

**AGRICULTURAL CREDIT AND ITS IMPACT ON FARM
PRODUCTIVITY: A CASE STUDY OF KAILALI DISTRICT**



Nepal Rastra Bank
Banking Development and Research Unit
Dhangadhi Office
November, 2014

FOREWORD

This study was carried out by Banking Development and Research Unit of Nepal Rastra Bank, Dhangadhi Office. The study aims at exploring the problems related to the procurement and use of agricultural credit by farmers in Kailali district, investigate the major determinants considered by banks and financial institutions while disbursing such credit and assess the impact of such credit on farmers' technical efficiency and productivity.

I believe that the findings of this study will be beneficial for policy makers, national and international agencies working in the area of Nepalese agricultural sector, and all others interested in this area. The study reveals the need for easing the access to agricultural credit, reducing the credit interest rate and extending the formal financial intermediation in the rural areas of the district. Easier access to credit will ultimately contribute to higher productivity of the farmers enabling them to attain higher technical efficiency.

I would like to thank all the members of the Banking Development and Research Unit of Nepal Rastra Bank, Dhangadhi Office for their continued devotion. In particular, this study would not have been possible without the persistent effort and continuous patience of Assistant Manager Mr. Siddha Raj Bhatta. He deserves special appreciation for survey design, data compilation and processing, statistical analysis, and report writing. Let me also thank Deputy Manager Binod Raj Lekhak for providing moral support to the research staff and Assistant Managers Mr. Prem Chand and Mr. Bharat Owd, and Assistant Mr. Lalit Karki for their support, cooperation and tireless efforts in data collection. Patience of all the survey respondents is praiseworthy for their invaluable time and information.

I would like to thank Corporate Planning Department for budget allocation and Research Department for comments and suggestions on the research proposal. Nepal Rastra Bank, Dhangadhi Office bears the sole responsibility for any errors and discrepancies in this report.

.....
Dr. Gunakar Bhatta
Manager
Nepal Rastra Bank
Dhangadhi Office

TABLE OF CONTENTS

FOREWORD	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	iv
LIST OF CHARTS	v
LIST OF ACRONYMS	vi
EXECUTIVE SUMMARY	vii-viii
1. CHAPTER ONE: INTRODUCTION	1-3
1.1 Background	1
1.2 Objectives of the Study	2
1.3 Significance of the Study	2
1.4 Limitations of the Study	3
2. CHAPTER TWO: REVIEW OF LITERATURE	4-6
3. CHAPTER THREE: RESEARCH METHODOLOGY	7-12
3.1 Research Design	7
3.2 Population of the Study	7
3.3 Sample Size and Sampling Technique	7
3.4 Data Collection Instrument	8
3.5 Data Analysis	8
3.5.1 Cobb-Douglas Production Function	8
3.5.2 Stochastic Frontier Analysis (SFA) Production Function	10
4. CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS	13-24
4.1 Growth and Structure of Agricultural Lending in Kailali District	13
4.2 Socioeconomic and Demographic Characteristics of Sample Farmers	14
4.3 Procurement of Agricultural Credit	16
4.4 Determinants of Agricultural Lending	18
4.5 Impact of Agricultural Credit on Farm Productivity	18
4.5.1 Cobb-Douglas Production Function Estimation Results	18
4.5.2 Stochastic Frontier Analysis Estimation Results	22
5. CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS	25-26
5.1 Conclusions and Recommendations	25
REFERENCES	27-28
APPENDIX	29-35

LIST OF TABLES

Table 3.1	: Distribution of Sample Farmers	8
Table 4.1	: Summary Statistics of Age and Household Size	14
Table 4.2	: Credit Procurement and Interest Rate Paid by Farmers	17
Table 4.3	: Estimation Result of Cobb-Douglas Production Function	19
Table 4.4	: Breusch-Pagan Test for Heteroskedasticity	20
Table 4.5	: Multicollinearity Test Results	20
Table 4.6	: Ramsey RESET Test Results	21
Table 4.7	: LINK Test Results	21
Table 4.8	: Shapiro-Wilk W Test Results	22
Table 4.9	: Descriptive Statistics of Technical Efficiency Scores	22
Table 4.10	: Distribution of Technical Efficiency between Credit-Users and Non-Users	23
Table 4.11	: Final MLE Estimates	24

LIST OF CHARTS

Chart 1.1	: Share of Agricultural Credit to Total Credit by Commercial Banks in Nepal	2
Chart 4.1	: Total Agricultural Lending by BFIs in Kailali District	13
Chart 4.2	: Average Lending to Agricultural Sectors	14
Chart 4.3	: Distribution of Household Head of Sample Farmers by Sex	15
Chart 4.4	: Distribution of Sample Farmers by Caste	15
Chart 4.5	: Distribution of Sample Farmers by Occupation	15
Chart 4.6	: Distribution of Sample Farmers by Religion	15
Chart 4.7	: Educational Status of Sample Farmers	16
Chart 4.8	: Distribution of Sample Farmers by Land Size	16
Chart 4.9	: Difficulty of Credit Receipt by Sample Farmers	17
Chart 4.10	: Factors Responsible for Credit Constrained Situation	17
Chart 4.11	: Determinants of Agricultural Lending	18
Chart 4.12	: Plot of Actual and Fitted Values of \ln_yield	21
Chart 4.13	: Plot of Kernel Density Estimate of Residuals	22

LIST OF ACRONYMS

BFI	:	Bank and Financial Institutions
FY	:	Fiscal Year
GDP	:	Gross Domestic Product
MLE	:	Maximum Likelihood Estimate
NRB	:	Nepal Rastra Bank
OLS	:	Ordinary Least Squares
RESET	:	Regression Error Specification Test
SFA	:	Stochastic Frontier Analysis
TE	:	Technical Efficiency
VDC	:	Village Development Committee
VIF	:	Variance Inflation Factor

EXECUTIVE SUMMARY

- ✎ This study is based on a survey conducted by Nepal Rastra Bank, Dhangadhi Office with a sample of 100 farmers (50 agricultural credit users and 50 credit non-users) and 10 officials from banks and financial institutions working in the area of agricultural credit from Kailali District, Far-Western Nepal.
- ✎ Agricultural credit in Kailali district is on **rising trend** during the recent years. It has reached **Rs. 940 million in January 2014** from **Rs. 336 million in July 2010**. However, most of such credit has been disbursed in **urban and semi-urban** areas only. Thus, there is a need to extend the formal financial intermediation services in the rural areas also.
- ✎ Credit from banks and financial institutions to agriculture sector has been disbursed mainly for financing the **capital instruments** like tractors, threshers, trailers, etc. The share of such credit for **mini-irrigation services, fertilizer, pesticides and improved seeds** has been **very low**. To increase the farmers' access to better inputs and mechanized farming methods and thereby raising farm productivity, more credit should be disbursed to purchase better inputs besides capital instruments.
- ✎ Farmers of the study area **do not have an easy access to agricultural credit**. They do not get as much credit as required to finance the inputs of agricultural production. Moreover, they have to bear a **high interest rate** while taking credit from micro credit banks and rural development bank. It is, thus, necessary to improve their access to agricultural credit at a lower interest rate.
- ✎ Farmers have not benefited very much from the use of credit for the production of food crops and vegetables in the study area. This is due to **the high interest rate** charged on such credit and **low rate of return from agricultural sector**. **Farmers, thus, should be imparted the technical know-how about how to utilize credit for the enhancement of farm productivity by using better farming inputs and better farming practices.**
- ✎ Banks and financial institutions are skeptic about the repayment of loan disbursed to agricultural sector. So, they demand a lot of mortgage and annual income of farmers. Small farmers have, thus, little access to agricultural credit. This problem can be resolved by introducing agricultural insurance policies, ensuring fair market price of agricultural products and raising the productivity of agriculture sector.

- ✎ Agricultural credit has helped to enhance the agricultural productivity of the farmers in the study area. With such a credit facility, farmers have a better access to improved seeds, fertilizer, pesticides and better irrigation facility. In the study area, all the farmers using the credit facility have achieved **a higher technical efficiency level. (82 percent on the average)** whereas **the farmers not using the credit facility have a lower level of technical efficiency (63 percent on the average)**. Thus, agricultural credit services should be extended and deepened even in the rural areas to increase the access of the farmers to better inputs and mechanized techniques of production so that the farmers can attain higher level of technical efficiency.

CHAPTER ONE

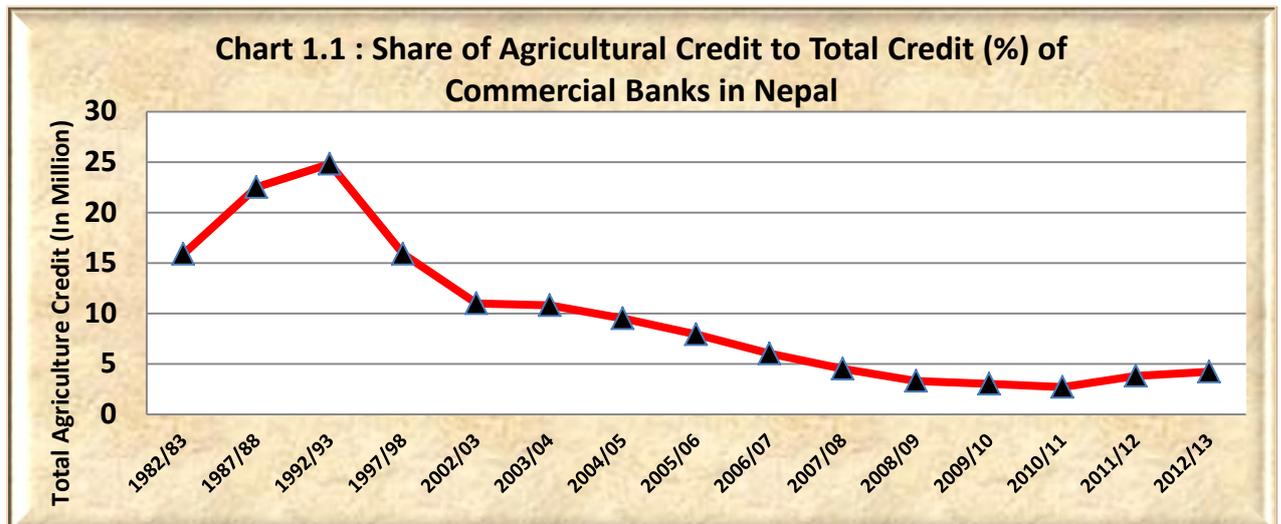
INTRODUCTION

1.1 Background

Agricultural sector has been one of the effervescent sectors lubricating the industrial sector as well as the overall growth of the economy of the developing economies. In the past, it was viewed as the passive sector in the development process. In the last few years, however, it has been taken as an active sector and a co-partner of the industrial sector in the development process (Thorbecke, 1970). In the less developed world where majority of the people depend on agriculture as a source of livelihood and a significant portion of domestic value added comes from agricultural sector, it has been one of the widely discussed public policy topic.

Different issues pertaining to agricultural sector hit the discussions and dialogues among policymakers of the underdeveloped economies while formulating, implementing and evaluating the policies concerning agricultural sector. Some of them are: increased use of modern techniques of production, availability of modern and efficient irrigation system, use of improved seeds, availability of fertilizer and easy access to agricultural credit. Among these factors, the last one has attracted thoughtful attention of public policy makers; because once farmers have an easy access to credit, they can intensify the use of improved seeds, fertilizer and mechanized techniques of farming. Thus, it is considered as one of the strategic resources playing a decisive role in the development of an underdeveloped economy (Bashir et.al, 2010).

Agricultural sector has been a major focus for the policy makers in Nepal in almost all the planning periods. It has contributed approximately one third of the Gross Domestic Value Added of the economy and provided the source of livelihood to more than two thirds of the Nepalese people (Agricultural Survey 2011). Despite the consideration devoted by policy makers to this sector within the last five decades, Nepalese agricultural sector has not progressed much. At present, import value of agricultural products is increasing at an alarming rate: during the FY 2012/13, the figure stood at Rs. 50 billion. On the contrary, credit to agriculture sector has not grown satisfactorily over the years. Agricultural credit disbursed by commercial banks has grown at a sluggish rate from 0.65 billion in FY 1982/83 to 31.53 billion in FY 2012/13 (a 47-fold increase in FY 2012/13 as compared to 1982/83) while total credit of commercial banks has soared up by 184 fold over the period (from 4.09 billion in FY 1982/83 to 757.09 in FY 2012/13) (Shrestha 2014).



Note: Credit figures relate to the credit from commercial banks only. But it includes credit from the Agricultural Development Bank Limited before its upgrading to commercial bank too.

Source: Shrestha (2014)

Chart 1.1 shows that the share of Agricultural credit to total credit (of commercial banks) has fallen significantly over the time span of 1992/93 to 2010/11. Though one reason for such a decline in the share of agricultural credit may be the upgrading of Agricultural Development Bank Limited, which disbursed credit to Agricultural sector with high priority before its upgrade, into ‘A’ class commercial bank, the scenario of agricultural credit is not encouraging for other commercial banks too as revealed by chart 1.1. It has necessitated exploring the problems associated with the agricultural lending by commercial banks and other banks and financial institutions and the resultant impact on the lives of Nepalese farmers through the increase in farm productivity.

1.2 Objectives of the Study

The specific objectives of this study are:

- To analyze the structure and trend of agricultural credit in Kailali district during the recent years.
- To explore the problems related to the procurement and use of agricultural credit.
- To examine the determinants that play decisive role in agricultural lending decision.
- To assess the impact of agricultural credit on farm productivity.

1.3 Significance of the Study

Studies on agriculture sector furnish the policy makers with the relevant information regarding the issues of this sector which helps them prioritize different areas and earmark necessary resources accordingly. This, in turn, helps achieve allocative efficiency as well as technical efficiency and realize the long term economic goals.

In a developing economy like Nepal where about three-fourth (73.9%) of the population depends on agricultural sector as a source of their livelihood and about one third (34.5%) of the Gross Domestic Product comes from this sector, the relative role played by agriculture sector cannot be overlooked in

the policy formulation process (Economic Survey, 2012/13). Despite the heavy dependency on this sector, the stark reality is somewhat different: the per-capita productivity of agricultural labor is very much low, the farmers are dependent on traditional and less efficient methods of production, there is no sufficient irrigation facility as such farmers rely on monsoon, shortages of fertilizer and improved seeds during the plantation time, and little access to formal financial intermediation are common phenomena. This has led to a dismal prospect of agricultural sector as a subsistence sector only. In this scenario, the present study may provide a platform upon which the policy makers can reside to exploit the potentialities of the agricultural sector in order to strengthen the export, assist the industrial sector and accelerate the overall economic growth with a higher level of technical and allocative efficiency. Moreover, the findings of the study may be equally helpful to evaluate the factors that are creating obstacles in expanding the credit to agriculture sector and focus on some of the policy issues that can boost up such credit. Nepal Rastra Bank itself is giving special attention to channel the resources to productive sector through monetary policy which includes agricultural sector and deprived sector directed credit programs. In such a context, it will be beneficial to NRB policy makers too for devising the appropriate policy tools and actions to achieve the above mentioned goals.

1.4 Limitations of the Study

The study has the following limitations:

- The study area covers Kailali district only. Thus, the results from the study may not reflect the overall situation in Far Western Nepal and the whole Nepalese Economy.
- Only food crops and vegetables have been taken into consideration while measuring the impact of agricultural credit on farm productivity.
- Agricultural credit from the NRB-licensed banks and financial institutions only has been considered i.e. credit from co-operatives that are not licensed by NRB to perform banking activities and credit from informal sector has not been taken into account.

The rest of the study is organized as follows: chapter two presents a brief review of the studies carried out at national and international level, chapter three discusses the data and methodology used , chapter four presents the estimation results and analysis, and the final chapter draws conclusions and provides some policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

Agricultural credit and its socioeconomic impact on the lives of the farmers has been a major policy issue in the arena of public policies especially in the underdeveloped and developing economies. In such economies, agriculture sector occupies a significant slice of the pie in Gross Domestic Value Added and employment. As such, it has enticed a vast pool of researchers. Some of the prominent studies among them are Farrell (1957), Aigner et.al. (1977), Carter (1989), Zuberi (1989), Meyer (1990), Feder et.al.(1990), Coelli et.al.(1998) and Konare (2001). A short review of some of the studies carried out at national and international level is presented below.

Dong et.al. (2010) observe that production inputs, farmers' capabilities and education cannot be fully employed under credit constrained situation. Based on a survey of 511 households from Heilongjiang Province of Northeast China and employing endogenous switching regression model, they conclude that agricultural productivity in the study area can be increased by 31.6% with the removal of credit constrained situation. The study further shows that productivity and income of the credit unconstrained farmers are higher than the credit-constrained farmers.

Ayaz and Hussain (2011) observe that credit availability to farmers is much more important than any other factors to improve the resource use efficiency in agriculture sector. Their study is based on the 300 cross section sample farmers from Faisalbaad District of Pakistan. By employing Stochastic Frontier Production Analysis (SFA), they conclude that credit to agricultural sector has more constructive and significant impact on the farmers' technical efficiency than other factors like farming experience, education, herd size and number of cultivation practices.

Duy (2012) has analyzed the impact of agricultural credit on farm productivity taking a sample of 654 farmers from Mekong Delta region of Pakistan by using quintile regression and Stochastic Frontier Analysis(SFA) techniques. The study concludes that technical efficiency and rice yield were positively influenced by access to credit, education level and farm technology. It also demonstrates that access to formal credit sector had a larger effect on rice production than access to informal credit.

Devi (2012) found that agricultural credit not only helped to increase the productivity but also develop the process of cultivation as a whole in Andhra Pradesh, India. She argues that there was an enormous increase in the usage of modern seeds, modernized inputs, fertilizers and pesticides after receiving the agricultural credit, which increased yield per acre and thus the income of the farmers. She further observes that the impact of agricultural credit was more significant in non-irrigated and semi-irrigated villages than the irrigated villages.

Akram et.al. (2013) observe that access to credit results in a higher level of technical efficiency of farmers. Their study is based on a sample survey of 152 farmers from Sargodha District of Punjab Province of Pakistan. Using stochastic frontier analysis (SFA), the study concludes that agricultural credit in the study area helped the farmers obtain the farm inputs in time, resulting in a higher level of technical efficiency.

Ayegba and Ikani (2013) observe that unregulated private money lenders are still a major source of financing agricultural sector in Nigeria. The main obstacles for agricultural credit from formal sector include high interest rates, bureaucratic bottlenecks, late approval of loans, and unnecessary request for collateral, among others. They recommend that banks and financial institutions should create credit instruments and services that are tailored to the risks and cash flow patterns in the agricultural sector. The banks should open up new branches in rural areas and avoid unnecessary credit conditionalities that discourage farmers from borrowing.

Ibrahim and Bauer (2013) have analyzed the impact of micro-credit on rural farmers' profit taking a case of Dryland of Sudan employing the Heckman Selection Model to analyze the responses from 300 samples. The findings from the study affirm the fact that farmers with access to credit are better off compared to those who do not have such access. The study recommends that by increasing the size of the loan, efficient and sustainable technology can be made available to farmers to increase farm profits.

Sharma (2014) has analyzed the impact of agricultural credit from commercial bank on GDP growth by using the time series data of Nepalese economy covering the period 2002-2012. This study has found that agricultural credit has positively and significantly impacted agricultural GDP of Nepal. However, use of fertilizer and improved seeds have not shown any significant impact on agricultural GDP. He recommends the extension and deepening of financial service system in the rural area and facilitating the agricultural lending.

Rahman et.al. (2014) emphasizes agricultural credit as a major determinant of farm productivity. Their study utilizes logistic regression method on the 300 samples from Bawalpur, Pakistan. With the positive association between credit and agricultural productivity, they conclude that timely provision of appropriate amount of loan to farmers is helpful for the enhancement of agricultural productivity as it enables them to purchase high yielding variety seeds, fertilizers and pesticides.

Conclusion:

Despite the heavy dependency of Nepalese people on agriculture as a source of income and employment, there is still a paucity of research on how the agricultural productivity can be boosted up by extending the access of farmers to better seeds, fertilizer, pesticides and modern techniques of production. There are a couple of studies about the impact of agricultural credit on farmers' productivity and income based on aggregate time series data. However, studies related to the evaluation of impact of institutional lending to agricultural sector at household level are still lacking. The present study aims at fulfilling this gap by taking the household level data from 100 farmers from Kailali district to explore the problems related to the procurement and use of agricultural credit and assess its impact on farm productivity.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This study is based on a survey conducted by Nepal Rastra Bank, Dhangadhi Office. The data were collected with the help of a survey conducted in the study area. Besides, it has used the data collected by Nepal Rastra Bank Dhangadhi Office for the Economic Activities Study Reports during July 2010 to January 2014.

3.2 Population of the Study

The population for this study comprises the farmers of Kailali district. The population has been broadly divided into two groups: the farmers who used credit facility for agricultural production (food crops and vegetable) from banks and financial institutions licensed by Nepal Rastra Bank during the Fiscal Year 2012/13, and the farmers who did not use such credit facility during the period. It also includes the bank officials working at credit departments of the banks and financial institutions of the study area who have disbursed credit to agricultural sector during FY 2012/13.

3.3 Sample Size and Sampling Technique

Due to sparsely distributed population, time constraint and resource constraints, a combination of convenient and judgmental sampling procedure has been used to select 50 farmers out of all the farmers who used the credit facility for agricultural production (food crops and vegetable production) during the FY 2012/13 and 50 farmers out of the farmers who did not use such credit facility. To make the sample more representative, farmers were selected from three different municipalities (Dhangadhi, Tikapur and Attariya) and Chaumala VDC. The farmers who did not use credit facility were selected from the vicinity of the farmers using agricultural credit facility and having similar socioeconomic characteristics (income level, amount of wealth, access to education and health facilities, cultural values and farming practices) as the credit users. Such a selection has been made to reduce the possibility of inclusion of outlier observations and make the sample units more homogeneous in terms of socioeconomic characteristics. In addition, 10 officials (working at credit department) from different banks and financial institutions out of 15 such institutions which provided credit facility to farmers during the FY 2012/13 have been selected. This makes a total of 110 samples for the study. The distribution of sample farmers has been presented in table 3.1.

Table 3.1
Distribution of Sample Farmers

Area	Credit-Users/Non-Users	No. of Respondents
Tikapur, Lamki and Sukhad	Credit-Users	25
Tikapur, Lamki and Sukhad	Non-Users	25
Dhangadhi, Attariya, Chaumala	Credit-Users	25
Dhangadhi, Attariya, Chaumala	Non-Users	25
Total Sample Farmers		100

3.4 Data Collection Instruments

A structured questionnaire was used as the major instrument for data collection. The questionnaires were filled up by the enumerators from Nepal Rastra Bank, Dhangadhi Office for recording the responses of the farmers. Besides this, interview technique was also used to extract detailed information wherever needed for open end questions. The data related to input and output of the agriculture sector is related to the fiscal year 2012/13.

3.5 Data Analysis

The following instruments have been used for the analysis of the data:

- Frequencies, percentages, bar graphs and pie-charts to analyze socio-economic and demographic characteristics of the sample farmers.
- Frequency and percentage analysis to examine the main factors responsible for farmers' credit constrained situation or the lending decisions of banks and financial institutions.
- Regression analysis (Log Linear form of Cobb-Douglas Production Function and Stochastic Frontier Analysis-SFA Production Function) to assess the impact of agricultural credit on farm productivity.

STATA 12 and **FRONTIER 4.1** were used for all the calculations and estimations.

3.5.1 Cobb-Douglas Production Function

Following Bashir et.al. (2010), the Cobb-Douglas form of agricultural production function (relation (1)) was estimated to assess the contribution of agricultural credit to farm productivity by taking food crops and vegetable production as the representative production of the whole agriculture sector. Cobb-Douglas form of the production function has been selected since: i) it can handle multiple inputs in its generalized form, ii) it does not introduce distortions of its own in the presence of imperfections in the market, iii) various econometric estimation problems like serial correlation, heteroskedasticity and multicollinearity can be handled adequately and easily, and iv) it facilitates

computations and has the properties of uniformity, representability and flexibility (Bhanumurthy, 2002).

Formally, the production function can be written as:

$$Y = AX_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} X_4^{\beta_4} X_5^{\beta_5} X_6^{\beta_6} e^U ;$$

Where,

Y(=yield) = Yield of food crops and vegetables(in k.g. per kattha[†])

X₁(=seed) = Amount of seed used (in k.g. per kattha)

X₂(=fert) = Amount of fertilizer used (in k.g. per kattha)

X₃(=irrig) = Irrigation cost (in Rs. per kattha)

X₄(=capex) = Amount of capital used (cost of trailer, thresher, etc. in Rs. Per kattha)

X₅(=labor) = Amount of labor used including the farmer's own labor time (man days per kattha)

X₆(= credit_receipt) = Dummy for Credit ('0' for loan not taken and '1' for loan taken)

e = Base of natural logarithm

U = Stochastic random error term

Log-linearizing the production function;

$$\ln Y = \ln A + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 X_6 + U \dots\dots\dots(1)$$

In more convenient terms,

$$\ln_yield = \ln A + \beta_1 \ln_seed + \beta_2 \ln_fert + \beta_3 \ln_irrig + \beta_4 \ln_capex + \beta_5 \ln_labor + \beta_6 \text{credit_receipt} + U \dots(2)$$

The β 's (except β_6) are the output elasticities with reference to a particular input in consideration that show the marginal increment in the yield of food crops and vegetables from the increment in input and are expected to bear a positive sign with them. Since credit_receipt is a dummy, the parameter β_6 helps us assess the extent of the vertical shift of the production function compared to the reference group (farmers not using agricultural credit). Thus, β_6 measures the impact of agricultural credit on the yield of the food crops and vegetables.

Hypothesis

Null (H₀): $\beta_6 = 0$ i.e. yield of food crops and vegetables is not significantly affected by the use of agricultural credit.

Alternative (H₁): $\beta_6 \neq 0$ i.e. yield of food crops and vegetables is significantly affected by the use of agricultural credit.

This hypothesis has been tested with the help of the familiar **t-statistic**.

[†] One Kattha is equivalent to 338 square meters.

Besides the t-statistic, a group of other statistics have been used to check the diagnostic test of the estimated model: **F-test** for the overall significance of the model, **VIF Factors** and **Tolerance Factors** for multicollinearity, **Breusch-Pagan test** for Heteroskedasticity, **Shapiro-Wilk W-Test** for testing the normality of the residuals, regression error specification (**RESET**) test and **LINK test** for omitted variables and model specification errors.

3.5.2 Stochastic Frontier Analysis (SFA) Production Function

Stochastic Frontier Analysis (SFA) is a parametric technique that uses standard production functions like Cobb-Douglas production function and Translog production function and explicitly takes into account the maximum feasible output level for a given set of inputs. It is used in modeling functional relationships where we have theoretical bounds such as: i) modeling cost functions and analyzing cost efficiency, ii) modeling production functions and analyzing production efficiency, iii) modeling revenue functions and analyzing revenue efficiency, etc (Coelli et.al. 2005).

To compare the credit users with the non-users in terms of their technical efficiency in production, Stochastic Frontier Analysis (SFA) production function was estimated. It was independently proposed by Aigner, Lovell and Schmidt (1977) and Meeusen and Van Den Broeck (1977) which involved a production function with an error term having two components, one to account for random effects (measurement errors and other random factors like weather, strike, luck, etc.) and another one to account for technical inefficiency on output variable. It has been used in a vast number of empirical applications and altered and extended in a number of ways (Battese and Coelli, 1996).

Following Battese and Coelli (1995), the SFA production function can be expressed as:

$$y_i = x_i \beta + v_i - u_i ; i=1 \dots \dots \dots N; \dots \dots \dots (3) ;$$

Where,

y_i = logarithm of production of i^{th} farmer

x_i = $k \times 1$ vector of logarithms of input quantities of i^{th} farmer

β = vector of unknown parameters ;

v_i = random variable assumed to be iid $N(0, \sigma_v^2)$ and independent of u_i ;

u_i = inefficiency error term, which is a non-negative random variable associated with technical inefficiency of production, assumed to be independently distributed, such that u_i is obtained by truncation (at zero) of the normal distribution with mean $z_i \delta$ and variance σ_u^2

z_i is a $p \times 1$ vector of variables that are assumed to influence the technical efficiency of the firm and δ is an $1 \times p$ vector of parameters to be estimated.

The technical inefficiency effect u_i can be modeled as:

$$u_i = z_i \delta;$$

The explanatory variables in the inefficiency model are expected to include the variables which explain the extent to which the production of i^{th} farmer fall short of the corresponding stochastic frontier production value $(x_i \beta + v_i)$.

From this production function, technical efficiency of i^{th} farmer can be estimated as proposed in Coelli et.al. (2005) as the ratio of observed output of the i^{th} farmer relative to the potential output defined by the frontier function. Formally, technical efficiency of i^{th} farmer is :

$$TE_i = \frac{y_i}{\exp(x_i \beta + v_i)} = \frac{\exp(x_i \beta + v_i - u_i)}{\exp(x_i \beta + v_i)} = \exp(-u_i)$$

The following model was specified for the estimation of SFA production function:

$$\ln(\text{yield}) = \beta_0 + \beta_1 \ln(\text{seed}) + \beta_2 \ln(\text{fert}) + \beta_3 \ln(\text{labor}) + \beta_4 \ln(\text{irrg}) + \beta_5 \ln(\text{capex}) + (v_i - u_i) \dots (4)$$

Where, the variables: yield, seed, fert, labor, irrg and capex carry the meaning as defined in relations (1) and (2) and v_i and u_i carry the meanings as defined in relation (3).

All the β_s are expected to bear a positive sign (except β_0 whose sign cannot be expected a-priori) showing a positive relationship between the quantity of inputs used and the resultant output therefrom.

The technical inefficiency component u_i includes:

$$u_i = \delta_0 + \delta_1(\text{age}) + \delta_2(\text{edu}) + \delta_3(\text{credit_receipt}) + \delta_4(\text{seed_q}) + \delta_5(\text{land_size}) \dots (5);$$

Where,

age = age of the household head as a proxy for farming experience

edu = dummy for educational status; '0' for illiterate and '1' for literate

credit_receipt = dummy for credit use; '0' for credit facility not used and '1' for used

seed_q = dummy for seed quality; '0' for local seeds and '1' for improved seeds[‡]

land_size = size of the land being cultivated by i^{th} farmer.

The coefficients of all the explanatory variables in model (5) are expected to bear a negative sign implying that longer farming experience, educational achievement, credit receipt, improved seed and larger land size reduces the level of technical inefficiency of the farmers.

[‡] Seed quality used for paddy production has been used as a proxy.

The SFA model has been estimated by using the FRONTIER 4.1 software which is based on the Three Step Estimation Methodology proposed by Coelli (1996): (i) Ordinary Least Squares (OLS) estimates of the function are obtained, (ii) a two phase grid search for γ^{\circledast} is conducted with the β parameters set to OLS values (except β_0) and the β_0 & σ^2 parameters are adjusted according to Corrected OLS presented in Coelli (1995), (iii) the values selected in the grid search are used as starting values in an iterative procedure (using the Davidon-Fletcher-Powell Quasi-Newton Method) to obtain final MLE estimates (See the Program Guide to Frontier 4.1 by Coelli (1996) for details).

Hypothesis (One-sided Generalized Likelihood Ratio Test)

Null Hypothesis (H₀): $\gamma = 0$ i.e. inefficiency effects are absent in the model.

Alternative Hypothesis (H₁): $\gamma > 0$

The test statistic LR is calculated as:

$$LR = -2\{\ln[L(H_0)] - \ln[L(H_1)]\};$$

Where, $L(H_0)$ and $L(H_1)$ are the values of the likelihood function under null and alternative hypotheses H_0 and H_1 respectively.

LR statistics has a mixture of chi-square distribution and the critical value is 2.71 at 5% level of significance (Coelli, 2005).

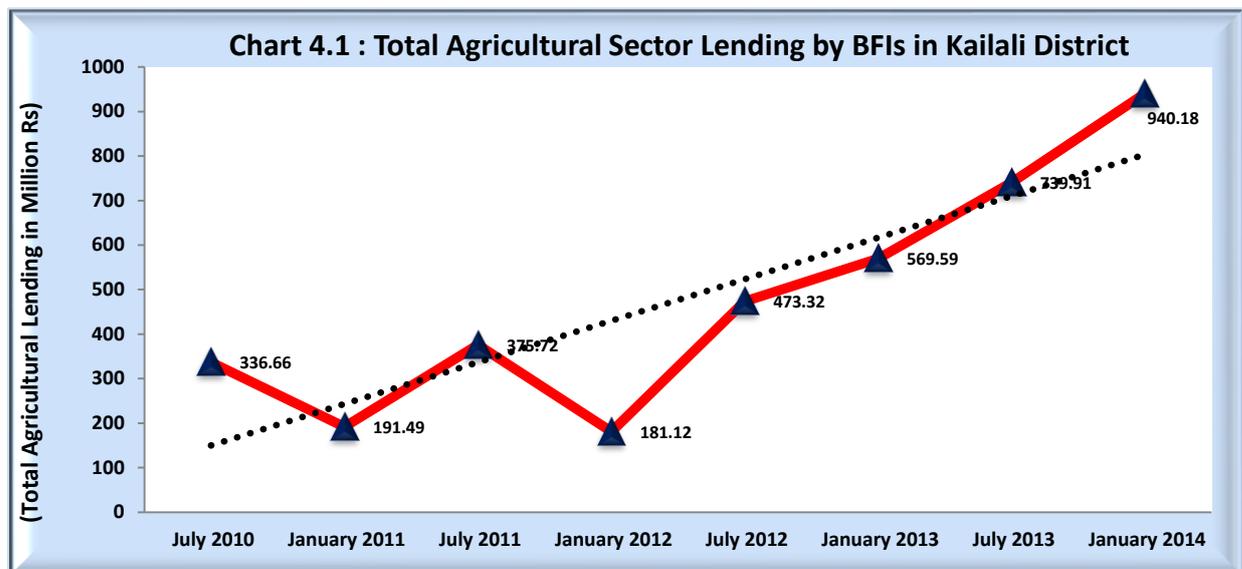
[⊙] γ is a variance parameter in the likelihood function defined by Coelli et.al.(2005) and is given by $\gamma = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$. Its value ranges from zero to one.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Growth and Structure of Agricultural Lending in Kailali District

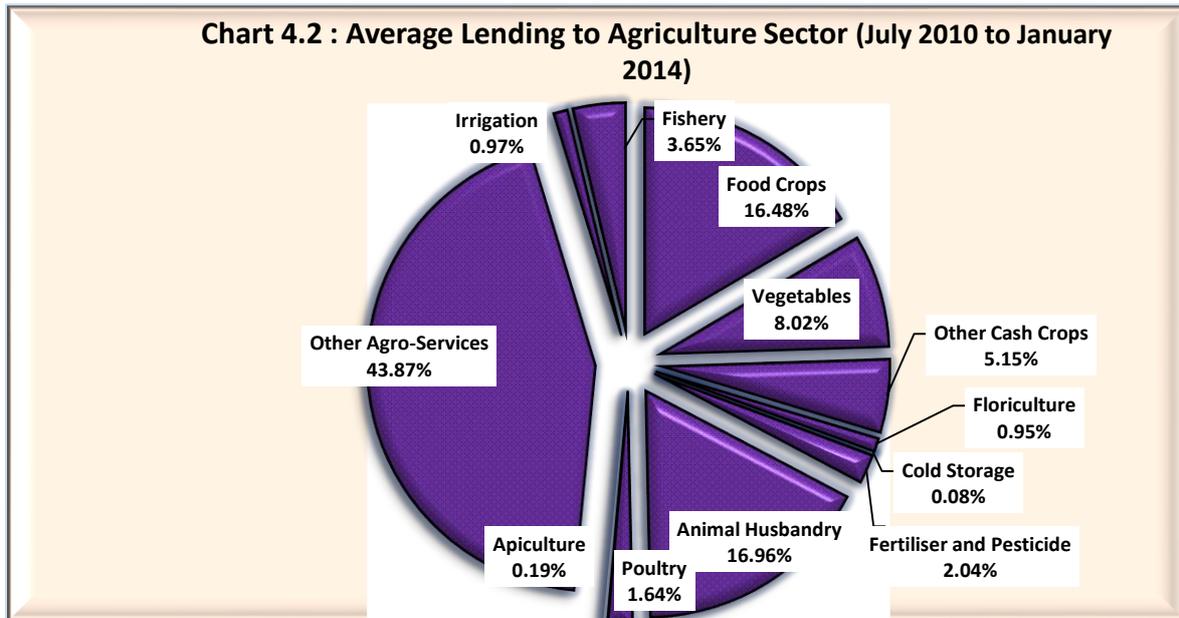
Agricultural lending in Kailali district has increased over time with the increasing number of banks and financial institutions (BFIs). The outstanding lending to this sector by A, B, C and D class BFIs and NRB licensed cooperatives reached Rs. 940 million in January 2014 which is about 7.8 percent of the total outstanding lending in Kailali district. It has grown by 34.28 percent on the average (on semi-annual basis) over the period July 2010 to January 2014 (Chart 4.1). A large fraction of such lending is from micro credit banks, NRB licensed co-operatives, rural development bank and Agricultural Development Bank Limited. Moreover, more than two-thirds of the banks and financial institutions in Kailali districts have been operating in the municipality areas extending credit facilities to the nearby customers. It shows a stark concentration of agricultural and other types of credit facilities to urban and semi urban areas only (Economic Activity Study Reports: NRB Dhangadhi).



Note: Agricultural lending figures for January 2011 and January 2012 are lower as fewer numbers of BFIs were included in Economic Activities Study.

Source: Economic Activity Study Reports, NRB Dhangadhi

Out of the lending to agricultural sector in Kailali district, a scanty portion of the lending has gone to Cold Storage, Fertilizer and Pesticides, Poultry, Apiculture, Floriculture and Irrigation. Average lending to each of these sectors has remained less than 3 percentage of the average agricultural credit over the study period (Chart 4.2). However, Food Crops, Vegetables, Animal Husbandry and Other Agro-services have obtained a good chunk of the agricultural lending on the average. Out of the disbursed credit to agricultural sector, a significant portion has gone to finance tractors (under other Agro-Services) which can also be used to transport construction materials like sand and stones besides farming.



Source: Economic Activity Study Reports, NRB Dhangadhi

4.2 Socioeconomic and Demographic Characteristics of the Sample Farmers

The mean household size of the sample farmers is 8.6. Joint family system in Tharu community has been reflected in a higher average household size. Furthermore, age of the household head ranges from 25 years to 71 years having an average of 49.05 years (Table 4.1).

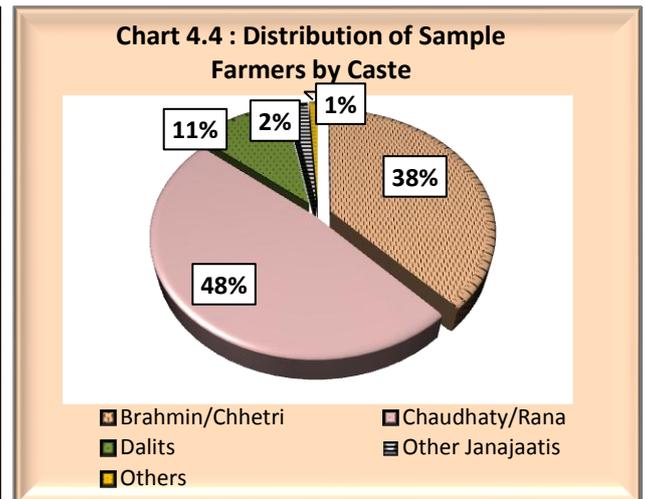
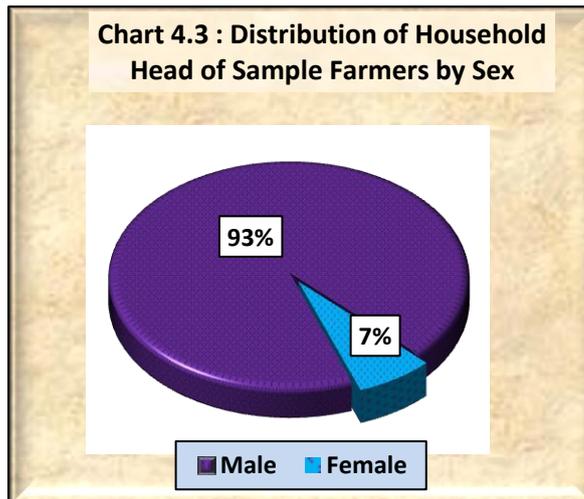
Table 4.1

Summary Statistics of Age and Household Size

Variable	Obs.	Mean	Std. Dev.	Min	Max
Age	100	49.05	10.95	25	71
Household Size	100	8.6	4.60	2	34

Source: NRB Dhangadhi Field Survey, 2014

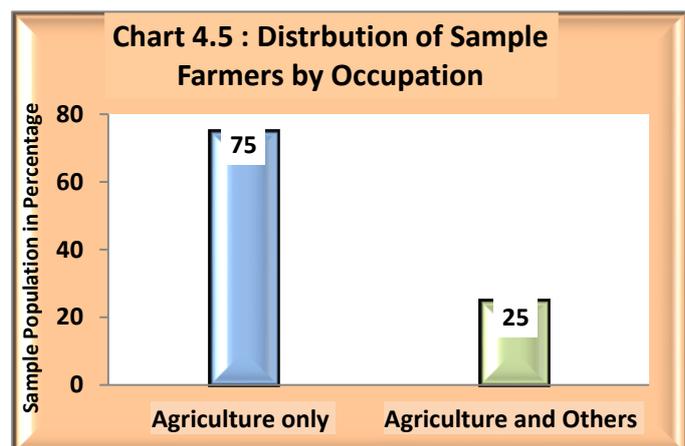
The distribution of sample farmers by sex reveals that major decisions at family level are still male dominated and there is little room for females' participation in the decision making. Only less than ten percent of the sample farmers have a female as the household head (Chart 4.3).



Source: NRB Dhangadhi Field Survey, 2014

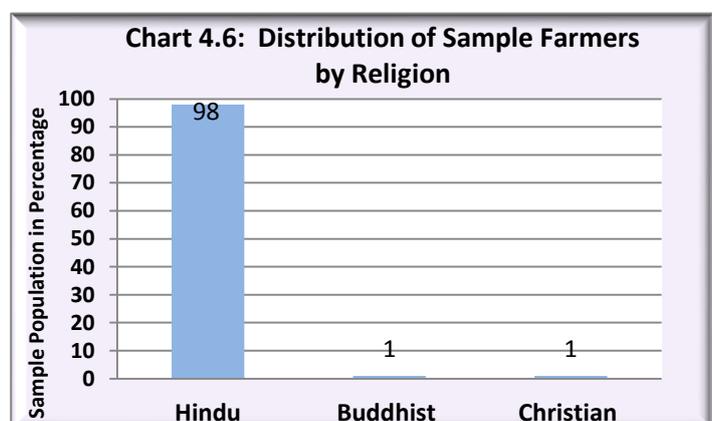
Out of the total sample farmers, about half (48%) of the farmers are Tharus (Chaudhary/Rana). About two-fifths (38%) of the sample farmers are Brahmin/Chhetries and about one-tenth (11%) are Dalits (Chart 4.4).

Agriculture is the only occupation of the majority of the sample farmers in the study area. Three-fourth of the sample farmers has agriculture as the one and only occupation for earning their livelihood. Rest of the sample farmers are engaged in teaching profession, other employment and small trading businesses besides agriculture (Chart 4.5).



Source: NRB Dhangadhi Field Survey, 2014

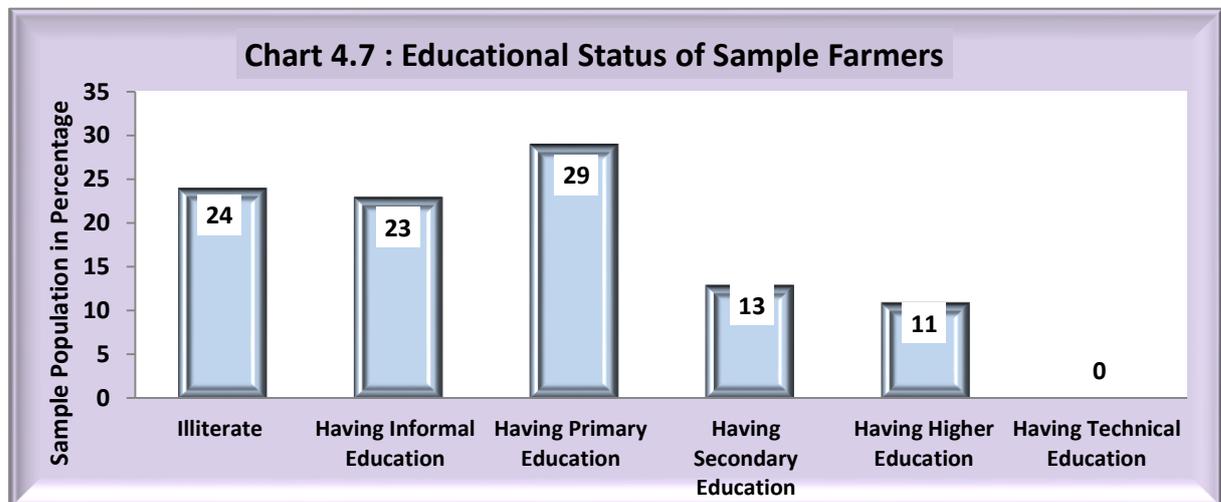
The distribution of the sample farmers by religion shows the dominance of Hindu religion in the study area. Almost all (98%) of the sample farmers are followers of Hindu Religion (Chart 4.6).



Source: NRB Dhangadhi Field Survey, 2014

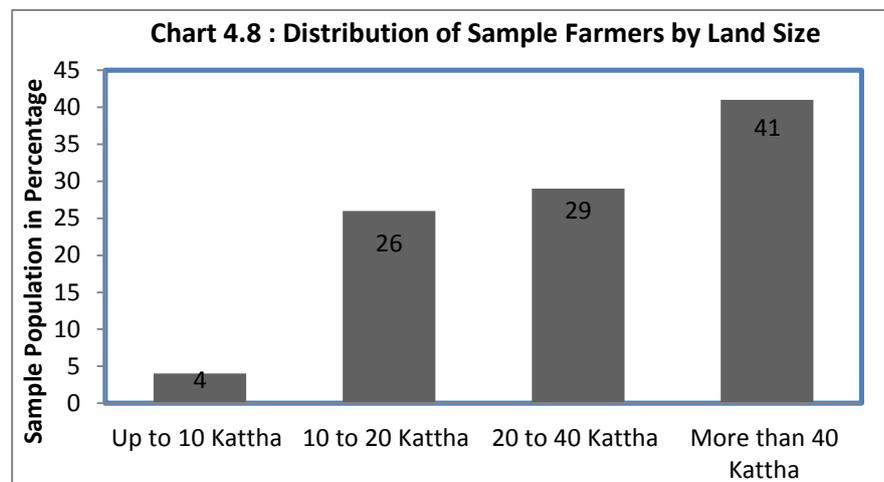
Low educational achievement is reflected in terms of traditional farming practices in the study area. About one fourth of the sample farmers (24%) are

illiterate and 23 percent of the sample farmers have informal education only. Further, about one tenth (11%) of them have attained higher education and none of the farmers have any form of technical education relating to modern farming methods (Chart 4.7).



Source: NRB Dhangadhi Field Survey, 2014

The status of land holding demonstrates that majority of the farmers in the study area have sufficient amount of land to feed their families and earn income by selling the agricultural products. More than two fifths of the sample farmers have land holding of 40 kattha (two Bigahaa[§]) or more. Only four percent of the farmers have small-sized land holding (less than 10 kattha) for agricultural purposes.



Source: NRB Dhangadhi Field Survey, 2014

4.3 Procurement of Agricultural Credit

Out of the 50 sample farmers who have taken agricultural credit from financial institutions, 23(46%) farmers responded that they have not obtained sufficient amount of credit as per their demand. The average rate of procurement is 78.16 percent of their demand, the rate ranging from 20 percent to 100 percent (Table 4.2).

On the other hand, average interest rate charged by the financial institutions for agricultural credit in the study area is relatively higher than most of the other types of credit facilities. It is due to the fact that agricultural credit has been disbursed mainly by micro credit banks and rural development bank

[§] One Bigahaa equals twenty katthas and is equivalent to 6772.41 square meters.

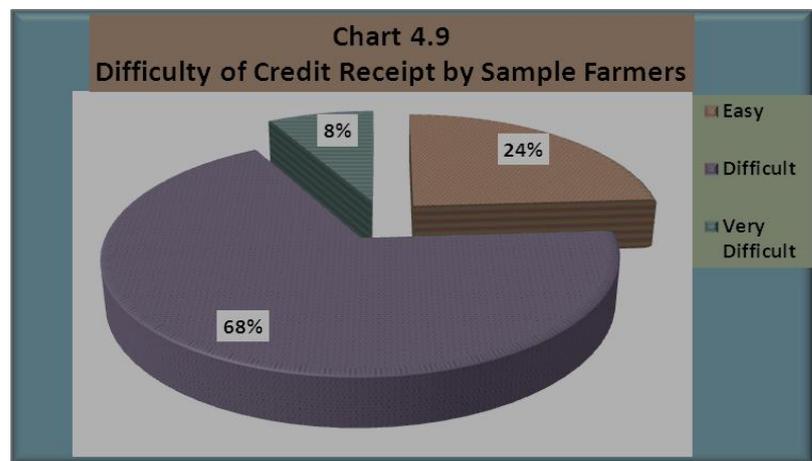
on the basis the guarantee of women saving groups. Interest rate on such lending has been higher than 18 percent in the study area^Ω.

Table 4.2
Credit Procurement and Interest Rate Paid by Sample Farmers

Variable	Mean	Std. Dev.	Min	Max
Credit Procurement (% of Demand)	78.16	21.30	20	100
Interest Rate	14.83	3.43	10	24

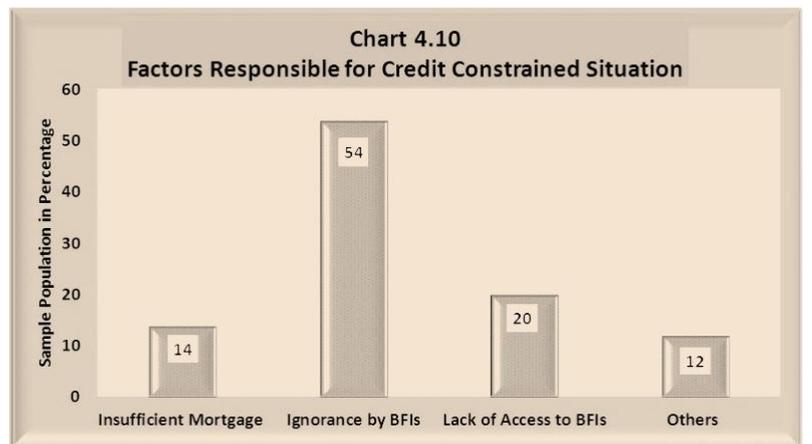
Source: NRB Dhangadhi Field Survey, 2014

More than two thirds of the sample farmers who have taken agricultural credit responded that it is difficult to obtain such credit. Only one fourth of the respondents have experienced an easy access to credit (Chart 4.9).



Source: NRB Dhangadhi Field Survey, 2014

The respondents using agricultural credit have felt that the main reason for not getting sufficient amount of loan is the unwillingness of banks and financial institutions to invest in agriculture. More than half (54%) the sample farmers who were enjoying agricultural credit during



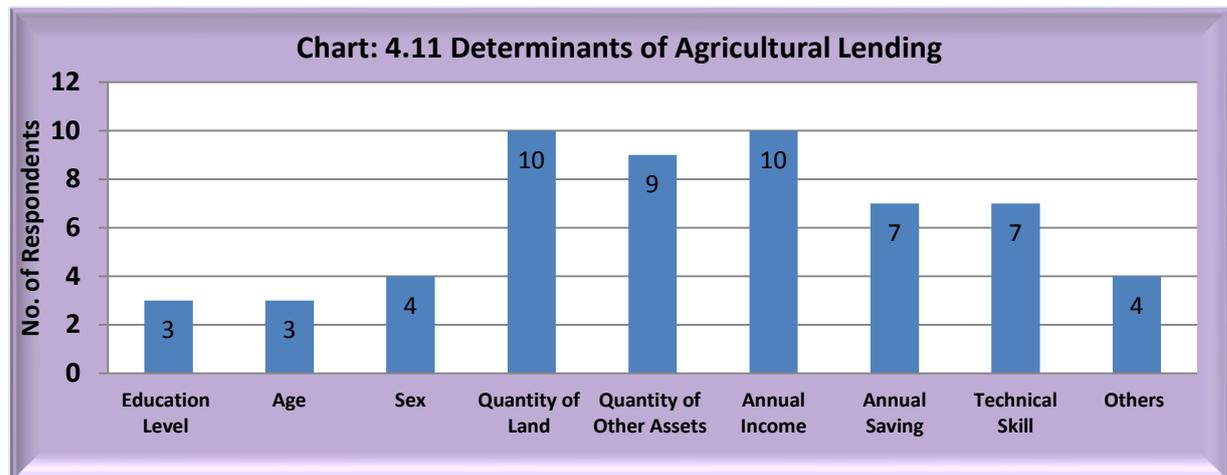
Source: NRB Dhangadhi Field Survey, 2014

the FY 2012/13 pointed out that the unwillingness of the banks to give credit is the main reason of credit constrained situation of the farmers. Only 14% of the sample farmers felt that lack of mortgage as the reason for credit constrained situation (Chart 4.10).

^Ω For instance, the interest rates charged by Nirdhan Utthan Bank Limited branches and Nepal Grameen Bikash Bank Limited branches on Group Guarantee based micro-credit loans were 18-20 percentage in the study area at the time of survey.

4.4 Determinants of Agricultural Lending

Quantity of land owned and annual income of the farmers are major determinants for agricultural lending decision by the banks and financial institutions. All of the sample banks officials responded that they consider quantity of land and annual income of the farmers as the basic requirement for approving the loan proposal for agriculture sector (Chart 4.11).



Source: NRB Dhangadhi Field Survey, 2014

Chart 4.11 reveals the fact that education level of the farmers, their age, their sex and technical skill owned by farmers play less significant role in the agricultural lending decision in the study area.

4.5 Impact of Agricultural Credit on Farm Productivity

4.5.1 Cobb-Douglas Production Function Estimation Results

The estimation result of the Cobb Douglas production function in table 4.3 shows that the overall regression equation is highly significant as shown by the zero probability value of F-test. All the variables under consideration have expected signs except irrigation expenditure and capital expenditure. The inputs: amount of seed used and amount of fertilizer are significant at 1 percent level of significance and amount of labor used is significant at 5 percent level of significance. However, irrigation expenditure and capital expenditure are not statistically significant even at 10 percent and they do not bear the expected signs.

Table 4.3

Estimation Result of Cobb-Douglas Production Function*

ln_yield	Coef.	Std.Err.	t	P> t
ln_seed	.26**	.091	2.89	.005
ln_fert	.18**	.057	3.17	.002
ln_irrg	-.04	.032	-1.22	.225
ln_capex	-.02	.063	-.38	.707
ln_labor	.14*	.062	2.27	.026
credit_receipt	.25**	.058	4.28	.000
_cons	4.23**	.333	12.70	.000

Source	SS	DF	MS	Number of obs =	95
Model	3.89	6	.65	F(6,88) =	8.38
Residual	6.81	88	.08	Prob > F =	.00
				R-squared =	.36
Total	10.70	94	.73	Adjusted R-squared =	.32
				Root MSE =	.28

*Indicates that the coefficient is significant at 5% level of significance.

**Indicates that the coefficient is significant at 1% level of significance.

The result shows that credit receipt is highly significant implying that credit receipt contributes significantly to farm productivity. But the magnitude of the impact is rather lower as the coefficient of credit_receipt 0.25 only. It shows that mean log of output per kattha (ln_yield) for agricultural credit users is higher by 0.25 units than the farmers who did not use such credit facility. Low impact of agricultural credit may be due to two reasons in the study area. First, some of the farmers have not utilized the credit facility for agriculture purpose only; rather they have used it for other business purposes, consumption and purchasing land. Second, some of the credit users are not so much enthusiastic to adopt modern seeds and mechanized methods of production; they want to cling to the subsistence farming practices even after getting credit facility.

The resultant estimated production functions for credit users and credit non-users can be presented as:

For Credit Non-Users (credit_receipt=0)

$$\ln_yield = 4.23 + 0.26 \cdot \ln_seed + 0.18 \cdot \ln_fert - 0.04 \cdot \ln_irrg - 0.02 \cdot \ln_capex + 0.14 \cdot \ln_labor$$

For Credit Users (credit_receipt=1)

$$\ln_yield = 4.23 + 0.26 \cdot \ln_seed + 0.18 \cdot \ln_fert - 0.04 \cdot \ln_irrg - 0.02 \cdot \ln_capex + 0.14 \cdot \ln_labor + 0.25 \cdot \text{Credit_receipt}$$

The significant positive sign with the coefficient of the dummy variable credit_receipt shows that the productivity of the credit users (credit_receipt=1) is greater than the productivity of credit non-users (credit_receipt=0). This result is in line with the economic theory and consistent with the empirical investigations (e.g. Dong et.al.(2010), Ibrahim and Bauer (2013), Rahman et.al. (2014)) that credit

* Five observations of farmers having very high and very low quantities of land have been removed while estimating the regression model as they seemed to be outliers affecting the average relationship among the variables significantly. Thus, the estimation result is based on the information from 95 sample farmers (47 credit users and 48 non-users).

receipt furnishes the farmers with the capacities to utilize improved seeds, fertilizer, pesticides and more efficient production methods which ultimately enhances the productive capacity of the farmers.

Other coefficients show the elasticities of agricultural yield with respect to some particular input in consideration. The coefficient of \ln_seed is 0.26 which shows that if quantity of seed per kattha is increased by one percent, production per kattha will increase by 0.26 percent. Similarly, the coefficient of fertilizer is 0.18 implying that if amount of fertilizer per kattha is increased by one percent, production per kattha will increase by 0.18 percent. The coefficient of labor being 0.14 implies that if man days per kattha is increased by one percent, production per kattha will increase by approximately 0.14 percent. The coefficient of irrigation expenditure and expenditure on capital instruments are insignificant and their magnitudes are very small. The negative sign attached with these coefficients may be due to the fact that the credit constrained farmers have fewer resources to invest in improved seeds and fertilizer. In such a situation, if the farmers spend more for irrigation facility and use of capital instruments, they do not have resources left for enough fertilizer and better quality seeds as such production may be lower.

Tables 4.4 to 4.8 show the results of different diagnostic tests of the estimated Cobb-Douglas Production Function.

Table 4.4
Breusch-Pagan Test for Heteroskedasticity

Ho: Constant variance of Error Term		
Variables: fitted values of \ln_yield		
chi2(1)	=	0.00
Prob > chi2	=	0.99

Table 4.5
Multicollinearity Test Results

Variable	VIF	1/VIF
\ln_capex	1.57	0.64
\ln_irrg	1.50	0.67
\ln_seed	1.36	0.73
\ln_fert	1.27	0.78
\ln_labor	1.27	0.79
credit_receipt	1.04	0.96
Mean VIF	1.34	

As per the result of Heteroskedasticity test (Table 4.4), we cannot reject the null hypothesis that the error term has constant variance due to high probability value of Chi-square statistics. The variance inflation factors (VIF) of all the variables and mean VIF are less than 10 confirming that the model is not suffered from the problem of multicollinearity.

Table 4.6
Ramsey RESET Test Results

Ho: model has no omitted variables	
F(3, 85) =	1.47
Prob > F =	0.23

Table 4.7
Link Test Results

Ln_yield	Coef.	Std.Err.	t	P> t
_hat	-2.90	3.71	-.78	.43
_hatsq	.42	.39	1.05	.29
_cons	9.08	8.64	1.05	.29

The RESET test (Table 4.6) results show that the null hypothesis of no omitted variables cannot be rejected with a high probability value of F-statistics. The LINK test results (Table 4.7) also confirms the fact that we cannot add any more significant variable to the model as the coefficient of the square of the predicted value(_hatsq) is not statistically significant as shown by a low t-ratio (or a higher probability value of t-statistics)

Chart 4.12

Plot of Actual and Fitted Values of Ln_yield

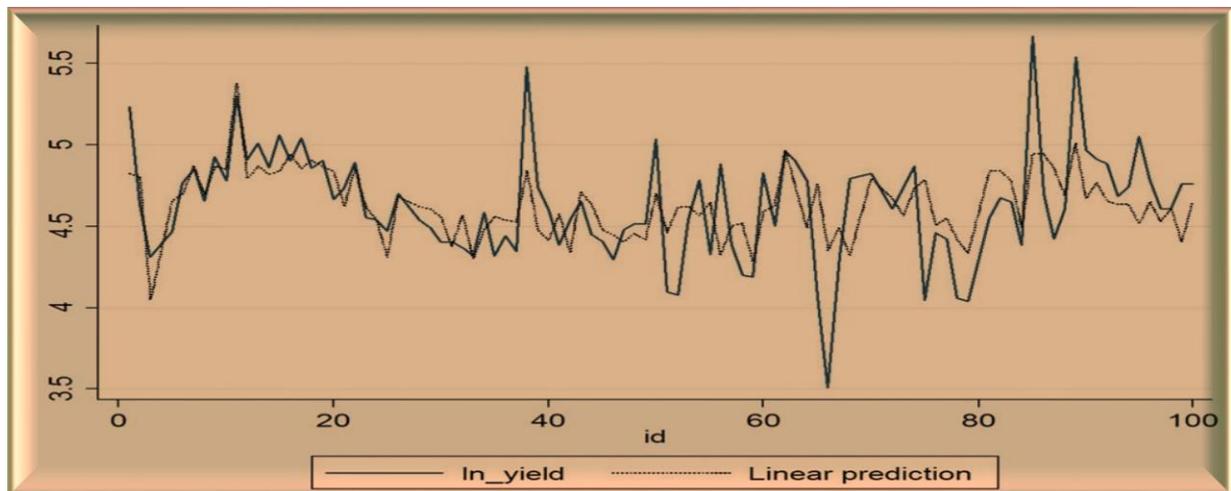


Chart 4.12 shows the plot of actual and estimated values of the natural log of production per kattha. The predicted values have well captured the actual values of production.

Table 4.8

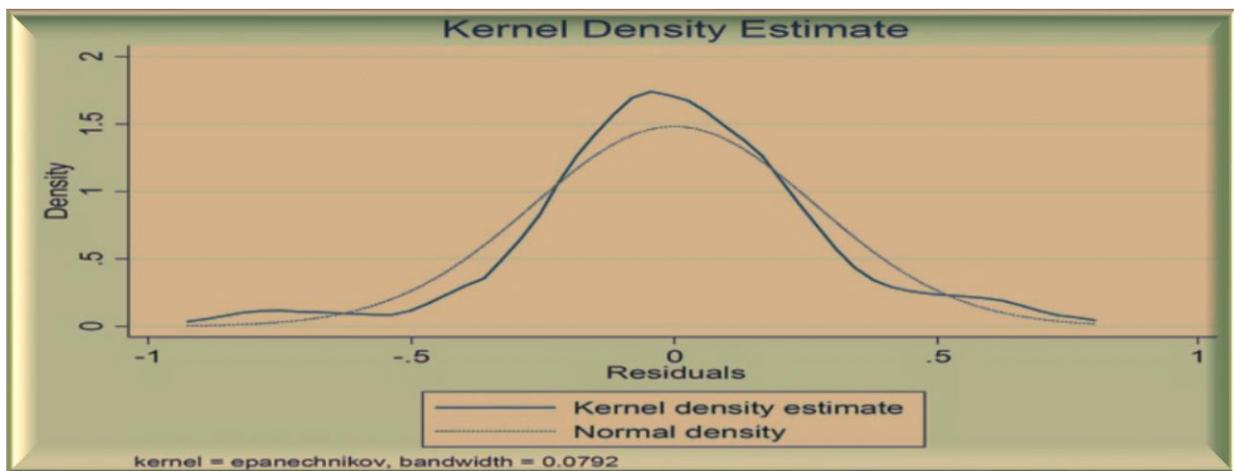
Shapiro-Wilk W Test Results

H₀ = Error Term is Normally Distributed.					
Variable	Obs.	W	V	z	Prob. > z
Residual	95	0.97	2.30	1.84	0.03

The Shapiro-Wilk W Test results (Table 4.8) show that the null hypothesis of normality of error term cannot be rejected at 1 % level of significance. It is also evident from the Kernel density estimate of the error term in Chart 4.13.

Chart 4.13

Plot of Kernel Density Estimate of Residuals



4.5.2 Stochastic Frontier Analysis (SFA) Results

Table 4.9 demonstrates that the mean efficiency level of the farmers ranges from 58 percent to 87 percent with the mean efficiency score of 72 percent. It implies that the sample farmers have exploited 72 percent of their maximum potential productive capacity on average. There is, thus, scope of increasing the level of farmers’ technical efficiency level from 72 percent to 100 percent by utilizing new and mechanized methods of production and using better inputs.

Table 4.9

Descriptive Statistics of Technical Efficiency Scores

Mean	0.72
Standard Deviation	0.09
Minimum	0.58
Maximum	0.87
Total Observations	95

The results from table 4.10 reveal that the sample farmers using the credit facility have achieved a higher technical efficiency level (82 percent) on average compared to the sample farmers who did not use such facility (63 percent). None of the farmers has the technical efficiency level of less than 40 percent. All of the farmers not using the credit have efficiency level of less than 80 percent whereas it is only 23.4 percent for credit users. About three fourth (76.6%) of the farmers using credit have efficiency level of more than 80 percent. It implies that credit receipt has helped the sample farmers of the study area attain a higher level technical efficiency.

Table 4.10**Distribution of Technical Efficiency Scores between Credit Users and Non-Users**

Efficiency Class	Farmers Using Credit (%)	Farmers not Using Credit (%)
≤ 0.40	0	0
0.40-0.60	0	2.1
0.60-0.80	23.4	97.9
0.80-1.00	76.6	0
Total	100	100
Total no. of Farmers	47	48
Minimum	0.75	0.58
Maximum	0.87	0.70
Average	0.82	0.63
Standard Deviation	0.02	0.02

The coefficients from β_1 to β_5 in table 4.11 represent the elasticity of output with respect to the particular input in consideration. The MLE estimates in table 4.11 are in agreement with the OLS estimates in table 4.3. The coefficients of irrigation expenditure and capital expenditure are not statistically significant and they do not bear the expected positive sign. All other coefficients bear expected positive signs and are significant.

The coefficients from δ_1 to δ_5 demonstrate the relative impact of the variables on the inefficiency of the farmers. The variables age, credit receipt and seed quality have the expected negative signs implying that increase in experience; receipt of agricultural loans and use of improved seeds reduce technical inefficiency of the farmers. However, the coefficient of credit receipt only is highly significant implying that access to credit is much more important than other factors to enable the farmers achieve a higher level of technical efficiency. This result is in consistent with Ayaz and Hussain (2011), Duy (2012) and Akram et.al. (2013).

Table 4.11
Final MLE Estimates

	Coefficient	Standard Error	t-ratio
beta 0	4.79*	2.32	2.06
beta 1	0.24**	0.09	2.75
beta 2	0.19**	0.06	3.36
beta 3	0.13*	0.06	2.09
beta 4	-0.05	0.03	-1.48
beta 5	-0.04	0.07	-0.53
delta 0	0.59	2.20	0.26
delta 1	-0.003	0.003	-1.15
delta 2	0.01	0.06	0.10
delta 3	-0.25**	0.06	-4.26
delta 4	-0.04	0.07	-0.58
delta 5	0.0003	0.001	0.29
Sigma squared	0.07**	0.01	6.89
gamma	0.01	8.49	0.001
LR Test of the one-sided error = 19.79 with the number of restrictions = 7			
Number of Iterations = 47			
Maximum Iterations Set at 100			
No. of Cross Sections =95			

*Indicates that the coefficient is significant at 5% level of significance.

**Indicates that the coefficient is significant at 1% level of significance.

The likelihood ratio test of one sided generalized error shows that the LR test statistic is greater than the critical value 2.71 at 5% level of significance implying that the null hypothesis of no technical inefficiency in the sample is rejected.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The main objective of this study was to explore the problems related to the procurement and use of agricultural credit disbursed from banks and financial institutions licensed by NRB in Kailali district and assess the impact of such credit on farm productivity. It has utilized the information from 95 sample farmers from the study area to estimate Cobb-Douglas production function and Stochastic Frontier Analysis (SFA) production function to assess the impact of the agricultural credit on farm productivity in the study area.

5.1 Conclusions and Recommendations

- Credit to agricultural sector is on upward trend during the recent years. However, such credit is mostly disbursed by micro credit banks, Rural Development Bank and Agricultural Development Bank. Other ‘A’, ‘B’ and ‘C’ class banks and financial institutions have shown reluctance to disburse credit to this sector. Thus, government and NRB should create proper environment to induce them to disburse credit to this sector.
- Out of the disbursed credit to agricultural sector, a significant portion has gone to finance tractors which can be used to transport construction materials like sand, concrete, etc. Fertilizer, pesticides, irrigation and other necessary farm inputs have obtained a low chunk of the credit. Thus, banks and financial institutions should be encouraged to disburse credit to finance the necessary inputs of agricultural production besides the capital inputs.
- Farmers are not getting as much credit as they need even by paying very high interest rates. Thus, policy makers should ensure that the farmers get as much credit as they need at a subsidized interest rate. It will enhance their access to improved seeds, use of fertilizer and pesticides, better irrigation facilities and mechanized methods of production which will ultimately increase the productivity of farmers.
- Getting credit from banks and financial institutions has been felt difficult by most of farmers. This procedure should be simplified and made farmer friendly.
- Farmers in the study area have not benefited much from using the credit facility in the production of food crops and vegetables because of high interest rate charged and low productivity of agricultural sector. One reason for such low productivity is the subsistence farming practices being used by the farmers. Thus, farmers should be provided technical know-how about how to utilize credit for the enhancement of farm productivity by using better farming practices and better inputs. Coordination with the District Agricultural Development Offices can be made to impart such technical know-how.

- Banks and financial institutions are skeptic about the repayment of loan disbursed to agricultural sector. So, they demand a lot of mortgage and annual income of farmers. Small farmers have, thus, little access to agricultural credit. This problem should be resolved by introducing agricultural insurance policies and ensuring fair market price of the agricultural products.
- Agricultural credit has helped enhance the agricultural productivity of the farmers in the study area. With such a credit facility, farmers will have a better access to improved seeds, fertilizer, pesticides and better irrigation facility. Thus, farmer friendly agricultural credit services should be extended and deepened even in the rural areas. It will help the farmers of the rural area attain a higher level of technical efficiency and higher farm productivity.

REFERENCES

- Aigner, D. C., A. K. Lovell and P. Schmidt (1977). "Formulation and Estimation of Stochastic Frontier Production Function Models". *Journal of Econometrics*. Vol. 6(1), pp. 21-37.
- Akram, W., Z. Hussain, N. Ahmad and I. Hussain (2013). "Does Agriculture Credit Affect Production Efficiency?: Frontier Production Function Approach" *Pakistan Economic and Social Review*. Vol.51. No. 2. pp.179-190.
- Ayaz, S. and Z. Hussain (2011). "Impact of Institutional Credit on Production Efficiency of Farming Sector: A case Study of Faisalabad." *Pakistan Economic and Social Review*. Vol.49.No.2, pp.149-162.
- Ayegba, O and D.I. Ikani (2013). "An Impact Assessment of Agricultural Credit on Rural Farmers in Nigeria." *Research Journal of Finance and Accounting*. Vol.4, No.18.
- Bashir M. K., Yasir Mehmood and Sarfraz Hassan (2010). "Impact of Agricultural Credit on Productivity of Wheat Crop: Evidence from Lahore, Punjab, Pakistan". *Pakistan Journal of Agricultural Science*. Vol.47(4), 405-409.
- Bhanumurthy, K.V. (2002). "Arguing a Case for the Cobb-Douglas Production Function". *Review of Commerce Studies*, pp. 75-91. New Delhi.
- Carter, M. (1989). "The Impact of Credit on Peasant Productivity and Differentiation in Nicaragua." *Journal of Development Economics*.vol. 103: 13-36.
- Central Bureau of Statistics (2011). *Agricultural Survey 2068*.
- Coelli T.J. (1995). "Estimators and Hypothesis Tests for a Stochastic: A Monte Carlo Analysis." *Journal of Productivity Analysis*. Vol.6, pp.247-268.
- Coelli T.J., D.S. Rao, Christopher J. O'Donnell and G. Battese (2005). *An Introduction to Productivity and Efficiency Analysis*. Springer Media Inc., New York.
- Coelli, T. J., D. S. P. Rao and G. E. Battese (1998). *An Introduction to Efficiency and Productivity Analysis*. Boston: Kluwer Academic Publishers.
- Coelli, T.J. (1996). *A Guide to Frontier Version 4.1: A Computer Program*. University of New England, Armidale, Australia.
- Devi, R.Uma (2012). "Impact of Co-operative Loan on Agricultural Sector: A Case Study of E.G. District Andhra Pradesh". *Journal of Arts, Science and Commerce*. Vol III. Issue 4(2).
- Dong F., Jing Lu and A.M. Featherstone (2010). "Effects of Credit Constraints on Productivity and Rural Household Income in China." A working paper presented at Center for Agricultural and Rural Development (CARD), Iowa State University.
- Duy, V.Q. (2012). "The Role of Access to Credit in Rice Production Efficiency of Rural Households in the Mekong Delta, Vietnam." CAS Discussion paper No 84.

- Farrell, M. J. (1957). "The Measurement of Productive Efficiency". *Journal of the Royal Statistical Society*. Vol. 120(3), pp. 253-290.
- Feder G., J. Lau Lawrence, Y.Lin Justin and Lno Xiaopeng (1990). "The Relationship between Credit and Productivity in Chinese Agriculture: A Microeconomic Model of Disequilibrium." *American Journal of Agricultural Economics*. Vol.72. pp. 1151-1157.
- Ibrahim A.H. and S. Bauer (2013). "Access to Microfinance and Its Impact on Farm Profits among Rural Farmers in Dryland of Sudan". *Global Advanced Research Journal of Agricultural Sciences*. Vol 2(3). pp.88-102.
- Konare, K. (2001). "Challenges to Agricultural Financing in Mali." A Paper submitted to Michigan State University in Partial Fulfillment of the Requirement for the Degree of MSc Agricultural Economics.
- Meeusen, W. and Van Den Broeck (1977). Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error." *International Economic Review*. Vol.18. pp.435-444.
- Meyer R. L. (1990). "Analyzing the Farm-Level Impact of the Agricultural Credit Decisions." *American Agricultural Economics Association*. pp.158-159.
- Ministry of Finance (2013). *Economic Survey (2013)*. Government of Nepal.
- NRB Dhangadhi (2013). Economic Activity Study Report (Annual).
- Rahman, S.U., A. Hussain and M. Taqi (2014). "Impact of Agricultural Credit on Agricultural Productivity in Pakistan: An Empirical Analysis." *International Journal of Advanced Research in Management and Social Sciences*. Vol.3.No.4.
- Sharma N.R. (2014). "Agricultural Credit flow of Commercial Banks and Impact on Agricultural Production in Nepal." *Scholars Journal of Arts, Humanities and Social Sciences*. Vol. 2(2C).pp.372-376.
- Shrestha M.B. (2014). "Status of Credit Flow to Agriculture Sector and Prevalent Challenges." *Arthik Mimansa*, FIEUN, NRB.
- Thorbecke E. (1970). *The Role of Agriculture in Economic Development* available at [www:nber.org.books/thor70-1](http://www.nber.org/books/thor70-1).
- Zuberi, H. A. (1989). "Institutional Credit and Agricultural Development within the Framework of Balanced Growth". *Journal of Economic Development*, Vol. 15(1), pp.121-139.

Appendix A

Questionnaire for Farmers

This questionnaire has been prepared for the study entitled “**Agricultural Credit and Its Impact on Farm Productivity: A Case Study of Kailali District**” being carried out by Nepal Rastra Bank, Dhangadhi Office. All the information received hereby will be kept secret and will not be used for any other purpose except this study.

Name of the Enumerator:	Date:
Time of Interview:	Signature:

1. Personal Details

Name of the Household Head:	
Address:	Age:
Household Size: ...members	Contact Number:

2. Sex of the Household Head?

Male [0]

Female [1]

3. Which level of education have you attained?

Illiterate [1]

Informal Education [2]

Primary Level [3]

Secondary Level [4]

Higher Education [5]

Technical Education Related to Farming [6]

4. Which occupation are you involved in?

Agriculture Only [0]

Agricultural and Others [1]

5. Which religion do you follow?

Hinduism [1]

Buddhism [2]

Islam [3]

Christianity [4]

Others [5]

6. Your Caste?

- Brahaman/Chhetri [1]
- Chaudhary/Rana [2]
- Dalit [3]
- Other Janajati [4]
- Others [5]

7. How much land did you use for farming food crops (Wheat, Paddy, Barley, Maize and Millet) this year?

- 0-10 Kattha [1]
- 10-20 Kattha [2]
- 20-40 Kattha [3]
- More than 40 Kattha [4]

8. How much area of land did you use for producing vegetables this year?

- 0-10 Kattha [1]
- 10-20 Kattha [2]
- 20-40 Kattha [3]
- More than 40 Kattha [4]

9. Have you taken agricultural loan from NRB licensed banks and financial institutions?

- No [0]
- Yes [1]
- (If No, go to question no. 14.)

10. If loan taken, have you obtained sufficient credit as per your demand?

- Yes [0]
- No [1]

11. What percent of your credit demand was fulfilled by the loan taken from BFIs?

About percent.

12. How much interest rate are you paying for the loan?

..... percent.

13. How much easy do you think obtaining agricultural loan from banks and financial institutions?

- Easy [1]
- Difficult [2]
- Very Difficult [3]

14. If you have not obtained credit as per your demand, which of the following factor do you think is responsible for such a credit-constrained situation?

- Insufficient Mortgage [1]

Lack of Interest of BFIs for Agricultural Credit [2]

Sparse Presence of BFIs [3]

Others [4]

15. How much area of land did you plant paddy this year?

.....Bigahaa.....Kattha.

16. How much of the following inputs did you use for paddy production this year ?

Amount of Seed..... k.g.

Amount of Fertilizer.....k.g.

Amount of Laborman days

Irrigation Expenditure Rs.

Capital Expenditure Rs.

Agricultural Loan Rs.....

17. How much rice did you produce this year?

Rice Yield:Quintals.

18. Did you use improved paddy seeds?

Yes [0]

No [1]

19. How much area of land did you plant wheat this year?

.....Bigahaa.....Kattha.

20. How much of the following inputs did you use for wheat production?

Amount of Seed..... k.g.

Amount of Fertilizer.....k.g.

Amount of Laborman days

Irrigation Expenditure Rs.

Capital Expenditure Rs.

Agricultural Loan Rs.....

21. How much wheat did you produce this year?

Wheat Yield:Quintals.

22. Did you use improved wheat seeds?

Yes [0]

No [1]

23. How much area of land did you plant maize, millet and barley this year?

Maize.....Bigahaa.....Kattha.
Millet.....Bigahaa.....Kattha.
Barley.....Bigahaa.....Kattha.

24. How much of the following inputs did you use for maize, millet and barley production?

Amount of Seed: Maize k.g., Millet k.g. and Barley k.g.
Amount of Fertilizer: Maize k.g., Millet k.g. and Barley k.g.
Amount of Labor: Maizeman days, Millet..... man days and Barley.....man days.
Irrigation Expenditure: Maize Rs., Millet Rs.and Barley Rs.
Capital Expenditure: Maize Rs. Millet Rs.and Barley Rs.
Agricultural Loan Rs: Maize Rs., Millet Rs.and Barley Rs.

25. How much maize, millet and barley did you produce this year?

Yield of maize:Quintals.
Yield of millet:Quintals.
Yield of barley:Quintals.

26. Did you use improved seeds of maize, millet and barley?

Yes [0]
No [1]

27. How much area of land did you plant vegetables this year?

.....Bigahaa.....Kattha.

28. How much of the following inputs did you use for vegetable production?

Amount of Seed..... k.g.
Amount of Fertilizer.....k.g.
Amount of Laborman days
Irrigation Expenditure Rs.
Capital Expenditure Rs.
Agricultural Loan Rs.....

29. How much vegetables did you produce this year?

Wheat Yield:k.g.

30. Did you use improved vegetables seeds?

Yes [0]
No [1]

31. What problems are you facing while producing food crops and vegetables?

- Lack of Capital [1]
- Lack of Improved Seeds [2]
- Deficiency of Irrigation Facility [3]
- Unavailability of Fertilizer [4]
- Crop Disease [5]
- Others (Please Mention)..... [6]

32. What should be done in order to solve the problems faced by the farmers like you?

- Agricultural Loan at Subsidized Interest Rate [1]
- Subsidy on Improved Seeds [2]
- Irrigation Facility [3]
- Timely Control of Crop Diseases [4]
- Others (Please Mention)..... [5]

Thank You Very Much for Your Time and Patience.

Questionnaire for the Bankers

This questionnaire has been prepared for the study entitled “**Agricultural Credit and Its Impact on Farm Productivity: A Case Study of Kailali District**” being carried out by Nepal Rastra Bank, Dhangadhi Office. All the information received hereby will be kept secret and will not be used for any other purpose except this study.

Name of the Enumerator:	Date:
Time of Interview:	Signature:

1. Details of the Lending Institution

Name:

Total Lending during the FY 2070/71:

Total Loan Disbursed to Agricultural Sector during the FY 2070/71:.....

Total Number of Loanee during the FY 2070/71:

Total Loanee of Agricultural Lending during the FY 2070/71:

2. How many loan proposals do generally to your office per year?

Aboutproposals.

3. How many of the received agricultural loan proposals are accepted on the average?

Aboutpercent.

4. How much interest do you charge for agricultural loans?

Aboutpercent.

6. Which factors do you consider as important ones while accepting agricultural loan proposals?

Educational Level of Farmers [1]	<input type="checkbox"/>
Age of Farmer [2]	<input type="checkbox"/>
Sex of Farmer [3]	<input type="checkbox"/>
Land Size of the Farmer [4]	<input type="checkbox"/>
Amount of Other Assets with the Farmer [5]	<input type="checkbox"/>
Annual Income Farmer [6]	<input type="checkbox"/>
Annual Saving of Farmer [7]	<input type="checkbox"/>
Technical Skills of Farmer [8]	<input type="checkbox"/>
Others (Please Mention)..... [9]	<input type="checkbox"/>

6. If you are to arrange the determinants of agricultural lending in an Ordinal Scale of 1 to 5, how would you like to rate?

-(1)
- (2)
- (3)
- (4)
- (5)

7. What are the main problems faced by you regarding agricultural lending?

.....

.....

.....

.....

.....

.....

8. What steps should be taken in order to sort out the problems faced by you regarding agricultural lending?

.....

.....

.....

.....

.....

.....

Thank You Very Much for Your Time and Patience.