CHAPTER - 4

Research Methodology
RESEARCH METHODOLOGY

Sampling

The study pertains to the district Deoria of Uttar Pradesh which was purposively selected because of use researcher is acquittance with the area. The central bank of India being the lead bank for the district started financing the farmers in the year 1974-75. Its branches spread all over the district through which it provided credit to the farmers. The technical personnel of the Central Bank of India conducted a survey in the year 1997-98 with a view to examine the impact of the lead bank scheme in the district. This year was named as productivity year. In this year study an attempt has been made to compare the resource use, income, production, productivity, intensity of cropping, level of consumption and savings of borrower farmers with those of the non borrower farmers during 2000-2001 against year 1997-98.

For the purpose of the present study, Five blocks are selected randomly. The selected blocks are Rampur Karkhana, Gauri bazar, Rudrapur, Salempur, Bhatpar Rani. Four villages selected from each sampled block for the purpose of this study to select the 20 villages of district treated as one unit. Thus two stage sampling plan has been used.

Selection of the Farmers:

The operational size of the holding of each individual household was ascertained and recorded. The scrutiny of the records pertaining to the operational holdings reveals that he majority (model value) of the holdings are 5 hectares or less and only about 5% of the households have holdings exceeding 5 hectares. The households having operational holdings up to 5 hectares of only were considered as representative holdings of the area for the purpose of this study and as such the sample was selected from the holdings, which were of 5 hectares or less. Further all the recorded data of the operational holdings of the farmers availing credit from the Financing Institutions classified into four size groups below 1 hectare, 1-2 hectares, 2-4 hectares and more than 4 hectares and called marginal, small, medium and large farmers respectively. This classification was on the pattern of the classification followed by the Govt. of U.P. It was felt that such a classification could offer scope for comparison. The list of all the farmers of the area under study was collected from the respective block office and the list of borrowers was obtained from the respective
Having obtained the name of borrowers all the household of the area under study were divided into borrowers and non-borrowers. They are than classified into four above stated size groups, namely marginal, small, medium and large. Thus there were two groups of farmers, borrowers (B) and non-borrowers (NB) for each of the four size groups. The distribution of borrower and non-borrower farmers according to their respective size groups with sampled block has been given in the table 4.1.

**Table 4.1**


<table>
<thead>
<tr>
<th>Name of Blocks</th>
<th>Size</th>
<th>Rampur</th>
<th>Gauri</th>
<th>Rudrapur</th>
<th>Salempur</th>
<th>Rani</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
<td>NB</td>
<td>B</td>
<td>NB</td>
<td>B</td>
<td>NB</td>
</tr>
<tr>
<td>Marginal</td>
<td>Karkhana</td>
<td>345</td>
<td>120</td>
<td>280</td>
<td>125</td>
<td>310</td>
</tr>
<tr>
<td>Small</td>
<td>Bazar</td>
<td>290</td>
<td>90</td>
<td>300</td>
<td>110</td>
<td>360</td>
</tr>
<tr>
<td>Medium</td>
<td>Rani</td>
<td>89</td>
<td>40</td>
<td>60</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>Large</td>
<td>30</td>
<td>12</td>
<td>50</td>
<td>26</td>
<td>55</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>754</td>
<td>262</td>
<td>690</td>
<td>291</td>
<td>815</td>
<td>298</td>
</tr>
</tbody>
</table>

B = Borrowers and NB = Non Borrower farmer

Source - Block Officer and Lead Bank of Deoria district.

At the final stage, from each size group, 5 borrowers and 5 non-borrowers from sampled blocks are randomly selected. Thus, a sample of 100 borrowers and 100 Non-Borrowers are drawn for the purpose of this study.

**The Data:**

On the whole, following categories of data were required for the study which were collected by the researcher through specially designed schedule. (See Appendix I).
General Information:
It included information pertaining to the location, rainfall, population, occupational pattern, land use classification and credit institutions.

Resources Availability and Its use:
It included information on farm size, ownership, area leached in and leached out, area under irrigation, availability of farm family labour, source of income of farm family, draft animal, farm implements, cropping pattern, intensity of cropping investment pattern, availability of credit and its use on the farm. These have been collected separately for each sampled block and each group.

Prices:
It included information on harvest prices of the farm produce prices of various inputs used in crop production, wage rates for human labour, cost of hiring bullock labour, irrigation, charges, rate of interest on credit etc.

Farm Household Income, Consumption: Expenditure:
It included data on total income from farming as well as from sources other than farming and annual consumption expenditure of the farm family. This included expenditure on feeding, clothing, medicine, education, entertainment etc.

Source of Data:
Data relating to the district's characteristics were obtained from the office of the District Agriculture Office and District Statistical Officer, Deoria. The names of the borrowers with the amount of loan given to them and the repayment positions were obtained from the respective branches of Financing Institutions in sampled blocks. These data were further verified from the borrowers at the time of data collection. The data were collected from the sampled blocks by personal interviews. The data relates to the bank year (January 2000 to 30th September, 2001).

The data were collected through specially designed schedules which were pre-tested and modified after Pilot survey.
The productivity year report of the project area for the year 1997-98 is obtained from lead bank section of Central Bank of India, Deoria. The data for the level of resource use, physical input-output data, prices, income and consumption expenditures are collected from the sampled farmers by personal interviews.

**Owned Bullock Labour:**

The total annual cost of owned bullock labour is calculated summing up the costs of feed and fodder, depreciation of bullock and miscellaneous charges, for working out the depreciation (appreciation) of the draft animals, their difference in the market values at the beginnings and at the end of the year was taken into consideration. The difference was added (subtracted) to other components to arrive at the annual cost. The annual cost minus the incomes from hiring out the bullock labour was then divided by the total number of bullock labour days employed at the farm in the year to arrive at the working cost per bullock day.

**Seed Cost:**

Home produced seed-cost is evaluated on the basis of its prevailing price in Kgs. In village at the time of sowing. Purchased seed-cost, however, were evaluated on the basis of actual price paid plus the cost of transportation, if any.

**Manures And Fertilizers:**

The cost of manures and fertilizers is calculated by summing their marked prices per quintal irrespective of their source of supply; plus of transportation, if any.

**Interest on Capital Investment:**

Interest on fixed capital is charged at the rate of 12.5 percent per annum on the value of inventory of fixed farm capitals for both borrowers and non-borrowers. This is the rate for interest charged by the central bank of India. Expenditure made on maintenance and repair of farm buildings, farm tools and implements and also other miscellaneous expenses not accounted for in the working capital have been also incorporated. Interest on working capital such as seeds, fertilizers etc, was also charged at 12.5 percent per annum for the period during which capital remained locked in production.
The depreciation is calculated by 'straight line method' after taking in to Account the cost and the expected life of the equipment.  
1- Govt. of India, "Hand Book on methods of Collection of Agricultural Statistics in India". Directorate of Economics and Statistics and I.C.A.R. New Delhi, 1959. Evaluating the inputs as well as the produce (both main and by-products) at two different prices, as prevailing.  

Consumption Units:  
The consumption unit of the farm family were standardised by converting into male adults as per 'At water's' scale of adult male units. This was done to arrive at the consumption per adult unit. The conversion table is given in Appendix II.

Gross Farm Returns:  
Estimation of Gross Returns:  
In this study, both main and by-products are considered for gross returns of farm and these are evaluated at the harvest price prevalent in the nearest local market. The harvest price used is the average whole sale price at which the produce was sold by the farmers during the specific gravest period. Here, the harvest price period is taken as two months following the actual harvest months of respective crops because the farmers are expected to dispose off major portion of their produce from six to eight week after harvest.

During 2000-2001 and 1997-98, may not give the correct picture and the conclusions drawn from there may not be valid, hence, the same were evaluated at constant prices viz. those prevailing during the year 2000-2001.

Period of Study:  
Survey method was used for the enquiry which relates to the period from January 2000 to September 2001.
Analysis of the Data

Econometric is a branch of economics that uses mathematical and statistical tools to analyse economics phenomena. The most commonly used statistical tool for measuring economic relationship is regression analysis.

Ratio Analysis:

Often absolute figures could be misleading. Therefore, with a view to examine the relative efficiency of the sampled farms over time as also between the borrower and non-borrowers, three efficiency ratios, viz., operating ratio, capital turnover ratio and rate of return to capital were worked out.


Operating Ratio = \( \frac{\text{Total operating expenses}}{\text{Gross income}} \)

Capital turnover = \( \frac{\text{Gross income}}{\text{Capital investment}} \)

Rate of return to Capital = \( \frac{\text{Net income}}{\text{Capital investment}} \)

Regression Analysis:

Multiple regression analysis is used as the analytical tool for establishing the relationship between the output and the different variable inputs that go into production. Two types of productions function viz. Cobb-Douglas and linear are tried for the regression analysis. This is done separately for each size group for both the years i.e. 1997-98 (when a detailed survey was carried out in productivity year) and 2000-2001 (the year under study). It is assumed that in each size group, the individual units of observation are relatively homogeneous with respect to production function. Thus, the equations are developed for each size group separately pertaining to each individual year and also all size groups pooled together.

The Zero order correlation matrices indicates that interaction between inputs is low enough to undertake the study of their independent effect on the farm business return. Therefore, with a view to study the output-input relationship...
relationship and to assess the relative influence on output the multiple regression analysis is carried out. The general forms of the equations are given below:

(i) Cobb-Douglas Production function:

\[ Y = a x^1 x^2 x^3 x^4 x^5 e^u \]

(ii) Linear function:

\[ Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + U \]

Where,

- \( Y \) = Gross income in Rupees.
- \( x_1 \) = Gross cropped area in hectares.
- \( x_2 \) = Cost of fertilizers and manures in Rupees.
- \( x_3 \) = Value of total human labour in Rupees.
- \( x_4 \) = Value of total bullock labour in Rupees.
- \( x_5 \) = Capital (Seed + Irrigation + Plant protection + Measures + Maintenance and upkeep of implements, Equipments + miscellaneous) in Rupees.
- \( a \) = Intercept (Constant value determined by the Available data).
- \( b_1 \) = Regression Coefficients.
- \( u \) = Error terms.

The following properties of the function make it convenient choice.

1. Although the function is nonlinear, it can easily be converted into a linear function in logarithms which alone gives the elasticity's of production of each input factor separately and independently. In its logarithmic form, the associated linear function is:

\[ \log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + \ldots + b_n \log x_n \]
Thus the function, on the one hand, has the ingredient of essential non-linearities and, on the other, provides benefit of the simplification of Calculation from linearity in logarithms. The logarithmic function, it may be pointed out, is linear in the parameters.

2. It can be used with scanty data, as the loss in the degrees of freedom or parameters is minimum. Unlike a parabolic function, it is economical in the use of degree of freedom, and at same time gives the advantage of non-linearity.

3. For this function, the parameters are the elasticities and the elasticities of the individual factors are their exponents in the production function. The sum of exponents show the degree of "Return to scale" in production, i.e. indicating the percentage by which output will increase if all inputs are increased by 1%.

Suppose, we have the production function in equation

(1) Constant returns to scale will be obtained, if

\[ b_1 + b_2 + b_3 + \ldots + b_n = 1 \]

By 1% increase input of all factors, there will be an increase in output by 1%.

If \[ b_1 + b_2 + b_3 + \ldots + b_n < 1 \], decreasing returns to scale.

If \[ b_1 + b_2 + b_3 + \ldots + b_n = 1 \], Constants returns to scale.

If \[ b_1 + b_2 + b_3 + \ldots + b_n > 1 \], increasing returns to scale.

Suppose that each input is increased by 5%, then output is increased by less than 5%, by 5%, or by more than 5% according to whether there are decreasing, constant or increasing return to scale.

In this study, production function analysis is applied for the farm business as a whole. In all forty equations, twenty each for Cobb-Douglas and linear production function, have been developed. Separate equations are developed for the borrowers and the non-borrowers; four each for the individual size groups and one each for all the size groups pooled together. Thus, for each year, 10 linear and 10 Cobb-Douglas equations have been developed. Two to three runs of regression analysis with varying number of variables are carried out. It is evident from the better results obtained that Cobb-Douglas function is a much better fit in the present context; therefore, only Cobb-Douglas function is finally considered for the analysis.
of the data pertaining to both the years. The details are given in Appendix IIIa &b.

With a view to study the impact of credit on the farm business returns, efforts is made to examine the same with the help of multiple regression analysis. The logic behind this concept is that the credit borrowed is likely to be spent on the purchase various inputs, more so, since much of the credit borrowed is disbursed in the form of kind than the cash. Hence, the farmer's working capital is divided into two groups parts viz. Home inputs and inputs purchased or received from disbursal of credit in cash/kind. Even though these two types of inputs are considered as two different variables, although the inputs might involve some expenditure from the farmer's own funds. However, the effort to collect the data did not throw any light on this aspect, because the farmers seem very touchy about revealing the same. Therefore we may be justified in our assumption that the major portion of the purchased inputs of the borrowers is financed through credit facilities. The general form of the function is given as:

\[ Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + e_u \]

Where,

\[ Y \] = Gross income in Rupees.
\[ x_1 \] = Gross area of land in hectares.
\[ x_2 \] = Value of owned inputs in Rupees.
\[ x_3 \] = Value of purchase inputs in Rupees.
\[ a \] = Intercept.
\[ b \] = Regression Coefficients associated with \( x_i \)
   \[ i = 1,2,3 \]
\[ U \] = Error term or random component.

The parameters \( a \), the constant term and different \( b \)'s, the production elasticities of the respective inputs is estimated and the significance of regression coefficients was determined by using appropriate t-test. The corresponding t-statistic is defined as
't' = bi/S.E (bi)

having v = n - 2 df.

Where,

\[ b_i \] = Regression Coefficient.

\[ S.E. \] = Standard error of bi.

In all, twenty equation are developed for the purpose; sixteen for individual, size groups and four for all size groups pooled together.

Marginal Analysis:

Estimation of Marginal Value Products of Inputs:

The marginal value product of certain input at a certain level is the increase or decrease of output in rupees due to unit increase of the input at the level. If \( Y \) is expressed in rupee units, then marginal value product of \( X_1 \) is simply the differential coefficient of \( Y \) with regard to input factor \( X_1 \). Here, the marginal value products of inputs are worked out at their respective geometric mean levels-

\[ \text{MVP} (X_1) = \frac{dy}{dx_1} \]

It is found from the Cobb-Douglas production function at the given level of \( x_1 \) and other inputs held constant at some level.

For this analysis only final run equations are used. The marginal product of the gross cropped area can not be estimated and discussed because most of the regression coefficients are found to be statistically non-significant. Moreover, in practice, the scope of increasing or decreasing the area under cultivation is negligible. Therefore, it is not considered necessary to emphasis much on the marginal value product of land. However, the same have been worked out and are given in Appendix IV.

Comparison of Marginal Value Productivity:

Since the bank loan is supposed to be development oriented, efforts in this study, was made to compare the marginal value product of inputs between different size groups of credit recipients and non-credit recipients during the year 1997-98 (the productivity year) as also for the year 2000-2001; so as to assess the impact of bank finance on the farm productivity. Further the marginal value product of the inputs used by the
credit recipients and non-credit recipients during 1997-98 have been compared with those of their respective marginal value products for the year 2000-2001. For the purpose of this analysis only the statistically significant coefficients are taken into account.

Consumption and Savings:

In order to estimate a relationship between the consumption and disposable income, a consumption function is fitted. Akly gardner (1978) has shown that there is linear relationship between these two variables and hence a linear consumption function based on keynesian hypothesis is tried.1


Many researchers in the past have found that linear function gave the best fit in establishing a relationship between income, consumption and savings.2

Though, size of the family is also an important factor in determining the level of consumption, it did not take into account the age and sex which is likely to influence the consumption and savings of the farm family and hence the function is fitted on the basis of per standard consumption unit2 of farm family. The specific linear relationship used was:

\[ C = a + by \]

Where

\[ C = \text{Consumption per standard Consumption Unit of farm family (in Rs.).} \]

\[ b = \text{Marginal propensity to consume.} \]

\[ Y = \text{Total disposable income per standard consumption unit of farm family (in Rs.)} \]

It is felt that the impact of the above independent variable C may differ significantly between different categories of farms viz. Marginal, small, medium and large. Therefore, separate equations have been developed for each category of farms for both the years, viz. 1997-98 and 2000-2001.
An estimate of marginal propensity to save (MPS) can be obtained from marginal propensity to consume (MPC) by relationship:

\[
\text{MPS} + \text{MPC} = 1 \\
\text{MPS} + 1 - \text{MPC} \quad \text{i.e. MPS} = 1 - b
\]

Processing of Data:

The data has been processed by electronic computer PC/HP, HCL.

2. For calculation of per standard Consumption unit See Appendix II. World Bank working paper No. 382, April.

The choice of the final regression equation for the analysis is made in the following manner. First, all possible combinations of the variables have been formed. For each relationship, two or three runs of the regression curve equation with varying number of variables has been made to get the regression coefficient as statistically significant have been retained in the regression equation. The variables which are relevant in the equation from the theoretical point of view are retained in the equation even if the regression coefficient are statistically insignificant. The coefficient of multiple determination R^2 is computed for all formed regression equations. A regression equation having highest value of R^2 is chosen for subsequent analysis.