CHAPTER- III

DATA BASE AND METHODOLOGY

This chapter presents the broad methodological framework used in achieving the concerned objectives of the present study, “Production and Marketing of Fruits and Vegetables in Punjab-A Case Study of Patiala District”. Various sources from which data have been collected are also mentioned in this chapter.

Locale of the Study: The locale of the study is Patiala district of Punjab state. The district is selected purposively as it holds the important position in the production of total fruits and vegetables in Punjab state. It was the sixth largest producer of fruits and vegetables in Punjab state during the year 2008-09 when the study was planned.

Selection of Fruits and Vegetables: Main fruits and vegetables grown and sold in Patiala district are guava, ber, mango, jamun, litchi, kinnow and chicku. Among vegetables, the main are potato, tomato, cauliflower, cabbage, radish, peas, beans, green chillies, ladyfinger, etc. Among these fruits and vegetables, three fruits and three vegetables with largest quantities grown and sold are purposively selected for the study, which are as under:
1. **Fruits:**  
   (i) guava  
   (ii) ber and  
   (iii) mango

2. **Vegetables:**  
   (i) potato  
   (ii) tomato and  
   (iii) peas.

**Selection of Villages:** The list of villages growing fruits and vegetables around the periphery of Patiala district was prepared in consultation with Officers of Mandi Board and Deputy Director, Horticulture, Patiala. The sampled villages selected from Patiala district were Fatehpur Rajputan, Bhadurgarh, Sanaur, Asarpur, Ajraur, Ghanaur, Mandauli, Kaboolpur and Kohlemajra from which almost all of the produce of selected fruits and vegetables arrive in Patiala district markets.

**Selection of Farmers:** Firstly, the list of farmers growing fruits and vegetables in selected villages was prepared in consultation with the Officers of Market Committee and Deputy Director, Horticulture, Patiala. The number consisted of 245 who grow fruits and vegetables in selected villages. Among these, 150 farmers were selected who grow especially guava, ber and mango fruits, and potato, tomato and peas vegetables. As 47 farmers were growing selected fruit crops and 103 were engaged in the production of selected vegetables, therefore, for fruits, sample size consisted of 47 farmers and for vegetables; sample size consisted of 103 farmers.
Table 3.1
Classification of Fruit and Vegetable Growers in Selected Villages of Patiala District

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Selected Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guava</td>
<td>21</td>
</tr>
<tr>
<td>Ber</td>
<td>14</td>
</tr>
<tr>
<td>Mango</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
</tr>
<tr>
<td>Potato</td>
<td>37</td>
</tr>
<tr>
<td>Tomato</td>
<td>31</td>
</tr>
<tr>
<td>Peas</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
</tr>
<tr>
<td>Grand total of Fruits and Vegetables</td>
<td>150</td>
</tr>
</tbody>
</table>

**Source:** Field Survey, 2008-09

**Formation of Size-Group:** The information on operational size for all the farm households in the selected villages was collected from the revenue records of chosen villages for obtaining the representative size groups for the study. Then the operational area so obtained was arranged in ascending order by applying cube root frequency method (Cum. $3\sqrt{FX}$). After taking the cumulative totals, three size groups/farm categories were obtained in such a manner that each size group covered one-third of the total cumulative area. Thus, the three farm category groups were obtained, i.e., small farms (0-3 hectares), medium farms (3-5 hectares) and large farms (≥ 5 hectares).
Table 3.2  
Classification of Farm Categories

<table>
<thead>
<tr>
<th>Farm Category</th>
<th>Area (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>0-3</td>
</tr>
<tr>
<td>Medium</td>
<td>3-5</td>
</tr>
<tr>
<td>Large</td>
<td>5 and above</td>
</tr>
</tbody>
</table>

Selection of Intermediaries: A list of commission agents/wholesalers and retailers, dealing with fruits and vegetables was prepared from the Office of Market Committee, Patiala. The final sample consisted of 25 commission agents/wholesalers and 25 retailers who were randomly drawn from the above obtained list. These intermediaries were selected from large market, i.e., Patiala market.

Collection of Data: Both the primary as well as secondary data have been used to achieve the objectives of this study. For the present study, two well-designed and pre-tested questionnaires were used. One questionnaire was used to collect information from the farmers while the other from commission agents/wholesalers/ retailers. (Appendices 1& 2).

Secondary Data: The secondary data regarding total area, production, and yield of fruits and vegetables in Punjab state as well as in Patiala district were collected from different issues of Statistical Abstracts of Punjab and from Office of Punjab Agriculture Department, Chandigarh.
for the period 1981-82 to 2007-08. The data regarding market arrivals and prices were procured from Directorate of Marketing of Punjab, Chandigarh and from Market Committee of Patiala.

**Primary Data:** The primary data for the year 2008-09, in respect of fruits and vegetables were sought from producers/sellers, commission agents/wholesalers/traders and retailers. Primary data collected for the purpose pertained to family structure, operational holdings, area under fruits and vegetables, per hectare yield, marketable surplus, pattern of marketing, prices, costs of marketing, marketing difficulties, etc. The data were collected by using pre-tested schedules through the personal interview method.

For the collection of the primary data, a four-stage stratification scheme was adopted. At **the first stage**, the selection of Patiala district was made as Patiala holds an important position in the production of total fruits and vegetables in Punjab state. At **the second stage**, two markets, one small and one large, were sampled from Patiala district. For this purpose, using the criteria of market arrivals, the markets were arranged in descending order and later categorized into two categories, i.e., large and small. As Patiala market represented more or less the characteristics of a large market, it was chosen as a representative large market. The share of Patiala market in the arrival of total fruits and vegetables in Patiala district was the highest, i.e., 30 per cent during the
year 2008-09, so it was considered as a large market. Ghanaur market had the least share in the arrivals of both fruits and vegetables in Patiala district, i.e., 3 per cent in the same year, so it was chosen as a representative small market.

At the third stage, four villages from each of the markets were sampled from the list of villages growing these crops having maximum area under the crop. The sampled villages from Patiala market in the case of fruits and vegetables were Fatehpur Rajputan, Bhadurgarh, Sanaur and Asarpur as 60-70 per cent of these crops are grown in these villages. The sampled villages from Ghanaur market in the case of fruits and vegetables were Ajraur, Mandauli, Kaboolpur and Kohlemajra respectively. From these selected villages, 150 farmers growing these crops were sampled from each of the three crop area size categories. All efforts were made to collect a sample of population engaged in the production of specified crops having the maximum area under these crops. At the fourth stage, from each of the two markets, a sample of 25 commission agents/wholesalers was randomly drawn. An additional sample of 25 retailers was also utilized.

**Analytical Framework**

In order to achieve the objectives of the study, statistical techniques used in the analysis are as under:
Compound growth rates were calculated by using an exponential function to examine growth rates of area, production and yield of fruits and vegetables both at the state level and at the district level.

**Functional Form:** \( \text{Log } Y_j = \text{Log } A + (\text{Log } B) \cdot t + u \)

Where, \( Y_j \) denotes:

- \( Y_1 \) = Area under fruits and vegetables during the \( t^{th} \) year.
- \( Y_2 \) = Production of fruits and vegetables during \( t^{th} \) year.
- \( Y_3 \) = Yield of fruits and vegetables during \( t^{th} \) year.

\( t \) = time \hspace{1cm} u = \) error term.

C.G.R. = \([\text{antilog (log B)} - 1]\) \times 100

Where, C.G.R. = Compound Growth Rate

Log B = Regression Coefficient.

To calculate the marketed surplus, from the total production of all farmers (small, medium and large), their retention (gifts, family consumption, payment to the labour, etc.) was deducted.

**Marketed Surplus = Total Production – Total Retention**

Regression analysis was applied to find out whether there exists an elastic relationship between marketed surplus and production. Several log linear equations were fitted by taking the different variables at a time and dropping the other one already taken in earlier equation. For computing the parametric values, the technique of ordinary least square
method was deployed. Further, an attempt was also made to find out whether the aggregate market behaviour is simple sum total of individual market behaviours.

In absence of reliable price data over a long period, no detailed study on the arrivals and prices of fruits and vegetables was possible. One of the factors which seriously handicapped price analysis was the existence of different varieties and absence of standardization. However, the available data on arrivals and average monthly prices from the period 2004-05 to 2009-10 were subjected to time series analysis by using multiplicative model:

\[ Y = T \times S \times C \times I \]

\( Y \) = Time series data on arrivals/ prices of fruits and vegetables.

\( T \) = The time trend.

\( S \) = The seasonal variations.

\( C \) = The cyclical variations.

\( I \) = The irregular variations.

Firstly, the trend and cyclical variations were removed by dividing the actual value of arrival/price data of each month by the corresponding centered 12-month moving average and quotients were listed as ‘Percentages of Centered Moving Average’. This is presented by:

\[ \frac{T \times S \times C \times I}{T \times C} = S \times I \]
By averaging these percentages using median for each month, the irregular factors were cancelled and the average itself reflected the seasonal influence alone.

Hence the equation is:

$$ \frac{S \times I}{I} = S $$

Here S is Seasonal Index.

The steps involved in the construction of seasonal index by this method are as follows:

(i) Firstly, a series of 12-months moving totals is generated.

(ii) Then a series of 12-months moving average is generated.

(iii) Then a series of 2-months moving total is formed.

(iv) In next step centered 12-month moving averages are calculated.

(v) The next step involves the calculation of the percentages of centered 12-month moving averages. These percentages are calculated by dividing the original arrival/price data by centered 12-month moving average and multiplying the value by 100.

(vi) The percentages of centered 12-month moving averages are then arranged in month-wise form. Median is used to
average the figures given for the individual months, because it is not affected by extreme values.

(vii) The sum of 12 values so obtained is adjusted in such a way that their total becomes 1200. This adjustment is done by multiplying the median value of each month by a correction factor (K). The correction factor (K) is worked out as follows:

\[ K = \frac{1200}{S} \]

Where K is correction factor and S is sum of median values for 12 months. The final result thus obtained gives the seasonal index.

Correlation coefficients were also computed to verify the negative relationship between month-wise prices and arrivals of fruit and vegetable crops for the period 2004-05 to 2009-10.

The mode method was applied for calculating marketing margins, costs and price spreads. The marketing margins were calculated during the peak marketing periods of fruits and vegetables for the year 2008-09. The marketing margins at purchaser’s price were computed as a difference between price paid and price received by a specific agency in the marketing sequence. The percentage margins for a product at producer’s prices were computed as the ratio of the difference of the purchaser’s and producer’s prices to the producer’s prices multiplied by hundred (Bawa and Gupta 1967).
Percentage margins at producer's price = \[
\frac{\text{Consumer price} - \text{Producer price}}{\text{Producer price}} \times 100
\]

Producer’s share in consumer’s rupee is calculated by using the following formula:

\[P_s = \left( \frac{P_f}{P_c} \right) \times 100\]

\(P_s\) = Producer’s share in consumer’s rupee.
\(P_f\) = Net Price of produce received by producer/farmer.
\(P_c\) = Price of produce paid by consumer.

Other statistical techniques such as averages, percentages, etc. were used for the analysis of the primary as well as the secondary data.

**Summing-up**

To achieve the objectives of the study, data from both the primary and the secondary sources were obtained. The secondary data regarding total area, production and yield of fruits and vegetables, and arrivals and average wholesale prices were procured from various government offices/departments, research journals, etc.

However, the primary data for the year 2008-09 were collected from producers, commission agents/wholesalers, pre-harvest contractors and retailers with the help of two specially designed questionnaires. Appropriate statistical techniques/tools, i.e., time series analysis, regression analysis, correlation analysis, percentages and averages, etc. were applied to analyze the collected data.