3. MATERIALS AND METHODS

Towards realizing the objectives envisaged in the chapter on introduction, the following studies were carried out at Coimbatore Forest Circle comprising of three forest divisions viz., Anamalai, Coimbatore and The Nilgiris during the period between 2002 and 2007.

1. Assessment of the nature and type of programs implemented by the FDAs
2. Quantification of the impact created by various activities of FDAs
3. Identification of factors influencing participation of tribes in FDA activities.
4. Policy options for sustainability of FDA

A. MATERIALS

The current investigation was carried out in the Coimbatore Forest Circle which consists of three FDAs viz., FDA Coimbatore (formed in Coimbatore Forest Division), FDA Anamalai (formed in Wild life Division, Pollachi) and FDA Nilgiris (formed in The Nilgiris North Forest Division). This circle is credential for its flora, fauna and other natural resources. These three FDAs have significant number of tribal population and commands higher multifarious forest developmental activities including wildlife conservation and management. The Coimbatore District has 1.58 lakh ha of forest, which constitutes 21.20 per cent of total geographical area of the district. It is higher than the percentage of forest area in the State (16.40 per cent). The forest area of the district accounts for 7.43 per cent of state forest area. This district ranks eighth among the districts in Tamil Nadu in the share of forest area. The district wise area under forests in Tamil Nadu State is given in Annexure I. Coimbatore Forest Circle (CFC) is purposively selected for the present study so that the results of this study would act as a model for conservation strategies and sustainable development of forests in other areas.
A.1. Anamalai Wild life Division (AWD)

The FDA constituted in the Anamalai Wildlife Division lies in the tract between 76°49.3' and 77° 21.4' East longitude and 10°13.2' and 10°33.31' North latitude. This division covers an area of 958 sq.km spreading over Valparai, Pollachi and Udumalpet taluks of Coimbatore district and portion of Kodaikanal taluk of Dindigul district. This wildlife division was established in the year 1971 as a sanctuary and then renamed as Indira Gandhi Wildlife Sanctuary and National Park during 1987. It included 3 segments of National Parks (declared in 1989) that is Manjampatty (7201.75 ha.), Karian Shola (503.25 ha.) and Grass Hills (3122.50 ha) and covered an area of 108 sq.km as National Park. It is one of the largest protected areas in South India at an altitudinal range of about 350m to 2600m. This division has six administrative ranges viz., Pollachi, Valparai, Ulandy, Manambolly, Udumalpet and Amaravathi (Table 1: Figure 1).

Flora and Fauna

This Anamalai Forest Division is housed with wide range of forest types from southern tropical dry deciduous to tropical wet evergreen forest. The natural occurrence of Teak (*Tectona grandis*), Vengai (*Pterocarpus marsupium*), Karumarudu, Rosewood (*Dalbergia latifolia*) and many shola species are indications of the richness of diverse species in this locality. The most important animals found are Bonnet Macaque, Lion Tailed Macaque (LTM), Slender loris, Panther, Elephant, Deers and Nilgiri thar.

Non Timber Forest Products (NTFPs)

The important NTFPs, available in this division are Tamarind (*Tamarindus indica*), Amla (*Emblica officinalis*), Kadukkai (*Terminalia chebula*), Soapnut (*Sapindus emarginatus*), Honey, Stone and Tree Mosses (*Marapasam, Lichens*) and some spices like Pepper (*Pepper nigrum*), Turmeric (*Curcuma longa*) and Cardamom (*Elattaria cardamomum*).
Tribal settlement and Composition

The Anamalai Forest Division comprised about 36 tribal settlements with 6 major communities viz., Kadars, Malasars, Malaimalasars, Erevalars Pulaiyar and Mudavars. They live in settlement situated in Valparai, Ulandy and Monamballi ranges. They are engaged in NTFP collection. Malasars and Malaimalasar are said to be the most aboriginal of the tribes. Their customs are similar to malasar and they are good NTFP collectors. Eravalars settled in Karattupatti of Amaravathy range, appear as confused lot between modernity and tradition. Pulaiyurs are the largest community and good agriculturists. Muduvars are ranked high in tribal hierarchy. Their main occupation is cultivation of lands.

A. 2. Coimbatore Forest Division (CFD)

The FDA constituted in the Coimbatore Forest Division lies in the tract between 10°37' and 11°31' North latitude and 76°39' and 77°5' East longitude. The greater parts of the division are situated in south wardly extending to Western Ghats with North Western parts forming the lower ranges of The Nilgiris. This division is bounded on the North by The Nilgiris and Sathyamangalam division, on the East by Erode division, on the South by Indira Gandhi Wildlife Sanctuary, Pollachi and on the West by Palghat forest division of Kerala State. The division consists of six territorial ranges viz., Bolampatty, Coimbatore, Periyanaikenpalayam, Karamadai, Mettupalayam and Sirumugai (Table .2: Figure 1).

Flora and Fauna

The main forest types found in the districts are (i) The southern thorn forests (ii) southern dry mixed deciduous forests (iii) the phoenix savanna, (iv) the west coast semi-evergreen forests and (v) the west tropical evergreen forests. These forests are housed with wide range of species with multipurpose utility and economically important tree species like teak, sandalwood, vengai (Pterocarpus sp) etc.,
Non Timber Forest Produce (NTFPs)

The major NTFPs grown in this Forest Division are Tamarind (*Tamarindus indica*), Amala (*Emblica officinalis*), Kadukkai (*Terminalia chebula*), Soapnut (*Sapindus emarginatus*) and Honey.

Tribal Settlement and Composition

The Coimbatore Forest Division comprised of 56 tribal settlements and the major tribal communities are Irular, Mudavar and Valayar. They speak different dialects of Tamil. These tribals commonly cultivate crops like ragi, sorghum, varagu and they live mostly with subsistence farming. The tribal communities enjoy the benefits and other rights and concessions prescribed by Forest Department.

A.3. The Nilgiris North Forest Division

The FDA constituted in the Nilgiris North Forest Division lies in the tract between the latitudes 11° 14’ 40” and 11° 36’ 50” North and longitudes 76° 31’ 50” and 77° 1’ East. This division is very unique for the grassland shola forest ecosystem with wide range of grass and tree species diversity. The major forest types found in this division are (1) Southern Montane Wet Temperate Forests; (2) Southern Sub Tropical Hill Forests and (3) Open Deciduous Scrub. The natural vegetation of the plateau and upper slopes has been considerably altered by extensive Bluegum (*Eucalyptus globulus*), Wattle (*Acacia mollisima*) and Pine (*Pinus patula*) plantations in the past and also to some extent by Government owned Tea plantations in Coonoor and Kotagiri Taluks.

This division included three terrain categories viz., (1) The Nilgiri Plateau; (2) The Segur Plateau and (3) The outer slopes. In Nilgiri plateau, the highest of the peaks is the Doddabetta which is 2635 meters above the mean sea level. The current NAP scheme is operated only in the Reserve Forests occurring in Nilagiri plateau and in the outer slopes and not in Segur plateau. The shola forests of the plateau are Ever Green Montane
Temperate Forests with short boled, slow growing trees and abundant growth of epiphytes and lianas. They play a vital role in stabilizing the water regime and regulating the water supply of the streams that feed the rivers and reservoirs of both the hilly areas and adjacent lower slopes. The shola forests are surrounded by grass lands called as Downs which were subjected to repeated fires, both incidental and intentional, in the past. In order to protect the sholas and the grass lands from fire and from indiscriminate fire wood collection, Bluegum and Wattle were planted in the grass lands and later these plantations became very important sources to meet wood and bark required for pulp wood / tan extraction industries. Currently afforestation / replanting with bluegum and wattle has been stopped and in suitable locations where existing bluegum and wattle growth is felled, reforestation with shola species is being attempted under various schemes including the current NAP scheme. The total forest area of this division is 54722.81 ha with forest boundary of 138 kilometers. There are seven territorial ranges (Table .3 : Figure 1).

Flora and Fauna

This Forest Division comprises a wide range of species and the notable among them are *Michelia nilagirica, Meliosma simplicifolia, Elaeocarpus oblongus, Elaeocarpus munroii, Litsea floribunda, Evodia lunu-ankend, Ilex wightiana* as top story species; *Turpinia nepalensis, Viburnum acuminatum, Euonymous crenulatus, Vaccinium neilgherrense, Symplacos pendula* as middle storey; *Maesa indica, Hedyotis stylosa, Alsophila latebrosa, Strobilanthes spp., Arundinaria wightiana* – Shrubs: *Lianas scandent* shrubs and other climbers. The major epiphytes grown are *Aerides ringens, Schoenorchis roseus, Eria nanna, Coelogyne nervosa, Fagraea blumei*. Besides this, the division is known for the grassland species viz., *Agrostics schmidii, Bromus diandrus, Poa gamblei, Breviypodium sylvaticum, Bromus maximus* and *Abras precatorius* (kundumani). The major wild animals found in this tract are Sambhars, spotted deers, black buck, jackal, gaur, wild dogs, bears, Nilgiris langur etc., are common. Tigers, panthers, mouse deers are rare. Common birds are the pen fowl, the crow pheasant, the small green
barbet, the red vented bulbul, the snipe, and paradise fly catcher, the golden backed wood pecker, the grey patridge, the barl owl and the hoopoe the Moyar river marsh is abundant with crocodile population.

Non Timber Forest Produce (NTFPs)

The main items of NTFP collected in this division are Tamarind, Honey, Bees, Wax, Stone and Tree Moss, Wild Pepper, Wild Ginger, Lemon Grass, Chikakai, Turmeric, Soapnut, Amla, Avaran and Konnai Bark, Ber, Gaultheria, Phoenix leaves etc. A limited number of NTFP are permitted for collection. Further collection of NTFP in Sigur and Singara ranges was stopped in 1997 itself considering the importance of bio diversity conservation in these areas.

Tribal Settlement and Composition

The principal inhabitants on the plateau are the Badagas who migrated to this district about 500 years back from Mysore territory. The indigenous populations are Todas, Kotas, Irulas, Kurumbas, Chettis and Paniyans. The hill tribes Irulas and Kurumbas are found in lower elevations of the plateau and Chettis and Paniyans are common in the Nilgiris-Waynad region.

The current study was conducted in three FDAs viz., Anamalai FDA, Coimbatore FDA and the Nilgiris FDA. These FDAs have a systematic organizational set up prescribed by the Government of India which facilitated various activities and functions of FDA. The organizational set up of FDA is depicted in Figure 2. The Figure 2 shows that the FDA administration is governed by a State Coordination Committee constituted with Chief Secretary as Chairman and Secretary to Government, Department of Environment and Forests as its Convener to monitor and evaluate the functioning of FDAs. At Circle level, the Conservator of Forests as its Chairperson and the Deputy Conservator of Forests (DFO of the concerned territorial division) is the Member Secretary and Chief Executive of the FDA. The FDAs are registered as per the Societies Registration Act, 1975 (Plate 1a, 1b and 1c).
The Joint Forest Management Committees (JFMCs) established at Territorial Forest division and Wildlife division are respectively known as Village Forest Committees (VFCs) and Eco Development Committees (EDCs) in Tamil Nadu. The Joint Forest Management Committee (VFCs / EDCs) headed by a President is elected by the members of the concerned VFC / EDC. The NAP guidelines strongly advocate that the women presidents should be in power to a level of at least 50 per cent. The VFCs / EDCs created are registered in the office of Conservator of Forests and Chairman, CFC (Plate 2a, 2b, and 2c).

**B. METHODS**

**B.1. Data Collection**

The primary data collection was done by personal interview method using a pre-tested structured interview schedule. A detailed interview schedule containing questions for obtaining the required data was prepared in consultation with experts to avoid ambiguity and redundancy in the schedule (Annexure II). Field level functionaries were also consulted before finalization of the interview schedule. The schedule was pretested and validated for survey (Plate 3).

The primary data covered the general socio-economic features of the sample tribal households, details of their asset position, land use, livestock possession and cropping pattern. The income and employment generation, extent of tribal’s participation in project activities, constraints faced in the adoption of recommended technologies, practical suggestions made by beneficiaries to improve forest management were collected and compiled during the collection of primary data.

Secondary data on the project activities like project planning and management, area coverage and concomitant development expenditures, data on the performance of various development activities such as perennial tree crops and yield performance of various improved practices that accompanied the development activities of the Programme were gathered from various reports of Tamil Nadu Forest Department,
State of Forest Report (FSI 2009) and reports of various departments, academic & research institutions and from interaction with the various stakeholders. The researcher developed rapport with the respondents before proceeding with the interview. Extensive personal interviews and focused interview with respondents were also conducted to study indigenous knowledge systems and indigenous innovations of community management of forest resources.

### B.2. Sampling Design

The details of number of VFCs and the households surveyed in respect of the above FDAs are summarized in Table .4.

In the first stage, Coimbatore Forest Circle was purposely chosen. The entire members of the selected FDAs form the universe of the study. Under each FDAs, five VFCs/EDCs which were having higher tribal population were selected in the second stage. In the third stage, under each VFCs / EDCs, the tribal households numbering 20 were randomly selected to form 300 sample households to assess the impact and the participatory mode of tribes in the developmental activities following a multi stage sampling technique (Panse and Sukhatme,1999). The distribution of sample households in each village is furnished in the Table .5.

### B.3. Analytical Techniques

The impact assessment of FDA activities on sample households required proper valuation of inputs and the outputs gained by the respondents. This in turn calls for the use of appropriate tools and techniques of mathematics, statistics and econometric models to measure the impact of implemented program on the socio economic status of the sample households in the study area. These techniques of analysis are assumed to be consistent with both, general conditions and conducive to the efficient allocation of resources.
As regards data analysis, the average technical and financial data generated through the farm models have been used to provide comparisons between 'before inception of FDA' (Ex Ante) and 'after inception of FDA' (Ex Post). The techniques used are discussed under the subsequent sub-headings.

B.3.1 Common Analytical Techniques

B.3.1.1 Percentage Analysis

Simple percentages were worked out in respect of target and achievements of FDA activities (both physical and financial) in the study area, to identify general characteristics of sample household, land use, cropping pattern, consumption expenditure, annual household income, employment generation, their social participation etc.

B.3.1.2 Measures of Central Tendency

Simple average was used to summarize in a single value as a set of data like socio-economic features, crop production, livestock activities, etc., for both ‘before’ and ‘after’ FDA inception. Arithmetic mean symbolized by $\overline{x}$ was used and the formula for the mean for the sample is as follows:

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

where,

$\overline{X} = $ sample mean,

$X_i = $ is measured value of an $i^{th}$ item

$n = $ size of the sample
B.3.1.3 Simple Mean Comparison

As our objective is to assess the tribal participation in group activities and its impact on the household welfare, simple mean comparison of key indicators is done. The different indicators such as household specific characteristics and various welfare indicators like income, consumption expenditure, social participation were compared between 2002 and 2007 among the households. As the sample households were randomly selected, a simple comparison of income and other indicators could provide unbiased estimate of the program (Rangasamy, 2000). The difference in the means of these indicators between _ex ante_ situation and _ex-post_ situation were expected to capture the impact of FDA activities on tribal household welfare.

To assess the impact, comparison of mean differences of income between two situations were performed using statistical tests. The differences in mean comparison between the two groups capture the impacts of participation.

**Test for Equality of Two Means**

\[
Z = \left[ \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \right] \sim N(0,1)
\]

is used if the two samples come from the different population.

\[
Z = \left[ \frac{\bar{x}_1 - \bar{x}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \right] \sim N(0,1)
\]

is used if the two samples have come from the same population

where \( S^2 \) = pooled variance (or) combined variance.
\[ s^2 = \left[ \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2} \right] \]

where,

- \( \bar{x}_1 \) and \( \bar{x}_2 \) are means of two samples
- \( s_1 \) and \( s_2 \) are the standard deviations of the two samples
- \( n_1 \) and \( n_2 \) are sizes of the two samples

3.1. NATURE AND TYPE OF PROGRAMS

To assess the nature and type of ongoing programs in the study FDA divisions, the government records available with the Forest Department and other associated line departments were reviewed, inventoried and reported as actual schemes implemented by the respective department.

3.2 QUANTIFICATION OF THE IMPACT OF PROGRAMS OF FDA

To study the impact of FDA on the socio-economic status of tribal households apart from common techniques described above, the following specific analytical techniques were also used.

3.2.1 Lorenz Curve

The Lorenz curve was used to study the distribution of income among the selected tribes before and after the inception of FDA (Lorenz, (1905) and Palanisami et al., (2002)). In this study, the curve relates to the cumulative proportion of household income when the units are arranged in ascending order of their income. The units may be individuals, income groups and alike, amongst which inequalities exist and sought to be measured. The inequality measure itself is described by the Gini coefficient of concentration derived from the Lorenz Curve. This was drawn to depict and analyse the income distribution of the tribal household. If each of the samples has same income, the Lorenz
Curve would coincide with the diagonal, which is also referred to as the “Line of Absolute Equality” or “Egalitarian Line”. Thus, the Lorenz Curve is a curve of actual distribution and the lines limiting the area below the diagonal is the income of absolute inequality. Accordingly the curve was drawn and presented for each FDAs.

### 3.2.2 Gini Concentration Ratio (GCR)

The inequality was measured using Gini Concentration Ratio (Palanisami et al., 2002). Its value ranged between 0 and 1. The Gini concentration ratio of ‘0’ means that every individual had equality with income. Ratio of ‘1’ would mean that it reflect inequality of the income distribution among the sample households. Thus, if the Gini coefficient is being used to describe household income inequality, then no household can have a negative income. The respondents were arranged in the order of non-decreasing income i.e., first respondent \((i = 1)\) had the least income and the last respondent \((i = n)\) had the highest income. Gini Concentration Ratio was worked out by using the following equation:

\[
G = 1 + \frac{1}{n} - \frac{2}{n^2} \sum_{i=1}^{n} i(i - 1) + 1 - \frac{1}{n} \sum_{i=1}^{n} Y_i
\]

where,

- \(G\) = Gini Concentration Ratio
- \(n\) = Number of individual respondents
- \(Y_i\) = Income realised by the \(i^{th}\) individual
- \(Z = \sum (Y_i/n)\)

### 3.2.3 Per Capita Calorie Consumption

In order to overcome the age and sex difference, the individuals constituting the family are converted into consumption units. The consumption unit per day is calculated (Table 6).
In the present study Lusk coefficients were used for standardization of household into consumption units (Rao 1983).

In order to find out the extent of under nutrition in the study area, the calorie norms of 2400 Calories per person per day for rural areas as fixed by the Planning Commission, 1993 was taken into account. The food requirements to meet out this calorie norm are presented in Table. 7.

The sample households were post stratified into three income groups based on the average annual household income during Ex-Ante situation (2002) and Ex-Post situation (2007) to find out the differences in consumption of food intake.

Ex-Ante Situation (2002)
- Group I – Less than Rs 2500 per year
- Group II – Rs 2501 to Rs 6000 per year
- Group III – More than Rs 6000 per year

Ex-Post Situation (2007)
- Group I – Less than Rs 6000 per year
- Group II – Rs 6001 to Rs 12000 per year
- Group III – More than Rs 12000 per year

3.2.4 Measurement of Poverty

Finally, in order to assess the impact of participation in NAP / FDA activities on household welfare and poverty reduction, the comparison of mean differences was employed to different indicators like expenditure on education, consumption expenditure per capita etc. For the study, two measures viz., Head Count Ratio (HCR) measuring the incidence of poverty, and Poverty Gap Index (PGI) measuring the depth of poverty, were taken into account for estimation.
3.2.4.1 Head Count Ratio (HCR)

The simplest and widely used measure of poverty is the Head Count Ratio (HCR). This is the share of the population which is poor i.e., the proportion of the population for which the consumption expenditure \( y \) is less than that of the poverty line \( z \). The HCR is defined as follows:

\[
HCR = \frac{M}{N}
\]

Where,
- \( HCR \) is the Head Count Ratio
- ‘M’ is the number of poor households
- ‘N’ is the total number of households

3.2.4.2 Poverty Gap Index

The poverty gap (PG) measure provides how far the households are from the poverty line. It could be defined as follows:

\[
PG = \frac{1}{N} \sum_{i=1}^{M} \left[ \frac{z - y_i}{z} \right]
\]

where
- PG is Poverty Gap Index,
- ‘N’ is the total number of households,
- ‘M’ is the number of poor households
- \( Z \) is the poverty line
- ‘\( y_i \)’ is the per capita consumption expenditure of \( i^{th} \) household and the sum is taken only on those households who are poor.

In order to estimate these poverty measures, the official poverty line estimates made by the Government of Tamil Nadu for the year 2002 and 2007 were used. The poverty
line for the rural Tamil Nadu was estimated as Rs.6000 per household per year before 2002 and Rs.12000 per household per year in 2007.

3.2.5 Garrett’s Scoring Technique

To analyze the constraints faced by the tribal households in crop production and livestock production, Garrett’s Scoring Technique was employed. Ranks were assigned to the scores using per cent position for each of the assigned rank by using the following formula.

\[
\text{Per cent position} = \frac{100 (R_{ij} - 0.50)}{N}
\]

Where

- \( R_{ij} \) = Rank assigned for the \( i^{th} \) category by the \( j^{th} \) respondent
- \( N \) = Number of reasons assigned by the \( j^{th} \) individual

Using the table developed by Garrett (1977), the percent positions of each rank were converted into scores. For each factor, the score of individual respondents was added together and divided by the total number of respondents for whom scores were added. The mean scores of all the factors were arranged in descending order and ranks were given. The factor having the highest mean value was considered to be the number one factor.

3.3 IDENTIFICATION OF FACTORS INFLUENCING PARTICIPATION OF TRIBES IN FDA ACTIVITIES

To study the factors influencing participation of the sample households in FDA activities apart from common techniques described above, the following analytical techniques were used.
3.3.1 Regression Analysis

The regression analysis is the main statistical tool used to obtain the estimates. It is the analysis of relationships among variables. It is one of the most widely used statistical tools because it provides a simple method for establishing a functional relationship among exogenous and endogenous variables.

3.3.1.1 Factors Influencing Quantity of Fuel Wood Collection

There are numerous factors influencing quantity of fuel wood collection. The major and possible explanatory variables which are capable of influencing the quantity of fuel wood collection were assessed, employed and only the screened variables which illustrated strong relationship with the dependant variable alone were considered and incorporated in the regression analysis. In the present study area, the tribal villages are not using kerosene and gas for their cooking purposes as one of their fuels. Hence, the availability of gas or kerosene as one of the variables influencing fuel wood collection was not included. The major explanatory variables are size of the family, number of trips carried out to collect fuelwood per annum, and distance travelled in Kms to collect fuel wood. Hence a linear type of function was fitted to the data.

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_t \]

- \( Y \) = Quantity of fuel wood collected in Kg per year per household
- \( X_1 \) = Size of the family
- \( X_2 \) = Number of trips for fuel wood collection per annum
- \( X_3 \) = Distance travelled in Kms to collect fuel wood per household per trip
- \( \beta_1, \beta_2 \) and \( \beta_3 \) are Regression Coefficients
- \( \beta_0 \) = Constant
- \( e_t \) = Error term
3.3.1.2 Factors Influencing NTFP Collection

There are numerous factors influencing collection of NTFPs. NTFP collection was expressed in monetary value which included both wage earning from the NTFP collection and profit from the sale of NTFPs. The major explanatory variables included are size of the family, distance travelled to collect NTFPs, number of man days employed per annum, the condition of the forests and the distance from the tribal village to the market. Hence a linear type of function was fitted to the data incorporating the specified variables.

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 D_1 + \beta_6 D_2 + e_t \]

- \( Y \) = Value of NTFP collected in Rs per annum per household
- \( X_1 \) = Size of the family
- \( X_2 \) = Distance travelled in Kms to collect NTFPs
- \( X_3 \) = Number of man days employed in collection of NTFP per household per annum
- \( X_4 \) = Distance from the tribal village to the market in Kms
- \( D_1 \) = Condition of the forest (as dummy variable)
  - \( D_1 = 1 \) if it is Dense Forest; 0 = Otherwise
- \( D_2 \) = Condition of the forest (as dummy variable)
  - \( D_2 = 1 \) if it is Very Dense Forest; 0 = Otherwise
- \( \beta_1, \beta_2, \beta_3, \beta_4, \beta_5 \) and \( \beta_6 \) are Regression Coefficients
- \( \beta_0 \) = Constant
- \( e_t \) = Error term

3.3.2 Participation and its Impact at Household Level

The central objective of the present study is to assess the determinants of tribal participation and to determine the impact of participation in FDA activities on socio economic status of tribal households. In order to assess their participation in FDA activities and its impacts, the following methods were employed.
3.3.2.1 Factors Influencing the Tribal Participation in FDA/VFC

The efficiency of FDA depends upon the participation of the tribals. Thus, an important research question is what factors influenced the participation of the tribes in FDA activities. For the purpose, the number of meetings attended by the women member was identified as key indicator to represent the tribal participation in group activities. To construct the Participation Index, the variables taken into consideration were (i) Awareness on the membership of VFC, (ii) Number of meetings attended, (iii) Involvement in discussions during the meetings, (iv) Attitude towards Forest Department and (v) Attitude towards VFC and involvement of households in discussions during the conduct of meetings. The variables taken into consideration to analyze its influence on the Participation Index were educational status of head of households, educational status of women in the sample households, age of the head of the households, size of the family, annual income of the households and the condition of the forests. It is argued that the meetings attended by the VFC members fairly explain the tribal participation in group activities.

The linear multiple regression model fitted was expressed as follows.

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 D_1 + \beta_7 D_2 + e_t \]

Where,

\( Y \) = Participation Index (PI)
\( X_1 \) = Education Status of the Head of the Household
\( X_2 \) = Education Status of the Woman in the Household
\( X_3 \) = Age of the Head of the Household
\( X_4 \) = Size of the Family
\( X_5 \) = Annual Income (Rs per Household per Year)
\( D_1 \) = Condition of the forest (as dummy variable)
  \( D_1 = 1 \) if it is Dense Forest; 0 = Otherwise
\( D_2 \) = Condition of the forest (as dummy variable)
  \( D_2 = 1 \) if it is Very Dense Forest; 0 = Otherwise
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and $\beta_7$ are regression coefficients.

$\beta_0 = \text{Constant}$

$e_t = \text{Error term}$

3.3.3. Measurements of Variables

3.3.3.1. Age

Age was operationally defined as “the number of years completed by the respondent at the time of the study”.

3.3.3.2. Education

Education indicated the level of formal education of the respondent, which was quantified using the procedure adopted by Karippai (1998) with slight modifications (Table 8).

3.3.3.3. Attitude Towards VFC

Attitude towards VFC was operationalised as “the degree of positive or negative effect of the member towards the group”. For measuring this a schedule of six questions to reflect positive and negative attitudes was constructed. The questions (3 positive and 3 negative) were arranged on a three point continuum (Agree, Neutral and Disagree) with a scoring pattern of 2, 1, 0 for positive and vice versa for negative. The score ranged between 0 and 2.

3.3.3.4. Attitude Towards Forest Department

This variable was operationalised as “the effect of the member towards the functioning of Forest Department”. For measuring this, a set of six questions containing both positive and negative statements arranged on a three point continuum (Agree, Neutral
and Disagree) scoring 2, 1, 0 for positive and vice versa for negative was presented for response. The total was used as the attitude towards forest department and it ranged between 0 and 2.

3.4 POLICY OPTIONS FOR SUSTAINABILITY OF FDAs

The existing guidelines and policy frame works of Ministry of Environment and Forests, Government of India and the interaction with the implementing officers of the State Forest Department and Line Departments formed the basis for recommendations of the current objective. The current study on implementation, adoption of FDA programs and activities and its impact on the socio-economic status of tribes revealed the requirement of major changes in the implementation system of FDA activities. Accordingly, policy guidelines were designed and suggested for adoption towards successful implementation of programs of FDA to restore the ecological balance in a participatory approach.