

ACCESS AND DETERMINANTS OF FORMAL AGRICULTURE CREDIT IN UTTAR PRADESH, INDIA

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Abstract

The study has attempted to examine the determinants of formal agricultural credit in rural Uttar Pradesh using National Sample Survey Organisation data from the 70th round (2012–13). The Binary Logistic Regression (BLR) model is used to examine the determinants of formal credit in Uttar Pradesh. Socio-economic and demographic characteristics such as age, gender, social group, and family size are grouped into social, economic, and extension services. The findings from this study revealed that indebtedness exists and that almost 45 per cent of farmers have taken credit from informal credit agencies. Further, there is significant heterogeneity in terms of socio-economic and demographic features among farmers who have taken credit from formal and informal credit agencies. The BLR results show that gender, literacy rate, operated area, bank account, livestock, and Kisan Credit Card are key social and economic determinants of formal credit in rural Uttar Pradesh. The calculated odds ratio shows a 2.008 times higher probability of literate male farmers taking a loan from formal credit than others. Likewise, there is a 3.10 times higher probability of taking formal credit if farmers follow technical advice provided by agricultural universities, NGOs, and scientists through open-source platforms. Hence, the following policies are suggested to deal with indebtedness: (i) Policymakers can choose to intervene in the rural credit lending system by liberalising policy to more accurately reflect the characteristics of potential borrowers and in light of their current borrowing strategies, (ii) the BLR results depict a positive relationship with land size, and agricultural households with larger land seem to get more benefits. Therefore, the government should focus on marginal and small farmers, who have larger shares in the total operational landholdings, (iii) safety net programmes like the Public Distribution System (ration cards), in the presence of formal credit, may induce farmers and their families to increase their per capita monthly consumption expenditures, and (vi) State intervention is also required in terms of increasing the size of livestock, as this can be an area where Uttar Pradesh can lead the other States as this will help in diversification in the field of agriculture .

Keywords: Indebtedness, NSSO, Rural Credit, Logistic Regression Model, Uttar Pradesh, Regional Credit Disparities .

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Introduction

Agriculture is a key source of livelihood for the rural Indian population, as it plays a critical role in poverty reduction, employment generation, the welfare of the rural population, and hunger alleviation (Singh & Nayak, 2020). Sustainable agriculture contributes to a country's economic development and ensures livelihood security (Singh 2020a). However, it is highly vulnerable in terms of its relative dependence on monsoon rainfall. In recent years, India has received frequent droughts and floods, making agriculture a highly vulnerable occupation (Singh, 2020b; Jatav et al., 2021a; Jatav et al., 2022). The widespread adoption of Green Revolution technology in agriculture since the 1970s has increased food production substantially. For example, rice production increased from 42 million tonnes in 1971–72 to over 166 million tonnes in 2018–19. Likewise, wheat production rose from 24 million tonnes to over 102 million tonnes during the same period (Gol, 2020). However, there was a corresponding increase in the use of agricultural inputs such as fertiliser and irrigation. The national consumption of fertilisers rose from two million tonnes in 1971–72 to over 25 million tonnes in 2012–13. Further, the area under irrigation rose by 117 per cent between 1971–72 and 2014–15. In other words, input costs have also increased multiple times, while there has been a steady decline in earnings from cultivation (Gol, 2020). The gap thus created is an important driver of rural indebtedness. The All India Debt Investment Survey Data of 2002–03 and 2012–13 shows that the average outstanding amount for rural households in 2012 increased from about Rs.8800 in 1981 to more than Rs.32500 in 2013, a 270 per cent increase. Since 1991, the average loan amount outstanding for a rural household has more than doubled; from 1971–2013, the mean debt-to-asset ratio of rural households doubled.

There are several reasons for indebtedness. First, it is observed that farmers have realised that crop diversification is the only solution to increase farm income. Therefore, they are diversifying their cropping pattern from traditional crops (i.e., rice

and wheat) to commercial crops (i.e., horticultural crops). However, traditional crops such as rice and wheat are being supported by the government in terms of subsidies, institutional credits, and remunerative price policies, while such supports are not available for commercial crops (Path, 2008). Further, commercial crops also require 2-3 years to get output and need heavy investment, leading to an increase in the cost of cultivation. Second, the cost of cultivation is increasing year-by-year, but the price of agricultural commodities is increasing relatively less (Rawat et al., 2010). Third, there is debate on the productive and non-productive use of agricultural credit. Farmers are taking loans for mainly three purposes: agriculture inputs (i.e., fertilisers, seeds, irrigation, and pesticides), health, and social consumption (Singh and Toor, 2005). Productive use, i.e., the purchase of agricultural inputs, leads to an increase in agricultural production and reduces the intensity of indebtedness.

On the contrary, non-productive uses, i.e., spending on health and social consumption, lead to an increase in indebtedness. The All India Rural Financial Inclusion Survey (AIRFIS) conducted by NABARD (2016–17) reported that consumptive purposes were the key driving forces behind a majority of loans. Domestic requirements were found to be the most pressing need for about one-third of the loans sought. Meeting financial requirements for housing purposes (21 per cent) and medical expenses (17 per cent) were other common purposes for various loans taken by non-agricultural households. Lastly, a faulty credit policy was also responsible for indebtedness among marginal and small farmers. AIRFIS (2016–17) reported that a sizeable 40 per cent of total loans were reported to have been taken from non-institutional sources like relatives and friends, local landlords, and money lenders. Further, land size-wise data also reported that the incidence of indebtedness ranges from 49-60 per cent among farmers belonging to marginal and small landholdings. Higher transaction costs, illiteracy, and small land sizes are major credit constraints for farmers belonging to marginal and small land groups to take loans from institutional sources.

In totality, marginal and small farmers (>80 per cent) use agricultural credit for their survival, whereas large-scale farmers use it to improve their income streams (Singh, 2018a; Singh, 2019). Credit constraints and insufficient income usually hinder these farmers because they cannot provide collateral for bank credit. When farmers are unable to get credit at lower interest rates from institutional sources, they ultimately move towards non-institutional sources and get credit at a higher interest rate. It is worth noting that repayment of credit is a big task if the credit is inherited.

Review of Literature

The most significant studies on the impact of institutional agricultural credit in India include Singh and Toor (2005), Patil (2008), Rawat et al. (2010), Sajjad and Chauhan (2012), Subbarao (2012), Narayanan (2016), and Kumar et al. (2017). Patil (2008) reported that declining profitability in agriculture, rising commercialisation with a weak support system, declining public investments, ineffective and inadequate risk mitigation arrangements, the absence of technology reducing cost and increasing productivity, input prices, insensitive rural institutions, inferior quality and poor coverage by formal credit institutions, and a lack of stringent action in the case of poor input quality and periodic natural calamities are important factors for indebtedness in agriculture. Further, Rawat et al. (2010) carried out a study using a field survey and secondary data collected from 1970–1971 to 2006–2007. The findings from the study revealed that agrarian crises were a major reason for suicides. In general, farmer suicides were reported frequently in those States where credits were concentrated more on the cultivation of commercial crops.

Further, most of the farmers who committed suicide had land holdings below one acre, and the average loan liability was Rs.84, 000. Besides, the farmers have private loans from friends and relatives, and their inability to repay the loans was considered to be the reason for the suicides. Likewise, Sajjad and Chauhan (2012) pointed out

that the major factors that led to indebtedness were instability of foodgrain yields, level of yield and net returns, and cost of cultivation. A high incidence of indebtedness characterises the States with a high level of agricultural development. Most of the indebted farmers belong to the small and marginal categories, but in the States where the degree of commercialisation is high, the incidence of indebtedness is high among the semi-medium and medium farmers. Similarly, Singh and Toor (2005) showed that higher indebtedness among farmers was not only due to the higher cost of cultivation but also to higher expenditure on unproductive purposes due to the diversion of loans. A reduction in profit margin due to multi-layer intermediaries was also considered a factor leading to the entrapment of households in the vicious cycle of indebtedness.

Despite the significance and relevance of the above-mentioned issues, the implications of institutional credit on farmers' welfare received less attention in the rural economy of India and Uttar Pradesh. Further, the efficacy and effectiveness of institutional credit in agriculture are often questioned. Moreover, none of these studies (i.e., Singh & Toor, 2005; Patil, 2008; Rawat et al., 2010; Sajjad & Chauhan, 2012; Subbarao, 2012; Narayanan, 2016; Kumar et al., 2017) are State-specific and thus did not capture the dynamics and implications of rural or agricultural credit in a State like Uttar Pradesh. In this context, this paper examines the status and changes in rural credit patterns, and the factors that influence and motivate farmers to take credit from formal credit agencies. Data from a nationally representative household survey carried out by the National Sample Survey Office (NSSO) during 2012–13 was used to test the hypothesis.

Methods and Materials

Data Sources: The study is based on unit-level data from the Debt and Investment Survey carried out by the National Sample Survey Office during 2012-13 (70th round). The Debt and Investment Survey is generally carried out once every 10

years, and it provides information on different aspects of rural finance. The survey was undertaken across India, and a sufficient number of samples (32,500) were collected from all States. The survey also provides information on household characteristics, such as ownership of assets, social and demographic variables, and households' associations with networks such as self-help groups.

Further, this dataset allows analysis from the borrowers' side, making the analysis more authentic. The determinants of agricultural households' access to institutional credit and its impact on farm households' economic welfare have been analysed using the 70th NSSO round of data on the Situation Assessment of Agricultural Households. The survey collects comprehensive information on the socio-economic welfare of agricultural households, including their borrowing, lending, and indebtedness, farming practises and preferences, resource availability of their farm and non-farm businesses, awareness of technological

development, and their access to modern technology in the field of agriculture.

In the 70th round of the NSSO, a total of 32,500 samples were collected from rural and urban areas, while 4,866 samples were collected from Uttar Pradesh. As our study is limited to Uttar Pradesh, the sample size for our study is 4,866. However, weight is used as provided by the NSSO to make the results more robust.

Estimation Method: The present study has adopted Binary Logistic Regression Model because its' underlying assumptions are less restrictive than those of other models (Singh, 2020a), and it is free from the problems with the use of ordinary least square (Gujarti, 2004). The agricultural credit is the dichotomous dependent variable (Y) of this model having a binary value of one (1) if farmers have taken loan from institutional sources, and zero (0) if otherwise. The model also assumes that credit from formal source is a log-linear function of the exogenous variables X_1, X_2 of term.

$$L_i = \ln \frac{P_i}{1-P_i} = Z_i = B_0 + B_1X_1 + B_2X_2 + \dots \dots \dots B_nX_n + U_i \quad (1)$$

That is L_i is the log of the odds ratio, which is not only linear in X_i but also linear in the

parameters. Where, L_i = logit model, P_i is the probability of using formal credit. Denote as:

$$P = \frac{1}{1+e^{-z}} = \frac{e^z}{1+e^z} \quad (2)$$

Where,

$$Z = B_0 + B_1X_1 + B_2X_2 + B_nX_n + U_i \quad (3)$$

Therefore, the probability of not taking formal credit is

$$1 - P = \frac{1}{1+e^z} = \frac{1}{1+e^z} \quad (4)$$

Now, $P/(1-P)$ is simply the odds ratio in favour of using formal credit, i.e., the ratio of the probability that a farmer will use formal credit to minimise the agriculture expenditure to the probability that he/she will not.

Thus, if $P= 0.9$, it means that the odds are 0 to 1 in favour of formal credit. Therefore, if P goes from 0 to 1 (that is, as z varies from $(-X_i$ to $X_i)$, the logit, L_i goes from $-X$ to $+X$. Although the probability lies between 0 and 1, the logit is not so

bounded. Finally, the study hypothesised that different factors affect farmers' decision to take formal credit.

Unit-level data was extracted from coded text files using NSSO's layout manual using STATA software version 13. Descriptive statistics have been used to understand the socio-economic dimensions of surveyed farmers.

Determinants of Formal Credit: A comparison between the socio-economic and demographic characteristics of farmers with respect to formal and informal credit has been made (Table 1). The calculated data confirm that farmers with informal credit are relatively young (i.e., 49.49 years) compared with farmers taking credit from formal

credit agencies (i.e., 53.20 years). The majority of indebted farmers are male. As far as a social group is concerned, about 32.49 per cent of farmers belonging to the general category have taken loans from formal credit agencies, while approximately 20.46 per cent of farmers have taken loans from informal credit agencies. In other words, nearly 70 per cent of farmers belonging to the socially backward groups have taken loans from formal credit sources, while more than 80 per cent of socially backward farmers have taken loans from informal credit sources. Also, there is a wide gap between farmers taking loans from formal and informal credit agencies as far as education is concerned.

Table 1

Description of the Dependent and Explanatory Variables

Variables	Description	Formal	Informal
Age (year)	Continuous	53.20	49.49
Gender (%)	Categorical (Male= 1; otherwise= 0)	97.31	92.08
Social Group (%)	Categorical (General= 1; otherwise= 0)	32.49	20.46
Literacy Rate (%)	Categorical (Literate= 1; otherwise= 0)	75.25	57.49
Family Size (nos.)	Continuous	7.12	6.51
Kisan Credit Card (%)	Categorical (Yes= 1; otherwise= 0)	44.10	13.22
Livestock (%)	Categorical (Yes= 1; otherwise= 0)	88.32	80.18
Operated Area (ha)	Continuous	1.01	0.52
Bank Account (%)	Categorical (Yes= 1; otherwise= 0)	94.29	79.28
Received formal training in agriculture (%)	Categorical (Yes= 1; otherwise= 0)	2.19	1.46
Principal Source of Income (%)	Categorical (Agriculture= 1; otherwise= 0)	90.32	77.59
Aware of Minimum Support Price (%)	Categorical (Yes= 1; otherwise= 0)	44.44	26.43
Having MGNREGA job card (%)	Categorical (Yes= 1; otherwise= 0)	16.08	27.53
Having Ration Card	Categorical (Yes= 1; otherwise= 0)	90.82	85.26
Took any technical Advise	Categorical (Yes= 1; otherwise= 0)	5.87	5.36

Source: Estimated from Unit-level data of 70th NSSO round, 2013.

Table 1 reported that farmers who had taken loans from formal credit agencies were relatively more educated (75.25 per cent) than farmers who had taken loans from informal credit agencies (57.49 per cent). The mean family size is relatively higher for farmers with formal credit compared to informal credit (i.e., 7.12 and 6.51). Furthermore, the operated area where farmers have taken loans from formal credit agencies (1.01 hectares) is relatively higher than that of farmers who have taken loans from informal credit agencies (0.52 hectares).

As far as extension services are concerned, about 44.10 per cent of farmers have taken loans from formal credit sources using the Kisan Credit Card. At the same time, the corresponding figure is relatively small for farmers who have taken loans from informal credit agencies (i.e., 13.22 per cent). A bank account is a prerequisite for taking credit from formal credit agencies. Table 1 reported that nearly 95 per cent of farmers have taken credit from formal credit agencies and have a bank account, while nearly 80 per cent of farmers have bank accounts and have taken credit from informal credit agencies. In totality, farmers who have taken loans from formal credit agencies are relatively in a better economic situation than those who have taken loans from informal credit agencies.

Results and Discussion

Trends of Rural Credit in Uttar Pradesh and India: India has a wide setup of financial institutions that are active in the rural credit market. Credit agencies can be divided into two categories: formal and informal. The formal credit agencies include cooperatives, regional rural banks, scheduled commercial banks, non-banking financial institutions, self-help groups, micro-financial institutions, and other government agencies. Further, informal credit sources comprise moneylenders, friends, relatives, traders/shopkeepers, employers, etc. The share of formal rural credit in Uttar Pradesh (UP) has increased from 55 per cent in 1991–92 to 61 per cent in 2012–13, which is almost a replica of the national trend (Table 2). However, the existence of an informal credit market along with a formal institutional credit market has been a salient feature of the rural credit market in Indian agriculture. In UP too, informal credit, which is often exploitative, persists. Informal credit accounted for more than 40 per cent of the total borrowing by rural households. Its persistence, despite vigorous efforts to increase the flow of institutional credit, is mysterious and raises many questions about the effectiveness of institutional credit.

Table 2

Share of Formal and Informal Borrowings in Uttar Pradesh and India

Year	Uttar Pradesh		India	
	Formal	Informal	Formal	Informal
1991-92	54.80	45.20	55.70	44.30
2002-03	53.60	46.40	57.10	42.90
2012-13	60.70	39.30	60.30	39.70
1991-91 to 2012-13	56.37	43.63	57.70	42.30

Source: Estimated from Unit-level data of 70th NSSO round, 2013.

Note: Figures are in per cent.

Patterns of Rural Credit in Uttar Pradesh: The results confirm that informal sources account for 28.70 per cent of the loan volume for agricultural households in rural UP, and the rest, 71.3 per cent, is provided by formal sources (Table 3). Commercial banks are the dominant source of formal credit, which provides 88.60 per cent of the total formal loans, followed by cooperative societies (7.40 per cent) and government sources (3.90 per cent). Professional moneylenders, who usually

charge a high-interest rate, are the largest source of informal credit. It accounts for 43.0 per cent of the informal loan volume. Friends and relatives, who do not usually charge any interest, provide 39.2 per cent of the non-institutional loan. The shopkeepers and others account for 17.80 per cent of the informal loan for agricultural households. The share of employers and landlords is negligible in providing informal credit to agrarian households.

Table 3

Distribution of Loans by Sources in Uttar Pradesh

Share of formal sources		Share of informal sources	
Type	Per cent	Type	Per cent
Government	4.00	Employer or landlord	0.50
Cooperative Society	7.40	Agricultural professional or moneylender	42.50
Bank	88.60	Shopkeeper	4.50
		Relatives or friends	39.20
		Others	13.40
Total	100.00	Total	100.00
Total share of formal sources	60.70	Total share of informal sources	39.30

Source: Estimated from Unit-level data of 70th NSSO Round, 2013.

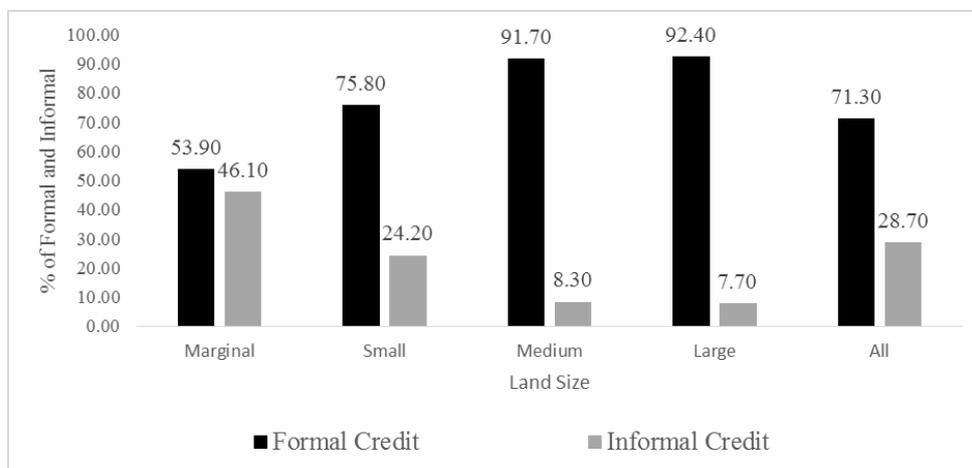
Note: Figures are in per cent.

Farmers' Access to Credit from Formal and Informal Sectors: The direct relationship between borrowing and land size indicates the involuntary exclusion of agricultural households from the rural credit market. Large segments of agricultural households still remain outside the formal credit system. The poor are often denied formal credit due to a lack of collateral or guarantors. The calculated results show that large farmers in the majority (>90 per cent) have taken loans from formal credit sources, while only 7.70 per cent have taken loans

from informal credit sources. Marginal farmers seem highly dependent on informal sources of credit among all the landholders. Figure 1 shows that 46.10 per cent of farmers belonging to the marginal land size have taken credit from informal sources. At the same time, only 24.20 per cent of farmers belonging to the small land size have taken credit from informal sources. Overall, 71.30 per cent of farmers have taken credit from formal sources, while 28.70 per cent have taken loans from informal sources.

Figure 1

Share of Formal and Informal Credit among Land Holders in Uttar Pradesh



Source: Estimated from Unit-level data of 70th NSSO round, 2013.

Note: Figures are in per cent.

Institutional Credit, Net Farm Income and Household Consumption Expenditure: Table 4 reflects a few significant observations on the rural credit debate. First, access to institutional credit is associated with higher farm income. The net farm income of formal borrowers (Rs.40974/ha) is significantly higher than that of informal sector borrowers (Rs.31392/ha) in the UP. Second, the relationship between farm size and net returns per hectare is not explicit. Lastly, the difference in farm income between formal and informal borrowers is much larger for marginal and large farm sizes than for small and medium farmers. The comparative result of average monthly per capita consumption

expenditure (MPCE) for formal and informal borrowers by farm size delineates that access to institutional credit is positively associated with higher per capita monthly expenditure. The MPCE of formal borrowers (Rs.1811) is significantly higher than that of informal sector borrowers (Rs.1088) in UP. Further, the difference in MPCE between formal and informal borrowers follows a similar pattern to the corresponding net farm income results. In other words, the difference in MPCE between formal and informal borrowers for marginal and large farm holders is larger than that of small and medium farmers.

Table 4

Institutional Credit, Net Farm Income and Household Consumption Expenditure

Farm Category	Net Farm Income (Rs./ha)		Consumption Expenditure (Rs./month/person)	
	Formal borrower	Informal borrower	Formal borrower	Informal borrower
Marginal	46,248	31,967	1947	1048
Small	29,202	28,282	1577	1168
Medium	35,692	26,890	1743	1511
Large	45,069	30,571	1449	2569
All Classes	40,974	31,392	1811	1088

Source: Estimated from Unit-level data of 70th NSSO Round, 2013

Determinants of Formal Credit in UP: Binary Logistic Regression (BLR) is used to identify factors influencing farmers' decisions to take loans from formal credit agencies. The method is best for predicting the probability of a farmer deciding to avail himself of a loan from institutional sources, where interest rates are relatively lower than from informal sources. The decision of farmers is a discrete value (1, 0). One (1) denotes farmers who opted for credit from institutional sources, while zero (0) denotes farmers who did not opt for credit from institutional sources. Table 5 shows the estimated results of the empirical binary logistic regression model. The regression result indicated that the BLR predicted about 74 per cent of the responses correctly (R² value). The model fits the data at ($p > 0.001$), as indicated by the LR chi-square ($\text{Prob} > \chi^2$) goodness of fit statistics. The goodness of fit demonstrated that the variables captured in this study were valid. It explains the factors that determine the willingness of a farmer to opt for institutional sources of credit in the study area, i.e., Uttar Pradesh. Study results also reject the null hypothesis and accept the alternative hypothesis, stating a significant relationship between the capture variables and farmers' willingness to take credit from institutional sources. Further, the determinants of formal credit are segregated into three main categories: social, economic, and extension services. The social factors include age, gender, social group, literacy rate, and family size, whereas economic determinants comprise operated area, bank account, and Kisan credit card. Use of extension services includes training, income, MSP, MGNREGA, ration card, and technical advice.

Social: The study has considered age, gender, caste, literacy rate, and family size as social determinants for formal credit (Table 5). The BLR results confirm that gender and literacy rate are key determinants for formal credit. In other words, educated male farmers are more likely to take loans from formal credit agencies instead of

informal ones. The calculated odd ratios highlighted the probability statistics. For instance, if the farmer is literate, the calculated odds ratio reflects a 2.008 times higher probability of taking a loan from formal credit.

Economic: The study has considered the operated area, use of a bank account, livestock, and the Kisan credit card as economic determinants for formal credit in Uttar Pradesh (Table 5). The BLR results show that all the economic determinants are statistically and positively associated with dependent variables, i.e., formal credit. Farmers with a larger operating area, are connected with financial institutions, have livestock, and have a Kisan Credit Card are more likely to take credit from formal credit sources than others. The calculated odd ratio also explained the probabilities. For instance, the calculated odd ratio shows a 3.01-fold higher probability of taking a loan from formal credit sources if farmers belong to large landholdings. Further, odd ratios confirm a 3.03 and 2.04 times higher likelihood of taking a loan from formal credit sources if farmers have a Kisan Credit Card and livestock.

Extension Services: The study has considered formal training in agriculture, principal source of income, minimum support price, MGNREGA job card, and technical advice as extension service determinants of formal credit (Table 5). These are key factors motivating farmers to take loans from formal credit agencies. Farmers with formal training in agriculture are more likely to take loans from formal sources. For instance, there is a 4.41 times higher probability for farmers who have the training to take credit from formal sources than those who have not taken proper formal agricultural training. Further, technical advice is also vital for coping with adverse impacts in agriculture. The calculated odds ratio shows a 3.10 times higher probability of taking formal credit if farmers have followed technical advice provided by agricultural universities, NGOs, and scientists through open-source platforms.

Table 5*Determinants of Formal Credit in Uttar Pradesh*

Determinants	Dependent variable (formal credit= 1; otherwise= 0)	Coefficient
Social	Age	0.00175** (0.998)
	Gender	0.01250 ^{NS} (1.013)
	Social Group	0.30789** (3.124)
	Literacy Rate	0.00797** (2.008)
	Family Size	-0.00918 [†] (0.991)
Economic	Operated Area	0.01062** (3.011)
	Bank Account	0.01022* (1.011)
	Livestock	0.03963** (2.040)
	Kisan Credit Card	0.03250* (3.033)
Extension Services	Received formal training in agriculture	0.34423* (4.411)
	Principal Source of Income	-0.43729* (0.646)
	Aware of Minimum Support Price	-0.09687*** (0.907)
	Having MGNREGA job card	0.65574* (1.926)
	Having Ration Card	0.36835* (1.445)
	Took any technical Advise	0.10189** (3.107)
	Constant	-0.15300 ^{NS} (0.858)
	Number of observation	4866
	LR chi2(14)	883.00
	Prob> chi2	0.0000
	Pseudo R2	0.0414
	Log-likelihood	-10232.826

Source: Authors estimated from Unit level data of 70th NSSO Round, 2013.

Note: *, **, and *** indicate 1, 5, and 10 per cent levels of significance, respectively, and NS indicates non-significant. Values in parentheses are odd ratios.

Discussion

The regression results highlight the determinants of formal credit. The estimated coefficient for age is positive and significant. It indicates that older farmers have more farming experience than younger farmers; they manage their farming effectively to smooth their living standards. Our results align with Amanullah et al. (2020), which explain that age influences the farmer's decision to opt for credit from institutional sources. Further, the coefficient of family size is negative and significant with the dependent variable, i.e., formal credit. Possibly, it explains two reasons for its significance. First, the farmers with large family size do not need to take credit because family members work as family labour, which decreases the cost of labour. Second, families with more members have additional possibilities of earning income from other off-farm activities (Amanullah et al., 2020). Furthermore, our results also show that large farmers belonging to the general social group are more likely to take credit from institutional sources than others. The results are also in line with the finding of Bedruand Motunrayo (2022), which explains that social factors are key constraints for institutional credit.

In rural Uttar Pradesh, livestock ownership is an important measure of household assets that could either substitute for credit or serve as an indicator of the household's capacity to bear risk. Our results are in line with the findings of Croppenstedt et al. (2003), which explain that households with a greater value of assets (livestock) are less likely to motivate farmers to take formal credit. A possible explanation for this relationship is that such assets can be used as collateral.

Lastly, access to information technology and consultation with experts also motivate and influence farmers to take formal credit. Our results show that access to information technology is positively and significantly associated with formal credit. Our results align with Wossen et al. (2017), who explain that farmers with good access to information technology are less likely to take credit from institutional sources.

Conclusion and Policy Recommendations

The study provided a broad base for discussion on rural credit markets for agriculture borrowing in rural households in Uttar Pradesh. Credit markets in Uttar Pradesh have played a vital role in financing rural development. However, not all rural households can enjoy the benefits formal credit sources can provide. This is demonstrated by the low contribution of the agricultural sector to the total gross domestic product, reflecting low farming productivity. In order to design credit schemes to encourage rural investment, it is essential to identify factors that influence household access to both formal and informal credit for their welfare. Hence, the drivers of farmers' access to formal credit are assessed in this paper.

The present study empirically tested the effect of demographic characteristics on access to formal credit sources using All India Debt and Investment Data from the 70th round of NSSO. The BLR results confirm that formal credit is affected by social, economic, and extension services significantly and positively, highlighting that educated farmers connected to the financial system are more likely to take loans from formal credit agencies than others. The results further confirm that small farmers have poor access to formal credit, and formal lenders are explicitly biased towards large-scale farmers. Consequently, marginal and small farmers are left out.

The major policy recommendations from this study are as follows: First, the BLR results depict a positive relationship with land size, and agricultural households with larger land seem to get more benefits. The government should focus on marginal and small farmers with larger shares in the total operational landholdings. They mostly depend on short and medium term loans for agricultural purposes. They have less interest in taking out long-term credit. This is due to the low level of income of agricultural households and the complexity of accessing loans. The performance of small farmers can be resilient only by raising their creditworthiness through a market-oriented production pattern.

Second, this study provides implications for poverty reduction policies, regardless of the credit source that the rural households rely upon. Hence, policymakers can choose to intervene in the rural credit lending system by liberalising policy to more accurately reflect the characteristics of potential borrowers and in light of their current borrowing strategies.

Third, State intervention is also required in terms of increasing the size of livestock. This can be an area where Uttar Pradesh can lead other States, as this will help diversify agriculture.

Fourth, crop diversification is a must since wheat and rice alone cannot take the State forward, given the fall in production of pulses due to the decline of the MSP of pulses over the years.

Lastly, horticulture is an area the State may explore by adopting a social entrepreneurship model. Such strategies are very popular and proved successful in Maharashtra and Andhra Pradesh. This will generate extra income for the farmers and bring down their level of indebtedness.

Author's Contributions:

Surendra Singh Jatav: Data collection and analysis

Sanatan Nayak: Literature review

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