Determinants of Institutional Agricultural Credit in India: Field Data Evidence From Small and Marginal Farmers

Dr. Inder Sekhar Yadav[1] and M Sanatan Rao[2]
[1]*Associate Professor, Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal. 721302, India, email: yadavis@hss.iitkgp.ac.in*
[2]*Doctoral Fellow, Department of Analytical and Applied Economics*
Utkal University, Vani Vihar, Bhubaneswar, Odisha, 751004, India, email: msanatanrao@gmail.com

Abstract

This primary study examines the determinants of institutional agricultural credit for small and marginal farmers across various social groups using multi-stage stratified random sampling and purposive sampling through a structured questionnaire by interviewing 400 cross sectional farmers in India. The correlation analysis shows a significant correlation between the selected continuous and discrete variables. The evidence from estimated model suggests that variables like education, gender, total income, total agricultural income, size of land holdings, irrigation facilities, banks visits, social extensions, collaterals, formal distance and caste are found to be significantly determining the access to institutional credit in the sample regions of India.

Keywords: Agricultural Credit; Field Data; Caste; Small and Marginal Farmers; Probit;India.

Introduction

India is mainly an agrarian economy. Agricultural sector in India plays an important role in provision of rural livelihoods, national food security, employment, development of primary industries and other non-agricultural sectors. This further incentivizes demand and supply that lead to industrial expansion, which in turn promotes economic growth (Subramanian and Reed, 2009). About 70 percent of the rural households depend upon agriculture for their livelihood and 87 percent of farmers are small and marginal farmers in India[1]. Nearly 55 percent of the total workers in the country are employed in agriculture and allied activities. Out of the total workers of 48.17 crore, there are about 11.87 crore cultivators, and nearly 14.43 crore are agricultural labourers[2]. The country's total number of operating holdings is about 146 million, and in 2015-16 the total area worked is about 157.14 million hectares. Marginal and small land holdings accounted for 86.21 percent,

[1] Tenth Agriculture Census, 2015-16
[2] Census 2011, Government of India

while in 2015-16 their share of the controlled area stood at 47.34 percent. In 2015-16 the average landholding was 1.08 hectares[3].

The development of the agriculture depends on institutional (such as agricultural credit, land holdings, infrastructural (such as irrigated area, farm mechanization, electricity, storage infrastructure, transportation, agriculture market), technological (such as high-yielding varieties (HYVs)/seeds, fertilizers, pesticides) and socio-economic (such as population, poverty, literacy) factors. Accordingly, agricultural credit is considered as an important non-land agricultural input that can be purchased by farmers only if they have sufficient money to invest after meeting their consumption needs. Agricultural credit also seems to be an important input for higher farm productivity with modern technology. Modern agricultural technology is necessary for economic growth and development, and the use of such technology in rural economies is only possible when farmers are provided credit for the purchase of modern technological inputs (Schultz, 1964; Zuberi, 1989).

The demand for agricultural credit arises due to factors such as lack of simultaneity between the realization of income and act of expenditure, unevenness of investment in fixed capital formation and random surges in capital needs and saving that accompany technological innovations. As one of critical non-land inputs credit has two important dimensions viz., availability of credit and the distribution of credit which affects the viability and sustainability of agriculture. The supply-led approach of lending to agricultural farmers has been embraced by India. There has been year on year growth of agricultural credit in India. Though agricultural credit has increased, still there exist many weaknesses which jeopardize the growth of the agricultural sector and increases distress among the farmers. Therefore, the cost, availability of adequate and timely agricultural credit helps the farmer to access various agricultural inputs and modern technology.

However, even today, for a large section of farmers particularly for small and marginal farmers' accessibility of institutional sources of agricultural credit has been low. Also, savings among small and marginal farmers is negligible. For instance, about 87 percent of small and marginal do not have sufficient money to finance their farming needs (Tenth Agriculture Census, 2015-16). One of the factors which continuously haunts the Indian agriculture is the dependency on non-institutional sources of credit like money lenders. Though the dependency upon the non-institutional sources has declined[4] but still, the share of non-institutional sources of credit represents about 36 percent of the total credit in India as of 2013[5]. Thus, the objective of the study is to investigate the socio-economic determinants of institutional agricultural credit in India using primary data for small and marginal farmers. Additionally, the study also examines the factors affecting the accessibility of institutional agricultural credit across various backward classes and caste groups given a disparity among social groups such as Scheduled Caste (SCs), Scheduled Tribes (STs), Other Backward Class (OBCs) and Other Class (OCs).

The approach of most of the existing studies examining determinants of institutional agricultural credit is based on secondary data collected and compiled from numerous sources which are often compiled in a cycle of every 10 years. For example, Kumar et al., (2010) uses National Sample Survey Organisation (NSSO) data during 1992 (48th round) and 2003 (59th round). Similarly, Kumar et al., (2021) employs data from the All-India

[3] Tenth Agriculture Census, 2015-16

[4] Share of institutional and non-institutional agricultural credit in India since 1950 is given in Appendix 1

[5] All-India Debt and Investment Survey (AIDIS) Report, 2013

Debt and Investment Survey of the 59th and 70th rounds of the NSSO for the years 2002-2003 and 2012–2013.

Therefore, this study contributes to the existing literature by providing new evidence on socio-economic determinants of institutional agricultural credit directly from the field across social groups for both kharif and rabi crops using recent survey data from small and marginal farmers. Further, this study contributes new evidence by employing relatively large data set covering wide range of sample regions in India (south, east and north) thus eliminating any sample biases. Accordingly, the evidence from present work gives significant insights to policy makers on socio-economic factors that affect the accessibility of institutional credit of small and marginal farmers also from the perspective of being socially advantaged and disadvantaged in India.

Field Data and Methods

Data and Sampling

Using multi-stage stratified random sampling and purposive sampling (a non-probability sampling method), small and marginal farmers across various social groups and study regions from three Indian states[6] were selected respectively. Accordingly, the district of Nalgonda was selected from Telangana State (south), the district of Azamgarh was selected from Uttar Pradesh (UP) (north) and the district of Balasore was selected from Odisha (east). Consequently, the primary data was collected through a structured questionnaire by interviewing about 400 cross sectional small and marginal farmers across various social groups[7]. The small and marginal farmers belong to various social groups such as SCs, STs, OBCs and OCs. The primary data was collected during the months of August and September, 2020 for both kharif and rabi crops.

Variables and Hypotheses

Important socio-economic, dichotomous and continuous variables were collected and compiled for examination of the objective of the study. Based on the primary data collected, variables reported in Table 1 are used to examine the determinants of formal agricultural credit for these regions.

[6] Maps of three selected Indian states and respective districts in each state is given in Appendix 2

[7] Distribution of sample small and marginal farmers across state, district and caste is given in Appendix 3

Tab. 1: *Selected socio-economic variables*

Variables	Description
Continuous	
Size of land holdings	Cultivated land area in (acres)
Education	Years of formal schooling
Age	Age of farmers in (years)
Formal distance	Distance from the nearest city in kms
Total income	Total income from all sources in INR
Agricultural income	Income from only agriculture in INR
Bank visits	Number of times bank visit in a year
Social extensions	Number of contacts with extension agents for accessing institutional credit
Discrete	
Gender	1 if the farmer is male, 0 for female
Irrigation facilities	1 if the farmer has irrigation facilities, 0 otherwise
Holding KCC	1 if the farmer holds KCC, 0 otherwise
Collaterals	1 if the farmer has collateral, 0 otherwise
Caste	1 if the farmer belongs to OC, 0 otherwise

Source: Compiled by Authors

The related hypotheses are as follows:

(i) size of land holdings: Size of land holdings is a continuous variable and is measured in acres. A farmer's large land holding is expected to increase the probability of taking credit from the institutional sources. Because the credit requirements of a large size land holdings are expected to be more as it will use more inputs and other allied services (Kumar et al., 2010). Also, large size land holdings enhance the repayment capability, farmer's ability to offer collateral and facilitates the quick disbursement of credit from the institutional sources (Kumar et al., 2010).

H1. Size of land holdings has a positive and significant effect on institutional credit.

(ii) education: Education of farmers is a continuous variable and is measured in years. The level of education of famers is expected to have a positive impact on access and the amount of institutional credit (Kumar et al., 2010). This is because when farmers attain a high level of education are able to accumulate and have better knowledge and access to institutional credit (Chandio et al., 2021). Therefore, highly educated farmers generally depend and demand higher institutional credit, that is, higher is the probability of accessing the institutional credit.

H2. Level of education has a positive and significant effect on institutional credit.

(iii) age: Age of the farmer is a continuous variable and is measured in years. It is considered that the age of decision-maker may influence the amount of credit, as it will act as a proxy of experience (Kumar et al., 2010). In this case, the impact of age on institutional borrowing may be positive because with age, people mature and hence have better knowledge, information and appreciation for the source of agricultural credit. Alternatively, it is may also be expected that as the farmer grows older and older, the ability to access institutional credit or demand for credit from formal sources may decline (Chandio et al., 2021). In this case, the impact of age on institutional borrowing may be negative because the aged farmer may not be strong enough to work efficiently or invest in the agricultural-related activities (Kuwornu et al., 2012).

H3. Age of the farmer has a significant impact on institutional credit.

(iv) formal distance: Distance is a continuous variable and is measured as distance of the village from the nearest city in kilometers (kms). Institutional sources located in cities or urban or sub-urban areas far away from villages may limit the ability of the farmers to access them. Thus, probability of participation in institutional credit may decrease significantly if the distance from living village to the institutional credit is longer. Thus, distance may significantly and negatively influence the access of institutional credit.

H4. Formal distance has a significant and negative impact on institutional credit.

(v) total income: Total income of the farmer is a continuous variable and is measured as total income from all the sources in Indian rupees (INR). Farmers with high level of total income from all sources including agriculture are more capable of obtaining agricultural credit from institutional sources (Chandio et al., 2021) compared to farmers who have low level of total income. This is because high income farmers have higher ability to access and demand institutional credit (Mohieldin and Wright, 2000). Thus, high level of total income is expected to significantly and positively affect the access to the institutional credit.

H5. Total income has a significant and positive impact on institutional credit.

(vi) agricultural income: Agricultural income of the farmer is a continuous variable and is measured as income from only agricultural sources in INR. The likelihood of the amount of institutional credit increases with increase in income from agricultural sources. Increase in agricultural income increases farmer's ability to meet the loan requirements without depending on non-agricultural sources of income. Therefore, increase in agricultural income is expected to significantly and positively affect the access to the institutional credit.

H6. Agricultural income has a significant and positive impact on institutional credit.

(vii) bank visits: Bank visit is a continuous variable and is measured as number of times a farmer visits the bank in a year. The farmer's access to institutional credit increases if the disbursal of loan is quick and materializes in few visits to the bank and vice-versa. The delay in disbursement of credit to the farmers from formal sources may lead them to depend on moneylenders for their immediate credit requirements (Chaudhuri and Gupta, 1996). Therefore, a significant relationship exists between bank visits and access to institutional credit.

H7. Bank visits has a significant impact on institutional credit.

(viii) social extension: Social extension is a continuous variable and is measured as number of contacts a farmer has with extension agents for accessing institutional credit. The contacts of farmers with social extension agents helps them to gain better access to information regarding different institutional sources of finance (Chandio et al., 2021) and the procedure to borrow. Also, social extension agents help farmers to link different institutional credit sources to various farmer groups (Anang et al., 2015, Muhongayire et al., 2017; Sanusi and Akintola, 2010). Thus, higher the number of contacts with social extension agents for accessing institutional credit, higher will be the probability of farmers accessing institutional credit.

H8. Contacts with social extension agents has significant and positive influence on institutional credit.

(ix) gender: Gender of the farmer is a discrete variable and is measured using a dummy variable (1 if the farmer is male, 0 for female). The male farmers are considered much capable with resources such as land and other assets at their disposal compared to their

female counterparts. Thus, the resources with which male farmers are endowed may serve as collateral security in accessing institutional credit (Chandio et al., 2021). Therefore, this is expected to have a positive and significant influence on institutional credit.

H9. Gender of the farmer has a significant and positive impact on institutional credit.

(x) irrigation facilities: Irrigation facilities is a discrete variable and is measured using a dummy variable (1 if the farmer has irrigation facilities, 0 otherwise). Farmers having better irrigation facilities are expected to demand and influence the magnitude of institutional credit positively (Kumar et al., 2010). This is because availability of sufficient irrigation facilities in the farm increases the ability of the farmer to cultivate varieties of crops in different seasons thereby increasing the requirement of agricultural credit.

H10. Irrigation facilities has a significant and positive impact on institutional credit.

(xi) holding KCC: Holding KCC is a discrete variable and is measured using a dummy variable (1 if the farmer holds KCC, 0 otherwise). Farmers holding KCC are expected to demand and influence the magnitude of institutional credit positively. This is because KCC is likely to install confidence about the credibility of the farmer among the banks and other institutional sources of finance which may ultimately aid the approval and disbursal of loan.

H11. Holding KCC has a significant and positive impact on institutional credit.

(xii) collateral availability: Collateral availability is a discrete variable and is measured using a dummy variable (1 if the farmer has collateral, 0 otherwise). The availability and provision of collateral is a significant variable that affects the farmer's ability to access institutional credit. This is because in event of default by the farmer the collateral can be used to recover the borrowed amount. Therefore, farmer's ability to provide collateral increases the probability of accessing the institutional credit.

H12. Collateral availability has a significant impact on institutional credit.

(xiii) caste: Caste is a discrete variable and is measured using a dummy variable (1 if the farmer belongs to OC, 0 otherwise). Farmers belonging to socially disadvantaged group (SCs, STs and OBCs), generally have very little loans from institutional sources of agricultural credit (Kumar et al., 2021). This is because socially disadvantaged farmers are economically poor and own little land which acts as a deterrent to access institutional credit. Thus, if a small and marginal farmer belongs to a socially disadvantaged group, there is a probability that the farmer may be deprived from accessing institutional agricultural credit.

H13. Caste has a significant impact on institutional credit.

Statistical and Econometric Methods

In order to measure the strength or degree of association between the selected socio-economic variables, Pearson's correlation[8] matrix is constructed. The statistical Pearson correlation approach gives the values between -1 and +1, where 0 indicates no correlation (relationship) between two variables, +1 indicates perfect positive correlation (relationship), and -1 indicates perfect negative correlation (relationship) (Keller, 2014). The Pearson correlation coefficient, say between two variables X and Y, is calculated using the following statistical formula:

[8] The selected variables meet the normality assumption of person correlation

$$r_{XY} = \frac{cov(X,Y)}{\sigma_X \sigma_Y} \quad \ldots(1)$$

where cov(X,Y) is the covariance between X and Y and σ_X is standard deviation of X and standard deviation of Y.

As noted before, access to agriculture credit is used as dependent variable. Accordingly, a farmer is credit constrained, if he does not have access to institutional credit and is unconstrained if he has access to institutional credit. Therefore, the dependent variable considered in the present study is binary in nature. In the present analysis, the binary dependent variable is = 1 for all the farmers who are unconstrained and = 0 for all the farmers who are constrained by credit. Accordingly, using cross sectional farmer's data obtained from the primary survey, probit estimates are used to examine the socio-economic factors that determine the institutional agricultural credit in the sample regions. Probit estimation is based on the cumulative normal probability distribution. In probit econometric model, dependent variable, y, is binary and takes on the values of 1 and 0. The outcomes of y are mutually exclusive and exhaustive. The binary dependent variable, y, is determined by k observable independent variables, X_k, where k = 1…k. While the values of 0 and 1 are observed for the dependent variable in the probit model, there is a latent, unobserved continuous variable, y*:

$$y^* = \sum_{k=1}^{k} \beta_k x_k + \varepsilon \quad \ldots(2)$$

where the binary dummy variable, y, is observed and is determined by y* as follows:

$$y = \begin{cases} 1 \; if y^* > 0 \\ 0 \; otherwise \end{cases} \quad \ldots(3)$$

The point of interest relates to the probability that y equals 1. From the above equations, we have:

$$prob(y = 1) = prob\left\{\sum_{k=1}^{k} \beta_k x_k + \varepsilon > 0\right\}$$

$$= prob\left\{\varepsilon > -\sum_{k=1}^{k} \beta_k x_k\right\}$$

$$= 1 - \varphi\left\{-\sum_{k=1}^{k} \beta_k x_k\right\}$$

where $\varphi \; is$ the cumulative distribution function of ε. The probit model assumes that the data is generated from a random sample of size N with a sample observation denoted by i, i = 1…N. Specifically, the following probit model is estimated:

$$y_{ki}^{*} = \beta_{k0} + \beta_{k1}x_1 + \beta_{k2}x_2 + \beta_{k3}x_3 + \cdots + \beta_k x_k + \varepsilon \quad \ldots(4)$$

Statistical Results and Discussion

Table 2 depicts the summary statistics of selected socio-economic variables of sample small and marginal farmers in the sample areas of three Indian states, Telangana, Uttar Pradesh and Odisha. It can be observed from Table 2, that the mean value of age is about 44.102 years with a standard deviation of 10.664, suggesting that the sample farmers are young compared to the national average. The mean statistics of education level of sample farmers is only about 6.570 years, suggesting that sample farmers hardly complete secondary schooling. The mean gender of the sample farmers is about 0.923 with a standard deviation of 0.300 of the sample farmers being males. The average total income of the sample farmers is about INR 1,54,282.250 whereas income only from agriculture is about INR 1,10,150.281. The mean average of size of land holdings is about 2.265 acres. The mean statistics of irrigation facilities is about 0.825. The mean value of bank visits is about 2.995 times whereas the mean value of formal distance between villages and institutional credit is nearly 10.947 kms, suggesting a fairly long distance between institutional source of finance and villages of farmers. The mean value of sample farmers holding KCC is about 0.505 whereas the mean value of collateral availability is about 0.183. The social extensions of sample farmers have a mean value of 2.195. The caste of sample farmers has a mean value of 0.500.

Tab. 2: *Descriptive statistics of socio-economic variables*

Variable	Observations	Mean	Std. Dev.	Min	Max
Age	400	44.103	10.664	20	75
Education	400	6.570	4.754642	0	36
Gender	400	0.923	0.300376	0	1
Total income	400	154282.250	64858.7	20000	400000
Agricultural income	400	110150.281	61586.5	12000	400000
Size of land holdings	400	2.265875	1.114202	0	5
Irrigation facilities	400	0.825	0.380443	0	1
Bank visits	400	2.995	1.632985	0	6
Holding KCC	400	0.505	0.500601	0	1
Social extensions	400	2.195	1.357048	0	6
Collaterals	400	0.1825	0.38674	0	1
Formal distance	400	10.9475	2.268835	0	17
Caste	400	0.500	0.500626	0	1

Source: Calculated by Authors from the field data

Table 3 reports the Pearson's correlation statistics among the selected variables. As noted above, correlation measures the nature, degree or strength of linear association between two or more variables. It is observed from Table 3, that the coefficient of correlation between education and gender (0.151), total income (0.202), agricultural income (0.218), size of land holdings (0.193), bank visits (0.121), holding KCC (0.233), social extension (0.235), caste (0.330) is found to be positive and significant whereas coefficient of

correlation between education and variables like irrigation facilities (-0.118), collateral (-0.325), distance (-0.210), age (-0.178) is found to be negative and significant. The coefficient of correlation between gender and agricultural income (0.126), social extension (0.103) is found to be positive and significant whereas for other selected variables it is found to be insignificant. The coefficient of correlation between total income and agricultural income (0.820), size of land holdings (0.576), bank visits (0.245), holding KCC (0.472), social extension (0.363), caste (0.570), (0.145) is found to be positive and significant whereas coefficient of correlation between total income and variables like collateral (-0.164), distance (-0.213) is found to be negative and significant. The coefficient of correlation between agricultural income and size of land holdings (0.563), holding KCC (0.220), social extension (0.362), caste (0.570), age (0.145) is found to be positive and significant whereas coefficient of correlation between agricultural income and variables like collateral (-0.190), distance (-0.254) is found to be negative and significant. The coefficient of correlation between size of land holdings and bank visits (0.154), holding KCC (0.263), social extension (0.261), caste (0.186), age (0.113) is found to be positive and significant whereas coefficient of correlation between size of land holdings and variables like distance (-0.240) is found to be negative and significant. The coefficient of correlation between irrigation facilities and collateral (0.167) and distance (0.175) is found to be positive and significant whereas coefficient of correlation between irrigation facilities and variables like holding KCC (-0.140), caste (-0.145) is found to be negative and significant.

The coefficient of correlation between bank visits and holding KCC (0.592), social extension (0.425), caste (0.230) is found to be positive and significant whereas coefficient of correlation between bank visits and variables like collateral (-0.126) is found to be negative and significant. The coefficient of correlation between holding KCC and social extension (0.463), caste (0.460), age (0.111) is found to be positive and significant whereas coefficient of correlation between holding KCC and variables like collateral (-0.477), distance (-0.261) is found to be negative and significant. The coefficient of correlation between social extension and caste (0.262) is found to be positive and significant whereas coefficient of correlation between social extension and variables like collateral (-0.283), distance (-0.315) is found to be negative and significant. The coefficient of correlation between collateral and distance (0.402) is found to be positive and significant whereas coefficient of correlation between collateral and variable like age (-0.278) is found to be negative and significant. The coefficient of correlation between caste and age (0.217) is found to be positive and significant.

Tab. 3: *Correlation matrix of socio-economic variables*

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Education	1.000												
(2) Gender	0.151*	1.000											
(3) Total income	0.202*	0.057	1.000										
(4) Agricultural income	0.218*	0.126*	0.820*	1.000									
(5) Size of land holdings	0.193*	0.008	0.576*	0.563*	1.000								
(6) Irrigation facilities	-0.118*	-0.022	-0.056	0.026	0.027	1.000							
(7) Bank visits	0.121*	-0.062	0.245*	-0.027	0.154*	0.079	1.000						
(8) KCC	0.233*	0.037	0.472*	0.220*	0.263*	-0.140*	0.592*	1.000					
(9) Social extensions	0.235*	0.103*	0.363*	0.362*	0.261*	0.071	0.425*	0.463*	1.000				
(10) Collaterals	-0.325*	-0.037	-0.164*	-0.190*	-0.095	0.167*	-0.126*	-0.477*	-0.283*	1.000			
(11) Distance	-0.210*	-0.056	-0.213*	-0.254*	-0.240*	0.175*	-0.085	-0.261*	-0.315*	0.402*	1.000		
(12) Caste	0.330*	0.050	0.570*	0.432*	0.186*	-0.145*	0.230*	0.460*	0.262*	-0.278*	-0.184*	1.000	
(13) Age	-0.178*	-0.073	0.145*	0.140*	0.113*	-0.059	-0.015	0.111*	0.073	-0.091	-0.142*	0.217*	1.000

Note: * Significant at 5% level of significance
Source: Same as Table 2

Econometric Results and Discussion

The probit regression estimates are reported in Table 4. The chi-square log likelihood ratio of 465.952 with a zero p-value indicates that the econometric model as a whole is statistically significant. The results of the probit regression depict that there are several significant socio-economic factors that determine the sample farmer's access to agricultural credit from institutional sources. Estimated variables like education, gender, total income, total agricultural income, size of land holdings, irrigation facilities, banks visits, social extensions, collateral, formal distance and caste are found to be significantly determining the access to institutional credit in the sample regions of India. However, variables such as holding KCC and age are found to be insignificant determinant of institutional credit (Table 4).

The positive estimated probit coefficient of education indicates that an additional year of farmer's education, holding other variables constant, increases the probability of accessing institutional agricultural credit by 47.80 percent (Table 4). As noted before, an educated farmer is relatively in a better position to understand the advantages of borrowing from institutional sources in terms of getting loan at a subsidized and probably lower rates of interest compared to non-institutional sources of finance like moneylenders amongst others. The educated farmers are generally aware that they cannot escape from the unfair means and exploitations of moneylenders, which may have devastating consequences on them as well as on their family. Hence, the farmers who attain higher level of education exhibit higher probability to access agricultural credit from institutional

sources than the less educated farmers. The positive estimated probit coefficient of gender suggests that if the farmer is a male, the probability of access to institutional agricultural credit increases by 6.80 percent (Table 4). As noted before, it may be possible that the resources with which the male counterparts are generally endowed with may serve as collateral security in accessing institutional credit.

Tab. 4: *Probit econometric estimates*

Variables	Coef.	St.Err.	t-value
Education	0.478***	0.154	3.10
Gender	0.068*	0.043	1.58
Total income	0.237***	0.069	3.43
Agricultural income	0.321**	0.149	2.15
Size of land holdings	0.224***	0.059	3.80
Irrigation facilities	0.076**	0.026	2.92
Bank Visits	-0.029*	-0.018	-1.61
Holding KCC	0.009	0.021	0.43
Social extension	0.072*	0.041	1.76
Collateral availability	0.412***	0.124	3.32
Distance	-0.014*	0.008	-1.75
Caste	0.064***	0.021	3.05
Age	0.037	0.906	0.04
Constant	27.113***	9.219	2.94
Mean dependent var	0.688	SD dependent var	0.464
Pseudo r-squared	0.938	Number of obs	400.000
Chi-square	465.952	Prob> chi2	0.000
Akaike crit. (AIC)	58.917	Bayesian crit. (BIC)	114.798

**** p<0.01, ** p<0.05, * p<0.1*

Source: Same as Table 2

The positive estimated probit coefficient of total income shows that an increase in farmer's total income, holding other variables constant, increases the probability of access to institutional agricultural credit by 23.70 percent (Table 4). This suggests that farmers with high level of total income from all sources including agriculture are more capable of obtaining agricultural credit from institutional sources compared to farmers who have low level of total income. The positive estimated probit coefficient of agricultural income depicts that an increase in farmer's agricultural income, holding other variables constant, increases the probability of access to institutional agricultural credit by 32.1 percent (Table 4). Therefore, this indicates that the likelihood to access institutional credit increases with increase in income from agricultural sources. The positive estimated probit coefficient of size of land holdings depicts that an increase in farmer's land size, holding other variables constant, increases the probability of access to institutional agricultural credit by 22.40 percent (Table 4) suggesting that a larger land holding is expected to increase the probability of taking credit from the institutional sources. The positive estimated probit coefficient of irrigation facilities indicates that an increase in farmer's irrigation facilities, holding other variables constant, increases the probability of access to institutional agricultural credit by 7.60 percent (Table 4) suggesting that farmers having better irrigation facilities are expected to demand and influence the magnitude of institutional credit.

The negative estimated probit coefficient of bank visits indicates that an increase in farmer's bank visits, holding other variables constant, decreases the probability of access to institutional agricultural credit by 2.90 percent (Table 4) indicating a delay in disbursement of credit to the farmers from formal sources may lead them to depend on informal sources such as moneylenders. The positive estimated probit coefficient of social extension indicates that an increase in farmer's social extensions, holding other variables constant, increases the probability of access to institutional agricultural credit by 7.20 percent (Table 4) suggesting that the contacts of farmers with social extension agents helps them to gain better access to information regarding different institutional sources of finance. The positive estimated probit coefficient of collateral availability depicts that an increase in farmer's collateral availability, holding other variables constant, increases the probability of access to institutional agricultural credit by 41.20 percent (Table 4) suggesting that the farmer's ability to provide collateral increases the probability of accessing the institutional credit.

The negative estimated probit coefficient of formal distance depicts that an increase in the distance to access institutional credit, holding other variables constant, decreases the probability of access to institutional agricultural credit by 1.40 percent (Table 4) suggesting institutional sources located in cities or urban or sub-urban areas far away from villages may limit the ability of the farmers to access them. The positive estimated probit coefficient of caste depicts that farmers belonging to socially advantaged groups (such as OC) generally have more access to loans from institutional sources of agricultural credit. The results indicate that if a farmer belongs to OC, holding other variables constant, increases the probability of access to institutional agricultural credit by 6.40 percent (Table 4). This is because socially disadvantaged farmers are economically poor and own little land which may act as a deterrent to access institutional credit. Thus, if a small and marginal farmer belongs to a socially disadvantaged group, the farmer may be deprived access to agricultural credit.

Conclusion and Policy Implications

This primary study examined the socio-economic determinants of institutional agricultural credit for small and marginal farmers across various social groups from three Indian states (Telangana State, UP and Odisha). The necessary primary data was collected by interviewing about 400 cross sectional small and marginal farmers belonging to various social groups such as OCs, OBCs, SCs and STs. Accordingly, continuous variables such as size of land holdings, education, age, formal distance, total income, agricultural income, bank visits, social extensions were employed along with some discrete variables like gender, irrigation facilities, holding KCC, collateral availability and caste in the empirical analysis.

The correlation analysis showed a significant correlation between the selected variables. The evidence from estimated probit model suggested that variables like education, gender, total income, total agricultural income, size of land holdings, irrigation facilities, banks visits (negatively), social extensions, collaterals, formal distance (negatively) and caste are found to be significantly determining the access to institutional credit in the sample regions of India. However, variables such as holding KCC and age are found to be insignificant determinant of institutional credit.

Based on the findings, it is recommended that the respective state and central government and other agencies such as National Bank for Agriculture and Rural Development

(NABARD), financial institutions or non-governmental organizations (NGOs) through various schemes and training programs should try to first increase the literacy rate of the small and marginal farmers in villages. The significance of literacy has again directed the need for enhancing knowledge and information of borrowing farmers. Teaching and training farmers concerning the technical, procedural and other regulations of financial institutions towards the extension and access of agricultural credit will certainly increase their access to institutional credit. The evidence also suggested that the probability of access to institutional agricultural credit decreases if a farmer belongs to socially disadvantaged groups such as SCs, STs and OBCs which may in turn lead them to depend on non-institutional sources of agricultural credit compared to their counterparts thereby limiting their access to institutional finance. This social anomaly needs to be corrected by all the stakeholders at large. Finally, the factors that reduces the probability of accessing agricultural credit from the institutional sources especially the formal distance needs to be corrected by bringing such sources closer to the farmer's village as far as possible.

Further, this work recommends, as future research direction, to estimate the effects of other socio-economic variables such as farmer's family size, experience, crop production and productivity, operational land, amongst others using experimental/field data in a similar framework to understand their possible significance in determining institutional credit. Also, the possible reasons for some of the estimated coefficients being insignificant in the present work may be investigated in future.

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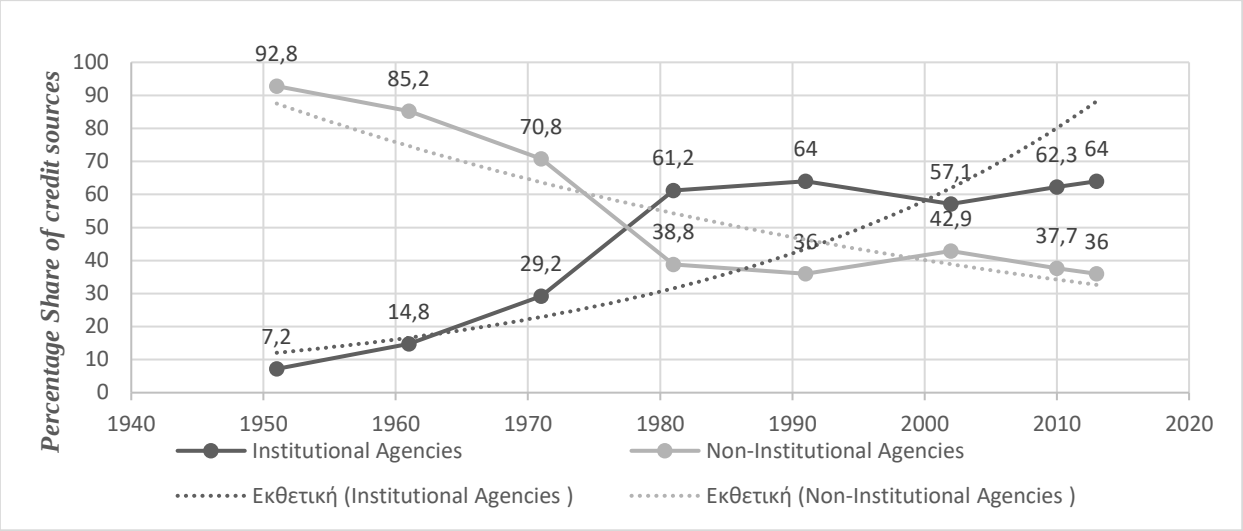
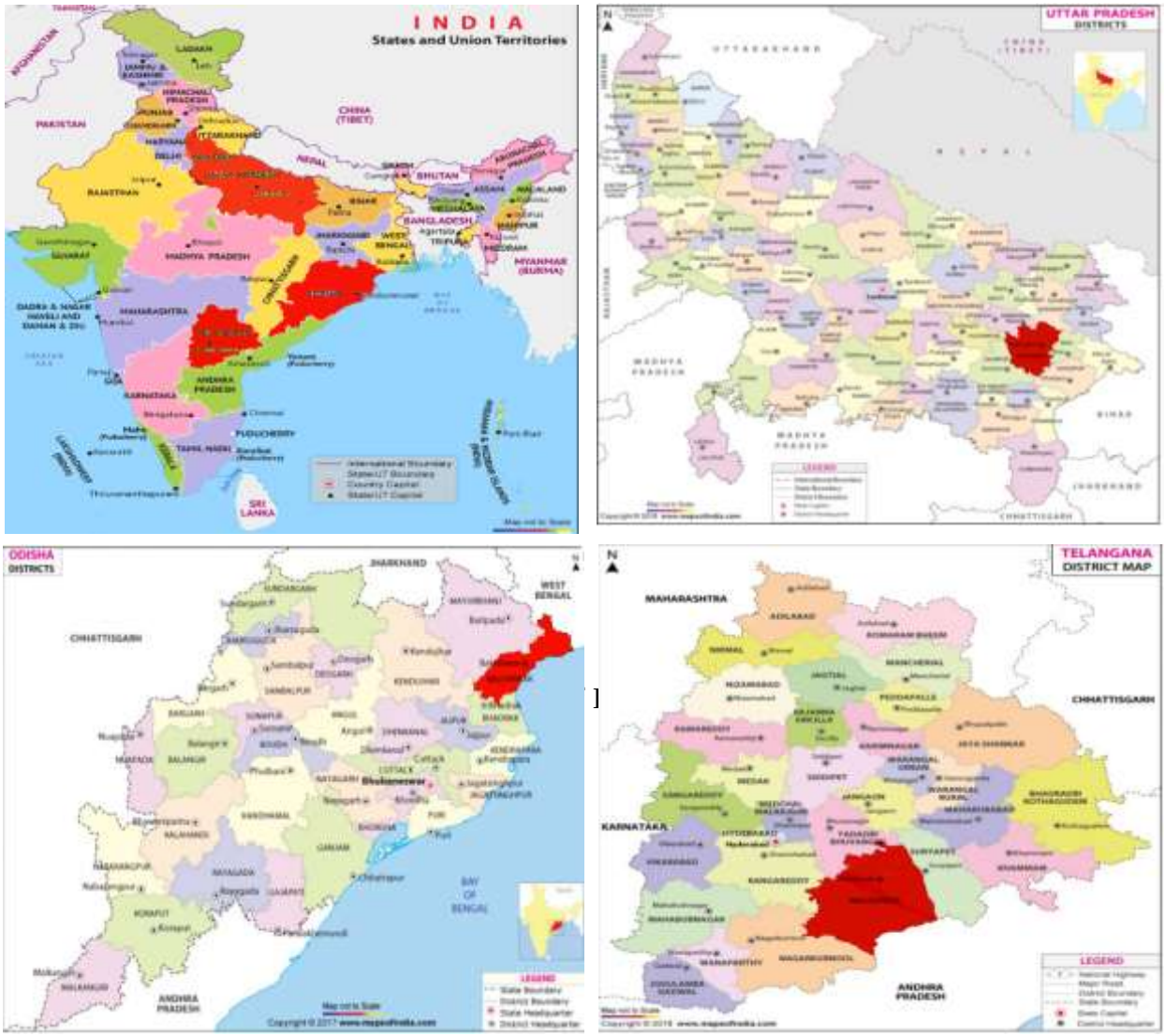
Appendix 1: *Share of institutional and non-institutional agricultural credit in India*



Source: All India Debt and Investment Survey (AIDIS), 2013

Appendix 2: *Maps of sample regions*



Source: Compiled by Authors

Appendix 3: *Distribution of sample small and marginal farmers across state, district and caste*

Social group	Categories of farmers	State/District			Total
		Telangana	UP	Odisha	
		Nalgonda	Azamgarh	Balasore	
OCs	Marginal farmers	5	25	24	54
	Small farmers	26	8	11	45
	Landless farmers	1	0	0	1
	Total	32	33	35	100
OBCs	Marginal farmers	15	25	23	63
	Small farmers	12	7	12	31
	Landless farmers	6	0	0	6
	Total	33	32	35	100
SCs	Marginal farmers	12	26	19	57
	Small farmers	12	6	16	34
	Landless farmers	9	0	0	9
	Total	33	32	35	100
STs	Marginal farmers	15	28	21	64
	Small farmers	8	5	14	27
	Landless farmers	9	0	0	9
	Total	32	33	35	100
Total	Marginal farmers	47	104	87	238
	Small farmers	58	26	53	137
	Landless farmers	25	0	0	25
	Total	130 (32.5%)	130 (32.5%)	140 (35%)	400 (100%)

Note: Figures in parenthesis are percentages
Source: Same as Table 2

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