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Factors Influencing the Use and Choice of Formal Agriculture Credit Sources among Rice Farmers in Chitwan District, Nepal

Bikram Kumar Singh[1], Om Prakash Singh[2], Sushmita Bhatta[2], Smriti Sapkota[2] and Binayak Prakash Mishra[2*]

[1]Nepal Polytechnic Institute, Bharatpur, Chitwan, Nepal
[2]Agriculture and Forestry University, Rampur, Chitwan, Nepal
*Corresponding author: binayakprakash.mishra@gmail.com
*ORCID: https://orcid.org/0009-0009-6526-8917

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ABSTRACT

Agriculture credit is important to sustain and further improve farming practices among rice farmers in developing countries like Nepal. Agriculture credit from formal sources safeguard farmers from fraud and misconduct which are common in informal sources. An investigation was carried out in Chitwan district of Nepal during January, 2023 to identify the factors influencing the use of formal agriculture credit among rice farmers. Further, factors influencing choice of sources among formal agriculture credit users was also assessed. Using random sampling, 59 formal agriculture credit users and 46 informal agriculture credit users were used for the study. Descriptive statistics and logit model were used to interpret the findings. Results revealed that use of formal agriculture credit increases with availability of off-farm income source and membership to agricultural cooperatives among farm household. Efforts should be made to promote participation in agricultural cooperatives to increase usage of formal agriculture credit among farm household. Similarly, choice of cooperatives over bank and microfinance increases with less formal education of the household head and non-availability of off-farm income source among farm household. Likely, choice of bank increases with no participation in agricultural cooperatives and choice of microfinance increases with higher contact with extension workers. Agriculture cooperatives should be further strengthened to provide timely and adequate credit, as it seems to support formal credit users characterized by lower formal education and no off-farm income source.

Keywords: Bank, cooperatives, farm household, participation

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INTRODUCTION

In Nepal, rice is the main cereal crop, grown over 1.47 million hectares with a total production of 5.13 million metric tons and average yield of 3.47 metric tons per hectare in 2021/22. Furthermore, in 2022/23, unhusked rice constituted 13.60% of the agricultural Gross Domestic Product (GDP) (MoALD 2023). Rice productivity in Nepal (3.36 tons/hectare) lags behind other South Asian countries, with a significant exploitable yield gap of 2.57 tons per hectare (40%) and a total yield gap of 4.85 tons per hectare (55%), however, there is considerable potential for boosting rice yields through the implementation of integrated good agronomic practices (Devkota et al 2021). Nepalese rice farmers attain only 76% of their potential rice yield, with various factors, including capital, contributing to this shortfall (Choudhary et al 2022). Although farmers are investing significant portion of earnings in the production of rice, still there exists considerable gap in capital inputs for sustaining the farming practices (Mishra 2021, Choudhary et al 2022). Insufficiency of capital, along with the expensive agricultural inputs and limited access to credit facilities, is constraining farmers' capacity to transform farming practices (Devkota et al 2018). Investments in inputs like high-quality seeds, fertilizers, and equipment are necessary for enhancing productivity and ensuring food security in Nepal's rice subsector (Choudhary et al 2022). Despite witnessing some growth in rice production and productivity over the past decade, Nepal continues to experience a rising trend in rice imports, failing to meet its domestic demand for rice (Gairhe et al 2021).

Agriculture Development Strategy (ADS) of Nepal (2015-2035) has pointed various factors contributing to low productivity. It highlights a significant disparity between current and potential production levels. Low productivity is attributed to a heavy reliance on subsistence farming, inadequate adoption of appropriate modern technology, limited availability of financial inputs, and insufficient investment in the sector. ADS highlights enhancing farmers' access, regardless of gender or socio-economic status and across all geographical areas, to agricultural production resources such as credit. Further it adds, effective financial services are essential for successful commercialization. Therefore, efforts are directed towards expanding the range of agricultural finance providers offering a diverse selection of competitive and customer-driven financial products (MoAD 2016).

The availability of credit positively influences the uptake of enhanced soil conservation techniques (Tiwari et al 2008), farmers' choices regarding climate change adaptation strategies (Khanal et al 2018), adoption of improved rive varieties (Bello et al 2020), access to fertilizer and pesticides (NRB 2014), mechanization of farming practices (Aryal et al 2021), and their willingness to invest to mechanized farming equipment (Paudel et al 2019). Thus, agricultural credit plays a vital role in increasing technical efficiency (Ayaz and Hussain 2011, Akram 2013, NRB 2014) and enhancing rice production in Nepal (Chandio et al 2021).

Farmers utilize agriculture credit from formal and informal sources. Formal sources are banks, cooperatives, and financial institutions like microfinance. Government receives economic benefits in the transaction from formal credit market. Informal sources are facilitated through social networks, are friends, relatives, neighbors, and professional moneylenders including elites, agrovet shop (input providers), and traders (Mishra 2021). Banks and Financial Institutions Act 2017 serves as a comprehensive financial legislation guiding Nepal's financial sector. Oversight and licensing of financial institutions are managed by the Nepal Rastra Bank (NRB). As per NRB directives, all banks and financial institutions are mandated to invest in agriculture as priority sector. The Fifteenth Five-Year Plan (2019/20-2023/24) outlines for bank and financial institutions to expand lending, enhance credit accessibility at the grassroots level, promote microfinance in remote and underdeveloped areas, and prioritize the reinforcement of cooperatives within local communities (Pandey 2022).

Despite ongoing efforts, reliance on formal institutions remains low, with a significant portion of individuals still depending on informal sources despite formal institutions providing credit at less interest rate (Mishra 2021, Pandey 2022). This reliance on informal channels makes them more susceptible to fraud and misconduct, as these sources are not subject to government regulation. Instances where farmers seek assistance from the government to address financial exploitation by money lenders occur regularly. It is common for money lenders to charge higher interest rates than initially agreed upon and seize farmers' assets as compensation (Moahid and Maharjan 2020).

Households engaged in rice farming continue to show limited reliance on formal financial institutions, suggesting that financial transactions within this subsector are likely dominated by informal credit markets (Mishra 2021, Choudhary et al 2022). Insufficient research has hindered efforts to customize policies aimed at accelerating the utilization of formal agricultural credit. Earlier study (Mishra 2021) only identified factors influencing the use of formal agricultural credit in a general sense, with focus only on smallholder farmers. This study is confined to more than just smallholder farmers, and presents separate findings specific to existing formal sources, aiding policymakers and institutions in crafting more targeted and effective policies.

MATERIALS AND METHODS

The research was carried during January, 2023 in Chitwan district, Nepal. Chitwan is a prominent developed area in Nepal, with easy access to various formal financial institutions like banks, cooperatives, and microfinance for farming communities. Further, study confined to Rapti municipality, Ratnanagar municipality, Kalika municipality, and Khairahani municipality within the district. Selection of these municipalities was based on their accessibility to both formal and informal credit sources for farmers. This study targeted rice farmers, who heavily rely on agriculture credit. Population for the study is rice farmer who is current agriculture credit user. Randomly, 31 cooperative credit users, 23 bank credit users and 5 microfinance credit users were selected, making total formal credit users to 59 farmers. Similarly, 46 farmers using informal credit were selected, thus totaling sample size to 105 rice farmers. Credit users from banks, cooperatives, and microfinance were selected in such a way that they had never entered other sources of formal credit. Informal credit users were selected based on the criteria that they had never previously entered the formal credit market. Both formal and informal credit users have used credit multiple times by now. Primary data was collected using semi structured interview with household head. Similarly, Focus Group Discussion (FGD) was held among farmers and Key Informant Interview (KII) was held among farmers, officials of financial institutions and other government and non-

governmental institutions; municipality, Agriculture Knowledge Center (AKC) Chitwan, Prime Minister Agriculture Modernization Project (PMAMP) Chitwan, and local community-based organizations in the study area. Two FGD and KII were carried out in each municipality. Secondary data were collected from research articles and reports from PMAMP, AKC, and financial institutions.

Empirical model

Descriptive analysis was done using IBM SPSS Statistics 25. Logit model was employed using Stata/SE 12.1 in order to determine the factors influencing the use of formal agriculture credit. Further, to assess the effect of each independent variable on the use of formal agriculture credit, marginal effect on those variables was estimated in the logit model. As mentioned by earlier study (Mishra et al 2023);

Model specification

$Zi = \ln [Pi/(1-Pi)] = a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8+b_9X_9+b_{10}X_{10} +U$

Where, Pi = is the probability of use and no use of formal agriculture credit
Pi = 1 indicates use of formal agriculture credit
Pi = 0 indicates no use of formal agriculture credit
Dependent variable:
Zi = Probability of use of formal agricultural credit
Independent variables:
X_1 = Age (continuous)
X_2= Gender (dummy)
X_3 = Family size (continuous)
X_4 = Education (continuous)
X_5= Income (continuous)
X_6 =Off-farm income (dummy)
X_7 = Experience (continuous)
X_8 = Farm size (continuous)
X_9 = Membership (dummy)
X_{10} = Extension (continuous)
a = Intercept
b_1 to b_{10} = Regression coefficients of the dependent variables
U = Error term
The marginal probability of the factors influencing the use of formal agriculture credit was estimated based on expressions derived from the marginal effect of the logit model.

$$dZ/dQ = \beta_i [Pi(1 - Pi)]$$

Where,
βi = Estimated logit regression coefficient with respect to the i^{th} factor
Pi = Estimated probability of using formal agriculture credit by farmers

Further, to determine the factors influencing the choice of sources among formal agriculture credit users, same procedure using logit model was used to each of the identified sources. Independent variables were same to the use of formal agriculture credit.

Model specification

For particular source,
$Zi = \ln [Pi/(1-Pi)] = a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8+b_9X_9+b_{10}X_{10} +U$

Where, Pi = is the probability of use and no use of particular source
Pi = 1 indicates use of particular source
Pi = 0 indicates no use of particular source
The description of variables is presented in Table 1.

RESULTS AND DISCUSSION

Descriptive statistics

Table 1 presents summary statistics and explanations of the variables. It is observed that 56% of respondents utilized formal agriculture credit. The average age of respondents was 48.40 years, with male comprising 50% on average and a typical family size of 5.69 members. Respondents had an average of 6.04 years of formal schooling. Additionally, 38% of households received off-farm income, with an annual income averaging NPR

437619. The average farming experience was 23.35 years, with a farm size of 12.43 katha. Furthermore, 52% of respondents were involved in agricultural cooperatives, and on average, respondents had 0.38 interactions with extension workers.

Table 1: Descriptive statistics of the dependent and independent variables used in the study

Variable	Description	Mean (n=105)	SD	Min	Max
Dependent					
Formal credit	=1 if respondent use formal credit, 0 informal credit	0.56	0.49	0	1
Independent					
Age	Age of the respondent (year)	48.40	14.45	18	87
Gender	Gender of the respondent (1-male, 0-female)	0.50	0.50	0	1
Family size	Family member in household (number)	5.69	2.10	2	15
Education	Formal education of respondent (year)	6.04	5.02	0	19
Income	Annual income from rice (NPR)	437619	498891.60	20000	4000000
Off-farm income	=1 if household receive off-farm income, 0 otherwise	0.38	0.48	0	1
Experience	Farming experience of respondent (year)	23.35	15.18	5	50
Farm size	Farm size of respondent (katha)	12.43	8.89	4.42	38.38
Membership	=1 if respondent is member in agricultural cooperatives, 0 otherwise	0.52	0.50	0	1
Extension	Contact with extension workers in a year (number)	0.38	1.01	0	6

Source: Field survey (2023)

Status of utilized agriculture credit

Table 2: Utilization of formal and informal agriculture credit in the study area

Formal sources (n=59)				**Informal sources (n=46)**			
Institution	Interest	Amount (NPR)	Frequency	Sources	Interest	Amount (NPR)	Frequency
Bank	10-17%	100000-1500000	23 (38.98)	Neighbors	12-24%	50000-150000	14 (30.43)
Cooperative	12-16%	25000-780000	31 (52.54)	Money lenders	24-36%	100000-500000	32 (69.57)
Microfinance	10-18%	100000-500000	5 (8.48)				

Source: Field survey (2023)
Note: Figure in parentheses indicate percentage.

Table 2 presents the status of agriculture credit utilization. Results revealed that informal sources carry higher interest rates, reaching up to 36%, in contrast to formal sources with rates up to 18%. Agricultural cooperatives emerged as the primary preference for formal credit users, constituting 52.54% of acquisitions. In the informal sector, respondents predominantly rely on professional moneylenders for credit, accounting for 69.57% of acquisitions from this source.

Multiple responses were noted to analyze the reactions of credit users towards formal and informal sources. A majority of credit users, comprising 56.19%, cited timely, adequate, and lower interest rates as factors encouraging their utilization of formal agriculture credit. Among formal users, 52.54% solely rely on cooperatives for credit, driven by a sense of ownership, adaptable payment schemes, and friendly collateral procedures. Friendly collateral procedure is preferred and sought-after by users which includes credit based on the member's standing within the cooperative, their contribution to the cooperative's deposit, and their ability to repay the loan or even collateral free rather than requiring traditional forms of collateral. This group highlights psychological factors associated with banks, such as unfamiliar environments, concerns about news of asset auctioning in case of loan default, assets like farm household and land assessment prior to loan approval, and strong collateral requirements, which limit their preference for bank credit. Similarly, 38.98% who solely rely on banks for credit emphasize the availability of timely and adequate credit as the reason for choosing banks over cooperatives and microfinance. They highlight issues like long queues for credit from other formal sources as hindrances to their participation. Additionally, 8.48% of microfinance credit users point to personal relationships with institution employees as a factor in their participation.

Similarly, 43.80% of those using informal credit mentioned the ability to negotiate payment schedules with lenders in case of default and a practice that has been in place for a long time as a reason for informal sources of credit. Despite highlighting higher interest rates in informal sources, they find it convenient to repay the entire loan amount after marketing their produce. Among informal users, the majority (69.57%) rely exclusively on professional money lenders, citing the availability of timely and sufficient credit as the primary reason for choosing them over other sources. They mention the possibility of obtaining credit again for the next season in case of loan default as important aspect in obtaining credit with money lenders. However, noted instances of money lenders acquiring assets from credit users in rate lower than prevailing, in case of loan default for long period, a problem. Like, conflicts due to misconduct by money lenders are reported. Similarly, 30.43% of informal credit users solely depend on community members, emphasizing the lower interest rates offered by them as a deciding factor.

Characteristics of respondents using formal and informal source of credit

The results of differences between means of characteristics describing formal agriculture credit users and informal agriculture credit users are presented in Table 3. There was a significant difference in off-farm income source and membership to agricultural cooperatives among the groups. In study, we found that off-farm income source and membership to agricultural cooperatives are significantly higher for formal agriculture credit users compared with informal users. Likewise, there were no significant difference in other listed characteristics among the groups.

Table 3: Characteristics of formal credit users and informal credit users in the study area

Variable	Formal (n=59)	Informal (n=46)	Difference	t-value
Age	48.76	47.96	0.806	0.282
Gender	0.47	0.50	-0.039	-0.696
Family size	5.47	5.98	-0.504	-1.217
Education	5.68	6.52	-0.844	-0.852
Income	398389.83	487934.78	-89544.952	-0.912
Off-farm income	0.42	0.33	0.098	1.018*
Experience	24.14	22.35	1.788	0.597
Farm size	11.942	13.070	-1.128	-0.643
Membership	0.68	0.33	0.352	3.787***
Extension	0.37	0.39	-0.018	-0.092

Source: Field survey (2023)

Note: ***, * indicate significant at 1%, 10% level of significance, respectively.

Factors influencing the use of formal agriculture credit

Logit regression analysis was done to assess the factors influencing the use of formal agriculture credit and results are presented in Table 4. Marginal effect was also driven from the regression coefficients as shown in Table 4. Result showed that, two variables were statistically significant for the use of formal agricultural credit. They were off-farm income source and membership to agricultural cooperatives.

The off-farm income source was found statistically significant to the formal agriculture credit use in the study area at 5% level of significance. Keeping other factors constant, if farm household receive off-farm income, there is a probability of 25.85 percent increase in the use of formal agriculture credit. Income from farming is

received only after a certain period of marketing. Off-farm income plays a vital role in enabling farmers to fulfill the regular payment requirements imposed by formal institutions. Unlike income solely derived from farming activities, off-farm earnings offer a stable source of revenue, ensuring timely repayments. This reliability increases farmers' appeal to lenders, making it easier for them to obtain formal credit. Result is in line with earlier studies (Muhongayire et al 2013, Dube et al 2015, Masaood and Keshav 2020, Kiros and Meshesha 2022).

Similarly, membership to agricultural cooperatives was found statistically significant to the formal credit use in the study area at 1% level of significance. Keeping other factors constant, with membership to cooperatives, there was probability of 46.61 percent increase in the use formal agriculture credit. This might be due to the increment in awareness of farmers about the formal institution lending credits and financial literacy. Cooperatives are also the formal institutions which empower the farmers to use the credit facility in many areas, as they offer friendly collateral procedure driven credit facilities (Mishra and Bhatta 2021, Niraula et al 2023). Result is in line with previous studies (Wossen et al 2017, Nwosu et al 2020).

Table 4: Logit regression analysis and marginal effect for factors influencing the use of formal agriculture credit in the study area

Variable	Coef.	Std. Err.	p-value	dy/dx	Std. Err. (dy/dx)
Age	-0.0093	0.0213	0.663	-0.0022	0.0052
Gender	-0.5188	0.5228	0.231	-0.1258	0.1253
Family size	-0.1555	0.1240	0.210	-0.0379	0.0302
Education	0.0205	0.0563	0.715	0.0050	0.0137
Log income	-0.9656	0.6306	0.126	-0.2355	0.1534
Off-farm income	1.1103**	0.5374	0.039	0.2585	0.1166
Experience	0.0166	0.0161	0.303	0.0040	0.0039
Farm size	-0.0388	0.0266	0.145	-0.0094	0.0064
Membership	2.0534***	0.5108	0.000	0.4661	0.0985
Extension	0.0388	0.2457	0.874	0.0094	0.0599
Cons	5.6305	3.5412	0.112		

Source: Field survey (2023)

Note: Number of observations = 105. Model fits at 1% level of significance. ***, ** indicate significant at 1%, 5% level of significance, respectively.

Factors influencing choice of sources among formal agriculture credit users

Table 5: Factors influencing choice of sources among formal agriculture credit users in the study area

Variables	Cooperative	Bank	Microfinance
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
Age	-0.005(0.033)	0.064(0.039)	-0.090(0.057)
Gender	-0.004(0.805)	1.164(0.938)	-1.756(1.567)
Family size	-0.039(0.164)	0.021(0.180)	0.226(0.282)
Education	-0.215(0.099)**	0.045(0.099)	0.033(0.142)
Log income	-0.795(1.038)	0.785(1.106)	0.678(1.835)
Off-farm income	-3.287(0.931)***	0.529(0.977)	3.263(2.201)
Experience	-0.042(0.027)	0.021(0.031)	0.019(0.045)
Farm size	-0.002(0.038)	0.025(0.043)	0.043(0.067)
Membership	Not measured	-3.923(1.205)***	0.178(1.525)
Extension	-0.248(0.456)	-0.409(0.397)	0.439(0.496)*
Cons	8.874(6.130)	-7.321(6.385)	-6.232(9.960)

Source: Field survey (2023)

Note: Number of observations = 59. Model fits at 1% level of significance for cooperative and bank; at 10% for microfinance. *, **, *** indicate significance at 10%, 5%, 1% level of significance, respectively.

Logit regression analysis was done to assess the factors influencing the choice of sources among formal credit users and results are presented in Table 5. Result showed that, education, off-farm income source, membership to cooperatives and contact with extension workers were statistically significant in the choice of sources. Keeping other factors constant, probability of obtaining credit from cooperatives over other formal sources

increases with decrease in formal education of the respondent. Van Leuven et al (2024) reported having less formal education is linked to being underserved by banks. Farmers with lower levels of formal education tend to prefer cooperatives as their source of credit over banks and microfinance institutions due to several factors. First, cooperatives operate within the local community, making them more familiar and accessible to farmers with limited educational backgrounds (Lawrence et al 2022, Van Rijn 2022). These farmers often find comfort in dealing with individuals they know and trust, rather than navigating the complex formalities and paperwork associated with banks and microfinance institutions. Similarly, participation of resource poor farmers including lower formal schooling is higher in cooperatives as cooperatives offer a range of supplementary benefits such as training, technical support, and access to essential resources like credit, inputs and markets (Mishra and Bhatta 2021). With availability of easy and friendly collateral driven credit, farmers meet the financial needs from these sources.

Keeping other factors constant, probability of obtaining credit from cooperatives increases with no off-farm income source among farm household. Simhadri (2021) reported farmers preferring commercial bank over cooperative-bank had higher off-farm income. Cooperatives provide convenient, friendly collateral driven credit and more adaptable payment plans than banks and microfinance institutions. This makes credit accessible and affordable for farmers who have limited financial resources. Farm household with limited resources encounter difficulties in obtaining bank credit due to perceived higher risks associated with agricultural lending (Weber and Musshoff 2012). Credit unions may be more accessible over traditional bank to individuals who might be sensitive to interest rates (Van Rijn 2022). Previous studies (Asante-Addo et al 2017, Yu et al 2023) reported cooperatives offer better credit access to farm households without alternative income sources, as cooperatives often serve the financial needs of their members more directly than traditional institutions.

Keeping other factors constant, probability of obtaining credit from bank increases with no participation in cooperatives among farm household. When farmers aren't part of cooperatives, they miss out on the credit opportunities they offer exclusively to their members. As a result, they typically turn to banks as their next viable option. Especially for farmers in need of substantial credit, banks become the preferred choice due to their ability to provide larger loan amounts. This preference is further reinforced by the lower interest rates offered by banks for significant credit transactions, compared to cooperatives and other sources. Therefore, farmers who lack participation in cooperatives often find themselves relying on banks to meet their financial needs, particularly when seeking higher credit amounts.

Keeping other factors constant, probability of obtaining credit from microfinance increases with increase in contact with extension worker. Having contact with extension workers enhances farmers' awareness of various credit sources, thereby easing their utilization of microfinance as a credit option. Extension workers could potentially play a role in these areas by providing micro finance institutions with more reliable information about potential borrowers, thereby possibly influencing the probability of credit approval (Pollinger et al 2007, Jumpah and Adams 2020, Assairh et al 2021). Flexible microfinance loans can improve credit access for farmers, which could be an alternative to traditional bank and cooperative loans in certain cases (Weber and Musshoff 2013).

CONCLUSION

Research revealed that use of formal agriculture credit increases with availability of off-farm income source and membership to agricultural cooperatives among farm household. Hence, the extension agencies of formal institution, government and non-governmental institutions should primarily focus on household with off-farm income source for efficient utilization of formal credit. Measures should be undertaken to promote the participation of farming communities to agriculture cooperatives for increased usage of formal credit. Similarly, choice of cooperatives over bank and microfinance increases with less formal education of farm household head and no off-farm income source to farm household. Like, choice of bank increases with no participation in agricultural cooperatives by farm household and choice of microfinance increases with higher contact with extension worker by farm household head. Agricultural cooperatives need to be strengthened to better support formal credit users who have less formal education and no off-farm income. In contrast, banks should enhance their credit offerings to farming communities without access to cooperatives. Moreover, increasing interaction between extension workers and heads of farming households could promote greater use of formal credit from microfinance institutions.

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AUTHORS' CONTRIBUTION

Bikram Kumar Singh and Binayak Prakash Mishra designed the research, conducted primary data collection, performed data analysis, and prepared the manuscript. Om Prakash Singh, Sushmita Bhatta, and Smriti Sapkota reviewed the initial draft, providing additional inputs to finalize the manuscript.

CONFLICTS OF INTEREST

There is no conflict of interest regarding this manuscript.

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