ECONOMIC PERSPECTIVE OF FARMERS INDEBTEDNESS IN SUICIDAL PRONE AREA – PUNJAB, INDIA

by

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Abstract

The number of farmer suicides has been high in Andhra Pradesh, Karnataka, Kerala, Maharashtra, and Punjab since 2000. Farmers' suicide in India is reported to be due to the burden of debt. While it makes some sense to attribute farmer suicides in Kerala, Karnataka, Maharashtra, and Andhra Pradesh to indebtedness in view of the widespread poverty, it is more difficult to consider in the context of the Punjab which is known for its prosperity.

Others have found that the prime cause for farmer suicides is indebtedness. The purpose of this research focuses on identifying and quantifying the reasons for farmers' indebtedness compared to non-indebted farmers in the same region. This was achieved by documenting the socio-economic profile of the farmers; studying the extent of indebtedness and pattern of capital use by farmers, and evaluating the farm business performance.

Results obtained for the socio-economic profile of the farmer indicated that age, education, family size and landholding had a significant effect on the probability of a farmer being indebted. Family size had the largest effect on the probability of indebtness. A study on the extent of indebtedness and pattern of capital use showed that farmers depend on non-institutional loans for meeting their financial needs and some loans are used for non-agricultural purposes. Farm business performance of the sample respondents showed that they had a negative balance on farm business performance. Some of the methods to improve the situation would to improve and expand free and compulsory primary education, thereby reducing the debt incurred on education; diversifying towards high value/more remunerative crops, reviewing the system of subsidization of

agricultural inputs, and expanding institutional sectors for providing loans at reasonable interest rates.

Table of Contents

List of Figures

List of Tables

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Dedication

Affectionately dedicated to my Beloved Parents K. N. Jayappa and D.B. Manjula, Brothers - Prasanna and Adarsh, grandparents, relatives and friends and to the Farmers who have laid down their lives while toiling.

CHAPTER 1: Introduction

The current number of farmer suicides in Kerala, Karnataka, Maharashtra, Andhra Pradesh and Punjab, India is certainly a disturbing phenomenon. According to the statement made by the Prime Minister of India, "Farmers' suicides have to be viewed as a national disaster". This opens our eyes to the agrarian crisis that haunts India today (Anonymous, 2006). Tens of thousands of farmers in different states in India have committed suicide. These suicides can no more be considered isolated cases of farmers' deaths but a symbol of a deepening crisis of Indian Agriculture. There is a debate regarding causes and number of deaths of farmers in the country. In the initial periods of the late 1990s when there were sporadic incidents of suicides across country, there was general indifference and apathy towards these incidents. But, in early 2000 when the number of farmer deaths started rising fast in Andhra Pradesh, Karnataka, Kerala, Maharashtra and Punjab, the Governments took immediate relief measures with some appointing commissions to probe into the cause of the matter.

1.1 Farmer Suicides Worldwide

Farmers across the globe succumb to suicides when they face distressed conditions. Although suicide is a universal phenomenon, its nature and rates vary from country to country. Studies in the USSR attributed disintegration of the USSR to a high suicide rate in Russia and Eastern Europe (RIA Novosti, 2006). The United States of America faced the problem of suicide during the great depression of 1930s (Eugene and Learner, 1971). In the 1980s, many farmers in United Kingdom committed suicide during Bovine Spongiform Encephalopathy (BSE), because of mental depression caused by the

crisis and lost farming income. There were also farmer suicides in the United Kingdom between 1979 and 1990 (Kelly et al, 1995) due to a series of difficulties developed over a period of time rather than a sudden response to an acute crisis. China has also experienced farmer suicides. Similarly Malaysia, Pakistan, Bangladesh have reported cases of farmer suicides. Sri Lanka reports the highest suicide rates especially among the farming communities (Eddleston, Sheriff and Hawton, 1998).

Any perspective on farmers' suicide should involve a holistic and global outlook. It is more so in the context of the globalization of the agricultural economy. Therefore, the issue of farmer suicides should be treated dispassionately without prejudice to avoid a global agrarian disaster.

What makes farmer suicides in India more worrisome is the reported common cause of suicide: the burden of debt. While it makes some sense to attribute farmer suicides in Kerala, Karnataka and Andhra Pradesh to indebtedness in view of the widespread poverty, it is more difficult to consider this attribute in the context of Punjab which is known for its prosperity. For this and various other reasons, the increase in suicides among Punjab farmers warrants a serious study. There have appeared several journalistic accounts about the incidence and causes of farmer suicides in Punjab, but they vary enormously in their estimates and explanations.

In recent years, the rural credit delivery system in Punjab has been changing. Formal credit institutions whether in the form of commercial banks or cooperative banks are reducing their operations in rural areas. The immediate fallout of this is an increasing reliance on informal sources of credit, particularly money lenders, with higher interest and debt burden. Debt burden refers to insufficient profitability of the farms, socio-

economic conditions of the farmers, credit system and farmers incapability to repay the debt which causes the debt to accumulate and become a burden. Increasing indebtedness has been cited as one of the important risk factors associated with suicide of farmers (Bhalla et al, 1998; Dandekar et al, 2005; Deshpande, 2002; Iyer and Manick, 2000; Mishra, 2006a, b, c; Mohan Rao, 2004; Mohanty, 2001; and Mohanty and Shroff, 2004).

1.2 Indebtedness - the prime culprit for farmers' suicides?

As observed above, indebtedness is one of the major factors argued to be responsible farmers' suicides and the agrarian crisis in India. According to NSSO (2005) data, as many as 48.6 percent of farmer households are indebted in the country. Per capita income in Punjab for the year 2005-2006 was Rs. 36,759. Indebtedness is the highest in Andhra Pradesh (82 percent), followed by Tamil Nadu (74.5 percent), Punjab (65.4 percent), Kerala (64.4 percent), Karnataka (61.6 percent) and Maharashtra (54.8 percent). The NSSO study found that in Haryana, Rajasthan, Gujarat, Madhya Pradesh and West Bengal 53 percent of farmer households were indebted. States with a lower percentage of indebted households were Meghalaya, Arunachal Pradesh and Uttaranchal with less than 10 percent of the farmers being in debt.

Table 1.1: Total Outstanding Loans per farmer

States	Outstanding loan per farmer (Rs)
Punjab	41576
Kerala	33907
Haryana	26007
Andhra Pradesh	23965
Karnataka	18135

Source: NSSO 2005

The average amount of outstanding loans per farmer was the highest in Punjab followed by Kerala, Haryana, Andhra Pradesh and Karnataka (Table 1.1). Borrowing in the farming season and returning the principal with interest at the time of harvest is a routine activity most commonly followed by farmers over the years (NSSO, 2005).

The inability to repay past debt resulting in no or limited access to new loans has been widely accepted as the most significant cause of farmer suicides that were so widespread in Andhra Pradesh and Karnataka and are apparently continuing in Kerala, Maharashtra and Punjab.

The foregoing facts indicate that suicides were not just individual actions alone but perhaps driven by certain socio-economic pressures either sudden or accumulated. The causes for suicides are 'multifactorial, interlinked and progressive'. It is clear that suicide cannot be just attributed to mental depression. Various socio-economic factors together contribute to mental depression (Vidyasagar and Suman Chandra, 2004).

It is important in the present context to solve this problem. Finding a solution to these problems, calls for an understanding of its root causes. As discussed before, indebtedness is thought to be a prime culprit, so there is a need to understand the nature and extent and underlying causes of farmers' indebtedness.

1.3 Study Objective

1. To document the socio-economic profile of the farmer respondents.
2. To study the extent of indebtedness and pattern of capital use by the farmers.
3. To evaluate the farm business performance of farmer respondents.
4. To suggest appropriate policy measures.

1.4 Organization of Study

The remaining chapters of this thesis are organized as follows. Chapter 2 reviews previous research conducted on indebtedness of farmers. Chapter 3 provides the description of the study area, sampling procedure, presents the sources of data and identifies the methodologies utilized in this study. Chapter 4 presents the results. Chapter 5 provides the summary and conclusions for the thesis. Chapter 6 suggests appropriate policy implications and suggestions for future research.

CHAPTER 2: Review of Literature

The purpose of this chapter is to briefly summarize previous work on farmer indebtedness. Also reviewed are studies that discuss the extent and pattern of indebtedness of farmers to private and public financial institutions.

2.1 Indebtedness of farmers

Sucha S. Gill (2005) studied and established a close relationship between economic hardship, indebtedness, and suicide. This study found that poor economic conditions led to indebtedness and sometimes led to economic distress causing suicide. In 59.9 percent of cases, it was a quarrel between family members, primarily caused by indebtedness or economic hardship. The pressure of commission agents or banks for the return of loans and fear of loss of social status led to 21.6 percent of the suicides. High interest rates charged on loans and diversion of loans for non-productive purposes or crop failure placed them into a debt trap, creating pressure for suicides.

Nagesh (2005) reported that indebtedness was the major factor for farmer suicides in Karnataka. As many as 61.6 percent of farmer households were indebted compared to a national average of 48.6 percent. The study found that banks were a major source of loans (50 percent) followed by moneylenders (20 percent), co-operative societies (16.9 percent), relatives and friends (6.8 percent), and traders and government agencies (1.9 percent each). However, the study revealed that 34 percent of indebted farmer households borrowed from moneylenders. Thirty two percent took loans from banks and 23 percent from co-operatives. Seventy one percent farmers were unaware about the minimum support price scheme and 57 percent of farmers' had no knowledge about the crop insurance scheme.

Menon Parvathi (2001) stated that indebtedness, a huge and growing burden in the rural country side, particularly among poor farmers, was the single most conspicuous reason for the mounting number of suicides in Karnataka. While there may be a variety of triggers that cause individuals to take this drastic step, indebtedness is the common thread that links them. Further, in these cases, indebtedness of farmers was predominantly tied to informal sources of credit and not to institutional credit structures like banks and co-operative credit societies. The diminished presence of institutional credit in agriculture was not the only reason for increasing indebtedness. It was accentuated by three years of inadequate rainfall and resulting crop losses during 2000 to 2003.

Deshpande et al. (2001) reported that agricultural labor households belonging to the scheduled caste were the weakest section of the rural society. Wage earnings were the only source of income for a majority of these households. Most of the time the earnings were inadequate to meet their consumption expenditures. Therefore, they were forced to incur debt. An attempt was made to determine the incidence as well as the extent of indebtedness of SCLHs (Scheduled Caste Labor Households) using state, cross-section data for 5 time points (1974-75, 1977-78, 1983, 1987-88 and 1993-94) available through RLE (Rural Labor Enquiry). The study covered the 17 major states of India. To determine the state-wise position of incidence and extent of indebtedness, states were classified in terms of ranks based on their level of indebtedness. Regression analysis was performed using pooled cross section data corresponding to the five points of time to determine the factors related to the incidence as well as the extent of indebtedness.

The NSSO (2005) reported that nearly 43.42 million or 48.6 percent of the total farmer households in the country have a liability of at least Rs. 300 in cash or kind. Out

of 147.90 million rural households, 60.4 percent or about 89.35 million are engaged in farming. Estimated indebtedness was the highest in Andhra Pradesh at 82 percent followed by Tamil Nadu at 74.5 percent and Punjab at 65.4 percent. Outstanding loan balance per farmer was highest in Punjab, followed by Kerala, Haryana, Andhra Pradesh and Karnataka.

Vidyasagar and Chandra (2004) reported that about 3,000 Andhra Pradesh farmers committed suicide in five years because of the debt trap, drought and crop failure. The government perspective on farmer suicides in India has been critically analyzed by Vidyasagar and Chandra who argue that farmer suicides cannot be reduced to a personal problem, but rather are related to an agrarian crisis. There was also a view that an ex-gratia payment to the suicide victims would encourage suicides. Their study revealed that the debt trap was the main cause of farmers taking the extreme step of committing suicide. The debt trap tightened because of the agrarian crisis on the one hand and inaccessibility of institutional credit on the other. No institution was lending money to the farming community for the same purposes for which they lend money to the urban middle class. Thus, farmers depend on non-institutional credit. In many cases, the extreme step of suicide was taken as recourse due to the heavy pressure and humiliation from the non-institutional sources (money lenders).

Deshpande and Nageshprabhu (2005) reported that the prevalence of indebtedness among farmers was seen to be highest in Andhra Pradesh (82%) and lowest in Uttaranchal (less than 10 percent). More than 50 percent of farmers availed loans for capital or to meet current expenditures for farming purposes, 58 percent of borrowing accrued to cultivation and other agriculture activities while the remaining percentage met

other consumption needs. The largest percentage of indebted farmers was in the size class of 0.01 to 1 hectare. More than 70 percent of farmers who owned less than 2 hectares were indebted. The average amount of loan outstanding was Rs. 12,585 (1 US dollar = Rs. 44.895)

2.2 Extent and pattern of indebtedness of farmers to private and public financial institution

Ramamurthy et al. (1972) found that cooperatives, commercial banks, and money lenders were the main sources of supply of credit to sample farmers of two districts in Tamil Nadu. The credit from the government was absent. They further showed that cooperatives were the most important source of lending accounting for 61.73 percent, followed by commercial banks and money lenders constituting 12.61 percent and 25.06 percent, respectively.

Manto and Torres (1975) found that even in the areas of high participation farmers continued to seek credit from private sources at high rates of interest. This situation signified a need to strengthen public credit sources so that farmers can acquire credit at reasonable costs.

Sinha (1979), while studying the development and prospects of agricultural credit, found that simultaneous functioning of multiple agencies did not succeed in providing credit to weaker sections of the community.

Banakar and Suryaprakash (1987) studied the supply and utilization of crop production credit in Karnataka and concluded that small and medium sized farms

received a lower proportion of total loans compared to their numerical strength in the total number of borrowers, while the large farmers received a larger share.

Singh and Sharma (1990) while studying agricultural finance and management argued that the cost of loans was one of the important basic characteristics of a good loan and should be at a reasonable cost that involves not only interest rates but also fees for documents and services associated with the loan.

Pouchepparadjou (1992) found that the cost of credit was more in the case of money lenders than commercial banks because of a higher rate of interest charged by them. Farmers were happier with commercial bank credit because the interest rate charged was lower.

Singh and Tyagi (1995) concluded that cooperatives, by providing adequate and timely credit could create a favorable impact on agriculture development even in subsistence areas. This study was conducted in the Vikramjot block of Basti district of Uttar Pradesh.

Surender S. Jodhka (1995) studied the changing structure of informal credit in rural Haryana. His results were based on a field study of three villages selected from a Green Revolution district in the Haryana state. He analyzed the sociology of informal credit with a focus on understanding the changing structure of the informal credit market and the emerging patterns of debt dependencies in light of i) the agrarian transformation experienced with the success of the green revolution and ii) increasing availability and growing popularity of institutional sources of credit.

CHAPTER 3: Methodology

This chapter outlines briefly the characteristics of the study area, the sampling procedure, the nature and source of data, and the statistical tools and techniques employed for analyzing the data.

3.1 Description of the study area

The present study was conducted in Hoshiarpur, Amritsar, Gurdaspur, Kapurthala, Ludhiana, Bathinda and Ferozepur.

Figure 3.1 Location of the Study Area within India

Source: District at a glance 2005, Punjab.

Figure 3.2 Location of the Study Area within the Punjab State

Source: District at a glance 2005, Punjab.

3.1.1 Hoshiarpur district

The Hoshiarpur district falls in the eastern part of the Punjab State and covers an area of 3,365 sq. km. The district is drained by the river Beas in the north and northwest and Satluj in the south. The main townships are Hoshiarpur-I and Hoshiarpur-II. Administratively the district has four tahsils, five sub-tahsils, and ten blocks. The tahsils are Hoshiarpur, Dasuya, Garh Shankar, and Mukerian. The blocks are Hoshiarpur-I,

Hoshiarpur-II, Bhunga, Tanda, Dasuya, Garh Shankar, Mahipur, Mukerian, Talwara, and Hajipur. The district is the second lowest densely populated district of the state. The total population of the district as per the 2001 census is 1,480,736. The population density is 440 persons per square kilometer. The decennial growth rate of population in the district for the decade 1991-2001 was 14.02 percent. A majority of population in the district live in rural areas (i.e., 80.28% of population (1,188,662) live in rural areas; 19.72% (292,074) live in urban areas). The land utilization pattern and details of demographic features of the study area are presented in Table 3.1 and Table 3.2 respectively.

The climate of Hoshiarpur district is classified as tropical steppe, hot, and semi-arid, and is mainly dry with very hot summers and cold winters except during the monsoon season when the moist air of oceanic origins penetrates the district. There are four seasons a year. The hot weather season starts from mid-March to the last week of June followed by the southwest monsoon which lasts up to September. The transition period from September to November forms the post monsoon season. The winter season starts late in November and remains to the first week of March.

The normal annual rainfall of the district is 938 mm which is unevenly distributed over the area in 38 days. The southwest monsoon contributes about 77% of annual rainfall. July and August are the wettest months. The remaining 23% of rainfall is received during the non-monsoon period in the wake of western disturbances and thunderstorms. Generally, rainfall in the district increases from southwest to northeast. The information on cropping patterns of the district is presented in the Table 3.3.

The district forms a part of Indo-Gangetic plain and Sutlej sub-basin of the main Indus basin. The area comprises three distinct geomorphologic units, a hilly area in the

northeast, the piedmont zone belt, and the alluvial plains in the southwestern part of the district. The soils are yellowish brown to dark brown in color. These range from calcareous sand to fine sandy loam to silt. Sand is mostly cultivated and is well drained with an estimated infiltration rate of 8-10 cm/hour.

3.1.2 Amritsar district

The Amritsar district is located in the northern part of the Punjab state. The total area of the district is 5056 sq. km. Amritsar I, Amritsar II, Baba Bakala and Ajnala are four teshils of the district. Majitha, Attari, Tarsikka, Lopoke, and Ramdas are sub tehsils in the district. There are eight development blocks namely Tarsikka, Rayya, Ajnala, Chogawaan, Majitha, Verka, Jandiala Guru, and Harsha China. The population of the district was 2,157,020 as per the 2001 census which constitutes 8.85% of the total population of the state. The total population of the Amritsar district in 1991 was 1,745,252 and indicated a 23.59% decennial growth from1991 to 2001. The population density of the district is 804 persons per square kilometer versus the state average of 484 persons per square kilometer. The Amritsar district falls between river Ravi and Beas. The land utilization pattern of the study area is presented in Table 3.1. Table 3.2 presents details of demographic features.

The climate of the district is classified as tropical steppe, semi-arid, and hot; and is mainly dry with a very hot summer and cold winter except during the southwest monsoon season. There are four seasons in a year namely the cold season from November to March, the hot season from April to June, the southwest monsoon season from the last week of June to the middle of September, and the post monsoon season from September to the beginning of November. During the cold season, a series of

western disturbances affect the climate of the district. The normal annual rainfall of the district is 680 mm unevenly distributed over 31 days. The southwest monsoon contributes 75% of yearly rainfall and sets in the last week of June and withdraws in the middle of September. The remaining 25% of annual rainfall occurs in the non-monsoon months. The rainfall increases from the southwest to the northeast in the district. The information on cropping patterns for the district is presented in Table 3.3.

The Amritsar district falls in between Ravi river and Beas river. The Ravi river flows in the northwest of the district and forms the international border with Pakistan. The Beas river flows in the eastern part of the district. The soils in the western part of the district are coarse loamy, calcareous soils, whereas in the central part of the district, the soils are fine loamy, calcareous, and are well drained. The soils are Ustochrepts to Haplustaff types.

3.1.3 Gurdaspur district

The Gurdaspur district is located in the northern most part of the Punjab state. It shares the boundary with Jammu and Kashmir and Himachal Pradesh. The district is bounded by the Ravi and Beas river. It has a unique characteristic of sharing the international boundary with Pakistan. Hoshiarpur, Kapurthala, and Amritsar are situated on the eastern, southern, and western side of the district, respectively. It covers an area of 3,513 square kilometer and forms a part of the upper Bari Doab area. Physiographically, the area is divided into three units (i) the Siwalik Hills lying in northeast of the district, (ii) the Kandi Zone lying immediately southwest of the foothill zone of Siwalik hills, (iii) and the Alluvial plains lying southwest of Kandi. The district is divided into five tehsils and 16 development blocks for the purposes of administrative control. The land

utilization patterns and demographic features of the study area are presented in Table 3.1 and Table 3.2, respectively.

The normal annual rainfall of the area is 1113 mm which is unevenly distributed over the district. The southwestern monsoon (July to September) contributes about 80% of the rainfall and the rest occurs during the non-monsoon period. The rainfall in the district increases from the southwest to the northeast. The highest annual rainfall of 1443 mm, 30% more than the normal, was recorded in 1988 and the lowest of 615 mm, 44% less than the normal, was experienced in 1989. The climate of the district is tropical with four well defined seasons. The maximum temperature is 41 C and minimum is 6 C. The information on cropping patterns for the district is presented in Table 3.3.

The district can be divided into three geomorphologic types-a Hilly area, a Piedmont zone, and an alluvial plain. The hilly area is predominately on the northeast part of the district and called Siwalik which are mainly clays and clay with boulders. The Dherkalan block is predominantly covered by hilly terrain. The Piedmont comprises pebbles, and cobbles drain from the Siwalik along with sand of medium to coarse grained gravel. The alluvial plain is sand intercalated with clays deposited by the rivers Ravi and Beas.

3.1.4 Kapurthala district

The Kapurthala District is situated in the Bist Doab and comprises two noncontiguous parts separated by some 32 kilometers. Kapurthala, Sultanpur Lodhi and Bholath Tehsils form one part and Phagwara Tehsil, the second separated portion. The geographical area of the district is 1,633 square kilometer. The Kapurthala District is bounded partly in the North and wholly in the West by the Beas River, named as the Hydaspes River. The Kapurthala district is surrounded by Amritsar in the West,

Hoshiarpur in the North, Jalandhar in the east, and Firozepur in the South. The Phagwara block is surrounded on three sides, the northwest, west, and southwest by the Jalandhar District, on the northeast and east by Hoshiarpur District, and by Nawan Shehar in the south. The Kapurthala district ranks 13th in the Punjab with a population of 754,521 which is 3% of the total population of the Punjab state. The population density is 461 per square kilometer. The literacy rate is 73%. Sixty seven percent of the population lives in rural areas while the remaining 33% lives in urban areas. The land utilization pattern and details of demographic features of the study area are presented in Table 3.1 and Table 3.2, respectively.

The climate of the district is characterized by general dryness except for a short period during the southwest monsoon season. There are four seasons a year namely the cold season from November to March, the hot season from April to June, the monsoon season from the last week of June to the middle of September, followed by post monsoon season through the beginning of November. During the cold season, a series of western disturbances affect the climate. During the summer months (i.e., from April to June) the weather is very hot, dry, and uncomfortable. The weather becomes humid and cloudy from July to September with the penetration of moist air of oceanic origin in the atmosphere.

The normal annual rainfall of the district is 779 mm, which is distributed over 33 days a year. The southwest monsoon contributes 75% of the rainfall and sets in the last week of June and withdraws in the middle of September. July and August are the rainiest months. The information on the cropping patterns of the district are presented in the Table 3.3.

The Kapurthala district is occupied by Indo-Gangetic alluvim soil. The major portion of this region lies in the river tract falling between the Beas and Black Bein and is called '*BET*'. To the south of the Black Bein lies the tract known as 'Dona'. The word 'Dona' means that the soil is formed of two constituents, sand and clay, with sand predominating. The numerous streams coming down from Hoshiarpur district keep the soil moist all year. Some of the streams are silt laden and at first deposit fertile soil though later deposits are more sandy. Due to the existence of drainage channels, patches and strata's of hard clay are also found. The major soil types in the district are the arid brown soils and tropical arid brown soils. The arid brown soils are found mostly in the southern parts of the district and the tropical arid brown soils are found in the northern part and Phagwara block of the district. The arid brown soils are calcareous in nature and tropical arid brown soil is deficient in nitrogen, potassium, and phosphorus.

3.1.5 Ludhiana district

The Ludhiana district falls in the central part of Punjab. The Satluj forms the border of the district in the north with the Jalandhar and Hoshiarpur districts. The Ropar and Fatehgarhsahib districts mark the eastern and southeastern boundaries. The western border adjoins the Moga and Ferozpur districts. The geographical area of the district is 3790 square kilometers. Administratively, Ludhiana falls under the Patiala division. The district has four sub-divisions, Ludhiana, Khanna, Samrala, and Jagraon, and eleven development blocks: Ludhiana, Mangat, Doraha, Khanna, Dehlon, Pokhwal, Samrala, Machiwara, Jagraon, Sidhwanbet, and Sudhar. The land utilization patterns and details of demographic features are presented in Table 3.1 and Table 3.2 respectively.

The climate of the Ludhiana district can be classified as tropical steppe, hot, and semi-arid; and is mainly dry with very hot summers and cold winters except during the

monsoon season when the moist air of oceanic origin penetrates into the district. There are four seasons. The hot weather season starts from mid-March to the last week of June, followed by the southwest monsoon which lasts up to September. The transition period from September to November forms the post-monsoon season. The winter season starts late in November and remains up to the first week of March.

The normal annual rainfall of the district is 680 mm which is unevenly distributed over the area in 34 days. The southwest monsoon sets in from the last week of June and withdraws at the end of September and contributes about 78% of annual rainfall. July and August are the wettest months. Generally, rainfall in the district increases from the southwest to the northeast. The information on cropping patterns for the districts is presented in the Table 3.3.

The district is occupied by Indo-Gangatic alluvium soils. There are no surface features except that the area is a plain with its major drains being the Satluj and its tributaries. The soil is the end product of the parent material resulting from the influence of climate, topography, and the natural vegetation over a long period of time. In the district, soil characteristics are influenced to a very limited extent by the topography, vegetation, and parent rock. The variations in the soil profile are much more pronounced because of the regional climatic differences. The soil of this zone has developed under semi-arid conditions. The soil is sandy loam to clay with a normal pH from 7.8 to 8.5.

3.1.6 Bathinda

The Bathinda district is situated in the southern part of Punjab. It covers an area of 3367 square kilometer. The district is surrounded by the Sirsa and Fatehabad districts of the Haryana State in the south, the Sangrur and Mansa districts in the east, the Moga in the northeast, and the Faridkot and Muktsar districts in the northwest. The Bathinda

district has three sub-divisions: Bathinda, Rampura phul, and Talwandi Sabo. It has seven blocks: Bathinda, Nathana, Rampura, Phool, Talwandi Sabo, Sangat, and Maur. The district has a good network of canals for irrigation and domestic water use. The land utilization patterns and demographic features of the study area are presented in Table 3.1 and Table 3.2, respectively.

The climate of the Bathinda district can be classified as tropical steppee, semi-arid and hot; and is mainly dry except in rainy months and characterized by an intensely hot summer and cold winter. During the three months of monsoon season from July to September, the moist air of oceanic origin penetrates into the district and causes high humidity, cloudiness, and a good monsoon rainfall. The period from October to November constitutes the post monsoon season. The cold weather season prevails from December to February followed by the hot weather season that ends the last week of June.

The normal annual rainfall of the Bhatinda District is 408 mm in 20 days which is unevenly distributed over the district. The southwest monsoon sets in the last week of June and withdraws towards the end of September, and contributes 82% of annual rainfall. July and August are the rainiest months. The rainfall in the district increases from southwest to northeast. The information on cropping patterns is presented in the Table 3.3.

The district area is occupied by Indo-Gangetic alluvim soils. The maximum elevation in the area is 220.6 m. and the minimum elevation is 197.5 m. The master slope of the area is towards the southwest. The southern part contains isolated sand dunes of various dimensions. The district has two types of soils, the arid brown soils and siezoram

soils. The arid brown soils are calcareous in nature. These soils are imperfectly to moderately drained. Salinity and alkalinity are the principal problems of this soil. In siezoram soils, the accumulation of calcium carbonate is in the amorphous or concretionary form. The presence of a high amount of calcium carbonate and poor fertility are the main problems of this soil. The arid brown soils are found mostly in the eastern parts of the district and the siezoram soils are found in the western parts of the district.

3.1.7 Ferozepur

The Ferozpur district is the southwestern most district of Punjab with a total geographical area of 5850 square kilometer. Administratively, the district is under the control of the Ferozpur division and is divided into five sub-divisions, Ferozpur, Fazilka, Abohar, Zira, and Jalalabad; and four sub tehsils; Arniwala Sheikh Subhan, Mamdot, Talwandi Bhai, and Makhu. The Ferozpur district forms a part of Sutlej sub-basin of main Indus basin and is interrupted by clusters of sand dunes. The district contains almost a flat terrain with a gentle slope towards the southwest. Physiographically, it is characterized by four distinct features, the upland plain, sand dune tracts, younger flood plain, and active flood plain. The river Sutlej is of a perrineal nature that mainly drains the area. The river Sutlej shows both the influent and effluent nature in the area. The area is traversed by a dense network of canals. In terms of irrigation practices, the contribution of tube wells is large compared to the canal system. The land utilization patterns and demographic features of the study area are presented in Table 3.1 and Table 3.2, respectively.

The climate of the district can be classified as tropical desert, arid, and hot. The area receives about 389 mm of annual rainfall that is unevenly distributed over the area in 23 days, out of which about 79% occurs during the southwest monsoon season. The rainfall in the district decreases from northeast to southwest. Information on cropping patterns is presented in the Table 3.3.

The district forms a part of Indo-gangetic plain and the Sutlej sub basin of the main Indus basin. The area as a whole is almost flat with a gentle slope towards the southwest. The physiographic of the district is broadly classified from north to south into four distinct features, Upland plain, Sand dune tract, younger flood pain, and active flood plain of Sutlej. The soil of the district is of two types (i.e., sierozem (in northern parts) and desert soils (in southern parts)).

Table 3.1: Land Utilization Pattern in Selected Districts

	Districts						
Item	**Hoshiarpur**	**Amritsar**	**Gurdaspur**	**Kapurthala**	**Ludhiana**	**Bathinda**	**Ferozepur**
Total Geographical area (sq. km.)	3364	5094	3560	1633	3680	3382	5850
Area under forest (sq. km.)	1000	100	213	20	100	8	-0.12
Cultivable area (sq. km.)	3410	4260	2850	1350	6080	297	0.0247
Other uncultivated land (ha)	1000	1000	2000	1000	0	0	2000
Fallow land (ha)	below 500	below 500	0	1000	5000	0	below 500
Net sown area (sq. km.)	2180	2220	2850	1350	3250	297	0.0133
Net irrigated area (sq. km.)	1570	2220	2360	1350	3060	2910	4735

Source: Statistical abstract of Punjab, 2005

Table 3.2: Socio-Economic Features of the Study Area

	Districts						
Variables	**Hoshiarpur**	**Amritsar**	**Gurdaspur**	**Kapurthala**	**Ludhiana**	**Bathinda**	**Ferozepur**
Number of inhabited village (No.)	1386	1185	1532	618	897	280	968
Total Population (No.)	1480736	3096077	2104011	754521	3032831	1183295	1746107
a. Rural	1188662	1872802	1568788	507994	1339178	831541	1295382
b. Urban	292074	122327	535223	246527	1693653	351754	450725
c. Male	765132	1650589	1113077	399623	1662716	632809	926224
d. Female	715604	1445488	990934	354898	1370115	550486	819883
Population density (persons/sq.km.)	440	608	590	462	805	350	329
Literacy rate (%)	81.0	67.3	73.8	73.9	76.5	61.2	60.7
a. Male	86.5	72.6	79.8	79.0	80.3	67.8	68.7
b. Female	75.3	61.3	67.1	68.3	71.9	53.7	51.7
Normal rainfall (mm)	523.7	303.1	761.1	230.9	270	209.5	32.1
Agricultural holding (ha)							
a. Marginal holdings	23887	19763	27581	5980	9924	8779	11238
b. Small holdings	18937	25739	22467	7498	12696	7565	12798
c. Medium holdings	23627	46303	32901	13274	17756	14147	29655
d. Large holdings	15810	35408	22246	9368	20515	19603	36824

Source: Statistical abstract of Punjab, 2001

Table 3.3: Area under Major Crops in the Study Area (thousand hectares)

	Districts						
Variables	**Hoshiarpur**	**Amritsar**	**Gurdaspur**	**Kapurthala**	**Ludhiana**	**Bathinda**	**Ferozepur**
Cereals							
Paddy	58	334	202	105	247	102	238
Maize	64	4	13	3	2	1	0
Wheat	145	372	227	115	258	241	386
Barley	0	0	0	0	0	1	1.4
Pulses	0.4	1.1	0.7	0.2	1.7	1.1	1.4
Oilseeds	1.9	1.6	1.2	0.5	0.3	1.1	1.5
Commercial Crops							
Cotton	0	0.1	0	0	0.2	129	123
Sugarcane	18	7	20	5	3	0	2

Source: Statistical abstract of Punjab, 2005

Table 3.1 shows the land utilization patterns in selected districts of Punjab for 2005. The data were collected for each district by the Punjab state department. The total geographical area was the highest in Ferozepur followed by Amritsar, Ludhiana, Gurdaspur, Bathinda, Hoshiarpur, and Kapurthala. The net-sown area was highest in Ludhiana, followed by Gurdaspur, Amritsar, Hoshiarpur, Kapurthala, Bathinda and Ferozepur. This indicates that Ferozepur, having the highest geographical area, has the lowest cultivable area and net-sown area.

Table 3.2 shows the socio-economic features in the selected districts of the Punjab. The data were collected for each district in 2001 by the Punjab state government. Ludhiana had the highest population density followed by Amritsar, Gurdaspur, Kapurthala, Hoshiarpur, Bathinda, and Ferozepur. The literacy percentage was the highest in Hoshiarpur, followed by Ludhiana, Kapurthala, Gurdaspur, Amritsar, Bathinda, and Ferozepur. We can also observe from the table that a majority of the farmers fall into small and medium land holdings.

Table 3.3 shows the area under major crops in selected districts of Punjab. Farmers mainly grow wheat, paddy, and maize and do not concentrate on pulses, oil seeds, and commercial crops. This is one of the reasons why farmers may not be able to repay loans. They follow traditional cropping patterns. Farmers may need to adopt newer cropping systems that involve cash crops.

3.2 Sampling procedure

A random sampling procedure was adopted for the selection of the district, taluks, villages, and cultivators to collect the required information for this research (Dr. Rajinder Sidhu).

3.3 Data

For evaluating the specific objectives of the study, primary data were obtained from families in suicide prone areas through personal interviews with the help of a structured survey. The data collected pertained to agriculture for the year 2005. The data collected from respondents included general information about the farmer, their resource position, land holdings, cropping patterns, debt condition, sources of income, asset position, sources of credit, and any other information the family wished to share. The researchers were able to interact with the next of kin in the family and other members of the family in addition to the farmer to get the required information. The method of personal interview was adopted to ensure that the data obtained from the respondents were relevant, comprehensive, consistent, and reasonably correct.

3.4 Analytical techniques employed

For the purpose of achieving the specific objectives of the study, the data were subjected to the following analysis.

3.4.1 Tabular analysis – Ratio's, percentages

Tabular analyses involves the computation of means, percentages, etc, that were used to present the data regarding demographic features, socio-economic profile, cropping systems, costs, and returns of the farmers. Similarly, data pertaining to different sources of income were also computed.

3.4.2 T-test

A t-test is any hypothesis test in which the test statistic follows a simple t-distribution if the null hypothesis is true. It is most commonly applied when the test

statistics would follow a normal distribution if the value of a scaling term in the test statistics were known. When the scaling term is unknown and is replaced by an estimate based on data, the test statistics follows a simple t-distribution.

3.4.3 Farm Business Analysis Tool

Ratios are important measurements to analyze the performance of any business organization. Relevant financial ratios determined for the farm enterprises were the debt equity ratio, debt asset ratio, net worth, and net capital ratio.

3.4.4 Debt-Equity Ratio (Leverage)

This ratio is also known as the leverage ratio. It indicates what proportion of equity and debt the company is using to finance the asset base. It compares the owner's stake in the business with outside liabilities. A lower value of the ratio indicates that leverage is small and the major capital being equity.

$$\text{Debt-Equity ratio} = \frac{Longterm\ Liabilities}{Net\ Worth}$$

In the above ratio, debt represents only long term liabilities and not current liabilities, while equity refers to net worth after deducting intangible assets. Net worth includes statutory reserves and share capital.

3.4.5 Debt Asset Ratio (DAR)

The Debt Asset Ratio (DAR), is a ratio of amount of debt to amount of assets per farm. The higher the value of DAR the higher the risk.

$$\text{Debt asset ratio} = \frac{Total\ Liabilities}{Total\ Assets}$$

3.4.6 Net Worth

Net worth indicates what the business owes to the owners of business. It measures the excess of assets compared to liabilities and indicates the soundness of the business.

$$\text{Net worth} = Total\ Assets - Total\ Liabilities$$

3.4.7 Net Capital Ratio

This ratio indicates the degree of liquidity in a business for the long term. It measures the availability of assets to pay long term liabilities.

$$\text{Net Capital Ratio} = \frac{Total\ \ Assets}{Total\ Liabilities}$$

The higher the net capital ratio, the greater the margin of safety against a decline in the prices of major assets.

3.4.8 Logistic Regression Model

Based on the survey, the data were categorized into farmers' who are indebted and farmers' who are non-indebted. Debt use (indebted or non-indebted) was hypothesized to depend on the farmers' age, education, family size, landholding, occupation, and net income. The influence of various socio-economic factors on the probability of incidence is often investigated using logit analysis (Mishra, 2006). In this thesis, five types of models were estimated using Stata: logit, tobit, McDonald and Moffitt decomposition, probit, and the heckman two-step method.

The logit model was used to analyze the probability of a farmer being indebted or non-indebted. The tobit model was used for the data that were censored. Decomposition

was used to analyze the conditional mean functions in the tobit model. The probit model was used to construct the selection bias control factor. The heckman two step method was used to remove the bias in the results. All these models were used for different purposes in this study.

The logit model assumes that the probability of an individual, i, being indebted has the form (Mishra, 2006):

$$P_i = P\ (Y_i=1/X_i) = e^{X_i\beta} / (1+e^{X_i\beta})$$

where X_i is the set of explanatory variables that include individual characteristics and β is the set of unknown parameters. Similarly, the probability of an individual being non-indebted is:

$$1-P_i = P\ (Y_i=0/X_i) = 1 / (1+e^{X_i\beta})$$

Taking the ratio of the two expressions we get

$$P\ (Y_i=1) / P\ (Y_i=0) = e^{Xi\beta}$$

Taking the natural log of both sides we get

$$\ln [P_i / (1-P_i)] = X\beta = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots + \beta_nX_n$$

These parameters can be estimated using maximum likelihood estimation techniques. The logit model guarantees probabilities in the range of (0, 1).

The specific LOGIT model to predict the odds of a farmer being indebted is specified as follows:

$$\ln [P_i/(1-P_i)]=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6$$

where P_i= probability that the i^{th} farmer will be indebted,

$1-P_i$= Probability that the i^{th} farmer will not be indebted,

Age (X_1) = The respondents were asked their actual age in years,

Education (X_2) = The respondents were asked for their education level,

Family size (X_3) = The respondents were asked for the number of people in the family,

Landholding (X_4) = The respondents were asked for their total farm size (land holding),

Occupation (X_5) = Occupation (0 = Agriculture; 1 = Agriculture + Business), and

Net-income (X_6) = Net income calculated in rupees

3.4.9 Tobit Model

Tobit analysis is used for data that are censored, meaning that the dependent variables have several observations clustered at a lower or upper limiting value. Tobit analysis includes all observations, including those at the limit, to estimate the regression parameters. Tobit analysis corrects for omitted variable bias and accounts for the fact that the expected values of the errors are changing.

3.4.10 Tobit model for censored observations

Censoring occurs when data on the dependent variable is lost or limited but not data on the regressors. Censoring is a defect in the sample – if there were no censoring, the data would be a representative sample from the population of interest.

When the distribution is censored on the left, observations with values at or below 0 are set to

$$Y = \begin{cases} y^* & if\ y^* > 0 \\ 0 & if\ y^* \leq 0 \end{cases}$$

The Tobit model is:

If $X\beta + e > 0$, then $y = X\beta + e$

If $X\beta + e \leq 0$, then $y = 0$,

where X represents the independent variables, β is the Tobit coefficient corresponding to the independent variables, and e is an error term with a normal distribution (Roncek, 1992). A combination of these two equations results in the total derivative for Tobit analysis.

3.4.11 Expected Values for Tobit Model (Decomposition)

The expected value of y when y is greater than 0:

$E[y|y > 0] = X_i\beta + \sigma\lambda(\alpha)$

where $\lambda(\alpha) = \dfrac{\varphi\left(\dfrac{X_i\beta}{\sigma}\right)}{\phi\left(\dfrac{X_i\beta}{\sigma}\right)}$ is the inverse mills ratio. $\varphi(.)$ is the standard normal probability distribution function and $\phi(.)$ is the standard normal cumulative distribution function.

The expected value of y when y is equal to 0:

$$E[y] = \Phi\left(\frac{X_i\beta}{\sigma}\right)[X_i\beta + \sigma\lambda(\alpha)]$$

where $\lambda(\alpha) = \dfrac{\varphi\left(\frac{X_i\beta}{\sigma}\right)}{\phi\left(\frac{X_i\beta}{\sigma}\right)}$ is the inverse mills ratio. $\varphi(.)$ is the standard normal probability distribution function and $\phi(.)$ is the standard normal cumulative distribution function. This is the probability of being uncensored multiplied by the expected value of y given y is uncensored. This is known as the McDonald and Moffitt's decomposition.

3.4.12 Estimation with Heckman's Two-Step Procedure

The Heckman approach corrects for selection bias in the data. Selection bias may arise when a sample does not randomly represent the underlying population. The inverse mills ratio (Heckman) controls for selection bias and including it allows for unbiased coefficient estimates.

There are basically two versions of selection bias. In the standard case of selection bias, information on the dependent variable for part of the respondents is missing. Secondly, information on the dependent variable is available for all respondents, but the distribution of respondents over categories of the independent variable we are interested has taken place in a selective way. This kind of bias is also called as heterogeneity bias.

Heckman proposed a two-step procedure that involves the estimation of a standard probit and a linear regression model. In the first step, the standard probit model is estimated and a selection bias control factor called Lambda is constructed. This factor reflects the effects of all unmeasured characteristics in the model.

$$Prob(y=1|X_1,X_2,X_3,X_4,X_5,X_6) = \Phi (\beta_1X_1,\beta_2X_2,\beta_3X_3,\beta_4X_4,\beta_5X_5,\beta_6X_6)$$

where y is 1 if indebted and 0 otherwise, X_1, X_2, X_3, X_4, X_5, X_6 are vectors of explanatory variables. βs are unknown parameters and Φ is cumulative distribution function of the standard normal distribution.

Estimation of the model yields results that can be used to predict the probability of each individual being in debt.

In the second step, a regression model is estimated along with the selection bias control factor lambda (inverse mills ratio) as an additional independent variable. Because this factor reflects the effects of the unmeasured characteristics related to the indebtedness decision, the coefficient of this factor in the analysis catches the part of the effect from these characteristics that are related to non-indebtedness. Because we have a control factor in the analysis for the effect of the indebtedness, the other predicators in the equation are free from this effect and the regression analysis produces unbiased coefficients for them.

The loan equation is specified as:

$$L^* = \beta_1 age + \beta_2 education + \beta_3 family\ size + \beta_4 landholding + \beta_5 occupation + \beta_6 net\text{-}income + u$$

where L* denoted the total amount borrowed in rupees. The conditional expectation of loan given the farmer takes the loan is then

$$E [L|X_1,X_2,X_3,X_4,X_5,X_6, y=1] = \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+ e$$

Under the assumption that the error terms are jointly normal, we have

$$E [L|X_1,X_2,X_3,X_4,X_5,X_6, y=1] =$$

$$\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+ \rho\sigma_u\lambda(\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6)$$

where ρ is the correlation between unobserved determinants indebtedness. The term, σ_u is the standard deviation of u, and λ is the inverse mills ratio evaluated at $\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6$

Applying the theoretical model in practice is not straight forward. An important condition for its use is that the main equation contains at least one variable not related to the dependent variable in the lambda equation. If such a variable is not present (and sometimes even if such a variable is present), there may arise severe problems of multicollinearity and the addition of the correction factor (lambda) may lead to estimation difficulties and unreliable coefficients.

CHAPTER 4: Results

4.1 Socio-Economic Profile of the Sample Respondents

To understand the nature and cause of indebtedness, the socio-economic profile of the sample respondents was studied.

4.1.1 Age

Age was categorized into three groups, less than 35 years, 36-50 years, and more than 50 years (Table 4.1; Figure 4.1). The average age of indebted farmers was 48.72. The middle age group is more likely to be in debt than younger or older farmers. This is the age when a large number of decisions are made for the households. A majority of the respondents belonged to 36-50 years age group (45 percent). The remaining 37.5 percent belonged to the older age group and remainder (17.5 percent) in the younger age group. The average age of sample respondents without debt was 47.69. The mean t-test for age variable is statistically significant at 1 percent level indicating a statistical difference between the age of indebted and non-indebted individuals.

4.1.2 Education Level

The education level of farmers was categorized into four groups, illiterate, primary, secondary, and college education (Table 4.1; Figure 4.2). A majority of farmers who were indebted were educated up to primary level (45.45%). About 26 % were illiterate, about 20% were educated up to secondary level, and 8% were educated up to college level. Among non-indebted farmers, 40% had secondary education followed by primary (30%), illiterate (25%), and college education (5%). The mean t-test for

education variable is statistically significant at 5 percent levels indicating a statistical difference between education of indebted and non-indebted farmers.

Table 4.1: Social Charteristics of the Sample Respondents

Particulars	**Indebted Farmers**		**Non-indebted Farmers**	
	Frequency	**%**	**Frequency**	**%**
Age				
Young (<35)	27	12.27	14	17.5
Middle (36-50)	108	49.09	36	45
Old (>50)	85	38.64	30	37.5
Average	48.72		47.69	
Education				
Illiterate	58	26.36	20	25
Primary	100	45.45	24	30
Secondary	44	20.00	32	40
College	18	8.18	4	5
Average	6.67		5.85	
Family Size				
Male	447	39.56	155	35.71
Female	384	33.98	150	34.56
Children	299	26.46	129	29.72
Total	1130	100	434	100
Average	5.14		5.43	

Figure 4.1: Social Characteristics of Indebted Farmers- Age

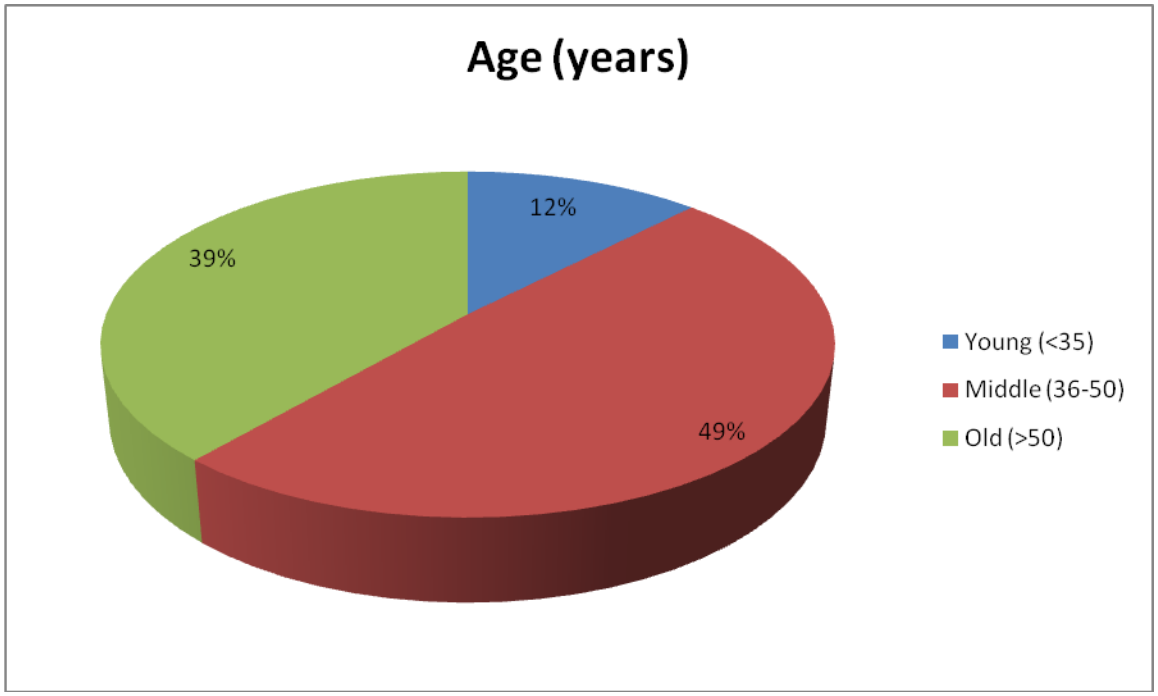
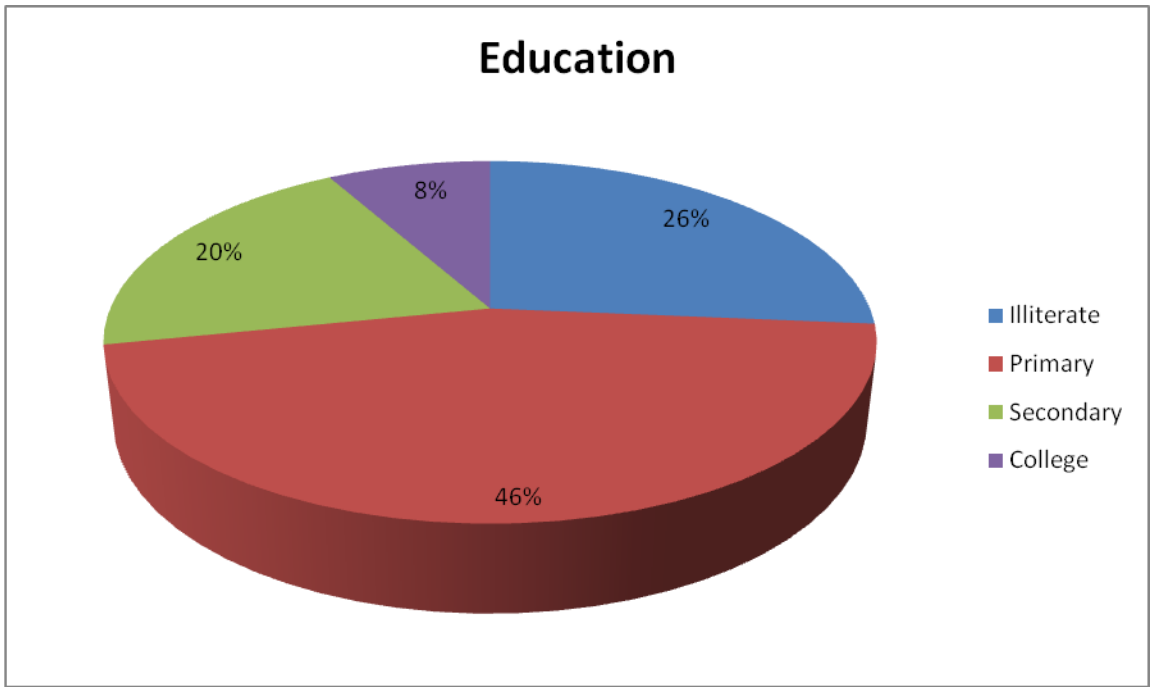


Figure 4.2: Social Characteristics of Indebted Farmers- Education



4.1.3 Family size

Family size included the number of male, female and children in the family. The average family size was slightly smaller with an average number of 5.14 for the indebted farmers when compared to non-indebted farmers (5.43). Within the family there was not much difference in the distribution of the male, female, and children of both indebted and non-indebted farmers. The mean t-test for family size variable is statistically significant 5 percent level indicating a statistical difference in family size among the with and without debt.

4.1.4 Land Holding

Land holding was categorized into four groups, less than 1 hectare, 1 to 2 hectares, 2 to 4 hectares, and more than 4 hectares (Table 4.2). An analysis of the distribution of various land holding categories revealed that among the indebted farmers a majority of the farmers had between 2 and 4 hectares (35.45 percent) or more than 4 hectares (30.91 percent). Among the non-indebted farmers, a majority of the farmers had between 2 and 4 hectares (28.75 percent) and between 1 and 2 hectares (26.25 percent). The mean t-test for landholding variable is statistically significant at 1 percent level indicating a statistical difference in landholding with and without debt.

4.1.5 Occupational pattern

Occupational patterns of sample respondents (Table 4.2) revealed that a majority of farmers were dependent on agriculture. Among the indebted farmers, 93% were dependent upon agriculture and the remaining had a supplementary business (7%). Among the non-indebted farmers, 90% depended upon agriculture. The percentage of

farmers with a supplementary business was slightly higher than that of indebted farmers (10%).

A greater dependency of farmers on farming with negligible supplementary enterprises indicates a vulnerability to natural and financial risks. The mean t-test for occupational pattern variable is not statistically significant at 10 percent level.

Table 4.2: Agro-Economic Profile of Respondents

Particulars	**Indebted Farmers**		**Non-indebted Farmers**	
	Frequency	**%**	**Frequency**	**%**
Land holdings				
Marginal (<1ha)	25	11.36	16	20
Small (1-2ha)	49	22.27	21	26.25
Medium (2-4ha)	78	35.45	23	28.75
Large (>4ha)	68	30.91	20	25
Total	220	100.00	80	100
Occupational Pattern				
Agriculture	205	93.18	72	90
Agriculture + Business	15	6.82	8	10
Total	220	100	80	100
Total Land Holding (ha)	748.81		235.09	
Average Land Holding (ha)	3.40		2.94	

4.1.6 Distribution of indebtedness by retrospectively reconstructed reasons

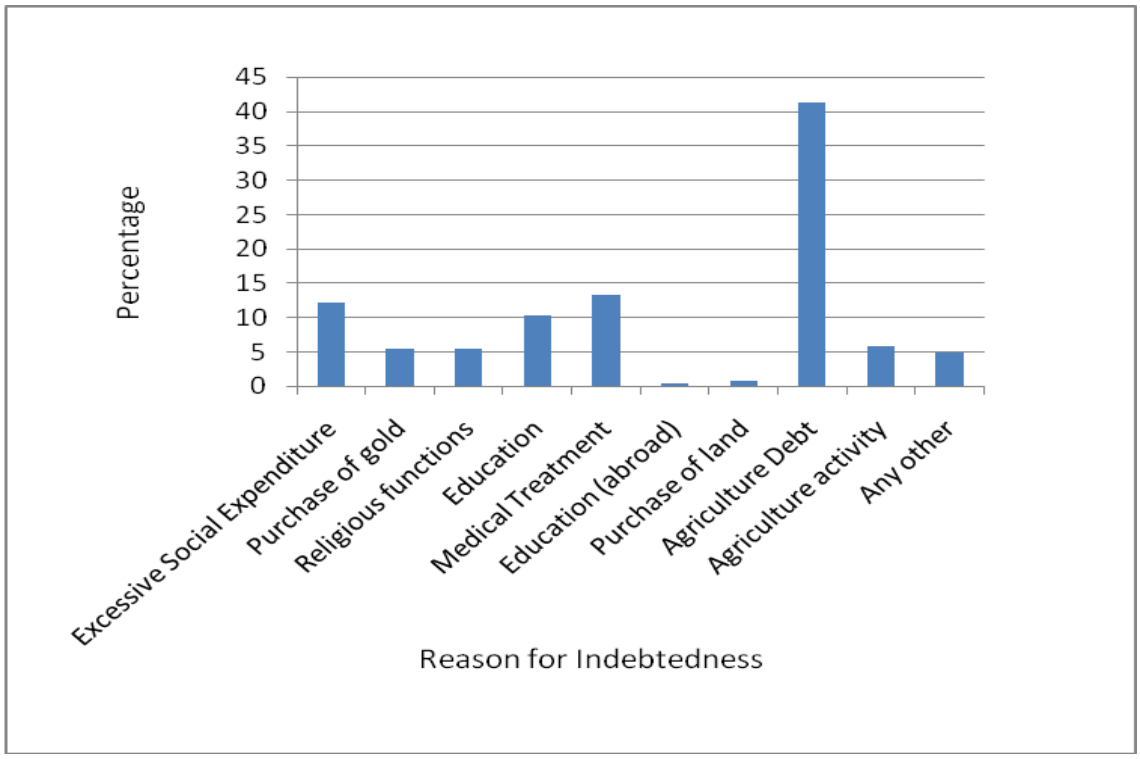
Various reasons have been suggested as causes for farmers' indebtedness. In this study, the method of retrospectively reconstructed reasons was adopted to determine the probable causes for farmers' indebtedness (Table 4.3; Figure 4.3).

The most predominant reason as revealed by respondents was for agricultural debt (Table 4.3). About 41 percent of the respondents ascribed agriculture debt to be the major factor. This was followed by others like medical treatment (13.28%), excessive social expenditure (12.11%), and education (10.35%). Other causes reported were agriculture activity (5.86%), purchase of gold (5.47%), and religious functions (5.47%).

Table 4.3: Distribution of Indebtedness Cases by Retrospectively Reconstructed Reasons

Reasons for Indebtedness	Number	Percentage
Excessive Social Expenditure	62	12.11
Purchase of gold	28	5.47
Religious functions	28	5.47
Education	53	10.35
Medical Treatment	68	13.28
Education (abroad)	2	0.39
Purchase of land	4	0.78
Agriculture Debt	212	41.41
Agriculture activity	30	5.86
Any other	25	4.88

Figure 4.3: Distribution of Indebted Cases by Retrospectively Reconstructed Reasons



4.2 Farm Business Performance

4.2.1 Cropping patterns of Indebted and Non-indebted farmers

An examination of cropping patterns on the farms of sample respondents is presented in table 4.4. There was not much difference in the cropping pattern of the two types of farms.

In the kharif season, farmers that were indebt grew kharif paddy (23.68%), cotton American (17.53%), kharif fodder (6.25%), and maize (1.93%). Other crops grown were vegetables, sugarcane, and kharif oilseeds. Similar patterns were noticed on the farms of non-indebted farmers. They grew Kharif paddy (25.20%), kharif fodder (11.35), maize (4.73%), and cotton American (4.41%).

In the rabi season, farms with and without debt had similar cropping patterns. Wheat was the dominant rabi crop. Farms with debt grew wheat (44.24%), rabi fodder (4.60%), and rabi oilseeds (.04%). The crops of farmers without debt were wheat (44.27%), rabi fodder (7.65%), and rabi pulses (0.04%).

Table 4.4: Cropping Pattern of the Farms of Indebted and Non-indebted Farmers

Season	Crop	Indebted Farmers		Non-indebted Farmers	
		Area (ha)	Percent	Area (ha)	Percent
Kharif	Paddy	353.94	23.68	138.59	25.20
	Cotton American	262.02	17.53	24.28	4.41
	Cotton Desi	0	0.00	0.28	0.05
	Maize	28.8	1.93	26.04	4.73
	Sugarcane	5.6	0.37	10.2	1.85
	Kharif Pulses	0	0.00	0.2	0.04
	Kharif Oilseeds	0.6	0.04	0	0.00
	Kharif Fodder	93.49	6.25	62.43	11.35
	Vegetable	17.6	1.18	1.6	0.29
	Fruits	0	0.00	0	0.00
	Others	1.6	0.11	0	0.00
Rabi	Wheat	661.28	44.24	243.45	44.27
	Barley	0	0.00	0	0.00
	Rabi Pulses	0	0.00	0.2	0.04
	Rabi Oilseeds	0.6	0.04	0.6	0.11
	Rabi Fodder	68.81	4.60	42.08	7.65
	Others	0.4	0.03	0	0.00
	Total	1494.74	100.00	549.95	100.00

4.2.2 Cost-return Profile of Major Crops Grown by the Respondents (Rs. /hectares)

To calculate the cost-return profile of major crops the following equations were used.

- Cost A = seed cost + fertilizer cost + pesticide cost + hired labor + hired machinery + rent paid for leased land.
- Cost B = Cost A + interest on fixed capital excluding land.
- Cost C = Cost B + input value of family labor.
- Farm Business Income = Gross returns – Cost A
- Family Labor Income = Gross returns – Cost B
- Net Income = Gross returns – Cost C

The relative profitability of major crops was determined by farm business analysis. Farm business income is a difference between gross returns and cost A whereas net income is the difference between gross returns and cost C.

Among the indebted farms, out of the three crops examined, the farm business income was positive for kharif paddy (Rs. 8,311), and cotton American (Rs. 1,028), and negative for wheat (-2,813) (Table 4.5). Net income per hectare for cotton American and wheat was found to be negative.

A different situation occurred for non-indebted farmers. Among the three crops, the farm business income was positive for kharif paddy (Rs. 17,320), cotton American (Rs. 2,474), and wheat (Rs. 1,133). Net profit for kharif paddy and cotton American was Rs. 15,435 and Rs. 418, respectively and net loss for wheat was Rs. 783.

Cost return profile of major crops indicated less profitability for farmers in debt.

Table 4.5: Cost and Returns Profile of Major Crops Grown by the Farmer Respondents

	Indebted Cases			Non-indebted Cases		
Variables	**Kharif Paddy**	**Cotton American**	**Wheat**	**Kharif Paddy**	**Cotton American**	**Wheat**
Cost A	23281.34	26708.84	25459.9	20014.7	27000.79	21092.07
Cost B	24792.47	28219.97	26971.03	21183.85	28169.94	22261.22
Cost C	25727.74	29287.28	27820.99	21899.43	29056.6	23008.53
Gross Returns	31492.2	27737.31	22647.27	37334.33	29474.63	22225.47
Farm Business Income	8210.86	1028.47	-2812.63	17319.63	2473.84	1133.4
Family Labor Income	6699.73	-482.66	-4323.76	16150.48	1304.69	-35.75
Net Income	5764.46	-1549.97	-5173.72	15434.9	418.03	-783.06

Cost A = seed cost + fertilizer cost + pesticide cost + hired labor + hired machinery + rent paid for leased land

Cost B = Cost A + interest on fixed capital excluding land

Cost C = Cost B + input value of family labor

4.2.3 Farm financial ratios

Farm financial ratios are calculated and represented in table 4.6. The Net Capital Ratio is an indicator of long term liquidity position of farm business. The net capital ratio for indebted farmers and for non-indebted farmers was 0.98 and 6.99, respectively. For a farm business to be successful, net capital ratio should be more than one. In this case, the net capital ratio was less than one for indebted farmers, but more than one for non-indebted farmers indicating a poor solvency position for indebted farmers.

The debt to asset ratio is a ratio of total amount of debt per farmer to total amount of assets per farmer. The debt to asset ratio was higher for the indebted farmers (0.91) when compared to non-indebted farmers (0.13). A higher debt to asset ratio indicates a higher potential for loss when income falls. This shows that debt was higher among indebted farmers in relation to their asset position.

The Debt to Equity Ratio (DER) is the ratio of total liabilities to owner's equity. It indicates the capacity of farmer to meet long-term commitments. The debt-equity ratio was 3.62 among the indebted farmers compared to 0.12 for non-indebted farmers. A very high ratio indicates a greater degree of dependence on borrowing.

Table 4.6: Farm Financial Ratios

Variable	Indebted Farmers	Non-indebted Farmers
Net capital ratio	0.98	6.99
Debt to Asset ratio	0.91	0.13
Debt to Equity ratio	3.62	0.12

4.2.4 Asset Position of Sample Respondents

Table 4.7 shows the asset and per farm asset position of the indebted and non-indebted farmers. Assets of sample farmers were classified into land, farm machinery and equipment, livestock, and non-farm assets.

The value of assets of indebted farmers was higher compared to those of non-indebted farmers (Table 4.7). A large proportion of this value was contributed to farm assets. Among farm assets, land contributed about 96 percent of the total value of assets. This was followed by farm machinery and equipments (1.76%), livestock (0.71%), and the rest was contributed by non-farm assets (1.18%). It can be noticed from the table that the overall per farm value of assets of indebted farmers was more compared to the non-indebted farmers. The per farm assets of the indebted farmers was Rs. 5,298,893.

The value of farm assets of non-indebted farmers contributed 98 percent of total assets. Among the farm assets, share of land was about 95.46 percent followed by farm machinery and equipments (1.58%), and livestock (1.13%). The non-farm assets contributed to the remaining 1.82 percent of the total value of assets. The per farm capital asset position of non-indebted farmers was 4,617,490.

Table 4.7: Asset Position of Sample Respondents

Assets (resources)	Indebted Farmers			Non-indebted Farmers		
	Quantity	Value (Rs)	Rs./Farm	Quantity	Value (Rs)	Rs./Farm
Land (ha)						
Total	748.81	1,123,215,000	5,105,522.7	235.09	352,635,000	4,407,937.5
Farm machinery and Equipments						
Tractor	104	13,714,000	62,336.4	23	4,036,000	50,450.0
Seed drill	84	243,600	1,107.3	41	118,900	1,486.3
Power tiller	33	3,481,500	15,825.0	12	1,266,000	15,825.0
Thresher	57	228,000	1,036.4	37	144,300	1,803.8
Pump set	34	2,867,000	13,031.8	3	280,000	3,500.0
Sub-Total		20,534,100	93,336.8		5,845,200	73,065.0
Livestock						
Sub-Total	1,446	8,287,668	37,671.2	495	4,179,300	52,241.3
Non-farm assets						
Construction/repair of house	61	5,349,500	24,315.9	23	3,874,500	48,431.3
Vehicles	13	2,003,000	9,104.5	3	375,000	4,687.5
Bikes	164	3,444,000	15,654.5	47	948,000	11,850.0
Fridge/TV/Washing machine	55	558,500	2,538.6	55	731,250	9,140.6
Telephone/Mobile	50	149,150	678.0	22	54,700	683.8
Gold	67	2,045,300	9,296.8	20	673,500	8,418.8
Furniture	88	170,230	773.8	14	82,750	1,034.4
Sub-Total		13,719,680	62,362.2		6,739,700	84,246.3
Total		1,165,756,448	5,298,892.9		369,399,200	4,617,490.0

4.3 Extent of Indebtedness and Pattern of Capital Use

4.3.1 Interest Rates

Table 4.8: Interest Rates Charged by Different Institutional Sources for both Indebted and Non-indebted Farmers

Source	Rate of Interest (%)
Institutional	
Co-operative Society	10
Regional Rural Bank	10.3
Commercial Bank	11.4
Any Other	10.5
Non-Institutional	
Commission Agent	22.6
Land Lords	24
Friends & Relatives	24.6
Village shopkeeper	22
Employee working in village	20
Others	24.4

Table 4.8 shows the different interest rates charged by different institutional and non-institutional sources for indebted and non-indebted farmers. From the institutional sources, cooperatives charge 10%, regional rural banks charge 10.3%, commercial banks charge 11.4%, and any other charge 10.5%.

From non-institutional sources, commission agents charge 22.6%, landlords charge 24%, friends and relatives charge 24.6%, village shopkeeper charge 22%, employee working in village charge 20%, and others charge 24.4%.

This reflects the fact that non-institutional sources charge higher rates of interest when compared to institutional sources.

4.3.2 Liability position of Indebted and Non-indebted farmers in the beginning of the year

Major sources of borrowing for both indebted and non-indebted farmers were categorized into Institutional (Co-operative society, Regional banks, Commercial banks, and any other) and Non-Institutional (Commission agents, Landlords, Friends and Relatives, Employees working in village, and others). Information regarding the liability position of indebted and non-indebted farmers is summarized in table 4.9. Figure 4.4 shows the amount borrowed per farmer among the indebted and non-indebted farmers.

Farmers borrow loans for agricultural purposes and personal use from different sources (Table 4.9). The number of farmers who cleared all their debts (non-indebted farmers) and those who did not clear their debts (indebted farmers) is presented in the Table 4.10.

Indebted Farmers

Major sources of borrowing by respondents were co-operative banks, regional rural banks, commercial banks, commission agents, village shopkeepers, friends and relatives, and landlords.

The average amount borrowed from regional rural banks was Rs. 160,545 followed by commercial banks Rs. 119,653, others Rs. 122,583, commission agents Rs. 94,696, friends and relatives Rs. 58,167, the cooperative society Rs. 40,161, village shopkeepers Rs. 10,735, and landlords Rs. 10,000. The average amount borrowed per farmer from different sources among the indebted cases was Rs. 628,592.

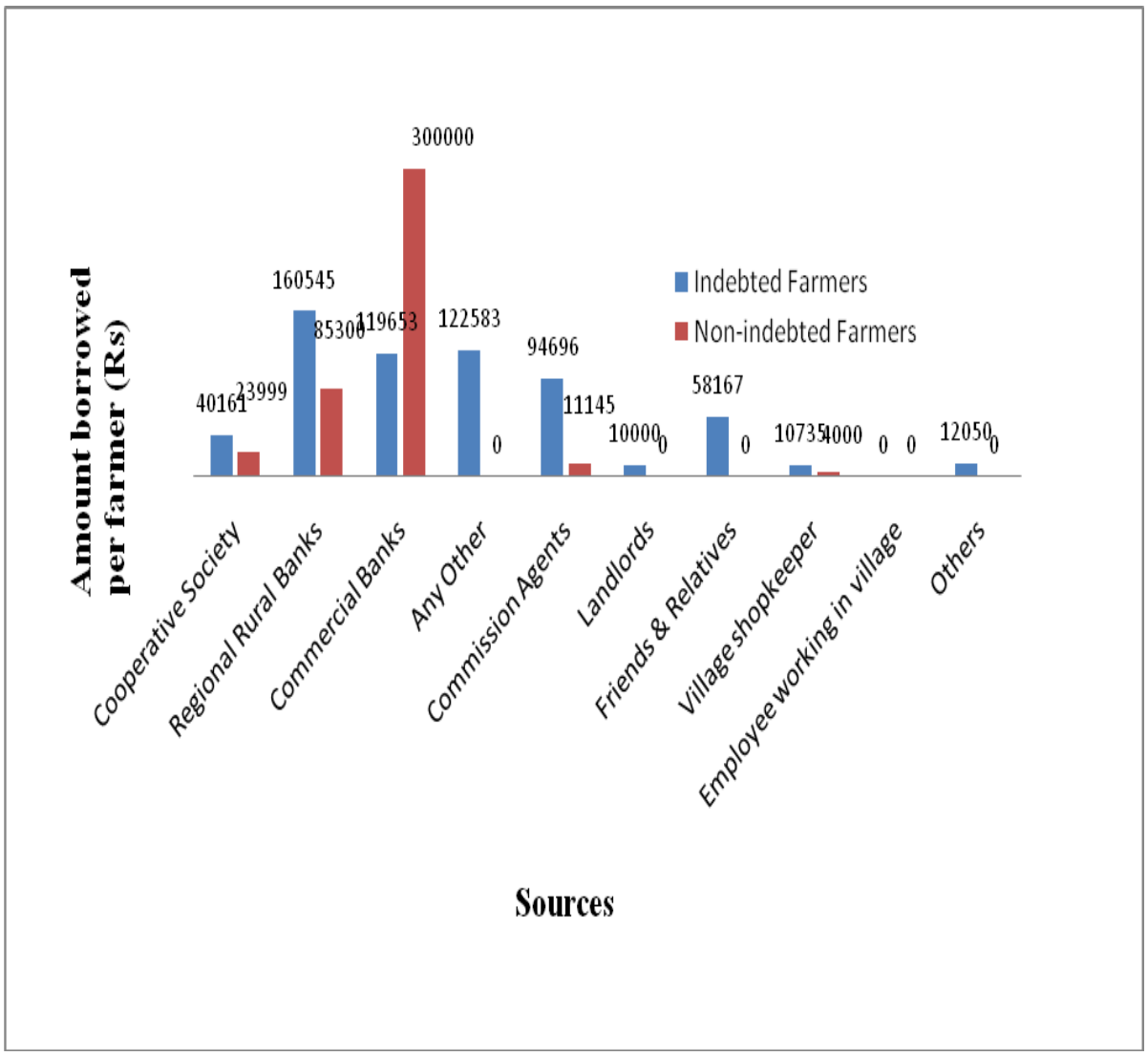
Non-Indebted Farmers

The amount borrowed per farmer was highest from commercial banks Rs. 300,000, followed by regional rural banks Rs. 85,300, the cooperative society Rs. 23,999, commission agents Rs. 11,145, and village shopkeepers Rs. 4,000. The average amount borrowed per farmer from different sources among the non-indebted farmers was Rs. 424,444. It can be observed that total amount of loans borrowed by indebted farmers was 32.5 percent more than that for non-indebted farmers.

Table 4.9: Liability Position of Indebted and Non-indebted Farmers in the Beginning of the Year

Source	Indebted Farmers		Non-Indebted Farmers	
	Number of borrowers	Amount Borrowed per farmer (Rs)	Number of borrowers	Amount Borrowed per farmer (Rs)
Institutional				
Co-operative Society	190	40161	36	23999
Regional Rural Bank	44	160545	10	85300
Commercial Bank	75	119653	1	300000
Any Other	6	122583	0	0
Non-Institutional				
Commission Agent	143	94696	17	11145
Landlords	1	10000	0	0
Friends & Relatives	9	58167	0	0
Village shopkeeper	17	10735	1	4000
Employee working in village	0	0	0	0
Others	2	12050	0	0
Total	220	628592	80	424444

Figure 4.4: Amount Borrowed Per Farmer among the Indebted and Non-indebted Farmers



4.3.2 Overdue position of the indebted and non-indebted farmers

With regards to the extent of overdue loans, table 4.10 and figure 4.5 suggests that indebted farmers have 53.45% of their amount overdue, but in case of non-indebted farmers all debts were cleared by the end of the year.

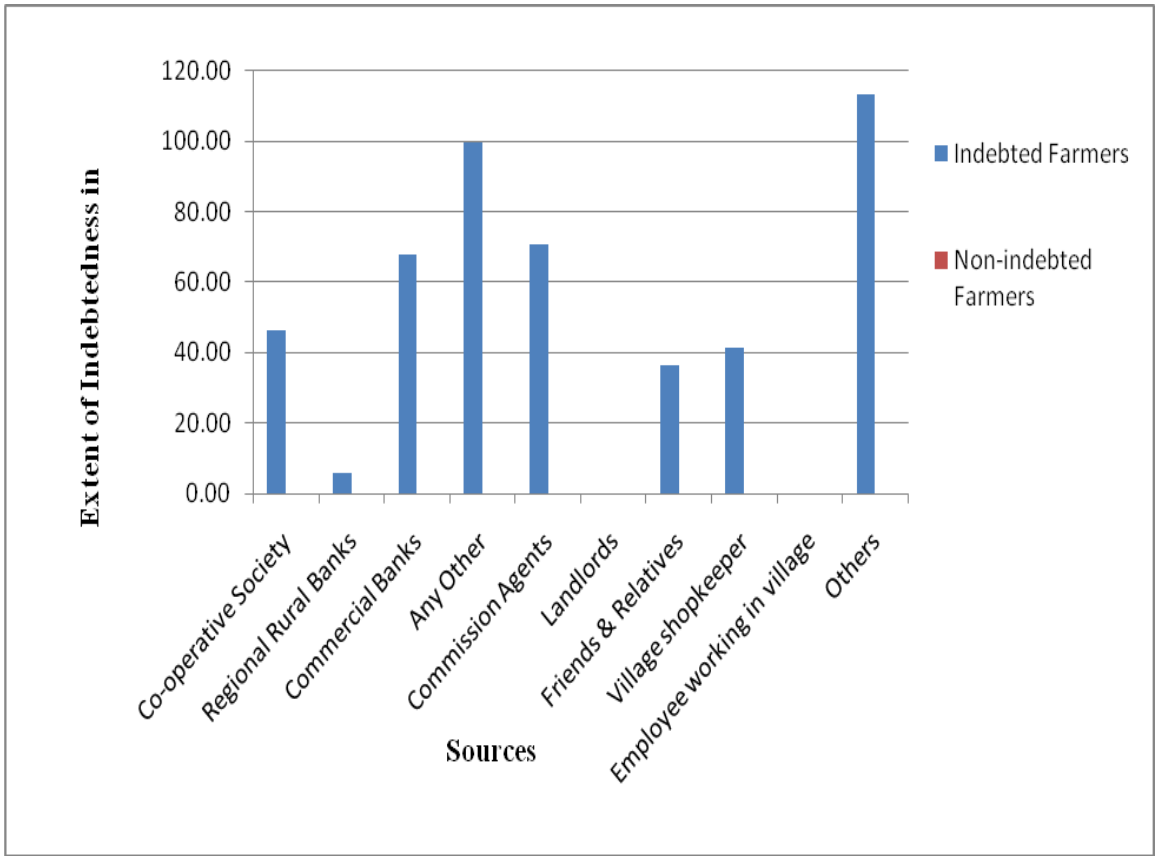
Among the indebted cases, the extent of overdue loans was higher for institutional than non-institutional lending (113.20% and 99.59%), followed by commission agents (70.91%), commercial banks (67.86%), the cooperative society (46.45%), village shopkeeper (41.37%), friends and relatives (36.58%), and regional rural banks (6.04%).

Table 4.10: Overdue Position of Indebted and Non-Indebted Farmers at the End of the Year

	Indebted Farmers		Non-indebted Farmers	
Source	**Number of borrowers**	**Amount Overdue (Rs)**	**Number of borrowers**	**Amount Overdue (Rs)**
Institutional				
Co-operative Society	190	3544174 [46.45]	36	0
Regional Rural Bank	44	416900 [6.04]	10	0
Commercial Bank	75	6089425 [67.86]	1	0
Any Other	6	732500 [99.59]	0	0
Non-Institutional				
Commission Agent	143	9602965 [70.91]	17	0
Landlords	1	0 [0]	0	0
Friends & Relatives	9	191500 [36.58]	0	0
Village shopkeeper	17	75500 [41.37]	1	0
Employee working in village	0	0 [0]	0	0
Others	2	27280 [113.2]	0	0
Total	220	20680244 [53.45]	80	0

Number in the parenthesis shows the percentage overdue of the total amount borrowed.

Figure 4.5: Overdue Position of Indebted and Non-indebted Farmers



4.3.3 Sources and pattern of capital use by indebted and non-indebted farmers

Table 4.11 depicts the sources of capital and their uses. Indebted and non-indebted farmers borrowed more from institutional sources than from non-institutional sources, but when we compared non-institutional sources, indebted farmers borrowed about 36.91% more. Non-indebted farmers borrowed about 8.76% from non-institutional sources. This reflects the fact that the indebted farmers depend more on private sources than institutional sources.

Of the total amount borrowed (Rs.24,404,140.5) by indebted farmers from institutional sources, 87.66% was utilized for agricultural purposes and the remaining was utilized for non-agricultural purposes. But it was not the same case with non-

institutional sources where of total amount (Rs.14281695) borrowed only 53.53% was utilized for agriculture purposes and rest was used for non-agricultural purposes.

Among indebted cases, nearly 75.05% of loans were used for agricultural purposes and the remaining was for non-agricultural purposes.

Among the non-indebted farmers, institutional sources contributed about 91.24% of the total loans while the remaining came from non-institutional sources. With regards to use of borrowed institutional capital, Table 4.11 reveals that among the non-indebted cases, 92.07% was used for agricultural purposes while the remaining was utilized for non-agricultural purposes. This revealed the fact that more institutional finance was used for agricultural purposes among non-indebted farmers than compared to indebted farmers.

Among the non-indebted farmers, of the total amount borrowed from non-institutional sources Rs.193,468, about 91.08% was used for agricultural purposes.

Among the non-indebted farmers, 91.98% of total funds were used for agricultural purposes while the remaining was for non-agricultural purposes. This highlights the fact that more of non-institutional amount was used for agricultural purposes.

Table 4.11: Sources and Pattern of Capital Use by Indebted and Non-indebted Farmers

Source/Categories	Indebted Farmers			Non-Indebted Farmers		
	Pattern of Capital Use			Pattern of Capital Use		
	Agricultural Purpose	Non-Agricultural Purpose	Total	Agricultural Purpose	Non-Agricultural Purpose	Total
Institutional	21392140.5	3012000	24404140.5	1856960	160000	2016960
	(87.66)*	(12.34)*	(63.09)**	(92.07)*	(7.93)*	(91.24)**
Non-Institutional	7644695	6637000	14281695	176218	17250	193468
	(53.53)*	(46.47)*	(36.91)**	(91.08)*	(8.91)*	(8.76)**
Total	29036835.5	9649000	38685835.5	2033178	177250	2210428
	75.05	24.94	100	91.98	8.02	100

* Percentage of Agricultural purpose and Non-agricultural purpose to total

** Percentage of Institutional and Non-institutional sources to total

4.3.4 Logit Estimation Results

The estimated coefficients for the logit model analyzing respondents' choices between farmers being indebted or non-indebted are presented in table 4.12.

Table 4.12: Logistic Regression Estimates of Probability of Farmers Being Indebted

Variables	Coefficients	Std. Err.	t-statistic	P>|t|
Age	0.0228*	0.0124	1.83	0.067
Education	0.0785**	0.0343	2.29	0.022
Family size	-0.2286***	0.0807	-2.83	0.005
Landholding	0.1165*	0.0629	1.85	0.064
Occupation	-0.5068	0.4971	-1.02	0.308
Net-income	0.0035	0.004	0.87	0.384
Constant	0.298	0.7701	0.39	0.699
Log Likelihood	-164.3109			

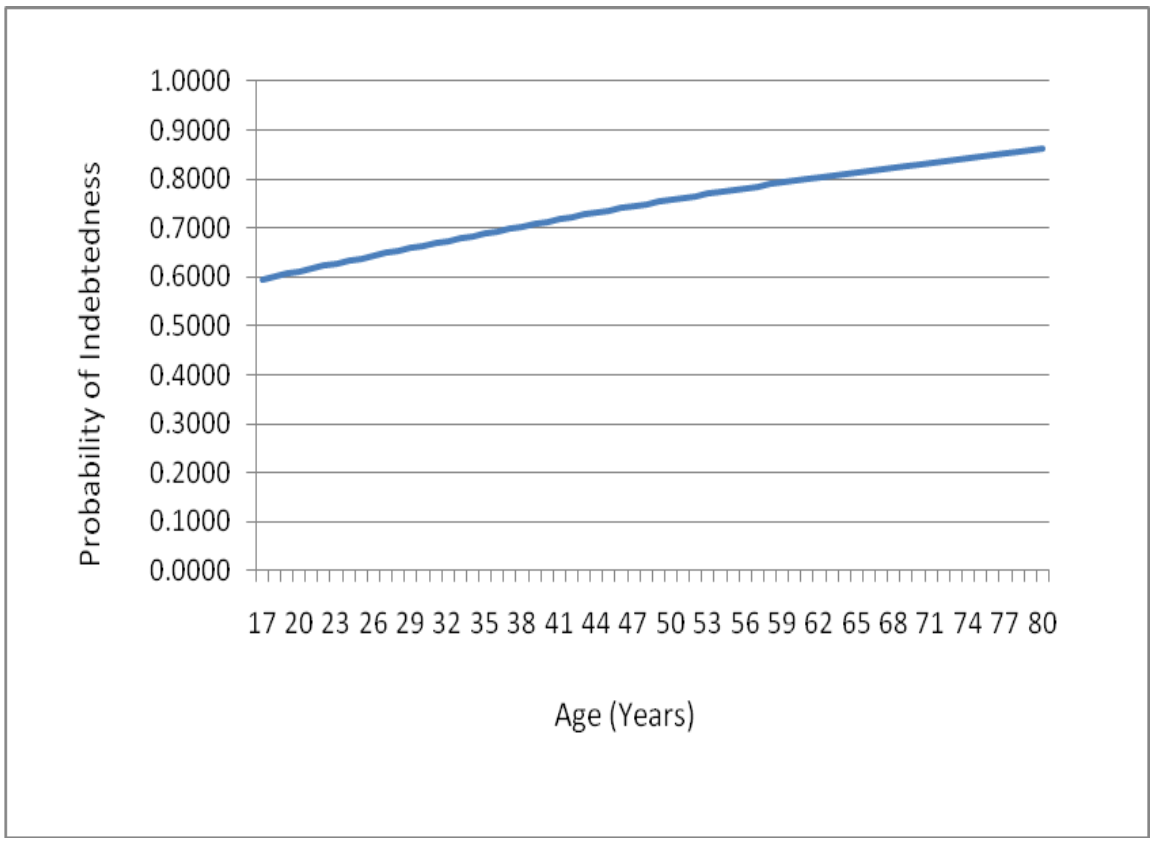
* **, **, * represents statistical significant at 1%, 5% and 10% level, respectively.

In the model investigating the choice of debt, the estimates on age, education, family size, and landholdings were significant at the 10 percent level of statistical significance.

The age variable has a positive sign, implying there is a positive effect of age on the probability of farmer being indebted. For every one unit increase in age, the log odds of indebtedness increases by a factor of 0.0228 (Table 4.12).

The relationship between age and the probability of debt is plotted in figure 4.6. Age increases the likelihood of a farmer being indebted. As age increases from 30 to 40 years, the probability of debt increases from 0.664 to 0.712 at the means of the other variables.

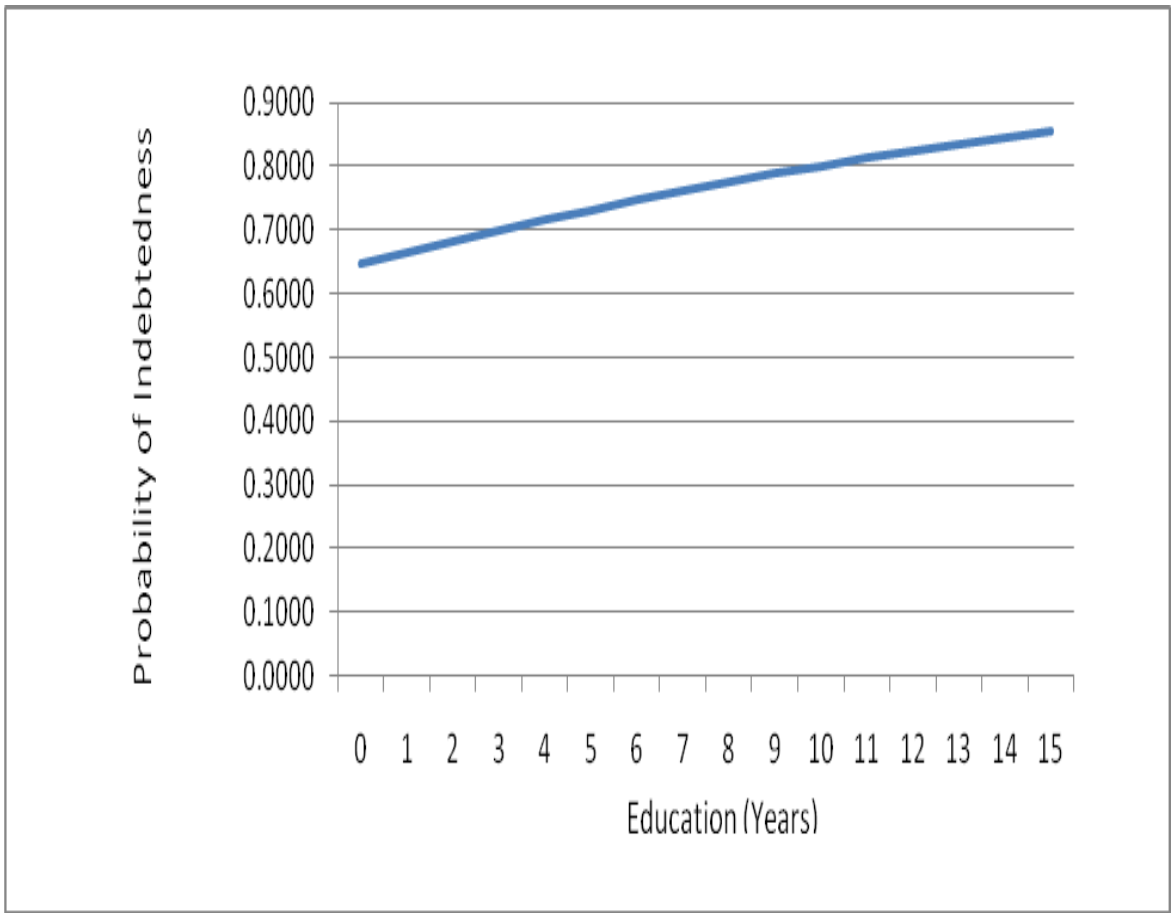
Figure 4.6: Change in Probability of Indebtedness as Age Changes



The education variable has the positive sign, implying there is a positive effect of education on the probability of farmer being indebted. For every one unit increase in education, the log odds of indebtedness increases by a factor of 0.0785 (Table 4.12).

The relationship between education and the probability of debt is plotted in figure 4.7. Education increases the likelihood of a farmer being indebted. As education increases from 3 to 6 years, the probability of debt increases from 0.6989 to 0.746 at the means of the other variables.

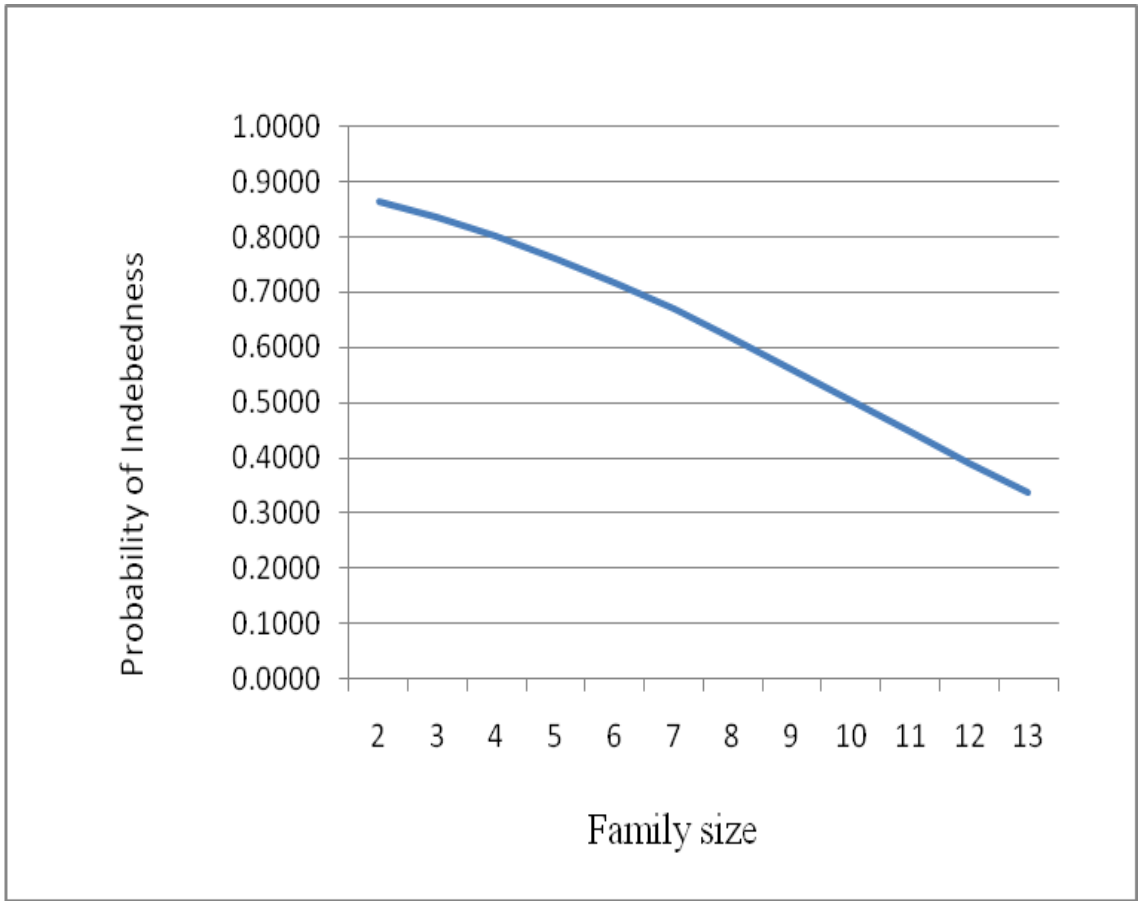
Figure 4.7: Change in Probability of Indebtedness as Education Changes



The family size variable has a negative sign indicating a negative correlation on the probability of farmers being indebted. For every one unit increase in family size, the log odds of indebtedness decreases by a factor of 0.2286 (Table 4.12).

The relationship between family size and the probability of debt is found in figure 4.8. Family size is negatively related to the likelihood of farmer being indebted. As family size increases from 2 to 4, the probability of debt decreases from 0.8638 to 0.8005 at the means of the other variables.

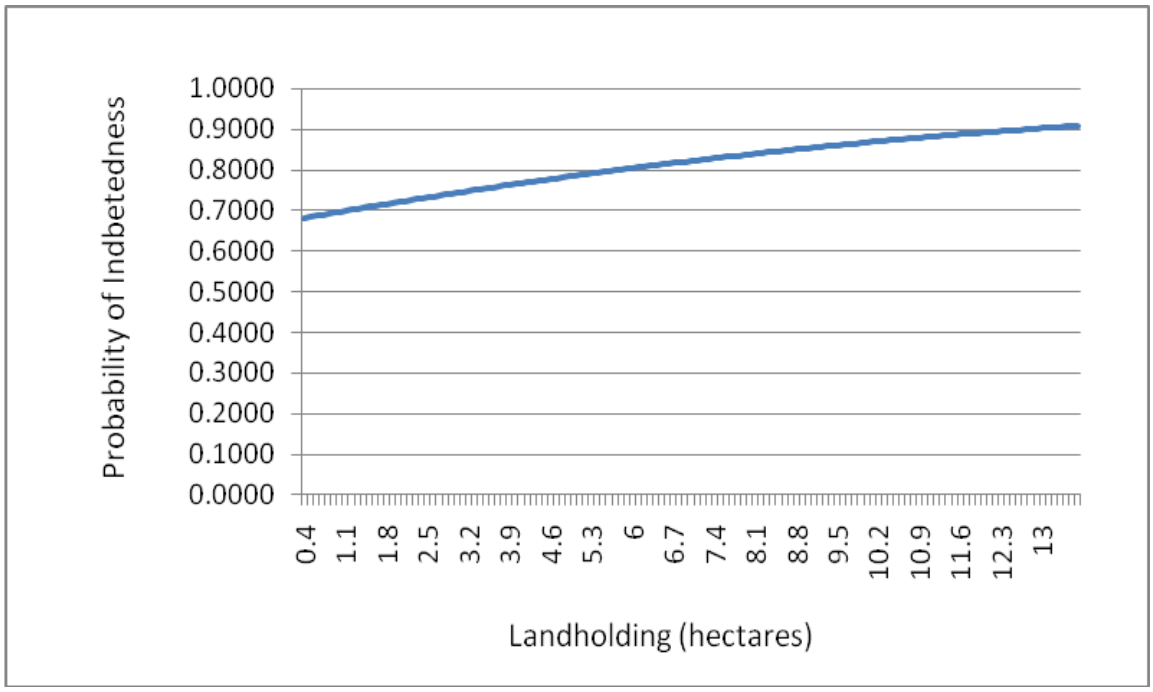
Figure 4.8: Change in Probability of Indebtedness as Family Size Changes



The landholding variable has the positive sign, implying there is a positive effect of land holding on the probability of farmer being indebted. For every one unit increase in family size, the log odds of indebtedness decreases by a factor of 0.1165 (Table 4.12).

The graph relationship between landholding and the probability of debt is found in figure 4.9. Landholdings increase the likelihood of farmer being indebted. As landholding increases from 2 to 4 hectares, the probability of debt increases from 0.7209 to 0.7653 at the means of the other variables.

Figure 4.9: Change in Probability of Indebtedness as Landholding Changes



The occupation and net income variables are not statistically significant in the model but they both had a positive sign. From the above analysis we can observe that the family size variable has a large effect on the probability of default.

4.3.5 Tobit estimation results

The estimated coefficients for 220 observations are presented in table 4.13.

Table 4.13: Tobit Estimation Results

Variables	Coefficients	Std. Err.	t-statistic	P>|t|
Age	7.6381	5.1656	1.48	0.14
Education	23.1113	14.1439	1.63	0.103
Family size	-10.4827	33.725	-0.31	0.756
Landholding	46.1161**	23.1372	1.99	0.047
Occupation	-379.6924*	214.9498	-1.77	0.078
Net-income	7.6189***	1.0083	7.56	0
Constant	-747.122	324.1336	-2.30	0.022

* **, **,* represents statistical significance at 1%, 5% and 10% level, respectively.

In the model investigating the indebted farmers, occupation, landholdings and net-income were significant at the 10 percent level of statistical significance in explaining indebtedness.

The age, education and family size variables were not statistically significant in the model. Age and education had positive sign and family size had a negative sign.

The landholding variable was statistically significant at the 5 percent level and has a positive sign implying a positive effect on landholding on indebtedness. The occupation variable was statistically significant at the 10 percent level and has a negative sign, implying a negative effect on indebtedness. The net-income variable was statistically significant at the 1 percent level and has a positive sign, implying a positive effect on indebtedness.

4.3.6 McDonald and Moffitt Decomposition

The decomposition of the marginal effects of farmer being indebted is presented in table 4.14 for all the variables.

Table 4.14: Estimation Results for McDonald and Moffitt Decomposition

Variables	Latent Variable	Unconditional Expected Value	Conditional on Being Censored	Probability Censored
Age	0.0058	0.0051	0.0039	0.0021
Education	0.0201	0.0175	0.0135	0.0072
Family size	-0.0605	-0.0529	-0.0408	-0.0218
Landholding	0.0266	0.0233	0.0179	0.0096
Occupation	-0.1202	-0.1028	-0.0779	-0.048
Net-income	0.0004	0.0003	0.0002	0.0001
Constant	0.4784	0.4187	0.3225	0.173

We are interested in only the unconditional expected value and conditional on being censored columns in the table 4.14. Increases in mean age tend to increase the farmer being indebted by 0.0039 years for all the farmers and by 0.0051 years for all those who are already in debt. Increases in mean education tend to increase the indebtedness by 0.0139 years for all the farmers and by 0.0175 years for all the farmers who are already in debt. Increases in mean landholdings tend to increase the indebtedness by 0.0179 for all the farmers and by 0.0233 for all the farmers who are already in debt. Increases in mean net-income tend to increase the indebtedness by 0.0002 for all the farmers and by 0.0003 for all the farmers who are already in debt.

Increases in mean family size tend to decrease the farmer being indebted by 0.0408 for all the farmers and by 0.0529 for all the farmers who are already indebted. On average, an increase in mean occupation tends to decrease the indebtedness by 0.0779 for all the farmers and by 0.1028 for all the farmers who are already in debt.

4.3.7 Estimation results for Probit and Heckman's Two-Step method

The estimated coefficients for the probit model and heckman two-step method are presented in the tables 4.15 and 4.16.

Table 4.15: Probit Estimation Results

Variables	Coefficients	Std. Err.	t-statistic	P>|t|
Age	0.0138*	0.0074	1.86	0.062
Education	0.04651**	0.0204	2.27	0.023
Family size	-0.1371***	0.0483	-2.83	0.005
Landholding	0.065*	0.0352	1.84	0.065
Occupation	-0.2935	0.2961	-0.99	0.321
Net-income	0.0015	0.0019	0.80	0.423
Constant	0.2042	0.4637	0.44	0.66
Log Likelihood	-164.4225			

***, **,* represents statistical significance at 1%, 5% and 10% respectively

In the model investigating the choice of debt using the Probit model estimates, age, education, family size, and land holding were significant at the 10 percent level of statistical significance.

Comparing the results of the Probit model in table 4.15 to the Logit model in table 4.12, it is evident that the same variables are significant regardless of model specification. The sign of the parameter estimates are identical and the magnitudes of the coefficients are similar.

As age increases the probability of indebtedness increases by 1.38 and 2.28 for the probit and logit models respectively. As education increases the probability of indebtedness increases by 4.65 and 7.85 for the probit and logit models respectively. As family size increases, the probability of indebtedness decreases by 13.71 and 22.86 for the probit and logit models respectively. As landholding increases the probability of indebtedness increases by 6.5 and 11.65 for the probit and logit models respectively.

Table 4.16: Heckman Model Estimation Results for 220 Indebted Farmers

Variables	Coefficients	Std. Err.	t-statistic	P>|t|
Age	37.517**	17.13	2.19	0.03
Education	125.684**	58.005	2.17	0.031
Family size	-312.921*	172.96	-1.81	0.071
Landholding	182.014**	75.58	2.41	0.017
Occupation	-1042.42**	426.64	-2.44	0.015
Net-income	10.754***	1.566	6.87	0
Inverse Mills	5515.306**	2643.25	2.09	0.038
Constant	-3895.9	1683.75	-2.31	0.022
R-Square	0.2749			
F-Stat (7, 212)	11.48			

***, **,* represents statistical significance at 1%, 5% and 10% respectively

In the model investigating the selection bias among the indebted farmers, all the variables including the inverse mills are significant at the 10 percent level, indicating there is selection bias in the results.

The age variable is statistically significant at the 5 percent level and has a positive sign, implying that there is a positive effect on the loan amount borrowed (Table 4.16).

For every one year increase in age the amount borrowed increases by 37.51 rupees. The education variable is statistically significant at the 5 percent level and has a positive sign, implying that there is a positive effect on the loan amount borrowed. For every one year increase in education the amount borrowed increases by 125.68 rupees.

The family size variable is statistically significant at the 10 percent level and has a negative sign, implying that there is a negative effect on the loan amount borrowed (Table 4.16). For every one member increase in family size the amount borrowed decreases by 312.92 rupees. The landholding variable is statistically significant at the 5 percent level and has a positive sign, implying that there is a positive effect on the loan amount borrowed. For every one hectare increase in landholding the amount borrowed increases by 182.01 rupees.

The occupation variable is statistically significant at the 5 percent level and has a negative sign, implying that there is a negative effect on the loan amount borrowed (Table 4.16). On average, if the occupation is agriculture or agriculture + business, then the amount borrowed decreases by 1042.4 rupees. The net-income variable is statistically significant at the 1 percent level and has a positive sign, implying that there is a positive effect on the loan amount borrowed. For every one rupee increase in net-income the amount borrowed increases by 10.75 rupees.

The inverse mills ratio variable is statistically significant at the 5 percent level and has a positive sign, implying there is a selection bias in the results due to the significant inverse mills ratio (Table 4.16).

CHAPTER 5: Summary and Conclusion

This research investigated factors related to farmer indebtedness in Punjab, India. The analysis is based on data collected from interviews with the help of a structured questionnaire. With a relatively large sample size, not all variables were statistically significant.

To understand the nature and cause of indebtedness, the socio-economic profile of sample respondents was obtained. From the data collected, the average age of the indebted farmer was 48.72 years. The middle aged group is more likely to be in debt than younger or older farmers.

A majority of farmers who were indebted were educated up to primary level followed by illiterate, secondary level, and college. Among non-indebted farmers, the majority of farmers belong to secondary level followed by primary level, illiterates and college. Thus, education seems to reduce that amount of indebtedness.

Family size included the number of males, females, and children in the family. The average family size was slightly smaller for indebted farmers when compared to non-indebted farmers. We could observe from the data that there was not much difference in the distribution of the number of males, females, and children for both indebted and non-indebted farmers.

Landholdings of the farmers were categorized into four groups. Among the indebted farmers, a majority of farmers had between 2 and 4 hectares or more than 4 hectares. Among the non-indebted farmers a majority of farmers had between 2 and 4 hectares and between 1 and 2 hectares.

Occupation pattern was categorized into two groups. Among the indebted farmers 93 percent were dependent on agriculture and the remaining had a supplementary business. Among the non-indebted farmers, 90% depended on agriculture. The percentage of farmers with supplementary business was slightly higher for non-indebted farmers than for indebted farmers. Thus, the greater dependence of farmers on farming with very less supplementary businesses revealed their vulnerability for natural and financial risks.

From the literature reviewed, various reasons have been cited for farmers' indebtedness. Results indicate that the agriculture debt burden was the major cause for indebtedness. However, this is not the primary cause. It is manifested in secondary factors like crop failure, non-remunerative prices for their produce, etc. The debt burden is a debt trap. The Indian farmer is caught in the grid because commercial farming has forced the farming community to invest more by taking higher risk in anticipation of higher returns. But with intervening factors like drought, failure of water sources, crop failure, and low prices, debt may keep increasing. Meanwhile there are social obligations for farmers like any other member of society. These include medical expenses, social expenditures, and education, among others. The debt trap is interwoven with losses from farm activities resulting in a decline in repayment capacity.

Farm business performance of the sample respondents was calculated to examine cropping patterns, cost-return profiles of major crops grown, farm financial ratios, and asset and per farm asset positions of sample respondents. The overall observation of the cropping patterns on farms of both indebted and non-indebted farmers revealed that there was not much difference in the cropping pattern. Prices were a crucial factor in deciding

the cropping pattern of farms. To avoid financial risk, elements of sustainability and diversification need to be incorporated into the farming system to ensure sustainability of income and avoidance of financial risks.

The cost-return profiles of major crops were calculated and indicate the causes for distress in the farming community. Farmers pay heavily for the inputs from borrowed funds. On the other hand, he receives less in terms of prices for his produce. In between he has off-farm commitments. These factors together put the farm business in a negative cash flow balance. To make up for the negative balance, he borrows from both public and private sources. When the debt burden goes beyond his material capacity, he faces the threat of losing his land. Land is the best source of security for Indian farmers.

Farm financial ratio analysis considered three financial ratios namely, the net capital ratio which is an indicator of the long term liquidity position of farm business. This ratio was less than one which indicated a poor solvency position of the farms for indebted cases. The debt to asset ratio for indebted farms indicated that debt was higher in relation to the asset position of farmers. A very high debt to equity ratio indicates a greater degree of dependence on borrowing.

The asset position of sample respondents was calculated based on the data and indicated that the value of assets of indebted farmers was higher compared to non-indebted farmers. Among farm assets, land contributed the most to the total value followed by farm machinery and livestock.

The extent of indebtedness and pattern of capital use was considered to understand the liability position, overdue position and sources and patterns of capital use

by indebted and non-indebted farmers. The liability position of indebted farmers' shows that the total amount borrowed by indebted farmers is much higher when compared to non-indebted farmers and also their borrowing was scattered between more sources. The present study focuses on the debt burden of indebted cases and we can see that 71% of farmers borrow from commission agents that are non-institutional lenders. This clearly shows that the farmers in the rural areas depend on commission agents for their financial needs. This shows a low share of public institution debt.

Based on the data collected, we observed that indebted farmers had higher amount overdue. Negative balances in the farm business coupled with social obligations, crop failures, and drought are some of the causes for the overdue loans in the case of indebted farmers. The government may want to initiate a survey on an country basis, along the lines of the All India Rural Credit Surveys of 1960s, to study the gamut of farm lending activities and the problems of indebtedness and non-repayment.

The sources and patterns of capital use by indebted farmers show that borrowing from non-institutional sources should be reduced because we can observe that non-institutional sources charge higher rates of interest compared to institutional sources and diversion of loans intended for agriculture to loans for non-agricultural purposes should be made more difficult. The earlier practices of commercial banks to probe into the technical aspects of credit needs of farmers should be restored. There is also a need to look into the off-farm financial requirements of the farmer that lacks the funds.

The analytical results for the various socio-economic factors on the probability of indebtedness were obtained by estimating a logit model. The model was built to estimate

how independent variables affect the probability of farmers being indebted. The factors considered in this study included age, education, family size, landholding, occupation, and net-income. The estimated results showed that age, education, family size, and landholding variables were significant at 10 percent level of statistical significance, but occupation and net-income variables were not statistically significant. Specifically, the results suggested that increases in age, education and landholding variables have a positive effect on the probability of farmers being indebted. The family size variable had a negative sign.

As age increases, family responsibilities increase, but the ability to work in the field is less as a farmer begins to face health problems that are prevalent in the rural areas, thereby increasing the probability of being indebted. As education increases, farmer tends to concentrate more on education than on fields, and this decreases the farm incomes. Government schools and colleges are very few and there is a lot of competition because of an increasing population. Getting into private schools and higher education is expensive. Therefore, increasing education increases the probability of farmers being indebted. Increases in family size, decreases the probability of farmers being in debt. Additional members of the family provide the farmer with additional labor thereby increasing the income and reducing the probability of being in debt. As landholdings increase, the probability of the farmer being indebted also increases. As landholding increases, field input costs like fertilizer costs, seed costs, pesticide cost, and hired machinery costs also increase therefore to farm the land, the family tends to borrow more.

The analytical results for the various socio-economic factors on the probability of indebtedness were also obtained using a probit model. Comparing the results of the probit

model to the logit model, we observe that the same variables were significant regardless of the model specification. The signs of the parameter estimates were also identical and the magnitudes of the coefficients were similar.

Tobit analysis and McDonald and Moffitt decomposition was calculated. Tobit analysis corrects the omitted variable bias and accounts for the fact that the expected values of the errors are changing. The decomposition of the marginal effects provides a richer and better understanding of the magnitude of the effect of independent variables on the dependent variable (McDonald and Moffitt, 1980). The Tobit model results showed that net-income, landholding, and occupation variables were significant at the 1, 5, and 10 percent levels of statistical significance respectively, but age, education, and family size variables remained insignificant in the model.

The tobit results indicated that the net-income, and landholding variables have a positive sign, indicating that there is a positive effect on the loan amount borrowed. The occupation variable has a negative sign, indicating a negative effect on the loan amount borrowed. For every one unit increase in net-income and landholding, the loan amount borrowed would increase by Rs. 46.11 and Rs 7.61, respectively. On average, if the occupation is agriculture or agriculture plus business, then the loan amount borrowed would decrease by Rs. 379.69.

The decomposition results suggested, with increases in mean age, education, landholding, and net-income, indebtedness increases by .0039, 0.0135, 0.0179, and 0.002, respectively for all the farmers and by 0.0051, 0.0175, 0.0233, and 0.0003 for all the farmers who are already in debt. Increases in mean family size and occupation tends to

decrease the indebtedness by 0.0408 and 0.0779, respectively for all the farmers and by 0.0529 and 0.1028 for all the farmers who are already in debt.

Lastly, the study corrected for selection bias in the data. The Heckman two-step approach was used for removing any potential bias in the data. The estimation found heterogeneity bias that was corrected by using the Heckman two-step method. In the first step, the standard probit model was estimated and a selection bias control factor is constructed. This factor reflects the effects of all unmeasured characteristics in the model. In the second step, the regression model is estimated along the with the selection bias control factor as an additional independent variable.

The estimated results showed that all the variables including the inverse mills are statistically significant at the 10 percent level indicating there is selection bias in the results due to the significant inverse mills ratio. Results indicated that for every one unit increase in age, education, landholding, and net-income the loan amount borrowed increases by Rs. 37.51, Rs. 125.68, Rs. 182.01, and Rs. 10.72, respectively. For every one unit increase in family size and occupation the loan amount borrowed would decrease by Rs. 312.92 and Rs. 1042.4, respectively.

CHAPTER 6: Policy Implications

The analytical results for various social-economic factors on the probability of farmers being indebted were obtained. The estimated results showed that the age, education, and landholding were positively related but family size was negatively related to the probability of the farmer being indebted. Education being an important sector for achieving employment, human resource development, and bringing about change in the social environment leads to overall progress through the efficient use of resources. Results obtained in this thesis showed that an additional unit of education increased the probability of indebtedness. The government may want to consider reducing the expenditure on education by providing free and compulsory education, promoting free lunch schemes, free transportation services for distance schools, and providing text books up to elementary level of education. Government schools, evening schools and colleges should be started for farmers at no cost. Thereby reducing the cost and decreasing the debt on education. Promoting free vocationalisation of education in the field of their choice to self-employment helps to increase their income and decrease debt.

Farm business performance of the sample respondents was calculated to give a clear picture on cropping patterns, cost-return profiles of major crops, and farm financial ratios. From the study, we observed that the cropping pattern on the farms of both indebted and non-indebted farmers were similar. We observed that most of the farmers grew paddy and wheat as their major crops. This could be because of food security issues, low risk, and easy market access. The cropping system and cost-returns calculated showed that farmers had negative returns. We observed a monocropping system throughout the study area which has resulted in over exploitation of natural resources and

therefore adversely affecting crop diversification. Therefore, the thrust should be on crop diversification towards high value/more remunerative crops considering the agro-climatic conditions, endowment of land and water resources and the market demand both within the country and outside. The subsidy system for agricultural inputs has to be reviewed by the government.

The extent of indebtedness and pattern of capital use was considered for the liability position, overdue loans and sources and patterns of capital use. From the study, we observed that farmers borrowed loans from various sources (institutional and non-institutional) and diversion of these loans from agricultural to non-agricultural purposes was noticed. This shows that farmers in the rural areas depend upon non-institutional loans for their financial needs. To overcome these problems, the government may want to develop policy to ensure sufficient and timely credit at reasonable rates of interest to a larger segment of the rural population. The strategy devised for the purpose should be on expansion of the institutional sector or direct lending to disadvantaged borrowers at lower interest rates. The diversion of loans to non-agricultural purposes should be stopped. The banks should look into these technical aspects and allocate technical experts to make sure loans are directed mainly for agricultural purposes.

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