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Submission title:	Production Management and Techn…
File name:	Technical_Efficiency_Of_Red_Onio…
File size:	443.05K
Page count:	6
Word count:	3,435
Character count:	17,730
Submission date:	26-Oct-2019 08:36AM (UTC+0700)
Submission ID:	1200613980

J. Basic. Appl. Sci. Res., 3(3)85-90, 2012

ISSN 2090-4304
Journal of Basic and Applied Scientific Research
www.textroad.com

Production Management and Technical Efficiency of Red Onion Farming in Brebes Regency

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ABSTRACT

Production management and technical efficiency are very important note in red onion farming in Brebes Regency. The objective of this study was to investigate how far the production management and technical efficiency affect the farmer income. By applying Cobb Douglas frontier production function analysis, the results showed that 1) the factors of area number, seed, pesticide, and employer gave significant influence to the the production of red onion in Brebes Regency; 2) technical efficiency of red onion in Brebes Regency was high enough; 3) the factors of production management, experience, age, and education gave significant influenet to the technical efficiency; and 4) the production of red onion farming in Brebes Regency increase the farmer income.

KEYWORDS: production management, technical efficiency, red onion farming

INTRODUCTION

Most of red onion farming is still traditionally carried out and has not applied modern technology. Impact of the condition is lower quality of commodity and less competitive power for inside as well as outside country. Therefore, it is needed an effort through the improvement of production management which is based on quality and market. The pattern of production management is as an integrated activity starting from crop production system until the management of nutrition, water, harvest, post harvest, human resource, and environment. Implementation of production management is willing the firm performance in the scheme on increasing of quality and productivity. Implementation of production management is necessary supported by institution or organization. Crop management as one of the production management activities includes some activities starting from seed preparation, area preparation, cropping, cutting, cleaning until the effort of flowering induction.

There was 38.15 % or 63,375 ha area of 166,117 ha area number in Brebes Regency, Centre Java Province was as irrigated rice area. The more area number was as country forest, dry field or plantation, dyke, society forest, and others. From the area number of irrigated rice area, there was 20,000 ha was cropped with red onions. This commodity was mostly cropped in the centre of Brebes. North cost side of Brebes was filled with fishery and dyke. In south of Brebes was as forestry and vegetables. Red onions which was as superior commodity as well as dependable in Brebes Regency was developed in 10 districts that were as production centre of main commodity. The 10 districts include Wanasari, Bulakamba, Larangan, Tanjang, Brebes, Losari, Kersana, Ketanggungan, Larangan, Jatibarang, and Songgom. Nowadays, red onion is still as specialty for the farmers in Brebes Regency. In addition, 75 % of their production has marketed in Centre Java and the other 23 % is supplied to the national market [1]. By the production of 312,533.2 ton in 2009, red onion farming has supported local income in Brebes Regency of 58 %.

In 2010, production of red onion in Brebes Regency had decreased of 4.77 % than in 2009. There was a decreasing trend of 0.7 % per-year for red onion production in Brebes and 0.87 % per-year for the productivity [1]. The decreasing of red onion in Brebes Regency was caused by the usage of production factors was estimated not optimal such as area number, seed, manure, employer, and pesticide. The aims of this study were as follow: 1) to investigate the influenced factors of red onions farming production in Brebes Regency; 2) to analyse the technical efficiency of red onion farming production for each farmer in Brebes Regency; 3) to investigate the production management influence and the other factors like age, education and experience to technical efficiency of red onion farming for each farmer in Brebes Regency; and 4) to analyse the profit level of red onion farming in Brebes Regency.

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by Ade Banani

Submission date: 26-Oct-2019 08:36AM (UTC+0700)
Submission ID: 1200613980
File name: Technical_Efficiency_Of_Red_Onion_Farming_in_Brebes_Regency.pdf (443.05K)
Word count: 3435
Character count: 17730

J. Basic. Appl. Sci. Res., 3(3)85-90, 2013

ISSN 2090-4304
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MATERIALS AND METHODS

This research was conducted in Brebes Regency. The selection of farming location was carried out purposively such as in the district of Larangan, Bulakamba, Wanasari, and Brebes by considering that these districts are as the production centre of red onion production in Brebes Regency. Therefore, it is hoped being able to answer the willing problem. Table 1 presented the area number, production, and production average of red onion in Brebes Regency in 2010.

Table 1 Area number, production, and production average of red onion in Brebes Regency in 2010

	District	Harvest area number (ha)	Production (kw)	Production average (kw)
1.	**Larangan**	**5.723**	**566.300**	**98.95**
2.	**Bulakamba**	**2.723**	**279.621**	**128.62**
3.	**Wanasari**	**7.145**	**918.544**	**128.56**
4.	**Brebes**	**3.179**	**310.829**	**97.78**
5.	Losari	823	53.098	64.52
6.	Kersana	723	60.907	83.78
7.	Jatibarang	992	96.686	97.47
8.	Ketanggungan	897	81.214	90.54
9.	Songgom	683	73.827	108.09

Source: Agricultural and Plantation Department of Brebes Regency

Table 1 showed that four districts such as Larangan, Bulakamba, Wanasari, and Brebes were as the biggest producer of red onion in Brebes Regency with harvest area number more than 1,000 ha, the production was more than 100 kw, and production average was more than 90 kw. Based on the production average, there were some districts like Songgom, Jatibarang, and Ketanggungan produced more than 90 kw but harvest area number relatively was still small.

According to Singarimbun [2] and Lawrance e*t al* [3] which presented that in the selection of sample, it was necessary to considerate the adequating of sample scheme, the aim of research, availability of data, and resources. Therefore, this study used farmers as the samples and determination of samples number used the formula as follow [4]:

$$n = \frac{NZ^2\,\sigma^2}{Nd^2 + z^2\sigma^2} \qquad \text{..... (1)}$$

Analysis of Production Function

Analysis of influenced factors to red onion farming production in Brebes Regency used Cobb Douglas Model. This frontier stochastic model was as the expansion of deterministic model for measuring stochastic effects in production. This study used stochastic production function of Cobb-Douglas frontier model with the formula was as follow:

$$Y = aX_1^{b_1} X_2^{b_2} \dots X_i^{b_i} \dots X_n^{b_n} e^u \qquad \text{..... (2)}$$

$$= a \prod_{i=1}^{n} X_i^{bi}\, e^u$$

Note:

Y = quantity of red onion production in one harvest time (kg)
X_1 = area number that is used in one harvest time (ha)
X_2 = seed number in one cropping time (kg)
X_3 = total of the whole manure in one cropping time (kg)
X_4 = total of the whole pesticide in one harvest time (in unit of Lt)
X_5 = total of employers in one cropping time (day –human-work/ HOK) or unit work equivalent with male (sksp)
a,b = estimated parameter
u = disturbance term
e = 2,718 natural log

Measuring of technical efficiency

Technical efficiency of farming production for farmer is estimated by using the formula as follow [5]:

$$TE_i = \frac{Y_i}{Y_i^*} = \frac{\exp(x_i\beta + v_i - u_i)}{\exp(x_i + v_i)} = \exp(-u_i) \qquad 4.3$$

with Y_i is actual production from observation and Y_i^* is frontier production estimation that is obtained from the production function of stochastic frontier. Efficiency of a farmer has a range between zeros to one which has invers correlation with technical inefficiency level. Technical efficiency value is estimated together with frontier function estimation by using the software of Frontier Version 4.1c from Coelli.

Measuring of profit level

Profit is as the difference between total accepting (TR) and total cost (TC) or TR – TC with TR = pq that expresses the multiplication between total and value of output. TC is as quantity of the whole input cost that is used in production process such as real cost like area rent, seed, manure, pesticide, and employer in outside of household as well as input which is belonged to himself like area and household employer as imputed cost and the value is analysed as opportunity cost with the formula as follow:

$$TC = \sum_{i=1}^{n} X_i r_i$$

Note:

p = value of output
q = number of produced output
Xi = number of input
r = value of input
i = type of input

RESULTS AND DISCUSSION

Stochastic production frontier function analysis of red onion

Because of the producers such as the farmers did not always success in producing the maximum yield, so there would be seen that did the farmers have been able to carry out it in their farming. Model that was used to estimate production function of red onion farming in Brebes Regency was Cobb-Douglas Stochastic Production Frontier Function. Estimated production factors which influenced red onions production were area, seed, manure, pesticide, and employer. Estimation of parameters used Maximum Likelihood Estimation (MLE) and it presented as in Table 2 below.

Table 2 Parameter estimation used MLE method for production function of Cobb-Douglass Stochastic Frontier In Brebes Regency, Centre Java Province in 2012

Variable	Parameter	Coefficient	Standard Error	t-ratio
Constant	β_0	64.03	0.98	65.05
Area number (ha)	β_1	1.20***	0.05	21.92
Seed (kg)	β_2	0.59***	0.02	24.00
Manure (kg)	β_3	-0.28	0.03	-0.86
Pesticide (Lt)	β_4	0.25	0.35	-0.71
Employer (HOK)	β_5	0.24**	0.12	2.00
Squared	Σ	0.14		
Gamma	γ	0.91		
Log Likelihood Function	-155.31794			
LR Test of The One-sided Error	155.85032			

Note: ***, **, * indicates the significance at level: α of 1% (2.358), 5% (1.980), 10% (1.289),

The usage of area had positive and significant influence with level of significance of 99.9 % to the red onion production. Value of area elasticity to red onion production was 1.2. It indicated that by increasing of area number of 1 % would increase red onion production of 1.2 % ceteris paribus. The big enough of area influence was estimated caused by area in location of study was as fertile area and suitable for red onion cropping. Area expansion was really carried out by extensification but in fact it was very difficult to be done because area was as limited number factor and dragging of red onion farming for residential usage. This result was suitable with the research of Mohammad Bakhshoodeh and Kenneth J. Thomson [6] that used Cobb-Douglas frontier production function for measuring efficiency. Productivity was influenced by company size and had positive mark, while the study of Nilam Sari [7] produced the different conclusion because it showed that variable of area size did not influence production. It was the same as the research of Olivia Yessy [8]. She expressed that

variable of area did not influence production in commodity of Lettuce Romaine Organic. Therefore, area number in this study was suitable with the hope that the more availability of area number would increase the production of red onion.

The usage of seed had positive and significant influence with level of significance of 99.9 % to the production. The value of seed elasticity to red onion production was 0.59. It indicated that by adding number of seed of 1 %, it would increase red onion production of 5.9 % ceteris paribus. This condition showed that the usage of seed could still be increased and it had the possibility to be increased in order to be able to increase production. This result was suitable with the research of Claudio [9], although the commodity was white onion but it indicated that seed had positive influence to production. However, this result was opposite with the research of Nilam Sari [7] which expressed that variable of seed did not significantly influence to red onion production. Some red onion varieties that were developed in Brebes Regency were Bima Brebes, Kuning, Timor, Sumenep, and import red onion such as from Philippine and Bangkok (especially was cropped in dray season).

The usage of employer had positive and significant influence to red onion production with level of significance of 95 %. The elasticity value of employer was 0.24 and it indicated that the employer increasing of 1 % would increase red onion production of 0.24 %. The increasing of employer was needed for the activity of crop maintenance like control of disease and manuring. This result was suitable with the research of Aprillia Dina [10] which produced that variable of employer had positive influence to production, but Sukiyono Ketut [11] produced the different conclusion. He expressed that variable of employer had negative influence to production in commodity of red pepper.

Technical efficiency

Technical efficiency is one of indicators for measuring the performance of production process. Therefore, technical efficiency of red onion farming was intended to measure how much the level of production could be reached of the production potency that might be able to be reached by the farmer.

Technical efficiency was analysed by using Frontier Program Version 4.1.c which was created by Coelli [5]. Result showed that technical efficiency of red onion farming in Brebes Regency was in average of 80 % with maximum value of 99.8 % and minimum value of 64.9 %. It meant that there was inefficiency of 20 %. Actual production was in average of 9,240.15 kg per-ha so the production potency per-ha was 11,550.19 kg. Therefore, if the farming was carried out by good technique and management, so the red onion production could be increased of 2,310.04 kg. If all of farmers could reach the maximum technical efficiency level of 99 %, so the averaged production that could be reached was 11,434.69 kg. Table 3 presented the technical efficiency of red onion in 2012.

Table 3 Technical efficiency of red onion in 2012

Level of efficiency	Total
Until 70%	8
70 – 80%	46
81 – 90%	37
91 – 100%	9
The average of efficiency level	0,801067
Standard deviation	0,063106
Variant	0,003982
Minimum	0,64969
Maximum	0,998931

Distribution of technical efficiency on every farmer was illustrated as in Figure 1 below.

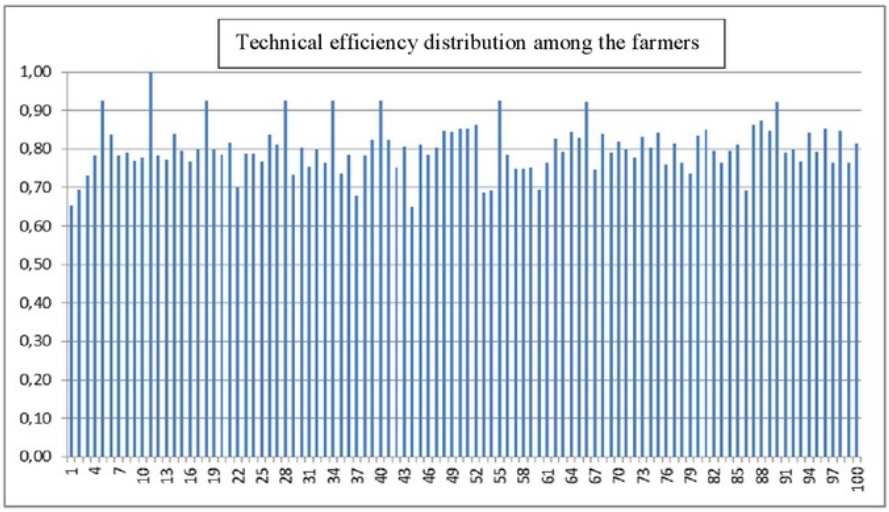

Figure 1 Technical efficiency distribution of every farmer

Influenced factors on technical efficiency of red onion farming in Brebes Regency

The influenced factors on technical efficiency of red onion farming in Brebes Regency was identified by double linear regression but variables that were assumed to influence technical efficiency were age, production management, education, and experience of farming. Result of estimation was presented as in Table 4.

Table 4 Estimation of parameter by using Regression Method on technical efficiency of red onion in Brebes Regency in 2012

Variable	Parameter	Coefficient	Standard Error	t-ratio
Interception	β_0	42.79***	2,707	15.809
Age (year)	β_1	0.088**	0,043	2.041
Production management (Score)	β_2	1.246***	0,193	6.460
Education (year)	β_3	1.705***	0,336	5.075
Experience (year)	β_4	0.004	0,042	0.090
F calculation	68.56			
R2	0.74			

Note: ***, **, *, each indicated the significant level: α of 1% (2,358), 5% (1,980), 10% (1,289),

Estimation result indicated that R^2 was 0.74 or 74 %, so it could be said that technical efficiency of farmer was explained by the variables of age, management, education, and experience of respondents, while 26 % was described by the other factor. F calculation was more than F table (68.58 >8.55), so it could be concluded that this model could be used.

Alocation efficiency or value

Marginal product (PM) of Coubb-Douglas production function was as coefficient of regression (β) multiplied by the averaged production of each input. In Cobb-Douglas production function, area production function was assumed fix such as area number of 1 ha. Input factor which was analysed had significant influence such as seed and employer, Analysis result of alocation efficiency was presented as in Table 5.

Table 5 Analysis result of allocation efficiency or value of red onion in Brebes Regency

Input	Production elasticity	Averaged production (PR)	Marginal production	Value of marginal production (NPM)	Input value (PX)	Ratio NPM/PX
Seed	0.59	6.01	3.5459	10,141.27	7,650	1.325656
Employer	0.24	4.48	1.0752	3,075.072	30,000	0.102502

Based on the analysis as above, it indicated that the ratio value of NPM with input value of seed was 1.325657, so it could be concluded that input usage of seed production was not efficient. Therefore, the usage of input had to be increased. Then, the analysis indicated that ratio value of NPM with employer input was

0.102502, so it could be concluded that input usage of employer was not efficient. Therefore, the usage of employer was remain to be maintained

Profitability of farming

Analysis result of red onion farming in Brebes Regency indicated that the production of red onion farming was high enough and it reached in average of 9.100 kg or more than 9 ton per-ha in one cropping season with the value of Rp. 27,300,000.- and the cost was about of Rp. 18,053,348.- per-ha. Therefore, the farmers were able to produce the profit in one time production approximate to Rp. 9,246,652.- in one cropping season or at about two months. In fact, Respondent of farmer was almost 100 % had area number less than 1 ha and in average they had 0.3 ha.

CONCLUSION

Based on the analysis result as above, it could be concluded as follow:

1. Positive influenced factors to the red onion farming frontier production in Brebes Regency included area number, seed, pesticide, and employer. It was indicated with the coefficients each of 1.20; 0.59, 0.25; and 0.24; but negative influenced factor was manure with coefficient of – 0.28. Ratio value of NPM with input value of seed was 1,325,657, so it could be concluded that the input usage of seed was not efficient. Therefore, the usage of seed had to be increased. Then, the ratio value of NPM with input value of employer was 0.102502, so it was concluded that the input usage of employer was not efficient. Therefore, the usage of employer had to be decreased.
2. Technical efficiency of red onion farming in Brebes Regency was high enough. It was almost 50 % of respondents were on the technical efficiency level of 81 %.
3. The variables which had significant influence were age, production management, and education. Educational factor supported the biggest influence among the variables of production management, experience, and age with coefficient of 1.705. The second rank was variable of production management with coefficient of 1.746.
4. Net income of farmer family on red onion farming in Brebes Regency produced positive income or profit.

SUGGESTION

Based on the conclusion above can be suggested that farmers should do collective farming in order to be feasable economically and technical efficiency can be improved. The Government of Brebes Regency should keep encouraging the farmers by providing technology, production management and fostering farmers by providing authorized seeds, fertilizer availibility to make farmers are able to improve their production and finally increase their income.

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