CHAPTER-III
METHODOLOGY

This chapter deal with the methodology which comprises selection of the study area, types of data and information used, sampling techniques and tools used for analysis of data. It is divided in the following sub title

3.1 Location
3.2 Sampling Techniques
3.3 Sources of Data
3.4 Statistical Analysis

3.1 LOCATION

The city Patna is situated on the southern bank of river Ganga. The city also straddles the rivers Sone, Gandak and Punpun. The city is approximately 35 kilometres (22 m) in length and 16 to 18 kilometres (9.9 to 11.2 m) wide. Patna has a humid subtropical climate under the Koppen climate classification: with extremely hot summers from late March to early June, the monsoon season from late June to late September and chilly winter nights and foggy or sunny days from November to February. Highest temperature ever recorded was 46.6 °C (115.9 °F), in the year 1966, the lowest ever was 1.1 °C (34 °F), on 9 January 2013, and highest rainfall was 204.5 mm (8.05 in), in the year 1997. The Buddhist, Hindu, and Jain pilgrimage centres of Vaishali, Rajgir, Nalanda, Bodh Gaya, and Pawapuri are nearby and Patna city is also a sacred city for Sikhs as the tenth Sikh guru, Guru Gobind Singh, was born here. The Vaishal Patliputra Dugdh Utapadak Sahkari Sangh Ltd. is located in Phulwarisharif, Patna, Bihar.

The present study was confined to the VPDUSS (Sudha Dairy), Patna Dairy Project, Patna. Patna district was selected purposively for the study.

3.2 SAMPLING TECHNIQUE

The purposive sampling technique has been adopted for the study. From the Patna district two tehsils namely Phulwari and Danapur were selected purposively for the study. The sample was restricted to only member of the dairy cooperative for analyzing problems of member producers’. In Phulwari tehsil, Parsa village was selected purposively because the Parsa Dairy Cooperative is located in Parsa village
and member producers belong from three village i.e Nobatpur, Ibrahimpur and Parsa. Hence total 60 member producers, 20 each from the Parsa, Nobatpur and Ibrahimpur village from the Phulwari tehsil were selected for the study of problems faced by member producers.

Danapur tehsil was selected because the cooperative unit is located in that area. Total 60 customers, 20 each from the Danapur, Khagaul and Phulwarisharif town from the Danapur tehsil were selected for the study of customers’ satisfaction level towards the Sudha brand.

Fig. 3.1 Map of Patna district

Fig. 3.2 Map of tehsils of Patna district
3.3 SOURCES OF DATA

The data was collected from both primary and secondary sources.

3.3.1 Primary Data

Primary data was collected with the help of well-prepared structured questionnaires by taking the response of the consumers’ towards the Sudha brand price, quality, quantity, taste etc. for analyzing consumers’ satisfaction. The questionnaires was also used for taking the response of member producers’ regarding the breeding, feeding, management etc. related problems towards the VPDUSS Ltd for analyzing the problems of the member producers’.

3.3.2 Secondary Data

Secondary data was collected for estimation of growth, financial performance and the financial health. The secondary data was collected through government sites, annual reports of the cooperative society etc.

3.4 STATISTICAL ANALYSIS

Based on the well-structured questionnaires, interview of customers and member producers was conducted. The ratio analysis was used to find out the financial performance of the VPDUSS Ltd. and Likert scale was used to find the customer satisfaction level whereas the Garrett ranking for finding the problems of the member producers’.

3.4.1 The Growth of Sales

3.4.1.1 Compound Annual Growth Rate (CAGR)

Compound annual Growth Rate (CAGR) is a business and investing specific term for the geometric progression ratio that provides a constant rate of return over the time period. CAGR is not an accounting term, but it is often used to describe some element of the business, for example revenue, units delivered, registered users, etc. CAGR depicts that effect of volatility of periodic returns that can render arithmetic means irrelevant. It is particularly useful to compare growth rates from different data sets such as revenue growth of companies in the same industry and this method suggested by (Narayan 2017).

\[ Y = ab^t \]
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Where,

\[ Y = \text{Sale of milk products} \]
\[ a = \text{Constant/intercept} \]
\[ t = \text{Time variable} \]
\[ b = \text{Regression co-efficient} \]

- The equation can be rewritten in logarithm form as follows

\[ \log Y = \log a + t \log b \]

- The present compound annual growth rate (g) was calculated by using the relationship

\[ g = (\text{Antilog of } b - 1) \times 100 \]

Where,
\[ g = \text{compound growth rate per annum in per cent} \]

3.4.2 Evaluation of Financial Performance

(a) Net Present Value (NPV)

It is the difference between the sum of present worth of benefits and sum of present worth of cost for given discount rate. NPV was calculated on the basis of following formula (Karthick et al. 2013).

\[
\text{NPV} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1 + r)^t}
\]

Where,
\[ B_t = \text{Benefits in } t^{th} \text{ year (Rs.)} \]
\[ C_t = \text{Costs in } t^{th} \text{ year (Rs.)} \]
\[ n = \text{Number of years} \]
\[ r = \text{Discount rate (Percentage)} \]
\[ t = \text{Time period (Year)} \]

(b) Internal Rate of Return (IRR)

IRR is the discount rate the net present worth of cash flow equal to zero. The IRR was calculated on the basis of following formula (Karthick et al. 2013).
Methodology

\[
IRR = \sum_{t=1}^{n} \frac{B_t - C_t}{(1 + r)^n} = 0
\]

Where,

\(B_t\) = Benefits in \(t^{th}\) year (Rs.)

\(C_t\) = Costs in \(t^{th}\) year (Rs.)

\(n\) = Number of years

\(r\) = Discount rate (Percentage)

\(t\) = Time period (Year)

(c) Benefit-Cost Ratio

The BCR is the ratio of sum present value of benefit to sum of present value of cost for a given discount rate. The B-C ratio was calculated on the basis of following formula (Karthick et al. 2013).

\[
\text{B-C ratio} = \frac{\sum_{t=1}^{n} B_t}{\sum_{t=1}^{n} C_t}
\]

Where,

\(B_t\) = Benefits in \(t^{th}\) year (Rs.)

\(C_t\) = Costs in \(t^{th}\) year (Rs.)

\(n\) = Number of years

\(r\) = Discount rate (Percentage)

\(t\) = Time period (Year)

3.4.3 Financial Ratio Analysis

(a) Liquidity ratio: It measures the ability of firm to meet its current obligations \(i.e.\) liabilities (Pandey, 2015).

**Table 3.1 Liquidity ratios**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Formula</th>
<th>Satisfactory condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Ratio</td>
<td>(\frac{\text{Current Assets}}{\text{Current Liabilities}})</td>
<td>2:1</td>
</tr>
<tr>
<td>Quick Ratio</td>
<td>(\frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}})</td>
<td>1:1</td>
</tr>
</tbody>
</table>
(b) **Activity ratio**: It is employed to evaluate the efficiency with which the firm manages and utilizes its assets (Pandey, 2015).

**Table 3.2 Activity Ratio**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Formula</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets Turnover Ratio</td>
<td>Sales / Total Assets</td>
<td>Firm’s ability in generating sales from all financial resources</td>
</tr>
<tr>
<td>Fixed Assets Turnover Ratio</td>
<td>Sales / Net Fixed Assets</td>
<td>Firm’s ability in generating sales from fixed resources</td>
</tr>
<tr>
<td>Current Assets turnover Ratio</td>
<td>Sales / Current Assets</td>
<td>Firm’s ability in generating sales from current resources</td>
</tr>
</tbody>
</table>

(c) **Profitability ratio**: It measures the operating efficiency of the firm (Pandey, 2015).

**Table 3.3 Profitability Ratio**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Formula</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit Margin</td>
<td>Sales – Cost of goods sold / Sales</td>
<td>Reflects the efficiency with which management produces each unit of product</td>
</tr>
<tr>
<td>Net Profit Margin</td>
<td>Profit after tax / Sales</td>
<td>Ability of firm’s to turn each rupee sales into net profit</td>
</tr>
<tr>
<td>Return on Total Assets</td>
<td>EBIT * Total Assets</td>
<td>Return on investment</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>Profit after tax / Net Worth</td>
<td>Indicates how well the firm has used the resources of owner.</td>
</tr>
</tbody>
</table>

EBIT*- Earning before interest and tax
(d) **Leverage Ratio**: It evaluates the long term financial position of the firm (Pandey, 2015).

### Table 3.4 Leverage Ratio

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Formula</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt Ratio</td>
<td>Total Debt</td>
<td>Analyses long term solvency of firm</td>
</tr>
<tr>
<td></td>
<td>Net Assets</td>
<td></td>
</tr>
<tr>
<td>Debt to Equity Ratio</td>
<td>Total Debt</td>
<td>Describes lender’s contribution for each rupees of owner contribution</td>
</tr>
<tr>
<td></td>
<td>Equity</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.4.4 Forecasting the Financial Health and Long Term Viability

The first step in the determination of financial health of a company is to analyze the financial statements of the company. This provides a clear picture of how sound the business is and consequently provides a roadmap outlining the direction of the business activities. Ratio analysis is a widely used tool for financial analysis. Financial ratios are analytical tools, applied to financial data, which are used to identify positive and negative trends, strengths and weaknesses, investment attributes and other trends, which measure the viability of a company's business. Ratio analysis is a basic metric used to gauge the liquidity, profitability, activity, leverage and growth of a particular company. No single ratio calculation can provide a meaningful complete picture of a company's financial condition.

(i) **The Altman Model (Altman Z-Score)**

The Altman Z-score represents a relationship between the chances of a firm surviving or not in an economy. It is a function of several ratios weighted by coefficients. The model coefficients were originally estimated by Altman (1968) who identified a set of firms which were declared bankrupt and then collecting a matched sample of firms which had survived, with matching by industry and approximate size (assets).

Altman (1968) applied the statistical method of multiple discriminate analysis to a dataset of publicly held manufacturers and came up with parameter estimates of the model. However, the model was later re-estimated by including other datasets for private manufacturing, non-manufacturing and service companies.
In the financial sense, Z-score is the output from a credit strength test that gauges the likelihood of bankruptcy. The formula might be used to predict the probability that a firm will go bankrupt within two years.

The Z-score is used to predict corporate defaults and an easy to calculate control measure for financial distress status of companies in academic studies. The model is thus also called company failure or bankruptcy prediction model. According to the model, company's Z score is a positive function of five factors namely

1. Net working capital / Total assets
2. Retained earnings / Total assets
3. EBIT / Total assets
4. Market value of common and preferred / Book value of debt
5. Sales / Total assets.

Altman's model takes the following form

\[ Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5 \]  \hspace{1cm} \text{…………………………………………… (1)}

Where,

\[ X_1 = \text{Working capital/Total assets} \]
\[ X_2 = \text{Retained earnings/Total assets} \]
\[ X_3 = \text{Earnings before interest and taxes/Total assets} \]
\[ X_4 = \text{Market value of equity/Book value of total debt} \]
\[ X_5 = \text{Sales/Total assets} \]

According to Saikia et al. (2012), the elements of the Altman’s model ranges from 1.8 to 3.0. A firm is considered too health to fail if Altman Z-score ≥ 3; may or may not fail if Z-score is between 1.8 and 2.99 while a Z value below 1.8 indicates bankruptcy zone.

(ii) Modified Altman model

The Altman model was modified to suit the Indian business environment. It was argued that Altman (1968) only considered those firms which were listed on the stock exchange since market value of equity can only be obtained from listed firms. Altman (2000) in his research work, “Predicting Financial Distress of Companies: Revisiting the Z Score and ZETA Models,” revised his model to include firms whose stocks were not traded on the exchange by including book value of equity parameter instead of
market value of equity. The modified model that suits the Indian environment takes the following form

\[ Z = 0.717X_1 + 0.845X_2 + 3.107X_3 + 0.42X_4 + 0.995X_5 \]  

(2)

Where,

\[ X_1 = \text{Working capital/Total assets} \]
\[ X_2 = \text{Retained earnings/Total assets} \]
\[ X_3 = \text{Earnings before interest and taxes/Total assets} \]
\[ X_4 = \text{Book value of equity/Book value of total debt} \]
\[ X_5 = \text{Sales/Total assets} \]

According to the modified Z-score model, the following three situations arise,

1. If Z score is < 1.8 then the company is in the bankruptcy zone.
2. If the Z score is between 1.8 and 2.9 then it falls in the grey zone. At this stage, failure is uncertain to predict.
3. If Z score is > 2.9 then it falls in the comfort zone. This indicates good financial health of the company

(iii) Z-Score model components

(a) Working Capital/Total Assets (WC/TA)

This ratio is a good test for corporate distress. A firm with negative working capital is likely to experience problems meeting its short-term obligations because there simply is not enough current assets to cover those obligations. By contrast, a firm with significantly positive working capital rarely has trouble paying its bills.

(b) Retained Earnings/Total Assets (RE/TA)

This ratio measures the amount of reinvested earnings or losses, which reflects the extent of the company's leverage. Companies with low RE/TA are financing capital expenditure through borrowings rather than through retained earnings. Companies with high RE/TA suggest a history of profitability and the ability to stand up to a bad year of losses.

Retained earnings/total assets represents a measure of cumulative profitability reflecting the firm’s age as well as its earning power. A history of profitable operations and reduced debt is signified by firms that retain earnings or reinvest operational profits.
Low retained earnings may indicate a poor business year or reduced longevity for the firm (Anjum 2012).

(c) Earnings before Interest and Tax/Total Assets (EBIT/TA)

This is a version of return on assets (ROA), an effective way of assessing a firm's ability to squeeze profits from its assets before factors like interest and tax are deducted. Represented as earnings before interest and taxes/total assets, this ratio estimates that cash supply available for allocation to creditors, the government, and shareholders. Altman (2000) classifies the ratio as a superior measure of profitability that is better than cash flow.

(d) Market Value of Equity/ Total Liabilities (ME/TL)

This is a ratio that shows how much the company's market value would decline before liabilities exceed assets on the financial statements if a firm were to become insolvent. This ratio adds a market value dimension to the model that is not based on pure fundamentals. In other words, a durable market capitalization can be interpreted as the market's confidence in the company's solid financial position.

According to Altman (2000), market value of equity, or market capitalization, is the summation of both preferred and common stock or market value of equity/book value of total debt. The stock market, the primary estimator of a firm’s worth, suggests that price changes may foreshadow pending problems if a firm’s liabilities exceed its assets. Altman believes this ratio is a more effective financial distress predictor than net worth/total debt (book values).

(e) Sales/ Total Assets (S/TA)

This tells investors how well management handles competition and how efficiently the firm uses assets to generate sales. Failure to grow market share translates into a low or falling S/TA.

3.4.5 The Problems Faced by Member Producers

(i) Garrett ranking

Garrett’s ranking method was used to rank the problems. The respondents were asked to rank the factors that affect their smooth functioning. The order of merit thus given by the respondent was converted into ranks using the following formula suggested by
Methodology

\[ \text{Percent Position} = \frac{100(R_{ij} - 0.5)}{N_{ij}} \]

Where,

\( R_{ij} = \) Rank given for \( i^{th} \) factor by \( j^{th} \) individual.

\( N_{ij} = \) Number of factors ranked by the \( j^{th} \) individual.

By referring to the Garrett’s table, the per cent positions estimated will be converted into scores. Thus for each factor the score of the various respondents become added and then mean value will be estimated. The attributes with the highest value is considered as the most important one and other followed in order (Shashidhara, 2007).

(ii) Determinants to Garrett’s ranking

(a) Constraints related to breeding practices
- High cost in treatment of breeding related problem
- Lack of good breeding bulls
- Occasional availability of semen at the AI centres
- High cost of cross-bred cow

(b) Constraints related to feeding practices
- High cost of feed ingredients
- Lack of knowledge about preparation and feeding of concentrates
- Lack of awareness about the treatment of poor quality straw to improve its nutritive value
- Distant location of market for purchasing concentrate and mineral mixture

(c) Constraints related to management practices
- Limited resources for providing scientific housing to dairy animals
- Lack of knowledge about right time of drying off pregnant dairy animal
- Lack of knowledge about the clean milk production
- Scarcity of clean drinking water facility for dairy animals

(d) Constraints related to healthcare practices
- High cost of veterinary medicines
- Lack of knowledge regarding treatment of dairy animal diseases
- Distant location/non availability of veterinary hospitals
• Unavailability of emergency veterinary services
• Infrequent visit of veterinary staff
• Unavailability of vaccines

(e) Constraints related to fodder production practices
• Poor availability of HYV seeds for fodder cultivation
• Fodder crop get damaged due to unfavorable weather conditions
• Inadequate knowledge in fodder cultivation
• Irregular & inadequate supply of cattle feed

(f) Others
• Lack of training facilities
• Delay in payment of milk
• Low price of milk offered

3.4.6 The Customers’ Satisfaction Level

(a) Likert scale

The likert scale technique was used to identify the customer’s satisfaction level towards milk (Reena and Vadde, 2010).

A likert scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the likert-type scale, even though the two are not synonymous. The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually eight or more), and the format in which responses are scored along a range. Technically speaking, a Likert scale refers only to the consumers. When responding to a likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agrees-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item. A scale can be created as the simple sum of questionnaire responses over the full range of the scale. In so doing, Likert scaling assumes that distances on each item are equal.

A likert item is simply a statement which the respondent is asked to evaluate according to any kind of subjective or objective criteria. Generally the level of agreement or disagreement is measured. It is considered symmetric or balanced because
there are equal numbers of positive and negative positions. Likert scaling is a bipolar scaling method, measuring either positive or negative response to a statement. The items like highly satisfied, satisfied, average, dissatisfied, and highly dissatisfied.

(b) Determinants of Likert’s Scale

- Size of family member
- Occupation
- Marital status
- Quantity of milk (litre)
- Mode of milk usage (Packed branded milk/Loose raw milk/If any)
- Brand of milk the customer purchase
- Price of the milk (Rupees)
- Availability of the milk
- Problems with the leakage of the milk
- Customer preference over the products (Curd/Buttermilk/Sweets/other)
- Hygiene of the milk
- Quality of the milk
- Retail services