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EVALUATION OF FOREST SCHEMES OF THE KERALA FOREST DEPARTMENT UNDER THE WESTERN GHAT DEVELOPMENT PROGRAMME

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INTRODUCTION

The Planning Commission initiated the Western Ghat Development Programme (WGDF) in 1974-75. The main objectives of the programme were economic upliftment of the people and conservation of ecology in the Uestern Ghat region. During the Seventh Five Year Plan the objectives of WGDF were (i) to maintain the ecological balance which is essential for the life support system, (ii) to preserve genetic diversity, (iii) to restore the ecological dsmage caused by human interaction and (iv) to create awareness among the people and educate then, on the far reaching implications of ecological degradation and to enlist their active participation in the ecodevelopment scheme. With these otjectives in mind various programmes were initiated in the key sectors viz, Agriculture, Animal Husbandry, Forestry, Soil Conservation, etc. in the State of Kerala.

While considering the Forestry sector development in the State, we cannot ignore the role of forest in the maintenance of ecological balance. So the schemes implemented under WGDF also gave due importance to development. The Forest Department undertook the work of afforestation of the delicate and ecologically vulnerable hill slopes. for raising protection forests. As organised encroachment is one of the important protlems in the Western Ghat region, especially in Kerala, the need for forest protection was also felt. While drawing up programmes under this scheme the Department gave primary importance to maintain and improve the natural forests, so thst future forest degradation is stopped.

The present study attempts to evaluate the Forestry Schemes undertaken by the Kerala Forest Department under the WGDF during the Seventh Five Year Plan period.

As per the terms of reference of the Government of Kerala field studies have been conducted to find answers to the following questions:

1. How far the forestry programmes implemented so far under the WGDP have been effective in augmenting the forest resources and

2. How far the ongoing/completed programmes implemented by the Forest Department under WGDP satisfy the objectives of ecorestoration and ecodevelopment and if not how the existing programmes have to be re-oriented to fulfill these objectives ?

METHODOLOGY

Informatic, on various categories of works undertaken by the Kerala Forest Department under the Western Ghat Development Programme during Vllth Five Year Plan were collected from the the administrative units of the Forest Department. As per the records of the Department, programmes were implemented in the 28 Forest Divisions (Table 1). The different programmes which were carried out are listed below:

1. ECOPRESERVATION OF FORESTS

1.1 Establishement of bamboo plantations
1.2 Heterogeneous profuse mixed seeding
1.3 Raising of mixed plantation
1.4 Augmentation of rosewood
1.5 Introduction of tropical pines

2. FOREST CONSOLIDATION

2.1 Construction of cairns

3. IMPROVEMENT OF TEAK PLANTATIONS

3.1 Cutting and removal of loranthus

3.2 Establishment of Teak Seed Orchard

3.3 Establishment and maintenance of Teak seed production areas

4. FOREST PROTECTION AND CONSERVATION

4.1 Eco improvement of Mankulam Forest area

4.2 Protection of forests including plantations

Table 1. List of Forest Divisions where the programme has been implemented.

Name of circle	Name of Division
1. Research Circle	Silvicultural Research
2. Southern Circle	Thiruvananthapuram
	Punalur
	Thenmala
	Ranni
	Konni
	Achenkoil
3. Highrange Circle	Kottayam
	Kothamangalam
	Munnar
	Grassland Afforestation
	Mankulam

RESULTS AND DISCUSSION

The team surveyed and evaluated the works carried out by the Kerala Forest Department under the WGDP in the following areas (Map. 1).

1. Thiruvananthapuram
2. Ranni
3. Kottayam
4. Peerumed
5. Kothamangalam
6. Vazhachal
7. Chalakudy
8. Thrissur
9. Nenmara
10. Palakkad
11. Mannar kad
12. Nilambur
13. Kozhikode
14. North Wayanad
15. Wayanad Wildlife Sanctuary

The results of the field survey and analysis of data for each scheme is as follows:

i. ECOPRESERVATION OF FORESTS

1.1 **Establishment of Bamboo Plantations:** A total of 4483 ha of bamboo plantations were raised by the Department during the period under report. The team surveyed 34 plantations in the different sampling locations covering an area of 1384.17 ha (31% of the total area). A consolidated statment of the surveyed plantations is given in the Table 4.

4. Central Circle	Chalakkudy
	Malayattoor
	Vazhachal
	Thrissur
5. Olavakkode Circle	Palakkad
	Nemmara
	Mannarkad
6. Northern Circle	Nilambur (North)
	Nilambur (South)
	Wayanad (North)
	Wayanad (South)
	Kozhikode
7. Wildlife Circle	Project Tiger Thekkady
	Parambikulam
	ldukki
	Wayanad Wildlife Sanctuary

A multistage random sampling technique was used to choose the location/project sites for the evaluation. Geographical variations and type of work were given importance. Location specific schemes were examined individually.

A proforma was developed, field tested and corrected and was used in the assessment of the various programmes (Table 2). For planting programmes success was determined using the percentage stocking as the indicator (Table

lnformation on the financial and physical aspects were collected from various sources (Western Ghat Cell, Government of Kerala and the Forest Department) and are analysed separately.

Table 2. Proforma for collecting field information

Division
Range
Locality

1. Name of plantation
2. Type of work
3. Year of planting
4. Area
5. Vegetation
6. Rainfall
7. Elevation
8. Slope
9. Soil
10. Depth of soil
11. Stoniness
12. Erosion
13. Fire incidence

Silvicultural

1.1 Species
Local flora is represented by
1.2 Planting technique
1.3 Spacing
1.4 Age
1.5 Stocking
1.6 Growth characteristics
1.7 Protection
1.8 Fire hazard
1.9 Grazing
1.10 Illicit collection

Tab1e 3. Classification showing different categories of plantations

Category (Plantation)	Percentage of Stocking
Poor	0 - 20
Low	21 - 40
Average	41 - 60
Good	61 - 80
Very good	81 - 100

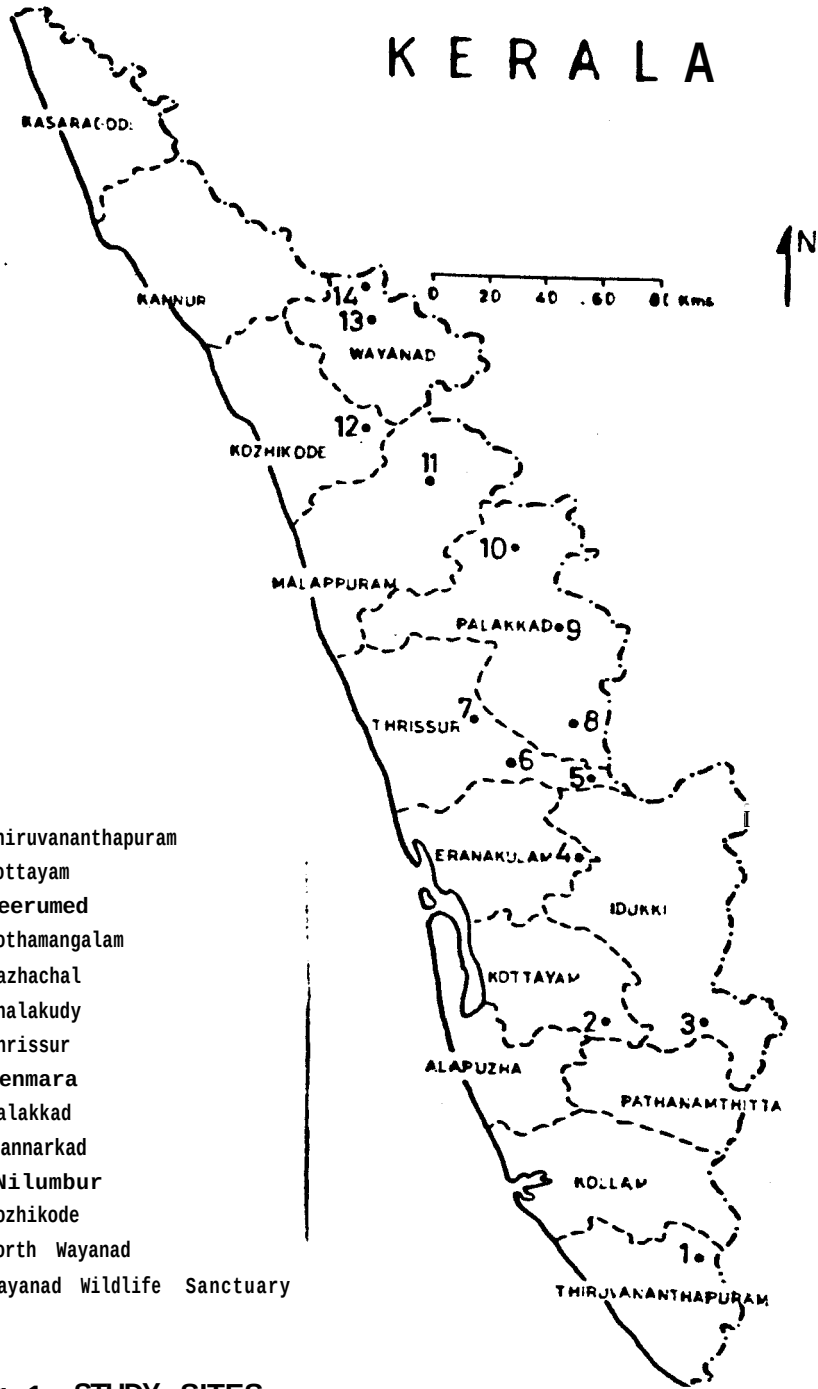

Fig 1. STUDY SITES

Table 4. Consolidated statement of bamboo plantations surveyed.

Sl. NO.	Scheme	Divition	Range/Locality	Year of planting	Area (ha)	Stocking (%)
1.	1985 Chorhikode Bamboo under planting In 1961 Teak plantation	Trivandrum	Kulathupuzha range Chozhikode	1985	2.00	8l-l00
2.	1987 Chozhiakode Bamboo under planting in 1961 Teak plantation	Trivandrum	Kulathupuzha range Chozhikode	1987	9.021	21-40
3.	1987 Kulathupuzha Bamboo under planting in 1961 Teal plantation	Trivandrum	Kulathupuzha range Mylammood	1987	10.48	0-20
4.	1986 Kalaketti Bamboo under planting in 1852 Teak plantation	Kottayam	Erumeli range Kalaketti	1986	26.62	81-100
5.	1980 Kalaketti Bamboo under planting in 1951 Teak plantation	Kottayam	Eruemeli range Kalaketti	1986	21.04	81-l00
6.	1987 Kalaketti Bamboo under planting in 1854 Teak; plantation	Kottayam	Erumeli range Kalaketti	1967	51.00	0-20
7.	1986 Kannimala Bamboo under planting in 1932, 1933, 1934 Teak plantation	Kottayam	Erumeli range Kannimala	1986	24.28	81-100
8.	1986 Bamboo underplanting in 1943,'44 Teak plantation	Kothamangalam	Kothomangalam range Thattekkad	1986	10.00	0-20
5.	1986 Bamboo under planting in 1952 Teak plantation	Kothamangalam	Kaliyar range Thenedom	1986	30.21	0-20
10.	1986 Bamboo under planting in 1942 Teak plantation	Kothamangalam	Kothamangalam range Thattekkad	1986	20.00	0-20
11.	1986 Bamboo under planting in softwood plantation	Chalakudy	Palapilly range Punnamittam	1986	125.00	21-40
12.	1987 Bamboo under planting in 1960 softwood plantation	Chalrkudy	Palapilly range Cheenikkunnu	1987	42.00	0-20
13.	1986 Bamboo under planting in 1962 softwood plantation	Vazhachal	Vazhachal range Vazhachal	1987	35.00	21-40
14.	1987 Bamboo under planting in 1963 softwood plantation	Vazhachal	Vazhachal range Pokalapara	1987	60.00	21-40
15.	1986 Bamboo under planting in 1963 softwood plantation	Vazhachal	Kollathirumedu range Karadipara	1986	17.00	21-40
16.	1989 Elanad (Kalapara) Bamboo plantatior. under 1939 to 1949 Teak plantation	Trichur	Machad Range Elanad (Kalapara)	1967	75.00	21-40

17.Elanad Bamboo plantation 1986 under 1937 and 1938 Teak plantation	Trichur	Rachad Range Elanad	1986	20.00	61-80
18.Palakathadam Bamboo plantation 1986 under 1962 and 1953 Teak plantation	Trichur	Rachad Range Palakathadam	1986	71.00	41-60
19.Elanad Bamboo plantation 1985 under 1962, 1963 softwood plantation	Trichur	Rachad Range Elanad	1985	110.00	61-80
20.Ambalappad Bamboo plantation 1985 under 1944 Teak plantation	Trichur	Machad Range Ambalappad	1985	50.00	81-100
2l.Oorochad Bamboo plantation 1985 under 1945 Teak plantation	Trichur	Nachad Range Oorochad	1985	16.50	61-80
22.Potta Bamboo plantation 1986, under 1962,1963 Potta Teak plantation	Trichur	Nachad Range Potta	1986	84.00	61-80
23.1986 Bamboo under planting in 1954, 1955 Teak plantation	Trichur	Pattikad range	1986	80.00	61-80
24.1986 Bamboo under planting in Old Teak plantation	Trichur	Peechi range Puthur-Paravattanimala	1986	70.12	61-80
25.Pumbatty 1987 Bamboo under planting in 1927-20, 1928-29 and 1931-32 teak plantation	Trichur	Peechi range Pambatty	1987	50.00	41-60
26.1986 Bamboo under planting	Trichur	Yadakkancherry range Akamala	1986	20.00	61-80
27.1987 Bamboo under planting	Trichur	Wadakkancherry range Paruthipra	1987	25.00	41-60
28.1986 Bamboo under planting In 1946 Poongodu teak plantation	Trichur	Wadakkancherry range Poongodu	1986	30.00	61-80
28.1986 Bamboo under planting in 1949 Teak plantation	Nemmara	Nelliampathy range Pothundy	1986	20.08	81-100
30.1986 Chenat Nair Bamboo under planting in 1939 Teak plantation	Palakkad	Olavakkod Chenat Nair R.F(Dhoni)	1986	11.73	81-100
31.1987-88 Bamboo under planting in 1967 Teak plantation	Nilambur	Karulai range Ezhuthukal	1987	69.85	Nil
32.1986-87 Bamboo under planting in 1965 Teak plantation	Nilambur	Karulai range Mundakadavu	1986	29.00	Nil
33.1988-89 Bamboo under planting in 1966 Teak plantation	Nilambur	Karulai range Kallanthode	1988	40.00	Nil
34.1986 Bamboo under planting in 1967 Teak plantation	Nilambur	Karulai range Kallanthode	1986	27.40	0-20

The Division-wise performance of the bamboo plantations raised under WGDP is given in fable 5.

Table 5. Categorisation of Bamboo plantations studied Division wise as per the stocking.

% Stocking	Thirvanthapuram	Kottayam	Kothamangalam	Vazhachal	Trichur	Nemmara	Palakkad	Nilambur	Total
3 - 20	1	1	3	0	1	0	0	4	10
21 - 40	1	0	0	3	2	0	0	0	6
41 - 60.	0	0	0	0	3	0	0	0	3
61- 80	0	0	0	0	8	0	0	0	8
81 - 100	1	3	0	0	1	1	1	0	7
Total	3	4	3	3	15	1	1	4	34

Of the 34 plantations inspected, 7 are with very good, 8 with good, 3 with average, 6 with low and 10 with very low stocking. The bamboo plantations raised in Trissur Division were the best and the reason can be attributed to the planting technique adopted by the then Divisional Forest Officer. Area wise, 47% of the plantations had low to poor stocking, while 53% possessed average to very good stocking.

The reasons for the success of bamboo planting can be attributed to:

1. Two year old seedlings with adequate rhizome drvelopment vas planted.
2. The area was protected from fire.
3. Grazing was prevented by raising a barbed wire fencing.
4. Appropriate silvicultural treatment was given.

The reasons for the failure of bamboos planting can be attributed to:

1. Planting of poor seedling stock.
2. Adequate protection from fire and grazing was not provided.
3. Poor soil treatment

Thus it can be seen that planting of bamboo seedlings with adequate rhizome development (2 year old) and affording protection from grazing during the early years of growth and continuous protection from fire results in highly successful plantations.

Field trials conducted by the Kerala Forest Research Institute (Thomas, 1991) have proved that if sufficient nutrients are provided to the seedlings in the form of fertilisers, enhancement of growth (culm biomass) upto 9.6 times of the control can be achieved within a span of 30 months. The dosage applied was 40gN, 9gP and 75g K per plant. For better results the above treatment is recommended.

1.2. Heterogeneous profuse mixed seeding

Profuse mixed seeding with seeds of different species like *Terminalia paniculata, Tectona grandis, Dalbergia latifolia, Pterocarpus marsupium, Terminalia crenulata, Albizia lebbeck, Vateria indica* etc.,was carried out. A total area of 1006 ha of degraded forests were treated in such manner. The team inspected 170.03 ha 117%) of the area. The list of the different species tried in this programme is given in Table 6 and the growth performance of individual species (5 year average) is given in Table 7. Details of the enumeration are given in Table 8 Division wise performance in Table 9.

Table 6. List of Species

1. Ailanthus triphysa	26. Odina wodier
2. Albizia lebbeck	27. Phyllanthus eoblica
3. Albizia odoratissima	28. Pongamia pinnata
4. Alstonia venenata	29. Pterocarpus marsupium
5. Anthocephalus chinensis	30. Radermacheria xylocarpa
6. Artocarpus heterophyl lus	31. Sapindus laurifolius
7. Artocarpus hirsutus	32. Schleichera oleosa
8. Bombax ceiba	33. Sindhuri (local name)
9. Bridelia crenulata	34. Sterculia villosa
10. Bridelia squomosa	35. Sterospermum suaveolens
11. Buchanania lanceolata	36. Strychnos nux-vomica

12. Cassia fistula
13. Ceiba pentendra
14. Dalbergia latifolia
15. Evodia lunu-ankenda
16. Gmelina arborea
17. Grewia tiliaefolia
18. Haldina cordifolia
19. lidala (local name)
20. Lagerstroemia microcarpa
21. Lannea corromandelica
22. Hangifera indica
23. Manihot glagiovii
24. Melia dubia
25. Nauclea parviflora
37. Swfetenia macrophylla
38. Syzigium cuminii
39. Tamarindus indica
40. Tectona grandis
41. Terninalia bellirfca
42. Terminalia crenulata
43. Terminalia paniculeta
44. Terminalia tomentosa
45. Vatteria indica
46. Vitex altissima
47. Xylia xylocarpa

Table 7. Growth performance of individual species

S1.No.	Species	Average Growth (5 years)	
		Height (cms)	Girth (cms)
1.	Ailanthus	500	14
2.	Albizia lebbeck	925	33
3.	Albizia odoratissima	74	Not measured
4.	Anthocephalvus chinensis	299	7
5.	Artocarpus heterophyllus	475	15
6.	Artocarpus hirsuta	584	22
7.	Bridelia squamosa	230	1

8.	Buchananina lanceolata	492	14
9.	Cassia fistula	220	2
10.	Ceiba pentandra	150	5
11.	Dalbergia latifolia	249	3
12.	Evodia lunu-ankenda	287	7
13.	Gmelina arborea	355	8
14.	Grewia tiliifolia	270	5
15.	Haldina cordifolia	250	7
16.	Lagerstroeaia microcarpa	253	2
17.	Hangifera indica	170	3
18.	Melia dubia	210	Not measured
19.	Odina wodier	150	4
20.	Phyllanthus emblica	330	6
21.	Pterocarpus narsupium	320	8
22.	Radermacheria xylocarpa	240	4
23.	Sapindus laurifolius	263	5
24.	Sehleichera oleosa	175	3
25.	Sterculia villosa	450	14
26.	Sterospermum suaveolens	163	Not measured

27.	Strychnos nux-vomica	237	2
28.	Syzigium cuminii	195	4
29.	Tamarindus indica	260	5
30.	Tectona grandis	297	6
31.	Terminalia bellirica	292	9
32.	Terminalia crenulata	275	6
33.	Terminalia paniculata	353	8
34.	Vateria indica	407	10
35.	Vitex altissima	228	
36.	Xylia xylocarpa	248	4

Table 8. Details of areas sampled and the Stocking percent

Sl. no.	Scheme	Division	Range/Locality	Year of planting	Area (ha)	Stocking %
1.	1985 Heterogenous mired seeding	Thriuvananthapuram	Kulathupuzha range Arippa	1885	5.00	61-80
2.	1886 Heterogenous mixed seeding	Thiruvananthapuram	Kulathupuzha range Arippa	1886	10.00	61-80
3.	1990 Alpara, Heterogenous mixed seeding	Kottayam	Erumeli range Alpara	1990	8.16	0-20
4,	1989 Heterogenous mixed reeding	Mannarkad	range Thiruvazhukunnu	1989	50.00	41-60
5.	1989-90 Heterogenous mixed seedings	Nilambur	Vazhikkadavu range Nellikuthu	1889	73.00	Nil
6.	Profuse mired seeding Ambakuthyvayal	Sulthanbatherry	Sulthanbatherry range Ambakuthy oaya I	1990	3.80	Nil
7..	1989 Heterogenous mired reedings	Sulthanbatherry	Begur range Thirunelli	1989	20.07	0-20

Table 8.Categorisation of Hetrogenous Mixed Seeding Plantations-Division wise as per the Stocking percent.

%	Thiruvananthapuram	Kottayam	Mannarkkad	Nilumbur	Wayanad
0 - 20	0	1	0	1	2
21 - 40	0	0	0	0	0
41 - 60	0	0	1	0	0
61 - 80	2	0	0	0	0
81 - 100	0	0	0	0	0
Tota1	2	1	1	1	2

Poor stocking was recorded in 4 areas (62% of the area), average in one (21% of the area) and good in two areas (0% of the area). It can be observed that the programme was more successful in the Southern Divisions than in other areas.

Heterogenous mixed seedings is used to augment the natural regeneration in areas far away from adequate seed sources. Though the protection by creating barbed wire fence was given to almost all the areas, the performance is discouraging. Thus the performance of this activity was not upto the nark in most of the areas due to the following reasons:

1. Many of the species are not locality specific as can be seen from the species composition of the surrounding vegetation.

2. Seed quality for its viablity, which is the pre-requisite for such operations is not seen carried out before sowing.

3. Adequate ground preparation has not been seen carried out in order to give the radicle access to the soil immediately on germination.

The following aspects require due consideration in this scheme :

a. Selection of species to be based on the type of vegetation of the surrounding area.

b. Viability and germination percentage to be studied for deciding the quantity of seeds of each species to be mixed.

c. Adequate preparation like howing, and others will have to be carried out in order to give sufficient opportunity to the radicle to reach the soil.

d. Adequate protection from small herbivores like mouse deer, rabbit etc., will give better results as the juvenile shoots are liable to easy damage. Morever, most of the species of the moist deciduous forest, which is the main area taken up under the scheae are not amenable for coppicing in the seedling stage once they are bitten and damaged by the small herbivores.

e. Adequate attention to be given for the maintenence of the seedlings including weeding in the initial stages so that they can reach the sapling stage.

f. Multi-locational trials to develop proper plantation technology for large scale implementation.

1.3. Raising of Mixed plantations: The team visited four mixed plantations raised during the period. The species mixtures comprised *Bambusa bambos, Sweitenia mahogany, Albizzia lebbek,* Tectona grandis, Anacardium occidentale and others. The details are given in Table 10.

Table 10. Consolidated statement of rising of mixed plantations

Sl. No.	Scheme	Division	Range/locality	Year of planting	Area (ha)	Stocking (%)
1.	1986 Hiscellaneous species	Thiruvananthapuram	Palode range Mylamood	1986	2.24	*Swietinia*) Bambusa)81-100
2.	Kochanakuzhi 1987 Miscellaneous species gap planting in 1949 failed Anjili plantation	Thiruvananthapuram	Palode range Kochanakuzhi	1987	12.00	Anacardium *swietenia 181-100*
3.	Oorochad Bamboo plantation and Acacia plantation 1986 under 1946, 1947.	Trichur	Machad range Oorochad	1986	35.00	81-100
4.	1986 *Casurina, Ailanthus* mixed plantation	Kozhikode	Peruvannamuzhy Range Kakkayar	1986	9.28	41-60

Of the four plantations sampled by the team three possessed good and one average stocking. Overall the growth was good in plantations under this programme. Meanwhile it is noteworthy that the species choice while raising mixed plantations has been very narrow limiting to only very few species. It is suggested that, more species may be out planted and the operation be carried out over 3-4 years so that an uneven aged crop is established. Otherwise, the mixed plantation will resemble an even aged plantation and will not serve the purpose of ecorestoration.

1.4. Augmentation of Rosewood: Plantations of rosewood *(Dalbergia* latifolia) were raised in an area of 222 ha. The team surveyed 4 plantations covering an area of 124 ha (56% of the total area). The details are given in Table 11.

Table 11. Consolidated statement of augmentation of rosewood plantations.

Sl. wo.	Scheme	Division	Range/Locality	Year of planting	Area (ha)	Stocking (%)
1	1985 Rosewood in natural forest	fhiruvananthapuram	Kulathupuzha range Arippa	1985	*50.00*	41-60
2.	1986 Rosewood in natural forest	fhiruvananthapuram	Kulathupuzha range Arippa	1986	*28.00*	41-60
3.	Rosewood plantation at Mathampa	Peermade-	Peerrade Research Range Mathampa	1986	36.00	21-40
4.	1986 Rosewood plantation	Sultanbathery	Begur range Karitkulam	1986	10.00	00-20

As far as stocking is concerned two plantations recorded average while one possessed low and the other very low stocking. Overall, the stocking was poor and the reasons can be: (a) high mortality of seedlings plant (b)slow growth of the species and (c) fire and grazing proneness of the area and (d) lack of sufficient after care.

It is necessary to raise big sized saplings for planting. Due after care is necessary including application of fertilizers as the lands where such plantations are raised, are highly degraded leading to changes in the ecological conditions suitable for the growth of rosewood. Moreover, relieving the plants from heavy weed competition, protection from fire grazing are the other aspects to be given due importance for the success.

1.5. Introduction of tropical pines: Tropicai pine (Pinus carribea var, hondurensis) was planted in the year 1986 in an area of 72 ha at Kolahalamedu, Perumedu Research Range. The team visited the area and enumerated the plantation (50.08 he). The details are given in Table 12.

Table 12 Consolidatcd statement of tropical pine plantation.

Sl. no.	Scheme	Division	Range/locality	Year of planting	Arta (ha)	Stocking (%)
1.	1986 Pilot plantation of tropical Pines at Kolahalamedu	Kottayam-	Peermade Research Range Kolahalamedu	1986	50.08	81-100

The plantation is highly successful as regards to stocking (81- 100%) and growth.

2. FOREST CONSOLIDATION

2.1. Construction of cairns: Approximately 25,044 cairns were established during this period for consolidating the forest boundary. The team verified the presence of cairns in areas where other programmes were evaluated and recorded the presence of 5762 cairns (23% to total)(Table 13).

Table 13. Forest consolidation (Construction of cairns) work inspected by the team

Division	Year	Number
1. Ranni	1985-86	59
	1986-87	125
	1987-88	125
	1988-89	375
	1989-90	250
	Total :	934
2. Kottayam	1985-86	1263
	1986-87	904
	Total :	2167
3. Munnar	1985-86	248
	1988-89	277
	1989-90	863
	Total :	1388
4. Trichur	1986-87	732
5. Mannarkad	1989-90	500
6. Wayanad Wildlife Division	1988-89	41

Soae of the cairns are damaged and require periodical maintenance.

3. IMPROVEMENT OF TEAK PLANTATIONS

[3.1.Cutting and removal of Loranthus: Loranthus is a serious parasite of teak and is reported to reduce the increment by 41.64% (Ghosh et. al., 1984). The Department has reported that Loranthus cutting was carried out in 832639 trees. The team verified this operation in 119999 trees (14.41% to total) distributed over five Divisions. Only at Wayanad Division severe reinfestation was observed (Table 14). It is difficult to assess the benefit as the previous growth data is not available. Overall, the work has been carried on infer that cutting was not carried out from the above. Overall, this work has been carried out.

Table 14. Details of cutting and removal of Loranthus

Division	Year	Number of trees
1. Kottayam Forest Division	1985-86	5928
"	1987-88	10000
"	1988-89	8340
2. Mannarkkad Forest Division	1987-88	15931
3. South Wayanad Division Chethelayam Range, Cheeyamban locality	1989-90	But in the field work is not done
4. Wayanad Forest Division	1985-86	6292
"	1986-87	12228
"	1987-88	21581
"	1988-89	19449
6. Wayanad Wildlife Division	1985-86	20250

Loranthus has become a very big menace in many of the localities. Periodical removal would be necessary to get the expected benefit. However, it would be beneficial if the plantations are watched regularly to remove the loranthus as and when found in the younger stage itself so that its permanent establishment on the trees can be ainimised.

3.2. Establishment of Teak seed Orchard: The Kerala Forest Department has established a Teak Seed Orchard at Kulathuputha under the WGDP. The orchard possesses 50 clones of plus tree of teak collected from all over Kerala with the help of the Kerala Forest Research Institute. It covers an area of approximately 30 ha. The. orchard is well maintained. Invariably the trees bare low number of seeds. Action should be taken including manuring to induce heavy seeding.

3.3. Establishment of Teak Seed Production areas (Seed Stands): The Department has identified and maintained teak seed production areas (Seed Stands) in an area of 1500 ha in the State. This work was

carried out with technical and scientific assistance from the Kerala Forest Research Institute. The team visited seed stands in the Nilambur Forest Division. The stands are maintained properly as specified for genetic improvement programmes and are able to supply good quality seeds to the Department.

The seed yield is low and has to be managed to bear more seeds by adopting appropriate silvicultural practices specific to the locality.

4. FOREST PROTECTION AND CONSERVATION

4.1. **Eco Improvment of Mankulam Forest areas:** On our visit to the Mankulam, the Divisional Forest Officer informed us that no work has been done there under the WGDP. Vide DFO's letter No. c-1/942/92 dt. 16-2-93 (Appended)

4.2. **Protection of forests including plantations:** Under the programme fire lines were constructed to a length of 4369.5 km. the fire lines which were taken in 1989-90 could not be verified in 1992 as they have over grown with weeds thereby impairing the identity of the fire tracing operations. Of late, a more effective method of fire control is being practiced by forest officers in certain Divisions and circles. Instead of taking firelines at various places, a force consisting of a number of people is stationed at vantage points and on receiving information about fire incidence, the squad rushes to the point to put out the fire. the advantages of this method are as follows:

1. Expenses on taking firelines are not incurred.

2. A squad of 15-20 people are able to tackle the fire more effectively than a fire vatcher positioned to look after 30-50 ha of forest area.

3. A few squads of this type can tackle fire incidence in a whole range.

4.3 To make this system o! firc management more effective the following points deserve consideration:

1. The squad may be given essential training well before the fire season to deal with forest fires and also be equipped with minimum fire fighting equipments viz. hand-axe, shovels, brooms etc.

2. From the history of fire incidences, the most vulnerable areas may be marked out in the map and squads posted there.

3. A Fire-weather lndex for each range may be scientifically prepared taking into consideration atmospheric humidity, temperature,, soil moisture and fuel load so that fire incidence can be predicted in advance and suitable preventive measures can be adopted. The require training to this can be given to the forest staff.

FINANCIAL TARGETS AND ACHIEVEMENTS

A total of Rs.694.83 lakhs were earmarked for this programme during the VIIith Five Year Plan. The Department has expended Rs.582.81 Lakhs (83%). Of this bulk of the amount 296.18 lakhs was spent under the head ecopreservation of forests. About Rs.ll8.61 lakhs was expended for forest consolidation, Rs.88.94 lakhs for improvement of teak plantations and Rs.79.08 lakhs for forest protection and consolidation (Table 15).

Table 15. Scheme wise Financial targets and achievements under WGDP

	Target	Achievement
Total	694.83	582.81
Eco-preservation of Forests	352.15	296.18
Forest consolidation and afforestation	155.01	118.61
Improvement of teak plantations	98.26	88.94
Forest protection and conservation	89.41	79.08

CONCLUSION

The evaluation of various vorks carried out by the Kerala Forest Department under WGDP during the VII th Five Year Plan permits us to draw the following conclusions:

1. The establishment of bamboo plantations has been a success. More can be achieved by extending the silvicultural practices which have been prescribed earlier in the text.

2. Improvement of degraded forests by heterogenous profuse mixed seeding has been successful at most sites. Given proper protection from fire and grazing, this method can be tried at other locations for improving degraded forests. The suggestion given in the text regarding this scheme is worth consideration.

3. The Department has achieved success in raising mixed plantations at various locations. The species mixtures and planting technology deserves improvement.

4. Planting of Rosewood *(Dalbergia latifolia)* has been only partially successful. Although average stocking is available at certain sites, growth is very poor. By developing appropriate technology the plantations can be made successful.

5. The introduction of tropical pines has been a commendable success story of the Department under this programme. The benefits of this activity is evident from the field itself.

6. Cairns for consolidation of forest boundary have prevented further encroachment into forests. At almost all locations cairns can be physically verified. The damaged ones need repair.

7. Although the Forest Department has carried out Loranthus cutting to enhance the yeild of teak, a one time operation is insufficient to give the expected result. Sustained operations will do good to the plantations.

8. It was impossible to verify the construction of fire lines taken during the Seventh Five Year Plan as the areas are overgrown with weeds due to passage of time. A more effective method for fire protection is proposed in the text.

On the basis of our evaluation we attempt to answer the two questions posed to us by the Government of Kerala in their Terms of Reference (see page 2):

1.. The forestry programmes implemented under the WGDP have to a great extent been effective in augmenting the forest resources.

2. The completed programmes implemented by the Forest Department under WGDP to a large extent satisfy the objectives of ecorestoration and ecodevelopment.

In future, forestry programmes under WGDP may be focussed on raising of bamboos, profused heterogenous mixed seeding, raising of mixed plantationss with indigeneous species improvement of productivity of the plantations, forest consolidation etc. Works like loranthus cutting, if cannot be carried out on a sustained basis and raising plantations of Dalbergia and other slow growing species, if cannot be maintained at least for the first 4-5 years, may be curtailed. Ecorestoration of the degraded forests by planting appropriate species should also receive adequate attention for conserving both soil and moisture.

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