CHAPTER VIII

CONCLUSION

In this chapter, a summary of the empirical findings, policy implications and potential areas for further research has been given.

1. The study has brought out a significant dependence of the sample households on (non-commercial) fuelwood as fuel for cooking. Both in Mathur and Nallur it has been found that more than 94 per cent of the sample households use fuelwood in the form of split wood, low bulk density faggot and brushwood for cooking. This finding is confirmed by the sample survey conducted by the Tamil Nadu Forestry Wing (1992) and the Forestry Sector Study in Tamil Nadu by the Tata Economic Consultancy (1995).

2. Monthly average fuelwood consumption per household of five member size (this is the average size of the households in both the villages) varies between 156.5 and 157.28 kgs. This is more than the average of fuelwood consumption by rural households in India and particularly in Tamil Nadu as reported by the Fuel Study Committee (1979), the National Council of Applied Economic Research (1978-79) and the Sample Survey on Consumption of Fuelwood, Fodder and Green Leaf Manure (1990). The reasons for this disparity are not far to seek. The district of Pudukkottai to which the two villages belong has been declared to be one of the high fuelwood consumption districts in Tamil Nadu by the Sample Survey on Consumption of Fuelwood, Fodder and Green Leaf Manure (1990). The reasons for high consumption of fuelwood in Mathur are the abundant supply of fuelwood, particularly the ubiquitous prosopis, widespread incidence of poverty and the consequent total dependence on fuelwood for cooking.
3. The monthly per capita consumption of fuelwood by the sample households in Mathur and Nallur is in the range of 31.30 to 31.46 kgs. This is certainly more than the per capita consumption in Rural India and Rural Tamil Nadu for a household of the same size as reported by the Fuel Study Committee (1979), the National Council of Applied Economic Research (1978-79), the Sample Survey on Consumption of Fuelwood, Fodder and Green Leaf Manure in Rural Tamil Nadu (1990). As pointed out earlier, the widespread prevalence of poverty and the consequent total dependence on fuelwood are the reasons for this relatively higher per capita consumption of fuelwood.

4. In view of the high per household and per capita consumption of fuelwood per month in both the study villages, the hypothesis that the per capita consumption of fuelwood in the study villages in Pudukkottai District, considered to be a dry, backward and poor region in Tamil Nadu state is likely to be lower than the state level per capita consumption of fuelwood is rejected as invalid. Per household as well as per capita consumption of fuelwood in both the villages is higher than the average for the state as a whole for reasons specified above.

5. The study has revealed that the sample households have no complaint about fuelwood shortage. They have admitted that they have adequate supply of fuelwood in their own land, poromboke land and road margin. Even though the fuelwood available from these sources is of a poor quality they are satisfied with the same. It is evident that the sample households are not experiencing any fuel shortage. This finding is confirmed by similar findings by Mike Arnold et. al., (1987), N.C. Saxena (1995) and Kedar Baidya (1996).
In both the study villages the sample households entirely depending on fuelwood collected from poromboke and roadside lands have been found to be using fuelwood of an inferior quality like twigs, split wood, low density faggots and brushwood. As such the hypothesis that the household consumption of fuelwood is likely to be dominated by inferior types of twigs and brushwoods, generally gathered from public or common lands is accepted as valid.

In both Mathur and Nallur, it has been found that the contribution of SF plantations to the supply of fuelwood is quite insignificant. It appears from the study that some of the sample households in both the villages were allowed to collect twigs, split wood and other inferior variants after the harvest of trees. Quality fuelwood from the plantations has not trickled down to the local poor but has found a ready market in cities and towns. This finding is in conformity with the one arrived at by the Sample Survey on Consumption of Fuelwood, Fodder and Green Leaf in Rural Tamil Nadu (1990) and Kedar Baidya (1996). Hence the hypothesis that SF plantations should have contributed considerably towards fuelwood supply of the locality is rejected as invalid.

There is a significant and positive association between the size of the sample households and their fuelwood consumption per month in both Mathur and Nallur. In Mathur 96.43 per cent of the sample households with less than 5 members consume less than 150 kgs of fuelwood per month while 75.95 per cent of the households with 5 or more than five consume more than 150 kgs. In Nallur all the sample households with less than 5 members consume less than 150 kgs of fuelwood. Of the remaining 72 households with five or more members 34 are found to consume more than 150 kgs.
9 There is a significant and positive association between the annual income of the sample households and their monthly fuelwood consumption in both Mathur and Nallur.

10 In both of Mathur and Nallur, there appears to be no discernible or specific trend between the fuelwood consumption pattern of the sample households and the literacy status of their heads.

11 It has been found that irrespective occupational differences among the heads of the sample households in both the villages major proportion of the households in the various occupational categories consume less than 150 kgs per month.

12 In Mathur there is no clear-cut association between the size of the land holdings and fuelwood consumption per month. Some of the households owning holdings of less than 2.5 acres are found to have monthly consumption of fuelwood in the range of 250 kgs and above. The reasons given for this are the big size of the household and their total dependence on fuelwood. In Nallur, on the other hand, it has been found that 68.75 per cent of the households in the small farmer category consume 150 kgs or less of fuelwood per month while more than 50 percent of the households of medium and big farmers consume more than 150 kgs per month. This is contrary to the findings of the Sample Survey on Consumption of Fuelwood, Fodder and Green Leaf Manure in Rural Tamil Nadu (1990) that consumption of fuelwood by an individual household in Tamil Nadu tends to diminish with an increase in the size of their land holding. The disparity is due to the fact that the villages selected for this study are situated in a district where fuelwood consumption is higher than the state average and irrespective of their land holding status the households totally depend on fuelwood for energy.
13 In Mathur the sample households with own source of fuel have shown a tendency to consume more fuelwood than those who partly or exclusively depend on collection of fuelwood. No such association has been identified in Nallur.

14 Both in Mathur and Nallur out of the sample households engaged in the collection of fuelwood more than 63 per cent depend on both poromboke land and road margin. In both the villages fuel gathering in the lands owned by others is practically non-existent. This is because the supply of fuelwood in such land is limited and sufficient for the household which owns it. Surplus, if any, is sold by the household locally.

15 In Mathur the percentage of households depending on fuelwood gathering has been found to be significantly high (more than 75 per cent) in the households of agricultural labourers. In Nallur only 52 per cent of such households are engaged in fuel gathering. The reasons given for the disparity are smallness of the size of the household, less frequent cooking and lack of manpower for gathering of fuelwood.

16 In Mathur sample households engaged in fuelwood gathering which are big in size depend on more than one source of collection. There is no such association between the size of the sample households gathering fuelwood and the source of gathering in Nallur.

17 In both Mathur and Nallur majority of owner cultivators who gather from poromboke land and road margin collect on monthly basis while others who depend on sources such as poromboke land and roadside or both collect on weekly or fortnightly basis.
18 In Mathur 37.1 per cent of the sample households who exclusively gather fuelwood from poromboke lands collect on monthly basis and 40.7 per cent who depend on both poromboke land and roadside collect fuelwood on monthly basis. In Nallur 50 per cent of the sample households which exclusively depend on poromboke land and more than 35.6 per cent who depend on both poromboke and roadside margin are found to be in the habit of gathering fuelwood on monthly basis.

19 Both in Mathur and Nallur the number of the members of the sample households appears to have no impact on the frequency of fuel gathering. However, majority of the sample households who collect fuelwood on daily, weekly, fortnightly and monthly basis have five or less than five members.

20 The study has shown that in both the villages majority of households who collect fuelwood on weekly, fortnightly and monthly basis consume less than 150 kgs of fuelwood per month.

21 In Mathur more than 50 per cent of the households, which cook food thrice a day, prefer fuelwood gathering on weekly basis. In the case of households which cook food twice a day there is equal preference for collecting fuelwood on weekly and monthly basis. In Nallur, on the other hand, a significant proportion of the sample households which are used to cooking food thrice or twice a day, have shown equal preference to gather fuelwood on fortnightly and monthly basis.

22 In both the villages majority of households in the lower income groups prefer collection of fuelwood on weekly basis while majority of the households in the higher income groups prefer gathering fuelwood on fortnightly and monthly basis.
23 The multiple correlation test and the ANOVA table show that the association between the consumption of fuelwood per month by the sample households in Mathur (as dependant variable) and frequency of cooking per day, area of wetland owning, source of fuelwood, literacy level, size of the household, nature of occupation, area of dryland owning, frequency of fuelwood gathering and household total income (as independant variables) is found to be insignificant. Hence the hypothesis that consumption of fuelwood by rural households is a function of frequency of cooking per day, land size and its use pattern, source of fuelwood, literacy level, size of the household, occupational pattern, income level and frequency of fuelwood gathering is rejected as invalid.

24 However the multiple correlation test and the ANOVA table show that the association between the consumption per month of fuelwood by the sample households in Nallur (as dependent variable) and frequency of cooking per day, area of wetland owning, source of fuelwood, literacy level, size of the household, nature of occupation, area of dryland owning, frequency of fuelwood gathering and household total income (as independent variables) is found to be significant. Hence the hypothesis that consumption of fuelwood by rural households is a function of frequency of cooking per day, land size and its use pattern, source of fuelwood, literacy level, size of the household, occupational pattern, income level and frequency of fuelwood gathering is accepted as valid.

25 The multiple correlation tests and the ANOVA tables for both the villages have shown that the association between the frequency of fuelwood gathering by households (as dependent variable) and sources of gathering, fuelwood consumption, occupational pattern, frequency of cooking, household income and size of the household is found to be significant. Hence, the hypothesis that fuelwood gathering by rural households
is a function of sources of gathering, fuelwood consumption, occupational pattern, frequency of cooking per day, household income and the size of the household (as independent variables) is accepted as valid.

26. Majority of the households in both the villages are used to cooking food twice a day irrespective of differences in the occupation of their heads.

27. The study has revealed a positive association between frequency of cooking and monthly fuelwood consumption by the sample households in both the villages. Sample households cooking food thrice a day consume more fuelwood than those who cook twice or once a day.

28. The opportunity cost of fuelwood collection by the sample households expressed in terms of money comes to Rs. 13,275 in Mathur and Rs. 11,525 in Nallur.

29. More than 60 percent of the sample household in both the villages own livestock of different varieties. Majority of the animals of the sample households in both the villages are owned by owner cultivator households.

30. In Mathur 40 per cent of the animals owned by the sample households are milch animals and another 10 per cent draught animals. In Nallur, on the other hand, 63 per cent of the animals are goat and sheep.

31. In both the villages a significant percentage of the sample households are found to draw fodder from own as well as public land.

32. More than 48 per cent of the men in both the villages who were employed at some time or other in the SF plantation belong to scheduled castes and more than 75 per cent of the women so employed belong to the same category which
is considered to be socially and economically a down-trodden one. The number of total mandays of employment generated is 541 in Mathur and 1012 in Nallur. In Mathur the SF plantations have generated altogether 356 mandays of employment during the project period for the 16 beneficiary households belonging to scheduled caste, socially the most downtrodden section. The per household employment in this category works to 22.25 days for the whole project period. In Nallur, the SF plantations have generated 791 mandays of employment to 22 households belonging to this category. Employment generated per household in this category in this village is 36.22 mandays for the entire period. The employment generated in both the villages is not considerable. Hence the hypothesis that SF plantations should have generated considerable employment is rejected as invalid.

33 In Mathur the SF plantation has generated an income of Rs. 12,245 for the members of the sample households employed in it while in Nallur the amount so generated is Rs. 19,400. In Mathur the plantations have generated a total income of Rs. 8000 for the entire project period for the 16 beneficiary households belonging to scheduled caste. The per household income in this category during the project period is Rs. 500. In Nallur the plantations have generated an income of Rs. 9835 for the 22 scheduled caste households during the project period. The income generated per household in this category is Rs. 447.04 for the entire period. This income generated in both the villages is not considerable. Hence the hypothesis that SF plantation should have generated considerable income is rejected as invalid.

34 In both the villages more than 90 per cent of the heads of the households have shown full awareness of the location of the SF plantation in their village, the type of trees grown in it and the department which is looking after the plantation.
But only less than 38.5 per cent of the respondent were able to recollect the year in which the plantation was raised.

Out of the 4 tank foreshore plantations in Mathur only two have yielded a revenue of Rs.2,29,919.54 and Rs.95,301.50 respectively. The benefit-cost ratio works to 40.61:1 and 14.53:1 respectively. In Nallur also out of the four plantations only two have yielded a revenue total of Rs.7834.30 and Rs.1319.25 respectively.

In Mathur, the panchayat, received so far the 1,69,035 which it has spent for laying a metal road connecting the village with the Tiruchirappalli Pudukkottai Main Road and for renovating the local temple, thereby providing employment and income to a number of persons. In Nallur, however, the panchayat received so far only Rs.13,439 which it spent for purchase of electric fitting and for carrying out minor road repairs.

**FINDINGS IN A NUTSHELL**

<table>
<thead>
<tr>
<th>Findings</th>
<th>Mathur</th>
<th>Nallur</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dependence on Non-Commercial Fuelwood as fuel</td>
<td>More than 90 per cent of the Sample Households</td>
<td>More than 90 per cent of the Sample Households</td>
</tr>
<tr>
<td>2. Monthly average fuel-wood consumption by a sample household</td>
<td>156.5 kgs. (Higher than State average)</td>
<td>157.28 kgs. (Higher than State average)</td>
</tr>
<tr>
<td>3. Monthly per capita consumption of fuelwood</td>
<td>31.30 kgs. (Higher than State average)</td>
<td>31.46 kgs (Higher than State average)</td>
</tr>
<tr>
<td>4. Quality of fuelwood</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>5. Contribution of SF to supply of fuelwood</td>
<td>Marginal</td>
<td>Marginal</td>
</tr>
<tr>
<td>6. Size of sample households and their monthly fuelwood consumption</td>
<td>Significant positive association</td>
<td>Significant positive association</td>
</tr>
</tbody>
</table>

252
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Significant</th>
<th>Positive</th>
<th>Not related</th>
<th>Related</th>
<th>Just above 50 per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Annual Income of the sample households and their monthly fuelwood consumption</td>
<td>Significant</td>
<td>Positive association</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>8</td>
<td>Literacy status of the Heads of the Sample Households and Monthly fuelwood consumption</td>
<td>Not related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>9</td>
<td>Occupational pattern and Fuelwood consumption</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>10</td>
<td>Size of landholding and Fuelwood consumption</td>
<td>Not related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>11</td>
<td>Own source of fuelwood and fuelwood consumption</td>
<td>Related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>12</td>
<td>Fuelwood gathering by majority of the sample households</td>
<td>From Public land</td>
<td>From Public land</td>
<td>From Public land</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>13</td>
<td>Percentage of sample households depending on fuelwood gathering</td>
<td>Significantly high</td>
<td>Significantly high</td>
<td>Significantly high</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>14</td>
<td>Size of the sample households and sources of fuelwood gathering</td>
<td>Related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>15</td>
<td>Gathering of fuelwood by the sample households and monthly fuelwood consumption</td>
<td>Related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>16</td>
<td>Income of the sample Households and frequency of fuelwood gathering</td>
<td>Related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
<tr>
<td>17</td>
<td>Occupational pattern of sample households and frequency of cooking</td>
<td>Not related</td>
<td>Not related (Chi-square)</td>
<td>Not related (Chi-square)</td>
<td>Related</td>
<td>Just above 50 per cent</td>
</tr>
</tbody>
</table>
### Frequency of cooking of related sample households and monthly fuelwood consumption

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related opportunity cost of fuelwood gathering per household per month</td>
<td>Rs. 126.42</td>
<td>Rs. 155.74</td>
</tr>
<tr>
<td>Related major source of fodder for the livestock of sample households</td>
<td>Village common land</td>
<td>Village common land</td>
</tr>
<tr>
<td>Related employment in SF plantation (mandays per beneficiary household for the project period)</td>
<td>Not considerable</td>
<td>Not considerable</td>
</tr>
<tr>
<td>Related income generated from SF plantations per beneficiary household for the project period</td>
<td>Not considerable</td>
<td>Not considerable</td>
</tr>
<tr>
<td>Related awareness of various aspects of SF</td>
<td>Significantly high</td>
<td>Significantly high</td>
</tr>
<tr>
<td>Related benefit-cost ratio</td>
<td>40.61:1</td>
<td>14.53:1</td>
</tr>
<tr>
<td>Related share to Village panchayat in net revenue from SF plantations (RS.)</td>
<td>1,69,035</td>
<td>13,439</td>
</tr>
</tbody>
</table>

The study has brought out the fuelwood scenario in both the study villages and the role of social forestry plantations in that context. On the basis of the findings of the study the following suggestions are made which may be of use in formulating future fuel policy for the rural sector in the country:
(1) People in both the villages are using fuelwood of an inferior quality which generates lot of smoke posing the problem of health hazard to a number of women. It is suggested that the state government may supply smokeless choolas at subsidised prices to the households here. The task of installing such choolas may be entrusted to the village panchayat.

(2) Both the household consumption of fuelwood and the per capita consumption of the same in both the villages appear to be high, judged by the standards prevailing elsewhere. The government must arrange for a mass awareness campaign in the District to make people understand the value of the fuelwood and economise the use of it by improved methods of cooking. Mass campaigns, such as Mass Literacy Campaign, have yielded good dividends in this district.

(3) Even households in comparatively affluent circumstances in both the villages are consuming excess fuelwood available in their own land as well as in the village common land. Most of them own livestock. The dung collected may be used for generating gobar gas. The government with the assistance of KVIC must educate them about the value of gobar gas and must also come forward to install gas plants. It can use the services of the panchayats for this purpose.

(4) Poromboke lands and road margins are fast getting depleted of their fuelwood stock. Policy makers must take this into consideration and provide for the development of fuelwood patches which were once very popular.

(5) There are non-forest waste lands in both the villages. Steps may be taken to rehabilitate such lands as they can be used for raising fuelwood trees.

(6) Environment may be made a subject in school curriculum and students must be taught about the value of growing trees.
One of the causes for the failure of some of the plantations in both the villages is lack of public cooperation (participation). Unlike traditional forestry programme, social forestry depends mainly on people's participation. This problem may be overcome through publicity and canvassing.

The Village Panchayats must play a more significant role in promoting social forestry. They must take active part in the management of the plantations. Now that the different phases of the social forestry programme have been completed, it is suggested that the existing plantations may be handed over to the Panchayats.

The field level officials of the forest department who have put in commendable work to make the SFP a success must be duly associated in SF planning strategies. Policy makers and planners must give due weight to their suggestions in formulating a future action plan.

The mushroom growth of the prosopis plant in village common lands, though an inferior fuelwood, has been the substantial source of fuelwood for the majority of the rural (also for urban consumers) households. But this plant is found to be not agricultural crop friendly. The weed effect has a permanent adversity on crop cultivation. Some useful R & D should go into the improvising of this prosopis plant to make it a multi-purpose (with timber value as well) and farm friendly plant, with better commercial value.

The fuelwood problem in its present magnitude and proportions may wrongly lead us to be complacent over the future. The gravity of the problem in future cannot be undermined. The continued deforestation and uneconomic and unscientific use of the available fuelwood are likely to bring in adverse consequences to the posterity. The ecological balance is also likely to be vitiated beyond recovery.
The present study has confined its attention to throw light on the ramifications of the fuelwood problem in villages and the role of social forestry programmes in alleviating the same. There are other aspects of the problem and the programme which are not covered by the present study and which may form the subject matter of future studies in this area. The following are some of them:

(1) Household Energy: Supply and Demand in Rural Tamil Nadu:

Supply of and demand for Household Energy in Rural Tamil Nadu with specific reference to their relative elasticity and the growing disparity between the two and its consequences.

(2) Social Costs of Social Forestry:

Social Costs of SF with special attention on the consequences of SFP in terms of the conversion of village pasture and common land into fuelwood plantation and changes in land use and cropping pattern.

(3) Social Forestry and the Rural Poor:

SF and Rural Poor elaborating on the problems of rural poor such as fuelwood scarcity, shortage of fodder, unemployment and underemployment, and low level of income and the role which SF can play in mitigating the intensity of these problems.

(4) Social Forestry and cropping pattern:

Highlighting on changes which are likely to happen due to conversion of cultivable land into fuelwood plantation and consequent development of innovative methods like intersperse cropping.
(5) Social, Economic and Ecological Impact of Social Forestry:

The study may focus attention on the inter-relationship between these three areas.

(6) Social Forestry in Tribal Development:

The study may deal with the role which SF can play in the upliftment of the welfare of the tribal people who have been affected by deforestation.

(7) Comparative study of fuelwood consumption in villages of different socio-economic/agronomical strata

(8) The demand and supply projection of fuelwood in a select region or district.

(9) Time-series/secular trends in land-use patterns in select villages from the historical records.

(10) Marketing/price trends and their feedback on fuel economy of villages.

Rural Fuelwood crisis and Social Forestry Project is an extensive and a multi-dimensional area, of which the present study has touched only the fringe. It is hoped that future research studies in this area can take a cue from the present study and delve deep into the various dimensions of this area.