

# Determinants of demand for credit by smallholder farmers': a farm level analysis based on survey in Sindh, Pakistan

Demand for credit by smallholder farmers

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## Abstract

**Purpose** – In the developing countries, formal credit has dominant role for the development of agriculture sector. It increases the farmer's purchasing power for better farm inputs and agricultural technology for high crop productivity. The main purpose of this study is to examine the influence of socioeconomic characteristics of smallholder farmers for credit demand in Sindh, Pakistan.

**Design/methodology/approach** – A cross-sectional data set randomly collected from 90 smallholder farmers in Thatta district, Sindh, Pakistan, is examined. Descriptive statistics, correlation and the OLS regression method were used to demonstrate the important factors affecting the demand for formal credit.

**Findings** – The results revealed that formal education, experience of farming, landholding size, road access and extension contacts positively and significantly influenced the demand for formal credit.

**Originality/value** – This study is the first, to the best of authors' knowledge, to demonstrate the influence of various socioeconomic characteristics of smallholder farmers on demand for formal credit in Sindh, Pakistan. It also illustrates the imperative contribution to the literature regarding credit access and demand to improve the agricultural productivity.

**Keywords** Determinants, Demand for credit, OLS approach, Pakistan

**Paper type** Research paper

## JEL Classification — O13, Q14, Q18

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## 1. Introduction

In the developing countries, agriculture has vital role to reduce poverty and hunger through employment generation, food security and also supports to the economic gross domestic product (GDP) of a country. It is a key player for obtaining the Millennium Development Goals (MDGs) to achieve sustainable development. In order to achieve this goal, agriculture is progressively moving from the traditional method to modern system for more production (Chandio *et al.*, 2017a, Hussain and thapa, 2012; Jan *et al.*, 2017; Saqib *et al.*, 2018). The improvement in the agricultural production cannot be derived without adoption of modern technology and inputs. Agricultural credit has dominant role and is a chief tool in attaining latest technology for the development of agricultural sector. Therefore, agriculture credit has huge demand in the agricultural sector to boost its production. However, credit access from formal sources is frequently a problem for the smallholder farmers because of the undersupply and shortage of qualified collateral or other circumstances (Hussain and thapa, 2012, Jan and Khan, 2012; Nouman *et al.*, 2013a). Formal agricultural credit is an important farm input along with modern technology playing role for improved crops yield and accelerating agricultural modernization and economic development (Anang *et al.*, 2015). According to Dube *et al.* (2015) and Zeller *et al.*'s (1997) studies, the welfare of households is affected by access to credit and eliminating the capital constraints during the vegetation growth and planting season of crops, thereby increasing the capabilities of those with low or no savings to meet their financial needs for crop production. The formal agricultural loan is not required only for the small- and medium-scale farmers for survival, but also large-scale farmers can get benefit to improve farm income with minimal savings (Das *et al.*, 2009). Ahmad (2011) illustrate the key role played by smallholder farmers in Asia and sub-Saharan Africa in terms of agricultural development, poverty reduction, livelihood and food security by using credit to enhance agricultural productivity.

The sources of institutional credit have increased as compared to noninstitutional credit in the farming sector. Credit has chief role in agricultural production, but farmers do not have easy access due to bureaucracy and complicated application procedures and restrictions by formal lending institutions (Dube *et al.*, 2015, Malik *et al.*, 1991). In developing countries such as Pakistan, smallholders' farmers are facing problems in the access of agricultural credits due to meager nature of the loan amount required by farmers, which is difficult to administer, and the inability to provide collateral demanded by formal sources (Chandio *et al.*, 2017b, Hussain and Thapa, 2012; Saqib *et al.*, 2018). The recent customers market is exceptionally engaged with more risk and debts, which creates difficulties for the farmers who depend on credit (Olusanya, 2012, Langat, 2013; Poulton *et al.*, 2006).

Kiplimo *et al.*'s (2015) study illustrates the procedures to realize equitable access to formal agricultural loan by small-scale farmers in order to realize the food security, increase economic outcomes and eradicate poverty. Several research studies have been conducted in the developing economies regarding formal credit access to small-scale farmers that are considered in a broad range various socioeconomic factors (for example, age, education, farm size, livestock and off-farm income) that determine smallholder farmers' credit access vary from one region to another. Kiplimo *et al.*'s (2015) study results show that recognized factors such as education, extension services, as well as salaried agricultural employment are the key positive drivers for the determinants of access to credit facilities among smallholders in Kenya. It was revealed after the logistic model application, and therefore, researchers recommended that in order to reduce lending process and procedure, loan and credit offices should be established close to the farmers. Furthermore, Langat *et al.*'s (2013) study illustrates that smallholder farmers have risk than other potential customers through consideration by the formal financial institutions. Moreover, they also concluded that the risk on credit defines the lending of farmers. Similarly, in Zambia, Sebatta *et al.* (2014) applied the double handle model to analyze the data from five provinces and reported that smallholder farmers'

education level, farmer savings with the help of formal financial institutions and the youth age positively influence the access to the credit and further revealed farmer savings, number of household daily meals, loan payback period as well as household size positively influenced the access to the amount of credit by smallholder farmers.

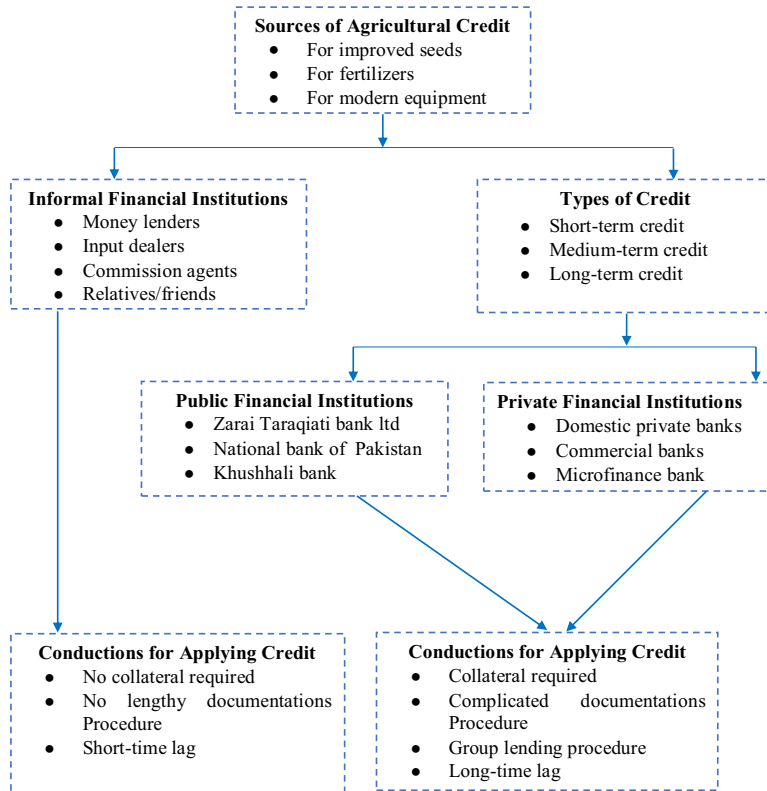
Further, [Yehuala's \(2008\)](#) research demonstrated that factors such as size of cultivated land holdings, access to agricultural extension service, formation of groups or provision of collateral, number of livestock owned by smallholder farmers, experience in credit from a formal financial institution and joining a multipurpose farmers' cooperation are the key driving factors in the determination of smallholder farmers' access to credit. The key motive of this paper is to investigate the smallholder farmers' credit demand in Sindh by using an econometric analysis.

## 2. Agricultural credit in Pakistan

The formal credit institution has been established in the rural areas of Pakistan in order to finance the agricultural and rural economy development. In the rural areas of Pakistan, commercial banks also help to provide the agricultural loan for the development of agriculture sector, and formal institutions also provide agricultural loan for the specific purposes to fulfill the rural households' requirements ([Khandker and Faruqee, 2003](#)). In the developing countries such as Pakistan, governments have long program to promote agricultural development by initiating several policies to facilitate productive resources in rural households. In these consequences, agricultural credit has vital role to promote small farmers' development. Most of the farmers have small farm holdings in the rural areas of Pakistan. The net area for cultivation per dependent on agricultural is relatively low and is around 58% of farm size of less than 5 acres. In 1960s, the rapid adoption of high-yield crop varieties played a vital role in stimulating agricultural growth and increased income for the farmers. The utilization of modern agricultural technologies varied for different size of farm due to lack of capital and limited access to formal agricultural loan from formal sources. Over the past few decades, many efforts have been made by policymakers to increase the supply of credit to farmers. Since independence, the major agricultural credits suppliers in Pakistan are Agricultural Development Bank of Pakistan (ADBP), Cooperative Bank and Taccavi Loans. The agricultural formal credit flow to smallholders grew rapidly after 1972 when commercial banks entered into the rural financial credit market. Under the supervision of State Bank of Pakistan (SBP), all commercial banks have been providing agricultural loans to the smallholder farmers. To provide incentives and protection to all commercial banks, agricultural formal credit disbursed by all the commercial banks was covered by guarantees from the SBP about 50% of their losses. In 1980s, the Government of Pakistan ratified another agricultural loan scheme called production loan under which all the commercial banks were asked to disburse interest-free production loan to small-scale farmers. These types of agricultural credit policies have nominal supply of agricultural credit by formal sources ([GOP, 2004](#)). Formal agricultural credit increased with the passage of time around 27.5% per annum. During 1972–1988, the share of small-scale farmers increased from 39 to 51% ([Sial and Carter, 1996](#)). However, in the rural areas of Pakistan, small-scale farmers are not obtaining their due share including share of total agricultural credit disbursed because of their less accessibility of credit from formal sources. A general framework for rural financial services is depicted in [Figure 1](#).

## 3. Agricultural credit demand in Pakistan

The agricultural sector has significant contribution to boost economic growth of Pakistan. Rural population of Pakistan is residing directly and indirectly involved in farming



**Figure 1.**  
Rural financial services  
provided by formal and  
informal sources in  
Pakistan

associated activities. Consequently, boost in the agriculture is not only an important for economic growth of Pakistan, but it is also a major source of livelihood for the rural population (Abedullah *et al.*, 2009). The farming sector of Pakistan is facing several challenges including the shortage of water, energy and raising price in the farm inputs. Majority of the small-scale farmers in Pakistan are facing rigorous situations and are unable to survive with the sector of farming. The key function of agricultural credit is to buy seeds, fertilizers, pesticides and other implements. Smallholder farmers are unable to save money and usually they borrow money from formal, informal institutions and financial institutions. These financial institutions are including Zarai Taraqiati Bank Limited (ZTBL), Punjab Cooperates Bank and other commercial banks that provide credit on collateral, while informal financial channels include input suppliers, village shopkeepers, fellow farmers, friends and relatives without collateral.

The ADBP was the main source of financial lending institution in Pakistan before 1972. The commercial banks of the Pakistan increased their loan portfolio in 1972 for the agricultural and rural development. Furthermore, the SBP started one window loan scheme and insurance loan scheme to support small-scale farmers to boost the agriculture sector. During 2012–2013, the agricultural credit was its highest position, and PKR, 336,247m was disbursed by various financial institutions against PKR, 293,850m to last year. During 2014–2015, the total agricultural credit disbursed was PKR 515,875m (GOP, 2015). The Pakistani government has created many agricultural development loan schemes to support agriculture

sector with the collaboration of several noninstitutional organizations. These development schemes have positive influence on the economy of Pakistan as well as on society. Study of [Abedullah et al. \(2009\)](#) reported that lack of financial services has adverse effect on the agricultural growth in Pakistan. [Sial et al. \(2011\)](#) reported that informal credit markets are very active in developing countries including Pakistan and give access to the farmers to gain agricultural credits from formal sources and restrained due to poor socioeconomic characteristics. The dominance of formal agricultural credit having impact on farm productivity hinders the small-scale farmers from the efficient allocation of resources in the production pattern. Easy and reliable access to the formal agricultural credit is a dominant way for satisfying the demand of credit to the small-scale farmers in the developing countries ([Bashir and Mehmood, 2010](#)).

#### 4. Literature review

Scholarly findings from [Kokoye et al. \(2013\)](#); [Saqib et al. \(2016\)](#); [Afrin et al. \(2017\)](#); [Chandio et al. \(2018\)](#); [Silong and Gadanakis \(2019\)](#) and other researchers identified formal agricultural credit as an effective tool for capitalizing farm households in order to spend further and introduce new technology for agricultural production to increase agricultural efficiency. Various scholars from various parts of the world including ([Abate et al., 2014](#); [Chandio et al., 2017b](#); [Duy et al., 2015](#)) reported that credit enhances the living conditions of people by raising their farm productivity to boost their self-confidence by raising profits and well-being. There exist few previous studies of smallholder farmers for credit demand. [Ajagbe \(2012\)](#) investigated the choice of credit by small-scale enterprises of 350 respondents in Nigeria. With the use of multinomial logit model, the findings of the study concluded that the availability of different sources of credit has a positive impact on demand for credit. The study also suggested that improved linkages would allow banks to benefit from informal agents' outreach and local awareness, increasing financial savings mobilization and credit distribution and enhancing the financial system's overall efficiency and profitability.

Using a linear regression analysis to demonstrate the linkage between various socioeconomic characteristics of the farmers and their rate of accessibility to the agricultural credit, [Etonihu et al. \(2013\)](#) reported that the formal education, distance to formal financial institutions and types of credit source were significant factors prompting smallholders' accessibility to credit in Nigeria. Determinants of access to formal credit by smallholder tobacco farmers in Makoni District, Zimbabwe, were investigated by [Dube et al. \(2015\)](#) by utilizing survey data of 77 smallholder tobacco farmers. The results of logit regression model revealed that improved access to credit usage information by extension programs is expected to have a significant effect on the attitudes of farmers about credit risk, which in turn will reduce the concerns associated with structured credit sources. The results further examined that motivating farmers to protect both their crops and loans against crop failure can reduce the risk affiliated with formal credit sources.

In Mardan district of Pakistan, [Saqib et al. \(2016\)](#) examined the differences in access to and utilization of agricultural credit among smallholder farmers in Pakistan by using survey data collected from 87 farmers. The study revealed that farmers with large acres of land had more access and utilization, and the years of schooling, farming experience and landholding size were significant factors that affected accessibility on credit. The results also showed that farmers with the small acres of land were the most vulnerable, so in order to protect their rights, credit policy needs to be updated. [Fecke et al., \(2016\)](#) investigated the influencing factors of loan demand in agriculture in Germany. With the use of an ordinary least square (OLS) regression, the findings of the study concluded that the interest rate, grace periods and farmers' perceptions have a significant impact on the market for loans in agriculture. The study also suggested that the interest rate has a major negative impact, and the market

aspirations of farmers have a significant positive effects on the demand for loans. The research of [Agbodji and Johnson \(2019\)](#) examined the impact of credit on cereal crops productivity in Togo. The results revealed that credit has a significant positive impact on these productivities. This general result varies depending on the type of credit, however, in kind credit has a significant positive impact on maize and sorghum productivity, but no significant impact on rice productivity.

## 5. Methodology

### 5.1 Study area

This research study is carried out in the Thatta District of Sindh, Pakistan. The Thatta district has total area of 17,355 sq. km and total population is 1,113,194 persons; among this, 589,341 (52.94%) are males and 523,853 (47.06%) are females according to 1998 census. Thatta district is popular due to cultivation of rice crop and most of the farmers relying on this crop, which is prime source for their income.

### 5.2 Sampling procedure and sample size

This study used multistage sampling technique to select the rice farmers in the study area and is based on four multistage sampling. The first stage is purposively selecting the southern region of Sindh, Pakistan, because of the predominance of rice cultivation in the region. The second stage is randomly selecting the Thatta district out of the number of rice cultivation districts in Sindh, Pakistan. In the third stage, Mirpur Sakro Taluka is randomly selected in the district. In the fourth stage, fifteen (15) rice growers are randomly selected from six villages, and a total of 90 rice farmers are sampled for the present study.

### 5.3 Theoretical model specification

Credit has dominant contribution in the agriculture sector to boost its growth. In the process of transformation from traditional agriculture to modern agriculture, the agricultural development demand for agricultural credit presents diverse characteristics. The agricultural development stage, the marketization of agriculture, production and management methods of farmers' households all have dominant influence on credit demand. Credit demand is associated with the buyer willingness, gain money to buy product and services. The demand for financial facilities is impacted by their own price and other several factors for the income of the borrower and related other costs. Therefore, financial institutions are concerned in the interest rate, which is charged for the credit. Its credible statement that the financial institutions charge a high interest rate. Different socioeconomic factors have a positive linkage with credit demand including income, level of education and household size. The high-income level, formal education, household size and dependency ratio cause the higher demand for agricultural credit ([Mohieldin and Wright, 2000](#)). Other factors have a negative influence on credit demand such as farmer's age, distance and delay in the disbursement of loan. In this research, the agricultural credit demand for an individual means that credit amount to the smallholder rice farmer, which is ready to borrow in order to purchase inputs, hiring labors and covering costs related to farming activities such as farm preparation, planting, weeding, harvesting and processing. The demand of formal agricultural credit can be expressed in [Eqn \(1\)](#) as follows:

$$Y_i^* = X_i\beta_j + \varepsilon_i \quad (1)$$

where  $Y_i^*$  represents the amount of formal agricultural credit borrowed by smallholder rice farmers from both credit sources formal and informal while  $X_i$  represents households'

socioeconomic characteristics that would potentially influence the demand of credit. In addition,  $\beta_j$  represents vectors of parameters to be estimated and  $\varepsilon_i$  is error term.

#### 5.4 OLS method

The OLS technique was adopted to determine the major factors influencing the credit demand of farmers in Sindh, Pakistan, and can be specified in Eqn (2) as follows:

$$Y_i = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}) \quad (2)$$

The empirical model can be expressed as in Eqn (3)

$$Y_i = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{GEN} + \beta_3 \text{EDU} + \beta_4 \text{HHS} + \beta_5 \text{FAE} + \beta_6 \text{LHS} + \beta_7 \text{FAS} + \beta_8 \text{LSK} + \beta_9 \text{RDA} + \beta_{10} \text{RDA} + \beta_{11} \text{DST} + \varepsilon_i \quad (3)$$

where  $Y_i$  is defined as earlier,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}$  are the explanatory variables including age of household head, gender, formal education, household size, farming experience, landholding size, farm status, livestock, extension contact, road access and distance of market from credit sources, respectively.

#### 5.5 Explanation of the study variables and hypothesis

**5.5.1 Age.** It illustrates as continues variable and measured in years. It is anticipated that as a sampled rural household head grows older, the capability to access credit or demand for credit from formal sources decreases. It is due to the fact that older rural household may not be strong enough to work efficiently or invest in the agricultural-related activities (Kuwornu *et al.*, 2012); hence, we hypothesize that:

*H1.* Age of the farmer has negative influence on credit demand.

**5.5.2 Gender.** Gender shows that the sample of rural household head is measured as a dummy variable (1 if household head is male, 0 for female). The male respondents are very much capable with resource such as land than their female counterparts; therefore, the resource they are endowed with serves as collateral security in accessing the formal credit. Thus, male respondents have more demand for formal credit; we hypothesize that:

*H2.* Gender of the farmer has positive influence on credit demand.

**5.5.3 Household size.** The household size is measured as continues variable and shows the total number of persons living in the farmers' house. It is assumed that as farmers' household size increases, the consumption requirements also increase, and as a result there is stress on limited resources. Nuryartono, (2007) and Oyedele *et al.* (2009) described that households having more household members have high credit demand. Hence, we hypothesize that:

*H3.* Household size has positive influence on credit demand.

**5.5.4 Formal education.** The formal education of respondents is expected to show positive and significant influence on formal credit demand. It is due to the fact that the respondents who attain the high level of education are more able to accumulate and have better knowledge and access to the credit. Hence, highly educated respondents have more demand for credit (Akram *et al.*, 2008). Therefore, we hypothesize that:

*H4.* Formal education has positive and significant influence on credit demand.

5.5.5 *Farming experience.* It is measured as the number of years spent in the farming-related activities and used as continues variable in our model. A farmer having more farming experience will know how to utilize the resources more efficiently. Therefore, we also hypothesize that:

H5. Farming experience has positive and significant effect on credit demand.

5.5.6 *Landholding size.* This variable measured in acres and considered as a continuous variable and expected that it has positive and significant effect on credit demand from formal sources (Sebopetji and Belete, 2009). We further hypothesize that:

H6. Landholding size has also positive and significant influence on credit demand.

5.5.7 *Extension.* Extension is a continuous variable and it is measured in number of contacts with extension agents in a production year. The rice farmers gain better access to information from extension agents. Moreover, agricultural extension agents help to link formal credit sources to the farmer groups (Anang *et al.*, 2015, Muhongayire *et al.*, 2013; Sanusi and Aadedeji, 2010). Consequently, we hypothesize that:

H7. Contact with extension agents has positively and significant influence on credit demand from formal sources.

## 6. Results and discussions

### 6.1 Descriptive statistics and correlation analysis

Descriptive statistics (mean and standard deviation) results are reported in Table 1. As around 83% of the respondents were headed by males, and the average age of household head was almost 42 years with an average of 26 years of farming experience and about six years of formal schooling, which demonstrate that respondents were middle-aged with substantial farming experience and a good level of formal education in the study area. The average family members were 8.64 persons per household. Land is a basic input in the production system; the average landholding size in the study area was about 10.53 acres and 87% of the respondents operated by tractor. In the study area, we find that 0.62% of the respondents were associated with livestock, 58% had road access and on average, had almost two contacts with the extension agents during the earlier year.

Table 2 reports the estimated results of correlation analysis, exhibiting that age of farmers, formal education, farming experiences, landholding size and road access are

Variables	Description	Mean	SD
Gender	1 if the household head is male, 0 otherwise	0.83	0.37
Age	Age of farmers in (years)	41.50	9.95
Education	Education of farmers in (years)	5.63	4.87
Household size	Family members in (numbers)	8.64	2.29
Experience	Farming experience of the farmers in (years)	26.20	8.36
Landholding size	Cultivated land area under rice crop in (acres)	10.53	7.76
Farm status	1 if tractor operated, 0 otherwise	0.87	0.32
Livestock	1 if farmers have livestock, 0 otherwise	0.62	0.48
Road access	1 if farmers have road access, 0 otherwise	0.58	0.49
Extension	Number of contacts with extension agents	1.75	1.52
Distance	Distance from credit sources in kilometers	10.97	3.83

**Table 1.**  
Descriptive statistics  
and measurement of  
the study variables

**Source(s):** Field survey data (2017)

	DCR	AGE	GEN	EDU	HHS	FAE	LHS	FAS	LSK	RDA	EXT	DST
DCR	1											
AGE	0.36***	1										
GEN	-0.02	0.01	1									
EDU	0.38***	-0.09	-0.04	1								
HHS	-0.12	0.11	-0.01	-0.20	1							
FAE	0.47***	0.61***	-0.11	-0.01	-0.07	1						
LHS	0.35***	0.17	-0.06	0.30***	-0.10	0.20*	1					
FAS	-0.10	-0.24	-0.07	0.07	-0.04	-0.18	-0.11	1				
LSK	0.01	-0.14	-0.10	0.22**	-0.03	-0.02	0.06	0.12	1			
RDA	0.19*	0.10	0.23**	0.11	-0.03	0.08	-0.09	-0.3	0.04	1		
EXT	0.09	0.16	-0.04	-0.02	0.03	0.18	0.01	0.05	0.29***	0.18*	1	
DST	-0.37***	-0.12	-0.06	0.07	0.08	-0.23**	-0.03	-0.07	0.10	0.14	-0.09	1

**Note(s):** DCR, AGE, GEN, HHS, FAE, LHS, FAS, LSK, RDA, EXT and DST denote the demand for credit, age of farmers, gender, formal education, household size, farming experience, landholding size, farm status, livestock, road access, extension and distance, respectively. \*\*\*, \*\* and \* indicate the significance levels at the 1, 5 and 10%, respectively

**Table 2.**  
Results of correlation analysis

positively and significantly associated with demand for credit while livestock and contact with extension agent are positively related to demand for credit but insignificantly. Further results indicate that gender, farm status and distance from formal credit sources are negatively associated with demand for credit in the study area.

6.2 Formal agricultural credit supplied to farmers in Pakistan

Table 3 presents formal agricultural credit disbursed to farm and nonfarm sectors by banks in Pakistan. The total amount of credit PKR. 473.1bn increased in 2016–2017 from PKR. 385.5bn in 2015–2016. Out of total credit (PKR. 473.1bn) supplied in 2016–2017, the farm sector received PKR. 232.0bn while nonfarm sector received PKR. 241.1bn. Both sectors received higher amount of credit in 2016–2017 as compared to previous year. Further data exhibited that the share of subsistence farmers and economic landholding decreased from 25.8 to 10.7% in 2015–2016 to 21.7 and 9.7% in 2016–2017. However, the share of above economic landholding gradually increased from 12.3 to 17.6%, as reported in Table 3. This means in Pakistan smallholder farmers have less access to formal agricultural credit than large-scale framers due to lack of collateral and high interest rate.

6.3 Results of OLS method

The results of OLS methods are demonstrated in Table 4. The results show that the demand for formal agricultural loan is positively affected by formal education of the rural household at the 1% level of significance for smallholder rice farmers. It illustrates that when rural household attended formal education, demand for the formal agricultural loan increased by 0.36%. In this regard, well-educated respondents are more open to new innovations and improved management practices, and it is consistent with prior expectations and findings of (Amjad and Hasnu, 2007; Duniya and Adinah, 2015; Ibrahim and Aliero, 2012). Their studies concluded that formal schooling years of farmers enable them to cope with the procedure to gain formal credit. Furthermore, the farming experience showed a positive and significant association with demand for the formal agricultural loan. The estimated coefficient of experience of farming is 0.130,936. This means that 1% increase in the experience of farming will increase the demand of formal agricultural loan by smallholder rice farmers at 0.13%. More experience of farming has dominant role due to more skilled farmers that dealt with the banks have access to the credit, so they have better understanding of the terms and conditions of loan. The results are consistent with the findings of (Amjad and Hasnu, 2007,

Sector	2015–16		2016–17	
	Credit Disbursement	Share (%)	Credit Disbursement	Share (%)
<i>A</i>				
Farm credit	188.1	48.8	232.0	49.0
Subsistence farmers	99.5	25.8	102.6	21.7
Economic landholding	41.2	10.7	46.1	9.7
Above economic landholding	47.4	12.3	83.3	17.6
<i>B</i>				
Non-farm credit	197.4	52.1	241.1	51.0
Small farms	69.7	18.1	85.5	18.1
Large-scale farms	127.7	33.1	155.6	32.9
Total (A + B)	385.5	100	473.1	100

**Table 3.** Access to farm and nonfarm formal agricultural credit (PKR. billion)  
**Source(s):** Economic Survey of Pakistan Report (2016–17)

Variables	Coefficient	Std. Error	t-Statistic	Prob
Age	0.076	0.057	1.340	0.184
Gender	-0.519	1.199	-0.432	0.666
Education	0.364 <sup>a</sup>	0.099	3.654	0.000
Household size	-0.067	0.193	-0.348	0.728
Experience	0.130 <sup>c</sup>	0.069	1.887	0.062
Landholding size	0.125 <sup>b</sup>	0.059	2.119	0.037
Farm status	0.264	1.376	0.192	0.848
Livestock	-0.186	0.910	-0.204	0.838
Road access	1.871 <sup>b</sup>	0.930	2.011	0.047
Extension	1.619 <sup>a</sup>	0.330	4.898	0.000
Distance	-0.129 <sup>a</sup>	0.049	-2.610	0.010
Constant	-4.293	3.573	-1.201	0.233
<i>Sensitivity analysis</i>				
$R^2$	0.651			
Adjusted $R^2$	0.601			
F statistic	13.235			
Prob (F statistic)	(0.000)			
Durbin-Watson stat	0.873			
<i>Robust check</i>				
$\chi^2$ NORMAL	2.975 (0.225)			
$\chi^2$ SERIAL	1.273 (0.227)			
$\chi^2$ ARCH	0.768 (0.670)			

**Note(s):** <sup>a</sup>, <sup>b</sup> and <sup>c</sup> Significant at 1, 5 and 10% probability levels, respectively

**Source(s):** Field survey data (2017)

**Table 4.**  
OLS results for the determinants of demand for credit

Duniya and Adinah, 2015; Nouman *et al.*, 2013b; Obilor, 2013; Saleem and Jan, 2011, Sebopetji and Belete, 2009; Yehuala, 2008). These studies' results illustrate that more experience of farming has a significant linkage with demand for credit. Furthermore, landholding size also has positive and significant association with demand for credit. It shows that increase in the rice farmers' cultivated land will increase the demand for loan. It is fact that increased landholding size requires more input costs. This corroborates the findings of (Akpan, 2013, Akudugu, 2012; Khan and Hussain, 2011). The road access is also positively and statistically significant at 5% level of significance, which shows that 1% increase in road access will increase 1.87% in demand for formal agricultural loan. Results also showed that amount of formal agricultural loan demand by smallholder rice farmers is positively and significantly influenced by the different extension services provided by development agencies in the study area. The coefficient is showing that 1% increase in extension services will lead to 1.61% increase in demand for formal agricultural loan by smallholder rice farmers. Access to different extension services will increase the level of awareness among smallholder rice farmers, access to new ideas, information, activities, opportunities, work environment and so on. In addition, the training could indicate that borrowers are aware of their rights and obligations to use credit and to repay it in a timely manner. As a conclusion, access to different extension services will have significant influence on farmer's decision to reimburse their loans. Likewise, the distance to formal agricultural credit providers is showing negative association with demand for credit. The distance to lender is statistically significant at 1% with the coefficient of 0.129,597, and it means that 1% increase in distance to formal agricultural credit providers will decrease the demand for credit by smallholder rice farmers at 0.12%. The results of this study are consistent with the findings of (Ayamga *et al.*, 2007; Dabone *et al.*, 2014; Dzadze *et al.*, 2012; Rahji and Fakayode, 2009; Tura *et al.*, 2017). The  $R^2$  is

0.651,143; this implies that the variables included in the OLS method could explain 65% of the variation that occurs in the amount of credit demanded by the rice farmers in the study area. This study used several diagnostic tests such as  $\chi^2$  *NORMAL*,  $\chi^2$  *SERIAL* and  $\chi^2$  *ARCH* for heteroscedasticity and autocorrelation. The outcomes of these tests are reported in [Table 4](#) and confirm that the multiple linear regression model is free of heteroscedasticity and autocorrelation problems.

*6.4 Robustness testing*

Further to verify the estimated outcomes of the OLS method, we applied the robust least squares (ROBUSTLS) technique. The obtained results of the ROBUSTLS approach are also consist with the results of the OLS method (see [Table 5](#)).

**7. Conclusion**

This study examines the determinates of demand for formal agricultural credit in Sindh, Pakistan, by undertaking the data of 90 smallholder farmers. The study has been conducted in Sindh province of Pakistan and mostly based on the field survey. A multistage sampling technique has been used to collect the data from smallholder farmers. We applied the OLS regression model to analyze the data. The evidence from this study suggests that formal education, farming experience, landholding size, road access and extension contact have a positive and significant influence on the demand for formal agricultural credit by smallholder farmers while distance has a negative effect on it. In the consequences of agricultural credit from financial institutions in Sindh, still, small-scale farmers have low access to agricultural credit as compared to landlord farmers due to lack of collateral, low income level and their less landholding size. Farmers with high-income level, large landholding size and availability of collateral are more capable of obtaining agricultural credit from formal sources. Based on the study findings, this study recommends that there is need to improve access to extension services for rice growers and also to provide extension-related information to the rice growers as this increases the probability of access to agricultural credit from financial institutions. Provision of agricultural credit-related information through extension services is also

Variables	Coefficient	Std. Error	z-Statistic	Prob
Age	0.091	0.058	1.712	0.106
Gender	-0.703	1.233	-0.570	0.568
Education	0.357 <sup>a</sup>	0.102	3.483	0.000
Household size	-0.184	0.198	-0.925	0.354
Experience	0.116	0.071	1.626	0.103
Landholding size	0.123 <sup>b</sup>	0.060	2.034	0.041
Farm status	-0.224	1.415	-0.158	0.874
Livestock	-0.582	0.936	-0.622	0.533
Road access	1.687 <sup>c</sup>	0.956	1.764	0.077
Extension	1.587 <sup>a</sup>	0.340	4.668	0.000
Distance	-0.168 <sup>a</sup>	0.051	-3.303	0.001
Constant	-2.371	3.675	-0.645	0.518
<i>Sensitivity analysis</i>				
$R^2$	0.658			
Adjusted $R^2$	0.610			

**Table 5.**

Results of robust least squares method

**Note(s):** <sup>a</sup>, <sup>b</sup> and <sup>c</sup> significant at 1, 5 and 10% probability levels, respectively  
**Source(s):** Field survey data (2017)

necessary and likely to change the risk attitude toward credit for those farmers who are not currently accessing agricultural credit from financial institutions. In addition, financial institutions should supply agricultural credit to small-scale farmers at low interest rate and the terms and conditions should be made easy and flexible.

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