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THE INTEGRATION OF QUR'AN VALUE IN TECHNICAL EFFICIENCY OF ONION BUSINESS: DATA ENVELOPMENT ANALYSIS (DEA) APPROACH

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ABSTRACT

The high productivity of onions is determined by the efficiency of farmers in using farm inputs. This study attempts to forecast onion production trends and technical efficiency levels. This study was conducted in Tawangagro Village, Karangploso District, Malang, East Java. The research data used primary data from as many as 40 onion farmers—data analysis using the Variable Return to Scale (VRS) and input-oriented Data Envelopment Analysis technique. The findings demonstrated the technical inefficiency of onion farming operations, with an average technical efficiency value assuming a CRS of 0.78 and an average technical efficiency value taking a VRS of 0.951. Associated with the Qur'an in the context of agriculture, the verse emphasizes that farmers should use inputs not excessively so that it causes waste in terms of capital or the use of input factors for their farming. There are 15 farmers with an efficiency scale of onion farmers (SE) equal to one, meaning that 37.5% of farmers are already farming with a constant return to scale, and 62.5% of other farmers are farming with an increasing scale of returns Farmers that have not been productive should change how they use their inputs to increase their efficiency. Thus the productivity of onion farming can also increase. To increase productivity, farmers should have an effective consultation helps to improve TE.

Keywords: DEA; onion; technical efficiency; quran

INTRODUCTION

East Java is one area that has a source of horticultural production, one of which is onions. Several onion centres in East Java include the Regencies of Malang, Pacitan, Banyuwangi, Bondowoso, Probolinggo, Nganjuk, and Pasuruan. Onions (Allium cepa) are plants widely consumed by the community as a mixture of cooking spices and can also be used as medicinal ingredients. Onions are annual plants with high economic value and suitable in the lowlands to highlands (Istiyanti & Maylani, 2022). In addition, onion cultivation is eligible to be carried out on former rice fields, especially during the dry season, so that it can be used as an alternative to crop rotation (Suwandi, 2013).

Onion farming is done mainly by farmers on a small scale and often faces very complex problems. Some of the issues in onion farming include the availability of land for agriculture tends to decrease, the quality of onion seeds being limited and expensive, and the continued high usage of production inputs such as inorganic fertilizers and pesticides. Even though the prices are high, selling prices tend to fluctuate, and climate conditions cannot control. Then problems from the social aspect of farmers in the form of access to technology, capital, and knowledge are still low, as well as the threat to farmers' health due to the use of pesticides which tends to be still high (Waryanto, 2014), seeing the many problems faced in onion farming can hamper onion production. However, these problems did not reduce farmers' enthusiasm for onion farming.

According to verse 14 of Surah An-Nahl in the Qur'an, "And it is Allah who has subjected the sea to you so that you may eat fresh meat from it, and you take out from the sea the jewellery you wear, and you see the ship sailing on it, and you seek to benefit from His bounty and that you may be grateful". In the context of agriculture, the verse explains that farmers must be patient, starting from

planting, cultivating, and caring for results. So how to optimize every business consistently and Istiqomah so that it is efficient to gain profits from farming.

In managing the farm, it is necessary to adhere to the principle of efficiency. From the point of view of Islamic economics, the concept of efficiency is in line with *syari'ah* principles which aim to achieve and maintain mawashi sharia. The idea of efficiency is avoiding all forms of waste, as in the letter Al-Israa' 26-27. The Quran forbids wasting wealth *(mubadzir).* Allah SWT forbids spending wealth without careful calculation until it is redundant. This prohibition aims to make Muslims regulate expenditures according to the estimates carefully adjusted to their income and needs (Kemenag, 2008). Waste, as has been interpreted by Ibn Mas'ud and Ibn Abbas, is giving infaq to something that is not right or not in place (Abdullah, 2004).

The production of onions in Malang Regency, especially the Karangploso Subdistrict, is unstable or fluctuates yearly. That is partly due to the declining onion harvest area. With market demand for onions being relatively constant, of course, production instability will have an impact on onion price fluctuations. For this reason, with the available land, onion production must still be increased to meet market demand. Increasing the output of onions by increasing the productivity of onion farming can be done by increasing the efficiency of onion farming (Minarsih & Waluyati, 2019). Technical efficiency refers to a farm's capacity to maximize production from a specific combination of inputs (Jiao et al., 2015). Farmers can be efficient if they achieve maximum output with the optimal variety of information along the isoquant curve.

If farmers are not inefficient performance, the production achieved is not optimal, which impacts profits that are not maximized. Therefore, farmers can make efforts to increase the output of onions currently experiencing fluctuations by measuring the performance of onion farmers through a technical efficiency approach. In this study, researchers used the DEA approach to examine the efficiency level in a non-parametric manner.

Banking, medical services, agriculture and dairy, transportation, and education are just a few fields where DEA has applied (Liu et al., 2013). The DEA approach is used because research on the technical efficiency of onions with the DEA approach with the assumption of VRS is new research rarely done. Many previous studies used the stochastic frontier approach in analyzing onion farming efficiency; (Astuti et al., 2019); (Waryanto et al., 2015); (Fajar et al., 2019) to analyze the efficiency of onion farming in Indonesia with SFA and analyze small-scale onion farmers (Sujarwo et al., 2016). (Khan, 2018) studying onion farming in Pakistan. Ulansari & Pujawan, (2020) used DEA but assumed the CRS approach. In DEA, technical efficiency is measured by the DMU or farmers who employ specific inputs to create the most significant amount of output. The purpose of this study is to evaluate the level of technological efficiency in onion farming and to examine the pattern of agricultural production, specifically whether farmers operate with a constant return to scale, rising returns to scale, or decreasing returns to scale.

MATERIALS AND METHODS

The research location is Tawangagro Village, Karangploso District, Malang, East Java. This study relied on primary data, which included the quantity of onion output in one growing season and the inputs utilized, including land, NPK fertilizer, manure, pesticides, and labour. The total sample observed in this study was 40 farmers. A simple random sampling procedure was used to make the selection.

The Data Envelopment Analysis approach is utilized in this study to examine and estimate the technical efficiency of onion farming and to see the pattern of farming production (DEA). This model employs a linear programming method to assess the relative performance of each DMU (Singh & Bajpai, 2013) (Jiao et al., 2015). The BCC model was used for this investigation because it is oriented to Variable Return to Scale (VRS). The BCC DEA model with the VRS assumption can be referred to as pure technical efficiency (PTE), and it may be defined systematically as follows:

$$\text{Min}_{\theta\lambda}\theta, \quad (1)$$
$$St - qt + Q\lambda > 0, \quad (2)$$
$$\theta xi - x\lambda \geq 0, \quad (3)$$
$$I1'\lambda = 1 \quad (4)$$
$$\lambda \neq 0 \quad (5)$$

Description: I1 = vector Ix1; = proportional input reduction for the i-th DMU; = weight of $_j$th DMU

The DEA method generates output based on technical efficiency metrics. Technical efficiency denotes the DMU's capacity to maximize production from a given set of inputs (Ullah et al., 2019); (Hassan et al., 2014). The resulting efficiency value output consists of two assumptions: CRS and VRS. Namely the value of technical efficiency with the assumption that farmers are farming optimally (CRS assumption) and technical efficiency values assuming that farmers are not optimal (VRS) (Rianti et al., 2018). The value of technical efficiency range from 0 to 1 (Chiang Yat H, 2020); (Marjelita et al., 2015). Farmers can be technically efficient if they have an ET value = 1, while farmers are said to be technically inefficient if they have an ET value <1. The technical efficiency value obtained from the calculation results is relative, so we cannot draw general conclusions. The efficiency value indicates that a respondent farmer is close to the other farmers in a particular planting season.

RESULTS AND DISCUSSION

Characteristics of Respondents

Before delving into the technical efficiency of onion farming, we provide the characteristics of the respondents we encountered. The Respondents' elements can be identified by looking at the farmer's age, education level, number of dependents, and business experience (Table 1).

Regarding Table 1, most of the farmers are in the age range of 25-50 years. That shows that farmers of productive age carry out onion farming. That means that onion farming can be optimally by devoting available physical labour. The age level is one of the factors used to determine job productivity when undertaking business growth (Soekartawi, 2010). Farmers' comparatively younger generation makes them more substantial, dynamic, open to new ideas, and responsive to their surroundings than professionals with a more excellent experience. Older folks are typically resistant to new ideas. All respondents had a formal education level ranging from Elementary School (SD) to Senior school (SLTA), with a ratio of 60% for elementary education, 32.5% for junior school, and 7.5% for senior school. According to Saputra (2012), education level is a deciding element in company development and enhancing productivity. A high degree of education generally leads to an increased production level. Higher education is usually faster in adopting technology. On the other hand, those with a poor education level face specific difficulties in adopting innovation fast.

Table 1. The Characteristics of Onion Farmer

No	Descriptions	Number (Farmer)	Percentage (%)
1	Farmer Age's		
	<20 year	0	0.0
	25-50 year	21	52.5
	>50 year	19	47.5
2	Education Level		
	Elementary School	24	60.0
	Junior School	13	32.5
	Senior School	3	7.5
3	Family Dependent		
	<3 person	9	22.5
	3-6 person	31	77.5
	>6 person	0	0.0
4	Farm Experience		
	<10 year	5	12.5
	11 - 15 year	32	80.0
	>15 year	3	87.5

Source: Primar Data 2021

The number of dependents in a family is the number of persons in charge of the household who is not the home's head. That will affect farmers' production and consumption patterns and result in differences in income received by farmer households. The average number of farmer members is three, ranging from 3-6 people. In onion farming, the number of family members is a source of work. The availability of 100% work comes from within the family, where the more workers, the higher the costs incurred for consumption, so the smaller the funds that can allocate for farming costs.

On the other hand, the more active family members are in farming activities, the more likely they are to earn higher incomes than other farmers with inactive family members. According to experience, farming is among the essential components in ensuring agricultural performance.

Respondent farmers' agricultural experience varied from 1 to 25 years, with 80% having more than 1 to 15 years of experience and an average of 32 years. There are more responders with children and spouses. It's more significant the responders' working hours (Situngkir, 2007). The farming experience is capital to develop farming (Saputra et al., 2012). Farming experience is essential in the farming process. The longer a farmer engages in farming tasks, the more experienced he will become. This occurs because farming is a learning process, and the farming experience boosts agricultural productivity.

Onion Farming Technical Efficiency: Analyzing onion farming efficiency in Tawangargo Village, Kec. Karangploso, Kab. In Malang, The researchers employed a DEA technique using VRS as an assumption. The VRS concept was adopted because farmers in the research area had not attempted farming optimally (Alviya, 2011). The efficiency analysis is input-oriented, which shows the combination of minimal production inputs to obtain a certain number of outputs. Table 2 displays the findings of the research that was conducted.

Table 2. Technical efficiency and efficiency scale estimation results using DEA

Descriptions	TE CRS	TE VRS	SE
Mean	0,784	0,951	0,812
Min	0,306	0,758	0,358
Max	1,000	1,000	1,000
Number of Efficiency = 1	15	27	15
Number of Efficiencies < 1	25	13	25

Source: Primary Data 2021

The results of the technical efficiency analysis using the DEA approach with VRS assumption produce total efficiency (CRSTE), pure efficiency (VRSTE), and scale efficiency (SE) outputs (Cooper et al., 2007). The average value of the efficiency levels of CRSTE and VRSTE shows the importance of TE < 1, which means that the onion farmers in the research location have not achieved total efficiency and maximum output. To gain full results, farmers can readjust their use of inputs.

Based on Table 1, the average value of onion farming efficiency using the CRS assumption is 0.784. With the belief of CRS, 15 farmers (37.5%) have managed to operate onions efficiently, and the remaining 25 have not managed onions efficiently (inefficiency). The lowest efficiency value on this assumption is 0.306. Related to Ulansari & Pujawan (2020), onion farming has not yet reached efficiency, with the highest value in the study being 0.63 with DEA.

The analysis with the VRS assumption showed an average technical efficiency of 0.951. Farmers already technically efficient with the VRS assumption are 27 onion farmers, or (67.5%) while 13 other farmers are still not operating efficiently (inefficiency). This TE VRS result means that if the farmer has not tried farming on an optimal scale with the return scale of the farmer variable, it is close to efficient, where the TE VRS value is 0.951.

Scale efficiency is another result of the DEA approach's investigation of technical efficiency, as seen in Table 2. (SE). When a firm employs a CRS, it achieves scale efficiency. The efficiency of the scale ranges between zero and one. A one on the efficiency scale shows that the firm runs at the ideal scale (Ogisi et al., 2012). The analysis showed that farmers with an efficiency value of one scale were 15. That means that as many as 15 farmers in the research location were already farming with a constant return scale. While the other 25 are scale inefficiencies, the production results show an increase or decrease in output returns.

In achieving efficient farming activities, farmers who are not yet efficient can refer to as already efficient, as presented in Table 3.

Table 3. Peer group DMU

DMU	Peer Group
1	7, 29, 14, 17
6	7, 17, 29,14
8	32, 24, 3, 37, 39
11	17, 14, 30, 31
12	14, 17, 32, 7
13	30, 9, 17, 29
15	16, 7, 18, 37
21	18, 30, 34, 16
22	38, 24, 34, 32, 37

Table 3. Peer group DMU

DMU	Peer Group
26	3, 24, 7, 32
28	29, 17, 14, 7
33	34, 24, 40, 2, 10
35	16, 37, 18

Source: Primary Data 2021

Table 3 is the DMU peer group which means the reference group of decision makers. The DMU referred to in this study are onion farmers. Onion farmers who are not yet efficient can refer to already efficient farmers. For example, farmer 1 has an efficiency value of 0.836 which means it is not efficient, so farmer one can do farming efficiently by referring to the use of inputs from DMU 7, DMU 29, DMU 14, and DMU 17. For other DMUs that are not efficient, they can refer to their respective Peer Groups. The DMU, which has been efficient so far with a relative efficiency value of one, can maintain the use of its individual inputs.

Farm Production Trends

One of the outputs of technical efficiency analysis using the DEA approach is the production trend of each onion farmer. The results show that onion farmers in Tawangagro Village operate with CRS and IRS. The details are presented in Table 4.

Table 4 shows that the Return to Scale return scale results from onion production activities has no farmers operating on a DRS scale. That means no farmers with additional production factors exceed the increased production proportion. There are 25 (62.5%) farmers with IRS, meaning that 62.5% of farmers operating at the ratio of additional production factors will result in a more significant increase in production. Finally, farmers who use a CRS scale of 15 or (37.5%), meaning that 37.5% of farmers lie in the proportion of additional production factors that will be proportional to the other production obtained. The majority of farmers who are not optimal operate on the IRS scale

Table 4. Farm Production Trends

Description	Observation (n)	Percentage (%)
DRS	0	0
CRS	15	37,5
IRS	25	62,5
Sample	40	100,00

Primary Data 2021 Source

According to the technical efficiency study's description, when it is related to the Qur'an, Surah Al Isra' 26-27, which says, "And share their rights to near relatives, especially to the destitute and those on the road, and do not waste (your riches extravagantly)". If in the context of agriculture, the verse emphasizes that farmers should use inputs not excessively so that it causes waste in terms of capital or the use of input factors for their farming. Suppose farmers are in a technically efficient condition. In that case, farmers can reduce farm input costs and increase their income to achieve prosperity from their farming results.

CONCLUSIONS AND SUGGESTION

According to the findings, onion growers are inefficient in terms of technology. This is evidenced by the fact that the average value of technical efficiency for both Technical Efficiency (CRS) and VRS is less than 1. According to the return scale, the majority of onion farmers in the study area are at an (IRS), 62.4% are at a CRS, and 37.5% are at an (IRS). Most farmers have carried out farming operations with the addition of output more excellent than the addition of input. Should growers with IRS production patterns significantly increase their work with effective input allocation. Farmers may expand their use of high-quality seeds to boost onion yield. Effective consultation aids in increasing onion production in Malang by improving the TE of the low TE target group. This requires a more substantial role for agricultural institutions, such as agricultural extension agencies, farmer associations, and government agencies, in improving farmers' pricing and market information expertise.

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