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Optimization of Red Chili Production in Central Bangka Regency

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ABSTRACT

The productivity of red chili in the Central Bangka Regency is still below its genetic potential, where the genetic potential of curly red chili per hectare is 200-220 quintals. This condition raises the assumption that the production of red chili in the Central Bangka Regency is not optimal. The purpose of farmers doing red chili production activities is to make a profit. Still, if the production of red chili is not optimal, it will affect the actual profits obtained by farmers. Therefore, it is important to research the optimization of red chili production in the Central Bangka Regency. This study aimed to analyze the effect of red chili production on the total cost of red chili farming and the optimal amount of red chili production by farmers in the Central Bangka Regency. The research method used is the survey method. The sampling method is simple random sampling with a sample of 34 people. The data analysis method used in this study uses inferential statistical methods. The formulation and objectives of the first research will be answered using the total cost function in cubic form. Furthermore, to answer the formulation and objectives of the second study, an analysis will be carried out using the abc formula (quadratic formula). The analysis results show that the amount of red chili production significantly affects production costs in red chili farming in Central Bangka Regency. Still, the amount of red chili production in Bangka Regency Middle is not optimal. So that farmers can achieve the optimal amount of red chili production, farmers should be able to use production inputs efficiently in their farming.

Keywords: *Central Bangka; Optimal Production; Red Chili*

1. Introduction

Bangka Belitung Islands Province is one of the provinces that produce red chili in Indonesia. The amount of red chili production in Bangka Belitung Islands Province in 2018 was 2,501 tons, but the amount of production did not meet the local community's need for red chili, which was 2,688 tons. Because the amount of red chili production in this province is insufficient for public consumption, it encourages traders to earn profits by bringing in red chilies from outside the island, namely Jakarta Capital Special Region, Central Java, and East Java (Badan Pusat Statistik, 2019).

One of the areas in the Province of the Bangka Belitung Islands that is used as a chili development area is Central Bangka Regency, especially Sungkap Village, Belililik Village, Keretak Village, and Trubus Village. The average productivity of red chili in the Central Bangka Regency is 35.6 quintals per hectare (Dinas Pertanian Provinsi Kepulauan Bangka Belitung, 2017). Compared with the genetic potential of curly red chili, the productivity of red chili in Central Bangka Regency is still below its genetic potential, where the genetic potential of curly red chili per hectare is 200-220 quintals. This condition raises the assumption that the production of red chili in the Central Bangka Regency is not optimal. The purpose of farmers doing red chili production activities is to make a profit. Still, if the production of red chili is not optimal, it will affect the actual profits obtained by farmers. Therefore, it is important to research the optimization of red chili production in the Central Bangka Regency.

Production is an activity to process inputs from goods or services into outputs in the form of goods or services that are more valuable or useful (Noor, 2007). Optimal production results are the number of production quantities to achieve maximum profit with minimal costs and efficiency in farming production factors (Jannah et al., 2019).

Cost theory is used to determine the optimal amount of production with minimal costs. Costs are expenses that must be incurred in carrying out an activity. Based on the characteristics of the amount, the costs are divided into two types, namely fixed costs and variable costs. Fixed costs are fixed in number, not affected by the size of the amount of output produced. For example, depreciation costs, rental costs, and others. On the other hand, variable costs change with the amount of output produced—for example, the cost of purchasing raw materials (Noor, 2007).

Based on the research background, the research problem can be formulated as follows:

1) Does the amount of red chili production affect the total cost of red chili farming for farmers in the Central Bangka Regency?
2) Is the production of red chili farmers in the Central Bangka Regency optimal?

The aims of this research are:

1) Analyzing the effect of the amount of red chili production on the total cost of red chili farming by farmers in the Central Bangka Regency.
2) Analyzing the optimal production of red chili farmers in the Central Bangka Regency.

2. Research Method

The research was carried out in Central Bangka Regency, namely in Belilik Village - Namang Sub-district, Sungkap Village - Simpangkatis Sub-district, Keretak Village - Sungaiselan Sub-district, and Trubus Village - Lubuk Besar Sub-district. The research location was chosen purposively because the four villages are areas that develop chili in Central Bangka Regency. The type of data used consists of primary data and secondary data. The research method uses a survey method. According to Wirartha (2016), the survey results not only

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describe certain characteristics of the research sample group but can also be applied or generalized to describe the characteristics of the population. The sampling technique used is simple random sampling, with a sample of 34 people. The data analysis method used in this study uses inferential statistical methods. The data for the first research formulation and objectives will be processed using the SPSS and Microsoft Excel programs. The formulation and objectives of the first research will be answered using the total cost function in cubic form. Before performing the total cost function specification, calculate the total cost. The total cost formula used according to Suratiyah (2015) is:

TC = TFC + TVC.....(1)

Information :

TC = Total Cost (Rp/lg/MT)

TFC = Total Fixed Cost (Rp/lg/MT)

TVC = Total Variable Cost (Rp/lg/MT)

The specifications of the total cost function in this study are as follows:

$TC = a + bQ + cQ^2 + dQ^3$ .....(2)

Information :

TC = Total Cost (Rp/lg/mt)

Q = Production Quantity (Kg/lg/MT)

a = Intercept

b, c, d = Slope

The second research formulation and purpose data were processed using Microsoft Excel. Furthermore, to answer the second research's formulation and objectives of the 2nd research, an analysis will be carried out using the abc (quadratic) formula, which consists of 3 stages. The first stage is the total cost equation obtained above will be derived to find the marginal cost (MC). The marginal cost formula in this study uses the formula referred to by Debertin (1986), namely:

$$MC = \frac{\delta TC}{\delta Q} = 0$$

$b + 2cQ + 3dQ^2 = 0$ ..... (3)

The second step is to reduce the marginal cost equation. The marginal cost formula used in this study is referred to by Debertin (1986), namely:

$$\frac{\delta MC}{\delta Q} > 0$$

$2c + 6dQ > 0$.....(4)

Optimal production can occur when P = MR = MC (Debertin, 1986). Thus the equation becomes:

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$$P = b + 2cQ + 3dQ^2$$

$$(b - P) + 2cQ + 3dQ^2 = 0 \quad \text{.....(5)}$$

Information :
P = Price of red chili (Rp/kg)

The third step is calculating the optimal production amount using the abc formula referred to by Debertin (1986). Based on equation (5), the abc formula in this study is as follows:

$$Q_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \text{.....(6)}$$

Information :
Q1,2 = Optimal or suboptimal production quantity (Kg/lg/mt)

If the Q obtained is greater than zero, it is said to be optimal, but if the Q obtained is less than zero, it is said to be not optimal.

3. Results and Discussion

3.1. Effect of Total Production on Production Costs in Red Chili Farming in Central Bangka Regency

The effect of the amount of production on production costs in red chili farming is analyzed by regressing the cubic equation whose data is processed using SPSS. The results of the analysis can be seen in **Table 1**.

Table 1. Results of Analysis of the Effect of Total Production on Production Costs in Red Chili Farming in Central Bangka Regency

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	0.656	60.978	1	32	0.000	3681267.941	2717.402		
Quadratic	0.656	29.613	2	31	0.000	4122046.149	2444.537	0.025	
Cubic	0.657	19.194	3	30	0.000	3382040.971	3412.041	-0.255	1.867E-5

Source: Primary Data Processed(2020)

The analysis results in **Table 1** show that the production cost function using the cubic equation is better than when using a linear or quadratic equation. This is shown by the R-square value obtained in the cubic equation being greater than the R-square in the linear and quadratic equations. The R-square value in the linear equation is 0.656, the R-square in the quadratic equation is 0.656, and the R-square in the cubic equation is 0.657. Thus, based on the cubic equation, the equation for production costs in red chili farming in Central Bangka Regency is obtained as follows:

$TC = 3{,}382{,}040.971 + 3{,}412.041Q - 0.255Q^2 + 0.00001867Q^3$

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The significance value obtained in the linear, quadratic, and cubic equations is 0.000 each. This shows that the significance value obtained in each equation is less than the significance value of = 5%. Thus it can be said that the amount of production significantly affects production costs in red chili farming in Central Bangka Regency.

Based on these results, the more red chili farmers produce, the greater the production costs incurred. To obtain the optimal amount of red chili production, good maintenance is needed on red chili plants, especially in terms of setting the provision of seeds, regulating fertilizer application, administering plant pest control drugs, setting lime application, and maintenance or management by farmers. Thus, to obtain the optimal amount of red chili production, good maintenance is needed, but maintenance requires costs.

3.2. Optimizing Red Chili Production in Central Bangka Regency

3.2.1. Production Costs in Red Chili Farming

The costs incurred by red chili farmers in Central Bangka Regency consist of fixed and variable costs. Fixed costs calculated in this study are the total cost of land rental and equipment depreciation. This is in line with Nofita et al. (2015) that the fixed costs incurred by farmers in large red chili farming include land rental costs and equipment costs. The types of tools used by respondent farmers in red chili farming in Central Bangka Regency consist of tractors, hoes, machetes, hand sprayers, buckets, sacks, polybag seedlings, mulch, stakes, raffia rope, cultivators, paranets, scrapers, and drum. The number of fixed costs incurred by farmers in red chili farming in Bangka Regency can be seen in **Table 2** below.

Table 2. Fixed Costs for Red Chili Farming in Central Bangka Regency in 2020

No	Description	Cost	
		Rp/lg/mt	Rp/ha/mt
1	Land lease	35,294	56,022
2	Equipment depreciation	3,714,948	5,896,742
	Total	3,750,242	5,952,764

Source: Primary Data Processed(2020)

The results in Table 2 show that the land rent issued by farmers for red chili farming for one planting season is Rp35,294 on a land area of 0.63 hectares or Rp56,022 per hectare. The low cost of land rent is because only two farmers rent the land. The rest is their land. The cost of renting land per month is Rp50,000. In the fixed cost component, the largest cost incurred is the cost of equipment depreciation. The equipment depreciation cost incurred by respondent farmers in red chili farming for one planting season is Rp3,714,948 on a land area of 0.63 hectares or Rp5,952,764 per hectare. Thus, the total fixed costs incurred by respondent farmers for red chili farming in Central Bangka Regency for one planting season are Rp3,750,242 on a land area of 0.63 hectares or Rp5,952,764 per hectare.

Other costs incurred by farmers are variable costs. The variable costs in this study include the cost of purchasing red chili seeds, the cost of labor outside the family, the cost of purchasing fertilizer, the cost of purchasing plant disease pest control drugs, and the cost of purchasing agricultural lime. This is in line with the research of Nofita et al. (2015) that the variable costs incurred by farmers in large red chili farming include the cost of purchasing agricultural production facilities, labor costs, and other costs. Widyastuti et al. (2019) include workers' salaries and overhead costs for electricity and water.

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The number of variable costs incurred by respondent farmers in red chili farming in Central Bangka Regency can be seen in **Table 3**.

Table 3. Variable Costs in Red Chili Farming in Central Bangka Regency in 2020

No	Description	Cost	
		Rp/lg/MT	Rp/ha/MT
1	Seed	630,882	1,001,400
2	Labor	962,059	1,527,078
3	Fertilizer	4,631,259	7,351,205
4	Plant Disease Pests	1,303,018	2,068,283
5	Agricultural Lime	787,794	1,250,647
	Total	8,315,012	13,198,433

Source: Primary Data Processed(2020)

The results in **Table 3** show that the largest variable cost incurred by the respondent farmers in red chili farming in Central Bangka Regency is the cost of purchasing fertilizer. The fertilizer cost for one growing season is Rp4,631,259 on a land area of 0.63 hectares or Rp7,351,205 per hectare. On the other hand, the smallest variable cost incurred by farmers in red chili farming is the cost of purchasing seeds. The types of fertilizers used by respondent farmers in red chili farming are varied, including Urea, SP36 fertilizer, KCl, Pearl NPK, Phonska NPK, Wayang NPK, Pak Tani NPK, manure, compost, KNO3, and biourin organic fertilizer. The cost of purchasing seeds for one planting season is Rp630,882 on a land area of 0.63 hectares or Rp1,001,400 per hectare. Different seeds used by farmers in red chili farming include Djitu, Lado, Lotambar, Laju, Krisna, and Lolay. The total variable costs incurred by farmers in red chili farming in Central Bangka Regency for one planting season are Rp8,315,012 on a land area of 0.63 hectares or Rp13,198,433 per hectare.

The total fixed costs and variable costs are called production costs. The number of production costs incurred by respondent farmers in red chili farming in Central Bangka Regency can be seen in **Table 4**.

Table 4. Production Costs for Red Chili Farming in Central Bangka Regency in 2020

No	Description	Cost	
		Cultivated Area	Ha
		Rp/MT	Rp/MT
1	Fixed Cost	3,750,242	5,952,764
2	Variable Cost	8,315,012	13,198,433
	Total	12,065,254	19,151,197

Source: Primary Data Processed(2020)

Table 4 shows that the variable costs incurred by respondent farmers in red chili farming in Central Bangka Regency are greater than the fixed costs.

3.2.2. Optimal Production

Calculation of the optimal amount of production is obtained through 3 stages. The first step is to find the first derivative of the following production cost equation:

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$TC = 3,382,040.971 + 3,412.041Q - 0.255Q^2 + 0.00001867Q^3$

The first derivative of the above equation is the marginal cost. If the above equation is derived, then the marginal cost equation obtained is as follows:

$3,412.041 - 0.51Q + 0.00005601Q^2 = 0$

After that, the marginal cost equation is derived again so that the following equation is obtained:

$$\frac{\delta MC}{\delta Q} = -0.51 + 0.00011202\,Q > 0$$

Optimal production occurs when P = MC. Thus, a new equation is obtained, which is as follows:

$10,144 = 3,412.041 - 0.51Q + 0.00005601Q^2$

$(3,412.041 - 10,144) - 0.51Q + 0.00005601Q^2 = 0$

$0.00005601Q^2 - 0.51Q - 6,731.959 = 0$

From the above equation, to calculate the optimal amount of production using the formula a, b, c as follows:

$$Q_{1,2} = \frac{0.51 \pm \sqrt{(-0.51)^2 - 4(0.00005601)(-6,731.959)}}{2(0.00005601)}$$

$$Q_{1,2} = \frac{0.51 \pm \sqrt{1.768}}{0.00011202}$$

$$Q_{1,2} = \frac{0.51 \pm 1,33}{0.00011202}$$

$$Q_1 = \frac{0.51 + 1.33}{0.00011202} = 16,425.64$$

$$Q_2 = \frac{0.51 - 1.33}{0.00011202} = -7,320.12$$

Based on these results, the optimal amount of red chili production (Q1) is 16,425.64 kilograms, where the value is more than zero. The red chili production (Q2) of -7,320.12 kilograms is not optimal because the value is less than zero. The results in the field indicate that the average amount of red chili production produced by respondent farmers in Central Bangka Regency during one planting season is 3,085 kilograms on a land area of 0.63 hectares. Compared with the optimal amount of production, the amount of red chili produced by respondent farmers in Central Bangka Regency can be said to be not optimal. This is because the amount of red chili production produced by respondent farmers is smaller than the optimal

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amount of production. Jannah et al. (2019) explained that to achieve the optimal amount of production, farmers should make efficient use of production factors in farming activities.

According to respondent farmers who cultivate red chili in Central Bangka Regency, there are several causes for the low amount of red chili production. These causes include pest and disease attacks on red chili plants, weather, and less than optimal plant maintenance. Red chili plants cultivated by respondent farmers in Central Bangka Regency experienced a lot of fruit loss before harvest time. According to farmers, fruit loss on chili plants is caused by pests and the rainy season. In addition, hot weather causes plants to dry out.

The results of Bahtera et al. (2020) research indicate that the regulation of fertilizer application has not been carried out properly by farmers who cultivate red chili in Central Bangka Regency, where farmers use the amount of P fertilizer that is not following the recommended dose, namely the amount of P fertilizer used by farmers is as much as 199.36 kilograms per hectare while the recommendation is 80 kilograms per hectare. Based on this, efforts to obtain the optimal amount of red chili production can be made in various ways, including the need for good maintenance of the cultivated red chili plants, such as in terms of setting the provision of seeds, regulating the provision of balanced fertilizers, regulating the administration of plant pest control drugs following recommended doses, and good maintenance or management by farmers. In addition, the high amount of production depends not only on the agricultural environment but also on the quality of seeds and management. According to Harun et al. (2015), increasing agricultural technology and machinery use among farmers will significantly affect agricultural productivity and income. The latest innovation and technology are very important. Besides, factors to increase agricultural yields and product competitiveness are supported by relevant information, compatible technology, operational costs, and payback rates to help farmers increase productivity and income (Muhammed et al., 2016).

4. Conclusion

The study results concluded that the amount of red chili production significantly affected production costs in red chili farming and the amount of red chili production in Central Bangka Regency was not optimal. Therefore, farmers should use production inputs efficiently to streamline production costs so that the optimal amount of production is obtained.

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6. Declaration of Conflicting Interests

The authors have declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

References

Badan Pusat Statistik. (2019). *Distribusi Perdagangan Komoditas Cabai Merah Indonesia Tahun 2019*. Jakarta, Indonesia: Badan Pusat Statistik.

https://doi.org/10.33019/society.v10i1.321

Bahtera, N. I., Purwasih, R., & Yulia, Y. (2020). Faktor-Faktor yang Mempengaruhi Produksi Cabai Merah di Kabupaten Bangka Tengah. *SEPA: Jurnal Sosial Ekonomi Pertanian Dan Agribisnis*, *17*(1), 49-54. https://doi.org/10.20961/sepa.v17i1.41166

Debertin, D. L. (1986). *Agricultural Production Economics*. New York, United States: Macmillan Publishing Company.

Dinas Pertanian Provinsi Kepulauan Bangka Belitung. (2017). *Jumlah Luas Tanam, Luas Panen, Produksi dan Produktivitas Cabai Merah di Kabupaten Bangka Tengah*. Provinsi Kepulauan Bangka Belitung, Indonesia: Provinsi Kepulauan Bangka Belitung.

Harun, R., Suhaimee, S., Zaffrie, M., Amin, M., & Sulaiman, N. H. (2015). Benchmarking and prospecting of technological practices in rice production. *Economic and Technology Management Review, 10*(b), 77–88. Retrieved from https://myjurnal.mohe.gov.my/public/article-view.php?id=89773

Jannah, R., Setiawan, I., & Bidayani, E. (2019). Optimalisasi Produksi Usahatani Seledri Daun (Apium Graveolens L) di Desa Zed Kecamatan Mendo Barat Kabupaten Bangka. *Jurnal Ekonomi Pertanian Dan Agribisnis*, *3*(1), 1–9. https://doi.org/10.21776/ub.jepa.2019.003.01.1

Mohammed, B., Abdulsalam, Z., & Ahmed, B. (2016). Profitability in Chilli Pepper Production in Kaduna State, Nigeria. *British Journal of Applied Science & Technology*, *12*(3), 1–9. https://doi.org/10.9734/bjast/2016/20300

Nofita, I., Sutiarso, E., & Hadi, S. (2015). Analisis Keuntungan Usahatani Cabai Merah Besar di di Desa Adongsari Kecamatan Ambulu Kabupaten Jember. *Agritrop : Jurnal Ilmu-Ilmu Pertanian (Journal of Agricultural Science), 13*(2), 166-171. Retrieved from http://jurnal.unmuhjember.ac.id/index.php/AGRITROP/article/view/87

Noor, H. F. (2007). *Ekonomi Manajerial* (Revision ed.). Jakarta, Indonesia: PT Raja Grafindo Persada.

Sriati. (2002). *Metode Penelitian Sosial*. Palembang, Indonesia: Unsri Press.

Suratiyah, K. (2015). *Ilmu Usahatani* (Revision ed.). Jakarta, Indonesia: Penebar Swadaya.

Widyastuti, D. E., Ibrahim, J. T., Winaya, A., & Sukorini, H. (2019). Financial Feasibility Analysis of Red Chili Pepper Seedling at Karanganyar, Poncokusumo, Malang. *INSIST*, *4*(1), 188-1909. https://doi.org/10.23960/ins.v4i1.188

Wirartha, I. (2006). *Metodologi Penelitian Sosial Ekonomi*. Yogyakarta, Indonesia: Andi Publisher.

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