CHAPTER - 3

RESEARCH METHODOLOGY

This chapter on research methodology is of great significance as it forms the basis for processing the research problems and analyzing the data with the application of suitable research methods and techniques. The statistical tools used for the data analysis are explained in this chapter. It also describes the scope, sample and sampling design, data collection methods, and limitations of the study.

Scope of the Study

The present study appraises the working and performance of MARKFED and HAFED operating in the states of Punjab and Haryana respectively. It attempts to intensively examine and compare the various aspects of growth, supply, procurement, marketing and financial performance of MARKFED and HAFED. The study also assesses the opinion of the farmers and employees of these organizations with respect to the working and functioning of the MARKFED and HAFED.

Sample and Sampling Design

One of the main objectives of the study has been to assess the perception of farmers regarding the working of MARKFED and HAFED. For this purpose, a sample of 200 farmers, i.e., 100 each from both these selected institutions was taken. For collection of data from the farmers, four districts have been selected from the two respective states on the basis of highest number of co-operative marketing societies. Amritsar, Ludhiana, Ferozepur and Jalandhar districts were selected from the Punjab state, while Hisar, Sirsa, Ambala and Kurukshetra districts were selected from the state of Haryana. One member society was chosen from each selected district on the basis of convenient sampling method. For the purpose of survey, 25 member farmers were selected from each selected society through convenient sampling method. The selected farmers were
interviewed with the help of pre-tested questionnaire at the mandis and society offices.

Another objective of the study is to analyze the opinion of employees from MARKFED and HAFED regarding the functioning of these institutions. For collection of data from the employees, five districts each were selected from the two respective states on the basis of highest number of co-operative marketing societies. Amritsar, Ludhiana, Ferozepur, Jalandhar and Sangrur districts were selected from the Punjab state; and Hisar, Sirsa, Ambala, Kurukshetra and Karnal districts were selected from the state of Haryana. For the purpose of survey, 20 employees from the respective head offices and 60 employees from the selected five district offices (taking 12 from each) were selected on the basis of convenient sampling method. The employees surveyed were of the rank of district managers, managers, senior assistants, accountants and field officers. The selected employees were interviewed with the help of a pre-tested questionnaire at their workplace.

**Data Collection**

For the purpose of this study, two sets of data have been collected. One set of data has been collected from secondary sources which include the annual reports and annual accounts of the selected institutions; Statistical Abstracts of Punjab and Haryana; Indian Cooperative Movement: A Statistical Profile–2012; Annexure of Report of the High Powered Committee on Cooperatives; Ministry of Agriculture Government of India; other government reports and publications; and other related websites. The secondary data pertains to the period 2000-01 to 2011-12.

The second set of data is primary data, which has been collected from the farmers and employees of the two federations with the help of questionnaires. The existing literature on marketing co-operatives was reviewed to develop the questionnaires; and many experts in the field
of co-operative marketing were contacted. The observations were made during visits to these federations and their district offices after having discussions with the employees and farmers of the respective federations which helped in the preparation of questionnaires. The preliminary drafts of the questionnaires were tested on equal number of farmers and employees, i.e., 20 (10 each from both the selected federations). This helped in improving the questionnaires; and also gave an indication about the kind of responses that would be forthcoming. With a few deletions and additions, the final questionnaires were developed. (Appendix 1 and 2).

The questionnaire for the farmers contains questions relating to the membership of societies, procurement of agricultural produce, products availability, additional services provided, opinion regarding various statements and the federation, and the overall satisfaction level regarding the societies and the federation. The questionnaire for the employees contains questions relating to opinion of the employees regarding achievement of objectives of federation, human resource practices, procurement and warehousing activity, plants activity, input activity and marketing activity, and overall satisfaction level regarding the functioning of the federation. Further, an endeavour has also been made to study the working and performance of MARKFED and HAFED in depth. For this purpose, the head offices, district offices, mandis and marketing society offices were visited a number of times. The discussions with the farmers, the employees of federations under study, the societies and the observations made thereof helped in collecting important information relevant for the present study.

Data Analysis

For the purpose of this study, the primary data as well as the secondary data has been analyzed from different perspectives using respective tools and techniques.
a) Primary Data

For the purpose of analysis of primary data collected through questionnaires, various tools including One-Sample Kolmogorov-Smirnov Test, simple percentage, Chi-square Test, Mann-Whitney Test and Kruskall Wallis Test have been used. Correlation analysis and regression analysis have been carried out to assess the relationship between agreement level/satisfaction level and overall satisfaction level. Further, the responses of the farmers and employees have been classified and presented in a tabular form, both in numbers and percentages. The satisfaction level and agreement level of the respondents was ascertained on a five-point Likert scale. The reliability and validity of the agreement level and satisfaction level statements have been checked through reliability analysis. A brief description of the tools used for the analysis of primary data are as follows:-

1. **One-Sample Kolmogorov-Smirnov Test (K–S Test):** The Kolmogorov–Smirnov test is a non-parametric test and is used to check the normality of a variable. The variable having p-value greater than 0.05 is said to be normal.

2. **Reliability Analysis:** The reliability and validity of the responses on the opinion statements has been checked through a scale, viz. reliability analysis. The statements are considered reliable, if the value of Cronbach’s alpha coefficient is 0.70 or higher; and the statements are considered valid, if the mean value of inter-item correlation is 0.20 or higher.

3. **The Chi-square ($x^2$) Test:** It is a non-parametric test which is used to determine whether categorical data shows dependency or the two classifications are independent. It has been applied to study the differences with regard to various qualitative aspects highlighted by the respondents in the questionnaire. It has been worked out as follows:
\[ x^2 = \sum \left[ \frac{(O - E)^2}{E} \right] \]

Where, \( x^2 \) = Chi-square value

\( O \) = Observed Frequencies

\( E \) = Expected Frequencies.

**Conditions for Application of \( x^2 \) Test**

- The sample size must be reasonably large. As a general rule, \( x^2 \) test should not be used when \( N \) is less than 50, however few the cells (Gupta, 2008).

- A proper application of the chi-square test requires that the expected frequencies in each cell are not too small. When the theoretical frequencies are less than 10 or especially less than 5, the ordinary table values of \( x^2 \) are less reliable. This is especially true for one degree of freedom, it is true to a lesser extent for two or three degrees of freedom (Gupta, 2008).

4. **Average Weighted Score (AWS):** The average weighted scores have been calculated at suitable places where the respondents were asked to rank or rate different attributes relating to the working and functioning of MARKFED and HAFED. For instance, where a five-point scale was used to measure the degree of agreement/disagreement or degree of satisfaction/dissatisfaction regarding different attributes related to MARKFED and HAFED, the scale was 5 to 1. The average weighted scores have been calculated by assigning weights 5 for ‘strongly agreed’/ ‘highly satisfied’, 4 for ‘agreed’/ ‘satisfied’, 3 for ‘neither agreed nor disagreed’/ ‘neither satisfied nor dissatisfied’, 2 for ‘disagreed’/ ‘dissatisfied’ and 1 for ‘strongly disagreed’/ ‘highly dissatisfied’. Using the frequency of ratings for each attribute, average weighted scores have been calculated with the help of following formula:
AWS = Σ wf_w / Σ f_w

Where, AWS = Average weighted score

W = Weight given to an attribute

f_w = Number of respondents who attached weight to the attribute.

5. **Mann-Whitney Test (U test):** It is a non-parametric test and is used for the comparison of two independent random samples. The test is used to determine whether two independent sets of data show significant difference in the magnitude of the variable under study. The method is applied when the data set is skewed. The results reveal significant difference between the two samples when Z-value is greater than 1.96 or p-value is less than 0.05.

The following equation is used for the test:

\[ U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1 \]

Where, \( n_1 \) and \( n_2 \) = Sample sizes

\( R_1 \) = Sum of ranks assigned to the values of the first Sample

\[ Z = \frac{U - n_1 n_2 / 2}{\sqrt{n_1 n_2 (n_1 + n_2) / 12}} \]

In practice, whichever rank sum can be conveniently obtained can be taken as \( R_1 \), since it is immaterial which sample is called the first sample (Kothari, 2007).

6. **Kruskall Wallis Test (H-test):** H-test is a non-parametric method and is used for comparing more than two samples that are independent, or not related. The method is used when the data set is skewed. The results show significant difference between the samples when p-value is less than 0.05. The following equation used for the test is:
\[ H = \frac{12}{N(N+1)} \left( \frac{R_1^2}{n_1} + \frac{R_2^2}{n_2} + ... + \frac{R_k^2}{n_{kn}} \right) - 3(n+1) \]

Where, \( N = n_1 + n_2 + .....n_k \)

\( n_1, n_2,.....n_k \) are the numbers in each of \( k \) samples

\( R_1, R_2, ....R_k \) are the rank sums of each sample.

7. **Pearson Bivariate Correlation Analysis**: Correlation analysis attempts to determine the degree and direction of relationship between variables under study. The following equation has been used for the correlation analysis:

\[ r = \frac{\sum xy}{N\sigma_x \sigma_y} \]

Where, \( r \) = the correlation coefficient

\( x = (X-x); \ y = (Y-y) \)

\( \sigma_x \) = Standard deviation of series \( X \)

\( \sigma_y \) = Standard deviation of series \( Y \)

\( N \) = Number of pairs of observations.

8. **Regression Analysis**: Regression analysis attempts to determine the strength of the relationship between one dependent variable and a series of other changing variables known as independent variables. Step-wise multiple regression analysis has been used to look for different combinations of independent variables that explain variation in the dependent variable and also for eliminating some of independent variables which are not required for the purpose, as some of them being correlated with other variables don’t add any value to the regression model. The enter method of the regression analysis has also been used in the study. The following equation has been used for the regression analysis:

\[ Y = a + b_1x_1 + b_2x_2 + ........... + b_nx_n + \varepsilon \]

\( Y \) = Dependent Variable

\( a \) = constant
\( x_1, x_2, \ldots, x_n \) are independent variables.
\( b_1, b_2, \ldots, b_n \) are the coefficients of independent variables.
\( \varepsilon = \) error term.

Statistical Package for Social Science (SPSS) version 20 has been used to conduct One-Sample Kolmogorov-Smirnov Test, reliability analysis, Mann-Whitney Test, Kruskall Wallis Test, correlation analysis and regression analysis in the study.

\textbf{b) Secondary Data}

The secondary data covering a period from 2000-01 to 2011-12 has been examined. The secondary data analysis has been done as under:

The growth of MARKFED and HAFED has been studied on the basis of various indicators like members, sales turnover, own funds, investments, long-term loans and total assets. The comparative analysis of the growth of MARKFED and HAFED on selected indicators has also been done. The analysis of the data has been done by using statistical tools like average, coefficient of variation, One-Sample Kolmogorov-Smirnov Test, exponential growth rate and T-test.

The supply activities of MARKFED include the purchase procedure of inputs and sale of fertilizers by the federation. The supply activities of HAFED include its purchase procedure, sale of pesticides, certified seeds and fertilizers. The procurement activities of MARKFED examine the procurement, sale and profit related to foodgrains like wheat, paddy and cotton, whereas in the case of HAFED procurement of wheat, paddy, bajra and mustard seeds has been analyzed. The warehousing activities of the two federations have been studied on the basis of their own storage capacity including hired storage capacity and open capacity. Tools like average, coefficient of variation, exponential growth rate and percentage have been applied for the analysis. At some places line diagrams and charts have also been used for the presentation of results.
The marketing practices of MARKFED and HAFED have been studied in terms of various P’s of marketing mix, viz. product, price, place, promotion, people, process and physical evidence and other activities performed by the respective federations. Further, the processing activities of the two federations have also been evaluated by analyzing the production, sale and profits of their plants. Tools like average and coefficient of variation have been used for the analysis.

The financial analysis of MARKFED and HAFED has been done by analyzing the liquidity, solvency, turnover and profitability position of the federations. The statistical tools like ratios, Mootals comprehensive ranking test, Z-score, correlation and regression have been used for analysis. The liquidity position of the federations has been analyzed through ratios like current ratio, liquid ratio, absolute liquid ratio and liquidity ranking. Debt-equity ratio, funded debt to total capitalization ratio, proprietary ratio, fixed-assets to net-worth ratio and fixed-assets ratio have been calculated to test the solvency position of the two federations. The turnover position of the federations has been analyzed on the basis of inventory turnover ratio, debtor turnover ratio and net working capital turnover ratio. The profitability of the federations has been measured through profitability ratios like the net profit ratio, return on shareholder investment ratio and return on assets ratio. For testing relationships between profitability of the federations and the other parameters of financial efficiency, net profit ratio has been used as a dependent factor and all the other liquidity, solvency and turnover ratios have been used as independent factors. The overall financial health of MARKFED and HAFED has been studied through Z-score analysis. A chart has also been used for the presentation of results.

A brief description of statistical tools used for the analysis of secondary data is given as under:
1. **Average**: Average is a single value that represents the entire mass of data. It has been worked out as follows:

\[
\bar{X} = \frac{\sum X}{N}
\]

Where, \(\bar{X}\) = Average
\(\sum X\) = Sum of all the values of the variable \(X\)
\(N\) = Number of observations.

2. **Coefficient of Variation (C.V.)**: The coefficient of variation is used to find and compare variability in the indicators. The series for which the coefficient of variation is highest is said to be more variable and less consistent. Thus, there is an inverse relation between the coefficient of variation and consistency. It is obtained as follows:

\[
C.V. = \frac{\sigma}{\bar{X}} \times 100
\]

Where, \(C.V.\) = Coefficient of Variation
\(\sigma\) = Standard deviation of given frequency
\(\bar{X}\) = Average of given frequencies.

3. **Exponential Growth Rate**: This growth rate considers value of a variable for all the years. The exponential growth rate has been calculated by using the following exponential relationships:

\[
Y = AB^T
\]

Where, \(Y\) is the variable, for which the rate of growth is calculated; and \(T\) is the time. Taking logarithm on both the sides

\[
\log Y = \log A + T \log B
\]

By estimating this log linear relationship with the help of the least square method, rate of growth has been derived by relation.

\[
B = 1 + g
\]

Where \(g\) is the exponential growth rate

\[
And \ g = [B-1] \times 100
\]
4. **T-Test**: This test is used to determine whether two sets of data are significantly different from each other, and is most commonly applied when the test statistics follow a normal distribution. The results reveal significant difference between the two samples when p-value is less than 0.05. The following equation is used for the test:

\[
T = \frac{\bar{X} - \mu}{\sqrt{n}}
\]

Where, \( \bar{X} \) = Mean of the sample

\( \mu \) = Actual or hypothetical mean of the population

\( n \) = Sample size

\( S \) = Standard deviation of the sample.

5. **Ratio Analysis**: Ratio analysis is used to evaluate various aspects of a company’s operating and financial performance such as its liquidity, solvency, turnover and profitability. Following ratios have been calculated:

**Liquidity Ratios**

- Current Ratio = \( \frac{\text{Current Assets}}{\text{Current Liabilities}} \)
- Quick Ratio = \( \frac{\text{Liquid Assets}}{\text{Current Liabilities}} \)
- Absolute Liquid Ratio = \( \frac{\text{Cash & Bank Balances}}{\text{Current Liabilities}} \)

**Solvency Ratios**

- Debt-Equity Ratio = \( \frac{\text{Outsiders' Funds}}{\text{Shareholders' Funds}} \)
- Funded Debt to Total Capitalization Ratio = \( \frac{\text{Long-term Funds}}{\text{Capital Employed}} \times 100 \)
- Proprietary Ratio = \( \frac{\text{Shareholders' Funds}}{\text{Total Assets}} \times 100 \)
- Fixed Assets to Net-Worth Ratio = \( \frac{\text{Fixed Assets after Depreciation}}{\text{Shareholders' Funds}} \times 100 \)
- Fixed Assets Ratio = \( \frac{\text{Fixed Assets after Depreciation}}{\text{Total Long-term Funds}} \times 100 \)
**Turnover Ratios**

- Inventory Turnover Ratio = \( \frac{\text{Sales Turnover}}{\text{Average Inventory}} \)

- Debtor/Receivable Turnover Ratio = \( \frac{\text{Sales Turnover}}{\text{Average Debtors}} \)

- Net Working Capital Turnover Ratio = \( \frac{\text{Sales Turnover}}{\text{Average Net Working Capital}} \)

**Profitability Ratios**

- Net Profit Ratio = \( \frac{\text{Net Profit after Interest & Taxes}}{\text{Sales Turnover}} \times 100 \)

- Return on Shareholder = \( \frac{\text{Net Profit after interest & Taxes}}{\text{Investment}} \times 100 \times \frac{100}{\text{Shareholders’ Funds}} \)

- Return on Assets = \( \frac{\text{Net Profit after Taxes}}{\text{Average Total Assets}} \times 100 \)

6. **Motaal’s Comprehensive Ranking Test (Liquidity Ranking):** It is used to check the liquidity position of a concern. In this method, composition of current assets such as inventory to current assets ratio (ITCAR), debtors to current assets ratio (DTCAR), cash & bank to current assets ratio (CTCAR) and other assets (including loan & advances and deposits) to current assets ratio (OATCAR) are calculated and combined in a points score. In the case of DTCAR, CTCAR and OATCAR, a high value indicates relatively favourable position. So, ranking is done in that order. On the other hand, a low ITCAR shows a more favourable position, hence, ranking is done in that order. Ultimate ranking is done on the principle that the lower point scored the more favourable is the liquidity position.

7. **Z-score:** Z-score has been applied as multi-discriminant analysis for studying the financial health of the federations. It uses weighted sum of five financial ratios in calculation of Z-score. The Z-score is calculated by multiplying each of several financial ratios
by an appropriate coefficient and then summing the results. The model is defined as \( Z = 1.2(X_1) + 1.4(X_2) + 3.3(X_3) + 0.6(X_4) + 1.0(X_5) \)

where, \( X_1 = \) Net Working capital / Total Assets, \( X_2 = \) Retained Earnings / Total Assets, \( X_3 = \) Earnings before Taxes / Total Assets, \( X_4 = \) Book Value of Equity / Total Debt, and \( X_5 = \) Sales Turnover / Total Assets.

**Interpretation of Z-score Model**

<table>
<thead>
<tr>
<th>Category</th>
<th>Z-score value</th>
<th>Inference/Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Below 1.81</td>
<td>Distress Zone / Bankruptcy Zone</td>
</tr>
<tr>
<td>II</td>
<td>1.81 – 2.99</td>
<td>Grey Zone / Healthy Zone</td>
</tr>
<tr>
<td>III</td>
<td>Above 2.99</td>
<td>Safe Zone / Very Healthy Zone</td>
</tr>
</tbody>
</table>

All statistical calculations have been made by the use of Microsoft Excel; and T-test has been conducted through Statistical Package for Social Science (SPSS) version 20.

**Limitations of the Study**

Although every effort has been made to make the present study a representative in its related area, yet some limitations have been encountered which are as follows:

1. The study is based on the secondary data and the limitations of using such data may affect the results. In certain cases, data was not available.

2. Any primary data based study through a pre-designed questionnaire or through interviews suffers from the basic limitation of the possibility of difference between what is recorded and what is truth, no matter how carefully, the questionnaires have been designed, the interviews and field investigations have been conducted. The respondents may not have deliberately reported their opinion due to some biasness. However, it has been tried to minimize this error in the present study by conducting interviews personally, yet there is no full proof way of avoiding the possibility of an error creeping in from here and there.
3. The number of employee respondents in both the federations under study varied in the case of responses on activities of these federations. This variation in number was due to their knowledge regarding a particular activity.

4. Since obtaining the opinion of the farmers and the employees was not the sole objective of the study and further to make study comparable between the two federations, the sample size of the farmers and the employees was kept limited to 200 and 160 respectively.

5. Some information which might have been useful for the research was not disclosed by the selected federations due to secrecy and thus, research results are based on the available information only.

6. Certain suggestions of the study are based on the observations of the federations and discussions with the staff working in these federations. However, no systematic attempt was made to study these aspects in detail.
REFERENCES

Gupta, S.P. (2008), Statistical Methods, Sultan Chand & Sons, New Delhi, p. 959.