# Factors determining subsistence farmers' access to agricultural credit in flood-prone areas of Pakistan

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## ARTICLE INFO

## ABSTRACT

This paper examines the factors influencing farmers' access to agricultural credit in a flood disaster risk-prone area in Pakistan. Multistage sampling through a structured questionnaire was used to collect data from 168 subsistence landholders in Khyber Pakhtunkhwa, Pakistan. The empirical results of the heteroscedasticity corrected and weighted least squares regression with robust standard errors revealed that education, farming experience, total landholding, monthly income, family size, and proportion of owned land were significant factors in farmers' access to credit. The findings of this study reveal that socioeconomic factors play a key role in farmers' access to agricultural credit in flood-hit areas in Pakistan. Hence, there is a need for credit policy to address the issues of farmers living in risk-prone areas. Moreover, the existing credit policy could be amended to protect the interest of tenant farmers, who lack collateral security.

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## Introduction

Agricultural credit is an essential input along with modern technology for increased farm productivity. With minimal savings, agricultural credit is obtained not only by the small- and medium-scale farmers for survival but also by large-scale farmers to increase farm income (Das, Senapati, & John, 2009). The importance of formal sources of credit has increased compared to informal sources in the farming sector. In spite of the increased importance of institutional sources of credit, farmers have limited access to formal credit (Malik & Nazli, 1999). Agriculture has been

the predominant sector in Pakistan's economy since independence. It contributed 20.9 percent of the Gross Domestic Product (GDP) in 2014—15 and is a source of livelihood for 43.5 percent of the rural population (Pakistan Economic Survey, 2015). Indeed, agricultural output is the main source of economic growth in Pakistan which has grown at an annual average rate of 4.4 percent.

The rural credit market in Pakistan includes both formal and informal sources, which play a substantial role in the rural economy (Aleem, 1990). Microfinance is important primarily for investment in rural production, where credit has been largely received by the non-poor, whereas poor have had little access to micro credit (Waheed, 2009). It is very important for farmers in Pakistan to obtain financial support for their social needs, to purchase farm inputs, and to make stable improvements in production. While endorsing the importance of the agricultural sector, the

government of Pakistan has over the years implemented agricultural credit policies to finance farmers' production toward increasing farm productivity and ensure food security. Agricultural credit can enhance farmers' managerial efficiency and encourage efficient resource allocation and profitability (Bashir, Mehmood, & Hassan, 2010). Timely access and availability of credit are critical to farmers for acquiring the required inputs and machinery necessary to carry out farm operations (Saboor, Hussain, & Munir, 2009).

There are significant differences for farmers in accessing formal sources of credit compared to informal sources. Large-scale farmers have greater access to formal credit than small-scale farmers, as the former possess assets and collateral security (Binswanger & Sillers, 1983; Heltberg, 1998; Rahman, Hussain, & Taqi, 2014; Swaminathan, 1991). The majority of small-scale farmers not only have limited access to credit from formal sources but also to informal sources such as friends, relatives, and landlords (Amjad & Hasnu, 2007). Informal credit markets are characterized by the personalized nature of contracts. On the basis of personal relationships, anyone who is prepared to pay the interest and meet the collateral requirements is likely to receive credit from all lenders (Basu, 1987; Tsai, 2004), interlinkages (Bell & Srinivasan, 1991; Braverman & Guasch, 1984; Mitra, 1983), and heterogeneous borrowers (Basu, 1987; Braverman & Guasch, 1984).

The major problem faced by farmers is limited credit accessibility or capital constraints, which hinder the adoption of more efficient and modern technologies in the farming sector. This lack of resources not only limits the possibilities of increased productivity, it also hinders the capacity for smooth consumption (Malik & Nazli, 1999). Farmers need money immediately after the harvest period for the next growing season to cover cash shortages and non-payment of their latest crop. Additionally, modern agriculture is based on high-yielding seeds, fertilizers, and plant protection measures which are expensive. Most of their inputs are purchased in cash or from dealers on a credit-in-kind basis, leading to an increased dependence of farm households on credit markets. An efficient credit market provides farmers with the opportunity to meet consumption requirements and proper input use, thus, resulting in improvement to farmers' livelihoods (Feder, Lau, Lin, & Luo, 1990). Farmers' easy and timely access to credit enables them to expand and diversify their farming activities by venturing into new investment or adopting new technologies.

Lack of collateral is the main reason for farmers' inability to benefit from loan schemes in Pakistan (Ahmad, 2011; Rahman et al., 2014). Access to formal credit is challenging for the small-scale farmers due to collateral issues, so they resort to informal sources due to their timely delivery, no need for collateral, and flexibility in loan transactions. The majority of small-scale farmers cannot borrow from banks or other financial institutions due to a lack of collateral security (Khandker & Faruqee, 2003; Rahman et al., 2014). In most instances, small-scale farmers can only apply for small amounts of credits

to purchase seeds, fertilizers, and pesticides, but cannot apply for loans to purchase tractors, tube wells, and farm machinery, due to insufficient collateral (Hussain & Thapa, 2012).

The effects of socio-economic factors such as age, family size, and income on access to agricultural credit has been well established in the literature (Abedullah, Khalid, & Kouser, 2009; Amjad & Hasnu, 2007; Hananu, Abdul-Hanan, & Zakaria, 2015; Nguyen & Le, 2015; Saleem, Jan, Khattak, & Quraishi, 2014; Saqib, Ahmad, & Panezai, 2016; Sebatta, Wamulume, & Mwansakilwa, 2014). Similar studies have revealed the effect of education on access to credit (Abedullah et al., 2009; Amjad & Hasnu, 2007; Chaudhary & Ishfaq, 2003; Hananu et al., 2015; Javed et al., 2006; Kosgey, 2013; Nguyen & Le, 2015; Saleem et al., 2014; Sebatta et al., 2014). Likewise, the literature has highlighted the role of farming experience in credit markets (Nguyen & Le, 2015; Yehuala, 2008). However, landholding size is the most important factor in farmers' access to agricultural credit in Pakistan (Ahmad, 2011; Hananu et al., 2015; Kosgey, 2013; Saleem et al., 2014). Studies have revealed the association of farmers' land ownership with their access to credit (Kosgey, 2013; Nguyen & Le, 2015). Farm labor has also been associated with farmers' access to credit sources (Ahmad, 2011; Nguyen & Le, 2015).

Farmers in Pakistan are confronted with natural hazards (flooding, drought, heavy rains, and storms), pests and disease, low product prices, high input costs, and monopolies by intermediaries, just to mention a few. In recent years, the agricultural sector in Pakistan has faced three massive floods that devastated the agricultural sector in Pakistan. Monsoon floods in 2010, 2011, and 2014 caused huge damage to agricultural crops, fisheries, forestry, livestock, and primary infrastructure like water channels, tube wells, houses, personal items, seed stocks, animal sheds, stored fertilizer, and agricultural equipment/machinery (National Disaster Management Authority, 2014). Pakistan's credit policy has no priority to assist the most vulnerable farmers who are in dire need of agricultural credit to rejuvenate crop production, prepare fields and buy seed, fertilizer, and other agriculture inputs (Saqib, Ahmad, Panezai, & Ali, 2016). In brief, it is important to study farmers' access to credit in flood-prone areas. Therefore, this study explores the socio-economic factors influencing farmers' access to credit in flood-prone areas in Pakistan.

## Material and Methods

### Study Area and Sampling

The data were collected using a multi-stage sampling technique. First, Khyber Pakhtunkhwa was purposely selected. Second, a vulnerable rural population was selected for further sampling. In total, 970 farm-households were identified as vulnerable in Khyber Pakhtunkhwa, Mardan District (Provincial Disaster Management Authority, 2013). Employing the formula of Yamane

(1967) with a 7 percent margin of error following Saqib, Ahmad, Panezai, and Rana (2016), p. 168 farm-households were selected as the sample size. Third, simple random sampling was used to solicit data from 168 subsistence farm households having landholdings up to 12.5 acres (the upper land area limit for subsistence farmers in Pakistan).

### Study Variables

#### Dependent Variable

Access to agricultural credit was the dependent variable in this study, which was measured as the ratio of the amount of credit received by farmers to their landholding size, as specified in equation (1):

$$Y_{ij} = \frac{\text{proportion of credit recieved by farmers to total credit}}{\text{proportion of landholding of armers to total landholding}} \quad (1)$$

where $Y_{ij}$ denotes access to credit; $i$ denotes farming household, and $j$ denotes either a formal or informal source of credit.

#### Independent Variables

The following independent variables were used in this study: age, education, experience, health status, family size, monthly income, landholding size, distance, proportion of owned land, and proportion of labor employed in the field. The descriptions, measurements, means and standard deviations of the variables are presented in Table 1.

#### Regression Model

Weighted least squares regression was employed to explore the factors influencing access to credit. The model was specified as in equation (2):

$$Y_{ij} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9) \quad (2)$$

The empirical model was specified as in equation (3):

$$Y_{ij} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \varepsilon_i \quad (3)$$

where; $Y_{ij}$ is as defined above, $\beta_i$ denotes the coefficients, and $\varepsilon_i$ denotes the random error term.

Using weighted least squares regression, the independent variables were standardized by the variance of access to credit. He data were analyzed using EViews 7 and Gretl.

### Empirical Results

Prior to estimating the model, multicollinearity was checked for all socio-economic factors where the VIF values were fairly low (less than 3) indicating no multicollinearity; these results are presented along with the regression results in Table 2. In addition, the correlation matrix was generated for all study variables and is shown in Appendix 1. The heteroscedasticity problem associated with cross sectional data was corrected using heteroscedastically corrected weighted least squares regression with robust standard errors. Here the weight was the variance of the dependent variable (access to credit). Normality of residuals is shown in Figure 1 with the actual, predicted, and residual plots of the access to credit. The residuals (error terms) are mean reverting, which implies that the residuals are

**Table 1**
Descriptions, measurements, means, and standard deviations of the variables

| | Variable | Description | Measurement | Mean | Standard Deviation |
|---|---|---|---|---|---|
| | **Dependent variable** | | | | |
| $Y_{ij}$ | Access to agricultural credit | Access to agricultural credit | Specified in equation (1) | 1.23 | 0.94 |
| | **Independent variables** | | | | |
| $x_1$ | Age | Farmers' age | In years | 46.8 | 13.8 |
| $x_2$ | Education | Farmers' education | Year of schooling | 5.6 | 5.5 |
| $x_3$ | Farming experience | Farming experience | In years | 23.9 | 14.6 |
| $x_4$ | Total landholding | Landholding size | In acres | 4.4 | 4.2 |
| $x_5$ | Distance | Farm distance from river | (Dummy; 1 = Farm within 500 m from bank of river, 0 otherwise) | 0.6 | 0.49 |
| $x_6$ | Monthly income | Average monthly income | In PKR[a] | 31,048 | 17,414 |
| $x_7$ | Family size | Total number of family members | Number | 9.1 | 3.3 |
| $x_8$ | Farm labor | Proportion of family members working as labor in the field out of total family members | Ratio | 0.31 | 0.42 |
| $x_9$ | Owned land proportion | Proportion of owned land of total landholding in acres | Ratio | 0.41 | 0.42 |

[a] PKR stands for Pakistani rupee: the national currency of Pakistan
**Source:** Field Survey, 2015

**Table 2**
Empirical results of heteroscedastically corrected weighted least squares regression with robust standard errors

| Variable | Coefficient | $p$ | VIF |
|---|---|---|---|
| $X_1$ Age | −0.006 (0.009) | .480 | 1.93325 |
| $X_2$ Education | 0.083 (0.0274) | .003** | 1.41175 |
| $X_3$ Farming experience | 0.0258 (0.0126) | .042* | 2.23938 |
| $X_4$ Total landholding | 0.216 (0.0333) | .000** | 1.76491 |
| $X_5$ Distance | −0.172 (0.244) | .482 | 1.06996 |
| $X_6$ Monthly income | $-1.31 \times 10^{-6}$ $(2.57 \times 10^{-7})$ | .000** | 1.20099 |
| $X_7$ Family size | 0.059 (0.0245) | .017* | 1.47649 |
| $X_8$ Farm labor | −0.098 (0.073) | .181 | 1.29894 |
| $X_9$ Owned land proportion | 0.946 (0.332) | .005** | 1.59422 |
| Constant | −0.689 (0.427) | 0.109 | |
| Sum squared residuals | 1734.193 | SE of regression | 3.312991 |
| R-squared | 0.548896 | Adjusted R-squared | 0.5232 |
| F (9, 158) | 21.36128 | P-value(F) | 0.000 |
| Log-likelihood | −434.4657 | Akaike criterion | 888.9314 |
| Schwarz criterion | 920.171 | Hannan-Quinn | 901.61 |

Significance levels: * = $p < .05$; ** = $p < .01$
**Source:** Field survey, 2015, Note: Figures in parentheses are standard errors

independently normally distributed with a zero mean and constant variance. The model had a good fit as implied by the coefficient of determination ($R^2 = 0.55$), indicating that 55 percent of the variations in access to credit by farmers was influenced by the independent variables. Indeed, the independent variables significantly influenced farmers' access to credit as indicated by the F-statistic value of 21.36 ($p < .01$). Among the socio-economic determinants, education, farming experience, total landholding, monthly income, family size, and owned land proportion were significant. The education variable significantly influenced farmers' access to credit ($p < .01$). This implies that a one-year increase in the education of farmers increases access to agricultural credit by 0.083 units. Similarly, a one-year increase in farming experience increases access to credit by 0.0258 units ($p < .05$). In addition, total landholding was significant ($p < .01$), implying that an increase in the landholding by one acre increases access to credit by 0.216 units. Moreover, an increase in family size by one member increases farmers' access to credit by 0.059 units ($p < .05$). Furthermore, the proportion of owned land to total land holding significantly increased access to credit ($p < .01$). Lastly, monthly income had a negative significant effect on access to agricultural credit ($p < .01$), although the effect was negligible (Table 2).

## Discussion

The results reveal that farmers' access to credit increased according to higher levels of education due to better technical knowledge, greater understanding of credit markets and facilities, better know-how and farming skills, and familiarity with bureaucratic procedures. It is evident that educated farmers with secondary and higher secondary education had more access to credit than their counterparts with a lower level of education. The results of this study are consistent with the findings of Amjad and Hasnu (2007). They reported that the education levels of household heads enable the household to cope with the
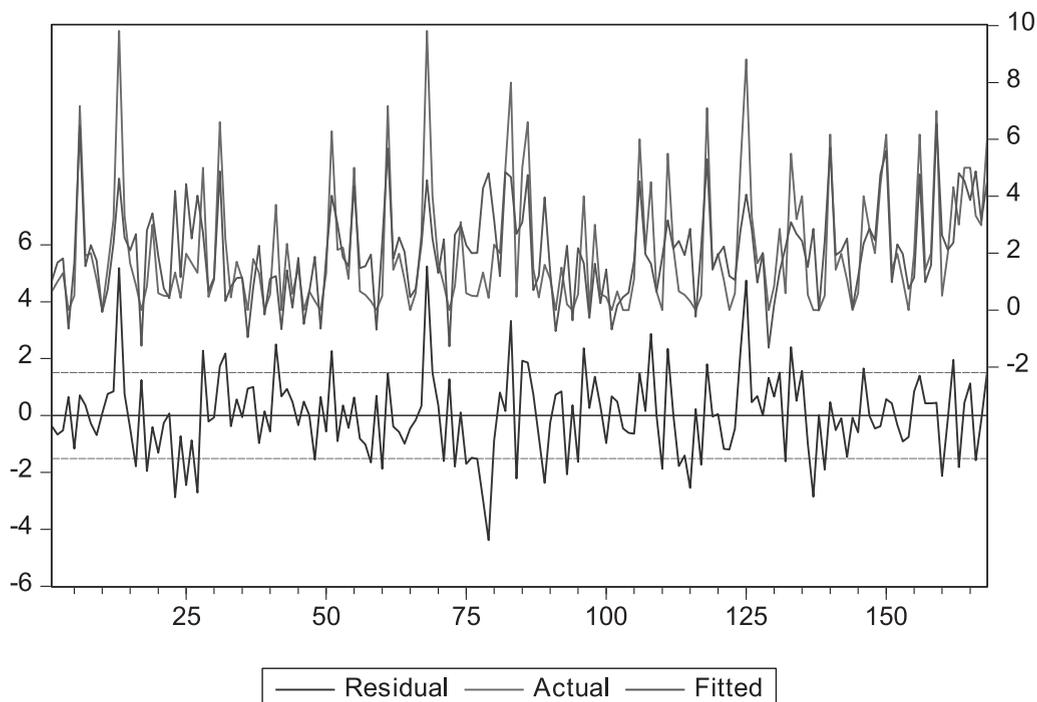


**Figure 1** Actual, predicted, and residual values of access to credit model

procedures required for accessing loans. Thus, education plays a key role in borrowing decisions and reduces the transaction costs of credit. A similar study was conducted by Abedullah et al. (2009). Their results were also in accordance with our findings. They found a significant relationship between access to credit for livestock and education in Pakistan. Moreover, the majority of farmers in the field were illiterate and did not fully understand the procedures to access loans from formal sources. For instance, they were not even able to understand and fill out the loan application forms by themselves.

Our findings reveal that farming experience showed a positive relationship with access to agricultural credit, that is, with an increase in farming experience, farmers' access to credit also increased. In the case of access to credit from informal sources, farmers with more experience had a better relationship with other farmers, money lenders, and traders. It takes time to establish trust among borrowers and lenders. For instance, it was reported in the field that credit for melon cultivation and vegetables is based on one's relations and experience in farming. The farmers who had relatively long term relationships with sources of credit were more likely to access such credit easily compared to relatively new farmers. In the case of access to credit from formal sources, farming experience also plays a key role because the experienced farmers would have already dealt with banks to access loans several times in the past, so they had a better understanding of the terms, conditions and procedure; hence, the cost incurred on the credit would remain low. Our results are in agreement with the findings of Nouman, Siddiqi, Asim, and Hussain (2013), Oboh and Ekpebu (2011), Saleem and Jan (2011), and Sebopetji and Belete (2009) who all reported a positive relationship between access to agricultural credit and farming experience. Similarly, Yehuala (2008) also revealed that farmers with greater farming experience had a much better association with cooperatives and other formal sources of credit like formal banks and non-governmental organizations.

Our findings show a positive significant relationship between landholding size and farmers' access to agricultural credit. Landholding size is seen as a symbol of social status in society. Therefore, farmers with large landholding are more likely to access loans from formal and informal sources. This is somewhat consistent with the assertion that the lack of collateral security deprived a large number of farmers from accessing loans from informal sources (Akram, Hussain, Sial, & Hussian 2008). Land is the most important readily acceptable form of collateral. Lacking collateral deprives a large number of tenants and landless people from participating in formal credit markets. The conditions for loans mentioned in the policies of the Agricultural Development Bank of Pakistan state that submission of a land ownership certificate is mandatory for the approval of loan. Most of the farmers had a low landholding size; hence, they had limited access to credit compared to farmers with greater landholdings. The findings of our study are consistent with the findings of Hussain and Thapa (2012), who reported that small-scale farmers with a landholding size ranging from 2.5 acres to 5.00 acres had above average access to formal sources of credit compared to those with a landholding size below this range. These results corroborate the findings of numerous other studies that found a significant and positive relationship between access to credit and landholding size (Amjad & Hasnu, 2007; George & Ouma, 2012; Kuwornu, Ohene-Ntow, & Asuming-Brempong, 2012; Mpuga, 2004; Nouman et al., 2013; Owuor & Shem, 2012). Contrary to our findings, Dzadze, Osei, Aidoo, and Nurah (2012) reported that there was no link between landholding and access to credit.

Our findings reveal that monthly income and access to agricultural credit are negatively associated with each other. As the level of income increased, access to credit decreased. This finding implies that the farmers with higher income had the ability to self-finance their farming operations using their own resources; thus, they were not in need of agricultural credit. The results of our study are in agreement with the findings of Nouman et al. (2013), who reported a negative relationship between income levels and access to credit. Nevertheless, our finding contradicts Akram et al. (2008) who revealed that the relatively higher wage respondents had higher access to credit than relatively lower wage respondents. In addition, Amjad and Hasnu (2007) reported that there was no significant relationship between income and access to agricultural credit.

The empirical results show that family size had a positive relationship with access to credit. As family size increased, dependence on the farm also increased and farmers required credit for agricultural production to provide food and other needs for their family. On the other hand, the farmers with a small family could meet their financial requirements within their agricultural income. Another reason for the positive association is that families with more members can diversify in their agricultural income, generating income with livestock, fruits, vegetables, and other agricultural activities which would otherwise require high amounts of credit. It is also likely that large families would have more contacts with traders and merchants who could help in accessing loans. Our findings are consistent with previous studies that revealed that access to credit was significantly determined by family size (Oboh & Ekpebu, 2011; Saleem & Jan, 2011; Sebopetji & Belete, 2009).

The results show that the proportion of owned land positively influenced farmers' access to credit. As the proportion of owned land increased, farmers were more likely to cultivate large areas of crops requiring seed, fertilizer, and other agricultural inputs; hence they would require higher levels of credit. Similarly, as the proportion of owned land increases, informal lenders would be more willing to grant loans to these farmers based on the understanding that these farmers would repay the loans on schedule. The issue of loan repayment was also highlighted by Saleem, Jan, and Khattak (2010). With formal sources, the main collateral demanded was the land ownership certificate which is called *intiqaal*[a] in Urdu. The farmer is required to submit the *Ferd* and *Jumabandi*[b]. These documents can be issued from the District Revenue Office and the original owner is required. Thus, tenants, who do not own land, cannot access

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[a] Official certificate that shows the transfer of ownership of land.
[b] Ownership document with full information of owner and land.

loans from these formal sources. In some cases, the banks request gold as collateral for approval of the loan. Most farmers do not have gold, silver, property, or other assests to use as collateral, so therefore have limited access to formal credit. Land ownership is also a very important factor for informal credit and most traders, merchants, and middlemen provide loans only to farmers who own land. In the field survey, farmers reported that informal lending sources required a personal guarantee by large-scale farmers or village heads for approval of a loan. The results of our study are in accordance with the findings of previous studies that reported that land ownership status significantly influenced farmers' access to agricultural credit (Ahmad, 2011; Nguyen & Le, 2015; Nouman et al., 2013; Okunade, 2007).

policy to address the issues of farmers living in these areas. Moreover, the credit policy in particular and agricultural policy in general can be amended to protect the interest of tenant farmers who lack suitable forms of collateral.

## Conflict of Interest

Authors declare no conflict of interest.

## Appendix 1

|    | Y | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 |
|----|---|----|----|----|----|----|----|----|----|----|
| Y  | 1 | | | | | | | | | |
| X1 | 0.326 (0.000) | 1 | | | | | | | | |
| X2 | 0.473 (0.000) | 0.177 (0.022) | 1 | | | | | | | |
| X3 | 0.427 (0.000) | 0.660 (0.000) | 0.221 (0.004) | 1 | | | | | | |
| X4 | 0.634 (0.000) | 0.424 (0.000) | 0.461 (0.000) | 0.413 (0.000) | 1 | | | | | |
| X5 | 0.028 (0.718) | 0.164 (0.033) | 0.003 (0.973) | 0.087 (0.260) | 0.163 (0.035) | 1 | | | | |
| X6 | 0.048 (0.538) | 0.153 (0.048) | 0.218 (0.005) | 0.204 (0.008) | 0.294 (0.000) | 0.084 (0.281) | 1 | | | |
| X7 | 0.358 (0.000) | 0.169 (0.028) | 0.361 (0.000) | 0.224 (0.003) | 0.398 (0.000) | 0.120 (0.120) | 0.350 (0.000) | 1 | | |
| X8 | 0.114 (0.143) | 0.051 (0.511) | 0.212 (0.006) | 0.118 (0.128) | 0.266 (0.000) | 0.143 (0.064) | 0.247 (0.001) | 0.413 (0.000) | 1 | |
| X9 | 0.492 (0.000) | 0.316 (0.000) | 0.353 (0.000) | 0.515 (0.000) | 0.414 (0.000) | 0.001 (0.993) | 0.131 (0.090) | 0.201 (0.009) | −0.006 (0.943) | 1 |

Note: Figures in parenthesis are *p*-values.

## Conclusion and Recommendations

Agriculture is the backbone of Pakistan's economy. It contributed 20.9 percent of the Gross Domestic Product (GDP) in 2014−15 and was the source of livelihood for 43.5 percent of the rural population (Pakistan Economic Survey, 2015). Indeed, agricultural output was the main source of economic growth in Pakistan and has grown at an annual average rate of 4.4 percent. Access to agricultural credit is a challenge for farmers in Pakistan. This paper examines the factors influencing farmers' access to agricultural credit in flood-prone areas in Pakistan. Multistage sampling was used to collect data using a structured questionnaire from 168 subsistence landholders in Khyber Pakhtunkhwa Mardan District.

The findings of this study reveal that socio-economic factors play a key role in farmers' access to agricultural credit in flood-hit areas in Pakistan. Experience, education, landholding size, family size, and proportion of owned land positively influenced farmers' access to credit, while monthly income had a negative association. Most of farmers were illiterate and lacked collateral security to access credit from formal sources and sometimes from informal sources as well. In these flood-prone disasters areas, farmers need more credit to finance their agricultural activities. Hence, there is a need for credit

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