CHAPTER - III

METHODOLOGY

This chapter deals with the description of the study area, sampling procedure, adopted method of survey, nature and source of data and various tools and techniques employed for analyzing the data. It was divided in the following heads.

3.1 Description of the Study Area

3.2 Sampling Technique

3.3 Source of Data

3.4 Statistical Analysis

3.1 DESCRIPTION OF THE STUDY AREA

The geographical location of Jamnagar district is 21.42 degree to 22.57 degree North (Latitude) and 68.57 degree to 70.37 degree East (Longitude). The temperature varies maximum 42°C in summer to and minimum temperature is 10°C in winter. There are four main rivers which flow through the district which are Rangmati, Und, Fuljar and Sasoi. The average rainfall of Jamnagar district is 550 mm. Jamnagar district is located in north Saurashtra region of Gujarat. The district is comprised into 6 talukas. The geographical area of Jamnagar district is 14,125 sq. Kms. Agriculture is the backbone of the district economy. Major crops grown in the district are groundnut, cotton, wheat, cumin, garlic and onion. The Jamnagar district is famous for its brass product, tie-dyed fabric (Bandhani), and handicrafts. World’s largest grass root refinery of Reliance petrochemicals is located in Jamnagar. India’s first marine national park located in Jamnagar. (Anon., 2016a)
3.1.1 Selection of Crop

The study was restricted to major two crops, accordingly groundnut and cotton crops were selected for the study. The average net gown area in district is 6.60 lakh ha area of Jamnagar district, occupying the highest 3.78 lakh ha area under groundnut and area under cotton crop was 1.80 lakh ha. Therefore these crops were selected.

3.2 SAMPLING TECHNIQUE

Multi stage sampling technique was adopted as per the objective of the study. At the first stage of sampling three talukas were selected on the basis of highest number of farmers using MIS from Jamnagar district. At the second stage of sampling 20 dealers were selected from Jamnagar district. At the third stage 20 farmers who has adopter MIS and 40 farmers non adopter from each taluka 60 farmers were selected randomly. In all, total sample comprise of 180 farmers.
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Table 3.1 Distribution of sample farmers

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of talukas</th>
<th>No. of dealers</th>
<th>No. of MIS farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Adopter</td>
</tr>
<tr>
<td>1</td>
<td>Jamnagar</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Kalavad</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Jam Jodhpur</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>60</td>
</tr>
</tbody>
</table>

3.3 SOURCES OF DATA

3.3.1 Primary Data

The study involves the utilization of various tools for information collected, the primary data related to land holding, area under MIS, area under irrigation and information on cost of cultivation for Cotton and Groundnut crop were collected with the help of personal interview of farmers and dealers using well-structured questionnaires given in Annexure-I and Annexure-II. The other information required for the study regarding company and its product was collected directly from the company.

3.3.2 Secondary Data

The secondary data and other relevant information included area under MIS, district wise net grow area, crop group wise area covered under MIS, category wise farmers area covered under MIS and district wise area covered under MIS in Gujarat state were collected for the study were gathered from the Gujarat Green Revolution Company, Government Agricultural Department, journal, annual report etc.

3.4 STATISTICAL ANALYSIS

The simple tabular analysis, percentage, graphical, frequency distribution and Garrett’s ranking technique was used for analysis of promotional activity preferred by farmers and dealers, expectations from company, and reason for change in area under MIS graphical presentation was used for interpretation of results. In addition following statistical tools were also used.
3.4.1 Garrett’s Ranking Method

The Garrett’s ranking technique was used to identify the market promotional activities preferred by farmers and dealers, as well as farmers and dealers expectations from the company and the reasons for change in area under MIS. (Kumar and Kumar, 2008)

The ranking was calculated through the following formula.

\[
\text{Per cent position} = \frac{100 \times (R_{ij} - 0.5)}{N_j}
\]

Where,

\( R_{ij} \) = Rank given to the \( i^{th} \) attribute by the \( j^{th} \) individual
\( N_j \) = Number of attributes ranked by the \( j^{th} \) individual

By referring to the Garrett’s table, the per cent positions estimated were converted into scores. Thus for each factor the scores of the various respondents were added and then mean values were estimated. The attributes with the highest value was considered as the most important one and the other followed in order.

3.4.2 Regression Model

A linear multiple regression model was used to predict the influence of independent variable (\( X \)) age of farmer (\( X_1 \)), cost of MIS (\( X_2 \)), land holding (\( X_3 \)), Quality (\( X_4 \)), area under irrigation (\( X_5 \)), education level (\( X_6 \)), annual income (\( X_7 \)) and brand image (\( X_8 \)), on the depended variable (\( Y \)), i.e. the factors affecting the adoption of area under MIS. The formula are as follows (Karunia et al, 2013).

\[
Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + U
\]

Where,

\( Y \) = Area under MIS (ha.)
\( B_0 \) = Intercept
\( B_1 \) to \( B_8 \) = Coefficient to be estimated
\( X_1 \) = Age of farmer (year)
\( X_2 \) = Cost of MIS (Rs./ha)
\( X_3 \) = Land holding (Rs./ha)
\( X_4 \) = Quality (scale)
\( X_5 \) = Area under irrigation (ha)
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\[ X_6 = \text{Education level (Year)} \]
\[ X_7 = \text{Annual Income (Rs./annum)} \]
\[ X_8 = \text{Brand image (Scale)} \]
\[ U = \text{Error term} \]

The variable \( X_4 \) and \( X_8 \) was measured using four point continuous scales. It is variable is not qualitative measure, it is four point continues scales measure in farmers satisfaction in quality and brand image of the adoption of MIS.

\[ \text{i.e., 4- Highly satisfied} \quad 2- \text{Moderately satisfied} \]
\[ \quad 3- \text{Satisfied} \quad 1- \text{Not at all satisfied} \]

The influence of independent variable on the dependent variable was evaluated using the value of \( R^2 \). If the value of \( R^2 \) is closed to 100 per cent then all the independent variable contribute to almost all the information needed to predict the depended variable. The simultaneous influence of Age of farmer \( (X_1) \), Cost of MIS \( (X_2) \), Land holding \( (X_3) \), Quality \( (X_4) \), Area under irrigation \( (X_5) \), Education level \( (X_6) \), Annual Income \( (X_7) \) and Brand image \( (X_8) \) on area under MIS \( (Y) \) was tested using F-test at 1 per cent level of significance. The partial influence of each of the eight independent variable on area under MIS was tested using T-test 1 per cent level of significance.

3.4.3 Economics of Micro-Irrigation

The concepts of cost of cultivation was used to assess the economics of MIS for various farmer group. The cost of cultivation of MIS farming compares with non MIS farming for cotton and groundnut crop for the year 2015-16. The technique of simple average, weighted average and tabular analysis were adopted for identifying and comparing the cost structure, price, output and net profit of the selected farmers according to their size of holding and for the district as a whole.

The cost concept that have been used in farm management studied such as cost-A, cost-B and cost-C were followed in the analysis. The input items including for variable cost concept are as under:
Small farmer: Farm holding size up to 2.00 ha have been treated as small farmers.

Medium farmer: Farm holding size from 2.01 to 4.00 ha have been treated as medium farmers.

Large farmer: Farm holding size above 4.01 ha have been treated as large farmers.

Concepts of cost of cultivation

Cost A\textsubscript{1}: Cost A\textsubscript{1} includes:
- Value of hired human labour
- Value of owned and hired bullock labour
- Value of owned and hired machine labour
- Value of owned and purchased seed
- Value of owned and purchased manures
- Value of fertilizers and pesticides
- Depreciation on farm implements, farm buildings etc.
- Irrigation charges
- Interest on working capital
- Other miscellaneous expenses.

Cost A\textsubscript{2}: Cost A\textsubscript{1} + Rent paid for the leased-in land.

Cost B\textsubscript{1}: Cost A\textsubscript{1} + Interest on the value of owned capital assets (excluding land).

Cost B\textsubscript{2}: Cost A\textsubscript{1} + Rent paid for the leased-in land + Rental value of the owned land (net of land revenue).

Cost C\textsubscript{1}: Cost B\textsubscript{1} + Imputed value of family labour.

Cost C\textsubscript{2}: Cost B\textsubscript{2} + Imputed value of family labour.

Concepts of income

Gross income: Synonymous with value of output (Gross income is the amount that a farm business earns from the sale product. included both main product and by product income)

Farm business income: Gross Income – Cost A\textsubscript{2} (Farm business income represented return to the farmers land, family labour, fixed capital and management. It is calculated by deducting the cost A\textsubscript{1} or A\textsubscript{2}, as the case may be, from the gross return.)
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**Family labour income:** Gross Income – Cost B₂ (Family labour income gives the return to the family labour and management of the crop enterprise. Which is arrived at by deducting cost B₂ from gross return.)

**Net income:** Gross Income – Cost C₂. (Net income indicates the profit or loss from farm business. It is the residual of gross income after deducting total cost viz., C₂ from it.)

**Farm investment income:** Net Income + Rental value of own land + interest on owned fixed capital. (Farm investment income represents income retained with the farmer for their investment and it comprises the rental value of own land, interest on own fixed capital, and return to the management.)

The standard concepts of costs and returns from farming as used in the Farm Management Studies (FMS) sponsored by the Directorate of Economics and Statistics, Ministry of Agriculture, have been adopted in the present study. The results and the perceptions of farmers on various issues relating to organic farming are presented (Sudheer, 2013).

### 3.4.4 Total investment cost for micro-irrigation

The following equation used to examine the total investment cost of micro-irrigation system (Maheta, 2003).

\[
A_t = P \left( \frac{i(1+i)^n}{(1+i)^n-1} \right)
\]

Where,

- \( i \) = interest rate in decimal
- \( n \) = number of year
- \( P \) = present cost of MIS in Rs.
- \( A_t \) = annual installment to be paid in Rs.