

NORWEGIAN UNIVERSITY OF LIFE SCIENCES



**Factors influencing demand for Credit from formal and informal sources in
Gujranwala District, Pakistan- A case of commercial banks and arties**

By

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Dedication

I would like to dedicate this research work to my parents and beloved wife “NAZIA TANVEER” who always prayed for me in every walk of life. I cannot proceed further without special dedication to my beloved and cute grandmother “SURAYYA BIBI” who is heaven for me and whose tremendous moral training enabled me to achieve my targets and goals with hardworking and determination.

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Declaration

I, Tanveer Hussain, hereby declare that this study is the result of my own research work and findings. All the informative sources, irrespective of my own, have been acknowledged and also a list of references has added. Besides it, this research work has not been submitted to any other academic institution or university in order to award of any sort of degree.

Signature.....

Date.....

Abstract

The intention of this research was to examine the effects of social and economic factors on credit demand of rice growers from arties and banks in Gujranwala district, Pakistan. The Cross-sectional data from 313 randomly selected loan beneficiaries (rice growers), were obtained. The data were analyzed by using multiple regression, t-test, percentages and frequency distributions. It was concluded that factors which showed significant results in both sources banks and arties were farm size, income level, time requirement, payback period and no. of dependent schooling children. Apart from the mentioned factors which other studies have also established, more interesting factors have been identified by this study including the question of trust between Arties and borrowers built on information of borrowers on reputation obtained by Arties and also follow up by arties on borrowers' use of credit. Here information seems to play a crucial role in building trust and therefore easing conditions for borrowing since most borrowers received their loans without any collateral conditions. Based on these results, it is suggested that banks must improve the amount of loans to agriculture sector in general and to rice growers in particular taking into account information and follow up of their clients. The lenient polices must be formulated by banks regarding collateral securities so that small scale rice growers can avail the loan facilities at lesser collateral conditions. Besides it, arties must reduce commission rate and other type of charges (per acre fixed quantity of rice). The least but not the last, rice must use the loan for same purpose for which it is granted.

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List of Acronyms

GDP	Gross Domestic Product
ZTBL	Zarai taraqiati Bank Limited
SBP	State Bank of Pakistan
PKR	Pakistani Rupee
ALA	Agriculturists Loan Act
ADBP	Agricultural Development Bank of Pakistan
PICIC	Pakistan Industrial credit & investment Corporation
USD	United States Dollar
UMB	Norwegian University of Life Sciences
VHLSS	Vietnam household living standard survey
OLS	Ordinary Least Squares
GLS	Generalized Least Squares

1.1 Introduction and Background:

Pakistan's economy mainly depends on agriculture sector which contributes 22% to country's GDP and 45% in its total employment. This sector also has substantial contribution 60% to exports and provides raw material to industrial sector of Pakistan. About 66% of the people residing in rural areas of the country are directly or indirectly involved in agriculture. So, this sector not only influences country's growth but also creates employment opportunities for people (Muhammad et al. 2007).

Rice is an important cash crop which plays a vital role in enhancing the country's economy. It fulfills about 2 million tons of our food requirements and serves as an employment source for people living in rural areas of rice zones (Abedullah et al, 2007).

. After wheat and cotton, rice is the 3rd major crop which was cultivated on more than 2.5 million hectares in 2005. It has a greater impact on national economy as it contributes 1.3% to GDP and 6.1% in total value added of agriculture (government of Pakistan, 2005-06). This crop also has a big share in foreign exchange earnings of Pakistan.

In Pakistan, there are two main rice-producing provinces i.e. Sindh and Punjab. These two provinces produce about 88% of total rice production in the country. The Punjab province is producing 100% Basmati rice in Pakistan due to its favorable soil conditions and agro based climate. In Punjab, major rice producing districts are Gujranwala, Okara, Hafizabad, Sialkot, Jhang and Mandi Bahaudin which are producing about 70% of total Basmati rice cultivation in Pakistan (Abedullah et al, 2007).

The agricultural credit market comprises of two broad segments i.e. formal and informal. Basically, friends, relatives and arties or commission agents (informal agricultural credit sources) are the major source of agricultural credit for rice growers. But, arties or commission agents play a significant role as a big contributor to informal agricultural source for rice growers. These arties lend money for shorter periods of time and charge high rate of commission. Rice farmers obtain loans for rice farming from them as well as during depression period for various consumption purposes. Arties always take advantage on rice growers when they are in sudden need of cash for buying seasonal inputs (Khalid, M. et al., 2007). When rice farmers get loans from dealers or arties they sell their produce to the same dealers because they find it convenient or are either under compulsion to sell

the produce to the dealer/arty. This condition is spelled out in the verbal agreement between Arties and small holder rice farmers most smallholder rice farmers of this region get their agriculture credit from Arties for various reasons including not having information or knowledge for getting loans from commercial banks in the area (SBP, 2008).

The formal source of agricultural credit consists of various commercial banks which serve as an intermediary for flowing of funds from richer class to the poorer class of the country (Atakilt Admasu & Issac Paul, 2010). Currently, in Gujranwala district, they are providing short, medium and long term loans to rice growers at very lesser rate of interests as compared to arties or commission agents. The banks have opened their branches in all rural areas of the district and rice growers have easy access to the banks. So, they can sell their produce in the open market and can fetch good prices if they get loans from banks (SBP, 2008). But, due to some complicated lending procedures and high demand of collateral securities, some small rice growers feel hesitation to obtain loans. Thus, the study in hand is undertaken by focusing on the factors which become the base for small holder rice farmers to take credit either from banks or arties.

1.2 Problem Statement

Gujranwala District, being a big producer zone for rice production, is facing enormous decrease in rice yield since last decades. Among other factors like soil fertility, land degradation, irrigation problems and old methods of production, the most important one is lack of capital (Waqar Akram, 2008). Due to shortage of capital, rice growers are unable to adopt modern methods of production and ultimately cannot buy modern technologies to increase per acre yield. Shortage of capital is one of the prevailing problems that result in stagnation of agriculture sector in general and for rice growers in particular. According to Assefa (1987), the vicious circle of poverty i.e. “the low productivity, low income and again low productivity cycle”, in agricultural sector can only be removed by giving credit to small farmers so that they can easily use advanced technologies and equipments, increase yield, and finally improving their ability to sell their produce in the open market for fetching good prices. Due to seasonal variations in

farmers return, they need immediate cash for sowing and cultivation processes. Though, credit is not a direct tool to increase production but it can reduce financial constraints for buying modern equipments.

In Gujranwala district, smallholder rice farmers access credit from both informal and formal sources. The reason for lack of capital by smallholder rice farmers in presence of these agricultural credit sources is that they are not obtaining the loan as they are intended (William E. Scott and A. David, 1988). Only 14.8% small farmers are getting loans from institutional sources while 53% are obtaining from arties despite the seemingly exploitative arrangements of arties credit terms.. . So what are the factors responsible for rice farmers' demand for credit from these sources?

1.3 Objectives

This study has three main objectives it addresses as follows;

- (i) To investigate the credit needs of rice growers and factors influencing credit demand from both commercial banks and arties ;

Research Questions

- (i) What are the factors influencing the demand for credit by smallholder rice farmers
 - (ii) What do smallholder rice farmers need loan for?
 - (iii) What types of securities are required for taking loans either from banks or arties?
-
- (ii) To find whether granted loans for rice production have been used as intended;

Research Questions

- (i) What uses of the obtained loans did the small holder farmers put into?

- (ii) Do rice farmers use loans for the same purpose for which loan was obtained?
 - (iii) Do rice growers return loan on agreed time?
- (iii)** To elucidate the challenges faced by both agricultural sources of credit (banks and arties);

Research Questions

- (i) What are strengths and weaknesses of both sources?
- (ii) What obstacles are faced by smallholder rice farmers to obtain loans from banks and arties?
- (iii) What obstacles are faced by banks or arties to grant loans?
- (iv) What should be done to improve efficiency of both agricultural sources of credit i.e. banks and arties?

1.4 Expected outcomes

This study will be fruitful for those planners who make policies for the credit distribution in agricultural sector. The Government of Pakistan can use the results and recommendations for taking appropriate steps towards agricultural credit advancements. The State Bank of Pakistan (SBP) can use the results of the study as a tool to make new agricultural credit policies for small farmers which will be considering the challenges smallholder rice farmers are facing in obtaining credit from different sources in Pakistan. In addition to this, in this era of competition, commercial banks can also formulate such policies which will encourage small farmers to take loan including few securities requirements, more payback period, low time gap between loan application and approval because only in this way farmers will prefer banks over arties. The small farmers can get fruitful information regarding selection of right source (banks or arties) at the right time.

1.5 Scope and Limitations

The study in hand has been conducted to examine the major factors which play a vital role in determining credit demand either from banks or arties by smallholder rice farmers in Gujranwala District, Punjab province in Pakistan. The major limitations which faced the study were the limited availability of financial resources and time to conduct this study on a large scale. The other limitation is obtaining data from farmers. We could not obtain data for earlier years since, farmers keep very limited records and because of memory lapse, it was difficult.

1.6 Ethical considerations

Ethical considerations are very important in research. They revolve around attitude of the researcher towards the respondents or people who are a significant part of research process. My role in this study has been as a participant and an observer in the research process. Confidentiality is a major feature of a research, this has been duly observed by the researcher during the time of research and beyond during data processing and writing by making sure respondents identities are protected (Stern et al., 2004:29). All of those who contributed in this research were properly informed about the objectives of the study and their permission was obtained before going on with the study. Efforts were put to have good ethical standards in data collection, processing and reporting.

2. Overview of Government agriculture credit policy, Credit supply arrangements by formal and informal sources

2.1 Government practices

Agricultural credit is a significant part of agriculture Modernization as well as commercialization of rural economy. The availability of cheap and easy credit is an appropriate way for increasing agricultural production level. Therefore, for fulfilling the credit needs of farming community, all successive governments have made and implemented credit policies (Abedullah et al., 2009).

According to “Agriculturists Loan Act of 1958 (ALA)”, credit was given in order to reduce anxiety and for buying fertilizer, seeds, tractors and diesel etc. This credit was termed as “Taccavi loans” which were basically relief loans and did not contribute to agricultural development. These loans were granted by revenue departments of four provincial governments (Punjab, Sindh, NWFP and Baluchistan). With the passage of time, the contribution of taccavi loans started to reduce because of establishment of other institutional sources. Only short proportion of provincial budgets was allocated for these loans. Furthermore, complex process of sanctioning loan and more time gap between application and approval of loan made taccavi loans inefficient and resultantly these loans completely finished since 1993-94 (M. Iqbal, 2003).

With cooperation and consent of provincial governments, the Federal government launched “Federal Bank for Cooperatives” in 1976. This bank depends entirely on State Bank of Pakistan (SBP) for financial assistance. The basic aim of FBC was to reduce the dependence of farmers on informal agricultural credit sources. But, the FBC did not show the fruitful progress due to improper disbursement of funds (M. Iqbal, 2003)..

In 1961, Government established Agricultural Development Bank of Pakistan (ADBP) which has recently renamed Zarai Taraqati Bank Limited (ZTBL) which is a dominant source of institutional agricultural credit in Pakistan. This bank basically gets all funding from state bank of Pakistan but funding is also provided by World Bank and Asian Development Bank for some certain funding programmes. Now a day, this bank is playing a vital role in providing loans to farmers (M. Iqbal, 2003).

The credit disbursement in agriculture sector shows that government's priority was farm sector. According to the survey of State Bank of Pakistan (2008), total disbursed credit was PKR 159281 million out of which PKR 111841 million (70%) was given to crop sector and remaining 30% was advanced to other agricultural sectors. In spite of above mentioned efforts by government, agricultural sector is not so developed due to poor policies, mismanagement and corrupt government officials. Therefore, government should rethink how to bring agricultural development in the country (Abedullah et al., 2009).

2.2 Main features of arties and banks as a credit source

In Pakistan, the agricultural credit market consists of two broad segments i.e. the formal and informal. While talking about informal source, it composes of friends, relatives and arties but focus of the study is on arties/ commission agents. The arties are a major source of informal credit. Arties generally lend money for short span of time normally for six months and charge high rate of commission. They charge commission in two ways i.e. firstly, commission is charged on market value of total output instead of borrowed money and secondly a stipulated quantity of output is charged per acre. The loans are provided both regularly and in bad periods. These loans are provided for buying inputs and also to meet daily consumptions. The credit providers have close relationships with farmers and are in better position to evaluate their credit worthiness and repute. The provided loans are often tied which enable farmers to enhance their credit access by repayment records. The farmers don't have to travel a lot because normally arties are in close vicinity to them. They get loan on the spot depending on their credit worthiness/relationship and how much cash is available by the arty at that time. (M. Khalid et al., 2007).

While talking about formal sources of credit, the focus of study is on commercial banks. The commercial banks provide short, medium and long term loans. They charge comparatively low rate of interest. Since they don't know detailed information about borrowers i.e. credit worthiness and repute so they mainly rely on collateral securities. The loans are provided for buying inputs and tractors. The process is complex for sanctioning loans especially for uneducated farmers and also take more time. The banks are established bit farther which takes more time to reach (Catherine, 2007).

3. Literature Review

Studies on formal and informal credit have been conducted by many previous authors with the intention to understand how credit can be used to improve the lives of various beneficiaries in agriculture and other sectors in developing countries. Below we review some of these studies to learn why they were done and how so as to learn from their achievement and challenges.

Alvaro Reyes and Robert Lensink (2010) conducted the research on “Interaction between Formal and Informal Rural Credit Institutions in Central Chile”. The basic objective of this research was to identify either informal or formal lenders in Central Chile serve as substitutes or complements to credit suppliers for peasants. By using a panel Logit model along with “dummy explanatory variable”, they denoted the major determinants which influence informal credit access. Because of some variables which can affect both independent and dependent variables, there were chances of some potential endogeneity problems. The outcomes of this study showed that when endogeneity is given relevant importance, there is reduction in outstanding informal credit by the credit constrained peasants. One argument of the study was that formal credit is selected for investments while informal credit is used for maintaining working capital. It was revealed that since farmers are credit constrained from formal sources and therefore they invest less which determines that in this case peasants will be in need of lesser amount of working capital, subsequently they will borrow fewer amounts from informal institutions.

Catherine (2006) studied “Understanding the Coexistence of Formal and Informal Credit Markets in Piura, Peru” and examined why farm households prefer informal sector over formal institutions even though they have to pay high amount of interest if they select informal borrowings. It was revealed by unique panel data set based econometric analysis which explained that informal sector serve different sort of clients’ i.e. both households and those households which borrow money from informal sources due to fewer risk and minimum transaction cost were excluded from formal sector. The deeper analysis of loan technologies and contract conditions allow a good comparison of

contractual risk and borrowing cost of both formal and informal sectors and explored that economies and proximity availed by informal sources permit them to monitor the contractual based risk in a good way.

The study by Waqar Akram (2008) on the topic “Constraint’s Analysis of Agricultural Credit Use: Implications for Poverty Reduction in Pakistan” identified the major credit constraints faced by peasants with the help of two household data sets. In order to study the objective, source structure and use of credit, the first “Pakistan Rural Household Survey (PRHS)” was used. While, the second was utilized to figure out interest rate and demand function by using “Heckman two stage process” in Sargodha District which covered about 160 households. To find out the impact of credit constraints on production and consumption behavior of households was the basic motto of the study. Furthermore, to study the impact of unconstrained and constrained farmers, the frontier production function was utilized. The results revealed that educational level of households accounts a lot for entering in credit market. There were many constraints faced by the farmers including poor distribution of water and land, small holdings, irrigation problems, low level of education, mismanagement of resources and uneven access to credit sources.

The study of “Determinants of formal agricultural credit allocation to the farm sector by arable crop farmers in Benue State, Nigeria” by Victor et al. (2011) was conducted to find the influences of demographic and economic factors on allocation of credit in Nigeria. About 300 loan beneficiaries were selected randomly for data collection. The available data were analyzed by using multiple regression, t-test, percentages and frequency distributions. As a result, it was found that there was a significant gap ($p \leq 0.001$) between applied and received money by farmers. It was also found that only 56% farmers used the loans on the same activity for which loan was obtained and remaining 44% farmers used loans on nonfarm activities. The major factors which greatly influenced the credit allocation to farmers were education, age, household size, farm size and time gap between application of loan and its collection. It was recommended in this study that there must be proper flow of funds by the commercial banks to farmers so that they can have enough amounts for their farm activities. It was

also suggested that banks must conduct supervisory services to farmers in order to enhance their capabilities up to great extent.

Barslund and Tarp (2007) conducted the research in Vietnam regarding “interaction between formal and informal rural credit”. In this study, two data sets “Vietnam household living standard survey (VHLSS)” 2002 and 2003 were being used. Both formal analysis and descriptive statistics in this study revealed that farmers use the loan for consumption patterns instead of agricultural activities. However in Vietnam, credit market is in progress because overall interest rate has been decreased during last few years. According to this study, it was expressed that land plays a major role as a collateral security for taking loans. The farmers who had poor credit history were rationed by the credit institutions.

Another study by Ibrahim et al. (2007) indicated that in Ethiopia both formal and informal credit markets are playing a vital role in credit expansion in rural areas of the country. It was found that barriers of banking credits can be removed by reducing transaction costs. Furthermore, it was suggested that for smooth running of credit markets there must be proper integration between formal and informal credit sectors.

The study by Zeller (1994) determined the loan rationing by formal and informal institutions. It was found that both informal and formal money lenders get information about credit worthiness of borrowers in the same manner. The major thing in this study was regarding the lesser significance of land as a collateral security and its only income level and relationship among borrowers and lenders which lead towards credit availability. Probit model was used by the author and results of this model showed that Wealth, risk bearing potential and human capital are major determinants to find either a peasant is credit constraint or not.

In the light of above studies which have been conducted in different parts of the world but with same objective i.e. evaluating formal and informal credit needs and constraints faced by the farmers in different perspectives. It is vivid from the above mentioned studies that both formal and informal credit sectors have their relevant importance. Some

studies have checked technical efficiency of credit in order to increase the production level while others have analyzed credit demand factors and constraints as well. Almost all studies suggest that land is major factor as a collateral security for taking loans with the exception of the Zeller (1994) who focused on income level and strength of relationship between borrowers and lenders. All the studies have relevance to the study in hand in different aspects because credit constraints, credit demand factors and coordination between formal and informal sectors are major areas of interest in this study. These researches suggest that informal credit is being used by the farmers to maintain working capital while formal credit sources are used for buying modern equipments like tractors, machineries, thrashers etc. Some studies say that the major credit constraint is credit rationing by the commercial banks due to high risk of agricultural sector while other are in favor of interest rate. The study by Victor et al. (2011) and Alvaro Reyes and Robert Lensink (2010) have used the same model (Multiple regression and Logit models) to check the credit allocation and coordination among informal and formal agricultural sources. This study has used a multiple regression analysis to study which factors influence credit demand by smallholder rice farmers in Gujranwala.

From these above mentioned studies, we have learned that why people prefer informal sources where they have to pay more interest while formal credits exist. The reason behind this is that farmers are normally risk averse as they do not have many collateral securities. Furthermore, I am in strong opinion regarding significance of interest rate for selection of credit source. The educational level of farmers for entering in the credit market also plays an important role i.e. educated farmers don't feel hesitation for taking loans from commercial banks at lesser rate of interest and vice versa. Besides it, normally, in underdeveloped countries like Pakistan, farmers do not use the loan for the same purpose for which loan was obtained which result in agricultural backwardness. In this study, we are therefore going to use some of these influencing credit demand factors in our study of Gujranwala to test their validity as well.

4. Research design and Methodology

Qualitative research employs observation techniques, whereas quantitative research is based on different measurement techniques (Bryman, 2008:21). This study used cross-sectional data for analysis obtained from households in the selected villages. Questionnaires were administered as a part of the study. The questionnaire was simple and easily understandable in order to collect appropriate information. All questions have been with the help of inferences extracted from the study. A pre test survey was arranged in study area to check either the designed questionnaire is workable or not and actual survey took place after that. Interviews were also conducted to ensure that notions and feelings of interviewees are properly gauged.

4.1 Data collection & Sampling

The survey was conducted in all the 4 Tehsils of District Gujranwala viz. i) Gujranwala ii) Wazirabad, iii) Kamonke iv) Nowshera Virkan. There were 802 villages in Gujranwala District out of which 8 villages have been selected randomly through stratified sampling for the survey; 2 villages from every Tehsil. A total of 313 respondents were interviewed during the survey covering 40 farmers/rural households selected randomly from each of the 8 villages.

The data collection procedure was carried out in two ways: Firstly, structured questionnaires were administered on the selected 313 rice farmers in the area as primary data collection. While, secondary data was collected from commercial banks, arties and Government offices through interviews focus group discussion.

Executives and credit experts from the Zarai taraqati bank limited (ZTBL), Pakistan Industrial credit and Investment corporation (PICIC), Bank Alfalah, Habib bank and Allied Bank were selected to represent all the commercial banks in Gujranwala district. The basic reason for selecting these five banks is their relative exposure to credit for rice growers in the study area, as revealed by the various literatures. Since the credit issue requires both access and appropriate knowledge regarding lending policies, two

individuals i.e. branch manager and agricultural credit manager have been selected through purposive sampling from all five mentioned banks.

4.2 Theoretical model specification

Demand is the willingness of a buyer, backed by money to buy a product. The demand for financial services, like other sort of product/service, is influenced by their own price and other factors such as level of income of borrower, and other costs related to borrowing. So far as financial services are concerned, interest charged is the price of credit. Specifically, in demand for credit analysis, other factors being constant, the higher the interest rate, the lesser will be the demand for credit (Paul Mpuga, 2004). It is a believable assumption because when interest rate is high (price of credit), it discourages borrowers from taking up loans to avoid paying up high interest on the loan in the future. In our study farm size can be an important determinant for credit demand. According to the set hypothesis farm size is positively correlated i.e. bigger the farm size, higher will be demand for credit and vice versa. Other factors considered in our analysis include; the payback period, which is hypothesized to have positive relation with demand for credit. Other determinants which also have positive correlation (according to set hypothesis) with demand for credit are income level, education, number of dependent schooling children and household size. It implies that higher income level, education, number of dependent schooling children and household size will result in higher demand for credit and vice versa. The determinants which according to set hypothesis are negatively correlated are distance, age and loan delay (time gap between application and approval of loan). It means that higher the distance, age and loan delay lesser will be demand for credit and vice versa. So, in the study of determinants of credit demand of an individual is directed towards consumer behavior. In this study credit demand of an individual means the amount of money a rice grower is ready to borrow in order to fulfill his or her agricultural activity needs such as buying farm inputs, hiring extra labor for farming and cover costs related to agriculture activity including farm preparation, planting, weeding, harvesting and processing. Then level of demanded credit is defined as the amount in PKR of credit demanded by rice farmer.

The demand for credit can be expressed in an equation as follows:

$$Y_i = X\beta + e_i \dots\dots\dots(1)$$

*
Where the subscript i represents the amount of credit borrowed by household from formal or informal sources respectively. X is a vector of factors that would potentially influence the demand of credit sources. The subscript i indexes individual farmer households. β are slope parameters, and e are errors, assumed to follow normal distribution.

4.3 Empirical model specification

The available data has analyzed by using frequency distribution, percentages, multiple regression analysis and t-test. T-test is employed in order to check the difference between credit needs of rice growers and supply of credit either by arties or commercial banks. Multiple regression models has used for determining the major factors influencing demand of credit by rice farmers. Specifying the above formulation in equation 1 above for empirical investigation we got excel used cross sectional data.

$$\ln Y_i = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + \beta_{10} \ln X_{10} + e_i \dots\dots\dots(2)$$

- $\ln Y_i$ = Natural logarithm of amount of credit demanded
- α = Constant
- $\ln X_1$ == Natural logarithm of age)
- $\ln X_2$ = Natural logarithm of educational level
- $\ln X_3$ = Natural logarithm of income level (PKR)
- $\ln X_4$ = Natural logarithm of farm size (acres)
- $\ln X_5$ = Natural logarithm of household size
- $\ln X_6$ = Natural logarithm of no. of dependent schooling children
- $\ln X_7$ = Natural logarithm of Interest rate (cost of borrowing
- $\ln X_8$ = Natural logarithm of payback period
- $\ln X_9$ = Natural logarithm of distance

$\ln X_{10}$ = Natural logarithm of loan delay (no. of days between loan application and receipt- reflects also the risk of failure in farming activities)

β_s = Regression coefficients;

e_i = “Random error term independently and identically distributed with zero mean and constant variance”

Data has presented in the form of diagrams, tables, pie charts. On the basis of statistical results, correlation between variables has organized. To evaluate interests of respondents, causal diagrams have been accomplished from interviews and focus group discussions. Microsoft Excel has used for regression and other statistical analyses.

4.4 Hypotheses

$\beta_1 < 0$, Negative relationship between credit demand and interest rate so higher the interest rate, the less credit is demanded /taken

$\beta_2 > 0$, Positive relationship between credit demand and farm size so bigger the farm size, the more loans is taken

$\beta_3 > 0$, Positive relationship between credit demand and payback period i.e. higher the payback period, more credit demand

$\beta_4 > 0$, Positive relationship between credit demand and income level: higher the income, more willingness for loan

$\beta_5 > 0$, Positive relationship between credit demand and educational level so higher educational level leads to higher demand for credit

$\beta_6 > 0$, Positive relationship between credit demand and household size so bigger the household size, the more loans is demanded

$\beta_7 < 0$, Negative relationship between credit demand and distance to the credit source so lesser the distance, more demand for credit

$\beta_8 < 0$, Negative relationship between credit demand and age so higher the age, lesser is the demand of credit

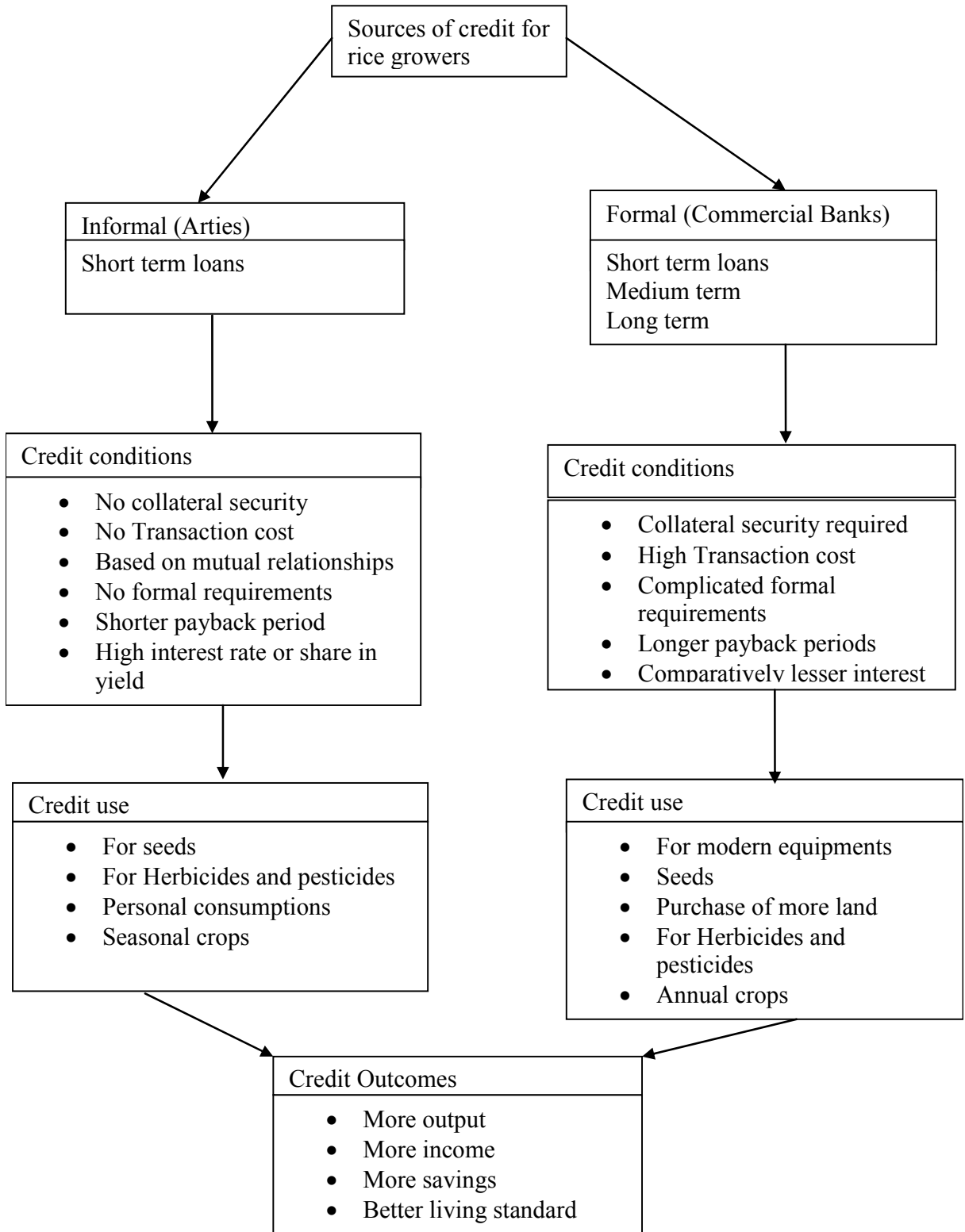
$\beta_9 > 0$, Positive relationship between credit demand and no. of dependent schooling children so higher the no. of dependent schooling children, the higher is credit demand

$\beta_{10} < 0$, Negative relationship between credit demand and loan delay period so higher loan delay period leads to less credit demand

4.5 Conceptual framework

Basically, in agriculture sector, credit comes from two segments i.e. informal and formal. In this study, formal source will take commercial banks into consideration while arties or commission agents have selected from informal agricultural credit source. Arties normally give short term loans to rice growers for running capital and sometimes for personal consumptions of rice growers. On the other hand, commercial banks in the study area are concerned with short, medium and long term loans depending on the nature of credit need by the rice farmers. But, both commercial banks and arties increase the financial strengths of rice growers so that they can purchase inputs (seeds, fertilizers etc.) and adopt modern technologies for getting more and more output. When farmers will have more yields, they will earn more and will be in better positions to fetch good prices in the open markets. Subsequently, they will enjoy better savings and living standard as well. The conceptual framework shows however there are differences in loan conditions between Arties and commercial banks; furthermore smallholder farmers take loans from both commercial banks and arties. In order to understand smallholder rice farmers' behavior in terms of access to credit, this study is thus aimed at looking into factors influencing the farmers' credit sources by comparing informal (Arties) and formal/institutional (commercial) credit providers.

FIGURE 1: CONCEPTUAL FRAMEWORK



5. Results and Analysis:

5.1 Descriptive analysis of the sample

The survey was conducted in two rounds: the first was pre-test survey which took place in February 2012 and second survey (for filling questionnaires and conducting interviews) took place in March 2012. The survey consists of comprehensive information on selection of banks or arties as a credit source. The survey also includes information regarding demographics, rice production, farm size, level of income, distance from credit source, household size, number of dependent schooling children, commission/ interest rate, delay time etc. The sample comprises of 313 households who were actually engaged in rice farming and were able to provide the information about variables of interest. The data were collected from 4 tehsils with two villages from each tehsil. These tehsils were Gujranwala, Kamoke, Wazirabad and Nowshera virkan. The data were collected using random sampling technique by taking approximately 40 rice growers from each village. The questionnaire was administered to every rice grower who was over 18 years (adult). The rice growers were asked to give information regarding their credit demand either from arties or banks. For both banks and arties, they were asked the question: “how much credit did you take annually?” This variable narrates the amount which a rice grower wants to borrow but not the amount he is actually able to borrow.

5.2 descriptive statistics of research questions

5.2.1 Uses of obtained credit by smallholder farmers

The rice growers were asked “What do smallholder rice farmers need loan for?” The response choices were (a) all: seeds, machinery, urea, spray & diesel (b) urea & diesel (c) urea & spray (d) seed & urea (e) seed & diesel. The responses are indicated below in the form of table.

Table 1: responses of uses of credit by smallholder rice farmers

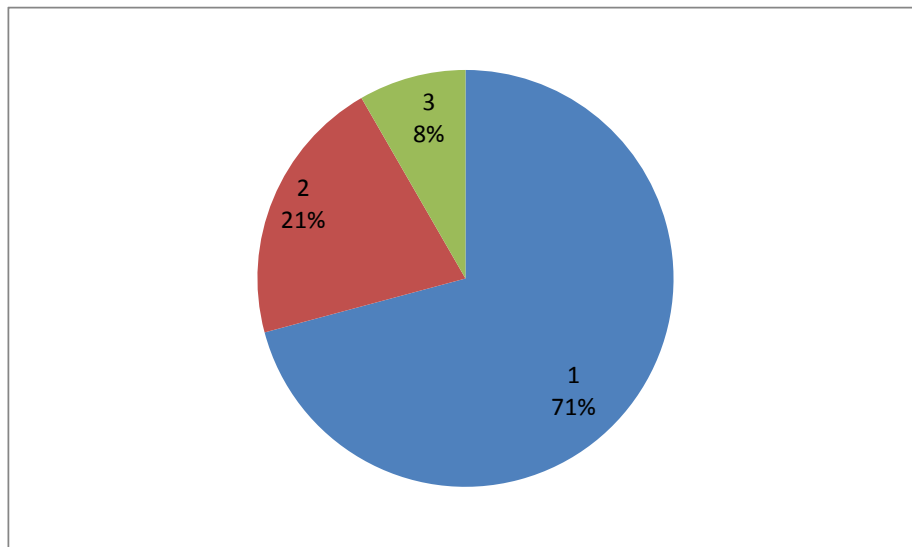
Credit need for	No. of responses	Percentage
All (seed, machinery, urea, spray & diesel)	248	79.23%
Urea & diesel	25	8%
Urea & spray	15	4.79%
Seed & urea	10	3.19%
Seed& diesel	15	4.79%

So, majority, 79.23%, of rice growers need loan for all inputs including seeds, machinery, urea, spray and diesel. The reason behind this was that mostly rice growers own few acres of land and they don't have enough savings to bear such input expenses at start of crop sowing. Among others 8% said that they need credit only for urea and diesel, 4.79% answered they need for urea and spray, 3.19% answered they need credit for seed and urea and 4.79% were in the view that credit is needed by them for buying seed and diesel. These were those rice farmers who have some savings but not enough so that they can bear all input expenses.

5.2.2 Payment on agreed time

To investigate rice grower's potential for payment of commission/interest along with original loan, data were collected from arties and banks. The following question was asked "Do rice growers pay interest/ commission and original amount on agreed time?". The response choices were (a) yes (b) no (c) sometimes. In case of arties, responses are shown in the graph below:

Figure 2.1: Payment on agreed time to arties

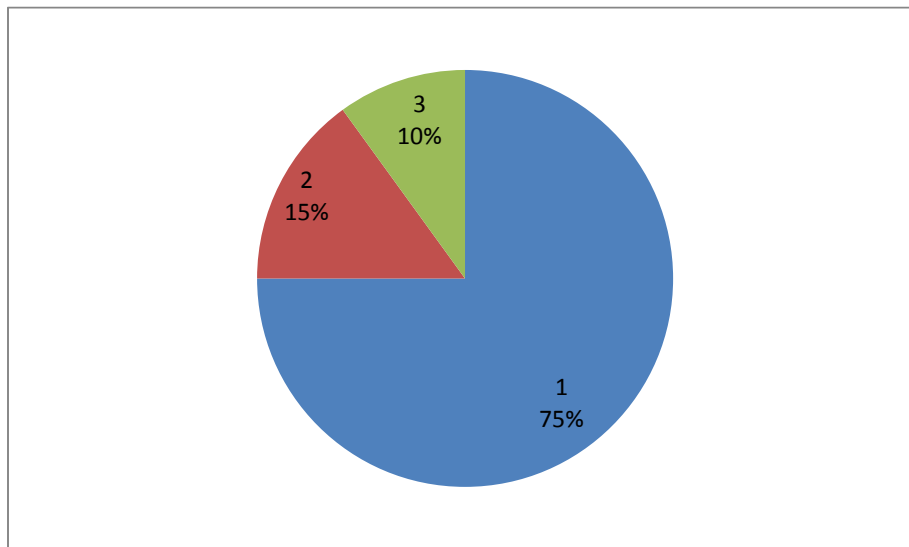


Blue= Yes, Pink=NO & Green=Sometimes

Data were collected from 24 arties (6 from each tehsil and 3 from each village). The graph above shows that 71% arties (17 arties) answered that rice growers pay commission and original loan on agreed time, but 21% (5 arties) said that they don't pay on agreed time. While, 8% (2 arties) answered that sometimes they pay on agreed time. Therefore, majority of rice farmers pay commission and principal amount on agreed time in order to build up strong relations with arties. Other 21% arties who said that rice farmers don't pay on agreed time are those farmers who don't have good repute in the market.

In case of banks, 40 agricultural credit mangers were interviewed and recorded responses are shown in figure below:

Figure 2.2: Payment on agreed time to Banks



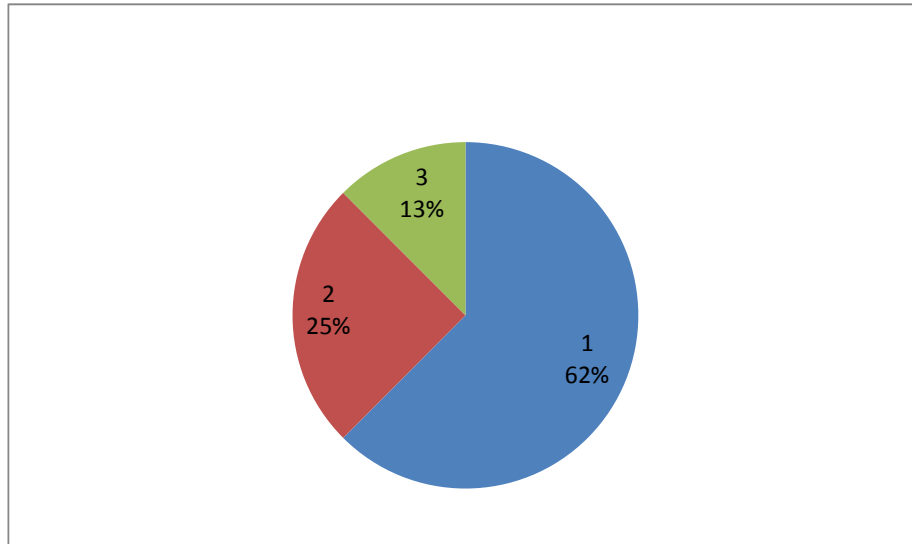
Blue= Yes, Pink=NO & Green=Sometimes

the pie chart. Out of the 40, 75% (30) answered that rice growers pay interest and actual borrowed money on agreed time. This was not without reason because they know that if they will not pay on agreed time then after giving two notices; their land will be sold out by the bank. Another reason was that they also want to establish good relations with bank officials so that for next time they can easily sanction their applied loan. But, 15% said “no” and 10% said “sometimes”. Again, these were those rice farmers who did not establish good repute in the market and are lured towards fraudulent activities.

5.2.3 Use of loan

To find the answer of the question “do rice growers use loan for the same purpose for which the loan was granted?” again arties and credit managers were visited. The response choices were (a) yes (b) no (c) sometimes. In case of arties, 24 arties were interviewed, among them 62% said “yes”, 25% said “no” and other 13% said “sometimes” as indicated by the pie chart below. The majority of rice farmers use loan accordingly because arties have detailed information about their credit worthiness and repute.

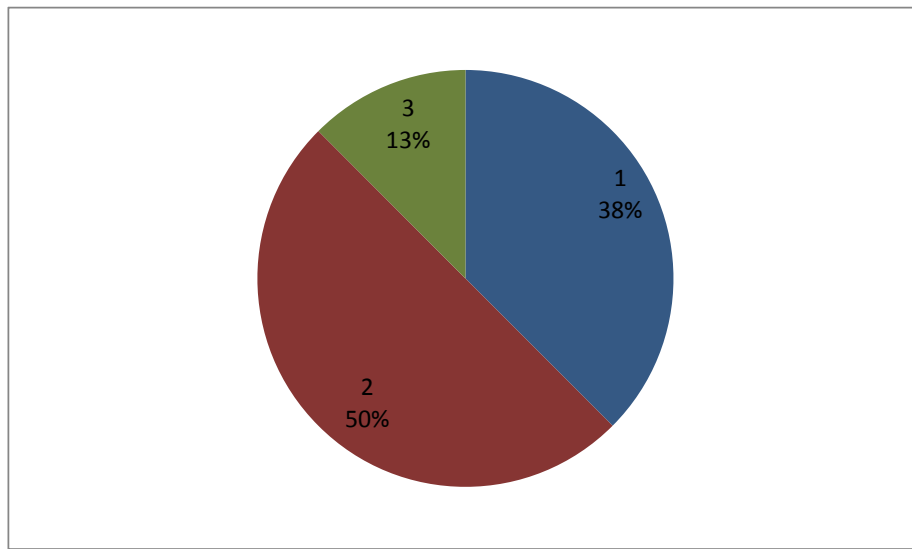
Figure 3.1 Purpose & use of loan in case of arties



Blue= Yes, Pink=NO & Green=Sometimes

In case of banks, 40 agricultural credit managers were interviewed and among them 50% said “yes”, 38% said “no” and other 13% said sometimes as shown by the pie chart below. It is clear from the chart that only 50% rice farmers who get loan from banks use the sanctioned loan for the same purpose which they have mentioned in their loan application form. Other 50% misuse the loan because bank employees are unable to get all information of their credit worthiness and repute in the market.

Figure 3.2 Purpose & use of loan in case of Banks

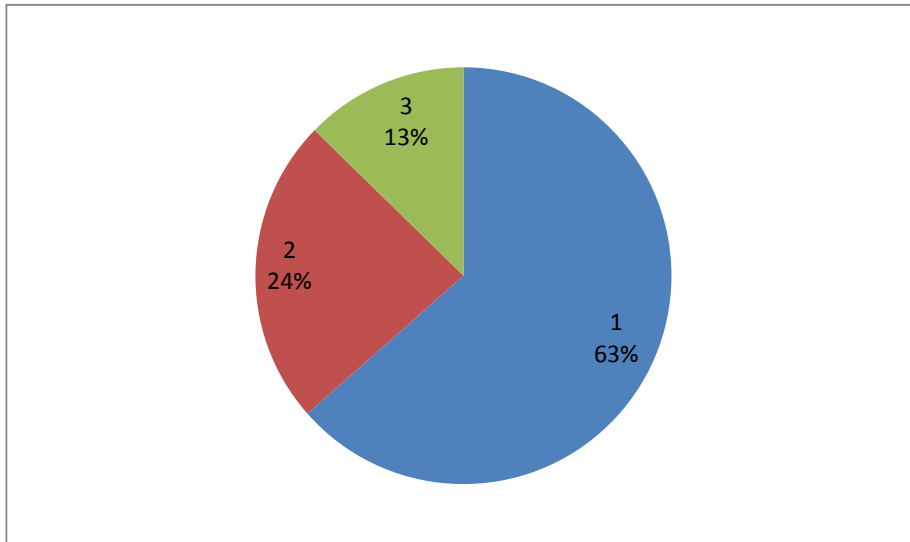


Blue= Yes, Pink=NO & Green=Sometimes

5.2.4 Type of securities

To find required securities by arties, 225 rice farmers who borrowed money from arties were given questionnaires. The following question was asked “What types of securities are required for taking loans either from banks or arties?”. The response choices were (a) land documents (b) house documents (c) both land & house documents (d) no security (e) other documents. Among 248 rice farmers, 63% answered “no security”, 24% answered “land documents” and remaining 13% answered “both land and house documents”. So, majority of rice farmers who used arties as a credit source are in the view that they don’t need any type of securities but it depends on their relationship with arties. Those who said that they need securities are those rice farmers who were new in rice farming or don’t have good repute in the market.

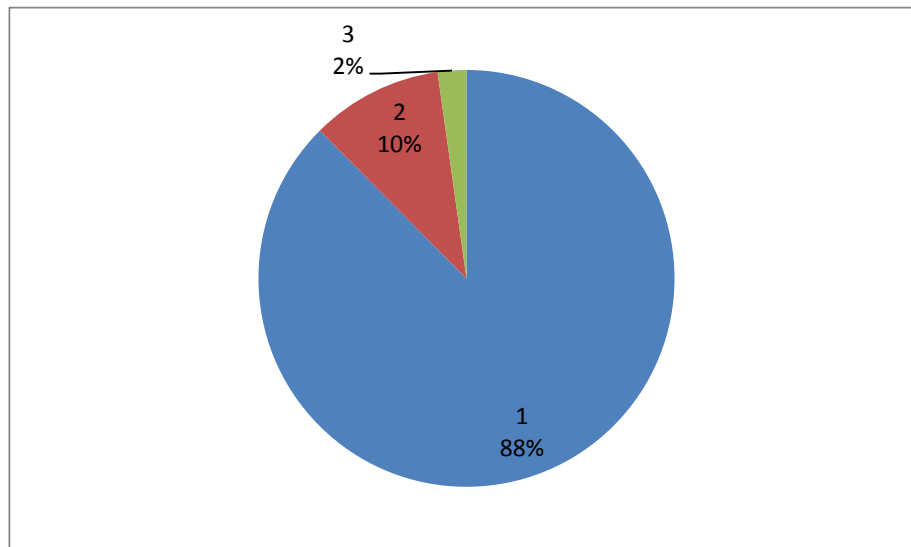
Figure 4.1: required securities by arties



Blue= No security, Pink= Land documents & Green= Land & House Documents

To find required securities by banks, the questionnaires were filled from 63 rice growers who have taken loan from banks. As the given pie chart indicates that 88% answered “land documents”, 10% said “land and house documents” and 2% said “house documents”. Therefore, majority of rice farmers are in the view that they need land documents in order to approve bank loan. It strongly recommends that bank always requires collateral securities which are normally land documents. If the bank manager thinks that he can recover the loan amount in case of rice grower’s default by selling land, as land documents are in his possession. He will just take land documents but if land documents have lesser market value than applied loan, then house documents will also be required by them so that they can recover their loan amount.

Figure 4.2 required securities by banks



Blue= No security, Pink= Land documents & Green= Land & House Documents

5.3 Household credit source used

Table 1 represents the number and percentage of households who borrowed money from both banks and arties in two successive years. The informal source consists of wide range of arties who, by lending money, manage a portfolio of agricultural activities including selling inputs and processing or marketing rice. Most arties give money to rice growers on short term bases and get money back after six months. The formal source consists of five commercial banks named, Zarai taraqiati bank limited (ZTBL), Pakistan Industrial credit and Investment corporation (PICIC), Bank Alfalah, Habib bank and Allied Bank. As, table 1 shows that the percentage of rice farmers who obtained loan from arties has increased from 68% to 72% from 2011 to 2012 while bank loan percentage has decreased from 25% to 20%. This means that more and more farmer prefer arties instead of banks. The percentage of farmers who use both credit sources has also showed minor increasing trend from 7% to 8%.

Table 2: Household credit source used (313 households)

Credit Source	This year (2012)	Last year (2011)
Informal.....Arties	225 (72%)	215(68%)
Formal.....Banks	63(20%)	77(25%)
Both	25(8%)	21(7%)

5.4 Descriptive statistics of independent variables

5.4.1 Arties as a source of credit

Table 3: DESCRIPTIVE STATISTICS: Credit from Arties (socio-economic profiles of rice growers):

VARIABLES	Mean	Median	Minimum	Maximum
Annual Demand.....PKR	196562.5	200000	50000	500000
Age (X1).....Years	46.23661	45	21	70
Education (X2).....years of study	1	1	1	5
Income level (X3).....PKR	1099107	1100000	100000	2200000
Farm size (X4)..... Acres	3.65	4	2	13
Household size(X5)..... No. of adults	7.41	8	2	13
No. of dependent schooling children(X6)	3.7	5	1	8
Commission1(X7)..... Percentage	3%	3%	3%	4%
Commission2(X7)...Amount	51128	48000	9600	96000
Payback period(X8).....months	7.06	7	4	13
Distance (X9)....Kilometers	4.89	5	2	7
Loan delay(X10).....Days	4.4	4	2	9

The descriptive statistics has been presented in Table 2. Results showed that average demand of credit from arties is PKR 196562.5 with median value200000 which is

equivalent to USD 2000. While minimum demand is PKR 50000 and maximum is PKR 500000. This identifies that majority of the farmers are small holders. The rice growers have an average age of 46.23661 years with median value of 45 years while minimum and maximum ages are 21 and 70 years respectively. This implies that majority of rice growers are middle aged i.e. not so young and not so old. This is because of the fact that old farmers don't have much capacity to perform all agricultural activities and young people don't take much interest in rice growing. This factor was included in the study to investigate which age group is dominant in rice farming. For determining education of rice growers the following codes have been used 1=primary, 2=matric, 3= intermediate, 4=bachelor, 5=master & 6= others. The rice farmer's education level has same mean and median value have of 1 so they are confined to primary schooling education. The minimum education is primary and maximum education is master because none of farmers fall in other type of education. This factor indicates that normally rice farmers are not so educated and hence qualified. This is not without reason because when the child of rice farmer grows up he mainly focuses on to involve him in agriculture so that he can assist his/her father. In this way rice farmers pay less attention on their children's education. Education as a credit determinant was included to examine whether education level influences decisions to apply for credit. This is under the assumption that the more one is exposed to the importance of capital to increasing productivity, the possibility for them to want to use the same will increase. In general, rice grower's income level varies between PKR 100000 to PKR 2200000 with an average of PKR 1099107 and median value of 1100000 which is equivalent to 11000 USD. This identifies that majority of farmers are not well established and passing lives hand to mouth. The major reason for low income level is old methods of cultivation which leads to underutilization of available land. The average farm size is showing same mean and median value of about 4 acres but minimum land ownership is 2 and maximum is 13 acres. This clearly states that majority of rice growers are small holders irrespective of landlords. The household size, on an average is 7 adults and median 8 adults while minimum size is 2 and maximum is 13. The major reason for this is that in Pakistan joint family system exist which lead to more number of adults. The rice farmers have approximately 4 dependent schooling

children on average because mean and median values are same with minimum 1 and maximum 8 children.

In case of commission, it is charged by arties bi-annually normally and in two ways at the time of harvesting season. Firstly, commission is charged @ 3% on market value of rice output and secondly per acre 160 kg is also charged by arties. In this way, commission is charged twice which results in higher amount as compared to interest charged by banks for six months. When rice growers harvest rice production and go to market for selling it, at the same time, arty or his representative will also be with him. The total value which rice grower will receive from buyer will be used to calculate commission of the arty. In the above table, commission 1 has an average of 3% with minimum and maximum values of 3% and 4% respectively. To find cash value of commission 2 which indicates stipulated commission rate of 160 kg/ 4 Munds rice per acre, we multiplied farm size, 160 kg/4 Munds per acre and per Mund rice market value of this year. In the above table, commission 2 has given mean value of PKR 51128 and median value of PKR 48000 with minimum and maximum values of PKR 9600 and PKR 96000 respectively. So, arties charge in two ways i.e. stipulated quantity of rice per acre plus commission rate on total value of crop. The payback period of arties, on average is about 7 months with minimum 4 and maximum 13months. This implies that rice growers pay at the end of harvesting season (after six months). In this way, they also try to establish their good relations with arties because every year they need loan from arties. Since majority of rice growers are small holders so they also don't want more payback period which will definitely create difficult circumstances for them. The distance to arties on average is approximately 5 Kilometers ranging from 2 to 7 Kilometers. This Implies that arties are not so far and normally they are in close vicinity almost in the same village where a rice grower resides. So, rice growers normally use bicycles, motor bike or car depending on their financial status to reach arties. The time gap between loan application and approval varies between 2 to 9 days with an average of about 4 days. This implies that rice growers have not to wait too much for taking loan because it mainly depends on their relationships with arties. If a rice grower has a strong relation with an arty, he will get loan on the spot but if a rice grower don't have strong relation or is quite new then arty will advance loan after some days in order to investigate his financial strength and repute.

Table 4: DESCRIPTIVE STATISTICS: Credit from Commercial Banks (socio-economic profiles of rice growers):

VARIABLES	Mean	Median	Minimum	Maximum
Annual Demand.....PKR	492063.5	500000	50000	1000000
Age (X1).....Years	49.95	40	25	70
Education (X2).....years of study	3.60	4	1	5
Income level (X3).....PKR	1235714	1200000	300000	2500000
Farm size (X4)..... Acres	11.34	12	2	21
Household size(X5)..... No. of adults	6.82	7	5	9
No. of dependent schooling children(X6)	3.36	3	1	6
Interest rate(X7)....Percentage	17%	18%	17%	18%
Payback period(X8).....months	33.76	36	6	60
Distance (X9)....Kilometers	9.07	9	4	12
Loan delay(X10).....Days	9.23	7	4	31

5.4.2 Banks as a source of credit

The descriptive statistics analysis of credit from banks has been presented in Table 4. Results showed that average demand of credit from banks is approximately PKR 500000 while minimum demand is PKR 50000 and maximum is PKR 1000000 while average credit demand from arties was PKR about 200000. This big difference exists due to the reason that normally rice growers who go to banks have more acres of land or are educated. So, because of more acres, they need more money for inputs and educated rice farmers want to enjoy the economies of large scale production or can hire some acres of land. The rice growers have an average age of about 50 years with median value of 40 years while minimum and maximum ages are 25 and 70 years respectively. This again implies that majority of rice growers are middle aged i.e. not so young and not so old. This is because of the fact that old farmers don't have much capacity to perform all

agricultural activities and young people don't take much interest in rice growing. This factor also shows which age group is dominant in rice farming. For determining education of rice growers the following codes have been used 1=primary, 2=matric, 3=intermediate, 4=bachelor, 5=master & 6= others. The rice farmers who apply for loans from banks have an average value of 4 which identifies bachelor degree. But, in case of arties, educational level of farmers was primary so there is big educational gap between rice growers who take loan from arties and who take loan from banks. This factor indicates that normally rice farmers who obtain loan from banks are qualified and that education does play a part in farmer's decision to apply for loans from the banks. In general, rice grower's income level varies between PKR 300000 to PKR 2500000 with an average of PKR 1235714 and median value of 1200000. The rice farmers who borrowed money from arties have average income of approximately PKR 1000000 so there is gap of about PKR 200000 between beneficiaries of two credit sources. The rice growers who are taking loan from banks are earning more income due to more acres of land and high degree of education. The average farm size is about 12 acres but minimum land ownership is 2 and maximum is 21 acres. This figure is 3 times higher than rice growers who are getting loan from arties. Normally, farmers who take loan from banks are either educated or have more acres of land. The household size, on an average is 7 adults while minimum size is 5 and maximum is 9 adults. Again the reason behind it is joint family system in the study area. The rice farmers have approximately 3 dependent schooling children on average with minimum 1 and maximum 6 children. This figure is indicating less no. of children because here rice growers are comparatively educated and implements family planning in order to secure future of their children. But, in case of uneducated rice farmers, the number of dependent schooling children figure is high which indicates that they don't apply family planning measures. The mean interest rate is 17% and median value is 18% along with minimum 17% and maximum 18%. This percentage is charged by banks on the borrowed money irrespective of rice's market value which occurs in case of arties. So, rice farmers pay less amount of interest to banks. The payback period of bank on average is about 34 months with median 36 months. The minimum no. of months is 6 and maximum is 60 days. This figure is 5 times higher than arties because rice growers who take loan from banks use the borrowed money for 2 to 3

years in order to earn maximum income. The distance to arties on average is approximately 9 kilometers with minimum 4 and maximum 12 kilometers. This figure is twice as compared to arties because banks are not in close vicinity to rice grower's residences but are established in cities. The loan delay (time gap between loan application and approval) varies between 4 to 31 days with an average (mean) of about 9 days while the mean value is 7 days. This figure is also twice as compared to arties. This is due to complex loan approval process of banks in which rice grower's land documents and per annum income level are taken into consideration.

Table 5: Comparison of mean values between Arties & Banks

Variables	Arties (Mean)	Banks (Mean)	Proportion
Age	46.23661	49.95	92%
Education	1	3.60	27%
Income level	1099107	1235714	88%
Farm size	3.65	11.34	32%
Household size	7.41	6.82	108%
No. of dependent children	3.7	3.36	110%
Commission(arties)/interest (banks)	3%	17%	18%
Payback period	7.06	33.76	20%
Distance	4.89	9.07	53%
Loan delay	4.4	9.23	47%

The table above shows that in case of arties, rice farmer's average age is lowered by 8% from age of rice farmers who get loan from banks. The education variable is also lowered by 63% in case of arties which identifies that rice farmers who get loan from banks are more educated. The mean income level of rice farmers who obtain loan from arties is

lowered by 12%. The mean Farm size of rice farmers who used arties as a credit source is lowered by 68% as compared to banks. Both household size and number of dependent schooling children are higher by 8% and 10% respectively in case of arties. In nominal terms, commission rate is lowered by 18% than interest rate but in real term commission rate is greater in two ways: firstly, commission is charged on market value of rice output and secondly per acre 160 kg is also charged by arties. In this way, commission is charged twice which results in higher amount as compared to interest charged by banks for six months. The payback period for arties is lowered by 80% which indicates that farmers who get loan from arties have to return loan sooner than banks and normally it takes place at time of harvesting season (November). The distance is lowered by 47% in case of arties which is good because for getting loan from arties, rice farmers don't need to travel much which results in lower travelling cost. The loan delay variable for arties is also lowered by 53% which states that less time is taken by arties for approval of loan which saves time of rice farmers who use arties as a credit source.

5.5 Comparison between applied for & received credit from banks & arties

5.5.1 Size of credit applied for and received by rice farmers from arties

Table 6 shows the results of t-test analysis which has been used to examine whether significant difference exist between credit received and applied by rice farmers. The result showed that mean value of credit applied PKR 196562 was significantly higher than mean value of received amount of credit PKR 158013.4. In other words, rice farmers are getting 80% of applied loan. The t-value is 4.787674 which imply that significant difference is existing at 1 % level of significance. This is due to shortage of money by arties and lack of relationship between arties and bad reputation of rice growers. Arties normally prefer to advance loan to few well established rice growers irrespective of advancing loan to many. The lesser amount of loan to rice growers may reduce their capacity to use money for farm activities which will definitely affect productivity and output levels.

Table 6: size of credit applied & received credit from arties

t-Test: Two-Sample Assuming Unequal Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	196785.7	158013.4
Variance	7.17E+09	7.52E+09
Observations	224	224
Hypothesized Mean Difference	0	
df	446	
t Stat	4.787674	
P(T<=t) one-tail	1.15E-06	

5.5.2 Size of credit applied and received by rice farmers from Banks

Table 7: Size of credit applied and received by rice farmers from Banks:

t-Test: Two-Sample Assuming Unequal Variances

	<i>demanded credit</i>	<i>received credit</i>
Mean	492063.5	238095.2
Variance	4.86E+10	2.51E+10
Observations	63	63
Hypothesized Difference	Mean 0	
df	113	
t-stat	7.421758	

7

Table 7 gives the results of t-test analysis which has been implied to check whether significant difference exist between credit received and applied by rice farmers. The result showed that mean value of credit applied- PKR 492063.5 was significantly higher than mean value of received amount of credit -PKR 238095.2. In this case, rice farmers are getting 48% of applied loan which is very low as compared to arties. The t-value is 7.421758 which imply that significant difference is existing at 1% level of significance. This is due to lack of required securities by rice farmers and relationship between bankers and rice growers.

5.6 Regression results of demand for credit

Regression analysis is used for determining the relationship between two or more variables. Normally, an investigator attempts to find the quantitative cause and effect relationship among variables (Alan, O. 2001). Among other regression tools or techniques, the ordinary least squares (OLS) regression can be regarded as a generalized modeling tool which can be used for modeling a response variable. This technique can be implemented on one or more explanatory variables (Hutcheson, G. D. 2011). Since cross sectional data have used in this study so heteroscedasticity was expected. There are three way to check it which are: Visual inspection of residuals, Goldfeld Quandt test and The Park test but I used Visual residuals for both arties and banks and we found evidence of heteroscedasticity in household variable in case of arties and in income level and farm size in case of banks (see figures 5.1, 6.1 & 7.1 in appendix 5). I attempted to correct heteroscedasticity by using Generalized least Square Method (GLS) as follows: $Y_iX_i = \alpha X_i + \beta_1 X_i^2 + \beta_2 (Z_i X_i) + (U_i X_i)$ and we have improved results as presented in appendix 5(table 8.1, 8.2, 9.1, 9.2 and Figures 5.2, 6.2, 7.2)

5.6.1 Regression analysis results for -credit from Arties

The results of regression analysis are shown in table 8.2 in appendix 5. The overall significance of the regression model can be checked from “coefficient of determination i.e. R-square” which is giving value 0.70677. This implies that about 70 percent change in credit demand is explained by the ten used independent variables. Adjusted R square

value is considered as first indicator of generalizability. This value is adjusted for all variables which are included in regression equation. It is being used to check expected shrinkage in value of R square. Since, both values R square and adjusted R square are close to each other so minimal shrinkage is anticipated in R square value. Multiple R or correlation coefficient determines the relationship between dependent and independent variables. Since, Multiple R is close to 1 so there is strong relationship between variables here (George,C.S. & Chaman, L.2001).

Age(X1)

Age as an independent variable is showing significant effect on demand for credit at 1% level of significance and coefficient has value of 0.202713 which means that with every 1 Percent increase in age, demand for credit by rice growers will also increase by 0.202713 percent. So, the first independent variable i.e. age showed the result against set hypothesis which was supposed that there will be inverse relationship between age and credit demand but coefficient of regression expresses that as the age increases, demand for credit by rice growers also increase which is due to the reason that as rice farmers get old, they have more experience in rice growing and resultantly become risk takers to take loan in order to diminish risk of low finance availability. This significant effect of age on credit demand is the evidence that age play a vital role as a determinant of credit demand.

Education(X2)

Being an independent variable Education is expressing non-significant impact on credit demand. The coefficient is showing positive relationship between education and credit demand which means that with 1 percent increase in education, demand for credit will increase by 0.0038 percent. So, the second independent variable education showed result according to hypothesis i.e. there is positive relationship between education and credit demand. As the rice farmers get educated, they tend to get more loans in order to perform agricultural activities in the best possible way by adopting modern methods of production.

Level of household income(X3):

The income level variable is statistically highly significant at 1% level of significance. This coefficient narrates that an increase of 1 percent in income level induces 0.18816

percent increase in credit demand by rice growers. Therefore, Third independent variable income level has a significant effect on credit demand because as income of rice growers increases their demand for credit also increases which is according to hypothesis, this is due to the reason that in such a case they have more money to pay loan on agreed time. The secondary data shows that 72% arties said that rice growers pay back all the money on agreed time because of building good creditworthiness. But 16% arties said that rice farmers don't pay on agreed time because of natural calamities with their rice production or misuse of loan. The other 16% arties expressed that sometimes money is not paid on agreed time. This result is same as found by Ibrahim et al. (2007) that income level and strong relationship with credit source always identifies more credit availability.

Farm size(X4):

The farm size is showing highly significant impact on credit demand at 1% level of significance. The coefficient value expresses that with 1 percent increase in farm size will bring 0.631163 percent increase in demand of credit. The Fourth independent variable farm size also has a significant effect on credit demand and positive relationship between farm size and credit demand has been shown by the regression model. This means that those rice farmers in Gujranwala district who have few acres of land (5 acres Or less) take lesser amount of loan due to lesser availability of available securities (to pledge property) demanded by arties. On the other hand, rice farmers who have more land (8 acres or more), are willing to demand more loans because of more available securities. Interviews with rice growers show that small farmers and landlords don't have the same accessibility status. This is not without reason because landlords always have strong relations with arties. Besides it, since they have many acres of land, arties always give them priority due to less risk involvement. Arties prefer to give loan to only one landlord irrespective of giving to 5 to 10 small rice farmers. The study conducted by Victor et al. (2011) also showed that land plays a vital role as a collateral security for granting credit. In case of arties, 60% said that they don't take any type of security because of strong relationships with rice farmers in the area. According to them, they know the credit worthiness and good faith of their customers due to dealing for many years. On the contrary, 20% arties said that they take land documents from those rice growers who take loan for first time.

About 16% arties expressed that they take house documents from those who don't have good faith or have only two acres of land.

Household Size (X5):

The household size variable is non – significant statistically significant. The coefficient is showing that 1 percent increase in household size will result in 0.075903 percent increase in credit demand by rice growers. Therefore Fifth independent variable household size has showed non- significant effect which means that it is not a prominent determinant for credit demand by rice growers in the study area. But the positive relationship exists between household size and credit demand which states that when household size (Number of adults) increases, the expense ratio also increases accordingly and rice growers need more money to cope with finance shortage. In this case more money is needed in order to fulfill the expenses of every adult. It has been known from the interview of rice growers in Gujranwala district that many times during off season; rice farmers go to arties and take loan even at high commission rates.

Number of dependent schooling children(X6):

The no. of dependent schooling children is statistically significant at 10% level of significance. The coefficient is showing that 1 percent increase in no. of dependent schooling children will bring 0.06383 percent decrease in demand of credit. The coefficient of regression has showed the result against hypothesis and determines negative relationship between credit demand and no. of dependent schooling children. This implies that farmers who have less no. of children take more loans and vice versa.

Commission rate-cost of capital (X7):

The P-value of commission rate variable is statistically significant at 1% level of significance. The coefficient has value of expresses that with every 1 percent increase in commission rate, demand for credit will decrease by 2.12304 percent. This is because of that farmers give much importance to commission but also give priority to sudden fulfillment of their credit demand. The secondary data collected from arties reveals that majority of rice farmers need money for buying all types of inputs i.e. seeds, diesel, urea, machinery etc. and 56% arties also said that they need money for all agricultural inputs.

On the other hand, 28% arties were in the view that rice farmers need money for seed and diesel. The data collected from rice farmers also shows that 70% rice farmers said that they borrow money for all agricultural inputs and others conveyed miscellaneous priorities.

Payback period(X8):

The payback period is statistically significant at 5% level of significance. The coefficient value is showing that with every 1 percent increase in payback period of arties will bring 0.44027 percent decreases in credit demand by rice growers in Gujranwala district. The 8th independent variable- payback period for arties has shown negative relation between credit demand and payback period which is against set hypothesis and means that rice farmers visit arties and take more loans if payback period is less. Because, rice growers normally pay them at end of rice season. They don't take loan from arties on medium and long term basis and arties also don't prefer it due to chances of default or fraud.

Distance to Arties (X9):

The distance variable has come up as a highly significant variable at 1% level of significance. The coefficient signifies that demand for credit by rice growers will increase by 0.352189 percent with 1 percent increase in distance to arties. The 9th independent variable distance has shown significant impact in case of arties. The positive correlation recommends that as distance increase rice farmers still visit the arties because they need money but normally in Gujranwala district arties are in close vicinity to farmers i.e. within the village.

Loan Delay (X10):

Loan delay variable has showed a non-significant effect. The coefficient value means that with 1 percent increase in time gap between application and approval of loan, demand for credit will decrease by 0.00086 percent. It means that rice growers take much care about time gap because they need money as soon as possible to cultivate rice crop on proper time and if they will receive loan after cultivation season it will be entirely useless for them.

5.6.2 Regression analysis results for -credit from Banks:

The results of regression analysis are showed in table 9.2 in appendix 5. The overall importance of used regression model can be checked from “coefficient of determination i.e. R-square” which is giving value 0.92. This implies that about 92 percent change in credit demand is due to ten used independent variables.

Age (X1):

The first independent variable “age” is showing non- significant impact on credit demand and coefficient value states that with every 1 Percent increase in age, demand for credit by rice growers will also increase by 0.94 percent. So, the first independent variable i.e. age showed the result against set hypothesis which was supposed that there will be inverse relationship between age and credit demand but coefficient of regression expresses that as the age increases, demand for credit by rice growers also increase which is due to the reason that as rice farmers get old, they have more experience in rice growing and resultantly become risk takers to take loan in order to diminish risk of low finance availability. This result also resembles to arties case which strongly recommends that age does not play a vital role as a determinant of credit source.

Education (X2):

Education, being an independent variable is showing significant impact on credit demand at 5% level of significance. The coefficient is showing positive relationship between education and credit demand which implies that with 1 percent increase in education, demand for credit will increase by 0.006815. So, education showed result according to hypothesis i.e. there is positive relationship between education and credit demand. As the rice farmers get educated, they tend to get more loans in order to perform agricultural activities accordingly. The data set also indicates that majority of educated rice growers take loan from banks instead of arties because of low interest rate.

Income level(X3):

The income level variable is statistically highly significant at 1% level of significance. This coefficient narrates that an increase of 1 percent in income level induces 0.408442 percent increase in credit demand by rice growers. Therefore, Third independent variable

income level has a significant effect on credit demand because as income of rice growers increases their demand for credit also increases which is according to hypothesis, this is due to the reason that in such a case they have more money to pay loan on agreed time. They intended to buy/hire more acres of land to expand area of cultivation.

Farm size (X4):

The coefficient of farm size variable is 0.22806 and t-value is 2.15 which is showing highly significant impact at 5% level of significance on credit demand. The coefficient value expresses that with 1 percent increase in farm size will bring 0.22806 percent increase in demand of credit. The Fourth independent variable farm size also has a significant effect on credit demand and positive relationship between farm size and credit demand has been shown by the regression model. This means that those rice farmers in Gujranwala district who have few acres of land (5 acres or less) take lesser amount of loan due to lesser availability of available securities (to pledge property) demanded by arties. On the other hand, rice farmers who have more land (8 acres or more), are willing to demand more loans because of more available securities. Interviews with rice growers show that small farmers and landlords don't have the same accessibility status. This is not without reason because landlords always have strong relations with banks. Besides it, since they have many acres of land, banks always give them priority due to less risk involvement. Like Arties, banks also prefer to give loan to only one landlord irrespective of giving to 5 to 10 small rice farmers. The study conducted by Victor et al. (2011) also showed that land plays a vital role as a collateral security for granting credit.

Household size (X5):

The household size is showing significant impact on credit demand at 5% level of significance. The coefficient is showing value of 0.2348 which expresses that 1 percent increase in household size will result in 0.2348 percent increase in credit demand by rice growers. Therefore Fifth independent variable household size has showed significant effect which means that it is a prominent determinant for credit demand by rice growers in the study area. The significant impact and positive relationship exist between household size and credit demand because when household size (adults) increase, the

expense ratio also increases accordingly and rice growers need more money to cope with finance shortage.

No. of dependent schooling children (X6):

The t-value of no. of dependent schooling children is showing significant impact on credit demand at 1% level of significance. The coefficient is giving value of -0.15008 which means that 1 percent increase in no. of dependent schooling children will bring 0.15008 percent decreases in demand of credit. The sixth independent variable no. of dependent schooling children has showed significant effect on credit demand. But, coefficient of regression has showed the result against hypothesis and determines negative relationship between credit demand and no. of dependent schooling children. This implies that farmers who have less no. of children take more loans and vice versa.

Interest rate (X7):

The interest rate is showing significant impact on credit demand at 1% level of significance. The coefficient has value expresses that with every 1 percent increase in interest rate, demand for credit will increase by percent 22.74006. This is because of that farmers give much importance to interest instead of commission. The main difference between commission and interest is that commission is charged on market value of rice output while interest is charged on borrowed money.

Payback period (X8):

The payback period is showing significant impact on credit demand at 1% level of significance.. The coefficient value is showing that with every 1 percent increase in payback period of arties will bring 0. 473423 percent increase in credit demand by rice growers in Gujranwala district. The rice growers who take loan from banks want to use money for longer period of time so that they can avail benefits of modern technology or can buy/ hire more land or can avail economies of large scale production.

Distance (X9):

The distance variable has come up as a significant variable at 1% level of significance and coefficient value signifies that demand for credit by rice growers will increase by 0.274448 percent with 1 percent increase in distance to arties. This implies that rice farmers don't care about distance but prefer less borrowing cost (interest) and more money which only banks can fix instead of arties. The banks are normally far from villages ranging from 5 to 15 kilometers.

Loan Delay (X10):

Loan delay has showed a non-significant effect and the coefficient value of-0.18698 means that with 1 percent increase in time gap between application and approval of loan, demand for credit will decrease by 0.18698 percent. The 10th independent variable time required to get loan (gap between application for loan and its approval) has indicated non-significant effect. It means that rice growers do not take much care about time gap because they prefer lower borrowing cost which they can only avail if they take loan from banks.

6. Discussion:

This study has shown the significant result of six independent variables in both banks and arties as shown in table below and these were income level, farm size, dependent schooling children, commission/interest rate, payback period and distance. In the study conducted by victor et al., (2010) “Determinants of formal agricultural credit allocation to the farm sector by arable crop farmers in Benue state, Nigeria” income level, farm size and distance variables have shown significant impact on credit allocation. The difference between studies in hand and by victor was that they used credit allocation as dependent variable but in this study credit demand has been taken as dependent variable.

Table10: Comparative regression-analysis of Arties & Banks after correction

Variables	Arties.....t-values	Banks.....t-values
Age	2.788292***	0.948483
Education	0.07096	1.802618**
Income level	2.72695***	5.997198***
Farm size	10.13314***	2.154324**
Household size	0.247186	1.66368**
No. of dependent children	-1.77434**	-2.720679***
Commission/interest	-4.76831***	2.337523***
Payback period	-2.06792**	3.746522***
Distance	4.446371***	1.69874**
Loan delay	-0.013342	-0.94548

The study by Catherine, 2007 on “understanding the coexistence of formal and informal credit markets in Piura, Peru” , showed household size and education as non-significant variables which is resembling to the study in hand as both variables in this study in case of arties have shown non-significant impact on credit demand.

In case of both arties and banks, majority of rice growers need loan for all types of inputs which include seeds, machinery, urea, spray and diesel. It means that buying of inputs is one of the basic reasons/factors for their credit demand. Other factors include marriage ceremonies, buying more acres of land and fulfilling daily expenses. If due to some reasons normally due to natural calamities, if the rice production is destroyed or not as much as in previous years then due to limited income level, rice farmers take loan from arties for daily expenses.

The results of the study showed that majority of rice growers don't need any type of security when they take loan from arties because it mainly depends on their relations with arties. Since arties also have close information about their clients so they only give money without security to those farmers who are dealing with them since many years. But, if a rice grower has good reputa in the market but not have too much experience in rice farming then it is quite possible that he will be able to get loan from an arty without any security. On the other hand, if a rice grower is quite new in rice farming, definitely an arty will demand some security to safeguard his loan.

In case of banks, security is essential because it is entirely impossible for bankers to get all information of credit worthiness and reputa of their clients. Therefore, in order to secure loan in case of rice growers default, always they demand that security (land documents) or combination of securities (both land & house documents) which has more market value than applied loan. Without security, bank don't sanction loan.

The loan taken by rice farmers either from arties or from banks is normally used for the same purpose for which it was obtained. In case of arties, the chances of misuse of loan are comparatively less because they have close contact with rice farmers and know timely demand. And sometimes, arties also give some agricultural inputs if they don't have hard cash, in this case chances of misuse are again less. But so far as banks are concerned, misuse of loan is comparatively high because of lack of close information about clients. When a rice grower sanctions the loan, he is free to use it because bank is concerned with its timely (monthly) interest payment and original payment (at end of debt period). So, in the study area, interviews with rice farmers revealed that sometime they misuse the loan for marriage of their daughters/sons, buying more acres of land and for some representative/ snobbery purpose.

The results of the study showed that normally in both cases: banks and arties, the rice growers pay interest/commission amount and original debt on agreed time in order to build goodwill and relations. Those who don't pay on agreed time either involve in fraudulent activities or face some natural calamities (bad weather conditions, storms, earthquakes etc.) which result in low rice production.

Another focus of the study was to investigate obstacles faced by farmers for getting loan from arties or banks. In case of arties, rice growers don't face any specific difficulty irrespective of good repute and sound relations but in case of banks they normally face collateral security as a big obstacle. Since majority of rice growers in the study area were small holders and were cultivating few acres of land so it was not possible for them to fulfill credit requirements of banks. On the other hand, banks face obstacle of misuse of loan and default of rice farmers due to lack of information about rice growers. But arties normally face default risk of small rice farmers.

Both credit sources have some strengths and weaknesses as well. Arties are more convenient in terms of timely availability of loan, less distance to travel, less time delay; no specific securities are required, easy to build relations. So far as banks are concerned they are convenient in terms of low interest rate, more payback period and more money can be advanced in case of more acres of land. The arties charge high commission which is basic flaw in this credit system and banks has many weaknesses which include complicated loan approval procedure, more time delay, high demand of collateral securities and more distance to travel.

From the above discussion, we see that banks offer better conditions in terms of cost of capital (interest rate), longer payback period and larger amounts of loan but still small rice farmers continue to take loan from arties. The reasons behind this include the following: (a) Strong relations with arties (b) Complicated loan approval procedures which is very difficult for small rice growers to understand (c) Collateral securities which cannot be managed by smallholder rice farmers due to owing few acres of land

(d) Illiteracy rate is high among rice growers and results of the study also show that most of educated rice farmers have taken loan from banks (e) Distance to travel is more as compared to arties (f) Loan delay is more as compared to arties and rice farmers need immediate cash for cultivation and harvesting seasons.

7. Conclusion and policy implications

It is concluded that factors which showed significant results in both sources banks and arties were farm size, income level, dependent schooling children, commission/interest rate, payback period and distance. The factors which showed non-significant results in case of arties were education, household size and loan delay. In case of banks non-significant variables were age and loan delay. Furthermore, it has been revealed by the study that there is significant gap between applied loan and received loan. Based on these results, it is suggested that government should enhance the volume of agricultural budget which may increase loan size of farmers. For reducing loan diversion rate, the loans must be given on time and bank employees must visit beneficiaries regularly. Besides it, for effective and efficient use of loan, there must be some arrangements for proper training of farmers. Banks must improve the amount of loans to agriculture sector in general and to rice growers in particular. The lenient polices must be formulated by banks regarding collateral securities so that small scale rice growers can avail the loan facilities at lesser interest rate. Besides it, arties must reduce commission rate and other type of charges (per acre fixed quantity of rice). The last but not the least, rice farmers must use the loan for same purpose for which it is granted.

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Appendices

Appendix 1 Survey Cover letter

(Norwegian university of Life sciences letterhead)

January 2012

From,

Tanveer Hussain

House # 5, Mohalla canal Park, near Cheema Hospital Daska.

Phone 00923316164539, Email: tanveernoorr @yahoo.com

Subject: Survey of Banks and arties as sources of agricultural credit

Dear Sir/ Madam:

I am conducting research on factors affecting demand of agriculture credit from formal and informal sources- A case of commercial banks and arties. This research project is partially funded by Norwegian university of Life Sciences, Aas, Norway. The research has been conducted in Gujranwala district and you have been selected randomly. Your help will enable me to complete this research work and all information provided by you will be kept in secrecy. After completion of research, all findings will be kept with Norwegian University of Life Sciences. If you have any query don't feel any hesitation and contact me on above mentioned address.

Thanks a lot for your assistance and cooperation.

Best Regards;

Tanveer Hussain

Appendix 2 Consent form for interviewees

Introduction:

Thanks a lot for agreeing to be interviewed. It can take approximately an hour and you are free to answer the questions.

Area of Research:

Agricultural credit sources: Arties & Banks

Purpose of the research:

This research is compulsory part of my Master degree from Norwegian University of Life Sciences, Aas, Norway. The purpose of research is to find basic factors which affect demand of agriculture credit of rice growers in Gujranwala District.

Investigator: Tanveer Hussain

Signature.....

Name.....

Date.....

Contact Number.....

Appendix 3: Survey questionnaire

Appendix 4: Survey Questionnaire

Factors influencing demand for Credit from formal and informal sources in Gujranwala District, Pakistan: A case of commercial Banks and Arties
Questionnaire

Questionnaire No. _____

Village _____ Tehsil _____
District _____ Region _____
Name of Enumerator: _____
Date: _____ Time start : _____ Time end : _____
Checked by : _____

SECTION A: HOUSEHOLD PROFILE:

Name of Household member	Relation to household head (see code A1)	Sex: 1= male; 2= female	Age (Years)	Educational level (see code A2)	Marital Status (see code A3)	Household size (Adult equivalent)	Size of farm (acres)	Level of income (PKR)	Main occupation (see code A4)	Secondary occupation (see code A4)

Codes:

A1

1=Son
2=Head
3=Brother
4=Father

A2

1=Matric
2=Primary
3=Intermediate
4=Bachelor
5=Master
6=Others

A3

1=Married
2= Single
3=Divorced

A4

1= Farming
2= Govt. employee
3= Business (other than farming)
4= Others

SECTION B: CREDIT CHOICE & USE:

- (1) How much experience do you have in rice farming?
(a) 3-5 years (b) 6-10 years (c) 11 -15 years (d) More than 15 years
- (2) Do you need credit ever?
(a) Yes (b) No
- (3) Why you need credit?
(a) For seeds (b) For Machinery (c) For Urea (d) For Spray (e) others
- (3) Are you getting loans according to your requirements?
(a) Yes (b) No
- (4) How much credit you take annually?
(a) Rs. 50,000 (b) Rs. 60,000- 1,00,000 (c) Rs. 1,00,000- 1,50,000 (d) More than 1,50,000
- (5) How much credit did you get from Arties?
a) This year...Rupees.....
b) Last year...Rupees.....
- (6) How much interest did you pay for these loans?
a) This year...Rupees.....
b) Last year...Rupees.....
- (7) What did you use the loan from Arties for?
a).....
b).....
c).....
- (8) How much credit did you get from commercial bank?
a) This year...Rupees.....
b) Last year...Rupees.....
- (9) How much interest did you pay for these loans?
a) This year...Rupees.....

- b) Last year...Rupees.....
- (10) What did you use the loan from commercial banks for?
- a).....
 - b).....
 - c).....

- (11) For how many times you take loan during a year?
- (a) 1 time (b) 2 times (c) 3 times (d) More than 3 times

- (12) (i) What type of loan you prefer?
- (a) Short term (b) Medium term (c) Long term

(ii) Explain why?

.....

.....

.....

.....

- (13) (i) Which source you will prefer to take loan?
- (a) Commercial banks (b) Arties (c) friends & relatives (d) Others

(ii) Explain why?

.....

.....

.....

.....

- (14) (i) How would you rank the followings as agricultural credit source?

Arties

Commercial Banks

- | | |
|------------------|------------------|
| (a) Excellent | (a) Excellent |
| (b) Good | (b) good |
| (c) Satisfactory | (c) Satisfactory |
| (d) Bad | (d) Bad |

(ii) Give the reasons:

.....

.....

.....

SECTION C: CREDIT CONDITIONS

- (1) (i) Which source is lenient in case of credit terms?

- (a) Commercial banks (b) Arties

(ii) Explain some reasons:

.....
.....
.....
.....

(2) What types of securities are required under each of the followings?

Commercial Banks

- (a) Land
- (b) House documents
- (c) Other documents
- (d) No security

Arties

- (a) land
- (b) House documents
- (c) other documents
- (d) No security

(3) (i) What interest rate you were charged by banks for your loan?

- (a) 8-10% (b) 11-13% (c) 12-15% (d) 16-18% (e) More than 18%

(ii) What interest rate you were charged by arties for your loan?

- (a) 8-10% (b) 11-13% (c) 12-15% (d) 16-18% (e) More than 18%

(4) What is payback period of loan under the followings?

Banks----- (a) 6 months (b) 1year (c) 2years (d) 3 years (e) More than 3 years

Arties..... (a) 6 months (b) 1year (c) 2years (d) 3 years (e) More than 3 years

(5) What is the time requirement for loans under each?

Commercial Banks

- (a) On the spot
- (b) 1-2 months
- (c) 3-4 months
- (d) 5-6 months
- (e) More than 6 months

Arties

- (a) on the spot
- (b) 1-2 months
- (c) 3-4 months
- (d) 5-6 months
- (e) More than 6 months

(6) How much distance you have to cover forgetting loan from following sources?

Commercial Banks----- (a) 1-2 Kilometers (b) 3-4 kilometers (c) 5-6 Kilometers (d) 7-8 Kilometers (e) More than 8 kilometers

Arties----- (a) 1-2 Kilometers (b) 3-4 kilometers (c) 5-6 Kilometers (d) 7-8 Kilometers (e) More than 8 kilometers

SECTION D: CREDIT OUTCOMES:

(1) How would you rank the effect of credit on your rice production?

No Little Good High
 0 1 2 3

(2) Did your income increase after using credit?

(a) Not at all (b) Yes (c) No

(3) Do you feel you have benefited by using credit?

Not at all Much | | | | | Yes
 1 2 3 4 5

SECTION E: HOUSEHOLD INCOME AND SOURCES:

What are the sources of income for your household?

- a).....
- b).....
- c).....
- d) Others.....

SECTION F: SIZE AND VALUE OF RICE-CULTIVATION

Area cultivated (Acres)		Quantity of harvested rice (Kg)		Value of harvested rice (PKR)	
This year	Last year	This year	Last year	This year	Last year

SECTION G: CROP PRODUCTION: Inputs used for farming

Serial No.	Type of input	Amount (number, kg, liters etc)		Cost (Rupees)	
		This year	Last year	This year	Last year
	Labor				
	Fertilizers				

	Pesticides				
	Others				

SECTION H: FOOD CONSUMPTION AND OTHER HOUSEHOLD EXPENDITURE

List all items used daily in a typical household for the whole year (food, cloth, energy, transport, water, school, medical, etc)

Serial No.	Type of expenditure	Amount per week, month, year	Value (Rupees)	Value per year Rupees

SECTION I: DISTANCE TO FACILITY

FACILITY NAME	What is the average distance between the center of the village and the credit source (Km)	What is the typical means of transport between the center of the village and the credit source	How much time does it typically take to travel from village to the credit source (Minutes or Hours)	How long do you stay at source each time you go? (Minutes or Hours)	How many times do you have to go there before you get the credit?
BANK					
ARTIE					

THANK YOU FOR GIVING YOUR TIME

CHECKLIST FOR BANKS AND ARTIES:

Name of credit institution (formal / informal)

Established in (year started giving credit)

Location:

1 2

What type of loans do you grant to rice farmers in the area?		
How much money you lend to rice growers last year and this year?		
For what purpose rice growers get loans?		
What credit conditions do you apply for giving loans?		
Do rice farmers feel hesitation for applying loans?		
What types of securities are required to get loan?		
Do farmers use the loan for same purpose for which loan was granted?		
How much interest do you charge per credit to small holder a rice farmer? Do farmers pay interest and Principal amount on agreed time?		
Do you think credit availability influence status and living standard of rice farmers?		
What obstacles do you face for granting loans to small holder rice farmers?		
How can credit availability be improved? Any other opinions?		

Appendix 5: Regression results

Table 8.1: Regression results of Arties before correction

SUMMARY OUTPUT

<i>Regression Statistics</i>			
Multiple R	0.860296		
R Square	0.74011		
Adjusted R Square	0.727909		
Standard Error	0.249576		
Observations	224		

ANOVA			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	10	37.78261	3.778261
Residual	213	13.26739	0.062288
Total	223	51.05	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
intercept	7.441612	1.032255	7.209081
Age(X1)	0.184686	0.070831	2.60743***
Education(X2)	0.00127	0.05197	0.02441
income			
level(X3)	0.184267	0.069608	2.6472***
farm size(X4)	0.609565	0.061457	9.918489***
hh size(X5)	0.042652	0.082715	0.515649
no. of dsc(X6)	-0.05143	0.035493	-1.44912*
Com. rate(X7)	-7.35572	4.31066	-1.706402**
payback			
period(X8)	-0.39102	0.223866	-1.74668**
Distance(X9)	0.303883	0.073897	4.112251***
Loan			
Delay(X10)	0.024682	0.062771	0.3932

***, ** and * indicate that parameter has significant result at 1%, 5% and 10% respectively.

Figure 5.1: Residual plot of Household size before correction

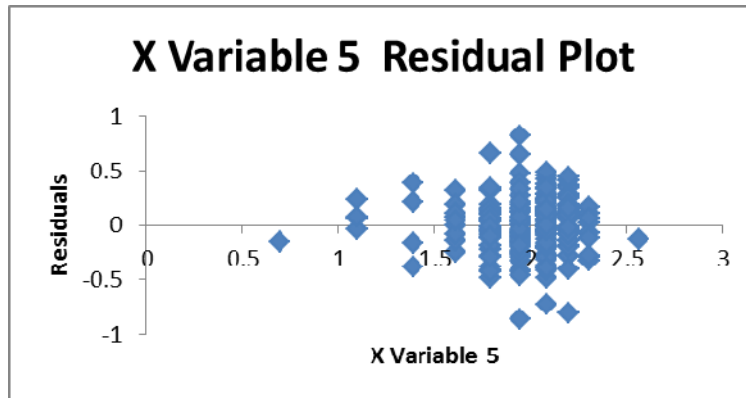


Table 8.2: Regression results of arties after correction

<i>Regression Statistics</i>			
Multiple R		0.80907	
R Square		0.70677	
Adjusted R Square		0.68956	
Standard Error		0.501828	
Observations		224	

<i>ANOVA</i>			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	10	2309.483	230.9483
Residual	213	53.64008	0.251831
Total	223	2363.123	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
intercept	0.131816	0.961744	0.13706
Age(X1)	0.202713	0.072701	2.788292***
Education(X2)	0.0038	0.05353	0.07096
income level(X3)	0.18816	0.069	2.72695***
farm size(X4)	0.631163	0.062287	10.13314***
hh size(X5)	0.075903	0.307067	0.247186
no. of dsc(X6)	-0.06383	0.035973	-1.77434**
Com. rate(X7)	-2.12304	0.445241	-4.76831***
payback period(X8)	-0.44027	0.212902	-2.06792**
Distance(X9)	0.352189	0.079208	4.446371***
Loan Delay(X10)	-0.00086	0.064428	-0.013342

Figure 5.1: Residual plot of Household size after correction

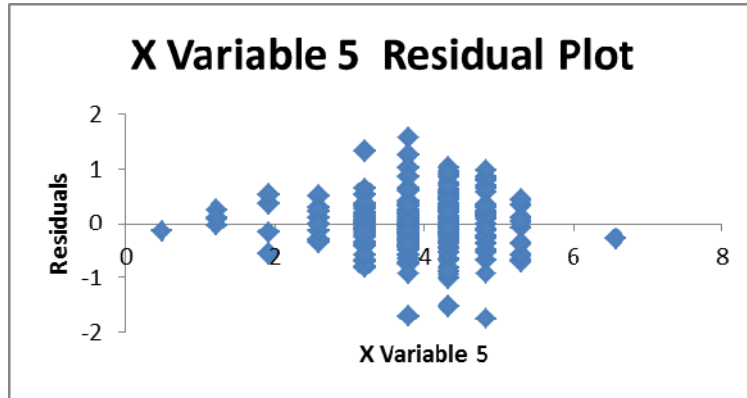


Table 9.1: Regression results of credit from banks before correction

<i>Regression Statistics</i>			
Multiple R	0.966064		
R Square	0.95328		
Adjusted R Square	0.92045		
Standard Error	0.174468		
Observations	63		

<i>ANOVA</i>			
	<i>df</i>	<i>SS</i>	<i>MS</i>
Regression	10	22.14065	2.214065
Residual	52	1.582825	0.030439
Total	62	23.72348	

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
intercept	0.46526	2.676617	0.173824
Age(X1)	0.131628	0.123382	1.06684
Education(X2)	0.075941	0.083621	0.908151
income level(X3)	0.390679	0.118119	3.307488***
farm size(X4)	0.218062	0.104091	2.094925**
hh size(X5)	0.237949	0.172087	1.382729
no. of dsc(X6)	0.15447	0.055073	0.80479
Interest rate(X7)	23.22267	9.771098	2.37667***
payback period(X8)	0.480481	0.124539	3.858072***
Distance(X9)	0.263419	0.160762	1.63856*
Loan	-0.18603	0.062745	-0.94548

Figure 6.1: Residual plot of Income level before correction

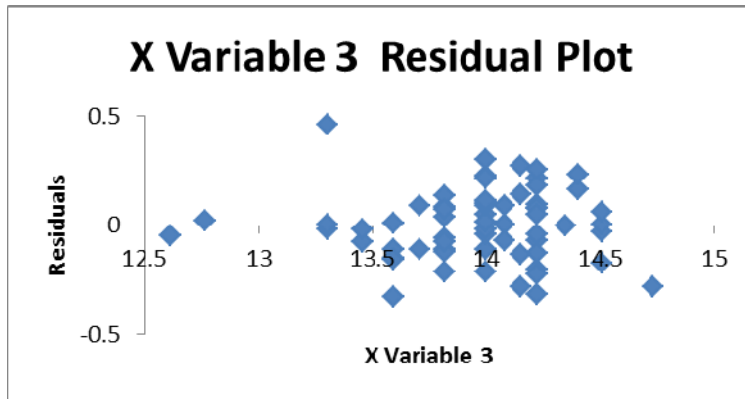


Figure 7.1: Residual plot of Farm size before correction

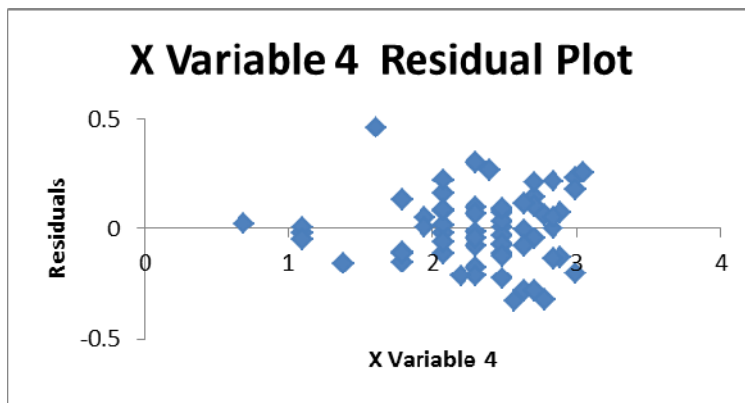


Table 9.2: Regression results of banks after correction
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.954838
R Square	0.929906
Adjusted R Square	0.904119
Standard Error	2.440197
Observations	63

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	10	997.946	167.5936
Residual	52	5.95456	
Total	62		

	<i>Coefficients</i>	<i>t Stat</i>
intercept	4.689753	0.250806
Age(X1)	0.118015	0.948483
Education(X2)	0.068159	1.802618**
income		
level(X3)	0.408442	5.997198***
farm size(X4)	0.228065	2.154324**
hh size(X5)	0.234876	1.66368**
no. of dsc(X6)	-0.15008	-2.720679
Interest		
rate(X7)	22.74006	2.337523***
payback		
period(X8)	0.473423	3.746522***
Distance(X9)	0.274448	1.69874**
Loan		
Delay(X10)	-0.18698	-2.94548***

Figure 6.2: Residual plot of income level after correction

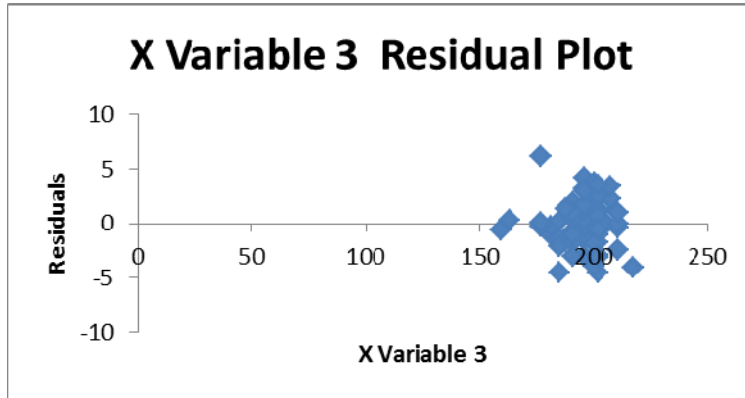


Figure 7.2: Residual plot of Farm size after correction

