to expenditure on inputs to achieve a certain level of output.

The cause of the high production costs of shallots is excess use of inputs or excess expenditure on farming inputs (Suminartika et al., 2022). Considering that input prices are a factor that is difficult for farmers to control, what can be done is to control the allocation of inputs used. For this reason, it is important to carry out this research to find out whether allocatively the costs of shallot farming are efficient and how to allocate the use of inputs so that shallot farming is carried out efficiently.

For this reason, this research was conducted in one of the villages chosen as the location for this analytical case study. The village is Bendosari Village, Pujon District, Malang Regency, which is one of the villages that produces shallots in Malang Regency. However, with the minimum land owned by Bendosari Village, the production produced by shallot farmers in Bendosari Village cannot be maximized. The production factors used by farmers are generally very limited, but farmers also want the production of their farming. Conditions like this can force farmers to use input production factors as efficiently as possible in their farming. What can be done is to use production factors by calculating their allocative efficiency. This achievement can be known if farmers know what production factors influence their farming business. Most shallot farmers in Bendosari Village have not been able to optimize production inputs properly, so shallot farmers in Bendosari Village have not been able to achieve maximum efficiency.

METHODS OF RESEARCH

This research was conducted in Bendosari Village, Pujon District, Malang Regency. This location selection was done purposively. This location selection was based on the consideration that Bendosari Village is one of the shallot producing villages in Malang Regency. According to (Puryantoro & Wardiyanto, 2022), a sample is a part of the population taken from certain, clear and complete methods which are considered to represent the population. The sample in this study used census sampling, where this sample was taken from all members of the existing population, namely 65 shallot farmers. The data analysis method used in this research is frontier stochastic analysis. Analysis of the stochastic frontier cost function using the Maximum Likehood Estimation (MLE) method, which is an analysis method that functions to determine the level of allocative efficiency (Rosdiantini, 2019). The frontier stochastic cost function equation model used in this research is as follows:

$$LnCi = \alpha + \alpha_1 lnC_1 + \alpha_2 lnC_2 + \alpha_3 lnC_3 + \alpha_4 lnC_4 + \alpha_5 lnC_5 + \alpha_6 lnC_6 + Vi - Ui \quad (1)$$

Where:

Ci: Total production costs (Rp);
α : constant;
C1: Cost of Seeds (Rp/ha);
C2: Manure Cost (Rp/ha);
C3: ZA Fertilizer Cost (Rp/ha);
C4: Cost of Phonska Fertilizer (Rp/ha);
C5: Cost of medicines (Rp/ha);
C6: Labor Costs (Rp/ha);
Vi – Ui: error term.

Data Envelopment Analysis (DEA) method to determine the level of allocative efficiency of shallot production. In the DEA method, efficiency measurement does not calculate the average, but measures the relative efficiency value of the use of production inputs. The assumption used in the DEA model is VRS (Variable Return to Scale) because farmers do not operate at an optimal scale. Mathematically, the calculation of technical efficiency using the VRS model is as follows (Coelli et al., 2005).

$$\begin{aligned} &\text{Min } \theta, \lambda\, \theta, \\ &st \quad -y_i + Y\lambda \geq 0, \\ &\theta x_i - X\lambda \geq 0, \\ &N1'\lambda = 1 \\ &\lambda \geq 0 \qquad (2) \end{aligned}$$

Where: θ is the score of Technical Efficiency (TE), yi is the total production of the i-th farmer, xi is the vector Nx1 is the amount of input used by the i-th farmer, Y is the 1xM vector for production, input used, λ is a vector of Mx1 and θ is a scalar. N1‘λ=1 is a convexity constraint which guarantees that the efficiency level is only a reference for DMUs of the same scale.

RESULTS AND DISCUSSION

Production is the activity of using various inputs to produce an output. To produce a certain output in the production process, it is necessary to use input production factors. According to (Mutisari, 2019) the use of production factors can have a positive or negative effect on efficiency. If the use of production factors is positive, it will increase efficiency, productivity and profits. Meanwhile, if the use of production factors is negative, then the efficiency results are low, this indicates that the use of production inputs is inappropriate.

Table 1 – Results of Cost Function Analysis of Shallot Farming Using the MLE Method

Variable	Coefficient	Standard-error	t-ratio
Constanta	0,902	0,314	2,864
Seed (C_1)	0,733	0,189	38,770*
Manure (C_2)	0,316	0,465	6,799*
ZA (C_3)	0,287	0,542	0,5299
Phonska (C_4)	0,238	0,495	24,806*
Pesticides (C_5)	0,125	0,305	0,409
Labor (C_6)	0,171	0,830	20,603*
Sigma-squared	0,109	0,153	7,101
gamma	0,999	0,126	7894,810
Log likehood function	99,034		

Based on the results of linear analysis, the regression model equation is obtained as follows:

$$Y = 0{,}902 + 0{,}733\ LnC_1 + 0{,}316\ LnC_2 + 0{,}287\ LnC_3 + 0{,}238\ LnC_4 + 0{,}125\ LnC_5 + 0{,}171\ LnC_6$$

Based on table 1 above, it is known that there are variables that have a significant influence on the production cost function of shallot farming in Bendosari Village, Pujon District, namely variables C_1 (Seeds), C_2 (Manure), C4 (Phonska Fertilizer) and C_6 (labor), and which has no real effect on variables C_3 (ZA Fertilizer), and C_5 (Pesticides).

The seed price variable from the results of the analysis above shows that t - count > t - table (38.770 > 2.00). The t - calculated value shows that the seed variable has a significant effect on shallot production costs. By having a coefficient value of 0,733, which means that every 1% addition results in an increase in farming production costs of 0.733%. With an average input value of 1160 kg with an average cost of IDR 37.045,128. Increasing the use of seeds will significantly increase shallot production (Astuti et al., 2020). Research (Suminartika et al., 2022) states that seeds influence shallot farming. Seeds are an important part of the input for shallot cultivation, if the price of seeds rises, this will make farmers buy less seeds, reduce other inputs, buy cheaper seeds but do not have quality certificates or increase output prices (Fadzil et al., 2023).

The variable price of manure from the results of the analysis above has a calculated t-value of 6.799, this value shows that the price of manure has a real effect on the production of shallot farming. The coefficient value is 0.456, indicating that every 1% addition of manure results in an increase in farming production costs of 0.456%. The average manure used is 5,062 kg with an average cost of IDR 3.954,544. This is in line with research (Prasmatiwi et al., 2022) which states that the price of manure has a real effect on shallot farming.

The results of the cost function estimation on the Phonska fertilizer variable (t count 4.806) have a significant effect on shallot production costs. The coefficient value is 0,238 which means that every 1% addition of phonska fertilizer results in an increase in farming production costs of 0,238%. With an average input value of 316,92 kg with an average cost of IDR 2.024,031. This is not in line with research (Istiyanti & Maylani, 2022) which states that Phonska inorganic fertilizer has a real effect on shallot farming production.

The ZA Fertilizer price variable shows a t-calculated value of 0.529, which means it has no significant effect on shallot production costs. This is not in line with research (Fauzan, 2016) which states that the cost function of the za fertilizer variable has a real effect on shallot production. The drug variable also has no real effect (t = 0.409) on shallot production costs due to non-optimality. prices made by farmers.

Labor prices have a significant effect on shallot production costs (t = 20.603). The coefficient value is 0.171, which means that every additional 1% of labor will increase labor costs and result in an increase in production costs for shallot farming by 0.171%. With an average usage input value of 24.56 HOK with average costs incurred of IDR 9,300,308. This is in line with research (Fauzan, 2016) which states that the cost function of the labor variable has a real effect on shallot production.

Table 2 – Distribution of Allocative Efficiency

Allocative Efficiency		
Value	Farmer	%
1	2	3,08
0,900-0,999	6	9,23
0,800-0,899	23	35,38
0,700-0,799	14	21,54
0,500-0,699	16	24,62
0,400-0,599	4	6,15
Total	65	100
Average = 0,773	Std.dev = 0,121	

Price efficiency or allocative is a value that shows the relationship between costs and output that can be achieved if you maximize profits by equating the marginal product value of each production factor (input) with each price (Fauzan et al., 2021). The sigma - square and gamma values are known to have values of 7.101 and 7894.810 respectively. The sigma - square value is known to be t - calculated > t - table (7.101 > 2.00) with a coefficient value of 0.109, meaning that there are technical inefficiencies that influence shallot production in Bendosari Village, Pujon District. Meanwhile, it is known that the gamma value with t - count > t - table is (7894,810 > 2.00) with a coefficient value of 0,999 which indicates that the gamma value is more than 0, meaning that there is an error term value in the allocative inefficiency component. To determine the level of allocative efficiency further in this research, the Data Envelopment Analysis (DEA) approach was used.

The allocative efficiency value using the DEA approach in Bendosari Village, Pujon District, Malang Regency is an average of 0,773, meaning that allocatively in shallot farming there is still inefficiency. The average allocative efficiency of shallot farming in previous research was 0,743 and was still lower compared to the technical efficiency value (Astuti et al., 2020). Farmers who are allocatively efficient or fully efficient (AE = 1) are only 3% of farmers. The distribution of farmers' allocative efficiency values (35.38%) is in the range of 0,800 to 0,899. The majority of farmers still have an allocative efficiency value below 0,800.

Factors that influence the allocative efficiency of shallot farming are pesticides, land area, seeds, and working hours (Ulansari & Pujawan, 2020). Allocative inefficiency is caused by farmers not being optimal in allocating their production inputs which causes inefficient costs incurred by farmers.

CONCLUSION

Based on the results of the research above which was carried out in Bendosari Village, Pujon District, Malang Regency, it can be concluded that the cost function that has a real influence on shallot farming in Bendosari Village, Pujon District, Malang Regency is the variable C_1 (seed), C_2 (manure), C_4 (phonska fertilizer), and C_6 (labor). The average allocative efficiency value is 0,773 on average shallot farmers have not yet achieved allocative efficiency.

There is a need to increase farmers' knowledge regarding price and market information through increasing the role of agricultural institutions such as agricultural extension institutions, farmer groups and government agencies. Efforts to increase efficiency in the allocation of production input use require input and output price policies by relevant agencies, such as access to business loans, ease of access to subsidized fertilizers, fuel subsidies, and stabilization of output prices.

REFERENCES

1. Astuti, L. T. W., Daryanto, A., Syaukat, Y., & Daryanto, H. K. (2020). Risk Behavior Analysis of Shallot Farmer Production in Brebes, Central Java, Indonesia. American Journal of Humanities and Social Sciences Research, 4(5), 273–281.
2. BPS. (2021). Statistics of Horticulture East Java Province 2021. In Badan Pusat Statistik.
3. BPS. (2022). Statistics of Horticulture 2022.
4. Coelli, T. J., Prasada Rao, D. S., O'Donnell, C. J., & Battese, G. E. (2005). An introduction to efficiency and productivity analysis. In An Introduction to Efficiency and Productivity Analysis. https://doi.org/10.1007/b136381.
5. Fadzil, M. I., Firdaus, M., & Tinaprilla, N. (2023). Proceedings of the International Symposium Southeast Asia Vegetable 2021 (SEAVEG 2021). In Proceedings of the International Symposium Southeast Asia Vegetable 2021 (SEAVEG 2021) (Vol. 1). Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-028-2.
6. Fauzan, M. (2016). Pendapatan, Risiko dan Efisiensi Ekonomi Usahatani Bawang Merah di Kabupaten Bantul. AGRARIS: Journal of Agribusiness and Rural Development Research, 2(2), 107–117. https://doi.org/10.18196/agr.2231.
7. Fauzan, M., Mu, J., & Sedek, M. (2021). Production Factor Efficiency of Shallot Farming in Pati , Central Java , Indonesia. 02036, 1–11.
8. Istiyanti, E., & Maylani, K. (2022). The Efficiency of Shallot Farming in the Highlands and Lowlands in Magetan Regency , East Java Province. 02009.
9. Mutisari, R. (2019). Analisis Risiko Produksi Usahatani Bawang Merah Di Kota Batu. Jurnal Ekonomi Pertanian Dan Agribisnis (JEPA), 3, 655–662. https://doi.org/https://doi.org/10.21776/ub.jepa.2019.003.03.21.
10. Prasmatiwi, F. E., Murniati, K., Iswara, R., Studi Magister Agribisnis, P., Pertanian, F., Lampung Jl Soemantri Brojonegoro No, U., & Lampung, B. (2022). Efisiensi Teknis Dan Ekonomis Usahatani Ubi Kayu Di Kabupaten Lampung Tengah Technical and Economic Efficiency of Cassava in Central Lampung Regency. 8(1), 118–131.
11. Puryantoro, P., & Wardiyanto, F. (2022). Analisis Faktor Produksi Dan Efisiensi Alokatif Usahatani Bawang Merah Di Kabupaten Situbondo. Jurnal Pertanian Cemara, 19(1), 20–29. https://doi.org/10.24929/fp.v19i1.1978.
12. Rosdiantini, R. (2019). Estimasi Efisiensi Ekonomi Usahatani Bawang Merah di Kabupaten Bantul. Jurnal AgroSainTa: Widyaiswara Mandiri Membangun Bangsa, 3(2), 114–125. https://doi.org/10.51589/ags.v3i2.20.
13. Saptana, Gunawan, E., Perwita, A. D., Sukmaya, S. G., Darwis, V., Ariningsih, E., &

Ashari. (2021). The competitiveness analysis of shallot in Indonesia: A Policy Analysis Matrix. PLoS ONE, 16(9 September), 1–20. https://doi.org/10.1371/journal.pone.0256832.

14. Siregar, A. F., & Supriana, T. (2018). Factors that influence the interests of farmer in shallots farming at Cinta Dame village of Simanindo sub district of Samosir district. IOP Conference Series: Earth and Environmental Science, 122(1). https://doi.org/10.1088/1755-1315/122/1/012005.
15. Suminartika, E., Deliana, Y., Hapsari, H., & Fatimah, S. (2022). The effect of input factor and optimization of input factor of shallot farm. IOP Conference Series: Earth and Environmental Science, 1107(1). https://doi.org/10.1088/1755-1315/1107/1/012110.
16. Suswadi, S., & Prasetyo, A. (2022). Factors affecting the income of organic shallot farmers in Boyolali Regency. IOP Conference Series: Earth and Environmental Science, 1001(1). https://doi.org/10.1088/1755-1315/1001/1/012032.
17. Ulansari, D. R., & Pujawan, I. N. (2020). Comparison Analysis of Tajuk's Onion Production Efficiency (Allium Ascalonicum) in Rejoso Sub-District-Nganjuk. IOP Conference Series: Materials Science and Engineering, 847(1), 1–9. https://doi.org/10.1088/1757-899X/847/1/012075.