

TNPL

SOCIO ECONOMIC IMPACT ANALYSIS AT TNPL PLANTATION AREA



TNPL

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**SOCIO ECONOMIC IMPACT ASSESSMENT
AT TNPL PLANTATIONS**

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CHAPTER I

INTRODUCTION

With only two percent of the World's total forest area and 17.31 per cent of its human and 15 per cent of its cattle population, India encounters a critical disequilibrium in its natural resource pool. Half of the country's legal forest is deplorably degraded and deforestation occurs at an alarming rate of 1.5 million ha year⁻¹ till the recent past. These have ushered in not only a total mismatch between supply and demand of both domestic and industrial wood requirements but also leads to degradation of the land surface. The Indian forests have very low growing stock at 74 m³ ha⁻¹ compared to the World average of 110 m³ ha⁻¹. Similarly, the Mean Annual Increment is very low at less than 1 m³ ha⁻¹ year⁻¹ compared to the World average of 2.1 m³ha⁻¹ year⁻¹. The shortfall in forest area coupled with poor productivity resulted in dwindling supply of raw material requirements of various wood based industries. Till 1988, most of the wood based industries like pulp, paper, match and veneers are largely dependent on forest department supply. But after the National Forest Policy of 1988, forest based industries have to become self-reliance in meeting the raw material demand by establishing direct linkages with the farmers by providing lending facilities and other input needs. Substantial improvement in productivity of forest resources on sustainable basis and large scale expansion of industry linked farm forestry plantations are critically important in meeting the industrial raw material requirements besides achieving the national goal of 33 per cent forest cover.

Agriculture is the main stay of Tamil Nadu state's economy and about 60 per cent of the population depends on agricultural and allied activities for employment and livelihood. Non-agricultural income generating activities in rural areas depend on agriculture which in turn depends on two seasonal monsoons for successful crop production and therefore occurrence of regular and sufficient monsoon decides the state rural economy to a larger extent. The rural population is estimated to be 51.55 per cent in which 50 per cent of the rural work force remains under employed and facing only seasonal employment. In Tamil Nadu, vast stretches of cultivable and current fallow land are either unutilized or under-

utilized. The state accounts for nearly 3.68 lakh ha under cultivable wastelands and nearly 7.58 lakh ha under current fallows. The other fallows account for 15.18 lakh ha. The annual recurring feature of failures of monsoon brings more area of cultivable lands under the category of waste lands. These lands are exposed to uncertain monsoon leading to soil erosion, thus deteriorating and depleting the soil health status further. Before it became totally impossible these lands were planned to bring under profitable industrial wood production through farmer's participation.

Diversification of agriculture should receive high priority in South India particularly in Tamil Nadu as water resources are depleting. However, tangible results can be achieved only if the farmers are offered with practical, viable and economically attractive alternative land use options. Technology based farm forestry plantation with genetically improved, high yielding and fast growing clonal planting stock of Casuarina and Eucalyptus has tremendous potential for diversification and meeting growing shortages of industrial wood on sustainable basis. After the National Forest Policy of 1988, wood based industries started tree plantations in their lands and hired private lands. As the gap between supply of raw materials and demand for wood increased these industries have shifted their attention towards the opportunities of establishing tree plantations on farm lands. Industries have started not only in introduction of farm forestry in the private farm lands, they have started research and development works in developing new improved varieties, clones, package of practices etc. They are not only concentrated in technology advancement also they focus in technology transfer along with meeting other needs of the farmers. Now their intervention is on input supply, transfer of good package of practices, arranging harvesting and even transport of materials to the industries. This paved the way for a strong industry-farmer nexus, with many farmers attracted towards tree husbandry due to assured marketability and income.

The Tamil Nadu News Prints and Papers Limited has an installed paper production capacity of over four lakh tonnes per annum and required about 12 lakh tonnes of pulpwood annually. This requirement is met from multifarious sources like forest department supply, farm derived pulpwood and open market. To

become self –reliance in raw materials availability the firm has implemented plantation program across the state of Tamil Nadu and established over 256756 acres of plantations involving 51676 FMU's. This large scale plantation program has created significant impact on the socio economic status of rural people coupled with the plantation growers. However, systematic evaluation of socio economic impact of pulpwood plantations and the associated activities implemented by TNPL has to been done which deserves systematic evaluation and reporting to satisfy the demands from various stakeholders besides contributing towards the social responsibility of the industry. Hence the current impact analysis has been carried out by the team of M/s.Society for Social Forestry Research and Development with the following objectives.

Objectives of the Study

The specific objectives of the study are

1. To identify the TNPL plantation schemes practices prevalent among the farmers
2. To assess the costs and returns associated with Farm Forestry/Captive plantations.
3. To assess the socio-economic impact of TNPL Plantation schemes on farmers livelihood and.
4. To identify the constraints associated with establishment of tree plantations and to suggest appropriate strategies.

The study has attempted to analyze the TNPL Plantation schemes practices with respect to cost and returns. The study will also throw light on income, employment generation possibilities from tree plantations. These information will be much useful to the researcher, extension functionaries, institutions and industries involved in improving the farm forestry/Captive schemes practices among the farmers, etc.,

The study is primarily based on the field level data collected through well framed pre tested interview schedules and discussion with the farmers/institutions/contractors/labourers/local public etc., belonged to different districts of Tamil Nadu where TNPL plantation schemes were implemented. The study was carried out in five agro-climatic zones covering specific time period. As

the project has been in progress from 2004-05, keeping all these in view, the present study was conducted with specific objective to examine the socio-economic impact of various stakeholders on adopting TNPL plantation schemes and their improvement in livelihood. The various level of stakeholders are involved in this study and their views are also taken into account for analyzing and documentation.

CHAPTER II

METHODOLOGY

Any research study is valued by methodological framework and its relevance in the present day context. Hence while choosing a study problem; methodology to address the problem is very important. In this regard, a detailed discussion on selection of study area, sampling design, methods of conduct of the study, tools used for various analysis are discussed below.

2.1 Selection of the Study area

The farm forestry/captive program by TNPL is in operation in Tamil Nadu since 2004-05. The technologies generated at TNPL were taken to the fields of farmers under these plantations program. The total area under study is about 19567 Ha covering 11040 FMU's in various Districts of Tamil Nadu. Based on the list obtained, five percent proportionate sampling was carried out from majority of the districts where the TNPL Plantation schemes was implemented. These districts fall under five agro-climatic zones of Tamil Nadu as districts of hilly zones and high rain fall zones were not covered under TNPL Plantations program.

2.2 Sampling Design

In Tamil Nadu, there are Seven Agro-Climatic Zones. Among the seven Agro-climatic zones, TNPL Plantations program activities are carried out in five Agro-climatic zones. Hence all the five Agro-climatic zones were selected in Tamil Nadu in the first stage.

In each district five percent proportionate sampling was followed and all the districts where TNPL Plantations program implemented were covered. From the list, farmers were selected randomly to cover five per cent of the population. Put together, a sample of about 530 various stakeholders like farmers, workers, contractors, etc, was selected for the study to assess the socio-economic impact of farm forestry plantations.

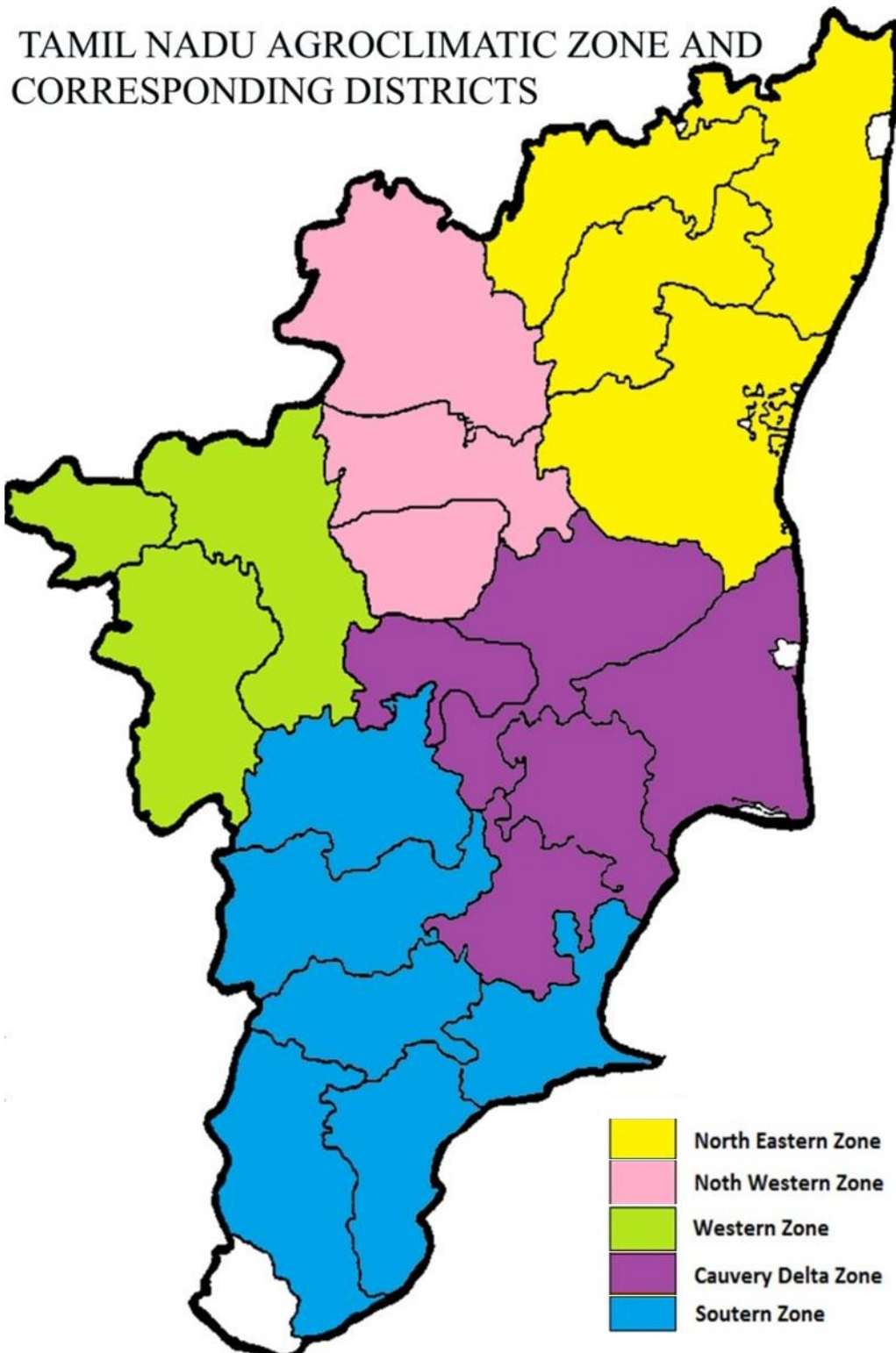
The farmers of TNPL Plantations program were spread over five different zones namely North Eastern Zone, North Western Zone, Western Zone, Cauvery

Delta Zone and Southern Zone. They were delineated in the following Table 1. The map of the study area is presented in Figure 1.

Table 1 Number of Sample Selected in the Study Area

Sl. No	Zone	No. of Selected
1.	North Eastern Zone	160
2.	North Western Zone	160
3.	Western Zone	40
4.	Cauvery Delta Zone	140
5.	Southern Zone	30
	Total	530

Figure 1 Map Showing Agro-Climatic Zones Selected for the Study



2.3 Study Period

The Study conducted and the data collected were related to the year 2023-24.

2.4 Data Collection

The data from the sample farms were collected with the help of interview schedule through personal interview. The information regarding the age, education, experience in farming, family details, size of the farm, asset position, investment in farm forestry/captive plantations, practices, problems in adopting pulpwood plantations activities, were obtained from the sample respondents through survey. Apart from these data, data on soil type, land use pattern, irrigation pattern and infrastructure facilities available, etc. were also collected from the sample farm households. The interview schedule is given in Appendix.

2.5 Tools of Analysis

The choice of the statistical and economic tools was decided with reference to the objectives of the study and the nature of data collected. The collected data were analyzed and tabulated to arrive at a meaningful conclusion.

2.5.1 Costs and Returns Associated with TNPL Plantations

2.5.1.1 Estimation of Cost of Cultivation

Cost and returns of farm forestry/captive plantations were discussed for both irrigated and unirrigated crops. The total cost of cultivation consists of total fixed cost and total variable cost. The total fixed cost was estimated based on the expenses on rental value of land, land taxes, depreciation of land and farm buildings and machineries. The variable cost was estimated based on the expenses on land preparation, seedlings, fertilizers, chemicals, inter cultural operations, labour (includes human labour, animal power and machines) and other expenses. The cost of production was estimated by dividing total cost (Rs/ha) by yield (Tonnes/ha). Gross return was estimated by summing up of income from main produce and by produce. The net return was estimated by subtracting total cost from gross return.

The break even output is estimated using the following formula.

$$\text{Break Even Output} = \frac{\text{Total Fixed Cost (Rs/ha)}}{\text{Price of the output (Rs/tonne)} - \text{Variable Cost (Rs/tonne)}}$$

2.5.1.2 Estimation of Net Revenue

The establishment cost is compounded at the rate 'i', Then

$$a_n = a_0(1+i)^n$$

Where,

a_n = Compounded establishment cost

a_0 = Establishment cost

i = Interest Rate.

n = Total number of years.

The annual cost (b_i) excluding interest rate varied from year to year. This was equivalent to an annuity.

$$bi = \frac{b_2(1+i)^{n-1} - 1}{i} + \frac{b_3(1+i)^{n-2} - 1}{i} + \frac{b_n(1+i) - 1}{i}$$

Where

b_i = Compounded establishment cost

b_2, b_3, b_n = Annual cost

i = Interest Rate.

n = Total number of years.

Net revenue is the total revenue less establishing and annual cost accounting to felling year.

$$NR_n = Y_n - a_0(1+i)^n - \frac{b_2(1+i)^{n-1} - 1}{i} + \frac{b_3(1+i)^{n-2} - 1}{i} + \frac{b_n(1+i) - 1}{i}$$

Where

NR_n = Net Revenue

Y_n = Total Revenue

n = Number of years

In this study, NPV, BCR and IRR were computed to assess the worthiness of investment in farm forestry practices.

2.5.1.3 Benefit Cost Ratio (BCR)

It is the ratio between the sum of discounted benefits and the sum of discounted costs. The same can be expressed as

$$BCR = \frac{\sum_{t=1}^n B_t(1+r)^t}{\sum_{t=1}^n C_t(1+r)^t}$$

Where,

B_t = Benefit of TNPL plantation realized during the year 't'

C_t = Costs incurred in TNPL plantations during the year 't'

r = Discount Rate.

t = Time between establishment and harvest.

n = Total number of years.

When Benefit Cost ratio is greater than one the system is beneficial. If it equals one, the system is neither worthy nor unworthy. If BCR is less than one, the system will be unworthy. Among the different farm forestry practices, the one capable of fetching highest Benefit Cost Ratio is preferred.

2.5.1.4 Net Present Value (NPV)

It was assessed using the following formula

$$NPV = \sum_{t=1}^n B_t(1+r)^t - \sum_{t=1}^n C_t(1+r)^t$$

Where,

B_t = Benefit of TNPL plantation realized during the year 't'

C_t = Costs incurred in TNPL plantations during the year 't'

r = Discount Rate.

t = Time between establishment and harvest.

n = Total number of years.

When NPV is greater than zero, the TNPL Plantation schemes is worthy. If NPV equals zero, the practice is neither worthy nor unworthy. If it is less than zero, the plantation will be unworthy. Among the different systems, one which is capable of generating the highest NPV is chosen.

2.5.1.5 Internal Rate of Return

$$IRR = LDR + DBTDR \left| \frac{NPV_L}{ABNPV_S} \right|$$

Where,

LDR = Lower Discount Rate

DBTDR = Difference between Two Discount Rates

NPV_L = NPV at the Lower Discount Rate

$ABNPV_S$ = Absolute Difference between the NPVs at Two Different Discount Rates

When IRR is greater than the cut off rate (Bank Interest Rate/ opportunity cost of capital) the plantation is worthy. If IRR is less than the cut off rate, the system will be unworthy. Among the practices, the one capable of generating the

highest IRR is favoured. The cut off rate is the critical minimum rate of return desired, below which the practices may be improved to yield more or the cost of maintenance reduced.

2.5.2 Percentage Analysis

Simple averages and percentages were worked out for assessing their general characteristics, land use, cropping pattern, consumption, annual household income, employment generation, their social participation constraints and awareness about FSC.

2.5.3 Gini Concentration Ratio

Using Gini Concentration Ratio, inequality can be measured. Gini Concentration Ratio is defined as the proportion of area under diagonal line, which is known as Lorenz Curve. Its value ranges between 0 and 1 (Palanisami et al., 2002).

The Gini Concentration Ratio of 0 means that every individual has equality with income. Ratio of '1' would mean that it reflect inequality of the income distribution among the sample farmers. Gini Concentration Ratio was worked out by using the following equation.

$$G = 1 + (1/n) - (2/n^2Z) \sum (n + 1 - i) Y_i$$

Where,

G = Gini Concentration Ratio

n = Number of individual respondents

Y_i = Income hold by the i^{th} individual

$Z = \sum (Y_i/n)$

2.5.4 Lorenz Curve

Palanisami et al., (2002) mentioned that the Lorenz curve is normally used to represent and analyse the distribution of income and wealth. 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 the like 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. 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 inequality. The Lorenz Curve is used to study the distribution of income among the farm forestry farmers.

2.5.5 Constraints Associated with Establishment of Farm Forestry Plantations

2.5.5.1 Garrett's Scoring Technique

To analyze the constraints faced by the farm 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.

$$\text{Percent Position} = \frac{100 (R_{ij} - 0.50)}{N}$$

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, the percentage position of each rank will be converted into scores. Then for each factor, the score of individual respondent will be added together and divided by the total number of respondents for whom scores are added. The mean scores of all the factors are arranged in descending order and ranks are given. The factor having the highest mean value is considered to be the most important.

CHAPTER III

RESULTS AND DISCUSSION

The present study is an attempt to understand the TNPL farm forestry/captive practices prevalent among the farmers and to assess the socio-economic impact of the adopters of these plantations. The data collected from TNPL farmers were analyzed and were discussed agro climatic zone wise. The sample of 530 farmers were post-stratified into small farmers with less than 1 ha of irrigated land, medium farmers with 1 to 2 ha of irrigated land and large farmers with more than 2 ha of irrigated land. Farms having irrigated land alone, farms having unirrigated lands alone and farms having both irrigated and unirrigated lands were classified into small, medium and large farms by treating two ha of unirrigated land as one ha of irrigated land. The results were analyzed Agro Climatic Zone wise and are presented under the following heads.

- 3.1 General Characteristics of Sample Households
- 3.2 Farm forestry Practices Prevalent among the Farmers
- 3.3 Costs and Returns associated with TNPL Plantations
- 3.4 Socio-Economic Impact of Farmers of TNPL Plantations
- 3.5 Constraints Faced by the TNPL Farmers
- 3.6 Awareness about FSC

Before entering into detailed discussion with respect to the objectives enunciated, a brief description of the general characteristics of sample farms would provide necessary settings for the discussion.

3.1 General Characteristics of Sample Households

3.1.1 Distribution of Sample Farms

The details of distribution of sample farms based on the size of holdings are presented Table 2.

The results showed that the sample farms in each zone comprised of 40, 160, 140, 160, and 30 households in Western, North Western, Cauvery Delta, North Eastern and Southern Zone respectively. Majority of the farms, nearly 65 per cent are large farms in all zones. This was followed by 26 per cent of medium farms and 9 per cent of small farms. North Western Zone has highest per cent of large farms (68 %) whereas Southern Zone has highest per cent (16 %) of small farmers.

Table 2 Distribution of Sample Farms According to Size Classes (Nos)

Classification of Farm Holdings	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
Small	15	10	6	20	5	56
Medium	43	40	10	40	10	143
Large	102	110	24	80	15	331
Total	160	160	40	140	30	530

3.1.2 Average Size of Holding among the Sample Farms

The size of holding of the sample households indicates the scale of operation and the extent of income from the farm. The details of size of holding under different categories of farms are furnished in Table 3.

The average size of holding of the sample farmers was more or less similar to each other almost in all the Zones. The small size of holding ranged from 0.59 ha to 0.72 ha. The medium size of holding ranged from 1.58 ha to 1.96 ha. In small size of holding North western Zone ranked first. In medium size of holding Cauvery Delta Zone ranked first. The large size of holding was more than 6.50 ha except in North Eastern Zone where the average size of large holding was 3.83 ha. Large size of holding has to be managed effectively which warrants higher number of labour force for maintenance and establishment.

Table 3 Average Size of Farm Holdings of Sample Farms (Ha)

Classification of Farm Holdings	North Eastern	North Western	Western	Cauvery Delta	Southern
Small	0.59	0.72	0.68	0.71	0.65
Medium	1.89	1.69	1.58	1.96	1.86
Large	3.83	7.85	7.82	6.51	6.30

3.1.3 Size of the Family in the Sample Farms

The size of the family and its composition influence family labour availability for different agricultural and farm forestry operations. The details of family composition are presented in Table 4.

Farms having 3-5 members per family accounted for 85 per cent followed by more than five member households in respect of all zones.

Among the zones, the Western Zone and North Eastern Zone had highest (84 per cent) number of farms in the 3-5 members per household category revealing the visible status of family labour support. To sum up, in Tamil Nadu,

North Western Zone, Cauvery Delta Zone and North Eastern Zone were found to be very active in adoption of TNPL farm forestry/Captive plantations.

Another important aspect is decision making to adopt farm forestry practices or captive plantation schemes. Here age and education were found to be the important variables. These details are analyzed and presented in Tables 5 to 6.

Table 4 Size of the Family in Sample Farms

Size of the Family	No. of Farms in Each Zone					
	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
< 3	5	9	3	6	2	25
3 – 5	145	135	30	118	25	453
> 5	10	16	7	16	3	52
Total	160	160	40	140	30	530

3.1.4 Age Distribution of Sample Households

The age of the head of household is classified into three groups and is presented in Table 5. Age of the farmers would influence the production decisions of the farmers. Hence, the details of age distribution of farm heads were analyzed and presented in Table 5. It revealed that nearly more than 50 per cent of heads of TNPL plantation farms were in the age group of 35 to 45 in all zones except in Southern Zone where 80 per cent of the farmers are in age group of 35 to 45.. This was followed by age group of more than 45. To sum up, in most of the farms, the adoption decision with regard to TNPL plantation practices was made by the middle age farmers. Age indirectly indicate the experience of the farmers in

farming. Usually youth involvement in agriculture could result in more technological infusement and thus the adoption of TNPL plantation practices in their farms in sustainable manner.

Table 5 Age Distribution of Head of the Sample Households (Nos)

Age (Years)	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
< 35	12	28	10	25	4	79
35 – 45	91	92	20	73	23	299
> 45	57	40	10	42	3	152
Total	160	160	40	140	30	530

3.1.5 Educational Status of Head of Sample Farms

Educational status of farm heads influence greatly in adoption of farming activities. Hence, the details of educational status of farm heads were analyzed and presented in Table 6. It revealed that most of the TNPL plantation heads had completed primary schooling accounted for 54.52 per cent followed by collegiate education arrived at 25.47 per cent. The illiterates occupied 1.50 per cent of the entire sample households.

Among the TNPL plantation farms, primary schooling was completed by 55 per cent of the farm heads, followed by 25 per cent of graduate farmers. Illiteracy was nil in North Western Zone, North Eastern and Southern Zones.

It is clear that due to increased educational status and exposure to latest technologies, the farmers have adopted farm forestry on their farms.

Table 6 Educational Status of the Head of Sample Farm (Nos)

Educational Status	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
Illiterate	0	0	1	7	0	8
Primary Schooling	90	85	25	69	20	289
Secondary Schooling	36	30	6	24	2	98
Collegiate Education	34	45	8	40	8	135
Total	160	160	40	140	30	530

3.1.6 Experience in Farming Activities

The details of experience of the head of households of TNPL plantation farms in all the five zones are presented in Table 7. It could be observed that in almost all the Zones, majority of the head of the TNPL plantation households (82 per cent) had more than 20 years of farming experience. Farming was incorporated by them through generations. Presence of higher experience revealed that the farm heads came into farming at a very young age itself.

This indicated that the farmers indulged in agriculture at very younger stage and thus gained more experience. Higher experience in farming operations also indicated that the involvement of youth in agriculture and allied activities like farm forestry found to be almost nil necessitated the promotion of awareness creation

programs and agricultural development schemes by the government to motivate the youths and to augment the middle age groups to stay in agriculture. Hence, investment on agricultural development needs to be made priority.

Table 7 Farming Experience of the Sample Farm Households (Nos)

Experience in years	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
< 5	0	0	0	0	0	0
5 – 10	6	8	4	7	2	27
10 – 20	30	12	3	20	4	69
> 20	124	140	33	113	24	434
Total	160	160	40	140	30	530

3.1.7 Social Participation of the Farmers

The farmers moving very socially otherwise who involved in various social activities and participated in social organizations usually have greater exposure to new technologies and business ventures. These farmers can be easily convinced by newer technologies and improved varieties and crop diversification and creating awareness about FSC (Forest Stewardship Council) and environmental activities. The social participation of the TNPL plantation farmers is presented in Table 8. It indicated that nearly fifty per cent of the farmers had social participation. Among

them majority of them were large farmers followed by medium farmers and small farmers. This reveals that awareness creation among the farmers regarding social participation is the need of the hour.

Table 8 Social Participation of the Head of the Family (Nos)

Classification of farm holdings	North Eastern	North Western	Western	Cauvery Delta	Southern	Total
Small	12	3	2	9	3	29
Medium	28	18	6	27	2	81
Large	51	38	12	41	8	150
Total	91	59	20	77	13	260

3.2 Farm Forestry/Captive Practices Prevalent Among the Farmers

Before availing the detailed discussion on TNPL Plantation schemes practices prevalent in the study area, it becomes important to analyse the existing cropping pattern with the adopters of TNPL Plantation schemes. The details are analysed and presented zone wise.

3.2.1 Cropping Pattern Prevalent among the TNPL Plantation schemes Farmers

The details of cropping pattern prevalent among the TNPL Plantation schemes farmers are presented in the Table 9 to 13.

The cropping pattern prevalent among the farmers of Western Zone was presented in Table 9. Here banana and turmeric were predominant among the farmers under irrigated condition. Under unirrigated condition, farmers grow pulses, groundnut and fodder crops.

The Cropping Intensity (CI) was high among the medium farmers followed by small farmers. This may be due to small sized holding, the farmers aimed at taking out as much income as possible from the farm. The area under farm forestry increased as the size of holding increased. The intercrops grown along with tree species are ground nut, turmeric, pulses and onion under irrigated condition.

**Table 9 Cropping Pattern Prevalent among the Farmers in Western Zone
(Area in Ha)**

Classification of farm holdings	Banana	Turmeric	Pulses	Onion/other vegetables	Ground nut	Farm Forestry	Average Size of Holding	Gross cropped area
Small	0.26	0.35	0.00	0.00	0.00	0.49	0.69	1.10
Medium	1.24	0.66	0.24	0.00	0.00	0.74	1.62	2.84
Large	2.60	1.86	1.01	1.10	0.63	1.22	7.68	8.37

The minimum area under farm forestry is 0.40 ha. Nearly 74 per cent of the farms are cultivating tree species under rainfed condition. Among them, very few farmers cultivated intercrops in farm forestry. They go for groundnut and pulses.

The cropping pattern prevalent among the TNPL Plantation schemes farmers of North Western Zone is presented in Table 10. It implied that under irrigated condition, banana, sugarcane and vegetables were the predominant crops among the farmers. The cropping intensity was more than 100 per cent irrespective of the size holdings. In case of unirrigated farms, farmers go for Tapioca, pulses (Mostly Horse gram) and fodder sorghum. Eighty two per cent of the farmers cultivate tree species under unirrigated condition. As in case of

Western zone, only few farmers go for intercropping. The intercrops grown were tapioca, pulses and groundnut.

Table 10 Cropping Pattern Prevalent among the Farmers in North Western Zone (Area in Ha)

Classification of farm holding	Banana	Sugarcane	Vegetables	Tapioca	Pulses/Forodder crops	Farm Forestry	Average Size of Holding	Gross cropped area
Small	0.21	0.23	0.21	0.0	0.0	0.46	0.71	1.10
Medium	0.64	0.68	0.0	0.09	0.15	0.72	1.69	2.25
Large	1.42	2.20	0.52	1.49	1.02	1.52	7.80	7.91

The cropping pattern in Cauvery Delta Zone is presented in Table 11. The major crops cultivated in this zone were paddy followed by pulses (mostly black gram) and sugarcane. Banana is also cultivated in most of the farms after the sugarcane. Ninety two per cent of the farm forestry farmers cultivate Eucalyptus under unirrigated condition. The cropping intensity was more than 100 per cent irrespective of the size of holdings. But compared to other zones it was less. This may be because of the most of the farmers were going for one year crops like banana and sugarcane. Intercropping in tree plantations was not practiced due to the practice of closer space tree cultivation which lead to minimum utilization of the land.

Table 11 Cropping Pattern Prevalent among the Farmers in Cauvery Delta Zone (Area in Ha)

Classification of farm holdings	Paddy	Sugarcane	Pulses	Groundnut / Beans	Farm Forestry	Average Size of Holding (ha)	Gross cropped area
Small	0.22	0.33	0.00	0.00	0.42	0.70	0.79
Medium	0.63	0.42	0.53	0.00	0.64	1.96	2.20
Large	1.04	2.30	1.50	1.00	1.21	6.51	7.10

The cropping pattern prevalent among the TNPL Plantation schemes farmers in North Eastern Zone is presented in Table 12.

It could be evidenced from Table 12, as the size of holding increased, the cropping intensity increased among the farms. Here the farm forestry farmers had high cropping intensity because the farm forestry farmers cultivated turmeric, citrus and other crops along with tree crops. The intercrops grown under farm forestry in irrigated condition was pulses and groundnut. In few farms, vegetables were grown as intercrops. Eighty five percent of the farms go for farm forestry under unirrigated condition. Among them, only few farmers cultivate groundnut as intercrops.

Table 12 Cropping Pattern Prevalent among the Farmers in North Eastern Zone (Area in Ha)

Classification of farm holdings	Sugarcane	Groundnut	Vegetables/ Groundnut	Pulses/fodder crops	Farm Forestry	Average Size of Holding (ha)	Gross cropped area
Small	0.21	0.30	0.00	0.00	0.40	0.59	0.90
Medium	0.72	0.81	0.34	0.16	0.74	1.86	2.81
Large	0.63	1.30	1.51	0.40	1.63	3.82	5.49

The cropping pattern prevalent among the farm forestry farmers in Southern Zone is presented in Table 13. The Cropping intensity decreased as the size of holding increased in farm forestry farmers. The high cropping intensity among farm forestry farmers was due to the land allocation towards farm forestry which gives high income. Seventy five percent of the farmers adopt farm forestry under unirrigated condition. The cropping pattern was groundnut, sugarcane and chillies. Under unirrigated condition the crops grown are chillies and pulses.

**Table 13 Cropping Pattern Prevalent among the Farmers in Southern Zone
(Area in Ha)**

Classification of farm holdings	Ground nut	Sugarcane	Chillies	Ground nut	Other crops /vegetables	Farm Forestry	Average Size of Holding (ha)	Gross cropped area
Small	0.49	0.16	0.00	0.00	0.00	0.50	0.65	1.16
Medium	0.60	0.92	0.16	0.00	0.00	0.73	1.89	2.49
Large	1.30	2.20	2.00	0.40	0.62	1.24	6.43	7.68

In general the Cropping intensity was more than 100 per cent irrespective of the size of holdings and zones among the farm forestry farmers. The high cropping intensity among farm forestry farmers was due to the land allocation towards tree species which give high income and yield. Irrespective of size of holdings and agro-climatic zones, the gross cropped area was high in farm forestry farms. This was mainly due to the fact that cultivable lands which are not cultivated due shortage of irrigation water were brought under farm forestry plantations. This ensures not only increased cropping area but also bringing uncultivated lands in the farms into cultivation. More than eighty per cent of the farm forestry plantations were under unirrigated condition. **The current fallow land and other fallow lands in farm holdings particularly in large size holdings are used for cultivating tree crops under TNPL Farm Forestry/Captive Plantations scheme.**

3.2.3 Awareness on TNPL Plantation schemes

The awareness on TNPL Plantation schemes to the farmers was obtained mainly from scientific institutions through various training programme, meetings which helped the farmers to gain knowledge on TNPL Plantation schemes and their advantages. The most of the farmers, 56 per cent gained awareness as soon as the project was started in 2004-05 and adopted it immediately. Few farmers, accounting for 32.85 per cent adopted farm forestry after seeing the experience of the other farmers and also after gaining required knowledge about farm forestry. About one per cent of the farmers came to know about this project through other media like, newspapers, radios, television, and NGOs and started adapting to farm forestry plantations.

3.2.4 Farm Forestry Systems Practiced in Tamil Nadu

The information about the predominant tree species and the prominent intercrop cultivated along with tree is provided in Table 14. The predominant tree crops in farm forestry were Eucalyptus and Casuarina. The species like Dalbergia, Gmelia and Melia were cultivated in very few farms.

Under irrigated condition, Casuarina was intercropped with banana, turmeric in Western Zone in the first year and in paddy fields, Casuarina trees are planted as boundary plantations. In North Western Zone Casuarina is intercropped with groundnut and pulses in the first year. In Cauvery Delta Zone, both Casuarina and Eucalyptus are planted as block plantations. In most of the farms intercropping was not practiced due to closed space planting. Eucalyptus and Casuarina were the dominant tree crop cultivated in North Eastern Zone which was intercropped with Turmeric, Rose and Cluster Bean under irrigated condition. In Southern Zone Casuarina was intercropped with groundnut. Casuarina being a leguminous tree crop, help in fixation of atmospheric nitrogen into the soil which helps in increasing productivity and soil fertility. Ground nut and pulses were the predominant intercrops in farm forestry. Horti-silviculture was also followed by the farmers of almost all the Zones under irrigated condition. More than eighty per cent of the farm forestry was practiced under unirrigated condition. More than

ninety per cent of Eucalyptus cultivation was under unirrigated condition and without intercrops.

Table 14 Average Area under Tree Species in Farm Forestry in Tamil Nadu

Zone	Area under Eucalyptus (ha)	Area under Casuarina (ha)
North Eastern Zone	1.66	0.45
North Western Zone	2.30	1.82
Western Zone	2.00	0.38
Cauvery Delta Zone	1.25	0.42
Southern Zone	1.24	0.53

3.3 Costs and Returns in TNPL Schemes Plantations

The cost of cultivation is discussed for the major tree crops under cultivation. The details of cost of cultivation of Casuarina and Eucalyptus cultivated in the study area under irrigated are presented in Tables 15 to 18.

3.3.1 Cost of Cultivation of Casuarina

The details of cost of cultivation of Casuarina under irrigated condition in Tamil Nadu are presented in Table 15. The costs incurred on annual basis, were furnished in the form of fixed and variable costs to arrive total costs. The details of cost are given activity wise, year wise in Table 15.

The total fixed cost in the first year was less due to high establishment cost. But the fixed cost increased gradually after first year and it was 75 per cent in the final year of harvesting. The cost of cultivation was high due to the high labour charges for planting, weeding, irrigation, pruning etc. Planting and weeding cost dominated all the other costs because of the higher labour charges and also due to the use of power weeders and tractors due to labour scarcity. The average yield of Casuarina obtained in the study area was 50 Tonnes per acre. The harvesting and transportation charges of Casuarina were borne by traders/ industries i.e Tamil Nadu News Print and Papers Limited (TNPL). The farmers

obtain their profit from Casuarina in three years of cultivation which is greater than profit from agricultural production. The net return to the farmer was 2.00 lakhs per acre of Casuarina.

Table 15 Cost of Cultivation of Casuarina in Tamil Nadu

A.	Cost of plantation establishment	1st year	2nd year	3rd year	Total
1	Bush clearing	0			0
2	Trench formation	0			0
3	Tyne Ploughing	1200			1200
4	Alignment and Digging of pits	4500			4500
5	Refilling, planting of pits and channel formation	4500			4500
6	Cost of manure (Incl. cost of manure)	3000			3000
7	Cost of Cleanl plants	6000			6000
8	Cost of pesticide (Cholrophriphos 2 gm/Littre)	100			100
9	Casuality replacement	1200			1200
	Sub Total	20500	0	0	20500
B.	Cost of Maintenance				0
1	Interploughing	1200			1200
2	Soil working and weeding (2 times)	3000	3000		6000
3	Pruning charges	5000			
4	Cost of manure (Incl. cost of manure)	4000	4000		8000
5	Irrigation charges	7000	7000	7000	21000
	Sub Total	20200	14000	7000	41200
	Grand Total	40700	14000	7000	61700
C.	Gross income				
	Value for 50 MT for Casuarina @ Rs.5250/MT				262500
D.	Net Income				
	Net Income per crop				200800
	Net Income per year				66933

3.3.2 Cost of Cultivation of Eucalyptus

The details of cost of cultivation of Eucalyptus in Tamil Nadu under irrigated condition are presented in Table 16. Eucalyptus was cultivated in block plantations mostly. In the total cost of cultivation, the highest share was on planting, weeding followed by labour charges. The average yield obtained was 25 Tonnes per acre. The net return to the farmer was about 0.69 Lakhs per acre of Eucalyptus.

Table 16 Cost of Cultivation of Casuarina in Tamil Nadu

A.	Cost of plantation establishment	1st year	2nd year	3rd year	4th year	5th year	Total
1	Bush clearing	750					750
2	Trench formation	800					800
3	Disc Ploughing	2000					2000
4	Alignment and Digging of pits	1500					1500
5	Refilling ,planting of pits and channel formation	1000					1000
6	Cost of manure (Incl. cost of manure)	1500					1500
7	Cost of Clonal plants	2000					2000
8	Cost of pesticide (Cholrophriphos 2 gm/Litre)	100					100
9	Casualty replacement	300					300
	Sub Total	9950	0	0	0		9950
B.	Cost of Maintenance						0
1	Interploughing	1000	1000	1000			3000
2	Soil working and weeding (2 times)	1600					1600
3	Cost of manure (Incl. cost of manure)		1500				1500
4	Plot watcher / Life irrigation	3000	3000	3000	3000	3000	15000
	Sub Total	5600	5500	4000	3000	3000	21100
	Grand Total	15550	5500	4000	3000	3000	31050
C.	Gross income						
	Value for 25 MT/Acre for Eucalyptus @ Rs.4000/MT						100000
D.	Net Income						
	Net Income per crop						68950
	Net Income per year						13790

3.3.3 Benefit Cost Ratio (BCR)

The information on BCR of farm forestry plantations in the study area is presented in Table 17. Generally, BCR of a project or enterprise should be greater than one to decide the worthiness of the project. It could be inferred that the BCR is greater than one in all the zones under the study which stated that cultivation of both Casuarina and Eucalyptus under farm forestry practices in these zones is more worthy to select and can be continued in future too without any hesitation. Comparing these two tree species, Casuarina cultivation was more beneficial when compared to Eucalyptus cultivation. Cauvery Delta Zone showed highest BCR followed by North Western Zone in both tree species cultivation. Southern Zone showed lowest BCR compared to all other zones indicating that it needed intervention in silvicultural operations. BCR was low under unirrigated condition when compared to irrigated Casuarina cultivation. But in case of Eucalyptus, BCR was high in unirrigated situation compared to irrigated Eucalyptus cultivation. This could indicate that industry should focus more on developing high yielding Eucalyptus suited for rainfed situation.

Table 17 Benefit Cost Ratio Realized from Farm Forestry Plantations

Sl. No	Name of the Zone	BCR at 14 Per cent			
		Casuarina (Irrigated)	Casuarina (Unirrigated)	Eucalyptus (Irrigated)	Eucalyptus (Unirrigated)
1	North Eastern Zone	1.99	1.90	1.53	1.66
2	North Western Zone	2.20	1.98	1.50	1.60
3	Western Zone	2.13	1.88	1.48	1.42
4	Cauvery Delta Zone	2.20	2.01	1.56	1.67
5	Southern Zone	1.86	1.74	1.48	1.43

3.3.4 Net Present Value (NPV)

The NPV of the farm forestry plantations in the study area is presented in Table 18.

Normally, the NPV should be greater than zero for a project to get selected. The results revealed that Cauvery Delta Zone realized highest NPV followed by North Western Zone. Southern Zone showed lowest NPV irrespective of crops. In respect of Eucalyptus, all the zones had earned almost equal net present value except Southern Zone revealing that these practices are worthy to take up. Comparing tree cultivation in irrigated and unirrigated situation, there was large difference in NPV in case of Casuarina under irrigated and unirrigated condition. But the difference is less in case of Eucalyptus under irrigated and unirrigated condition.

Table 18 Net Present Value Realized from Farm Forestry Plantations

Sl. No	Name of the Zone	NPV at 14 Per Cent			
		Casuarina (Irrigated)	Casuarina (Unirrigated)	Eucalyptus (Irrigated)	Eucalyptus (Unirrigated)
1	North Eastern Zone	77400	32000	32800	20811
2	North Western Zone	78900	33685	33563	22800
3	Western Zone	75613	34135	32653	21834
4	Cauvery Delta Zone	81500	34000	37142	24253
5	Southern Zone	71514	32019	30412	21821

3.3.5 Internal Rate of Return (IRR)

The details on the IRR of farm forestry plantations are provided in Table 19. It implied that the IRR is greater than the bank interest rate and hence the farm forestry practice is worthy of getting selected. Here also Cauvery delta had earned higher rate of return from Casuarina and Eucalyptus followed by North

Western Zone. In case of Casuarina cultivation in irrigated situation, IRR ranged from 43.64 to 57.64 and in case of unirrigated condition, it ranged from 35.12 to 47.70. But in case of Eucalyptus cultivation, there is no much difference in IRR in irrigated and unirrigated condition. The NPV, BCR and IRR calculation for all the zones implied that TNPL Farm Forestry/Captive plantation schemes are a worthy practice and will fetch greater income to the farmers than the pure agriculture.

To sum up, economic analysis of TNPL Farm Forestry/Captive plantation schemes outlined those agricultural crops in combination with Casuarina could reap higher return than Eucalyptus due to its short term yield. But Eucalyptus is cultivated under more rainfed area compared to Casuarina due to wide preference and acceptance among many stakeholders.

Table 19 Internal Rate of Return Realized from TNPL Plantations

Sl. No	Name of the Zone	Casuarina (Irrigated)	Casuarina (Unirrigated)	Eucalyptus (Irrigated)	Eucalyptus (Unirrigated)
1	North-Eastern Zone	49.76	40.74	26.90	26.77
2	North Western Zone	53.22	44.26	29.77	30.00
3	Western Zone	50.55	39.78	27.50	26.75
4	Cauvery Delta Zone	57.64	47.70	30.35	31.40
5	Southern Zone	43.64	35.12	24.13	23.51

3.4 Socio Economic Impact of Farmers of Farm Forestry Plantations

3.4.1 Assets and Liabilities of Farm Households

3.4.1.1 Asset Position

In the absence of income sources during particular season, the asset position with the farm household will help them to choose coping mechanism by way of pledging and selling certain assets for maintaining their livelihood status. In this circumstance, analyzing the value of assets with the farm forestry households

assume paramount importance. The details of asset position were analyzed and presented in Table 20 and Figure 2.

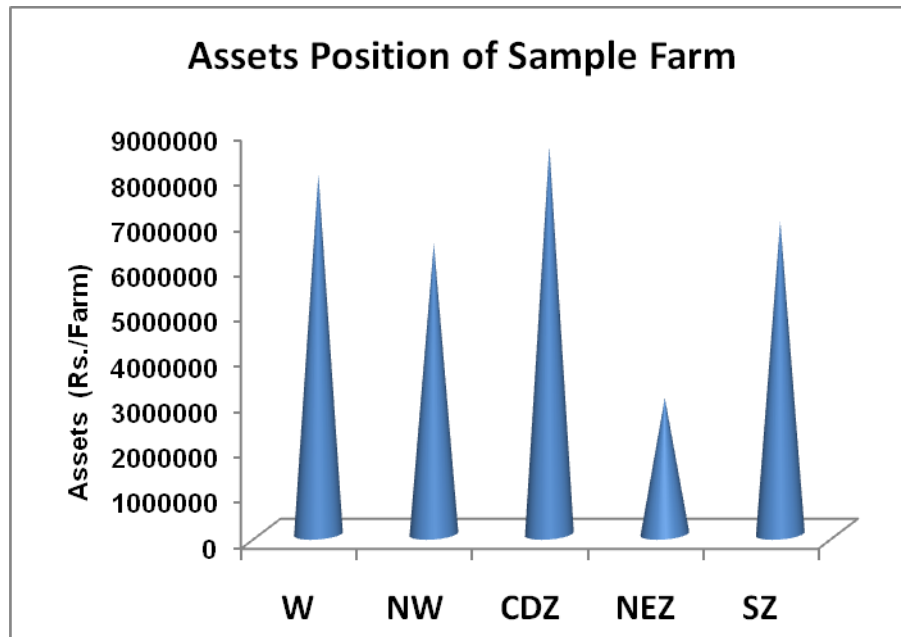
It could be evidenced that the asset position of the farm forestry farmers is highest in Cauvery Delta Zone followed by Western Zone farm households. This may be because the income from farm forestry plantations is higher than other zones. The income from tree crops could be obtained only at 4 to 5 years period which lead to a lump sum that could be spent on buying an asset for future use.

Table 20 Value of Assets Owned by Farm Forestry Households (per Farm)

Sl. No	Name of the Assets	Assets Owned by a Farm (Rs.)				
		North Eastern	North Western	Western	Cauvery Delta	Southern
I	Farm Assets					
1	Land Value per ha	10,36,000	31,10,000	38,42,460	43,55,412	42,34,156
2	Tools and Implements	3,412	7,725	12,450	15,800	8,652
3	Livestock	31,300	1,25,120	80,987	97,412	1,83,810
4	Farm Buildings	8,512	67,000	58,270	5,35,416	71,525
5	Pump and Well	2,62,512	2,56,550	3,52,547	5,28,514	1,38,750
	Total (I)	13,41,736	35,66,395	43,46,714	55,32,554	46,36,893

II	Household Assets					
1	Kutcha House	3,45,300	3,42,485	2,57,652	2,53,451	1,56,215
2	Pucca House	12,33,300	18,56,521	23,59,541	22,45,000	17,15,025
3	Furniture	19,445	14,585	19,050	18,401	12,150
4	Television	7,500	12,550	12,450	12,500	11,500
5	Fridge	1	12,550	15,748	14,500	12,514
6	Washing Machine	0	11,100	11,000	10,800	10,540
7	Two Wheeler					
	i. Cycle	1,410	2,050	1,680	1,200	1,550
	ii. Motor Bike	22,500	38,100	34,520	40,750	32,510
8	Four Wheeler	0	5,65,000	8,76,000	4,20,000	3,33,645
	Total (II)	16,29,456	28,54,941	35,87,641	30,16,602	22,85,649
	Total (I + II)	29,71,192	64,21,336	79,34,355	85,49,156	69,22,542

Figure 2 Assets Position of the Sample Household



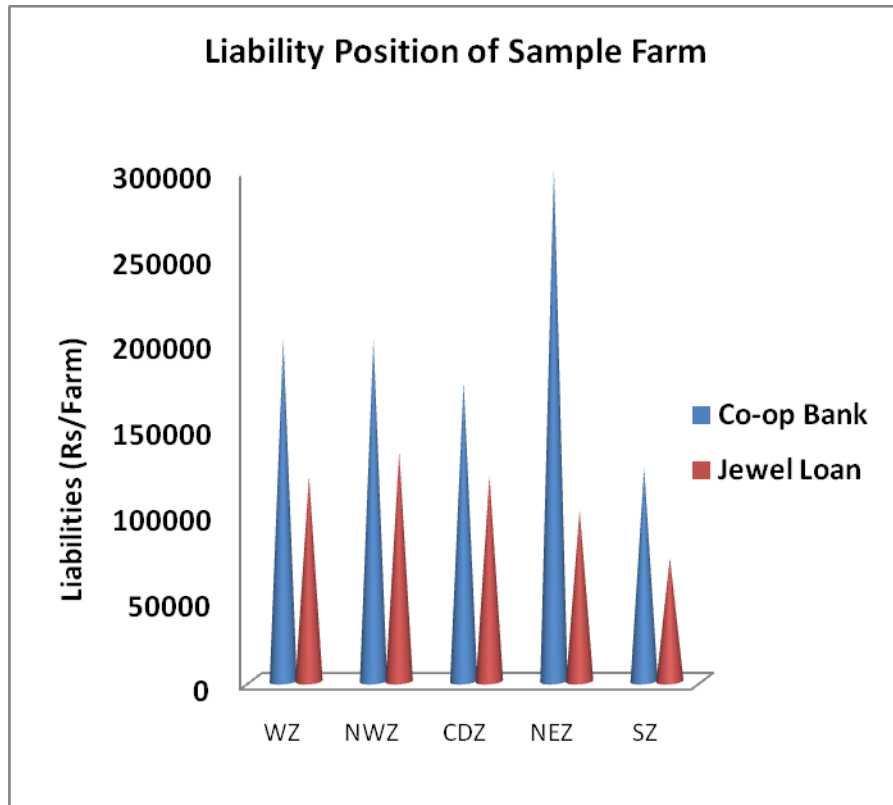
3.4.1.2 Liabilities of Head of Farm Households

The liability status of the farm forestry farmers of all zones is presented in Table 21 and Figure 3. The liabilities of farmers of North Eastern Zone were highest compared to all other zones. This is due their lowest assets position. Among the Zones, Southern Zone had experienced poor liabilities. This is due to poor return and poor investment cycle. Farmers practicing farm forestry had not availed money from private lenders and all the loans availed were from formal institutions. This may be due to the fact that majority of the farm households are large size and high level of literacy also helped the farmers to avoid lending money from private money lenders who usually charge more interest rates compared to organized financial institutions.

Table 21 Average Liabilities of the Farm Forestry Households (per Farm)

Sl. No	Liabilities	Amount to be paid in Rupees					
		North Eastern	North Western	Western	Cauvery Delta	Southern	Interest Rate
1	Private Money Lenders	0	0	0	0	0	24%
2	Co-op Bank – Crop Loan	3,00,000	2,00,000	2,00,000	1,75,000	1,25,000	14%
3	Jewel Loan	1,00,000	1,34,000	1,20,000	1,20,000	72,380	12%
	Total	4,00,000	3,34,000	3,20,000	2,95,000	1,97,380	

Figure 3 Liabilities Position of the Sample Household



3.4.2 Livestock Position in Sample Farms

The number of livestock available with the rural farm households indicates the potential of coping mechanism for livelihood sustainability. They were otherwise called as mobile banks of farmers, any time money to rural households in general and hence the livestock position of sample households were analysed and presented Zone wise in Tables 22 to 26.

The status of livestock population available in the Western Zone is presented in Table 22. In general, farm forestry farm household had all type of livestock population. It could be inferred that number of cows, sheep and goats population was found increased as the size of holding increased. It is mainly due to rearing of animals for manures and liquid cash benefits. Similar situation is pronounced in respect of poultry also. Number of birds were found to be increased across increase of size holding for meat and liquid cash benefits.

Table 22 Details of Livestock Owned by Farm Households in Western Zone

Size of Holdings	Cow	Buffalo	Bullock	Goat / Sheep	Poultry	Total
Small	3	1	0	3	5	12
Medium	2	2	0	5	7	16
Large	3	2	1	4	8	18
Total	8	5	1	12	20	46

The livestock population of farm households of North Western Zone is presented in Table 23. The farmer under large category possessed maximum

number of livestock compared to medium and small category. Poultry was found to be the highest position followed by goat and sheep. The small size of farm households do have bullock and buffalo and only medium and large size of holdings had bullock and buffalo. Maintaining sheep and goat and poultry population was mainly to act as a barrier to liability. They help in meeting immediate financial obligations.

Table 23 Details of Livestock Owned by Farm Households in North Western Zone

Size of Holdings	Cow	Buffalo	Bullock	Goat / Sheep	Poultry	Total
Small	2	0	0	3	5	10
Medium	1	2	2	3	5	13
Large	4	3	1	4	4	16
Total	7	5	3	10	14	39

The status livestock population of farm forestry farmers of Cauvery Delta Zone is given in Table 24. It indicated that the livestock population was higher in this zone compared to western and North Western Zones. The large farmer's category owned maximum number of farm animals than the other categories revealed that as the size of holding increased, the number of animals owned in the farm also was found to be increased. Higher number of animals reared in the farm is mainly due to the purpose of realizing organic manure and liquid cash benefits during emergency situations. They had about 44 per cent of the total livestock population out of total livestock and poultry population.

Table 24 Details of Livestock Owned by Farm Households in Cauvery Delta Zone

Size of Holdings	Cow	Buffalo	Bullock	Goat / Sheep	Poultry	Total
Small	2	1	0	3	3	9
Medium	4	3	1	3	4	15
Large	5	3	3	4	4	19
Total	11	7	4	10	11	43

The livestock population of farm forestry farmers of North Eastern Zone is presented in Table 25. The total livestock population of farms was found to be higher in large farm households. Similar to the other zones, North East Zone also had highest population of poultry population and lowest number of bullock population in the farm households.

Table 25 Details of Livestock Owned by Farm Households in North Eastern Zone

Size of Holdings	Cow	Buffalo	Bullock	Goat / Sheep	Poultry	Total
Small	1	0	0	2	3	6
Medium	3	2	1	3	7	16
Large	4	2	2	5	9	22
Total	8	4	3	10	19	44

The livestock population of both farm forestry farmers of Southern Zone is presented in Table 26.

It could be inferred from Table 26 that the Southern Zone farm forestry farmers hold the highest number of livestock than all other zones. Small category of farm households also had bullock and buffalo. Poultry population was found to be highest followed by goat/sheep population. In this zone small farmers maintained two cows per farm and it increased with increase in size of holdings. The results of livestock possession of farm households in all zones revealed that farmers have more faith and believe that to have a sustainable farming, maintaining livestock was the best choice among all other allied activities of agriculture.

Table 26 Details of Livestock Owned by Farm Households in Southern Zone

Size of Holdings	Cow	Buffalo	Bullock	Goat / Sheep	Poultry	Total
Small	2	2	1	2	4	11
Medium	4	3	0	5	4	16
Large	4	2	2	6	7	21
Total	10	7	3	13	15	48

3.4.3 Employment and Income Generation

Employment included total number of man days spent in the on farm, off farm and non-farm activities. Eight hours of work was equated to one man day. Three hundred or more days were considered as optimum employment for a person per annum. The details of employment generation in respect of TNPL farmers of the study area were outlined in Table 27. Non-farm income includes the income from business and other employments whereas in the case of man days of employment generated through non-farm activities include business alone. The Figures 4 and 5 graphically represent the zonal wise various sources of employment and per household income of the farm forestry farmers.

Irrespective of zones, the income from TNPL Plantation schemes was more than 30 per cent which was highest compared to all other sources of income. This was followed by non farm income and income from agriculture. Farm forestry income constituted 31.49 per cent of the total income. The mean man days of work generated by farm forestry in the study area was 26.80 per cent which was higher than all the other sources of employment. This may be because of the labour requirement of the agricultural crop cultivated as intercrop. When comparing income generation and employment though agriculture required more labour man days than non- farm its income contribution was less compared to non farm income.

Table 27 Income and Employment Generation of TNPL Farmers Households in Tamil Nadu

Sl. No	Income Source	Man days of Employment Generated per Individual per Annum						Amount Earned per Household per Annum					
		NEZ	NWZ	WZ	CDZ	SZ	Mean	NEZ	NWZ	WZ	CDZ	SZ	Mean
1	On Farm												
1.1	Agriculture	68	70	72	71	71	70	266319	248146	256788	244652	187002	250581
1.2	Farm Forestry	82	88	86	83	78	83	342901	403626	353022	347962	293528	360208
1.3	Livestock & Poultry	38	48	35	36	37	39	161040	201300	167750	164395	128086	164514
2	Off Farm	66	53	64	62	62	61	69120	86400	72000	70560	52144	74045
3	Non-Farm	55	53	62	65	51	57	288000	360000	300000	294000	170000	248400
	Total	309	312	319	317	299	310	1127380	1299472	1149560	1121569	830760	1097748

Figure 4 Employment Generations of the Farm Forestry Households

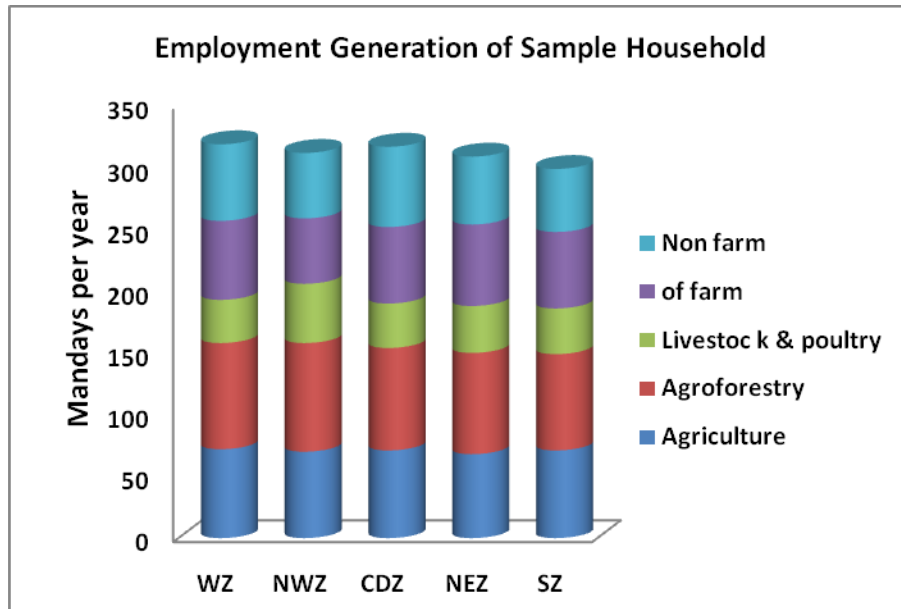
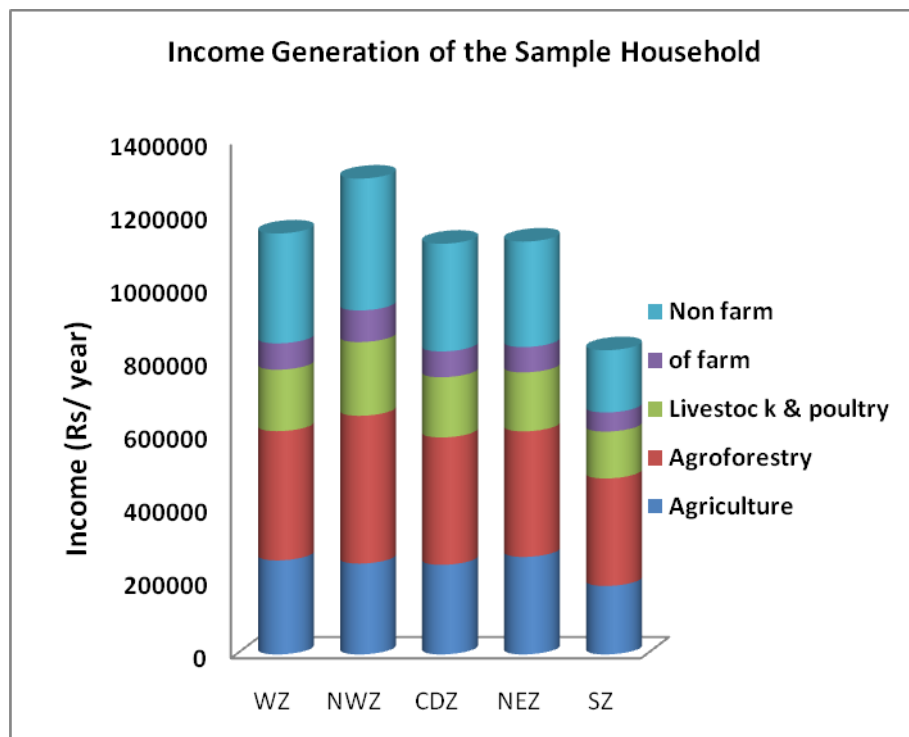


Figure 5 Income Generations of the Farm Forestry Households



3.4.4 Statistical Analysis of Income

The test for significant difference among the income earned by different groups from different sources in respect of all the zones is made the pattern of expenditure of the farmers. The analysis is made for the different income drawn from different sources such as agricultural, farm forestry, livestock and poultry, business and other employment and the 't value' calculated is presented in Table 28.

There is no significant difference between the incomes earned by different zones. It was clear that the income from agriculture, agroforestry, livestock and poultry, business, and other employment were more or less equal in all the five zones coming under the study area.

Table 28 Statistical Analysis of Income of Farmers

SI. No	Zones Compared	't' value
1	Western and North Western Zone	0.68
2	North Western and Cauvery Delta Zone	0.77
3	Cauvery Delta and North Eastern Zone	0.07
4	North Eastern and Southern Zone	0.15

t_{tab} value – 2.306

3.4.5 Distribution of Total Income

The total annual income of the sample household was calculated and the annual income of the farm households based on their size of holdings was calculated for all the five zones and presented in Table 29.

Table 29 Annual Income of the Farm households (Rs/Household/Year)

Classification of farm holdings	North Eastern	North Western	Western Zone	Cauvery Delta	Southern Zone
Small	390654	376253	375942	308572	285477
Medium	726854	689521	605824	700207	497936
Large	1640251	1596523	1535584	1501095	1176056
Average	919253	887432	839116	836624	653156

The average annual income of the farm households was highest in North Eastern Zone in case of small size of holdings. It was very low in Southern Zone. In case of medium size of holdings Cauvery delta and North Eastern Zone farmers had more or less same annual income. The annual income of the large farm households was highest in North Western Zone and it was lowest in Southern Zone. Here annual income per household was not the net income and it was gross income.

3.4.6 Gini Ratio of Income Inequality

The Gini Ratio (or) Index of Income Concentration is a statistical measure of income equality ranging from 0 to 1. Smaller the Gini ratio reflects lesser the inequality. A measure of 1 indicated perfect inequality. That is, one person has all the income and the rest have none, whereas, '0' indicates perfect equality. That is, all people have equal share of income. To study the impact of income distribution, Gini ratio was estimated and the results are presented in Table 30. Here the farmers were divided into three income groups such as low, medium and high based on their total annual income.

The gini concentration ratio of TNPL Plantation farmers is lower which means that the income inequality was low in the TNPL Plantation farmers of all the zones. The Average gini ratio of farm forestry farmers was 0.17. The farm forestry farmers were

approaching equality in income. In Western Zone the gini concentration ratio was high compared to all other zones. But in general the income was almost equally distributed among the farmers in all zones who practice TNPL Plantation schemes. The reason and the most important feature of TNPL Plantation schemes that all farmers are given same price to their produce through contract farming.

Table 30 Gini Concentration Ratio of Sample Farmers in Tamil Nadu

Sl. No.	Zones	Gini Concentration Ratio
1	North-Eastern Zone	0.17
2	North Western Zone	0.19
3	Western Zone	0.23
4	Cauvery Delta Zone	0.11
5	Southern Zone	0.20
	Tamil Nadu	0.18

The farms had equal distribution of income. It was mainly due to the assured income generation possibilities for TNPL Plantation scheme at regular intervals and the price fluctuation was almost nil in case of the produce of farm forestry practices. The distribution of income from farm households was given in Figure 6 to 10 for five agro climatic zones.

Figure 6 Lorenz Curve of the TNPL Farmers of North Eastern Zone

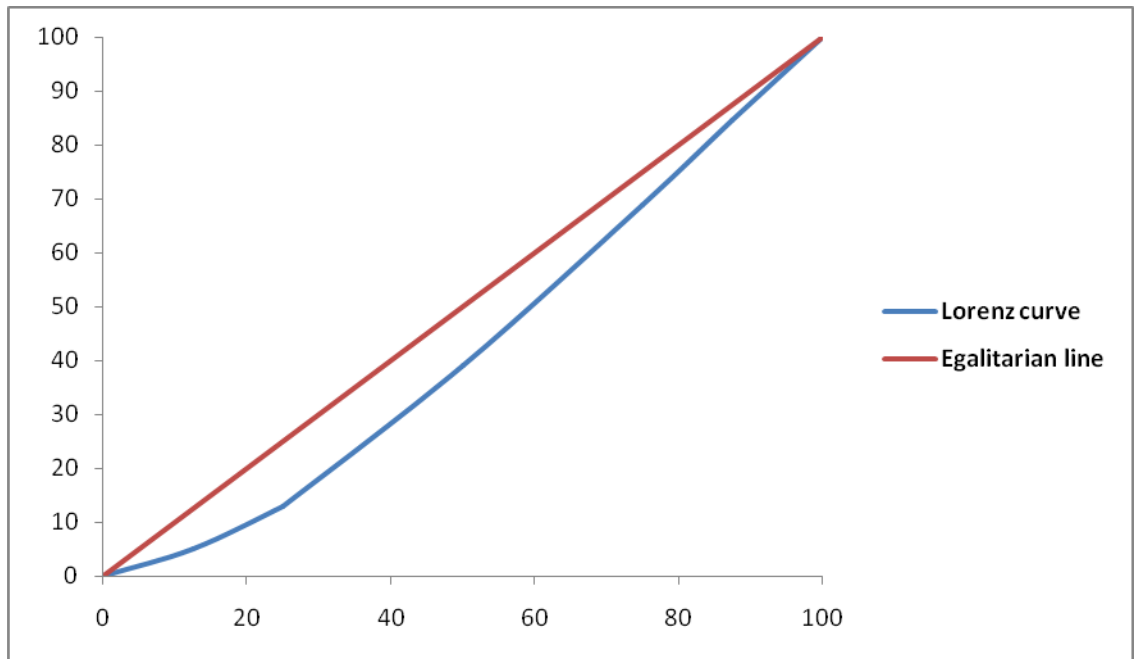


Figure 7 Lorenz Curve of the TNPL Farmers of North Western Zone

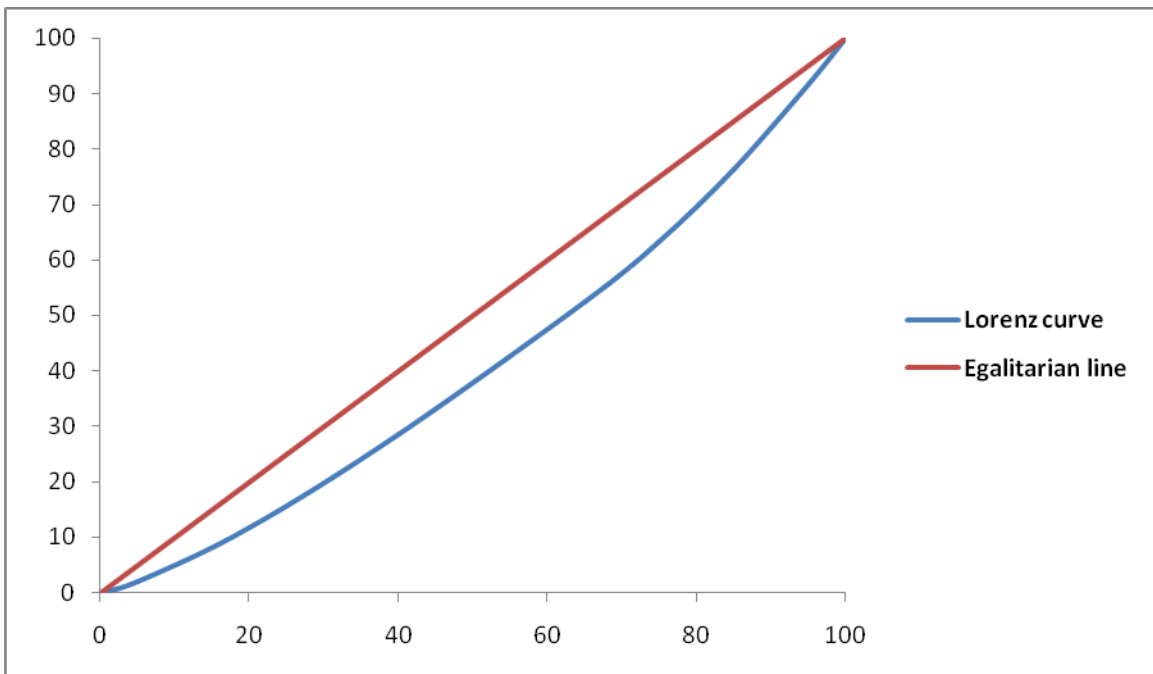


Figure 8 Lorenz Curve of the TNPL Farmers of Western Zone

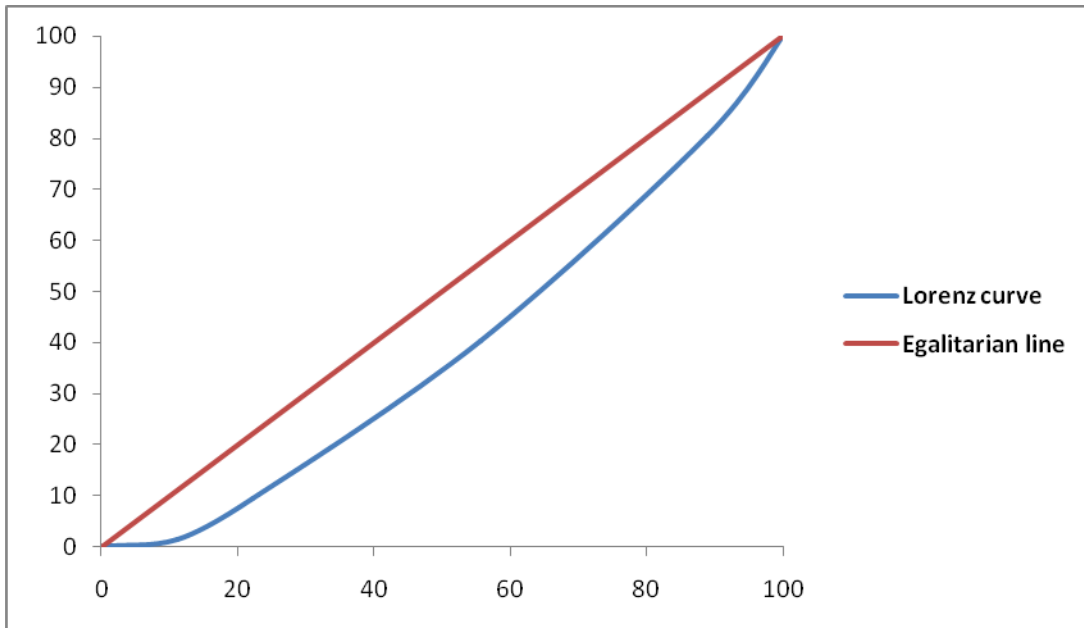


Figure 9 Lorenz Curve of the TNPL Farmers of Cauvery Delta Zone

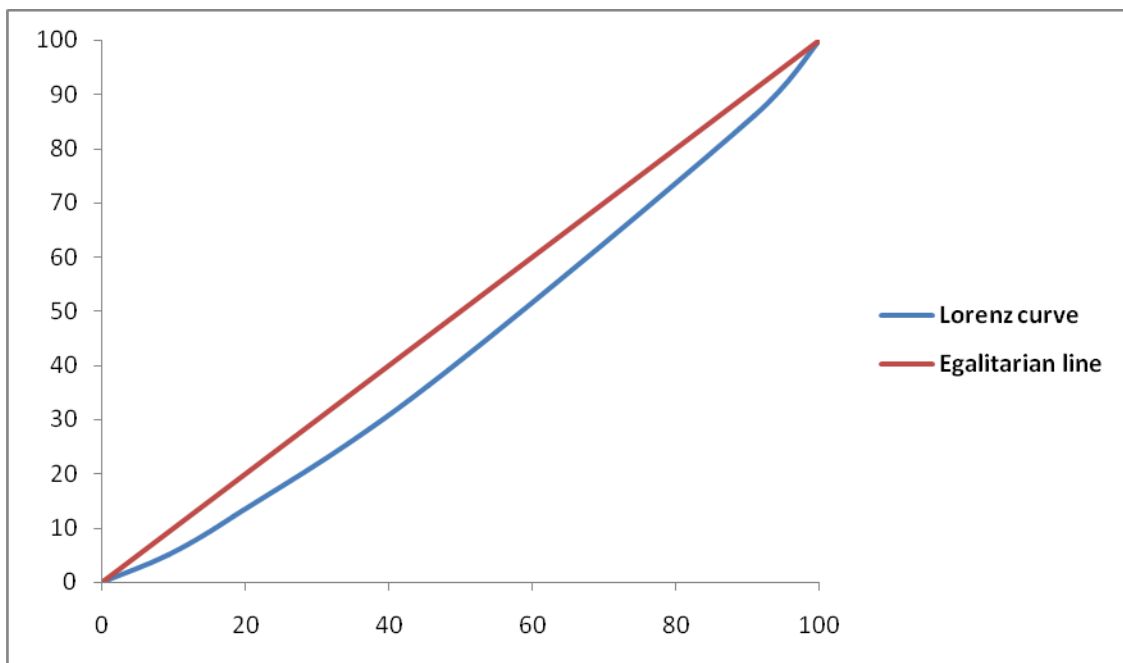
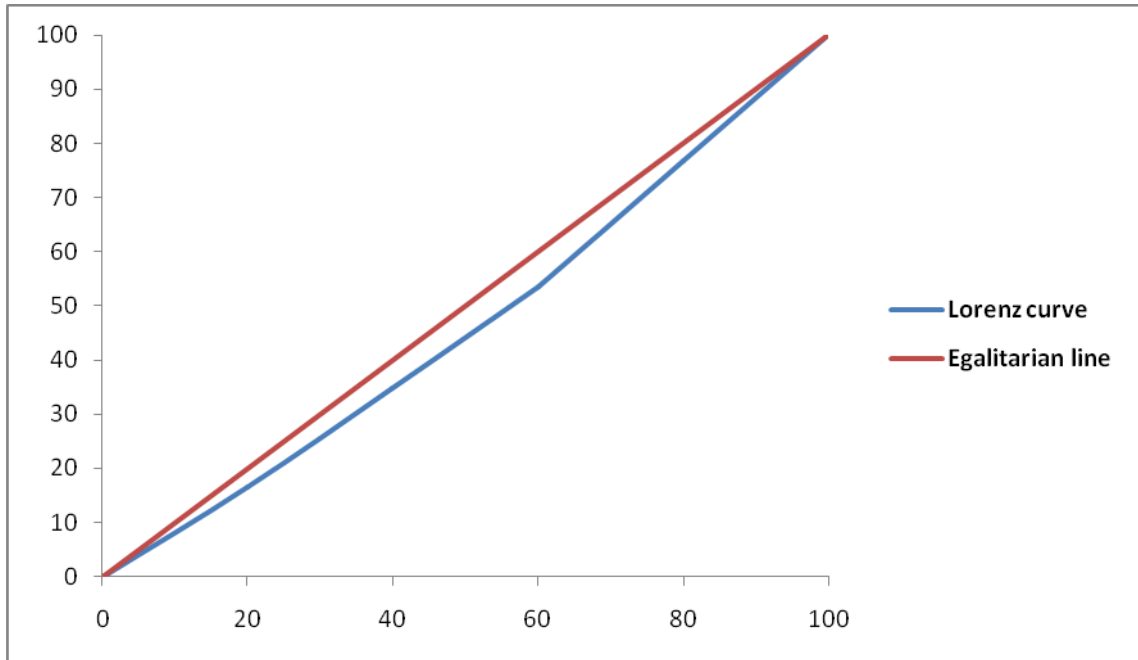


Figure 10 Lorenz Curve of the TNPL Farmers of Southern Zone



The Lorenz curve was drawn having percentage of number of households in X axis and percentage of income distribution in Y axis. The egalitarian curve denotes equal distribution of income among the households the Lorenz curve shows how the sample households deviates from the equal distribution of income. It could be evidenced from the figures 6 to 10 in all zones the results of Gini concentration ratio were supported by Lorenz curve. The households who are practicing TNPL Plantation schemes have almost equal distribution of income irrespective of zones. It is understood from the results that TNPL Plantation schemes practices are the potential practices in elevating the status of low income to middle; middle income category to high income category based on the size of farm holdings. Hence, continued practice of TNPL Plantation schemes with the technical advice from contacting firms will sustain and enrich the livelihood status of households. Continued efforts are needed in case of Southern Zone farm households to empower them technically in farm forestry practices.

3.5 Constraints Faced by the Farm Forestry Farmers

Using Garrett's Ranking Technique, the constraints faced by the farm households in farming activities were analysed and the results are presented in Table 31.

The labour scarcity was the main problem faced by the farmers in all the five zones taken for the study, followed by water problem and weed growth. But they manage with available water for cultivating tree crops. They reduce the frequency of irrigation after first year. In general they express their willingness to continue TNPL Farm forestry/Captive plantations as compared pest and disease problems they face in agricultural crops they are able to manage to reap higher return from these TNPL Pulpwood plantations. Most of the farmers expressed that crop insurance may be provided for tree cultivation like agricultural crops.

Table 31 Constraints Faced by Farm Forestry Households in Tree Cultivation

S. No	Constraints	Garrett's Score					Rank				
		NEZ	NWZ	WZ	CDZ	SZ	NEZ	NWZ	WZ	CDZ	SZ
1	Non exposure to latest technology	66.56	28.45	18.06	27.34	17.46	II	IV	IV	IV	IV
2	Weed growth	23.67	43.66	73.61	41.67	47.48	IV	III	II	III	III
3	Water problem	49.36	47.58	43.75	72.57	77.47	III	III	III	II	II
4	Labour Scarcity	88.37	85.26	87.50	84.85	81.63	I	I	I	I	I

3.6 Awareness about FSC

Table 32 Awareness about FSC of the Study Area

Classification of farm holdings	North Eastern	North Western	Western Zone	Cauvery Delta	Southern Zone	Total
Small	14	10	8	4	3	25
Medium	79	28	10	26	7	71
Large	85	75	14	61	9	159
Total	178	113	32	91	19	255

Regarding FSC awareness, around 72% of the various stakeholders like farmers, workers, contractors, local public, institutions, etc., were aware of FSC and its group formation (Table 32). Most of the farmers know what the role of FSC is and need for it. Farmers of medium and large holdings do not involve directly in using chemicals for plant protection measures. Even in small farms, less than 10 per cent of the farmers were handling plant protection chemicals and following the safety policies which are given by TNPL. Hence TNPL created awareness among the farmers about FSC and role and their guidelines in tree cultivation in notable way.

CHAPTER IV

SUMMARY AND CONCLUSION

The modern practices in plantation establishment along with precision plantation activity by industries like TNPL helps to convert unutilized farm lands, government waste lands, temple lands / institution lands into productive tree lands besides creating huge employment and income generation. These will have significant impact as a source of subsistence through employment, revenue generation besides satisfying the raw material demands of the wood based industries. Hence, TNPL plantation schemes have excellent scope to improve the socio economic status of the all level of stakeholders like farming community, workers, contractors, local public, etc..

Keeping all these in view the present study aimed to examine the socio-economic status and the improvement in livelihood among the various stakeholders of TNPL plantation schemes in Tamil Nadu.

The study was conducted purposively in five Agro-Climatic Zones of Tamil Nadu namely Western Zone, North Western zone, Cauvery Delta Zone, North Eastern Zone and Southern zone. The secondary data were collected by personal interview from selected people using pre-tested interview schedule. The study is primarily based on the field level data collected through well framed pre tested interview schedules and discussion with the different level of stakeholders belonged to different districts of Tamil Nadu where TNPL plantation schemes were implemented. The study was carried out in a specific agro-climatic zones covering specific time period. Tools of analysis included percentage analysis cost of cultivation, economics of farm forestry plantations, Net Present Value, Benefit-Cost analysis, Internal Rate of Return, Lorenz curve, Gini Concentration ratio, and Garette's Ranking Technique.

To become self –reliance in raw materials availability the firm has implemented two plantation schemes i.e., Farm Forestry and Captive plantations program across the state of Tamil Nadu. This large scale plantation program has created significant impact on the socio economic status of rural people coupled with the plantation growers.

Socio-Economic Impact of TNPL plantations schemes

- TNPL and its plantations schemes are compiling all the applicable laws, ratified international conventions and obligatory code of practice.
- TNPL plantations schemes improving the socio economic status of farmers and local people residing in its operating areas.
- TNPL engaging local labourers for its plantation activities which generates more employment for the rural community
- TNPL is having well established dispute/grievances resolution mechanism. In general, the complaints received from various stakeholders in the following categories:
 - For want of good quality seedlings
 - For want of releasing Purchase Order to harvest their plantations
 - Payment request for the pulpwood supplied by them
 - Replacement for damaged or dried plants which supplied from TNPL
 - Raising Pulpwood Plantations
- The above categorized complaints are well settled by TNPL which evidenced during consultation with various stakeholders in assessment.
- During Assessment, we have not find any disputes which are having substantial magnitude or substantial duration or involving a significant number of interests.
- It was confirmed that TNPL is providing various trainings in all level of stakeholders about workers rights. TNPL conducting a noteworthy programmes and activities with related to workers rights by which creating among all the level of stakeholders about the workers rights.
- It was also evidenced that no sexual harassment occurred in TNPL mill site areas as well as field. The same also confirmed while interviewing with female workers as well as men workers in TNPL operating areas.

- Higher number of animals reared in the farms nearby TNPL plantations especially in its Captive plantation areas since TNPL is allowing local public to graze their animals in its captive plantations.
- The liability of farmers/labourers from private finance institution is very lesser in TNPL plantations schemes operating areas.
- TNPL is allowing the local public to collect firewood from its captive plantations by which its fulfilling the basic need of local community (Fuel wood)
- TNPL is paying the payment to workers which deserves for their works and always higher than minimum wages.
- TNPL is also providing equal pay for equal works and no bias in the gender. Also it engaging more women workers for its plantation activities and encouraging women empowerment. So TNPL plantation activities are uplifting the socio economic status of women by which it empowering the rural women.
- TNPL not only improves the socio economic status of local public/labourers and also providing safety to them during its operational activity which is highly appreciable.
- TNPL also imparting knowledge about FSC on farmers/labourers those are living nearby its plantation areas.
- TNPL generating employment opportunities for local communities about 11.78 lakhs Mandays every year for its plantation activities. By generating and providing this much huge quantity of employment opportunities, TNPL improves the socio-economic status of local community, farmers and labourers.
- We finally concluded that the TNPL Plantation schemes are having long term economic viability which was evidenced through our entire socio-economic assessment in TNPL operating areas.

CHAPTER V

SWOT ANALYSIS OF TNPL PLANTATION SCHEMES

The Plantation programmes by TNPL, Karur is implemented in from 2004-05. Tree crops like Casuarina and Eucalyptus have been cultivated in farmers field for many decades. It order to have a clear view for the future SWOT analysis was attempted.

Strength

- ❖ Lump sum income to the farmers
- ❖ Current fallows and fallow lands is brought under cultivation.
- ❖ Requires less labour so labour cost is minimized.
- ❖ Not susceptible to many pests and diseases. So less expenses for plant protection.
- ❖ An assured income as not many crop failures are reported.
- ❖ Shortest rotation as compared to any other trees suited to farm forestry situation
- ❖ Not a scheduled timber so not subjected to any strict timber transit rules
- ❖ Self sufficient for industries in raw material requirement
- ❖ Enriches soil fertility
- ❖ No high price fluctuation as in case of agricultural and horticultural crops
- ❖ Assured market for farmers

Weakness

- ❖ Even four or five year rotation is fairly a long period for small farmers
- ❖ Short term financial obligations of the farms could not be met
- ❖ Most of the growers have small size of farm holdings

Opportunities

- ❖ By offering still better price, more quantity can be diverted as pulpwood to fill the gap in the availability of other species of pulpwood
- ❖ Since trees have manageable girth mechanized harvesting can be encouraged.
- ❖ High yielding hybrid clones for rain fed cultivation may be explored. So that more area can be brought under TNPL schemes

Threats

- ❖ Epidemic status of pests and diseases (Eg. Eucalyptus Gall wasp and Casuarina wilt)

ANNEXURE

TNPL PLANTATIONS EVALUATION

I. General Particulars

Name and Address of :
the farmer

Land Survey No :
Year and Registration No. :

Hamlet :

Village :

Block : Taluk :

District :
i)

ii) Soil Type : Clay/ Black Cotton/ Red/Red loamy/ Sandy loam/
Calcareous/ Problem soil

iv) Soil depth prevailing :
in that area (in cm)

v) Size of the Family and Employment Details

Particulars	Age	Educational Qualifications	Number of Years of Farming Experience	Employment			Days of Work	Annual Income		
				On farm	Off farm	Non farm		On farm	Off farm	Non farm
Head										
Wife										
Children – Male										
Children – Female										
Elders										
Other Dependents										

II. Details of participation of farmers in social organizations

Sl.No	Name of the organization	Position held	Years of participation
1.			
2.			
3.			
4.			
5.			

III. Land Holding Pattern

Particulars	Wet land	Garden land	Dry land
Area owned in ha (1)			
Area leased in ha (2)			
Area leased out in ha (3)			
Total Area in Possession in ha (1) + (2) – (3)			

IV. Assets and Liabilities

1) Assets

Assets	Name and No. of assets	Year of purchase /Construction	Value in Rs. Per unit
House – Kutcha /– Pucca			
Farm building			
Storage Godown			
Cattle Shed			
Furniture /			
Television / Radio			
Fridge / Washing Machine			
Vehicles			
Agricultural implements			
Machineries			
Wells Open wells /Bore wells			

2) Liabilities

Details of Liabilities	Source of funds	Value of Liabilities	Interest Rate	Remarks
Loan amount				
Jewels – Under mortgage				
Properties under mortgage				
Leased in land				

3) Possession of Livestock

Cattle	Breed	Number	Age	Value in Rs.
Cow				
Buffalo				
Bullock				
Calves				
Goat				
Sheep				
Poultry				
Others				

V. Details of Irrigation

S.No.	Source of Irrigation	Gross irrigated area	Net irrigated area	Remarks
1	Canals			
2	Tanks			
3	Open Wells			
4	Bore Wells			
5	Ponds			
6	Others if any			

VI. Cropping Pattern

S.No.	Name of the crop	Season	Area in ha	Total Cost Rs./ha	Total Income Rs./ha

VII. Details of Tree Crops / Farm Forestry Plantations established

S.No.	Name of the Tree crop	Age of the tree in yrs	Name of the Intercrop	Area under Tree crop in ha	Spacing in Meters
1.					
2.					
3.					
4.					
5.					

VIII. Details of maintenance of Livestock

Forage/Grass	Quantity/animal	Feed cost /animal/day
Green fodder		
Dry fodder		
Concentrate		
Silage		
Others if any		

IX. Employment and Income Generation

Name of the Enterprise	Number of Man days of Employment /annum	Prevailing Wage Rate per Day	Income Through Sale of the Produce	Total Income Generated per annum
Agriculture				
Horticulture				
Forestry				
Fishery				
Dairy				
Goat Farming				
Poultry				
Sericulture				
Apiculture				
Mushroom Production				
Any other				

X. Constraints in Tree farming

S.No.	Constraints	Ranks given to each constraint
1.	Water problem	
	a) Scarce	
	b) Water logged	
2.	Drainage problem	
3.	Availability of seedlings	
	Pest and disease incidence in the field	
4.	Lack of soil nutrients	
5.	Weed growth	
6.	Non Exposure to latest technology	
7.	Inaccessible production site and lack of transportation	
8.	Lack of marketing infrastructure	
9.	Labour scarcity	
10.	Others if any	

XI.Details of output

S.No.	Name of the crop / trees / livestock	Form of produce(main or by-product)	Place of Sale	Total yield Per ac	Price per unit of output	Post harvest handling cost	Total return (Rs/ac)
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

XII.Marketing

Sl.No	Form of produce	To whom sold	Price per unit	Marketing Cost					Storage & others	Total cost
				Electricity	Transport	Loading & unloading	Grading/ Processing	Commission charges		
Total										

XIII. Any benefits (in cash or kind) availed from Government schemes or NGOs.

XIV.Any technical training or skill oriented training attended. Details

XV. Success stories: If any

Appendix X.A. Economics of crops

Operations	Men				Women				Bullock				Machineries				Materials				Total	
	Own		Outside		Own		Outside		Own		Outside		Own		Outside		Own		Outside			
	Days	Wages (Rs.)	Days	Wages (Rs.)	Days	Wages (Rs.)	Days	Wages (Rs.)	Hrs.	Rs.	Hrs.	Rs.	Hrs.	Rs.	Hrs.	Rs.	Hrs.	Rs.	Hrs.	Rs.		
Field preparation/ Ploughing																						
Bund formation																						
Pitting																						
Seed or planting material																						
Sowing/Planting																						
Gap filling																						
Fertilizer / Manuring																						
Irrigation																						
Weeding																						
Pruning																						
Pesticide application i) Tree crop ii) Inter crops																						
Basin formation																						
Harvesting																						
Post harvest handling																						
Processing for value addition																						
Transporting																						
Total																						

XVI: Awareness about FSC requirements

- 1) Usage of chemicals for plant protection measures
- 2) Safety measures followed while using chemicals for plant protection
- 3) Whether the farmer is fulfilling FSC requirements or problems faced
- 4) Any negative impact on natural resources due to tree farming

XVII Opinion about crop insurance/ tree insurance against fire/flood/cyclone/theft

XVIII. Opinion about the sustainability of farm forestry

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