CHAPTER III

METHODOLOGY

This chapter is devoted to the methods and procedure used in this investigation. The various aspects included in this chapter have been described with relevant details.

The present study was undertaken to study the economics of production of Teak grown on farmer’s field.

Data for the present study was collected from Yavatmal and Akola districts of Vidharbha region of Maharashtra State. The selection of districts was done purposively because of more area under Teak plantation in both the districts and familiarity of the researchers with that area. The sampling technique adopted for this study was three stage random sampling. The selection of tehsil was considered as primary unit, the villages and the farmers were secondary and tertiary units respectively.

3.1 Selection of regions

The study was undertaken in Vidarbha region of Maharashtra State.

3.1.1 Selection of district

Two districts namely Akola and Yavatmal from Vidarbha region of Maharashtra State were selected.

3.1.2 Selection of tehsil and tree growers

3.1.2.1 Selection of site

The selection of tehsil was considered as primary unit and the villages and the teak growers as secondary and tertiary units respectively.

In the first stage six tehsils from Yavatmal namely Kalam, Darvwa, Pusad, Umerkhed, Relegaon and Digras and four from Akola namely Akola, Barshitakli, Patur, Balapur were selected. In all, ten tehsils from both the districts were selected on the basis of the concentration of teak growers.

In the second stage teak growing villages from each tehsil were identified. In all, 49 villages spread over ten tehsils were selected. 17 villages from Yavatmal and 32 villages from Akola districts were selected.
3.1.2.2 Selection of teak plantation

List of teak growers from identified villages was prepared and the number of teak growers selected from each village is given in Table 1.

3.2 Sample and sampling procedure

The list of farmers who has adopted teak plantation in Akola and Yavatmal district was obtained from social forestry department of Akola and Yavatmal district. From each districts 60 farmers who has adopted teak plantation were selected. In all, 120 farmers from both the districts were selected. All these selected farmers were the respondents for the present study. The detail about the number of teak growers in Yavatmal and Akola districts is given in Table 1 and Table 2 respectively.

Table 1 : List of selected Teak growers in Yavatmal district

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Tahasil</th>
<th>Village</th>
<th>Total Number of teak growers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kalamb</td>
<td>Hiwara(Darne)</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sukali</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Darwha</td>
<td>Pulshi</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taroda</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Pusad</td>
<td>Pusad</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dhankeshwar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paltur</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Umerkhed</td>
<td>Umerkhed</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dhangoan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Takli</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vidul</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kupti</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bramangoan</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chatari</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Ralegoan</td>
<td>Ranwad</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Armudi</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Digras</td>
<td>Nimba</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>60</td>
</tr>
</tbody>
</table>
Table 2: List of selected Teak growers in Akola district

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahasil</th>
<th>Village</th>
<th>Total number of teak growers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Barshitakali</td>
<td>Kanerisarap</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wagzali</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kanshivani</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Katepurna</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Patur</td>
<td>Patur</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deolgoan</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shirla Andhare</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Janephal</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ambashi</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sasti</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nandkhed</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Channi</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khanapur</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Channi</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bhandaraj</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Balapur</td>
<td>Redhora</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Babulgoan</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Akola</td>
<td>Kumbari</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chikalgoan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sivapur</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chandur</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sisa</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kapsi</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vizora</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yelwan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goregoan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dongergoan</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maishang</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kurnkhed</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Umari</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khadki</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Washimba</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>
3.3 Development of schedule

A interview scheduled specially prepared for these purpose was used to collect the information to fulfil the objective. The scheduled questions seeking information pertaining to family members, age, education, source of income, land holding, area under teak, irrigation, planting operation and methods etc were included in part I. In part II, questions regarding adoption of recommended practices of Teak cultivation were included. In addition to this constraints faced by teak growers in adoption of teak cultivation and problems were also invited by respondents. (Annexure I).

3.4 Data collection

The data were collected by personal interview method by contacting teak growers on their farms and homes. Before actually going for data collection the respondents were convinced about importance of study. The data pertaining to research project were obtained through personal interview from the identified teak growers. Necessary help from local leaders and gramsevek was obtained in order to acquaint with the respondents for establishing better rapport.

Collected data were used for working out the cost of establishment, total cost of cultivation, resource productivity and its efficiency. This mainly included the material used and actual expenses incurred by the farmers on different items. The data regarding the use of bullock labour, family labour, inventory of livestock, farm building, farm machinery and implements were also collected from the selected teak growers.

3.5 Variables and their measurements for socio economic status

The variables selected for the study and the procedure adopted for their measurement are explained in Table 3 for the measurement of variables standardized scales were used wherever available.

The empirical measures used in the present study to know the socio economic status of the selected Teak growers are given in Table 3.
Table 3: Variables for socio economic status

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variables</th>
<th>Empirical measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>Chronological age of Teak growers</td>
</tr>
<tr>
<td>2</td>
<td>Education</td>
<td>Literate/ illiterate with formal school education by the Teak growers</td>
</tr>
<tr>
<td>3</td>
<td>Family size</td>
<td>Number of Male, Female and children’s.</td>
</tr>
<tr>
<td>4</td>
<td>Land holding</td>
<td>Number of hectares of land possessed by the Teak grower for cultivation of Teak</td>
</tr>
<tr>
<td>5</td>
<td>Area under irrigation and rainfed condition</td>
<td>Actual area under irrigation/ rainfed of the total land holding</td>
</tr>
<tr>
<td>6</td>
<td>Occupation</td>
<td>Main and subsidiary</td>
</tr>
<tr>
<td>7</td>
<td>Area under Teak plantation</td>
<td>Area occupied by Teak plantation out of total area under cultivation</td>
</tr>
<tr>
<td>8</td>
<td>Plantation age</td>
<td>Actual chronological age of Teak plantation</td>
</tr>
<tr>
<td>9</td>
<td>Planting material</td>
<td>Seedling or Stump</td>
</tr>
<tr>
<td>10</td>
<td>Planting method</td>
<td>Pit or Crow bar method</td>
</tr>
</tbody>
</table>

3.6 Analysis technique

Simple tabular analysis was carried out to workout the levels of input utilization and cost of cultivation of tree crops. The expenditure incurred by the selected farmer for growing tree crop throughout its life cycle was worked out at different cost concepts. These concepts are recently revised by the committee appointed by Government of India under the chairmanship of S. R. Sen. The details of cost concept used are given below. The cost and returns were measured in Rupees and teak volume in cubic meters.
3.6.1 Cost concept

3.6.1.1 Cost A

It is the actual paid out cost by the cultivators in the form of cash and kind. It approximates the actual expenditure incurred by the farmer. This cost includes the expenditure on following items.

i. Hired human labour [permanent / casual]
ii. Bullock labour [owned / hired]
iii. Value of manures [farm produced / purchased]
iv. Value of fertilizers
v. Value of seedlings
vii. Plant protection.
viii. Irrigation charges
ix. Depreciation
x. Interest on working capital
xi. Miscellaneous expenses

3.6.1.2 Cost B

It was calculated by adding the [interest on fixed capital and imputed rental value of owned land to the cost ‘A’]

3.6.1.3 Cost C

It is the total of direct as well as imputed costs including the imputed value of family labour. It is obtained by adding the [imputed value of family labour to Cost ‘B’]

3.7 Measurement and evaluation of different cost elements

3.7.1 Human labour

It includes both the family and hired human labour used on the farm.

The value of family human labour was evaluated at the hiring wage rates prevailing in the locality from time to time.
3.7.2 Bullock labour

Hired bullock labour was evaluated at the rates of actual charges paid for the operation and the owned bullock was charged at the hiring rates for bullock pair prevalent in the area of study.

3.7.3 Manures

In case of purchased Farm Yard Manures (FYM), it was charged at the actual price paid by the cultivator and manures prepared on own farm was evaluated at the prevailing marked rates in the locality.

3.7.4 Fertilizers

The cost of fertilizer was worked out on the basis of actual expenses paid by the farmers for purchasing it including the transportation charges.

3.7.5 Seeds

For purchased seedlings actual expenses incurred for purchasing was considered.

3.7.6 Plant protection

This included the actual costs paid for the insecticides, fungicides with hiring charges of appliances.

3.7.7 Irrigation

In case of electric motors. Electric bill actually paid by the cultivators was considered.

3.7.8 Land revenue and other cusses

It included the actual land revenue with other cases paid by the farmers for the total land holdings. The land revenue per hectare was calculated by dividing total land revenue and other cusses by the gross cropped area of the respective crop.

3.7.9 Depreciation

Depreciation on the farm implements, machinery and building was calculated by straight line method at the rate of 10 per cent of the present value of assets and the proportionate charges were considered on the basis of area under individual crop.
3.7.10 Interest on capital

The interest on working capital was charged at the rate of 10 per cent per annum for the entire growing period of crop.

3.7.11 Rental value of land

The rental value of the owned land was charged at the rates prevalent in the study area.

3.7.12 Miscellaneous charges

Items which are not included above, but actual expenses incurred were added to the miscellaneous charges.

3.8 Economic feasibility of tree crops

The project evaluation technique was used to measure the economic feasibility of tree corps. This technique measure the productivity of capital invested and for which the flows of costs and returns over the life period of the crop are required. These costs and returns or cash outflows and cash inflow from tree crops can be brought to refer to particular point of time i.e. present period by discount/compounding them.

Net present value, Benefit Cost ratio and Internal rate of return were used to examine the comparative picture of different measures of capital productivity, given by (Tripathi 2009) in growing Teak plantations.

3.8.1 Net present value

In this method, generally, the discount rate / compound rate which reflects the price of the investment funds is used to arrive at costs and returns to a common point of time. These costs are subtracted from returns to get the net present value of the project. A positive net present value indicates that the investment is worthwhile and the size of the net present value indicates how worthwhile the project is in utilizing the resource to maximize income.

\[
\text{Net present value} = \sum_{t=1}^{n} \frac{R_t - C_t}{(1+i)^t}
\]
Where,

\[ R = \text{Returns} \]
\[ C = \text{Costs} \]
\[ n = \text{Project life} \]
\[ i = \text{discount / compound rate} \]

The decision criterion are:

[i] Profitability:

If \( \text{NPV} > 0 \) Investment is worth while
\[ \text{NPV} < 0 \text{ Investment is not worth while} \]
\[ \text{NPV} = 0 \text{ Indifferent case} \]

### 3.8.2 Benefit cost ratio (B:C)

The benefit cost ratio measures the returns or benefits per unit of cost of investment using the same notations.

\[
\text{Benefit cost ratio} = \frac{\sum_{t=1}^{n} \frac{R_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}
\]

The decision criterions are:

[i] Profitability:

If \( B-C > 1 \) Investment is worth while
\[ B-C < 1 \text{ Investment is not worth while} \]
\[ B-C = 1 \text{ Indifferent case} \]

### 3.8.3 Internal rate of return (IRR)

The internal rate of return means the discount/compound rate at which the present value of returns equals that of costs. Accordingly the derived discount rate
(IRR-r) is compared with the price of the investment funds to know the worthiness of the project.

\[
\text{I.R.R.} = \sum_{t=1}^{n} \frac{R_t - C_t}{(1+i)^t} = 0
\]

solve this equation to find the value of IRR-r

[i] Profitability:

If \( r > i \) Investment is worthwhile

\( r < i \) Investment is not profitable

\( r = i \) Indifferent case

3.9 Resources productivity and resources use efficiency

To examine the productivity and efficiency of inputs used in production of different forest crops, different types of production functions were tried. Among them, double log production function was finally selected on the basis of measures of goodness of fit (R²) and significance of least square estimators.

The functional form of the selected model is presented in following equation:

\[
Y = a x^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} U_i
\]

In model ‘B’ measures the elasticity of Y with respect to X. Therefore, in this functional form, if Y depicts the yield of crop and X-the various independent variable, B measures the elasticity of crop yield (with respect to each independent variable). This elasticity is constant throughout the function, hence the alternative name of the function is “Constant Elasticity Model”.

On logarithmic transformation of the model, we get

\[
\log Y_i = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + U_i
\]

The logarithms of the variables Y and X are linearly related in the above relation, hence the name of double log or linear model.

To estimate the coefficient a and b method of OLS is applied on logarithms of the true X and Y values.
The variables of the selected model were:

\[ Y = \text{tree crop yield in rupees per farm} \]

\[ X_1 = \text{area under crop in hectare} \]

\[ X_2 = \text{human labour in days/farm} \]

\[ X_3 = \text{bullock labour in days/farm} \]

\[ X_4 = \text{value of seedlings in rupees} \]

\[ X_5 = \text{expenditure incurred on manures and fertilizers in rupees} \]

\[ X_6 = \text{irrigation charges in rupees} \]

\[ X_7 = \text{expenditure on plant protection in rupees} \]

\[ a = \text{intercept} \]

### 3.10 Estimation of Marginal Value Products

The Marginal Value Products (MVP) of the inputs were derived by taking partial derivatives of yield (Y) with respect to input concerned (Xi) at the geometric mean level of the inputs.

The steps involved are described as follows:

\[ Y = a X_1^{b_1} X_2^{b_2} \ldots \ldots X_7^{b_7} \]

Where, \( Y \) is the output in rupees and \( X_1, X_2 \ldots \ldots X_7 \) are input variables.

The partial derivatives of \( Y \) with respect to the input \( X_1 \)

\[
\frac{dy}{dx_1} = a b_1 X_1^{b_1-1} X_2^{b_2} \ldots \ldots X_7^{b_7}
\]

The marginal value product of \( X_1 \) was then obtained by substituting the corresponding geometric mean value \( X_1, X_2 \ldots \ldots X_7 \) in the above equation. Equality of MVP to factor cost ratio indicates the optimum resource use efficiency of a particular input. Deviation of MVP to factor cost ratio indicates the degree of resource use efficiency. After obtaining the ratio of MVP to factor cost, it was tested for its significance with the help of ‘t’ test as given below:
\[
\frac{\text{MVPX}_1 - \text{Price } X_1}{\text{t}} = \frac{1}{\text{S.E. of MVP } X_1}
\]

Where,

\[
\text{S.E. of MVP } X_1 = \text{AVP}^2 X_1 V(b_1)
\]

AVP refers to average value product.

3.11 Adoption

According to Rogers (1983) adoption is a decision to make full use of innovation as the best course of action available.

In present investigation adoption means the degree of actual use of recommended technologies of teak by teak growers.

The list of recommended practices of Teak cultivation was prepared on the basis of available literature and with discussion with specialist from State Forest Department and considered for studying the extent of adoption. The recommended practices considered were site selection, soil type, rainfall, temperature, land preparation, planting material, planting method, pit size, period of planting, spacing, casualty replacement, irrigation, method and frequency of irrigation, soil working, fertilizer doses, weeding, pruning, thinning and plant protection. The questions related these practices were prepared.

3.12 Constraints

In the modern English dictionary the term constraint refers to use of force to influence or prevent an action or the state or quality of being compelled to do or not to do something.

In present study, it refers to the problems faced by the farmers in adoption of recommended practices of Teak cultivation.

All the possible constraints in the Teak cultivation were listed out and were grouped in categories namely non availability of quality planting material, shortage of technical labour, lack of adequate and reliable information and guidance about Teak cultivation, lack of irrigation facilities, lack of credit facilities, lack of information about timber market, prevalence of theft, long gestation period and lack of information
about Forest law. During data collection every grower was asked about the difficulties they actually encountered in adoption of recommended practices. After obtaining the responses from the growers, the constraints were expressed in terms of percentage.