Analyzing the determinants of agricultural credit accessibility for farmers in flood-prone regions

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Abstract  Agricultural finance is essential for farmers in flood-prone regions because it offers them access to the money they need to keep their crops running. Crop losses, property damage, and other unforeseen expenditures are quite likely for farmers in flood-prone locations. The provision of agricultural loans is crucial in allowing farmers to minimise these risks and ensure the continuation of their farming operations. The variables affecting farmer’s access to agricultural loans in a Pakistani region in danger of flooding are examined in this research. A structured questionnaire was utilized to gather information from one hundred and sixty-eight subsistence landowners in Khyber Pakhtunkhwa, Pakistan, using a multistage sampling method. According to empirical findings using a subjective slightest squares regression model with vigorous typical errors that accounted for heteroscedasticity, monthly income, family size, education, farming experience, total landholding, and the percentage of owned land were all important determinants of a farmer's ability to acquire loans. The results of this research show that socioeconomic determinants are very important for farmers’ access to agricultural loans in Pakistani flood-affected regions. As a consequence, a credit policy is necessary to tackle the issues encountered by farmers who live in dangerous areas. Additionally, the present financing strategy may be altered to defend the rights of occupant cultivators who require security.

Keywords: agricultural credit, agricultural credit accessibility, farmers, flood-prone regions

1. Introduction

Farmers in flood-prone areas depend on the availability of agricultural financing because it gives them access to the capital they need to continue operating their farms. Farmers in flood-prone areas run a high risk of crop losses, property damage, and other unanticipated costs. A vital factor in assisting farmers to reduce these risks and guarantee the continuance of their farming activities is the availability of agricultural loans (Arifullah 2020). Farmers in flood-prone areas must have access to agricultural loans to maintain and expand their agricultural operations. Floods have the potential to seriously harm infrastructure and crops, which may reduce farmers’ revenue. Therefore, having access to financing may aid farmers in both recovering from flood-related losses and making investments in defenses against further harm. Despite the need for financing for farmers in flood-prone areas, they often have trouble obtaining it because of things like a lack of collateral, a bad credit history, and steady revenue sources (Akter et al 2023). Along with contemporary technology, agricultural financing is a crucial factor in boosting farm output. In addition to large-scale farmers seeking agricultural financing to boost farm revenue, small- and medium-sized farmers also do so to ensure their existence. Compared to informal sources, official sources of credit are now more significant in the agricultural industry (Ahmad and Afzal, M.2022). Farmers have little recourse to formal financing despite the institutional sources of credit’s growing relevance. Since the country's independence, agriculture has consistently been the most important contributor to the economy. Both official and informal lending practices are represented in Pakistan's rural credit market, each of which plays an important part in the country’s rural economy (Qazbash et al 2021).

Microfinance is especially significant for investments in rural production, which have traditionally been dominated by non-poor borrowers due to the limited availability of microcredit to those who are economically disadvantaged. It is of the utmost significance for farmers to get financial assistance for their social requirements, to buy agricultural supplies, and to achieve consistent advancements in their output levels (Rizwan et al 2019). While acknowledging the significance of the agricultural segment, has, over many years, developed agricultural credit policies to fund farmers’ output with the goals of boosting agricultural productivity and ensuring that there would always be food available. Credit for agriculture has the potential to improve the management effectiveness of farmers, hence fostering more effective resource allocation and increased profitability. Farmers need to have timely access to credit as well as the availability of credit to purchase the...
appropriate inputs and equipment necessary to carry out farming activities. When compared to informal sources of credit, the process of gaining access to official sources of finance may be much more difficult for farmers. Small-scale farmers lack the assets and collateral that large-scale farmers have, hence the latter have less access to formal finance (Ao et al 2022). Most small-scale farmers have limited access to both official and informal sources of credit, including friends, family, and landlords, in addition to restricted access to formal sources of credit. Contracts in informal loan markets tend to be more individualized. Everyone who is pre-qualified to disburse the attention and fulfill the security criteria is likely to get credit from all lenders and various borrowers, according to personal contacts. The main issue facing farmers is restricted access to finance or financial limitations, which prevent the adoption of more advanced and efficient technology in the agricultural industry. This paucity of resources restricts both the potential for higher output and the ability for efficient consumption (Fahad et al 2022). Following harvest, farmers need money for the next growing season to offset financial deficits and unpaid bills for their most recent crop. Additionally, high-yielding seeds, pricey fertilizers, and plant protection techniques form the foundation of contemporary agriculture. The majority of their supplies are bought in cash or on credit-in-kind terms from dealers, which places farm families in greater reliance on the credit markets. Farmers that have quick and simple access to loans may grow and diversify their agricultural operations by making new investments or using cutting-edge technology. The biggest barrier preventing Pakistani farmers from taking advantage of loan programs is a lack of collateral. Small-scale farmers find it difficult to get formal credit owing to problems with collateral; as a result, they turn to informal sources because of their prompt delivery, and lack of requirements. Due to a lack of collateral security, the mainstream's tiny range of farmers is unable to sponge money from bank organizations. Minor-scale farmers often only qualify for minor loans to buy seeds, fertilizer, and pesticides and are unable to be appropriate for loans to buy tractors, pipe wells, and agricultural equipment because they lack enough collateral (Ahmad and Afzal 2021).

Saqib et al 2018 investigated the elements affecting farmers’ entrance to farming loan in a Pakistani region in danger of flooding catastrophe. Prearranged questionnaire were utilized to gather information from one hundred and sixty-eight subsistence landowners, using a multistage sampling method. According to the empirical findings of the biased slightest squares deterioration model with vigorous typical errors and heteroscedasticity correction, characteristics such as whole landholding, monthly profits, relations dimension, education, farming experience, and the percentage of own ground be important determinants of farmer’s entrance to credit. The results show that socio-profitable determinants are very important for farmers’ access to agricultural loans in Pakistani flood-affected regions. Both secondary and primary data were analyzed by Saqib et al (2018); resultant statistics be gathered from the State Bank of Pakistan’s and Pakistan Economic Survey's yearly reports. The results also showed that inferior and intermediate continuation farmers had the greatest levels of acknowledgment shortage of cash for agricultural ventures. Age, family size, education, experience, the total amount of land a farmer had, & the percentage of his or her land all had an impact on how adequate an agricultural loan was, according to the Tobit regression findings. Fahad et al (2018) investigated the variables affecting Pakistani farmers' decision to use crop insurance as a risk management tool. A systematic questionnaire was used to gather primary information from 400 farm families in four flood-prone areas of the northwest. The results of this research are anticipated to direct policymakers, insurance providers, and the government in establishing crop insurance. For the benefit of small farmers, the government should also fund crop insurance policies, and crop insurance knowledge has to be raised. Owusu and Yiridomoh (2021) examined the variables that underlie the usage of these tactics as well as the ex-post-targeted responses that women cultivators make in the face of adverse weather and climatic conditions. The study created a multivariate probit model to investigate the problem using sub-sectional data from a model of women farmers in Ghana's Upper West Region who had been exposed to weather extremes. Zulfiqar et al (2021) investigated the factors that influence access to agricultural loans. The probit model was utilized in this research to examine the data. The results revealed that although the farmer's age, location, and off-farm proceeds had an unconstructive and negligible result on the entrance to farming financing, the degree of mechanization had a positive and substantial influence. The results of this research provide a strategic direction for streamlining national agriculture finance strategy. Linh et al (2019) concentrated on the characteristics of rural credit markets, the elements affecting cultivator entrance to markets, and the socio-economic impacts of loan availability in Vietnam. The findings of this investigation point to the segmentation, government interference, and participation limits that characterize Vietnam's markets. The significant factors that affect credit convenience are shown by other findings. Chandio et al (2020) investigated how smallholder farmers' socioeconomic traits affect loan demand in Sindh, Pakistan. The findings showed that the desire for formal credit was positively and substantially impacted by formal education, agricultural experience, and the size of landholdings, road access, and extension connections. Akdemir et al (2021) looked at the determinants affecting farmers’ access to agricultural loans in the region of Adana, Turkey. A sample of 101 producers who had received training in basic random was subjected to questionnaire-based surveys. In this study, the factors influencing farmers’ access to agricultural loans in a Pakistani area at risk of floods.

2. Material and Methods

2.1. Study Area and Sampling
An approach called multi-stage sampling was utilised to get the data. Khyber Pakhtunkhwa was chosen on purpose first. For a second sample, a vulnerable rural population was chosen. In Khyber Pakhtunkhwa Mardan District, 970 agricultural families were found to be particularly susceptible. One hundred and sixty-eight farm households were chosen as the model dimension using Yamane’s technique with a 7% margin of error. Third, information was collected from 168 subsistence farm families with landholdings of up to 12.5 acres using a simple random selection method.

2.2. Study Variables

2.1.1. Dependent Variable

The relation of the quantity of recognition obtained by farmers to the size of their landholdings, as described in equation (1), served as the study’s dependent variable, which was access to agricultural finance.

\[ Z_{ji} = \frac{\text{proportion of credit received by farmers to total credit}}{\text{proportion of landholding of farmers to total landholding}} \] (1)

Where \( Z_{ji} \) defined entrance to acknowledgment; i defined agricultural household, and j defined either an official.

Independent Variables

In this research, the following were used: experience, and monthly income, education, age, size of the landholding, distance, health status, family size, percentage of owned land, and percentage of field laborers. The variables’ definitions, measurements, means, and standard deviations are listed in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Measurement</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Y_{ij} )</td>
<td>entrance to farming credit availability</td>
<td>Specified in equation (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( v_1 )</td>
<td>Total landholding</td>
<td>In acres</td>
<td>46.8</td>
<td>12.5</td>
</tr>
<tr>
<td>( v_2 )</td>
<td>Family size</td>
<td>Number</td>
<td>2.3</td>
<td>12.1</td>
</tr>
<tr>
<td>( v_3 )</td>
<td>Owned land proportion</td>
<td>amount of own ground of the whole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( v_4 )</td>
<td>Age</td>
<td>Ratio</td>
<td>0.41</td>
<td>0.52</td>
</tr>
<tr>
<td>( v_5 )</td>
<td>Distance</td>
<td>500 m</td>
<td>0.31</td>
<td>0.42</td>
</tr>
<tr>
<td>( v_6 )</td>
<td>Monthly income</td>
<td>Farmers' age</td>
<td>In years</td>
<td>45.7</td>
</tr>
<tr>
<td>( v_7 )</td>
<td>Education</td>
<td>Farm distance from the river</td>
<td>In PKRa</td>
<td>0.55</td>
</tr>
<tr>
<td>( v_8 )</td>
<td>Farm labor</td>
<td>Average monthly income</td>
<td>Year of education</td>
<td>0.6</td>
</tr>
<tr>
<td>( v_9 )</td>
<td>Farming Experience</td>
<td>agriculture education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2.2. Regression Model

Regression using weighted least squares was used to investigate the variables affecting loan availability. The model was described in equation (2) as follows:

\[ Z_{ji} = e(v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9) \] (2)

The empirical model was described by equation (3) as follows:

\[ Z_{ji} = \beta_0 + \beta_1 v_1 + \beta_2 v_2 + \beta_3 v_3 + \beta_4 v_4 + \beta_5 v_5 + \beta_6 v_6 + \beta_7 v_7 + \beta_8 v_8 + \beta_9 v_9 + \epsilon_j \] (3)

Where \( Z_{ji} \) as previously described, i stand for the coefficients, and \( \epsilon_j \) stands for the random error term. The independent variable was normalized through the disagreement of credit entrance using weighted least squares regression.

3. Empirical Results
Multicollinearity was examined before model estimation for all socioeconomic components in which the VIF values were relatively low, suggesting no multicollinearity. These findings are shown in Table 2 alongside the regression results.

Table 2 Empirical findings of robust weighted least squares regression with heteroscedasticity correction.

<table>
<thead>
<tr>
<th>changable</th>
<th>Coefficient</th>
<th>p</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$ Age</td>
<td>$-0.006 (0.009)$</td>
<td>.480</td>
<td>1.93325</td>
</tr>
<tr>
<td>$v_1$ Family size</td>
<td>0.059 (0.0245)</td>
<td>.017*</td>
<td>1.47649</td>
</tr>
<tr>
<td>$v_2$ Farming experience</td>
<td>0.0258 (0.0126)</td>
<td>.042*</td>
<td>2.23938</td>
</tr>
<tr>
<td>$v_3$ Farm labor</td>
<td>$-0.098 (0.073)$</td>
<td>.181</td>
<td>2.1517</td>
</tr>
<tr>
<td>$v_4$ Education</td>
<td>0.083 (0.0274)</td>
<td>.003**</td>
<td>1.41175</td>
</tr>
<tr>
<td>$v_5$ Total landholding</td>
<td>0.216 (0.0333)</td>
<td>.000**</td>
<td>1.76491</td>
</tr>
<tr>
<td>$v_6$ Monthly income</td>
<td>$-1.31 \times 10^{-6}$</td>
<td>.000*</td>
<td>1.71542</td>
</tr>
<tr>
<td>$v_7$ Farm labor</td>
<td>$-0.098 (0.073)$</td>
<td>.181</td>
<td>1.29654</td>
</tr>
<tr>
<td>$v_8$ Family size</td>
<td>0.059 (0.0245)</td>
<td>.017*</td>
<td>1.47745</td>
</tr>
<tr>
<td>Constant</td>
<td>$-0.751 (0.457)$</td>
<td>0.110</td>
<td></td>
</tr>
<tr>
<td>Sum square residuals</td>
<td>1414.210</td>
<td>SE of regression 3.312991</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.548754</td>
<td>Adjusted R-squared 0.5237</td>
<td></td>
</tr>
</tbody>
</table>

Additionally, the correlation matrix for each research variable was created and is shown in Table 2. Heteroscedastically corrected weighted least squares deterioration through resilient typical errors was used to address the heteroscedasticity issue using cross-sectional data. Here, the dependent variable (access to credit) variance served as the weight. Figures 1, 2, and 3 displays the expected, actual, & residual plot of the entrance to tribute to illustrate the normality of outstanding.

![Figure 1 Actual values of access to credit model.](https://www.malque.pub/ojs/index.php/msj)

![Figure 2 Predicted values of access to credit model.](https://www.malque.pub/ojs/index.php/msj)
Mean reverting indicates that the residuals (error terms) are independently normally distributed with a zero mean and a constant variance. The coefficient of determination ($R^2 = 0.55$) indicated that the model had a strong fit and that the independent variables were responsible for 55% of the differences in farmers’ access to loans. The $F$-statistic importance of 21.36 ($p$ less than .01) shows that the independent factors did, in fact, substantially impact farmers’ access to loans. Farmers’ ability to acquire loans was strongly impacted by the education variable ($p < .01$). According to this, farmers’ ability to acquire agricultural financing rises by 0.083 units for every year that their education increases. Similar to that, every extra year of agricultural expertise improves credit availability by 0.025 8 units ($p$ less than .05). Additionally, the overall landholding was significant ($p$ less than .01), which suggests that a one-acre increase in land holdings boosts entrance to credits. Additionally, adding one member to a family boosts admission to recognition for farmers ($p$ less than .05). Furthermore, access to credit was considerably improved ($p$ less than .01) by the ratio of owned land to total land ownership. Lastly, while the impact was minimal ($p$ less than .01), monthly revenue had a pessimistic significant impact on access to farming financing (Table 2).

### 4. Discussion

As a consequence of improved technical knowledge, a better awareness of recognition markets and services, improved know-how and agricultural abilities, and awareness of practical processes, the findings show that farmers’ access to credit rose in correlation with higher levels of education. Farmers with higher and secondary levels of education have access to finance more often than their less-educated competitors. The study’s findings are supported by the study’s outcomes. They said that the family can manage the processes needed to get loans due to the household leaders’ educational backgrounds. Education thus has a significant impact on borrowing choices and lowers the transaction costs associated with
loans. They discovered a strong link between schooling and livestock credit. Furthermore, the majority of a cultivator in the field was illiterate & were unclear about the steps needed to get loans from official sources. For example, they couldn't even comprehend and complete the loan application paperwork on their own. According to our research, farmers’ access to credit grew as their level of expertise increased, indicating a favorable association between farming experience and agricultural finance. Farmers with greater expertise had stronger relationships with other farmers, money lenders, and dealers, which improved their access to finance from informal sources. Building trust between borrowers and lenders takes time. For example, it has been said in the field that one’s connections and farming expertise play a role in receiving credit for the growing of vegetables and melons.

Compared to relatively young farmers, farmers who established ties with credit providers for a longer period were more likely to have easy access to such finance. The cost of the credit would stay cheap since seasoned cultivators would have interacted with a bank to obtain loans multiple times in the precedent. In the event of obtaining official credit, prior farming experience is also crucial. Our findings are consistent with those of other researchers, who found a link between previous farming experience and access to agricultural loans. Similarly to this, farmers with more official sources of finance had far better associations with cooperatives. Our results indicate a considerable positive correlation between the extent of landholdings and farmer’s loans. The size of the landholding is seen as a sign of social standing in society. Lack of collateral prevents many renters and landless people from accessing the official loan markets. According to the terms for loans outlined in the Agricultural Development Bank of Pakistan’s rules, submitting a land ownership certificate is required for the loan to be approved. Compared to farmers with larger landholdings, the majority of farmers had restricted access to financing because of their modest landholding size. These results support the conclusions of several earlier types of research on the advantageous link between loan availability and the size of landholdings. Land ownership and loan availability were unrelated. Our data show a negative correlation between monthly income and loan availability for agricultural purposes. Access to credit declined as income levels. Our outcomes run counter to this, showing that respondents with comparatively higher wages respondents with relatively lower salaries.

Additionally, there was no discernible connection between income and agricultural finance availability. The empirical findings demonstrate a favorable correlation between family size and loan availability. Farmers needed credit for agricultural productivity as their families’ requirements for food and other necessities rose along with the growth of their families and their reliance on the farm. In contrast, farmers who had small families could cover their expenses from their agricultural revenue. The ability of larger families to diversify their agricultural income by selling cattle, and other agricultural products that would otherwise need large amounts of credit is another factor contributing to the favorable correlation. Large families are also likely to have more connections with traders and merchants who might facilitate obtaining loans. Our results are in line with earlier research that showed that family size has a substantial impact on loan availability. The findings indicate that farmers’ access to finance was favorably impacted by the percentage of owned land. The land ownership certificate, or intiqaala in Urdu, was the primary type of collateral required. The original owner is necessary for these papers, which may be obtained from the District Revenue Office. As a result, renters who do not own land are unable to get loans from this official source. In rare instances, banks demand gold as security before approving a loan. Since the majority of farmers lack gold, silver, real estate, or other assets that may be used as security. Property ownership is another crucial component of informal credit, and the majority of traders, merchants, and middlemen only lend to farmers who have their property. The findings of our research are consistent with those of other studies, which found that farmers’ access to agricultural financing was highly impacted by their land ownership status. Additionally, changes may be made to the acknowledgment plan in particular and the farming procedure generally to safeguard the interests of occupant cultivators who require an adequate form of security.

5. Conclusion

The foundation of Pakistan’s economy is agriculture. 43.5 percent of the rural population relied on it as a source of income, and it generated 20.9 percent of the GDP in 2014-15. In Pakistan, agricultural production has been the major driver of economic development, increasing at a standard yearly rate of 4.4 %. Farmers in Pakistan struggle to get access to agricultural loans. In Pakistan’s flood-prone regions, this study investigates the variables disturbing cultivator entrance to agricultural loans. Data from one hundred and sixty-eight subsistence landowners in the Khyber Pakhtunkhwa Mardan District were gathered using multistage sampling and a structured questionnaire. The results of this research show that socio-economic determinants are very important for farmers’ access to agricultural loans in Pakistani flood-affected regions. Farmer’s access to credit was favorably impacted by experience, education, amount of landholdings, number of families, and percentage of owned land, however, monthly income showed a negative correlation. The majority of farmers lacked the necessary collateral to get loan from legal sources, as well as sometimes from informal ones, and were illiterate. Farmers in these disaster-prone flood zones need more loans to support their agricultural pursuits. Credit is thus necessary.

Ethical considerations

Not applicable.
Declaration of interest
The authors declare no conflicts of interest.

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