Chapter : 3 – Research Design
CHAPTER 3
RESEARCH DESIGN

3.1 PURPOSE:
In Western Maharashtra well-established sugar co-operatives have gone into allied industries based on their by-products. They use their by-products such as Molasses and Bagasse for Alcohol and Paper units respectively. These allied units subsequently become sick due to the underutilization of the capacity. This indicates that the decision-making regarding the diversification was not based on cost - benefit aspect.

It is also observed that there are no well-established parameters for assessing the cost-effectiveness of these sugar co-operatives. The methods used for apportioning the joint cost to the various by-products are sometimes arbitrary or sometimes no apportionment is made. The present study therefore aims at studying these aspects in detail and come out with concrete suggestions for effective decision making at the corporate level. Keeping in mind these aspects, the researcher has formulated the following objectives for the present study.

3.2 EVOLUTION OF THE OBJECTIVES OF STUDY:
The issues and gaps identified by the Researcher after the review of literature and had discussions with the President of National Federation of Sugar Co-operatives, New Delhi, Dr. M.R.Desai and with the following distinguished persons connected with the cooperative industry.

a) Senior Government Officers from the office of the Commissioner of Sugar, such as Commissioner of Sugar, Director of Sugar, Joint
Registrar-Audit Wing, Senior Auditors in the Department of Co-operation.

b) Cost Auditors who have conducted Cost Audit of Sugar Factories under the Companies Act 1956.

c) Managing Directors and Chief Accountants of several sugar co-operatives.

Besides this the Researcher had the opportunity of interaction with the Auditors and Managing Directors of leading sugar co-operatives in the capacity of the Chairman of the Committee appointed by the Government of Maharashtra in August 2003 for suggesting guidelines for the implementation of the Cost and Performance Audit in the sugar co-operatives in the State of Maharashtra.

In addition to this the Researcher had participated as a Resource Person in the Seminars and Training Programmes held in Kolhapur (2nd August 2003), in Pune (14th and 15th December 2003), Aurangabad (16th December 2003) and at Kolhapur (2nd and 3rd January 2004) for the Chief Accountants for the Co-operative Sugar Factories.

The interaction of the Researcher with all these persons and the gaps and issues identified after the literature review as mentioned above, were taken into consideration for the crystalisation of the objectives of the study.

### 3.3 OBJECTIVES OF THE STUDY

The objectives of the present study are follows.

3.3.1 To list out technical parameters for assessing effectiveness of the sugar co-operatives in Western Maharashtra
3.3.2 To study the cost structure of sugar co-operatives in Western Maharashtra.

3.3.3 To identify and assess the profitability of by-products and its implications on the overall profitability of the sugar factories.

3.3.4 To review the accounting methods used for the by-product accounting.

For studying these focused objectives, the Researcher has reached to the stage of formulating the following hypotheses guiding the direction of the study.

3.4 HYPOTHESES OF THE STUDY :-

The present study aims at testing the following hypotheses, formulated by the Researcher.

3.4.1 The growth of co-operative sugar factories is accelerated or retarded due to the Government policies.

3.4.2 For assessing the effectiveness of sugar co-operatives, existing parameters are not sufficient or they do not exist.

3.4.3 The policies of sugar co-operatives regarding by-products are affecting the overall profitability of the sugar co-operatives.

This hypothesis is sub-divided into the following sub-headings

a) The average material cost for the factories with by-products and without by-products differs.

b) The average conversion cost for the factories with by-products and without by-products differs.

c) There is significant difference in the average interest paid by the factories with by-products and without by-products.

d) There is a significant difference between average surplus of the factories with and without by-products
3.4.4 The profitability of by-products, of the sugar co-operatives are not assessed either scientifically or assessed crudely by using any thumb rule.

3.4.5 The decision-making regarding the utilization of the by-products, joint products and multi products is arbitrary and not based on the profit center concept.

3.5 REFERENCE PERIOD OF STUDY: -

In order to ensure that the study remains focused, it was necessary to decide the time frame of the study. Too short a time frame would have affected the reliability of the study. Further, too long a time frame would have resulted in a loss of the focus and difficulties in the data collection. Data related to the sugar co-operatives is not available easily as the Annual Reports and other related documents, like RT 8 Returns are not published and hence difficulties are faced in collecting these data. The annual reports of the factories contain information regarding the Profit and Loss Account and Balance Sheet besides other information regarding the by-products produced by the factories. The RT 8C returns filed by the sugar co-operatives contain information about the technical performance of the factory. Any exercise of data collection could start only after the term was operationalised. As such, it became clear that the data would have to be specifically compiled for the purpose of the study. The Researcher had identified the following relevant variables on which data has to be collected within a specified time frame.

1. Cost of material consumed
2. Conversion cost excluding interest
3. Amount of interest
4. Surplus or Losses  
5. Information about ancillary units based on by-products  
6. Technical performance  
7. Other information like sugarcane crushed, sugar produced, recovery percentage etc.

Therefore, it was necessary to arrive at a realistic time frame of the study. In view of this it was decided to fix a time frame of 4 years from the year 1998-99 to the year 2001-02 on account of the following reasons.

1. The data regarding the sugar factory especially about the financial and cost information is not available easily. After requesting to the factories, they were ready to give the data from the year 1998-99 onwards. This data was mainly in the form of the Annual Reports including the Annual Accounts. The Annual Reports were available upto the financial year 2001-02 as the Annual Accounts for the year 2002-03 were under audit at the time of the study. Therefore a time frame of four years was selected.

2. Another important reason behind the time frame of four years commencing from the year 1998-99 was that the liberalization process in case of the sugar factories commenced during this period. Sugar was partially decontrolled and the levy sugar percentage was brought down from 30% to 10%. This process of liberalization was initiated on the basis of the recommendations made by Dr. Madhavrao Godbole committee (1995) and Mahajan Committee (2001). These committees had recommended that the sugar industry should be decontrolled and be allowed more freedom for creating a level playing field to face the tough competition. In this context, the Researcher felt that it would be interesting to study the impact liberalization process brought in during
the period of study i.e. from 1998-1999 to 2000-2001 on the co-operative sugar industry.

3.6 SCOPE OF THE STUDY :-

Keeping in mind the objectives and the hypotheses of the present study, the scope of the study was confined to the following areas.

a) The by-products of the sugar industry and their implications on profitability of the sugar co-operatives.
b) Comparative Cost structure of the selected sugar factories with by-products and without by-products.
c) The rationale behind the decision making regarding the establishment of the ancillary units based on the by-products.
d) The existing parameters for measuring the cost-effectiveness of the sugar Co-Operatives.
e) The implications of the Government’s policy on the sugar co-operatives.

3.7 UNIVERSE OF AND SELECTION OF UNITS :-

3.7.1 India is a vast country and the total number of sugar factories established are 453 up to the year 2002-03\(^{(1)}\) and out of this in the State of Maharashtra, 179 sugar factories are in operation which is nearly 40 % of the total number of sugar factories in the country.

3.7.2 Out of these 179 factories, 164 are in the co-operative sector and the balance in the private sector.
3.7.3 Maharashtra also leads in the recovery percentage of sugar and also in the sugar production in the country. The following table shows the comparative position of Maharashtra with regard to total sugar production and sugar recovery.

**Table 3.1**

**SUGAR PRODUCTION AND SUGAR RECOVERY (%) IN INDIA AND IN MAHARASHTRA**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SUGAR PRODUCTION (M.T.)</th>
<th>SUGAR RECOVERY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INDIA</td>
<td>MAHARASHTRA</td>
</tr>
<tr>
<td>1997-98</td>
<td>12852</td>
<td>5239</td>
</tr>
<tr>
<td>1998-99</td>
<td>15539</td>
<td>5338</td>
</tr>
<tr>
<td>1999-00</td>
<td>18200</td>
<td>6503</td>
</tr>
<tr>
<td>2000-01</td>
<td>18511</td>
<td>6705</td>
</tr>
<tr>
<td>2001-02</td>
<td>18528</td>
<td>5613</td>
</tr>
</tbody>
</table>


In view of these facts, indicating the predominant role played by sugar co-operatives in Maharashtra the Researcher has selected this state for the present study.

3.7.4 In Maharashtra there are 164 sugar co-operatives\(^{(2)}\) as mentioned above. These sugar factories are spread over the entire breadth and length of the State. It was further observed that in the Western Maharashtra, consisting of five districts, viz. Kolhapur, Sangli, Satara, Pune and Ahmednagar, 44% of the total sugar factories in Maharashtra are situated. This shows dominance of Western Maharashtra in sugar Co-Operatives and traditionally Western Maharashtra has provided role Model in sugar Co-Operatives to the other parts of Maharashtra.
Thus it is abundantly clear that a major chunk of the sugar cooperative are situated in the Western Maharashtra. Within Western Maharashtra recovering variation also exists in two geographical areas. Three districts Kolhapur, Sangli & Satara come under High recovery Zone and the average recovery percentage in these districts in the year 2002-2003 was 12.05% as against in the remaining two districts of Pune and Ahmednagar the recovery percentage is comparatively lower. It is significant to note that the average of the entire State during this year was 11.68%.

Thus the universe of the study takes care of both types of the areas, the high recovery area and the middle recovery area.

3.7.5 Another factor which influenced the selection of universe was that Western Maharashtra is a pioneer in the co-operative movement with the first sugar factory in the co-operative sector was established in the Ahmednagar district at Pravaranagar in the year 1928. The growth in this area thereafter is quite fast and some of the most prominent sugar co-operatives are established in this area. There are factories with the highest crushing capacity of the sugarcane in this area. These factories with highest crushing capacity per day are shown in the following table.
Table 3.2
SUGAR CO-OPERATIVES WITH HIGHEST SUGARCANE CRUSHING CAPACITY PER DAY.

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Name of the factory</th>
<th>Crushing Capacity Per Day (Tones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Sahyadri co-op.sugar factory, Karad</td>
<td>7500</td>
</tr>
<tr>
<td>02</td>
<td>Shri Dutt co-op.sugar factory, Shirol Dist. Kolhapur</td>
<td>7000</td>
</tr>
</tbody>
</table>


On the basis of the above considerations it was decided that the universe of the study should be Western Maharashtra comprising of five districts, viz. Kolhapur, Sangli, Satara, Pune and Ahmednagar.

3.8 Selection of Sample

3.8.1 Control Groups:

After finalizing the universe, the next step taken was selection of the sample. Considering the constraint in the availability of the data, it was decided that the sample size should be equal to 15 % of the universe, which works out to be Ten (10). Further it was decided that the selected sample would be divided into two control groups as mentioned below.

1. Control Group I:- In this group, the factories that have set up ancillary units based on their by-products were included. In the Universe of the study, thirty five factories at present have set up ancillary units based on the by-products, \(^4\) Which is 52 % of the total factories in the universe.
2. Control Group II:- Factories who have not set up any ancillary units based on the by-products are included in this category. Thirty seven factories are without ancillary units based on by products and the percentage works out to be 48 % of the Universe.

3.8.2 Selection Criteria of the sample :-

The sample factories for indepth study were selected on the following basis.

1. Sugar factories having a crushing capacity of at least 2500 tones per day.

2. The factory should have crushing record of last 10 years.

3. The factory should have started allied units based on the by-products, multi products and joint products for the first group and those units disposing of their by-products from the second group.

3.8.3 Selection of the factories :-

The following factories were selected with the following method.

3.8.3.1 Selection Criteria :-
Since the universe contains 35 factories with by-products and 37 factories without by-products, it was decided to conduct a census survey. Accordingly a introductory letter was sent to the factories. The response for this was very poor. Hence it was decided to contact each unit personally. In this attempt 15 factories showed favourable response out of total 72.

Out of these 15, 10 factories were with by-products and 5 were without by-products. Observing the limitations of receiving data, it was decided to select a sample by purposive sampling method. The focus of the study is to analyze the implications of by-products on the profitability and hence more stress was given on control group 1, i.e. factories with by-products.
In the factories with by-products only two factories had established Paper mills and hence these two were selected. Out of 10 factories in this group, 5 factories have supplied all relevant information. The remaining factories in Control Group I have not supplied sufficient information and hence these were dropped from the study.

In Control Group II, two factories have not supplied sufficient information and hence in this group, 3 factories were selected.

Thus the sample consists of the following.

1. Factories with by-products: - 7 out of total 35 factories
2. Factories without by-products: - 3 out of total 37 factories

Total 10 factories out of 72

Thus the sample is 15% of the total universe.
The following factories were selected from control group I.

Table 3.3

FACTORIES SELECTED WITH BY PRODUCTS:- CONTROL GROUP I

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Factory</th>
<th>Crushing Capacity Per Day (Tones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Shri Dutt Shirol, Dist. Kolhapur</td>
<td>7000</td>
</tr>
<tr>
<td>02</td>
<td>Tatyasaheb Kore, Warana Dist. Kolhapur</td>
<td>5000</td>
</tr>
<tr>
<td>03</td>
<td>Vasantdada co-op.sugar Factory ltd. Sangli</td>
<td>4000</td>
</tr>
<tr>
<td>04</td>
<td>Malegaon co-op sugar Factory Ltd. Malegaon, Dist. Pune</td>
<td>4000</td>
</tr>
<tr>
<td>05</td>
<td>Krishna co-op sugar Factory Ltd., Karad, Dist. Satara</td>
<td>5000</td>
</tr>
<tr>
<td>06</td>
<td>H.Kisan Veer co-op Sugar factory Ltd. Bhuinj, Dist. Satara</td>
<td>4000</td>
</tr>
<tr>
<td>07</td>
<td>Shrigonda co-op sugar Factory ltd., Shrigonda, Dist. Ahmednagar</td>
<td>3500</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Name of the factory</td>
<td>Crushing Capacity per day (Tones)</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>01</td>
<td>Sant Tukaram co-op sugar Factory ltd, Dist. Pune</td>
<td>2500</td>
</tr>
<tr>
<td>02</td>
<td>Dudhganga Vedanta co-op sugar factory ltd, Bidri, Dist. Kolhapur</td>
<td>3500</td>
</tr>
<tr>
<td>03</td>
<td>Bhogavati co-op sugar factory ltd., Parite, Dist. Kolhapur</td>
<td>3500</td>
</tr>
</tbody>
</table>
3.9 METHOD OF DATA COLLECTION: -

The data was collected by the following method.

3.9.1 The primary data was collected by visiting the factories by the researcher and by personal discussion with various officials of the concerned co-operative factory like the Managing Director, Chief Accountant, Chief Chemist, Storekeeper etc. In few cases discussion with the Chairmen of the factories was also conducted.

3.9.2. Secondary Data used include the following.

a) Annual Reports of the selected sugar co-operatives
b) RT 8 Returns filed by the respective factories.
c) Publications of Vasantdada Sugar Institute Pune.
d) Sugar Year Book Published by Anekant Prakshan, Jaisingpur.

3.9.3 For qualitative assessment, detailed discussions were carried out with the Government Officers like the Commissioner of Sugar, Director of Sugar, Auditors of the sugar factories, Academicians and Researchers for collecting more facts about the sugar industry.

3.9.4 For the analysis of the cost structure of the sugar co-operatives, the financial data from the Annual Reports were transferred to the Cost Accounting Record format by using the Cost Accounting Record Rules (1997) as prescribed by the Ministry of Finance, Government of India. The format used is given in the Annexure I of the present study.
3.9.5 PROBLEMS AND DIFFICULTIES FACED IN THE DATA COLLECTION AND ANALYSIS: -

The basic problem faced in the data collection was regarding the information on the cost of production. The sugar co-operatives do not maintain cost accounting records and the annual reports do not contain sufficient information required for computing the cost of production.

3.10 ANALYSIS DESIGN: -

The analysis of the data was conducted by transferring the financial data in the format prescribed by the Ministry of Finance, Government of India. The available data was then tabulated for conducting the trend analysis. The data was analyzed based on following parameters -

3.10.1 Cost Structure of the sugar co-operatives was studied for conducting component wise analysis. The components shown were

a) Material Cost.

b) Conversion Cost Other than Interest.

c) Interest Cost.

The tables prepared also showed the surplus and retained earnings. This analysis was conducted for four years and for both control groups.

3.10.2 For all the sugar co-operatives under study, ratio analysis was conducted. The following ratios were calculated

a) Return on Capital Employed.

b) Return on fixed assets.

c) Current Ratio.

d) Debt-Equity Ratio.
e) Own Capital to fixed assets.
f) Inventory to sales.

3.10.3 Analysis of Profitability has been made by segregating the profits into:
a) Profits/Losses from sugar business.
b) Profits and Losses from ancillary units based on bagasse and molasses.
c) Profits and Losses from other divisions.

3.10.4 Statistical Tools For Analysis:
The following statistical tools were applied in the analysis.
A) Percentage: - Percentages give us the equal base for comparison.
B) Ratio Analysis: - In financial analysis and everywhere the ratios give relative measures from units. Hence for comparison ratios have been used.
C) Averages: - For comparison, between two groups of different components of costs and comparison for a period of four years, average is used.
D) ‘t’ Test: - For comparing whether the difference between the averages of different cost components and surplus components a ‘t’ test is being applied.
References for Chapter Three