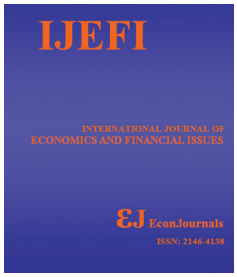

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2019, 9(5), 1-10.

# Sources and Effects of Credit Accessibility on Smallholder Paddy Farms Performance: An Empirical Analysis of Government Subsidized Credit Program in Indonesia

**Harianto Harianto[1], M. Parulian Hutagaol[1], Iman Widhiyanto[2]***

[1]Department of Economics, Faculty of Economic and Management, Bogor Agricultural University, Kampus Dramaga, Jln. Raya Dramaga Bogor Jawa Barat, Indonesia, [2]Treasury Indonesia, Ministry of Finance Republic of Indonesia, Jl. Lapangan Banteng Timur No1-2 Jakarta, Indonesia. *Email: lslayangseta@gmail.com

**Received:** 11 June 2019 **Accepted:** 28 August 2019 **DOI:** https://doi.org/10.32479/ijefi.8388

**ABSTRACT**

As part of strengthening food security and increasing farmers' income, the government established a program to improve farmers' access to working capital. However, the absorption of subsidized credits is still much lower than the allocation of credits provided by the government. This study aims to analyze the factors that are likely to affect farmers' opportunities to access subsidized credit, and how the impact of access to credit affects the performance of paddy farming. The propensity score matching method is employed in this research. The data in this study is from a farm household level survey. The results of the study showed that collateral, interest rate, farmer access experience to credit, farmer group quality, and financial literacy level have a significant effect on farmer accessibility to subsidized credit. Farmers' access to subsidized credit significantly not only improved the productivity and profitability of paddy farming in the research area but household non-farm income as well.

**Keywords:** Credit Accessibility, Working Capital, Inputs Allocation, Productivity
**JEL Classifications:** D240, G210, H25

## 1. INTRODUCTION

The Indonesian government allocates a substantial amount of budget for achieving national food security. One important aspect of food security is strengthening food availability through increasing food production. To increase food production the government sets a policy of subsidizing interest on agricultural credit, which is named as food and energy security credits (KKPE). Program loans are granted to farmers who do not have access to working capital from commercial financial institutions because they are considered not feasible, although they have profitable food farming. Small scale farms development is always limited by inadequate financial resources to meet operational and investment needs. In spite of the government's effort to expand subsidized credit institutions rapidly in recent years with the aim of combat poverty, many farm households remain constrained from formal credit and are forced to borrow from informal lenders (Nuryartono et al., 2005; Arief and Rosmiati, 2013). The government subsidized credit programs are expected to support the strengthening of food security, through improved productivity of food farming and increased employment opportunities in a rural area. With increasing farming productivity, farmers' income is also expected to increase.

Many credit schemes provided by the government and private sector, both formal and informal, are available to be accessed. Previous studies in different countries have shown that limited access to credit carries negative and significant consequences

on various aspects such as technology adoption, agricultural productivity, household nutrition intake, health, food availability, and the welfare of farmers in general (Jacoby and Skoufias 1997; Morduch 1999; Pitt and Khandker 1998). Through KKPE program, the government provides loan interest subsidies to ease the interest burden and to improve farm access to formal credit. In this program, the government bears a portion of the credit interest disbursed to farmers by the executing bank.

In practice, although the Indonesia government has provided interest subsidies, the accessibility of farmers to subsidized credit is still very low. The total subsidized credit allotment granted by the government in 2008 amounted to 11.9 trillion IDR but absorbed only 1.9 IDR or only 15.7%. The credit allotment is then reduced to 9.1 trillion IDR in 2009, but can only be absorbed by 2.2 trillion IDR. After the government attempted to push through executing bank, the absorption of subsidized loans begins to rise, and in 2014 with the allotment of 10 trillion IDR absorption has reached 43.7%. However, the problem of farmers' credit accessibility seems to persist and unsolved. Data from the Ministry of Finance in 2016 indicate that subsidized credit disbursed in the range from 5 to 15% of the credit ceiling provided by the executing bank. The existence of a large gap between the amount of allocated credit and its absorption reinforces the notion that access to microcredit in agriculture and rural areas in developing countries is limited (Etonihu et al., 2013; Yehuala, 2008; Diagne, 1999).

Low accessibility of microcredit can be caused by a variety of factors including strict credit requirements and procedures, lack of collateral, and high-interest rates (Akram et al., 2008). Other factors such as the high risk of the agricultural sector, the presence of asymmetric information (Hoff and Stiglitz, 1990), non-compliance with contracts, rent-seeking behavior also contributed to the low lending program in some countries. Many previous studies indicate that farming is in dire need of loans for working capital and for equipment investment, and better technological applications (Conley and Udry, 2010; Feder et al., 1988; Foster and Rosenzweig, 1995). The unabsorbed credit allotment in the national budget can be an opportunity loss for the economy. If the problems surrounding the subsidized credit are well known, then it is hoped that the formulation of agricultural credit policy can be formulated more accurately and can be implemented effectively. It is in this context that research on the farmer accessibility to subsidized credit and its impacts on farms performance become important to do.

This study aims to identify the factors determining credit accessibility of rice farming in Kendal Central Java region of Indonesia. The study also examines the impact of credit accessibility on farms performance. The study tests whether there is any difference in rice farms performance between those who are able to have access to government-subsidized credit and those who are not. Factors affecting credit accessibility of farmers can be influenced by internal factors of farmers and external factors. In this study, internal factors studied are not only age and duration of education but also the level of financial literacy of the head of household and the ability of a household to provide loan collateral. While the external factors for credit access which have not been included in the study of credit accessibility model are the status and activeness of farmers group and agro-ecological zone factors. Agro-ecological zone of farm location can represent the biophysical condition of the farming environment and represent the physical accessibility of farmers to the source of credit.

Research on credit accessibility has been done a lot, but the novelty of this research lies in the type of credit under study, which is subsidized credit which is one of a government program to increase food production. Previous studies have commercialized credit categories, i.e. credits with no element of government subsidy and no government interference in its distribution. The fungible nature of credit may result in subsidized credits taken by the farmers to be diverted for other purposes not intended to increase the production of the farm. It is not necessarily the subsidized agricultural credit provided by the government can achieve the target of increasing productivity and farm income as desired. If using a simple statistical comparison, i.e. without control over other variables other than variable access to credit, this study found that increased access to subsidized credit could improve the performance of paddy farming. But if using the method of propensity score matching (PSM) turns out the result is different, that is an increase of access to subsidized credit does not give significant influence to the improvement of paddy farming performance. Thus, the selection of comparison techniques in policy evaluation becomes a very important part in deciding the accuracy of policy effects of government subsidized credit.

## 2. LITERATURE REVIEW

### 2.1. Factors Affecting Farms' Credit Accessibility

Factors affecting farmers' accessibility to credit can basically be categorized into two groups, namely internal factors of farm household and factors outside the household. Internal factors of farm households are the characteristics of the head of household, the characteristics of household and farm business. Previous studies used various variables to explain internal and external factors of farm households that could affect farmers' access to agricultural credit.

The household head of the farmer has a central role in the allocation of household resources, i.e. the allocation of resources for production and consumption. In many households in developing countries, production decisions inseparable from consumption decisions, and vice versa. The head of the family determines whether to take credit or not take credit for his farm. Characteristics of household heads that are widely used in previous studies are age, gender, and education level. The role of age in influencing access to credit in previous studies yielded conflicting results. Baiyegunhi et al. (2010) and Chaudhuri and Cherical (2011) studies show that age has a positive effect on increasing access to agricultural credit. In contrast, Freeman et al. (1998), Jia et al. (2010), Barslund and Tarp (2008) in Vietnam found that age negatively affects credit accessibility. From these studies, there appears to be an indication that up to certain age accessibility to credit improves as age increases, but then access becomes decreased as the ages grow. Zeller (1994) and Kuwornu et al. (2012) study attempted to use the quadratic age variable to capture the age-affects behavior on

access to credit, but the results did not show a significant effect of the square of age on access to credit.

The education of the head of household is also widely used as a variable affecting farmers accessibility to credit. The higher the education is expected the better access to credit. Pham and Izumida (2002) and Ali et al. (2014) studies found that higher levels of household head education will improve accessibility to credit. However, Zeller's (1994) study found that better education increases household constraints to gain access to credit. Government subsidized credit generally designed to be accessed by poor farm households which usually also have a low level of education.

This study, in addition to using educational variables as factors affecting credit accessibility, also employ variable of financial literacy as a part of the head of household characteristics. Better education is not necessarily the same as a better level of financial literacy. This study suggests that the financial literacy index of the household head has a more significant effect on credit accessibility than the level of education. The study also included variables of farmers' experience in accessing agricultural credit. The more experienced farmers in accessing credit the greater the chance of obtaining credit again.

Ownership of the physical asset of farmer household can increase the chance of accessing credit since it can be employed as collateral to minimize repayment default and evidence of household production capacity. Land title or land area is popular indicators for physical capital. In general, households having a land title are more likely to gain better access to the credit market (Baiyegunhi et al., 2010; Boucher et al., 2009; Foltz, 2004). The effect of land title is clear, but the effect of the land area is ambiguous in farmers' credit accessibility. In fact, Foltz (2004) showed that land title can improve credit accessibility, but the land area has an insignificant effect. In China, Peru and Malawi, more farmland area have a greater chance of gaining access to credit (Simtowe et al., 2008; Boucher et al., 2009; Jia et al., 2010) which is also reported in Petrick's (2004) study on the effect of rented land. On the contrary, Omonona et al. (2008) find the insignificant contributory effect of land area to ease credit accessibility. Both land area and land use right in Vietnam have insignificant effects on the bank's decision to provide credit (Barslund and Tarp, 2008; Pham and Izumida, 2002). In some countries, farmland cannot be used as collateral, for example in China (Jia et al., 2010), thus, the land area may have positive, negative or no effect on credit constraints, depending on its effect on demand for credit.

As part of credit application, banks will inquire about household income levels, the desired amount of loan, and also assets owned by households. In this research, the household income level is approached through income obtained by the farmer from his farm. The size of the assets owned by farmers is approached through the area of cultivated land. Indeed land does not fully describe the assets owned by the household, because the cultivated land area can be obtained from leased or share farming, instead of owned by the household. The bigger the cultivated land area, can be interpreted the greater the capital assets owned by farmers or the greater productive capacity of household, so it is expected the greater the chance to be able to access credit. Government subsidized credit for food and energy security (KKPE) also requires collateral. Feder et al. (1988) showed evidence from three Asian developing countries that the use of land collateral is more common than other forms of security. It is also shown that larger farmers are more likely to utilize land collateral. In this study, farmers who do not have collateral still have the opportunity to access government subsidized credit (KKPE) through farmer groups where farmers are members.

External factors of farm households predicted to affect access government subsidized credit is the condition of farmer groups, the interest rate of credit, a distance of farms location from the financial institution. Farmers expected to join in farmer group in order to be eligible to access government subsidized credit. However, not all farmer groups are active and not all farmer groups have a formal legal entity. Active and legalized farmer groups are expected to provide more opportunities for their members to access subsidized credit. In this study, the status of legal entities and the activeness of farmer groups are included as variables that predicted affect farmers' accessibility to credit.

Another external factor that determines the farmer's decision to take credit is the lending rate. The higher loan interest rate will decrease the demand of farmers for credit, meaning the chance of farmers to access the subsidized credit is getting smaller. Accessibility of credit is also determined by the access of farmers to financial institutions. If physically available financial institutions are more distance or transportation cost to the executing bank increase, then farmers' opportunities to gain access to credit will be diminished. In this study, the distance farm households to financial institutions are represented by agro-ecological zone. The study was conducted in Kendal, Central Java Indonesia, which downtown of Kendal is located in the lowland area. Farmers in rural lowland have a relatively close physical distance to the city, where many formal financial institutions have offices. In contrast, farmers residing in upland farming areas have greater distances from urban areas.

### 2.2. Impact of Credit Access on Farm Performance

In developing countries, credit facilities will help farmers purchase modern inputs such as high yielding varieties of seeds, fertilizers, and install irrigation to increase production (Vicente and Vosti, 1995). Government subsidized loans for food and energy security (KKPE) are intended to facilitate the access of farmers particularly to the need for working capital. The accessibility of farmers to capital is considered as the determining factor of farm productivity. Farmers in developing countries regarded financial capital as a very important constraint. Lack of financial capital is one reason why the efficiency of farming production is relatively low compared to farmers with sufficient capital. Capital enables the farmer to purchase inputs they need timely and precise in quantity and quality. The agriculture production process is a biological process that highly dependent on natural conditions. By the time the crop is time to be fertilized, delayed in applying fertilizer due to the farmer inability to buy fertilizer will affect the level of crop productivity. Similarly, the type and the amount of fertilizer provided should

be in accordance with the specifications of the plant requirement. Inaccuracy in the application of fertilizer in quantity and or quality will also affect the productivity of farming.

In his famous paper, Herdt and Mellor (1964) show the need for a different amount of fertilizers for different crop varieties, as well as the importance of adequacy of fertilizer application for each variety to produce the desired amount of produce. The same crops with different variety require different amounts of fertilizer that ultimately determine the level of production of each variety. High yielding varieties of food crops are generally sensitive to fertilizer and require a bigger amount of fertilizer than local or traditional varieties. If farmers are unable to purchase sufficient fertilizer in accordance with the required amount of high yielding varieties, then the productivity of the farm will decrease drastically. Njinju et al. (2018) showed that inadequate fertilizer application in high yielding rice varieties in Kenya brought significant effects on productivity. That is why government subsidized credit accessibility can be a factor that determines the performance of farming, especially food crop farming using high yielding seeds as cultivated by the farmers in the research area.

Agricultural inputs not only have mutual substitution to each other at a certain degree, but it is also often having characteristics of complementary (Marenya and Barrett, 2007; Chivenge et al., 2011). Crops of high yielding or modern paddy varieties are not only responsive to fertilizer but also vulnerable to pest attack. It required more pesticides to prevent crops' pest and diseases. Therefore the lack of working capital can inhibit the access to pesticides, and delays in its delivery may lead to a decrease in crop productivity. The increasing needs for fertilizers and pesticides applied to the crops will make a demand for farm labor increase. If the availability of labor from inside farm household is not sufficient, then farmers need to hire labor from outside the household. Access to working capital will enable farmers to pay labor from outside the family in order to optimally manage the farms.

The credit helps farm households with a lack of working capital to confidently invest in their production activities because it gives them more choices and alternative routes of meeting expected household budget and dealing with unexpected shocks. Besides, credit is able to implicitly smoothening household incomes and explicitly stimulating investments in farming activities (Christen and Pearce, 2005). Essentially, credit is seen as a major component of the agricultural modernizing process in Indonesia as access to it ensures increased output and thus plays a critical role in agricultural production, and development (Chaves and Gonzalez-Vega, 1996).

## 3. RESEARCH METHODS

### 3.1. Time and Location

Kendal regency was selected as a research location. Kendal Regency is administratively located in the province of Central Java. The agro-ecological zone of Kendal Regency is divided into two, namely lowlands and uplands areas. Lowland areas are at an altitude of 0-100 meters above sea level (ASL), while the uplands areas are at an altitude of 100-2600 meters ASL. Farms located in the uplands are characterized by narrow arable land, simple irrigation system, terraced siring landforms, the use of simple technology, traditional farming methods, and slowly accepting technological changes. Farms located in the lowlands are characterized by wider arable land, modern irrigation system, flat landforms, use of advanced technology, and faster acceptance of the technological change.

Selecting of Kendal Regency as a research location was conducted on the idea that, first the farmer groups in Kendal Regency is in hundreds, but still few farmers accessed subsidized credit. Secondly, Kendal Regency has an agro-ecological zone of uplands and lowlands that hypothetically thought affects the accessibility of subsidized credit. Compare to lowland agriculture, upland agriculture is often located in remote and fragile environments where sustainable development is crucial to the overall equitable development of agriculture.

### 3.2. Data Sources and Sampling Method

Data were obtained using questionnaires through direct interviews with respondents. The respondents are rice farmers who accessed subsidized credit or who did not access subsidized credit. Samples are collected using a multistage sampling method. The first stage is the district determination. Geographically Kendal Regency consists of four zones. Zone I is a lowlands area with an altitude below 10 meters ASL. Zone II is a ramps area with an altitude between 10 to 100 meters ASL. Zone III is an uplands area with an altitude between 100 to 400 meters ASL. Zone IV is a highland mountain area with an altitude above 400 meters ASL. In this study, Zones III and IV represent the uplands area, while the lowland areas are represented by Zones I and II.

The second stage is the village selection. The villages selected as the study sites are 13 villages and representing the upland and lowland agro-ecological zones. Each selected village has at least one farmer group. The third stage is respondent selection. Selection of respondents was done randomly in one farmer group. In this third stage, the head of the farmer group contacted and explained briefly the purpose of the research. Then the head of the farmer group was given an explanation of the questionnaire contents that had been prepared previously. The next step is to conduct a face-to-face meeting between researcher and farmer group members at the appointed time. The number of farmers chose as respondent are 300 persons. After data being collected, examined, and filtered, many questionnaires are could not be used because some data are considered invalid or incomplete. The number of questionnaires that can be used in the study amounted to 258 consisting of 175 respondents access subsidized credit and 83 respondents did not access subsidized credit. Respondents located in the uplands are 94 persons, while respondents located in the lowlands are 164 persons.

### 3.3. Data Analysis Method

Questions in the questionnaire on personal financial literacy aspects include general knowledge of finance, savings and loans, insurance aspects, and investment aspects. The score of the financial literacy index of respondents is calculated by the number

of correct answers to the questions divided by the total number of questions in the questionnaire.

The analysis of data collected divided into two stages. The first stage is to analyze the accessibility of rice farming to subsidized credit. Credit accessibility model in this study can be categorized as a generalized linear model. The variables used in the regression refer to economic theories and previous studies related to credit accessibility. The equation model to be used to analyze the variables affecting the subsidized credit accessibilities is as follows:

$$ACSS=\beta_0+\beta_1 AGE+\beta_2 EDUC+\beta_3 SEX+\beta_4 FLIN+\beta_5 FEXC+\beta_6 MJOB+\beta_7 CEXP+\beta_8 HSIZ+\beta_9 AREA+\beta_{10} ASST+\beta_{11} COLT+\beta_{12} RATE+\beta_{13} FGST+\beta_{14} FGAC+\beta_{15} AGZN+U$$

Where:
$\beta_0$ = *Intercept* (Constanta)
$\beta_1 - \beta_{15}$ = Coefficient regression of each variable
$U$ = *Error term*

The description of the variables used in the equation model can be looked at Table 1.

The logit regression method is used to estimate the effects of predictor variables on farms credit accessibility. A logit regression method uses the cumulative distribution function of the logistic distribution. The function will take any number and rescale it to fall between 0 and 1. The coefficient in credit accessibility model that employs a logit regression method can be interpreted in terms of odds ratios.

The second stage is to analyze the effect of credit accessibility on farming performance. The analytical method used to test the effect of credit accessibility on farming performance is PSM. Since its introduction by Rosenbaum and Rubin (1984), this method began to be widely used in social and economic research by mimicking experimental design studies. The PSM method divides the object of observation into two groups, the treated group, and the untreated group. To evaluate the impact of credit accessibility on farms performance, all observable characteristics have to be the same between the treated farmers and the non-treated farmers. The non treated farmers become the control group. In this study, the treatment provided is credit accessibility. The comparison between the two groups is based on the value of the propensity score chosen based on the similarity characteristics of both groups.

**Table 1: Description of the variables in the equation model of credit accessibility**

| Symbol | Variable name | Variable explanation |
|---|---|---|
| *ACSS* | Subsidized Credit Accessibility | Accessed=1, Other=0 |
| *AGE* | Age | Respondents age in years old |
| *EDUC* | Education duration | Years |
| *SEX* | Sex of household head | Male=1, Other=0 |
| *FLIN* | Financial literacy index | Score in the range of 1-100 |
| *FEXC* | Farm experience | Years |
| *MJOB* | Main occupation | Farmer=1, Other=0 |
| *CEXP* | Credit access experience | Frequency access in the past |
| *HSIZ* | Household size | Persons |
| *AREA* | Size of cultivated area | Hectares |
| *ASST* | Asset of household | IDR millions |
| *COLT* | Collateral | Collect=1, Other=0 |
| *RATE* | The interest rate of credit | Percent per annum |
| *FGST* | Farmer group status | Incorporated=1, Other=0 |
| *FGAC* | Farmer group activeness | Active=1, Other=0 |
| *AGZN* | Agricultural zone | Uplands=1, Other=0 |

The propensity score is calculated based on the results of the logit credit accessibility model that has been obtained from the first stage of research. The selected matching algorithm employed is nearest neighbor matching, i.e. each observation unit is given the same weight and compared to the observation unit which has the nearest propensity score. This method is appropriately applied in this study and is also the most widely used in previous studies. Based on the matching process between the treated group and the non-treated group, it can be obtained the difference of performance between the two groups (Dehejia and Wahba, 2002).

Estimation of the average treatment effects on the treated (ATT) group using PSM relies on two key assumptions: the conditional independence assumption or unconfoundedness assumption and the common support or overlap assumption (Heinrich et al., 2010). The unconfoundedness assumption requires that selection into the treatment group is solely based on observable characteristics. This is a strong identifying assumption but has to be met for the results of the PSM to be valid and reliable. The overlap condition ensures common support which is the area where the balancing score has a positive density for both treatment and the control units. The assumptions of unconfoundedness and overlap assumption have to be met in order for the results of PSM free from selection bias. In this research, the estimation procedure used is maximum likelihood estimation, in order to free PSM of ATT from bias selection. In this study, ATT calculated is the use of commercial farm inputs, farm productivity, farm profit, and household income. Improving access of the farmers to credit is expected to increase the use of inputs, increase productivity, and higher farm profit.

## 4. RESULTS AND DISCUSSIONS

### 4.1. Respondents Overview

The number of male respondents is more than female respondents. It indicates that men as head of the household generally run the farming. Women who become respondents are because of her position as a household head. This phenomenon happens because her husband has died or her husband works in other sectors, such as civil servants, factory workers, or working abroad.

Age reflects the age of respondents at the time of the study. The youngest respondents were 28 years old while the oldest was 73 years old. The majority of respondents are mostly in the 41-50 years old group. The level of elementary school dominates

most of the formal education of the respondents. While college respondents are in the least amount.

The main occupation of the respondents in this study is not as a full-time farmer. Some of the respondents make farming as a second job. It is because income from the farm is not sufficient to meet the needs of the household. Other jobs that serve as the main occupation include builders, market traders, factory workers, transport drivers, and other informal jobs. If the portion of income per annum of the respondents is mostly derived from the farming, then the respondent is categorized as having the main occupation as a farmer, and the classification of the opposite applies to the main job instead of the farmer. The respondents whose main occupation as a farmer is 56.98%, while respondents whose main occupation not as a farmer is 43.02%. The annual income of respondents varies from IDR10 million to IDR150 million. Overall, most respondents were in the annual income group of IDR25-49 million. Respondents who have annual income above IDR100 million are only 1.94%.

Respondents in the research area that access subsidized credit are more than those who do not access subsidized credit. However, based on data from the Ministry of Finance in 2016, in the Kendal Regency, the accessibility of subsidized credit reaches only 8.3% of all farmer groups in the region. Overall, the number of respondents accessing subsidized credit is higher when compared to the respondents who do not access subsidized credit. In the uplands area, respondents who access subsidized credit are smaller than respondents who do not access subsidized credit, while in lowland areas respondents accessing subsidized credit is higher.

Subsidized credit could be accessed in groups or individually. Respondents in the uplands are more likely to access individual subsidized credit, whereas in the lowlands the respondents are predominantly accessing subsidized credit in groups. Respondents who did not access subsidized credit partially accessed credit from other financial institutions to meet their capital requirements. Of 83 respondents who did not access subsidized credit, 55 respondents access commercial credit from financial institutions, while 28 respondents did not access credit. In the upland areas, the number of respondents who did not access credit is more than that in the lowland areas.

Distance to credit sources probably affects the accessibility of credit. The closer to the credit source the easier to access credit. In the research area, the source of subsidized credit is located in the district capital that lay on the lowlands area, therefore the respondents in the uplands area are more difficult to reach the location of the subsidized credit sources. The respondents in the uplands are mostly within the distance of 30-39 km from the credit source. The respondents in lowlands are mostly within the distance of 10-19 km from credit sources. The average distance of all respondents to subsidized credit sources is 22.33 km, while the average distance to the subsidized credit sources for the respondents in the uplands is twice of the average distance to the subsidized credit sources for the respondents in the lowlands.

For subsidized credit loans, the interest rate to be borne by respondents is 5.5%/annum. Commercial credit interest rates vary between financial institutions and on average is 7.7%. The average commercial credit interest rate to be borne by the respondents in the uplands is 7.3% and lower than the average interest that is borne by the respondents in the lowlands (8.3%). Overall respondents had credit accessed experience 2.29 times on average. Respondents in the lowlands have more experienced in accessing credit than respondents in the uplands.

Cultivated land is the main production factor of farming. Cultivated land also shows the scale of business. The cultivated area of the respondents varies from 0.1 ha to 3.5 ha. Respondents in the uplands have a smaller cultivated area than the cultivated area of respondents in the lowlands.

Collateral is one of the requirements in accessing credit, whether subsidized or commercial credit. The joint collateral is needed in accessing subsidized credit through groups. An individual should provide individual collateral in accessing subsidized credit. The percentage of respondents in the uplands who submitted the collateral was lower compared to the respondents in the lowlands areas.

Farmer groups play a strategic role in bridging government programs to the interests of group members. Farmer members of active farmer groups are more likely to access subsidized credit. Regular group meetings, more frequent government support, more up-to-date information on their business units, and more advanced and more modern equipment used are the characteristics of active farming groups. Farmer groups in the lowlands are more active than farmer groups in the uplands areas.

Respondents' financial literacy index was resulted from filling questionnaires. Questionnaires are prepared with multiple-choice questions relating to personal finance, savings, loans, insurance, and investments tailored to the farming environment. Financial literacy index is calculated by dividing the correct answer with all the answers. Respondents with financial literacy indexes below 50 were classified with low financial literacy. Respondents with financial literacy index 50 to 80 were classified with moderate financial literacy. Respondents with financial literacy indexes above 80 are classified with high financial literacy. Based on the answer given by respondents to the research questionnaire, the majority of respondents (63.57%) were classified as having medium financial literacy with an average score of 64.30 (Table 2).

Financial literacy can be improved through financial education. Respondents who have experience in financial education will have better financial literacy index and that will ultimately show better financial behavior as well. Financial education can be held in the form of socialization, training, learning, posters, banners, advertisements and other activities in order to increase financial literacy.

Rice farming in the research area is generally conducted in irrigated rice fields, and only 10% of farmers are farming on rainfed land. The average cultivated area of rice farming is

mostly (57.4%) smaller than 0.5 ha. The number of farmers who cultivated paddy fields more than 1 ha in Kendal is only 10.8% of the total respondents. The seeds of rice planted by farmers have certified seeds of high yielding varieties obtained by farmers from agricultural inputs shops. Agricultural inputs shops can easily be found in rural sub-district of Kendal Regency. But there are farmers whose origin of the seed comes from previous planting seasons. There are also farmers who did not use paddy seeds, but buy rice seedlings from neighboring farmers instead. The large expenditure component of rice farming is spending on fertilizers, pesticides, and hired labor. Table 3 provides the average farm per hectare performance of farms group that accessed subsidized credit compare to farms group that did not base on the respondent's data.

Farming performance from farm groups that gain access to subsidized credit is better than those that do not have access. Except for fertilizers, farm groups that obtain subsidized credit use more agricultural inputs than other groups. The use of fertilizers did not show any significant difference between groups who obtained credit and those who did not get credit. The fertilizer applied for each unit of the planting area is relatively the same between the two groups. The amount of fertilizer application is generally not much different from one farm's group to the other group and from one growing season to the next. The amount of fertilizer applied by farmers is based on guidance from extension workers, or information on past experiences, and from neighboring farmers. The adequacy of fertilizer becomes the priority of expenditure for farmers compared to other inputs because the superior rice seeds grown by the farmers are sensitive to the application of fertilizer.

## 4.2. Variables Affecting the Accessibility of Credit

Analysis of variables affecting the subsidized credit accessibility is done by the logit model. The result of model estimation is presented in Table 4. Based on likelihood ratio (LR) 191.80, a pseudo $R^2$ 0.5917% and P = 0.000 that far below the level of significance ($\alpha$ = 5%), it can be said that the logit model as a good model.

**Table 2: Characteristics of financial literacy index of respondents**

| Financial literacy index | Frequency (persons) | Percentage |
|---|---|---|
| <50 | 48 | 18.60 |
| 50-80 | 164 | 63.57 |
| >80 | 46 | 17.83 |
| Maximum | 96.77 | |
| Minimum | 29.03 | |
| Mean | 64.30 | |

The estimation results show that from 14 independent variables used in the model, there are 6 independent variables that significantly affect the subsidized credit accessibility at a significance level of 1%–5%. The variables that significantly affect subsidized credit accessibility at the level significance of 1% include credit access experience, collateral, interest rates, and farmer group activeness, and agro-ecological zone. The variable that significantly affects subsidized credit accessibility at the level significance of 5% namely financial literacy index. Sex of household head and size of cultivated area are significant at the 10% level. The other 6 variables (i.e. age, education, farm experience, main occupation, an asset of household, and farmer group status) have no significant effect on subsidized credit accessibility.

The financial literacy index variable has a positive and significant effect on the subsidized credit accessibility at a significant level of 5%. The positive sign of z value indicates that farms with higher financial literacy index are better chances to access subsidized credit. The value of the odds ratio is 1.055. It means that each farm whose higher financial literacy index has the possibility to access subsidized microcredit 1.051 times bigger than the farm with one index lower financial literacy index.

The collateral variable has a positive and significant effect on the subsidized credit accessibility at a significance level of 1%. The positive sign of z value indicates that collateral availability makes the possibility to access subsidized credit greater. The odds ratio is 37.7407, it means that the participants who have available collateral are likely to be able to access the subsidized credit of 37.7407 times compared with those who do not have collateral. Farmers in upland areas generally have more serious problem in providing collateral compared to farmers in lowland areas. Farmers usually use the land title as collateral when lodging credit application to the financial institutions. The process of providing a land title for upland farming is often hindered by land status and land tenure problems.

The interest rate variable has a negative and significant effect on the subsidized credit accessibility at a significance level of 1%. The negative sign of z value indicates that the higher the interest rate will be less likely to access subsidized credit and/or other loans. The negative sign of the z value corresponds to the expectations. The odds ratio is 0.6554, It means that any 1% interest rate increase will decrease the likelihood of accessing subsidized credit by 0.6554 times. Meanwhile, the accessing credit experience variable has a positive and significant effect on the subsidized credit accessibility at a significant level of 1%. The positive sign of z

**Table 3: The average of farms performance per hectare of farms with access to subsidized credit compare to farms without access to subsidized credit in Kendal, Indonesia base on simple comparison *t*-test (without PSM process)**

| Farm performance indicator | Farms category | | Difference |
|---|---|---|---|
| | Accessed to subsidized credit | Not-access to subsidized credit | |
| Fertilizer (km) | 877.06 | 842.47 | 34.58 |
| Pesticide (L) | 11.99 | 10.39 | 1.60*** |
| Family labor (h) | 507.84 | 509.08 | −1.24 |
| Hired labor (h) | 582.78 | 517.20 | 65.58*** |
| Productivity (quintal) | 59.88 | 52.15 | 7.73*** |
| Profit (millionIDR) | 10.66 | 9.02 | 1.64*** |

***Significant at 1% level. PSM: Propensity score matching

value indicates that farms with experience in accessing credit in the past are more likely to access subsidized credit.

The activeness of farmer group variables has a positive and significant effect on the subsidized credit accessibility at a significant level of 1%. The positive sign of z value indicates that the farm belonging to an active farmer group has a greater chance of accessing subsidized credit compared to the farm belonging to the inactive group.

The agro-ecological zone of farm site variable has a positive and significant effect on the subsidized credit accessibility at a significant level of 1%. The positive sign of z value indicates that uplands farming are more likely to access subsidized credit. The value of the odds ratio is 6.3185. It means that farming located in the uplands has the possibility to access subsidized credit 6.3185 times larger than lowlands farming. Farming in upland areas is perceived riskier than farming in lowland areas due to bio-physic conditions in upland areas and the remoteness of farming location. In some areas of upland farming is conducted mostly under rainfed condition, because of lack of irrigation infrastructures. The problem of upland agriculture is also aggravated by the issue of legal processes of land title, especially for poor farmers. Farmers in upland areas are become more dependent on government-subsidized credit program as a source of working capital when at the same time commercial financial institutions tend to discount farming in upland areas. Farmers in low land areas have a more diverse source of credit compare to farmers in upland areas. In other word, the government credit program more likely needed and accessed by the farmers in upland areas.

**Table 4: Regression results of variable affecting subsidized credit accessibility**

| Variable Name | Odds ratio | z | P>\|z\| |
|---|---|---|---|
| *AGE* (Age) | 0.9381 | −1.29 | 0.198 |
| *EDUC* (Education duration) | 0.8998 | −0.83 | 0.405 |
| *SEX* (Sex of household head) | 5.1082* | 1.77 | 0.077 |
| *FLIN* (Financial literacy index) | 1.0554** | 2.34 | 0.019 |
| *FEXC* (Farm experience) | 1.0343 | 0.78 | 0.436 |
| *MJOB* (Main occupation) | 0.7837 | −0.42 | 0.671 |
| *CEXP* (Credit access experience) | 6.1275*** | 5.28 | 0.000 |
| *AREA* (Size of cultivated area) | 1.0001* | 1.70 | 0.090 |
| *ASST* (asset of household) | 0.9994 | −1.33 | 0.183 |
| COLT (Credit collateral) | 37.7407*** | 4.84 | 0.000 |
| *RATE* (Interest rate of credit) | 0.6554*** | −5.62 | 0.000 |
| *FGST* (Farmer group status) | 3.6369 | 1.47 | 0.142 |
| *FGAC* (Farmer group activeness) | 6.6043*** | 2.67 | 0.008 |
| *AGZN* (Agro-ecological zone) | 6.3185*** | 2.62 | 0.009 |
| Constanta | 0.003 | −2.03 | 0.042 |

***Significant at 1% level; **Significant at 5% level; *Significant at 10% level

## 4.3. The Impact of Credit Accessibility on Farms Performance

Better farmer access to subsidized credit is expected to improve farm performance. In this study the performance of farms that can access credit (treated group) compared with farm performance that does not access credit (control group) by using PSM. The matching process uses the *teffects psmatch* procedure in the Stata program. The result of the PSM model estimation can be seen in Table 5.

Table 5 shows that there is a difference between the treated group and the control group, that is, increasing credit accessibility brings the change to inputs allocation. Fertilizer application to the farms and hired labor used are significantly different between the two groups. Fertilizer application decreased and substituted by an increase in hired labor used. Farmer access to credit allows farmers to use more rational agricultural inputs. Osorio et al. (2011) show that rice farmers in Indonesia use too much urea fertilizer, and even up to 3 times that recommended. The use of too much fertilizer, especially urea fertilizer, has caused soil degradation (Simatupang and Timmer, 2008). The results of this study show that rice farmers in Kendal who have access to agricultural credit reduce the use of fertilizers for their agriculture, and instead increase the use of paid labor.

Theoretically, improved access to credit may lead to productivity improvement, increase in farms output and the use of inputs (Ciaian et al., 2012). Based on the results of the PSM method in this study it can be said that the improvement in access to subsidized credit was able to increase the productivity of rice farming. Improvement in access to subsidized credit was also significantly increased paddy farm profitability.

Small scale farmers in the developing country tend to avoid production risks by applying pesticides excessively in order to prevent crop failures (Ecobichon, 2001). This study found that pesticide used tends to decrease as farmers access to credit improved, but the reduction was statistically insignificant. These results reinforce the notion that improving access to subsidized credit can make farmers more rational in using their production inputs. The use of pesticides in rice farming is not intended to increase productivity but to prevent production decline. Rice farming productivity is likely to increase if the money obtained from the loan is allocated to add the use of labor.

**Table 5: The results of the estimation of the average treatment effects on treated (ATT) of credit accessibility to farm performance per hectare and to household non-farm income**

| Performance indicator | Coefficient (difference) | Standard error | z | P>\|z\| |
|---|---|---|---|---|
| Fertilizer (kg) | −70.9816*** | 25.5254 | −2.68 | 0.007 |
| Pesticide (L) | −0.4699 | 0.4643 | −1.01 | 0.312 |
| Family labor (h) | 30.28 | 56.68 | 0.53 | 0.593 |
| Hired labor (h) | 35.6547*** | 11.9545 | 2.97 | 0.003 |
| Productivity (quintal) | 1.3955*** | 0.6647 | 2.10 | 0.036 |
| Farm profit (IDR) | 1.4309*** | 0.2896 | 4.94 | 0.000 |
| Non-farm income (IDR) | 4.321*** | 0.5191 | 8.32 | 0.000 |

***Significant at 1% level

Agricultural credit is fungible and its use can be transferred to other purposes outside agriculture. Many farmers in Kendal also have businesses outside agriculture. This study shows that increasing access to agricultural credit can also increase income from off-farm businesses. For farmers who have other businesses outside agriculture, they can shift part or all of the credit they receive plus funds from the rationalization of the use of agricultural inputs to increase farmers' income in total.

## 5. CONCLUSION

Collateral and interest rates are still the dominant factor in determining farmers' access to subsidized credit. Farmers who provide collateral have a much greater opportunity to access subsidized credit. On the other hand, increasing lending rates will minimize farmers' opportunities for access to subsidized credit. Accessibility to credit also increases if financial literacy of farmers increase and the quality of farmer group improve. Farmers in upland agro-ecological zones have a greater opportunity to access subsidized credit than those in lowland areas. This suggests that farmers in the upland area are more dependent on subsidized loans to meet their working capital needs and also indicate the relatively low access of farmers in the upland area to commercial credit sources.

Increased access to government-subsidized credits significantly had a real impact on the performance of rice farming. Increased access to credit affects the combination of inputs used. Better access to credit made farmers more rational in allocating their working capital. Farmers tend to reduce employing fertilizers and pesticides and increase hired labor instead. Better access to subsidized credit has been able to encourage increase productivity of rice farming and bring higher farm profit.

The policy implication of this study is that government subsidized credit will be more effective in boosting farming performance and farmers' income if the credit given is also part of the introduction of new technology packages that can lead to more higher farm productivity and farm profitability. To improve farmers' access to credit, the government also needs to encourage better farmer's financial literacy and the quality of farmer groups. Results of the study show that age and duration of education did not significantly affect access to credit, but the level of farmers' financial literacy and the quality of farmers group did.

## REFERENCES


Akram, W., Hussain, Z., Sial, M.H., Hussain, I. (2008), Agricultural credit constraints and borrowing behavior of farmers in rural Punjab. European Journal of Scientific Research, 23(2), 294-304.

Ali, D.A., Deininger, K., Duponchel, M. (2014), Credit constraints and agricultural productivity: Evidence from rural Rwanda. Journal of Development Studies, 50(5), 649-665.

Foster, A.D., Rosenzweig, M.R. (1995), Learning by doing and learning from others: Human capital and technical change in agriculture. Journal of Political Economy, 103(6), 1176-1209.

Arief, B., Rosmiati, M. (2013), Impact of Credit Access on Rice Farmers Household Welfare. Proceeding on National Seminar and Discussion. The Identity and Reposition of Indonesia Cooperatives. Indonesia: IKOPIN Press.

Baiyegunhi, L.J.S., Fraser, G.C.G., Darroch, M.A.G. (2010), Credit constraints and household welfare in the Eastern Cape province, South Africa. African Journal of Agricultural Research, 5(16), 2243-2252.

Barslund, M., Tarp, F. (2008), Formal and informal rural credit in four provinces of Vietnam. Journal of Development Studies, 44(4), 485-503.

Boucher, S.R., Guirkinger, C., Trivelli, C. (2009), Direct elicitation of credit constraints: Conceptual and practical issues with an application to Peruvian agriculture. Economic Development and Cultural Change, 57(4), 609-640.

Chaudhuri, K., Cherical, M.M. (2011), Credit rationing in rural credit markets of India. Applied Economics, 44(7), 803-812.

Chaves, R.A., Gonzalez-Vega, C. (1996), The design of successful rural financial intermediaries: Evidence from Indonesia. World Development, 24(1), 65-78.

Chivenge, P., Vanlauwe, B., Six, J. (2011), Does the combined application of organic and mineral nutrient sources influence maize productivity? A meta-analysis. Plant Soil, 342(1-2), 1-30.

Christen, R.P., Pearce, D. (2005), Managing Risks and Designing Products for Agricultural Microfinance: Features of an Emerging Model. Washington, DC: CGAP Occasional Paper, No. 11.

Ciaian, P., Fałkowski, J., Kancs, D.A. (2012), Access to credit, factor allocation and farm productivity evidence from the CEE transition economies. Agricultural Finance Review, 72(1), 22-47.

Conley, T.G., Udry, C.R. (2010), Learning about a new technology: Pineapple in Ghana. American Economic Review, American Economic Association, 100(1), 35-69.

Dehejia, H.R., Wahba, S. (2002) Propensity score-matching methods for nonexperimental causal studies. The Review of Economics and Statistics, 84(1), 151-161.

Diagne, A. (1999), Determinants of Household Access to and Participation in Formal and Informal Credit Markets in Malawi. IFRI FCND Discussion Paper, No. 67.

Ecobicho, D.J. (2001), Pesticide use in developing countries. Toxicology, 160(1-3), 27-33.

Etonihu, K.I., Rahman, S.A., Usman, S. (2013), Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa State, Nigeria. Journal of Development and Agricultural Economics, 5(5), 192-196.

Feder, G., Onchan, T., Raparla, T. (1988), Collateral, guaranties and rural credit in developing countries: Evidence from Asia. Agricultural Economics, 2, 231-245.

Foltz, J.D. (2004), Credit market access and profitability in Tunisian agriculture. Agricultural Economics, 30(3), 229-240.

Freeman, H.A., Ehui, S.K., Jabbar, M.A. (1998), Credit constraints and smallholder dairy production in the East African highlands: Application of a switching regression model. Agricultural Economics, 19(1-2), 33-44.

Heinrich, C., Maffioli, A., Vázquez, G. (2010), A Primer for Applying Propensity Score Matching. Impact-Evaluation Guidelines, Technical Notes, No. IDB-TN-161. Office of Strategic Planning and Development Effectiveness. United States: Inter-American Development Bank.

Herdt, R.W., Mellor, J.W. (1964), The contrasting response of rice to Nitrogen: India and the United States. American Journal of Agricultural Economics, 46(1), 150-160.

Hoff, K., Stiglitz, J.E. (1990), Introduction: Imperfect information and rural credit markets: Puzzles and policy perspectives. The World Bank Economic Review, 4(3), 235-250.

Jacoby, H., Skoufias, E. (1997), Risk, financial markets, and human

capital in a developing country. Review of Economic Studies, 64(3), 311-335.
Jia, X., Heidhues, F., Zeller, M. (2010), Credit rationing of rural households in China. Agricultural Finance Review, 70(1), 37-54.
Kuwornu, J.K.M., Ohene-Ntow, I.D., Asuming-Brempong, S. (2012), Agricultural credit allocation and constraint analyses of selected maize farmers in Ghana. British Journal of Economics, Management and Trade, 2(4), 353-374.
Marenya, P.P., Barrett, C.B. (2007), Household-level determinants of adoption of improved natural resources management practices among smallholder farmers in western Kenya. Food Policy, 32(4), 515-536.
Morduch, J. (1999), The microfinance promise. Journal of Economic Literature, 37, 1569-1614.
Njinju, S.M., Samejima, H., Katsura, K., Kikuta, M., Gweyi-Onyango, J.P., Kimani, J.M., Yamauchi, A., Makihara, D. (2018), Grain yield responses of lowland rice varieties to increased amount of nitrogen fertilizer under tropical highland conditions in central Kenya. Plant Production Science, 21(2), 59-70.
Nuryartono, N., Zeller, M., Schwarze, S. (2005), Credit Rationing of Farm Households and Agricultural Production: Empirical Evidence in Rural Areas of Central Sulawesi, Indonesia. Conference on International Agricultural. Research for Development; 2005 Oct 11-13; Stuttgart-Hohenheim, Germany. Germany (DE): Tropentag. p1-8.
Omonona, B.T., Akinterinwa, A.T., Awoyinka, Y.A. (2008), Credit constraint condition and output supply of Cowan farmers in Oyo State, Nigeria. European Journal of Social Sciences, 6(3), 382-390.
Osorio, C.G., Abriningrum, D.E., Armas, E.B., Firdaus, M. (2011), Who Is Benefiting from Fertilizer Subsidies in Indonesia? Policy Research Working Paper, No. 5758. World Bank, East Asia and Pacific Region, Poverty Reduction and Economic Management Unit.
Petrick, M. (2004), A microeconometric analysis of credit rationing in the polish farm sector. European Review of Agricultural Economics, 31(1), 77-101.
Pham, B.D., Izumida, Y. (2002), Rural development finance in Vietnam: A micro-econometric analysis of household surveys. World Development, 30(2), 319-335.
Pitt, M., Khandker, S. (1998), Impact of group-based credit programs on poor households in Bangladesh: Does the gender of participants matter? Journal of Political Economy, 106(5), 958-996.
Rosenbaum, P.R., Rubin, D.B. (1984), Reducing bias in observational studies using subclassification on the propensity score. Journal of the American Statistical Association, 79(387), 516-524.
Simatupang, P., Timmer, C.P. (2008), Indonesian rice production: Policies and realities. Bulletin of Indonesian Economic Studies, 44(1), 65-80.
Simtowe, F., Diagne, A., Zeller, M. (2008), Who is credit constrained? Evidence from rural Malawi. Agricultural Finance Review, 68(2), 255-272.
Vicente, J.R., Vosti, S.A. (1995), An IEA-CATI objective survey data test at rural holding level for technology adoption. Agricultura em Sao Paulo, 42(2), 129-148.
Yehuala, S. (2008), Determinants of Smallholder Farmers Access to Formal Credit: The Case of Memeta Woreda, North Gondar, Ethiopia. A Thesis of the Agriculture Department of Rural Development and Agricultural Extension School. Ethiopia: Haramaya University.
Zeller, M. (1994), Determinants of credit rationing: A study of informal lenders and formal credit groups in Madagascar. World Development, 22(12), 1895-1907.