CHAPTER-II

DESIGN OF THE STUDY

I. INTRODUCTION

Farmers decide acreage under different crops after considering a number of economic and non-economic factors. The natural factors constitute most significant among non-economic factors in influencing the area under different crops. The natural factor here refers to the physical conditions of topography, temperature, rainfall or irrigation, soil characteristics etc. All of these factors not only have direct bearing upon the cropping pattern but also influences the acreage by way of affecting the productivity of land. Given the natural condition of the area, the allocation of acreage depends to a great extent on the variation in economic factors such as price, amount of input, size of land holding, agricultural knowledge, institutional credit, etc. At the outset, it is not possible to particularise the key variable responsible for acreage shifts. Hence, in the present study, an attempt is made to examine the impact of variations in price and non-price factors such as credit as on the acreage under different crops in the homogeneous geographical areas of the
Chittoor district under the changing technological and institutional conditions.

II. OBJECTIVES OF THE STUDY

In a market economy, with flexible prices, the area under a crop is expected to vary directly in response to change in the price of that crop. However, in an area capable of growing different alternative crops, the acreage under a particular crop also depends upon the prices of its substitute crops. Hence, it is expected that the relative price of the crop in relation to the prices of substitute crops rather than the absolute price of the crop has a great bearing upon the acreage of that particular crop. But when there is difference in the yield of the crops, the area may not be expected to change in response to change in its relative price. Under such condition, it is the relative profitability which influences the area under a particular crop. Given the relative profitability condition of the crop, the acreage of the crops also very according to the availability of inputs such as credit, the risk involved in the cultivation, institutional environment of the farmers, etc. While the influence of price, weather and technology factors have been widely studied the impact of credit and own finance has not been studied. Hence the focus of the study is the assessment of the impact of credit and other
factors on the acreage under different crops in various homogeneous geographical sub-regions from a cross section of farmers in the Chittigor District. The specific objectives of the study are:

1) to analyse the factors affecting the agricultural production decisions under the changing institutional credit conditions;

2) to estimate the supply response with respect to institutional credit and others factors;

3) to study the variation in supply response between crops and the role of institutional credit in it;

4) to study the regional variations in the supply response due to different credit conditions; and

5) to assess the impact of credit and other factors on the decisions of farmers belonging to different size classes.

The first objective of the study will give a clear idea about the farmers behaviour while deciding the acreage under different crops. It will indicate that the relative significance of credit vis-a-vis other factors affecting the acreage. The second objective will highlight the dimension
of response of farmers with respect to different explanatory variables. The third, fourth and fifth objectives will throw light on the difference in the behaviour of farmers between different regions, crops and in the classes.

III. HYPOTHESES OF THE STUDY

The following hypotheses have been tested in the study:
1) credit is a significant determinant of acreage under different crops;
2) the price response results improve with the inclusion of institutional credit variables in the supply model;
3) relative profitability rather than absolute price of the crop has a great say in the acreage decision of the farmers;
4) significant difference exists in the response of food crop and commercial crop acreage to changes in credit conditions;
5) significant variations occur in the price response of farmers between various geographical sub-regions and size classes due to different credit conditions.
IV. **CONCEPTS**

**A. Supply**

The area under different crops may be taken as the measure of supply of various agricultural products. For the present analysis, the supply is defined as the area of land that farmers are willing and able to allocate under a particular crop at different prices, credit and irrigation conditions in a particular crop year.

**B. Supply Function**

Conceptually, a static supply function shows the relationship between the output as a whole and the general price level. It depicts the various amounts of a commodity that producers wish to offer at various possible prices during a particular period. Normally, supply curves are said to be positively sloping, indicating a positive relationship between the price and the amount that will be offered for sale. This static relation holds good when all other influencing conditions other than price are held constant. Besides, this statistic relation is time-bound; it shows the flow (supply) per unit of time; whatever be the length of the time unit, it is fixed. In short, it explains the net supply relation.
In supply response relation, the product price explains only a part of the variations in supply. There are many other factors that influence supply. These include economic as well as social factors. Supply in agriculture, for instance, is influenced by the price of the substitute products, total irrigated area of all crops in the season, climatic conditions, technological advancement, liquidity position of the farmers, his access to credit, market information, the risk involved in the cultivation etc. In economic technology these factors are called supply shifters. The response relation, thus describes what will happen to the quantity of a commodity offered for sale/produced when all other things are not kept constant. In a sense, it is a study of shifter of supply. With special reference to credit.

In the light of the above definitions, a clear cut distinction can be made between the supply function and the supply response function. The supply function describes a price quantity relation when all other supply shifter are held constant. Whereas, the response relation is a more general concept. It is in fact, inclusive of net supply function. It refers to the change in quantity offered for sale/produced due to changes in price as well as shifters
and therefore, approximates to the long-run dynamic concept of supply in theory.

C. Supply Elasticity

Elasticity of supply is a concept used to measure the response of the quantity of commodity supply to changes in price. The definition of the elasticity of $Y$ is mathematically given as the ratio of the rate of change in $Y$ to the rate of change in $X$. It is given by

$$
E = \frac{\text{rate of change in } Y}{\text{rate of change in } X}
$$

where

$E$ is the marginal value and $Y/X$ is average value. In the supply response function, the short-run elasticities of acreage with respect to various variables employed in the function can be found out by multiplying the respective marginal value (parameter values) with the reciprocal of the respective average values. The mean values of their respective variables have been considered to find out respective average values. In the present analysis, this method has been adopted to find out the short-run elasticities.

Since the supply response relation approximates to long run, the long run elasticities of acreage with respect to the explanatory variables employed in the function can also
be calculated. The long-run elasticities can be found out by dividing the estimated co-efficients (b's) by the co-efficient of adjustment. One minus the co-efficient of lagged acreage gives an estimate of the adjustment co-efficient. Then, the long-run elasticity can be expressed as

$$\frac{b}{(1 - b)}$$

where $b$ is the co-efficient of lagged acreage.

D. Relative Profitability

Profitability refers to a condition of maximum return to fixed resource. Relative profitability, therefore, refers to the highest return of one crop in relation to the maximum return of the competitive crop. It is defined as the ratio of per unit cost return of a crop to per unit cost return of competing crop. Representing symbolically,

$$\frac{Y}{C}$$

Relative profitability = \(\frac{Y}{C}\) x 100

$$\frac{Y}{C}$$

\(\frac{c}{c}\)

= \(\frac{T/C}{c} \cdot \frac{C}{Y} \cdot 100\)

where $Y$ and $Y$ represent per hectare value of the crop and competing crop respectively, and $C$ and $C$ denote per hectare cost of cultivation of the crop and competing crop, respectively.
V. SCOPE OF THE STUDY

The study is confined to the Chittoor District of Andhra Pradesh. It considers three important crops grown in this district, one food crop, namely, paddy, two commercial crops namely, groundnut and sugarcane which together account for most of the cultivable area of the district. The importance of these crops is not the same all over the Chittoor District. What is important in one mandal may turn out to be less important in the other mandals of the district. Hence, different crops appear important in different mandals. The study analyses the problem at the cross-section level on the basis of sample data collected for the crop year 1991-92. The field study was conducted during the months May to September, 1992.

VI. METHODOLOGY

The importance of a study to a great extent lies in the method followed in the selection of statistical unit, collection of data and in the method adopted for their analysis. While deciding the validity of the results of a study, a clear understanding of the methods followed in the study is considered important. A detailed picture of the procedures and methods adopted are given below.
A. Selection of Study Area

In the present study, it is intended to analyse the supply response of farmers to institutional credit and other factors by homogeneous geographical sub-regions and size class of farmers of three crops within a district. In this context, the Chittoor District has been selected purposively since it comprises different areas with various levels of irrigation and varying in soil and other natural environment. The amount of rainfall received by various regions differ significantly. Hence, the area of district varies between dry belts and wet land. The physical condition of land is such that it is capable of raising multi-crops, given the well and tank irrigation condition of the area. Moreover, there is significant development in the infrastructure of the district, particularly in banking, co-operation and marketing. All of these conditions synchronize with the conditions presupposed by the objectives of the study. Hence the choice of Chittoor District for the study of farmer's supply response to credit and other factors. The agriculturally progressive nature of Chittoor District also for its selection for the study. The proximity of the district and the absence of studies in this area are the other reasons for this.
B. Selection of Mandals

The District is divided into 6 mandals spread over three agro-climatic divisions of the district. One mandal from each region has been chosen at random in the first stage. Thus, the mandals of Kammakalle, Gudipala and Santhipuram have been selected at random from the eastern, central and western regions of the district.

C. Selection of Villages

The statistical unit for the study is revenue village. Three revenue villages in each mandal have been selected in such a way that their selection represents the general geographical and other conditions of the mandal.

The irrigation facilities, geographical distribution of cultivated area under different category of land have been considered for the selection of the villages. With the help of mandal development officers, the villages have been selected on the above said lines and confirmed for the study after verifying the conditions of the village with the concerned village development officers. Selecting the villages in such a way enables the researcher to group the villages by homogeneous areas. Hence the selection of the village is also purposive. On the whole, revenue villages have been selected from the 3 mandals of the district.
Table II.1 provides the list of villages selected in each of the three mandals of the Chittoor District.

TABLE II.1

SAMPLE VILLAGES SELECTED

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Mandal</th>
<th>Revenue Village</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gudipala</td>
<td>A. Gudipala</td>
<td>Central</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Namgamangalam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Vasanthapuram</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Kamma Palli</td>
<td>A. Kamma Palli</td>
<td>Eastern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Kuppam Badu</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Ramapuram</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Santhipuram</td>
<td>A. Santhipuram</td>
<td>Western</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Koneeru Kuppam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Boyanapalli</td>
<td></td>
</tr>
</tbody>
</table>

D. Selection of Farmers

In each of the 9 selected villages, 25 farm households have been randomly selected from the list of farm households furnished by the respective village development officers. In one village however, only 22 households were selected due to non-availability of sufficient number of households. Thus, a total of 222 households have been selected. The decision making individuals in these households have been interviewed with a well-structured schedule prepared for this purpose. The persons who are actually making decisions on agricultural productions are considered as decision
making farmers in the cultivating household. While selecting households, the tenant households have been omitted, since the decision of the tenant farmers to a greater extent is influenced by other factors besides the factors influencing the farmers operating with own land. In total 222 decision making farmers have been identified and interviewed.

E. Collection of Data

The cross-section data have been collected by personal interview with the decision making farmers, through comprehensive and well structured schedules prepared for that purpose. The schedule has been prepared in such a way that it gathers information relating to family size, education, land and operational holdings, crop pattern, yield of the crop, cost of cultivation of the crop, agricultural and other asset position of the cultivating holdings, competing crops, HYV area cultivated, expected and realised prices, sources and availability of finance, basis of price expectation, risk involved in the cultivation and other related information considered important for the present study. While collecting data, it is verified whether the operational holdings of the decision making farmers, have changed during the study period. The farmers whose operational area have changed during the study period
have been dropped and farmers in the reserved list of random selection have been considered for interview. In order to get correct data and good response for the questionnaire, the persons known to the researcher in that particular area have been taken to the respondent and the respondent is made to convince that the data will be used only for the research purpose. The researcher has considered it necessary because the people are generally afraid of divulging the correct particulars on the notion that the data may be used for the tax purpose.

F. Data on Crop Acreage

Data on the area under different crops grown by the sample farmers have been collected at the two levels, i.e., from the farmers and the village development officer.

G. Price Data

For the cereal crop, paddy, data has been collected from the concerned Mandal Development Officers. For sugarcane, groundnut and sericulture the price data have been obtained from the concerned marketing committees and the Chittoor Marketing Committee. The prices collected for various crops from different sources are only wholesale prices prevailing in the respective centres and the prices of each commodity
among these centres differ slightly. Hence for the commodities whose prices are collected from more than one centres, average of these centres has been taken for analysis.

H. Credit Data

Data on the amount of agricultural credit made by different banks to the sample farmers has been collected from the concerned bank branches and it is cross verified with the data collected from the farmers. Loans advanced for short-term or for production purpose include the loans advanced by the commercial banks, regional rural banks and credit co-operative society (single window) for the rabi and kharif seasons. The short-term loans include all crop loans and other production loans repayable in 12 to 18 months. The short-term credit data has been aggregated in respect of each farmer and no distinction is made between loans advanced by the co-operative commercial banks and rural banks.

The long term credit considered in the study is the average long term loans received by the farmer household from the co-operatives, regional banks and commercial banks. The data is collected from the concerned banks and the sample farmers and in case of discrepancy the data collected
from banks and co-operatives is taken as the basis. All loans advanced for the purpose of mechanisation, land development, soil conservation, land reclamation and plantation crops are included under this category. The average for 5 years is taken as long term loans are not given every year.

The non-institutional finance considered in the study includes borrowings from friends, relatives, money lenders, merchants and others. It also includes own family funds besides the non-institutional sources during the last 5 years. In other words, average long term non-institutional finance received per year is included in this source as the households do not distinguish between the short term and long term non-institutional finance.

1. **COST OF CULTIVATION**

Data on cost of cultivation have been collected from the sample farmers. Wherever such details were not furnished by the farmers, the information regarding the cost was ascertained from the lead bank credit plans. The lead bank determines the scale of finance in each year for each of the crops cultivated in the district in such a way that it covers 50 per cent cost of cultivation of each of the crops. Hence, the scale of finance for each of the
crop under study has been taken as a good approximation to the cost of cultivation of the respective crop. These figures have been collected from the district credit plan and annual action plan reports of Lead Bank (Indian Bank).

J. OTHER STATISTICS

Other relevant data have been collected from three different sources:

1) season and Crop Reports;
2) the records of Mandal Development; and
3) Mandal Statistics (Ganaka Darshani)

VII MODEL

The following three Nerlovian type models have been used to estimate the impact of credit and other factors on the acreage decisions of the farmer.

\[ X_t = a + a P_t + a SCR_t + a LCR_t + a NIF_t + a I_t + U_t \]  \( t = 0 \) to 1 t 2 t 3 t 4 t 5 t \( t \) \( (1) \)

\[ X_t = a + a Rp_t + a SCR_t + a LCR_t + a NIF_t + a I_t + U_t \]  \( t = 0 \) to 1 t 2 t 3 t 4 t 5 t \( t \) \( (2) \)

\[ X_t = a + a pC_t + a SCR_t + a LCR_t + a NIF_t + a I_t + U_t \]  \( t = 0 \) to 1 t 2 t 3 t 4 t 5 t \( t \) \( (3) \)

where,

\[ p_t = \text{Expected price of the crop} \]

\[ p_{ct} = \text{Expected price of the competing crop} \]
Rpt = Relative profitability of the crop

SCRT = short term institutional credit

LCRT = Long-term institutional credit
       (average for 5 years)

NIFT = Non-institutional finance
       (average for 5 years)

It = area under irrigation

ai's = Parameters to be estimated

u = stochastic error term

The other standard Nerlovian factors such as technology and agricultural risk, cost of cultivation crop yield and fertilizer used have not been used in the study on the basis of preliminary analysis of data and on the consideration of availability of uniform data.

VIII. LIMITATIONS OF THE STUDY

Due to non-availability of data and multi-collinearity among explanatory variables, only price, profitability and credit factors have been employed in the regression analysis. The factors employed are expected to account for most of the variations in acreage under different crops. The study was conducted during the financial year 1992-93 covering the Kharif season (April-September 1991) and Rabi season (October-February 1992) for the three major crops. The year 1991-92 was a normal agricultural year. However,
in some parts of the district, there were drought conditions during this period. But the sample mandals were not adversely affected by the drought.

The study is confined to three major crops of paddy, groundnut and sugarcane and one competing crop, namely sericulture. While these crops constitute more than 75 percent of the cultivated area, there are other minor crops which are not covered in the study. Similarly, there are a number of small substitute crops to groundnut and paddy such as ragi, maize, tomato and other vegetables. While there are 66 mandals in the district, only three mandals representing three different agro-climatic regions have been selected for the study. To a large extent, these three mandals capture the features of the three agricultural regions. There could be some mandals which are different from the sample mandals in certain respects. But such differences, it is assumed, are not too serious to undermine the results.

The regression models employed have been estimated assuming linear relationship. All relations may not be linear and some may be non-linear and it is assumed that the linearity assumption best approximates most of the relationship.
As always, there are some methodological limitations associated with the econometric models. While every care has been taken to minimise these problems such as multicollinearity and hetero-seadasticity, they cannot be totally ruled out. But such problems are common to most of the studies in this area.