

**IMPACT OF AGRICULTURAL CREDIT ON PERFORMANCE OF RED CHILI FARMS
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ABSTRACT

Limited capital is a common problem in small scale farming in Indonesia, and red chili farms is no exception. The red chili farmers require a certain amount of inputs to carry out production activities. High production costs of those inputs, however, has led farmers to reduce the use of the inputs. This results in low crop production, while the demand for red chili in Indonesia continues to increase. Credit is a form of financing that can be given to the farmers in order to raise their purchasing power for the required production inputs. Some studies show that there is a positive impact of credit on farms' performance, while some other show the opposite results. The aim of this research is to examine the impact of credit on the performance of red chili farms in Indonesia. The method used in this research is propensity score matching. The result of this research revealed that credit has a positive and significant impact to the farm revenue. Meanwhile, the profits obtained by farmers who use credit are not significantly different from those of farmers who do not use credit.

Keywords: *agricultural financing, farm revenue, farm profit, propensity score matching, red chili farmers*

BACKGROUND

The horticultural commodity is an agricultural sub-sector that contributes greatly to the development of various regions in Indonesia (Hayati, et al. 2017; Widianingsih et al., 2016). A horticultural commodity classified as a basic need and affects the country's economy is red chili. Red chili is classified as a type of food that contributes to inflation or is referred to as volatile food. This can be felt when approaching particular periods such as Eid al-Fitr and Christmas Day in Indonesia, where the price of red chili increase along with increased demand from consumers (Naully, 2016). The increase in the price of red chili can cause a decrease in consumer purchasing power. Meanwhile, the decrease in the price will bring into farm income that is not compatible with the production cost. However, the changes in red chili price is common to happen at the consumer level while the price in the production level is tend to be stable because farmers were the price takers (Nurjati, 2021). The price of red chili depends on the level of demand and supply related to production activities at the farm level. Red chili production requires large costs and depends on factors of rainfall and harvest season (Farid & Subekti, 2012; Naully, 2016).

Farmers are producers in agriculture, and they have a role in providing red chili. However, the cost to produce red chili is quite expensive. The average production cost of red chili in Indonesia

is Rp 64,346,700 per hectare per growing season (BPS, 2018). In addition, the production of red chili depends on production inputs, the change in climate, also pests and disease that can lead into the crop failure (Anwarudin et al., 2015; Misqi & Karyani, 2020). The largest component in the production cost of red chili is labor and fertilizer wages which are 51.41% and 12.78% respectively of the total production cost (BPS, 2018). Those components with the highest cost have an important role in farm production, especially on horticulture farms. Meanwhile, limited capital has been still a problem in farming in Indonesia. The increase in fertilizer and pesticide prices makes farmers limit the use of these production components (Andayani, 2016; Misqi & Karyani, 2020). This can result in a decrease in the amount of production and availability of red chili which will be followed by an increase in prices. Therefore, farmers need financial support in order to meet input requirements and increase the red chili production.

The efforts to overcome the limited capital of farmers are through financing, such as through credit. The provision of credit can open up opportunities for farmers to obtain production inputs that previously could not be purchased, or could not be obtained fully due to not having capital (Moahid et al., 2021). Credit programs for the agricultural sector in Indonesia have been around for a long time and are constantly being updated. Various credit programs that have been running are the Mass Guidance Program (BIMAS) which was later refined into Farmer Business Credit (KUT), then updated to Food Security Credit (KKP) which later became Food and Energy Security Credit (KKP-E) (Adam, 2018). Currently, the ongoing credit program for the agricultural sector with small and medium enterprises is the People's Business Credit (KUR).

Credit is considered to have a positive impact on farming performance, farmers with credit can enhance their on-farm investment which bring an increase on production output also product added value (Lam et al., 2019). Farmers who use credit have an increase in production and obtain more income than before using credit (Abdallah et al., 2019; Awotide et al., 2015; Puspitasari et al., 2021.; Vhiswanatha & Eularie, 2017). In addition, several studies have shown that credit increases farm income (Lam et al., 2019; Luan et al., 2016; Noonari, 2015). However, several other studies have stated that credit does not have an impact on farm income (Abdallah et al., 2019; Phan et al., 2014). Also, there is a study which revealed that agricultural credit in Indonesia does not have a significant impact on farm performance beside paddy commodity (Feryanto, 2020).

Based on the description above, it can be seen various research results regarding the impact of credit on farming. Research on the impact of credit on the performance of horticultural and food crop farming in Indonesia is still limited, especially for red chili commodities. Hence, this research aims to analyze the impact of credit on the performance of red chili farming in Indonesia. A lot of study have been conducted to measure the impact of credit on farm performance, however the results can contain potential bias from the unobserved characteristics. In order to reduce the potential bias, this research used Propensity Score Matching as a method to estimate the impact of credit on red chili farm performance.

RESEARCH METHODS

This research used secondary and cross-sectional data taken from The Horticulture Farm Household Survey 2014: Red Chili by the Central Bureau of Statistics Indonesia (BPS). This data Impact of Agricultural Credit on performance of Red Chili Farms (Jono et al., 2023)

were chosen by the reason of the most complete data that represent Indonesian farmers' condition based on agricultural census in 2013 by BPS. Data were analyzed using Microsoft Excel and Stata 16 applications. The farming performance parameters used were farm revenues and profits.

The method chosen to analyze the impact of credit on red chili farming performance was propensity score matching (PSM). The PSM method was chosen to evaluate the impact by creating a group as close as possible to the treatment group for a matching process based on the observed factors that are thought to affect the probability of farmers taking credit (Gertler et al., 2010). The observed factors used in this research were farm site, farmer age, formal education level, gender, cooperative membership, farmer group participation, participation in extension, partnership, use of certified seeds, and ownership of machine tools. These variables were used to estimate the propensity value of credit taking by farmers using binary logistic analysis. The treatment group ($Y1_i$) in this research were red chili farmers who took credit and the control group ($Y0_i$) were farmers who did not take credit.

The propensity scores of each unit from the control group are then matched with the closest propensity scores of each unit from treatment group. The impact of a program was seen from the average value of the outcome variable obtained from the difference in the mean of the treatment and control groups. This value is referred to as the Average Treatment on Treated (ATT) (Khandker et al., 2009). The model for estimating ATT is as follows (Feryanto and Rosiana, 2021; Khandker et al., 2009).

$$ATT = E [Y1_i|D_i = 1] - E [Y0_i|D_i = 0]$$

The outcome variables measured in this research were farm income and profits. The impact can be observed based on the estimated ATT value of the group of farmers who take credit, $E [Y1_i|D_i = 1]$, and the control group or farmers who did not take credit $E [Y0_i|D_i = 0]$. The matching technique chosen in this research was Nearest Neighbor Matching (NNM) to match the ATT value of farmers who took credit with the ATT value of farmers who did not take credit. The NNM technique matched the treatment unit with the control unit based on the closest propensity score (n), it usually used $n = 5$ (Khandker et al., 2009). This was intended to reduce the potential for bias that occurred due to heterogeneity and confounding factors.

RESULT AND DISCUSSION

The impact of credit on the performance of red chili farming in Indonesia was analyzed using the propensity score matching technique. The first stage of the PSM method was to estimate the propensity scores of the observed characteristics using logit, then proceed by matching the control group to the treatment group with the NNM technique on the initial data. The impact can be estimated if there is sufficient overlap of the distribution of the propensity values, or if all treatments are matched with controls. Figure 1 on the graph on the left shows a bias in the distribution of covariates which was referred to as the lack of common support. Some areas were not homogeneous but there was still sufficient overlap. This means that if the two groups are compared directly, it will result in a bias in the conclusions. Furthermore, the bias is reduced after using PSM and NNM techniques. In

Figure 1, the graph on the right shows that there was an overlap in all parts. Thus, the differences in farm revenues and profits as outcome variables could be ascertained to be influenced by credit taking.

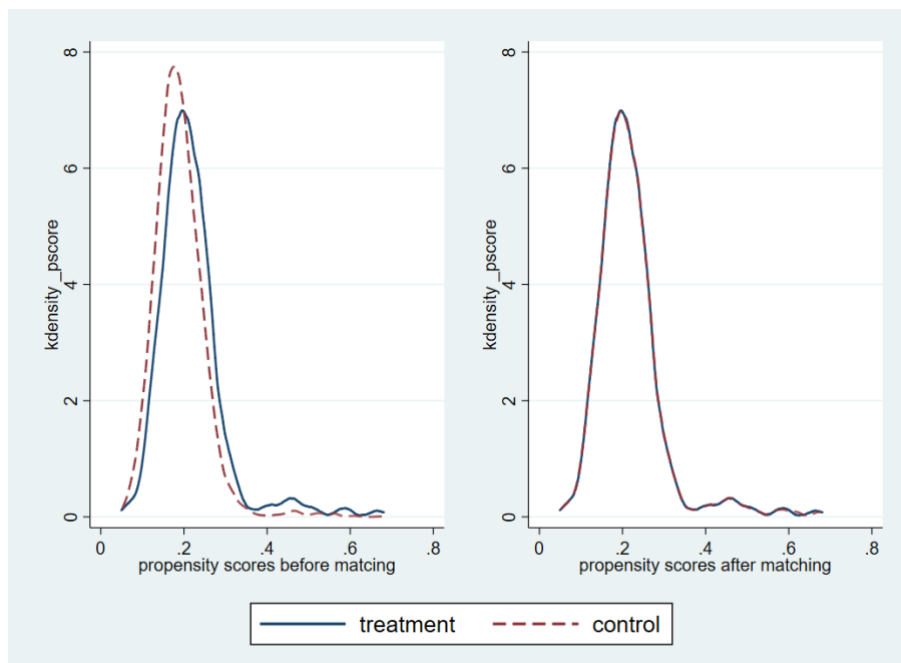


Figure 1 Balancing plot before and after matching
(Source: Primary Data, 2022)

Based on the graph, the common support area of the covariates is obtained. The results after matching can be seen in Table 1. All covariates had on support status. It means that no samples were eliminated during the matching process. Hence, the propensity value of all samples was in the same range, or in another sense, the two groups had matched. This research used a total sample of 6,250 red chili farming households in Indonesia of 1,216 farms that took credit and 5,034 farms that did not take credit.

Table 1 Common Support of Covariate on Matching Process

Treatment	On support	Off support	Total
With credit	1,216	0	1,216
Without credit	5,034	0	5,034
Total of covariates	6,250	0	6,250

Source: Primary Data, 2022

The impact of credit on farm performance was indicated by the average treatment on treated (ATT) value. The value of the unmatched sample was greater than the value of the ATT sample because it still had a bias, while the ATT value was the result of eliminating potential bias with the matching process. In this research, the ATT value was used. The performance parameters used in this research were farm revenues and profits. The impact of credit on the performance of red chili farming in Indonesia is shown in Table 2.

Tabel 2 Impact of Credit on Red Chili Farm's Performance in Indonesia

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Revenue	Unmatched	15,436,086	11,665,513	3,770,574	514,684	7.330***
	ATT	15,436,086	12,143,208	3,292,878	853,638	3.860***
Profit	Unmatched	5,134,306	4,600,000	534,306	382,775	1.400
	ATT	5,134,306	4,588,153	546,153	655,193	0.830

Note : * significant at $\alpha=10\%$, $|t| \geq 1.65$

** significant at $\alpha=5\%$, $|t| \geq 1.96$

*** significant at $\alpha=1\%$, $|t| \geq 2.58$

The Impact of Credit on Farm Revenue

The results of this research indicated that credit had a positive and significant impact on farmers' income. Estimation using the PSM model generated a significant t-statistic value at a significant level of $\alpha=1\%$ (T-stat >2.58). Farmers who took credit received an income of Rp 15.436 million and farmers who did not take credit received an income of Rp 12.143 million. The difference in the number of receipts in the treated group and the control group was Rp 3.292 million. It means that farmers who took credit receive greater revenue than farmers who did not take credit.

This results were in line with several other studies where farms with credit financing sources receive greater revenues than those of farms that do not take credit (Abdallah et al., 2019; Vishwanatha and Eularie, 2017). Farmer's income was related to the amount of production, where the amount of production depended on the use of farm inputs. The use of credit in farming can help farmers to buy inputs that previously could not be purchased due to a lack of capital (Moahid et al., 2021). An increase in the number of inputs can encourage production output, thus, farmers' revenue will increase (Iski et al., 2016; Toure, 2021). Hence, based on the result, credit have a significant impact in increasing the farmers' revenue.

The Impact of Credit on Farm Profit

Based on the results of this research, credit does not have a significant impact on the profits of red chili farming in Indonesia. The results of this research were in line with several studies, where credit does not have a significant impact on the profits obtained by farmers (Abdallah et al., 2019; Phan et al., 2014). Credit for the agricultural sector is of course intended for investment in farming. Yet, the use of credit cannot be separated from fungibility. Various studies have shown that farmers who have low incomes tend to use credit for their household needs. Credit functionality occurs in the agricultural sector because farmers' incomes depend on the frequency of harvesting which is only a few times a year. Hence, credit that was originally intended for investment in farming is used for daily household needs (Dewi et al., 2017; Phan et al., 2014).

The credit helps farmers to buy inputs according to the required quantity and quality. This can increase the amount of farm production. The farm production are related to the input that are used in the production stage, which resulting in the increase of total cost. The use of credit in farms can increase the total of product, farm size, productive and non productive asset, and total production cost (Awotide et al., 2015). Thus, farming costs incurred will be greater when compared to farming that does not use credit (Iski et al., 2016). Profits are obtained from the difference between revenues and

farming costs. Thus, even though the revenue obtained increases, the profits obtained do not increase due to the large production costs. The results of this research indicated that credit does not have a significant impact on farm profits, but the resulting statistical value is still positive although it does not have a significant effect. This means that credit can have a positive impact on farming profits. This result was in line with (Dewi et al., 2017) who stated that farmers who use credit gain greater profits along with an increase in the amount of production compared to before using credit. However, the results obtained by this research were that credit does not have a significant impact on profits.

CONCLUSION AND SUGGESTION

The use of credit has a positive and significant impact on farm performance. Farmers who use credit obtain a higher average revenue than farmers who do not use credit, meanwhile there is no significant impact of credit on farm profits. Farmers need to take advantage of financing, specifically to use credit in order to increase the production of red chili and the farms performance. This research aim to analyze the impact of credit on red chili farms' revenue and profit. However, the two performance indicators are very related to the production factors. This can be a reference for the further research to consider production outcome, such as total production or productivity to be used as indicators to evaluate the impact of credit on red chili farm performance.

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