INTRODUCTION, METHODOLOGY AND SCOPE OF THE STUDY

The practice of providing and obtaining loans is prevalent since times immemorial. *Manusmriti* mentions the detailed procedure of this ancient practice (Singh 2000). The centuries old lending system is still in existence, though it has evolved to a large extent with time. The *sahukar, mahajan* or *bania* was the terminology associated with rural credit. These were the sole suppliers of credit to the rural folk. The importance of this class can be gauged from the saying ‘*Guru bina gat nahn, Shah bina pat nahn*’ meaning thereby that one cannot be enlightened without a teacher, same way one cannot save his self-respect or reputation in the society without the help of a credit supplier. The colonial powers tried to institutionalize the land revenue system in India, but ended up making the moneylenders more powerful leading to severe exploitation of peasantry (Darling 1925). Exorbitant rates of interest charged by these sources led to a highly debt ridden, resource starved, weak and conservative farming community. Some efforts were initiated by the British government itself to improve the plight of cultivators like introduction of ‘*taccavi* loans’ and ‘cooperative credit societies’, but impact of these was very low. A clear shift was visible in the field of agricultural credit as well as sources of finance for rural poor only after independence.

The country faced a huge deficit of agricultural production at the time of independence. To achieve a higher level of production, the growth model adopted by Indian agriculture is popularly called ‘Green Revolution Model’. Under this modes of production have undergone major transformation, stimulating change in the forces of production as well as production relations in the society. The whole mechanism of transformation was and is being targeted at surplus generation, but is closely linked with growth of rural credit system in the country.

Capital is the most crucial input in any industry or in any country and agriculture is no exception to it. Agricultural sector, in most of the developing
countries, more so in India is primarily small farm agriculture characterized by low incomes, low levels of operating capital and low investment in depreciable assets (Kahlon and Singh 1984). Their share in total cultivated area of the country is much lesser on account of the skewed distribution of land. The credit starvation of the agriculture sector symptomizes a vicious circle of low productivity, low income and low investment. So, there could be two aspects of rural finance. One is for the survival and second is to earn higher income from agriculture and allied activities. So, need for finance is a major element of agricultural policy. Cultivation being a time bound process, there is need to incur costs before a saleable output is generated (Anant, 2002). These costs can be financed by two ways. The farmer has recourse either to his own resources or to borrowed resources i.e. debt. Raising of own resources is limited by the wealth of the individuals, so the only option is to see the external resource or debt. As mentioned earlier, only non-institutional sources were the main suppliers of credit to Indian peasantry before independence.

The 'Green Revolution Model' adopted for growth of agriculture was applied in certain specific regions of country, Punjab is predominant among these. The change introduced through a set of measures was suitably supported by various existing institutions. This takes us to the role of institutions, which have been defined as the rules of the game of a society (North 1990). These include both formal rules (laws, regulations, etc.) and informal constraints (conventions, self-imposed codes of conduct etc.). Agricultural growth in a country/region is produced by favourable institutions along with other non-institutional factors like soils, markets, community response etc.. Also, the receptivity of soils, farming community as a whole as well as of individuals in particular, markets, research institutions was enormous, which led to spectacular success of this model.

When agriculture sector transforms from traditional towards commercialized, the demand for capital increases for variable and fixed expenses. The agriculture was largely the traditional and subsistence before 1965, and the savings of the farmers were not sufficient to meet even their small production requirements. The position of the small and marginal farmers was
even more pathetic. The farming community of the country was badly caught in the clutches of moneylenders. Major proportion of the credit demand of farmers was provided by non-institutional sources of finance and rest was being met by the cooperative credit institutions. The participation of the commercial banks in the agricultural credit was negligible due to low rates of return. Whatever the small surpluses were generated by even medium and large farmers, were usurped by the moneylenders in the shape of interest payments. Under these circumstances, the possibility of adoption of new production technology was very less. So, in agricultural finance, many formal institutional arrangements were initiated to reduce uncertainty, to prevent the transactions from being too costly and thus to allow realization of the productivity gains to large scale (Gill 2002). In agricultural credit policy of the country, the emphasis has remained on adequate availability of credit at lower rates of interest and at a time when it is required. Since the recommendations of Rural Credit Survey of 1954, institutional agricultural credit policy has undergone many changes to meet this objective. The cooperative credit institutions catering to the farming community were reorganized and strengthened and commercial banks after their nationalization in 1969 were directed to lend to the agriculture sector, by fixing the norms for priority sector lending. The mandate of financial institutions dealing with agriculture sector was three pronged. First, the farmers should be saved from the cruel hands of the moneylenders by increasing the inflow of institutional agricultural credit. Second, they should be encouraged to adopt new production technology by meeting their credit requirements, short-term as well as long-term, so that the agricultural production, especially the food grains production, could be increased. Thirdly, special attention should be paid to the credit requirements of small and marginal farmers and other weaker sections of rural areas so that they could also participate in technology driven agricultural growth process and reap their due share. Even some credit linked programmes were initiated for this target group, like Integrated Rural Development Programme, Small Farmers Development Programme, Marginal Farmers and Agricultural Labour Development Programme etc. Special credit institutions i.e. Regional Rural Banks were also created to cater to the needs of weaker sections of the rural
areas. At the apex level, National Bank for Agricultural and Rural Development was established by merging the Agricultural Credit Department of RBI and Agricultural Refinance and Development Corporation to streamline and strengthen the institutional credit flow to the rural sector. New initiatives like Kisan Credit Cards (KCC) and micro-finance are the recent developments in this field.

The seed of commercialization in Punjab agriculture was sown by the introduction of high yielding varieties of wheat and rice followed by the use of chemical fertilizers, investments in irrigation especially on tubewells, use of agro-chemicals to control weeds, diseases and insect pests, and tractorisation to ensure timeliness and precision in farm operations. Favourable output pricing policy, assured marketing and input subsidies on power and fertilizers further facilitated this process. The agricultural sector, therefore, witnessed high growth till mid-nineties. Institutional credit is considered to have played a significant role in fast and widespread adoption of modern production technology and promotion of private investments on farms through its increasing as well as cheap supply. The large scale adoption of seed-fertilizer technology was facilitated by the existing canal irrigation, infrastructure, which was strongly complimented by the expansion of tubewells irrigation facilities. The growth of farm mechanization along with seed-irrigation-fertilizer technology resulted in large increase in the cropping intensity from 128.6 per cent in 1965-66 to 188.8 per cent in 2007-08. The total fertilizer consumption in the state was 1783 thousand tones of N + P + K in 2007-08. The number of tubewells was 12.32 lakh and the number of tractors was 4.05 lakh, respectively. There were 9.52 lakh number of electric motors and 2.80 lakh number of diesel engines in the state. All these technological changes in agriculture sector led to capital formation especially private capital formation at a faster rate. The capital intensity on Punjab farmers was Rs.86569 per farm or Rs. 14491 per hectare in 1982-83, which has increased to Rs. 241855 per farm or Rs.64182 per hectare in 2006-07. As the agricultural production process in the state became modernized and more capital intensive, cultivation became a costly affair. The cost of cultivation (Cost C2) went up from Rs. 3776 per hectare in 1981-82 to Rs. 26699 pr hectare in 2005-
In case of wheat, from Rs. 5474 per hectare in 1981-82 to Rs. 30007 per hectare in 2005-06 in case of paddy and Rs. 3417 per hectare in 1981-82 to Rs. 33849 per hectare in 2005-06 in case of cotton. Thus, agricultural credit policies were geared in a right sense from time to time to meet the increasing cost of cultivation in the state as well as in the country.

In the light of all these developments, it becomes imperative to critically examine various related issues in depth. The importance of such study becomes greater in wake of capital intensive agricultural growth in the state. It is very important to examine whether the growth of institutional agricultural credit has been commensurate with the growth of modern production technology. How far the government has succeeded in increasing the flow of institutional credit both for the country as well as for the state?

The supply of agricultural credit has been studied institution-wise to find out the contribution of various agencies as per the decades i.e. from 1980-81 to 2004-05 to emphasize the growth in pre-reform and post-reform era and to highlight the recent developments. The flow of credit has been measured at constant prices to find out the real growth by eliminating the impact of inflationary trends and on per hectare basis, to judge the intensity of agricultural credit for whole of the country as well as the state of Punjab. It is also necessary to find out whether the growth in agricultural credit has been in line with the increased use of variable inputs and fixed private investments in the state, in the wake of adoption of seed-fertilizer-irrigation technology. The share of various institutions and also that of short-term and long-term credit has been worked out in this study.

All the technological changes in agriculture sector have led to capital formation especially private capital formation at a faster rate, which comprised mainly of irrigation machinery/structures, tractors and other farm machinery/implements. It is obvious that investment is necessary to develop irrigation facilities, to effect permanent improvements in land, to use costly developed irrigation facilities more efficiently, to supply and use power, machinery and equipment and also inputs like fertilizers, pesticides and seeds. It is in this dynamic context that the capital investment is to be viewed to modernize
the agriculture sector (Kahlon and Singh, 1984). The experience of Punjab has demonstrated that agriculture offers excellent investment opportunities. The gains in productivity reflect largely an increased use of capital investments, purchased inputs and the new technology. So, investment pattern and then credit utilization of the farmers needs to be analyzed as agriculture is a biological enterprise, the rate of turnover is slow here. So, farmers generally face a financial crunch for their personal and professional needs. Also, in the social matrix, they are required to fulfill many personal and social obligations, but returns are lagged with respect to investment in this industry. Very few farmers will have their own capital to be able to modernize their farming business. They would, therefore, need more credit. Credit makes it possible to take a short cut, it enables to take advantage of new machines, inputs, farm developments, land improvements etc. There is no easy way to avoid credit if farmer wants to expand his business, and to operate on a more profitable basis. But when credit is made available for some specific purpose, the tendency to divert funds is high. Thus ‘utilization’ aspect of credit in a sense is equally important if not more important than availability of credit. If properly utilized, credit helps not only in increasing the returns but also creates its repaying capacity with the resource starved farmers. On the other hand, if available funds are utilized for other purposes, the income fails to increase to the desired extent; the very purpose of credit availability is defied. With rising overdues of institutional sources of finance and increasing burden of indebtedness, it is required to measure the extent of diversion of loans and also the actual share of credit in investment for various purposes on the farm. The reasons responsible for diversion of loans should be traced.

The Debt and Investment survey of 2003 brought out startling results on debt position in different states of India. The amount of debt was higher in developed states and was the highest in Punjab at Rs. 41576 per farm. Secondly, the proportion of non-institutional debt in total debt has gone up as compared to the year 1991 (Sidhu and Gill 2006). Despite significant increase in the availability of institutional agricultural credit, the share of non-institutional finance is still high (Sidhu et al 2000). There exists a substantial gap between
the demand for and supply of agricultural credit (Dandekar 1993) i.e. the share of non-institutional sources in the total debt in farming sector is 42.3 per cent at all India level and 52.1 per cent in Punjab state.

Many factors can be attributed to the significant presence of informal sources in agricultural credit despite the concerted efforts by the government to improve the institutional credit in rural areas. According to ‘Transaction Cost Approach’ devised by neo-classical, the institutions which minimize the transaction costs are key to performance (North 1990). This necessitates the need to examine institutional set-up. The lending procedures and environment of the institutional agencies were quite hostile to the simple and illiterate farmers (Dandekar 1988). Moneylenders succeed despite the exorbitant rates of interest charged by them (Kahlon and Singh 1984). Commercial banks intentionally focused on long term, large size credit, where rate of recovery is high ignoring small and marginal farmers (Ladman and Adams 1978). The hidden cost of borrowing from institutional sources in terms of time spent, documentation required and underhand corruption was higher relative to cost of credit from non-institutional sources (Egaitsu 1988). The informal credit sources though charged higher rates of interest, but came to the rescue of the farmers during difficult time (Samal 2002). They also survived and thrived because their cost of transaction was less (Srivastava and Kumar 1985) and there was social bonding between the credit source and borrower farmer. No documents are needed and disbursal is very quick (Bell 1988). The time is ripe for the institutions to modify terms of lending (down payments, grace periods, repayment schedule and repayment plans) appropriate to the nature of investments being financed and the financial condition of the potential borrower. Therefore, it is imperative that the lending procedures and cost of agricultural credit mainly transaction costs need to be studied for both formal and informal sources of finance, to bring out their weaknesses and strengthen their contribution towards growth with equity.

Agricultural incomes in Punjab were growing satisfactorily till nineties due to growth in productivity and output prices (Sidhu et al 1999). However, this growth declined since 2000 due to rise in the cost of production, almost negligible growth in output prices and stagnation in productivity, squeezing profitability of
the farming system. The growth of agricultural sector in the state has
decelerated and profitability declined (Sidhu et al 2005). Mounting debt in the
farming sector is an indication of its falling profitability (Shergill 1998). The issue
of growing indebtedness has become central and is regarded to be positively
associated with farmer’s suicides (Satish 2006). Factors like loan collateral,
documentation required, witness requirement, corruption involved in the lending
process, are major barriers in the success of institutional credit. Yet, the role and
contribution of institutional agricultural credit towards agricultural growth cannot
be negated. It has immensely helped in adoption of modern production
technology and encouraging private investments on irrigation, farm machinery
and land development (Sidhu et al 1998). Their contribution needs to be
examined and estimated. This study is, therefore, an attempt in this direction.

The present study has been devised to have an indepth knowledge about
farmer’s access to agricultural credit, its impact and cost involved in the state of Punjab.

Objectives: The scientific objectives of the study are:

1. to study the growth of agricultural credit in India and Punjab, source-
   wise;
2. to study the relationship of agricultural credit with inputs use and farm
   investments in Punjab;
3. to estimate the impact of agricultural credit on productivity and
   production in Punjab state;
4. to study the utilization pattern of loans obtained by the farmers;
5. to estimate the cost of credit of both institutional and non-institutional
   sources;
6. to examine constraints impeding availability of institutional agricultural
   credit and suggest some policy measures to improve its accessibility.
RESEARCH METHODOLOGY

In order to achieve the objectives of the study, the four stage random sample has been used for data collection from the respondent farmers. These stages are:

- **1st stage**: Districts
- **2nd stage**: Blocks
- **3rd stage**: Villages
- **4th stage**: Farmers

**Selection of zones:** Punjab state is divided into 3 agro-climatic zones on the basis of cropping pattern, topography, soil texture, soil quality, underground water table and quality, rainfall, humidity etc. by the Punjab Agricultural University, Ludhiana. These zones are as under:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Name</th>
<th>Cropping pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Kandi, sub-mountainous zone</td>
<td>Maize/Paddy-wheat</td>
</tr>
<tr>
<td>II</td>
<td>Central plain zone</td>
<td>Paddy-wheat</td>
</tr>
<tr>
<td>III</td>
<td>South-western zone</td>
<td>Cotton/Paddy-wheat</td>
</tr>
</tbody>
</table>

All the three zones of Punjab were taken for the study.

**Selection of districts:** Keeping the area under each zone, one district from zone-I, two districts from zone-II and one district from zone-III, were randomly selected for the study which came to be as under:

<table>
<thead>
<tr>
<th>Zone</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hoshiarpur</td>
</tr>
<tr>
<td>II</td>
<td>Ludhiana, Kapurthala</td>
</tr>
<tr>
<td>III</td>
<td>Bathinda</td>
</tr>
</tbody>
</table>

**Selection of blocks:** Economic and Statistical Organization, Punjab has structured development parameters for each block in each district of Punjab. A composite rank index was developed for each block of the selected district, by ranking all the parameters like literacy, proportion of agricultural workers to total workers, gross area sown per agricultural worker, cropping intensity, number of
tractors, productivity of principal crops, member of cooperative societies, population served per commercial bank etc. given by ESO. On the basis of this, the blocks in each selected district were classified into developed and underdeveloped blocks. Then one developed block from the upper four enlisted and one underdeveloped block from the lower four enlisted blocks was selected from district randomly for the study, which came to be as under:

<table>
<thead>
<tr>
<th>District</th>
<th>Development level</th>
<th>Name of the block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoshiarpur</td>
<td>Developed</td>
<td>Bhunga</td>
</tr>
<tr>
<td></td>
<td>Underdeveloped</td>
<td>Hoshiarpur-II</td>
</tr>
<tr>
<td>Ludhiana</td>
<td>Developed</td>
<td>Pakhowal</td>
</tr>
<tr>
<td></td>
<td>Underdeveloped</td>
<td>Machhiwara</td>
</tr>
<tr>
<td>Kapurthala</td>
<td>Developed</td>
<td>Nadala</td>
</tr>
<tr>
<td></td>
<td>Underdeveloped</td>
<td>Phagwara</td>
</tr>
<tr>
<td>Bathinda</td>
<td>Developed</td>
<td>Nathana</td>
</tr>
<tr>
<td></td>
<td>Underdeveloped</td>
<td>Sangat</td>
</tr>
</tbody>
</table>

**Selection of villages:** Separate lists of all the villages falling under the selected blocks were got prepared with the help of officials of Block Development and Panchayat Officer. Then two villages/a cluster of villages from each list were randomly selected namely Shahpur-Dango and Sarabha from Pakhowal block, Gehlewal, Khirnian and Barma from Machhiwara block of Ludhiana district. Ibrahimwal, Chogwan and Nadala from Nadala block of Kapurthala district and Bhulla Rai and Athouli from Phagwara block of the same district in central plain zone i.e. zone-II. In zone-I, Bhunga was the randomly selected developed block of the selected district Hoshiarpur. A cluster of villages was taken up in this block namely Nikkiwal, Kothe Jattan, Hajipur and Nangal Kango to get the sample. Hoshiarpur-II was the selected underdeveloped block of this district. Again a cluster of villages was taken up here which were Duvida Ahraina, Ahriana Kalan, Basti Hast Khan, Changran, Chak Hathauli and Chak Sadhu. In zone-III i.e. South-western zone of the state, Bathinda district was selected randomly. The two blocks selected randomly were Nathana block in the category of developed blocks and Sangat block in the category of underdeveloped blocks. The villages studied in Nathana block were Joganand, Puhla, Puhli, Dhelwan and Kalyan. The cluster of villages included in Sangat block were Gehri Buttar, Chak Hira Singh Wala, Doom Wali, Buddha and Phoolan Mithi.
Selection of farmers: All the cultivating households for each village were enumerated and classified into five standard categories on the basis of the operational holding. The operational holdings were stratified as marginal holdings of the size less than 2.5 acres (upto 1.00 hectare), small holdings of the size 2.51 to 5.00 acres (1.00 – 2.00 hectares), semi-medium holdings of size 5.01 to 10.00 acres (2.01 to 4.00 hectares), medium holdings of size 10.01 to 25.00 hectares (4.01 to 10.00 hectares) and large holdings of size greater than 25.00 acres (10.00 hectares). Then a sample of the total operational holdings, with probability proportional to the number of holdings falling in each strata were selected randomly. Thus a total of 320 operational holdings were selected. Ultimately the sample of the study came to be as under:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Farm size categories (No. of farmers selected)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marginal</td>
</tr>
<tr>
<td>I</td>
<td>8</td>
</tr>
<tr>
<td>II</td>
<td>22</td>
</tr>
<tr>
<td>III</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
</tr>
</tbody>
</table>

Selection of Institutions: In order to evaluate the lending cost incurred by various institutions, cooperative society of each selected village, one unit of commercial bank catering to sampled farmers in each selected block, one branch of Primary Agricultural Development Banks, one Regional Rural Bank falling in the study area, were selected.

Selection of Commission Agents: As much as 5 commission agents representing non-institutional sources were randomly selected from each district except Hoshiarpur where it was only 3, to study the lending cost of non-institutional sources for agricultural credit advanced to farmers.

Data collection: Both primary as well as secondary data were collected for the study.

(i) Primary data: Primary data regarding socio-economic characteristics, investments, loans obtained, utilization of loans, diversion of loans, repayment of loans, purposes of loans, sources of loans, terms and conditions of loans, cost of obtaining loans, problem in obtaining loans
etc. were collected from the selected farmers on a specially structured pre-tested questionnaire through personal interview method. Primary data regarding lending cost of agricultural loans were collected from the selected institutions and commission agents on a separately structured questionnaire.

(ii) **Secondary data**: Secondary data relating to short term and long term agricultural credit in India and Punjab were collected for the period 1980-81 to 2004-05 from various issues of Reports of Currency and Finance, a Reserve Bank of India, Statistical tables related to Banking data, again an RBI publication, various annual reports and annual credit Plans (ACP) of Lead Bank (PNB), Ludhiana etc. The data were also collected regarding the agricultural inputs in the state namely fertilizer consumption, pesticide consumption and consumption of high speed diesel for agricultural purposes from various issues of Statistical Abstracts of Punjab to find out the relationship between short term credit and inputs use in the state over time. Similarly, the number and prices of all the agricultural machinery including small and large implements, tractors, tubewells, diesel as well as electric motors, heavy machinery etc. were collected from Machinery Wing of Directorate of Agriculture, Punjab situated at Chandigarh as well as from College of Agricultural Engineering, Punjab Agricultural University, Ludhiana. A composite machinery index was developed at constant prices to bring out the relationship between long term credit and overall mechanization in the state. The facility provided by internet was also explored to search some data or seek some information.

**Analysis of data**: The analysis of the data was done farm-size wise and on per hectare basis among different categories of farmers because land is the major asset of the farmers and comprises more than 90 per cent share of the total assets of the farming families. The costs and returns were also directly related with the size of the farm. The per hectare analysis was carried out to negate the effect of area on the results and to make the results comparable. Two way tables were constructed to interpret the results.
**Statistical framework:** Simple as well as advanced statistical techniques have been employed to analyze the collected data.

(i) **Analysis of primary data:** Simple statistical tools like frequencies, percentages, averages, etc. were used to represent the data in the tabular form. Cost accounting method was used for this purpose. Some ratios were also calculated from the primary data such as:

\[
\frac{\text{Amount borrowed}}{\text{Amount invested}} \times 100
\]

Amount borrowed

\[
\frac{\text{Amount utilized}}{\text{Amount invested}} \times 100
\]

Amount utilized

\[
\frac{\text{Amount diverted}}{\text{Amount borrowed}} \times 100
\]

Amount diverted

to account for the share of loans in investment.

to highlight the actual utilization of borrowed funds in total investment.

to highlight the rate of diversion of borrowed funds.

**Regression analysis:** In order to identify the factors affecting diversion of loans obtained by the farmers, regression analysis was done by using two regression forms:

- **Linear form:** \( Y = a + bx \)
- **Log-linear form:** \( Y = ax^b \)
  
  In its log form: \( \log Y = \log a + b \log x \)

Finally log-linear form was chosen for the study, keeping in view the following criteria:

(i) Higher value of \( R^2 \)
(ii) Economic significance of independent variables
(iii) Logical significance of independent variables.

Therefore, the final equations came to be as under:
\[ Y = a + x_1^{b_1} + x_2^{b_2} + x_3^{b_3} + x_4^{b_4} + x_5^{b_5} + x_6^{b_6} + x_7^{b_7} + x_8^{b_8} + \mu \]

Where

- \( Y \) = Diversion of loan (%)
- \( a \) = a constant term
- \( x_1 \) = Farm size (ha)
- \( x_2 \) = Share of non-institutional loan (%)
- \( x_3 \) = Cost of debt per 100 rupees
- \( x_4 \) = Non-farm income
- \( x_5 \) = Per capita household expenditure (Rs. / annum)
- \( x_6 \) = Dummy : Type of loan

<table>
<thead>
<tr>
<th>Short term</th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
</tr>
</tbody>
</table>

- \( b_1 \) to \( b_6 \) = regression coefficients of \( x_1 \) to \( x_6 \)
- \( \mu \) = a random error term

**Students’ t-test:** To compare the transaction costs of different sources of loan and the gap between interest charged and transaction cost incurred, students’ t-test was applied by using the following formula:

\[
t = \frac{\bar{X}_1 - \bar{X}_2}{\text{S.E.} \ (\bar{X}_1 = \bar{X}_2)}
\]

\[
\text{S.E.} = S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}
\]

\[
S = S \sqrt{\frac{SD_1^2 (n_1 - 1) + SD_2^2 (n_2 - 1)}{n_1 + n_2 - 2}}
\]

where

- \( \bar{X}_1 \) = mean value in category-I
- \( \bar{X}_2 \) = mean value in category-II
- \( \text{S.E.} \ (\bar{X}_1 - \bar{X}_2) \) = Standard error of mean difference
- \( SD_1 \) = Standard deviation in category-I
- \( SD_2 \) = Standard deviation in category-II
- \( S \) = Common standard deviation
\( n_1 \) = No. of observations in category-I
\( n_2 \) = No. of observations in category-II

**(ii) Analysis of secondary data:**

**Trend Analysis:** Time series data on institutional credit in India and Punjab for the period 1980-81 to 2004-05 were collected and the growth trends were worked out for 3 sub-periods and overall period. 3 sub-period were classified as under:

1. **1st period**: Pre-liberalization : 1980-81 to 1989-90
3. **3rd period**: Recent trends : 2000-01 to 2005-06
   Overall period : 1980-81 to 2005-06

The trends in institutional credit were worked out both at current prices and constant prices by developing the price index taking the base year of 1993-94 as 100. The formula used for calculating compound growth rate is as under:

\[
Y = ab^t
\]

In its log-form:

\[
\log Y = \log a + t \log b
\]

Where \( Y \) = Parameter whose C.G.R. is to be calculated

\( a \) = a constant term
\( t \) = time variable
\( b \) = regression coefficient of time

One can find the value of \( b \) as under:

\[
b = \text{Antilog} (\log b)
\]

\[
r = b - 1
\]

\[
\text{C.G.R.} = (b-1) \times 100
\]

The significance of C.G.R. was tested through t-test i.e.

\[
\frac{\text{C.G.R.}}{\text{t-value}} = \frac{\text{C.G.R.}}{\text{S.E. of C.G.R.}}
\]

**Coefficient of correlation:**
To establish the relationship between production credit and investment credit, Karl Pearson coefficient of correlation was worked out by using the followed formula:

\[ r = \frac{\sum xy}{\sqrt{\sum x^2 - \sum y^2}} \]

Where 
- \( r \) = coefficient of correlation
- \( x = (X - \bar{X}) \)
- \( y = (Y - \bar{Y}) \)
- \( X = \) Long term credit
- \( Y = \) Short term credit

Co-integration analysis: Co-integration analysis was done to test the validity of relationship between short-term and long-term credit. For this purpose Co-integrating Regression Durbin Watson (CRDW) test was used. In CRDW we use the Durbin-Watson \( d \) obtained from co-integrating regression. The equation used is as under:

\[ LT \text{ credit} = a + b \ (ST) \ \ldots \ldots \ldots \ldots \ldots \ (1) \]

Since long-term and short-term credit are individually non-stationery there is the possibility that this regression is spurious. But when we performed a unit root test on the residuals obtained from equation 1, we observed the following equation:

\[ \Delta u_t = a + b \ u_{t-1} \]

and \( R^2 \) and Durbin-Watson \( (d) \) coefficient were also worked out.

On the basis of 10000 simulations formed from 100 observations each, the 1, 5 and 10 per cent critical values to test the hypothesis that the true \( d = 0 \) are 0.511, 0.386 and 0.322, respectively. Thus, if the computed \( d \) value is smaller then, say 0.511, we reject the null hypothesis of co-integration at the one per cent level. If the computed value of \( d \) is equal to or greater than the critical value, then it suggests that long-term and short-term credit are truly co-integrated.

**Coefficient of variation:**
This relative measure of dispersion, developed by Karl Pearson has been used to measure the variability / consistency of the data series.

\[
\text{Coefficient of variation (C.V.)} = \frac{\sigma}{X} \times 100
\]

Where

\( \sigma \) = Standard Deviation

\( \bar{X} \) = Arithmetic Mean

**Three-stage least square method**

To estimate the contribution of institutional agricultural credit towards the use of production inputs, private investments and growth, a simultaneous equations model specifying different relationships among these variables was developed and estimated with 3 SLS method, using statistical package STATA 9.2. The results of the model are based on data set for the period 1980-81 to 2004-05. Usual diagnostic tests of multi-co-linearity and auto-correlation were carried out to test the validity of the model. The equations included in the model are given below:

**Equation 1:**
\[
VOP = f (TOTIO, INDEXPRO) \dots (1)
\]

**Equation 2:**
\[
INDEXPRO = f (TOTIO, INPUTS, PVCAP) \dots (2)
\]

**Equation 3:**
\[
INPUTS = f (TOTINTER, STCREDIT, PVCAP) \dots (3)
\]

**Equation 4:**
\[
PVCAP = f \{TOTCAPFOR, INVESTCREDIT, INDEXPRO(-1)\} \dots (4)
\]

Where,

- **VOP** = Value of output from agriculture at 1993-94 prices, in crore Rs.
- **TOTIO** = Index of terms of trade in the form of output-input prices
- **INDEXPRO** = Index of productivity
- **INPUTS** = Value of variable inputs use at 1993-94 prices (in crore Rs.) deflated by price index of intermediate inputs
- **PVCAP** = Value of private capital stock at 1993-94 prices, in crore Rs.
- **TOTINTER** = Index for input-output price ratio for intermediate inputs
- **STCREDIT** = Short-term credit for agriculture at 1993-94 prices, in crore Rs.
- **TOTCAPFOR** = Index for input-output price ratio for capital formation
- **INVESTCREDIT** = Investment credit in agriculture at 1993-94 prices, in crore Rs.
- **INDEXPRO (-1)** = Lagged productivity index
Indices

Fixed base indices have been constructed for production credit, investment credit, fertilizer consumption, pesticide consumption, diesel oil consumption and cumulative value of machinery in Punjab with base triennium ending 1982-83 = 100.

SCOPE OF THE STUDY

The credit system has been prevailing since times immemorial though new aspects have been added to it with the passage of time. Same is true in the field of agricultural credit. The present study has been undertaken to explore some of the issues related to the agricultural credit.

The study covers four districts to represent all the three agro-economic zones based on differentials in the cropping patterns, topography, soil structure, irrigation availability etc. The central-plain zone being the largest provides the analysis of two districts for fair distribution of the sample covered.

The study aims at exploring the issues of credit availability in pre-reform period i.e. 1980-81 to 1989-90 and post-reform period i.e. after 1991 in case of secondary data based analysis. While in case of primary data, the information has been at one point of time i.e. 2005-06 (for both, rabi and kharif crop seasons) from the sampled farmers through personal interview method.

The study has focused on the quantum of loans in terms of various sources existing in the state at present. It is with an objective to cover both institutional as well as non-institutional agencies operating in the field of agriculture credit namely commercial banks, primary agricultural cooperative societies, primary agricultural development banks, regional rural banks and commission agents, both for borrowing as well as lending aspects under study. The study aims at elucidating the role of various institutions dealing with agricultural credit by carrying out the overtime analysis of their performance in real and nominal terms.
The present study is also envisaged to bring out various factors of the sampled households which have a bearing on agricultural credit. These factors including the size of operational holding, labour use, family size, educational status, participation in social groups, cropping pattern for one year under consideration, farm inventory, cost of variable inputs in enterprises, income of the household from various sources, expenditure pattern of the sample household, farm investments undertaken during the last five years, amount spent on various non-farm purposes during last five years including social / religious obligations, health, education, foreign visits, house construction, major purchases in the household, total loans obtained for various purposes and their utilization / misutilization, sources of loans and loan procedures in terms of application formalities, documentation required, legal aspects, time involved, bribe paid etc. The study has proposed to bring out the reasons for preference of one agency over the other in the light of factors like loan collateral, security required, mode of loan disbursement, technical guidance provided by the source etc.