CHOICE OF AGRICULTURAL CREDIT SOURCES BY NEPALESE FARMERS

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Abstract:
Nepal is predominantly an agricultural country. More than 35% of its GDP depends on agriculture. About 65% of Nepalese people rely agriculture for their livelihood. Agricultural credit plays a major role in agricultural development. Different sources are available in the agricultural credit market in Nepal. Formal sources include agricultural development bank, farmers' cooperatives, and other financial institutions while informal sources include borrowing from farmers group, women group, and money lender individual (mostly relatives). Several factors might play a role in selecting different credit sources: types of agricultural commodities, buying different operating inputs (machinery, seeds, and fertilizers), buying fixed inputs (machinery and equipment), interest rate, and reimbursement plan. In this paper, we want to determine which source is the most popular among the farmers of Nepal and explain why that particular source is a choice for farmers. We use Nepalese agricultural census data for the fiscal year 2011/12 and multinomial logit model for this analysis. The result of this study will explain the factors affecting the choice of agricultural credit and most popular credit sources in Nepal and come up with some policy recommendations. This would enrich literature in explaining the choice of agricultural credit sources in other developing countries like Nepal.

Keywords: agricultural credit, survey data, multinomial logit, farmers

1. Introduction

The nature of financial activity is of a fundamentally different variant in rural areas than in urban areas. To what needs does financial intermediation cater to and the tools of credit creation in both the settings are starkly apart. Urban credit needs are determined by the demands of industrial activity with purposes ranging from seed capital to start a business, expansion, capital replenishment and to cope with shocks in the external economic environment. The conditions under which industrial activity takes place is relatively stable as compared to rural agricultural activity. The organization of rural economic activity in general, and agricultural production in particular, is strongly conditioned by the fact that inputs are transformed into outputs with considerable time lags, and that production and sale outcomes can be highly uncertain because of the vagaries of nature or the swings of volatile commodity markets. In such environments, the ability of agricultural enterprises and rural households to make long term investments, take calculated risks, and create stable consumption streams will be shaped by the set of available financial instruments and strategies to transform one pattern of variable and uncertain resource inflows and outflows into another. If the available set of financial services is very limited, households may have to forego valuable investment and income-generating activities and suffer the consequences of volatile consumption (Conning and Udry 2007).

Nepalese Agriculture is in a low development stage. The sector still has more than two-thirds of the population engaged in agriculture, productivity and competitiveness of the sector are low, adoption of improved technology is fettered and even though most cultivated area is devoted to cereals, food trade deficit and malnutrition has been

growing. When the long-term agricultural strategic plan known as the Agriculture Perspective Plan (APP) was launched in 1995-96, the Nepalese agricultural sector was performing much worse than today. The current low development status of Nepalese agriculture spuriously makes us forget that over the past two decades, there has been improvement in living standards and that the agricultural sector overall is performing better today than in the past. Productivity, infrastructure, food security, and poverty have improved. However, some indicators such as food and agricultural trade deficit and land per capita have headed south. In spite of relative performance improvement than the past, agricultural sector in Nepal is still tottering. The improvement has been too little and the change has been deceptively too slow, both in terms of what the country had planned to achieve and relative to the progress made by its neighbors over the same period of time. In the agricultural case, growth has been not only slow (about 3%), but also highly inconsistent. Nepal's youth and some of its most productive labor force have emigrated for job elsewhere. About 300,000 migrants leave Nepal annually and this has been a growing trend for the past 10 years. Though remittance growth has shown a positive trend, estimated at over $3 billion per year (representing more than 20% of GDP), these resources have mostly gone into consumption and loan repayment rather than capital formation and investment. A number of factors explain the weak growth performance of agriculture over the past two decades. During this period the 12-year conflict that concluded in 2006 had adverse effects on the agricultural sector. Hundreds of thousands of rural households left the land behind and moved to the cities - mostly to the Kathmandu Valley; others moved abroad. These movements of rural population resulted in a situation of labor and investment scarcity in rural areas. Rapidly growing

urbanization implied that large tracts of peri-urban fertile agricultural land have been converted to residential uses. Political instability has resulted in the lack of stable government and leaders who could make a continued effort to implement policies, plans, and programs. Policies have proliferated, allegedly in favor of agriculture, but in many cases policies have been left at the draft stage, and lacked the supporting legislation and resources for implementation (MOAD 2014).

Poverty is still an Achilles heel (25% of the population) in a country abound with geographically remote and inaccessible mountain terrain. Most of the poor inhabit the rural areas and poverty is closely associated to a stagnant agricultural growth and rural economy. The rural population remains large and increasing despite urbanization, from about 18 million (89% of total) in 1996 to 24 million (82%) in 2010 (MOAD 2014). Agriculture employed about 14 million persons in 2010, 64% of the workforce. Gains in reducing poverty cannot be attributed solely to development of the agriculture sector, as there have been significant other influences including increased urban employment, remittances from migrant labor abroad, and increasing GDP contributions from sectors other than agriculture including tourism and services. Women farmers' participation increased from 40% to 50%. Similarly, disadvantaged groups comprised over 50% of total participating farmers (MOAD 2014).

The need for viable rural financial services remains a constraint to rural commercial development in Nepal. Asian Development Bank (ADB) has moved away from agricultural financing, but commercial banks have not yet filled the gap. The relevant policy is the Nepalese Government’s Financial Sector Reform Program (2009), implemented in coordination with the International Monetary Fund (IMF), World Bank

and ADB. The ADB financed Rural Finance Sector Development Cluster Program (2006-12) is developing an enabling environment for the rural finance sector through policy, legal, regulatory, and institutional reforms. The program helped reinstate ADB as a strong financial institution focused on agricultural and rural development, and improved the delivery mechanism for rural finance. The institutional development of the major rural finance institutions is expected to result in a credit environment with improved supervision and regulation. The institutions are moving toward eventual privatization (MOAD 2014).

2. Literature Review

Manig (1990) says that in development policy, the capital bottleneck hypothesis of economic development theories led to the establishment of formal credit institutions and to the supply of capital in the form of credits. However, in most developing countries, the formal credit institutions have failed to reasonably meet the demand for agricultural credit with regard to conditions, access, periods, quantity and administrative management. They were particularly unable to do this for all groups of farmers since formal credits are offered within an existing institutional system involving certain societal modes of distribution. In heterogeneous societal structures with uneven modes of distribution, the government's interest-subsidized loans are usually distributed in accordance with the institutional redistribution mechanisms. Elite groups use their economic, social and political position to reserve the advantages of the credit programs for themselves. Often, the target groups are no longer able to obtain credit since funds are scarce (Manig 1990).

(Zeller 1994) says that formal credit accessibility is, subject to collateral demands, of the agencies providing them, as a measure of risk reduction. Lenders often demand collateral in order to ascertain the borrower's creditworthiness and to increase the risk-adjusted return on the loan. Collateral requirements have been identified as a major determinant of the lender's decision to ration loan demand. The majority of formal lenders in developed and developing countries require physical collateral such as land. This lending policy is regressive for tenants, wage laborers, smallholders, and small-scale rural enterprises. It has serious implications for growth and equity objectives of development policy. It seems to be a travesty that the marginalized rural dwellers who were ostensibly to receive and benefit from formal credit disbursed via commercial/development banks, credit unions etc. by government sources are denied such access and the elite/large landowners should benefit at the cost of their disadvantaged counterparts. Therefore, there obviously is a void in the rural credit market which has to be filled. This is where informal credit sources come into the picture. (Basu 1997) says that the rural credit market in general is comprised of institutional credit agencies, private moneylenders, landlords (who include money-lending rich farmers), retail shops and grain traders. Interest rates not only vary between lenders and regions but they vary according to the purpose for which the loan is sought. Analysis done by (Boucher and Guirkinger 2007) shows that informal lenders' better access to local information allows them to offer contracts with lower collateral. As a result, an informal loan may be demanded both by those who cannot post the collateral required by the formal sector and by those who can but are unwilling to do so because of the associated

risk. The ensuing collateral reduction, however, comes at a cost as informal lenders expend resources on monitoring that must be recovered via a higher interest.

At the informal end of the continuum, submarkets (and lenders) are characterized by highly personalized loan transactions entailing face-to-face dealings with borrowers, and flexibility in respect of loan purpose, interest rates, collateral requirements, maturity periods and debt rescheduling. At the other end is the formal sector in which the scale of operations of individual lenders is much larger, transactions are usually arms' length, and loan terms more standardized. Moreover, the formal sector is subject to a variety of regulations relating to capital, reserve and liquidity requirements, ceilings on lending and deposit interest rates, mandatory credit targets, and audit and reporting requirements. Together with constraints imposed by the internal bureaucratic procedures of large- scale formal sector institutions, these requirements raise transactions costs in the formal sector to levels usually well above that in the informal (Ghate 1992). Informal lenders often use collateral substitutes. Third-party guarantees, tied contracts, and threat of loss of future access to credit are common devices in informal contracts. The efficient use of collateral substitutes depends on the ability of the lender to obtain information about the creditworthiness of the borrower at a low cost (Zeller 1994). Since formal sector loans are relatively cheap and the formal authorities not so well equipped in terms of client and local information, credit is rationed in the rural sector. Different clients are charged different rates of interest - which is to say that not all clients who demand credit at a particular rate get it. Only a select few get apportioned loanable funds at a particular rate. Any guesses for what the criteria/criterion for selection might be?

The existence of an informal credit market alongside a formal market where interest rates are substantially lower has long been recognized as a key feature of rural credit markets in developing countries and has received continuous attention in the field of development economics. Not only is the persistent segmentation of credit markets into an expensive informal sector and a cheaper formal sector puzzling, it is also worrying on equity grounds. As the poor typically rely on expensive informal credit to finance their economic activities, they may systematically earn a lower return, from their investment and thereby be on a slow wealth accumulation path than the rich who borrow in formal markets (Guirkinger 2008). One of the often noted features of less developed agrarian economies is the existence of interlinkages among the land, labor, credit, and product markets. The landlord is often the supplier of credit; he frequently purchases and markets the output of the tenant farmers; and he often sells raw materials (fertilizers) and even consumption goods to his tenant farmers (Braverman and Stiglitz 1982). (Mansuri 2007) says that the informal market is often characterized by heterogeneous non-specialists for whom money lending is a means of increasing returns to other economic activities. However, not all informal lenders are equally placed in lending to all rural households. In particular, occupational differences among lenders generate systematic differences in the cost and reliability of the information that each lender can acquire, and in the lender's enforcement capacity with respect to particular types of borrowers. One consequence of this is that borrowers are sorted across lenders, giving rise to distinct market niches. The picture that emerges is one of a fragmented market, with lenders who often exercise effective monopoly in identifiable pockets, but are nonetheless restricted to fairly narrow sub-domains of the market.

3. Objectives of the study

A perusal of the extensive literature on rural credit markets makes a fact of ubiquitous inter-linked formal and informal credit markets beyond a shadow of doubt. Most of the literature focusses on the supply of rural credit in developing countries with mild to scathing critiques of top down approach to rural credit need satisfaction. Governments/regimes in developing countries need to shoulder most of the blame for shoddy implementation of rural credit policies, interwoven with economic development aspirations; and for perhaps having a myopic perspective on the real needs of rural agriculturalists in particular. The Nepalese variety of such policymakers are no exception. It is important to eviscerate the factors which affect credit demand decisions of rural agriculturalists in Nepal and what factors contribute to choice of formal or informal (or both) source. Ceteris paribus, what drives the credit demand decision to veer towards formal or informal (or mixed usage) source of credit? Several factors might play a role in selecting different credit sources: types of agricultural commodities, buying different operating inputs (machinery, seeds, and fertilizers), buying fixed inputs (machinery and equipment), interest rate, and reimbursement plan. In this paper, we want to determine which source is the most popular among the farmers of Nepal and explain why that particular source is a choice for farmers. We use Nepalese agricultural census data for the fiscal year 2011/12 and multinomial logit model for this analysis. The result of this study will explain the factors affecting the choice of agricultural credit and most popular credit sources in Nepal and come up with some policy recommendations. This would enrich the literature in explaining the choice of agricultural credit sources in other developing countries like Nepal.

4. Data Source and Description

The study uses data from the National Census of Agriculture Nepal 2011-12 conducted and prepared by the Central Bureau of Statistics (CBS). The first National Sample Census of Agriculture was conducted in 1961/62 and since then, CBS has given continuity to this operation. The sampling frame used for the agriculture census is basically derived from the household schedule of the National Population and Housing Census 2011 which contains information about the holdings of agricultural land, household information, credit source and livestock as well. The sample census was carried across all 75 districts of Nepal. It adopted a two-step selection sampling technique. For the first phase, 5200 wards/ward groups were selected and in the second phase 124400 agricultural households were identified. The responses of the selected agricultural households were collected by direct interviews by assigned enumerators. The sample does not include corporate/commercial farmers and the identification of an agricultural household was done under desired criterion as per geographical location.

For this study we used the variables mentioned in table 1.

Table 1: Description of the variables used

VARIABLE	DEFINITION
LOANSOURCE	Source of credit (cooperative, relative/friend and bank)
HHSIZE	Number of people living in a household
GENDER	Sex of household head
DALIT	One of the caste group (so called lowest caste group)
BRAHMIN	Another category of caste
JANAJATI	One of the ethnic group of caste system
MJECO_ACTVT	Economic activities of household head (4 major group)
YRSCH	Years of schooling of household head
AGE	Age of the household head
OCCUP	Occupation of household head (categorized in four group)
EASTERN	Eastern development region
CENTRAL	Central development region
WESTERN	Western development region
MIDWESTERN	Mid-western development region
TOTAL_AREA	Land holding by a household
MPRODN	Major production of a household

The observation consists of three group of loan source: cooperative (farmers group, female group and cooperatives), relative/ friends, and bank source. Gender represents the sex of household head in a family. Three major caste group (Brahmin, janajati and dalit) are included in the study. The variable major economic activity has four categories in which categoty1 includes the activity of household head involved in mine, industry and construction, category 2 includes household head involved in wholesale and hotel, category 3 includes the involvement in transportation and communication, and category 4

includes involvement in education, health and social work. Similarly, we categorized occupation into four group (agricultural sector, government work, business and technician/ expert). Major production sectors are cereal, livestock, fruit/vegetable and bird.

Table 2 displays the descriptive statistics of the variables used in this study. Out of 125,000 household information, we have 1694 household information regarding agricultural credit. Household size ranges from 2 to 17 members, years of schooling ranges from 1 to 22 years, age ranges from 20 to 83 and land holding from 0.0016 hectare to 2.86 Ha.

Table 2: Descriptive statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
LOANSOURCE	1694	1.9906	0.8599	1	3
HHSIZE	1694	5.9593	2.5102	2	17
GENDER	1694	0.2255	0.4180	0	1
DALIT	1694	0.1009	0.3013	0	1
BRAHMIN	1694	0.3843	0.4866	0	1
JANAJATI	1694	0.3123	0.4636	0	1
MJECO_ACTVT	1694	2.1919	1.1006	1	4
YRSCH	1694	7.9534	3.4334	1	22
AGE	1694	41.9699	10.7453	20	83
OCCUP	1694	1.7857	1.0763	1	4
EASTERN	1694	0.3849	0.4867	0	1
CENTRAL	1694	0.1747	0.3799	0	1
WESTERN	1694	0.1954	0.3966	0	1
MIDWESTERN	1694	0.1328	0.3395	0	1
TOTAL_AREA	1694	0.3180	0.4461	0.0016	2.8647
MPRODN	1694	1.1364	0.4385	1	3

5. Methodology

In this study we estimate a model of farmers' participation in agricultural credit and credit source determination. Three categories of credit source are specified: credit from cooperatives, credit from relatives/ friends, and credit from different banking sectors. We begin with general specification applying some statistical test if these categorization are appropriate. As we see the discrete choice involved, multinomial logit model would be appropriate approach to estimate the probabilities that each individual chooses each sector of credit source. The model is derived from the theory of probabilistic choice developed by D. McFadden. It is based on the utility maximization in which utility conditional on the choice of farmers' alternative j for credit selection is specified in linear form: $V_{ij} = B_j X_i + u_{ij}$

Where, V_{ij} is the indirect utility function of individual i for selecting agricultural credit source j which is a linear function of explanatory variables ($\mathbf{X}_i$) such as household size, caste, occupation, economic activities, gender, age and regional factors; β_j is the vector of parameters to be estimated; and u_{ij} is the stochastic component of utility capturing unobserved determinants of credit source. The individual farmer is assumed to choose the credit source k (k=1, 2, 3) for which V_{ij} is the highest. Thus the probability of choosing sector j by an individual I, is given by

$$P_{ij} = \Pr (V_j > V_k) \text{ for all } j \neq k$$

$$= \text{pr} (\beta_j X_i + u_{ij} > \beta_k X_i + u_{ik})$$

$$= \Pr (\beta_j X_i - \beta_k X_i > u_{ik} - u_{ij})$$

Assuming u_{ij}'s are distributed independently and identically, their difference have a logistic distribution and the probabilities take the multinomial logit form which can be estimated by easily. The estimated coefficients β_j are interpreted as the effect of variable on the utility of being in credit source alternative j compared to the utility from the base category of credit source.

Consider the outcomes 1, 2, 3 recorded in j, and the explanatory variables X. Assume that there are j = 3 outcomes: "cooperative", "relative/friend", and "bank". In the multinomial logit model, we estimate a set of coefficients, β_1, β_2 and β_3, corresponding to each outcome:

$$\Pr(j = 1) = \frac{e^{X\beta_1}}{e^{X\beta_1)} + e^{X\beta_2} + e^{X\beta_3}}$$

$$\Pr(j=2) = \frac{e^{X\beta_2}}{e^{X\beta_1)} + e^{X\beta_2} + e^{X\beta_3}}$$

$$\Pr(j=3) = \frac{e^{X\beta_3}}{e^{X\beta_1)} + e^{X\beta_2} + e^{X\beta_3}}$$

The model, however, is unidentified in the sense that there is more than one solution to β_1, β_2 and β_3 that leads to the same probabilities for j = 1, 2, 3. To identify the model, we arbitrarily set one of β_1, β_2 or β_3 equal to 0 — it does not matter which. That is, if we arbitrarily set $\beta_1 = 0$, the remaining coefficients $\beta_2$and β_3 will measure the change relative to the j = 1 group. The coefficients will differ because they have different interpretations, but the predicted probabilities for j = 1, 2, and 3 will still be the same. Thus either parameterization will be a solution to the same underlying model.

Setting $\beta_1 = 0$, the equations become

$$\Pr(j = 1) = \frac{1}{1 + e^{X\beta_2} + e^{X\beta_3}}$$

$$\Pr(j = 2) = \frac{e^{X\beta_2}}{1 + e^{X\beta_2} + e^{X\beta_3}}$$

$$\Pr(j = 3) = \frac{e^{X\beta_3}}{1 + e^{X\beta_2} + e^{X\beta_3}}$$

The relative probability of j = 2 to the base outcome is $\frac{\Pr(y = 2)}{\Pr(y = 1)} = e^{X\beta^2}$

Let's call this ratio the relative risk, and let's further assume that X and $\beta_k^{(2)}$ are vectors equal to $(X_1, X_2, \ldots, X_k)$ and $(\beta_1, \beta_2, \ldots\ldots, \beta_k)'$ respectively. The ratio of the relative risk for a one-unit change in x_i is then

$$\frac{e^{\beta_1{}^2 X_1 + \ldots. + \beta_1{}^2 (X_i + 1) + \ldots.. + \beta_k{}^2 X_k}}{e^{\beta_1{}^2 X_1 + \ldots. + \beta_1{}^2 X_i + \ldots.. + \beta_k{}^2 X_k}} = e^{\beta_i^2}$$

Thus the exponentiated value of a coefficient is the relative-risk ratio for a one-unit change in the corresponding variable (risk is measured as the risk of the outcome relative to the base outcome).

5.1. Empirical Results

Table 3 represents the estimated results for factors affecting agricultural credit choice.

Table 3: Estimated results using multinomial logit method

VARIABLES	COOPERATIVE (Base outcome)	RELATIVE	BANK
HHSIZE		-0.0159	0.0704**
		(0.0316)	(0.0301)
GENDER		0.867***	0.610***
		(0.184)	(0.168)
DALIT		-0.0737	0.885***
		(0.301)	(0.256)
JANAJATI		-0.876***	-0.881***
		(0.217)	(0.186)
2.MJECO_ACTVT		0.434**	-0.0455
		(0.172)	(0.165)
4.MJECO_ACTVT		0.434**	0.480**
		(0.216)	(0.189)
YRSCH		0.0222	0.111***
		(0.0245)	(0.0226)
AGE		-0.0206***	0.0087
		(0.00721)	(0.0066)
3.OCCUP		-0.162	0.694***
		(0.169)	(0.154)
4.OCCUP		-1.949***	0.386
		(0.435)	(0.247)
EASTERN		-0.395*	17.75
		(0.226)	(707.2)
CENTRAL		-1.586***	17.76
		(0.295)	(707.2)
WESTERN		-1.333***	17.29
		(0.256)	(707.2)
TOTAL_AREA		0.257	0.487***
		(0.189)	(0.169)
3.MPRODN		-0.980**	0.724**
		(0.477)	(0.314)
CONSTANT		0.753	-19.54
		(0.466)	(707.2)
OBSERVATIONS	1,694	1,694	1,694

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

We have reported the results that are significant at least in one of the groups of outcome. We specified cooperative as base group and compared the coefficients of other credit sources (relative and bank source) to base group of credit source. We interpret the estimated coefficients of relative group and bank group comparing with cooperative group of loan source. The gender coefficient indicates that the multinomial logit for male relative to female is 0.867 unit higher for borrowing from relatives/friend source and 0.61 unit higher from bank compared to cooperative source given all other predictor variables are held constant. One unit increase in janajati, the multinomial log- odds for relative group compared to cooperative group would expected to decrease by 0.876 unit and for bank group, it would be decreased by 0.881 unit compared to cooperative group. Similarly, coefficients in age, occupation category 3 (business), regions and major production for relative group decrease compared to cooperative credit group.

Except for the coefficient of janajati in bank source, household size, dalit, major economic activity (education/ health/ social work group), occupation (business group), land holding and major production would be expected to increase compared to cooperative credit group. Bank source seems to be more attractive for agricultural credit compared to cooperative source.

5.2. Marginal effect

Table 4: Marginal effect of occupation and major economic activities

	Delta- method					
	Margin	Std. Err.	z	p>|z|	95% Conf.	Interval
OCCUP						
1.AGRI.	0.2655	0.0119	22.32	00	0.2422	0.2888
2. GOV.	0.4267	3.3508	0.13	0.89	-6.1407	6.9941
3. BUSINESS	0.2040	0.0170	11.98	00	0.1706	0.2374
4. TECH/EXP.	0.0609	0.0212	2.87	0.004	0.0193	0.1024
MJECO_ACTVT						
1.INDUSTRY	0.2014	0.0153	13.17	00	0.1714	0.2314
2. WHOLESALE	0.2615	0.0147	17.81	00	0.2328	0.2903
3. TRANSPORT	0.2365	0.0302	7.83	00	0.1773	0.2956
4. EDU./SOC.	0.2301	0.0196	11.72	00	0.1917	0.2686

We tried to obtain the marginal effect of explanatory variables using delta method but able to reported occupation and major economic activities only. Results show that except for occupation category 2 (government service), others are statistically significant. In brief, major influential factors for credit selection seem to be caste category, years of schooling, land holding, development regions and occupation. This is just a preliminary result, we will estimate and evaluate the results in detail in upcoming paper.

5.3. Independence of irrelevant alternative (IIA) Test

We employed Hausman test for testing IIA property which is the stringent assumption of multinomial logit model that the outcome categories should follow it. However; we are unable to get positive definite in our preliminary result. We might have some problems in the data and may require some additional information. We gather all information and follow standard procedure of estimation later on.

6. Future work

In our initial phase of this study, some of the information regarding household characteristics such as income, technology adoption, access to market, extension service are missing suffers. We will get enough information that affects in selecting agricultural credit source. Then we will go through an intensive empirical work that includes testing for IIA, getting marginal effect of each variables, relative risk ratio and model fit. We will test the hypothesis for in each step wherever required to maintain the consistency regarding model fit. After those steps, we will be able to interpret the parameters correctly and will be able to suggest its policy implication regarding the agricultural credit selection among the farmers. We will follow standard procedure of multinomial logit model by testing all of its required assumptions. If some of the assumptions such as IIA criteria is violated, we will adopt alternative methodology.

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