CHAPTER - FIVE

SAMPLE DESIGN AND METHODOLOGY

This chapter begins with the description of the sample design followed by a detailed discussion of the different methods used in the study for analysis of data. The extent of farmer’s efficiency level and the use of various determinants have been brought out from this analysis.

5.1 THE SAMPLE DESIGN

The sample design used in selecting the sample in each ADO circles was that of multi stage random sampling, in which villages constituted the primarily sampling units and the farm households as the secondary and the ultimate sampling units. In the first stage of selection, in order to select a sample representative of farmer, three villages were selected at random from each circle. In the second stage, about thirty percent of farm households in each of the selected villages were selected at random. The lists of farming households of the selected villages have been obtained from the Village Level Extension Worker (VLEW) of the concerned villages and an overall one thousand and seventy one (1071) farm households selected from the six Agricultural Development Officer (ADO) circles of the region which constituted the whole sample of the field study.
5.2. SAMPLE UNIT

The sample units of the present study are the farmers (either owned land or land taken on lease or both). To identify the sample size, we used Yamane formula (1967) which is given by

\[ n = \frac{N}{1 + N(e)^2} \]

Where,

\( N = \) is the population size.

\( n = \) is the sample size.

\( e = \) is the level of precision.

5.3. AGRARIAN CHARACTERISTICS OF THE SAMPLE LOCATIONS

Agriculture is the dominant economic activity in all the villages of the ADO’s circle. Of all the ADO’s circles, Salchapra, Banskandi and Ram Krishna Nagor have better economic base with diversified occupations of the household members. Compared to agriculture, permanent job outside the villages are generally considered as quite attractive in the sample survey area.
The dominant practice of agriculture in the sample villages is characterized by the institution of farm level efficiency of agricultural production. It is found that paddy, pulse, rape and mustard, vegetables (both Kharif and Rabi) etc. are generally grown in the sample survey area. Ahu, Sali and Boro (baruah) are the three important varieties of paddy. It is grown almost throughout the year in three seasons, Ahu is harvested in autumn season (August/September), Sali is harvested in the winter season (December/January) and Boro is harvested in summer season (April/May). The sample farms in all the villages has been cultivating of all these crops. Since most of the farmers of the region are nature dependent and their cultivation system depends upon the condition of the soil too, hence it is difficult to expect satisfactory yield from the cultivation system in each and every year. Meanwhile Sali crop is suitable for the soil where sufficient water is available. But Ahu is planted on the soil where there is scarcity of water, while Boro is cultivated only on the low lying lands which generally remain waterlogged. Due to seasonal variability and frequent floods, many of the low lying lands have been overlapped and the lands quickly dried up at the peak of the season and thus the fertility of the soil comes down which in turn reflect a very poor yield and that decreases the interest of
the farmers of the valley to cultivate Boro paddy. Thus such type of complexities does not arise in case of Sali paddy and hence the farmers generally prefer to cultivate Sali paddy in most of the lands of the valley. In addition the cultivation period for Sali paddy is slightly longer than that of the Ahu paddy.

However there has been a gradual decline in respect of the cultivation of autumn paddy due to hazard risk. Another important feature of the agriculture in the sample survey area is that most of the farmers follow single cropping pattern. Though insignificant, the incidence of double cropping is observed both in Salchapra and Ram Krishna Nagor circles. The low incidence of double cropping is due to the fact that agricultural practices in the sample survey area are traditional in nature. It depends mainly upon rainfall and there is neither irrigation facilities nor flood control arrangements are availably made nor hence the farmers are bound to depend on nature. Thus by depending only upon the nature, the farmers cannot expect a good return from the field. If the nature is favorable in a particular year, the farmers can expect a good harvest otherwise not. Moreover the farmers of the valley have the superstitious belief to depend on nature and their
hereditary traditional practices and thus the degree of mechanization is almost insignificant.

**5.4 NAME AND LOCATION OF THE FIELD**

There are 40 nos of ADO circles in the valley which comprises 19 from Cachar district 14 from Karimganj district and 7 from Hailakandi district. As it has been mentioned that there are six ADO circles which have been selected for the sample study from the entire valley. These six selected ADO circles are – (i) Nilambazar (ii) Ram Krishna Nagar (iii) Sonai (iv) Salchapra (v) Banskandi and (vi) Bualipar.

The Nilambazar and Ram Krishna Nagar circles are located in the Karimganj district. The Sonai, Salchapra and Banskandi are located in the Cachar district. The respective sub-divisions for the district are Sonai, Silchar and Lakhipur. The Hailakandi district consists of one agricultural sub-division, namely Hailakandi sub-division and the selected ADO circle is Bualipar.

The sample design is shown in the chart 5.1
Chart 5.1
SAMPLE DESIGN
Barak Valley (Three districts)

Hailakandi

Karimganj

Cachar

Hailakandi

R. K. Nagor

South-Karimganj

Sonai

Banskandi

Salchakra

BualiparADO

R.K. NagorADO

NilambazarADO

SonaiADO

LakhipurADO

SalchakraADO

Purbosunapur (51)

Nitainagor (52)

Rotonpur (57)

Hulashnagor (61)

Satrishhal (61)

Gandharajbari (51)

Lamabahadurpur (86)

Nayagram (76)

Medha (68)

Kazidohor (89)

Kochudorom (60)

Uttormuhonpur (51)

Labokthaba (51)

Kazirgramposchim (56)

Lambabosti (46)

Chandpur (56)

Durgapur (57)

Borjatrapur (46)
5.5 METHOD OF COLLECTION OF DATA

Objectives of the study require utilization of primary data at the farm level. The primary data relating to the cultivation of each farm household in the sample have been collected by interviewing the head of the farm family. For carrying out these interviews and for recording the collected information’s, a standard schedule of questionnaire was used. This schedule was finalized after a number of pre-test i.e. in the form of pilot survey which is already shown and also analyzed in the chapter four depending on the field study. All the data collected from the farm households pertains to the year 2012-2013.

The enquiry has also been conducted for detailed investigation to the principal crops in the valley, paddy varieties of both local and HYV’s, vegetables etc. For studying general cropping pattern, almost all crops have been taken into consideration. More especially, data collected includes information on various inputs such as seeds, manures, fertilizer, pesticides, irrigation, machinery use, human labor, bullock labor, crop yield, prices of inputs and output for the concerned crops.

General information regarding different local and HYV’s of paddy currently recommended, network of extension services etc. was obtained from District Agricultural Officers (DAO) of the three districts of the valley. The data on the general background of the six circles in
which field survey was carried out have been collected have been collected from the ADO’s of the respective circles.

5.6 METHODOLOGY

The data were analyzed both by tabular method as well as by functional analysis. The inter-relationship of farm level efficiency along with socio-economic characteristics of farm was mostly analyzed by tabular method with simple statistical tools like averages and percentages. For examining the resource endowment position of the sample farmers particularly for fixed capital resources both per farm and per hectare average value of such assets were found.

The extent of resource use was examined by the measure of average level of its use on per hectare of crop production. This was done for both the paddy crops including traditional and HYV’s and aggregate of concerned paddy crops. Mean difference of average levels of each of the resource use of the aggregate of concerned paddy crops for different categories of sample farms were calculated in order to ascertain whether there exists any discrepancy in inputs used in the production process. The significance of the estimated difference was tested using the statistical test of significance.

In order to identify a true functional form, which best fits the data of this study, the attention was drawn to production function. The value
of log likelihood indicates that the model is a good fit and the variables are justified and jointly influence the production of paddy. Since the relationship among variables is found to be non-linear, so we have used non linear model. Again we could not take non-linear model, since there were some observations having zero values and hence we could not take any log values of these observations and on the other hand we could not leave these observations as it is true that these variables have an effect on the output. In order to solve this problem, we have taken the help of another model using dummy variables. The model outlines here have been empirically tested with the help of the data collected from six ADO circles in Barak Valley region of Assam. Simple multiple regression model has been used. The analysis has been carried out in the computer mainly through Statistical Package for Social Sciences (SPSS). Maximum Likelihood Estimates (MLE) and Technical Inefficiency model are used to estimate the determinants of Farm Level Efficiency.

5.6 THE STOCHASTIC FRONTIER PRODUCTION FUNCTION:

The Stochastic frontier modeling has been increasingly popular in recent times because of its flexibility and ability to closely link economic concepts with modeling reality. The modeling, estimation and
application of stochastic frontier production function to economic analysis assumed prominence in economic analysis following Farrell’s (1977) seminar paper where he introduced a methodology to measure Efficiency of a farm (Ogundari and Ojo, 2007)

Over the years, Farrell’s methodology had been applied widely, while undergoing many refinement and improvements. One of such improvements is the development of Stochastic Frontier model which enables one to measure Farm level efficiency using Maximum Likelihood Estimates (a corrected form of ordinary Least Square – OLS) Aigner et al. (1977) applied the stochastic frontier production function in the analysis of the U. S agricultural data. Battese and Corra (1977) applied the technique to the pastoral zone of eastern Australia. In recent times, empirical analysis have been reported by Battese, Malik and Gil (1996), Ajibfun and Abdulkadri (1999), Ojo (2004), Coelli et al (1998). The model adopted in this study is based on the one proposed by Battese and Coelli (1995) and Battese et al. (1996) in which the Stochastic Frontier specification incorporates models for the technical inefficiency effects and simultaneously estimate all the determinants involved in the production model. The estimates of all the parameters of the stochastic frontier production function and the inefficiency model were
simultaneously obtained using the program FRONTIER version 4.1 (Coelli, 1996). The model is specified as follows: 

\[ \ln (y_i) = \beta_0 + \beta_1 D_{1i} + \beta_2 \ln \max (\text{fertiliser}_i, 1 - D_{1i}) + \beta_3 D_{2i} + \beta_4 \ln \max (\text{pesticides}_i, 1 - D_{2i}) + \beta_5 D_{3i} + \beta_6 \ln (\max (\text{irrigation}_i, 1 - D_{3i}) + U_i. \]

Where,

\[ D_{1i} = 1, \text{ if the farm uses fertilizer.} \]
\[ = 0 \quad \text{otherwise.} \]
\[ D_{2i} = 1, \text{ if the farm uses pesticides.} \]
\[ = 0 \quad \text{otherwise.} \]
\[ D_{3i} = 1, \text{ if the farm uses irrigation.} \]
\[ = 0, \text{ otherwise.} \]

\[ \beta_1 + \beta_2 = \text{Impact of fertilizer on production.} \]
\[ \beta_3 + \beta_4 = \text{impact of pesticides on production.} \]
\[ \beta_5 + \beta_6 = \text{Impact of irrigation on production.} \]

\[ U_i \quad \text{error term.} \]

\[ 1 - D_{1i} \text{ is considered as 1(one), when the farm does not use fertilizer.} \]
\[ 1 - D_{2i} \text{ is considered as 1 (one), when the farm does not use pesticides.} \]
\[ 1 - D_{3i} \text{ is considered as 1 (one), when the farm does not use irrigation.} \]
REFERENCES:


