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DRAFT FINAL REPORT

PERSPECTIVE PLAN FOR THE DEVELOPMENT OF FORESTRY SECTOR IN KERALA

PRINCIPAL INVESTIGATOR

S. SANKAR

ASSOCIATES

A. R. RAJAN
SANTHOSH KUMAR. V

KERALA FOREST RESEARCH INSTITUTE

AND

KERALA FOREST DEPARTMENT

OCTOBER 1995

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The Perspective Plan for the Development of Forestry Sector in Kerala is proposed in three phases of 5 year duration. The plan is based on the assessment of actual position of the non-market and marketable benefits of the forest cover in Kerala. During the 15 years it envisages to reclothe 70,000 ha of natural forests through integrated watershed management and enhance the productivity of 9,300 ha of plantations. Biodiversity Conservation is planned in all protected areas while joint forest management in 9,000 ha buffer zone within the forest area. An intensive but sustainable approach to Non-Timber Forest Product Management is proposed. Development of allied fields viz. Inventory, research, protection, training and publicity and institution building are also included to make the programme a reality.

A total investment of Rs. 2,006.29 million is proposed to develop scientific and sustainable forest resource management an conservation in the State. The first phase calls for an investment of Rs. 580.20 million, second phase Rs. 613.36 million and third phase Rs. 812.73 million.

Abstract of Investment requirements for different programmes

Programmes	Investment requirements			
	Phase I	Phase II	Phase III	Total
1. Forest Inventory	4.90	0.26	0.33	5.49
2. Forest Protection	22.30	14.10	19.10	55.50
3. Integrated watershed management	328.60	391.10	521.50	1241.20
4. Biodiversity conservation	44.60	38.20	55.30	138.10
5. Production forestry	65.50	68.50	79.80	213.80
6. Non-Timber forest products	10.20	1.70	1.90	13.80
7. Buffer zone management	7.00	33.70	46.70	87.40
8. Research needs	47.00	19.50	23.80	90.30
9. Education, Training and Extension	10.90	6.50	10.00	27.40
10. Institutions	10.00	7.20	11.20	28.40
Total	551.00	580.76	769.63	1901.39
Fiscal and Financial contingencies	29.20	32.60	43.10	104.90
Grand Total	580.20	613.36	812.73	2006.29

INTRODUCTION

1. INTRODUCTION

1.1 Kerala - A brief geogrphical account

Kerala State located in the South Western tip of Indian Peninsula extends between 8^{o} 18' N and 12^{o} 48' N latitude and 74^{o} 52' and 77^{o} 22' E longitude. The State has a total geographical area of 38863 sq.km. The State is be divided into fourteen districts on administrative basis (Fig. 1). The total population of the State is 29011237 persons and the density of population is the 747 persons/sq.km.(Census,1991).

Physiographically the land areas of the State can be divided into three main units viz., Highland, Midland and Lowland. Among these Highland comprises the largest percentage of area (48%) followed by Midland (42%) and Lowland (10%). These zones form three parallel belts (Fig.1).

The highland (75m above MSL) is the eastern strip along which the heights often rise above 900 m. The highest point in this region is Anamudi (2690 m) in Idukki District. The hills of this high land region support natural forests which are the treasure houses of unique plant and animal diversity.The total extent of this zone is 18707 Sq.Km. The introduction of plantation crops changed the whole landuse scenario of this region. In course of last few decades there was unlimited multiplication of small households of average size 0.43 ha. The introduction of tuber crops like tapioca, ginger, turmeric, etc. into this area also adds to the degradation of this area and to the rivers originating from here.

Due to the extremely unplanned developement of agriculture in the highlands, the natural vegetation has been fragmented in many places there by loosing continuity.Thus the forests at present confined to the high hill tops and steep slopes (Fig.2). These forests of Kerala harbour rich endemic flora and fauna.

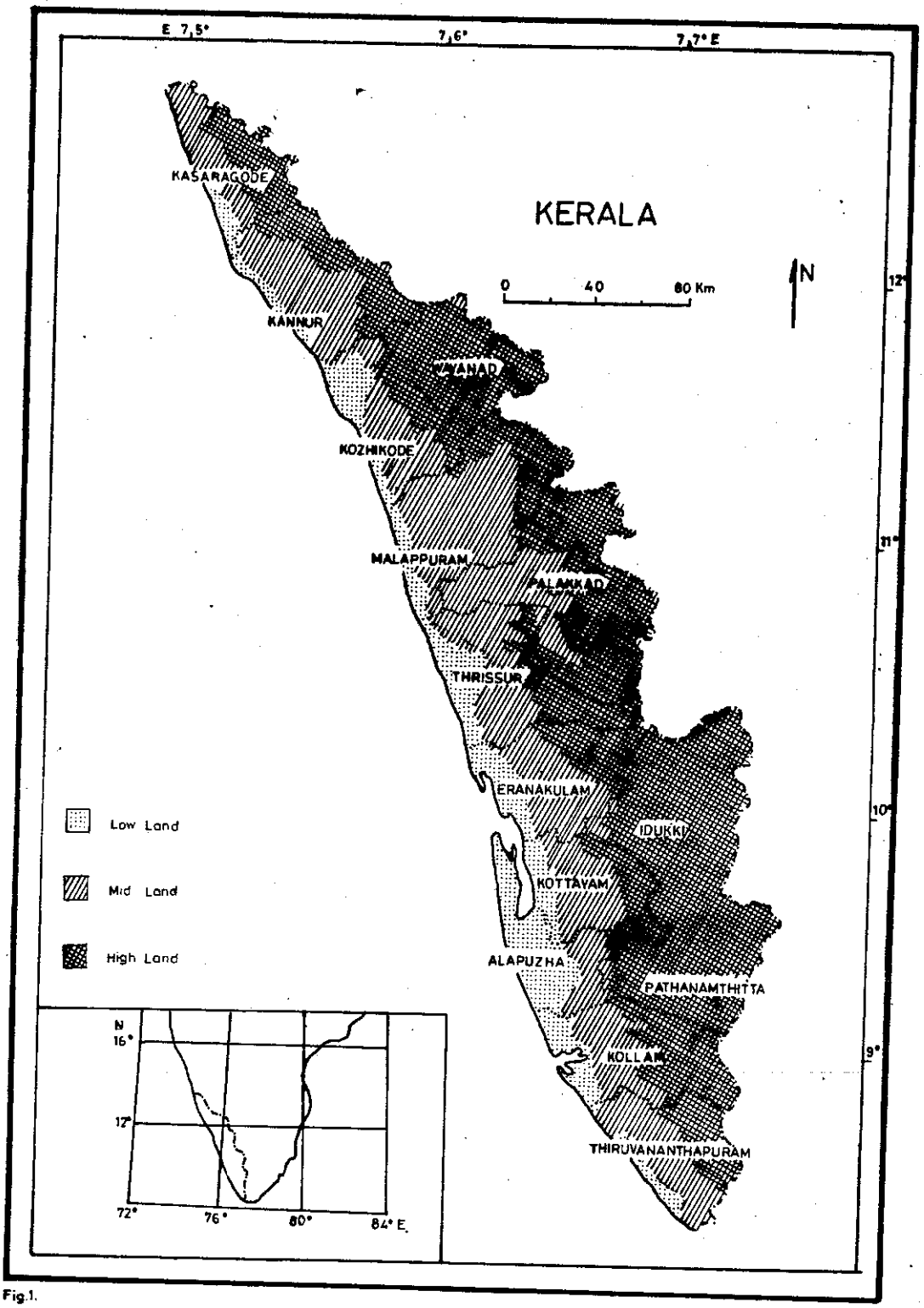
E 7,5°
7,6°
7,7° E
KERALA
0 40 80 Km
N
12°
11°
10°
9°
KASARAGODE
KANNUR
WAYANAD
KOZHIKODE
MALAPPURAM
PALAKKAD
THRISSUR
ERANAKULAM
IDUKKI
KOTTAYAM
ALAPUZHA
PATHANAMTHITTA
KOLLAM
THIRUVANANTHAPURAM
Low Land
Mid Land
High Land
N
16°
12°
72°
76°
80°
84° E

Fig.1.

The midland is a peneplain drained by the numerous rivers. The relief of this region varies between 7.5 m and 75 m. The total extent is 16227 Sq.Km. Very low extent of natural forests, in discontinuous patches, only left in this region. The natural forests had been converted largely into commercial plantations or forest plantations.

This land originally supported moist deciduous forests with economically high value timber species. A large number of medicinal plants primarily used in the health care of the rural population and many wild relatives of cultivated plants used to grow in these forests. With the conversion of these forests, biological diversity as well as many of the useful wild relatives which would have been useful for the breeding programmes also disappeared. A few patches of virgin forests have been preserved in the name of sacred groves which give the clue of the natural vegetation once existed in this tract of land.

The coastal zone lying between the sea level and upto 7.5 m above msl forms the plain area called the low land which is having the highest density of 1408 people per Km. It covers an approximate extent of 3921 Km^2. It is economically very rich and ecologically highly disturbed with lot of interconnecting backwaters, lagoons interspersed with high degree of agricultural activity comprising mainly paddy and coconut cultivation and also forms the sink for many industrial pollutants.There are no forests in this zone. A few patches of mangroves having sparce distribution are located along the coast facing the brackish water of the backwaters, estuaries, lagoons etc.

Here and there, in this zone are located the relics of once existed rich evergreen and semievergreen forests which are preserved on religious considerations and sacred groves. These bits of virgin forest support 660 species of flora, of which many are endangered.

The climate of Kerala is Tropical Monsoonal in nature with strong orographic and maritime influences. According to the annual variations in climate four seasons can be identified viz., 1) The

South-West monsoon season - June to September 2) The retreating monsoon season - October, November 3) The dry season - December to February 4) The hot season - March to May.

The average annual rainfall in the State is 3125 mm. Major part of the rainfall received during the South-West monsoon season. The rainfall generally increases from west to east. The morphology of Western Ghats is the most decisive factor in determining the rainfall of Kerala. The steep continuous wall of hills lying in the north-south direction acts as a barrier for the monsoon wind which strikes on it.

The temperature varies between 15^{o} C - 40^{o} C in the State. The relative humidity is very high in the coastal region and it varies from 95% in July-August to 60% in January. There is a progressive decline in humidity and temperature from the coastal belt to inland.

The land of Kerala is drained by 44 rivers originating from the Western Ghats. Of these, 41 are flowing westwards and drain into the Arabian Sea and the remaining three viz. Kabani, Bhavani and Pambar flow eastwards and join with the Cauvery. Among the rivers Periyar, Bharathapuzha, Pamba and Chaliyar are the largest.The total run off of all the rivers of the State amounts to 78,041 Mm^2. The quantity that is considered utilizable is computed as 42,772 Mm^2.

Kerala has variety of soils. It can be broadly classified into the following types.

1) Sandy soils of coastal belt
2) Laterite soil of Midland
3) Hilly and forest soils
4) Red soil found in Thiruvananthapuram district
5) Black soil of Palghat gap
6) Kari or peat soil of Alapuzha district
7) Alluvial soil in the eastern and southern parts of Vembanad Lake.

The portion of the Western Ghat hills coming within the State of Kerala is broken by a natural gap of 30 Km wide at Palghat and this has played a significant role in isolating a variety of organism on either side of it for a long period of time (Ali and Ripley, 1983).

Thick wet evergreen forests occur in the medium elevations of high hills. These are followed by islands of shola forests surrounded by high elevation grasslands on the crests of the hills. Their crest lines rise to higher altitudes and at places exceeding even 2000 m, where, the precipitation goes as high as 6000 - 7000 mm. The slopes of the high hills of Bramhagiri and Kottiyoor support good evergreen forests followed by the Wynad plateau and its western slopes supporting thick moist deciduous forests. The western slopes of Nilgiris, New Amarambalam, Silent Valley and Attappady bear rich evergreen and semievergreen forests. In the Attappady Valley there is an entire spectrum of transition zones from the wet evergreen forests in the South West and North West corners to the dry deciduous xerophytic forests on the eastern slopes which form the leeward side of the Attappady hills. To the South West of the Attappady hills are the evergreen forests of the *Lost Valley* and the Elival Malai which end at the Kalladikodu hills receiving the highest rainfall of over 6500 mm in the lower elevation. On its northern slope this condition has given rise to a patch of low level evergreen vegetation. In other parts in the lower slopes the vegetation is the semievergreen and moist deciduous type. To the south of the Muthikulam hills, the hill range abruptly ends as the Palghat gap where the rainfall goes down leading to moist deciduous forests culminating in moderate type of dry deciduous forests. Some of the forest areas in the hills are almost undisturbed supporting the pristine vegetation.

South of the Palghat gap starts the long hill chain of the Nelliampathy, Anamalais and Palani hills. The Western slopes contain the moist deciduous, semi evergreen and evergreen forests. The eastern slopes of the Munnar hills support sandal bearing dry deciduous forests of Marayoor. These forests form a continuous belt supporting a congenial habitat for both the plant and animal life of varying kinds.

Between the Periyar plateau and the Munnar hills lies the highly disturbed cardamom lands, which are at varying degrees of destruction due to following of different types cultivations interspersed among the cardamom estates. The clearance of forests in different parts of this stretch has led to the micro-climatic change resulting in the gradual deterioration in cardamom yield. This disturbed stretch of land has almost broken the continuity of the forest up to the Periyar plateau.

There is a very good stretch of evergreen, semi evergreen and moist deciduous forests starting from the Periyar plateau. This natural vegetation extends through the Gooderikal and Achenkoil belts till it reaches the Aryankav pass separating this stretch from the Agasthyamalai hills.

The Shenduruni Valleys and the Agasthyamalai hills support some of the rich virgin forests of Travancore. Most of the forests in the Ponmudi hills have been converted into tea and other crops. The moist deciduous, semi evergreen and little bit of evergreen forests situated on the Western slopes in Peppara and Neyyar have been brought under Wildlife Preserves for effective protection from high anthropic pressure.

1.3. History of Forest Management

Forests play multifarious functions and form an important component of life support system. Traditionally production of wood has been the major objective of forest management. Later the attention of forest management turned to forest conservation, ecological balance, eco-restoration, recreation, multiple use management and finally to biodiversity conservation. Irrespective of the various forest management practices followed over the decades, the forest area in Kerala declined drastically due to several factors, particularly encroachment, diversion for commercial plantations like rubber, oil palm, coffee, tea, pepper and cardamom and due to the construction of multi-purpose river valley projects. The high population density and changing pattern of demand have brought qualitative and quantitative

changes with significant effects on protective, productive and social functions of the forests.

Reports of forest loss and degradation both at global and national level began to appear since the late 1970's. The National Remote Sensing Agency reported that the forest loss in Kerala was of the magnitude of 1200 sq.km per year between1972-75 and 1980-82. The Centre for Earth Science Studies, Trivandrum estimated that the forest loss in Kerala between 1905-1965 was 6400 sq.km and between 1965 and 1973 was 4100 sq.km. The Pre-Investment Survey of Forest Resources estimated that the forest loss between 1940 and 1970 in Kerala was 3450 sq.km while between 1960 and 1970 alone was 1020 sq.km. In the same manner the extent of forest in Kerala has been estimated differently by various agencies as given below (Table 1).

Depending upon the reporting sources, the area of forests in Kerala can be calculated approximately as from 9400 sq.km to 11222 sq.km ie.,24% to 26.5% of the total geographical area of State. The discrepancy in the estimates given above may be primarily from the differences in the definition of forest. However, all these estimated figures or guestimated figures and are based on extrapolation of data collected from a limited area and hence of restricted applicability. This poses serious problem in the scientific forest management. But the fact reamins that there is tremendous loss of forest coverage over the decades.

If the Dutch and Portuguese invasions helped to develop commercial cultivation of pepper and coconut in Kerala, the British invasion resulted in adverse impact on the forest coverage of Kerala. The emergence of the British as the supreme power in India in the late eighteenth century led to major political and administrative changes that had significant impact on the forests of India.

Table. 1. Extent of Forests.

Source	Area under forest (in sq.km)	Pertaining to the year	% to the geographical area
Resource Survey of forest Dept.	9400	1973	24.1
Revenue Records	10815	1975-79	27.8
Administration Report of the forest Dept.	11222	1983	28.9
Landsat Studies	6628	1983	17.0
Forest Survey of India	10292	1993	26.5
Forest Statistics	9400	1992	24.02

Source: Various sources

The different phases in the history of forest management in Kerala can be portrayed as Rise of Forestry, Period of Turbulence and Change and the Ascent of Conservation. The first phase of forestry ie.,Rise of Forestry spans from 1840 to 1940, the second phase-the Period of Turbulence and Change , 1940-1980 and the third phase - the Ascent of Conservation, 1980 onwards (Chundamannil,1993) . However, it is not proper to consider that each stage is confined to a particular historical period because in each period the elements of different features are present.

1.3.1. Rise of Forestry 1840-1940:

In the middle of 18th century the East India Company helped the territorial expansion of Travancore and in 1811 the Company's representative became Diwan (Prime Minister). Lands owned by the feudal lords and temples were gradually appropriated to the state and taxes levied on the tenants. Cultivators were encouraged to open up forest land through subsidies and other inducements. During this period ie, in 1842, Nilambur teak plantations were initiated. Later, transfer of power from the East India Company to the British Crown in 1858 resulted in opening up forests for the growing of coffee, tea, cardamom etc and in 1865 the rules for grant of full ownership to tenants were enacted.

The first Indian Forest Act was enacted and implemented in 1865 which contained the provision for constituting permanent forest reserves. Again in 1878, the legal difference between reserved forests and protected forests was defined. In the same period, Madras Forest Act 1882, Travancore Forest Act 1887 and Cochin Forest Act 1905 were also enacted and implemented at the southern tip of Indian Peninsula. The management of forests and yield regulation based on carefully prepared working plan was the hall mark of the period. However, the early 'working plans' had the limited objective of regulating the timber extraction or in other words, working plans were meant for 'how to work' the forests for the timber needs. No doubt, the strategic interests of the British rule like defence, ship building, railways, spice and wood trade and then the first world war had tremendously influenced the forest loss and management in Kerala during this period.

1.3.2. Period of Turbulence and Change (1940-1980):

The period of turbulence and change was marked by a phase when the demand for timber exceeded the ability of the forest system to survive. For example, the demand for timber exceeded the quantity that was feasible on a sustained yield basis. The second world war and political developments are the most important factors which were

responsible for this change in the forestry sector as in other spheres. The second world war was a major turning point in the history of forestry in Kerala. The Kerala forestry had risen to the pinnacle of ascent. The intensification and attempts at mechanised logging in the inter-war and intra-war periods of first and second world wars caused a break with the traditions of forestry taught by the early German foresters. During this long interlude the old forestry traditions such as meticulous inspections to check compliance with working plan prescriptions and upholding of professional values got diluted.

The forest policy of Independent India was proclaimed in 1952 revising the British India policy of 1894. It envisaged the take over of private forests by the government after paying the compensation to the owners. The Kerala assembly passed a Bill in 1962 for the take over of private forests in Kerala after compensating the owners. As the Bill did not get presidential ascent , it was lapsed. But this led the private forest owners in Kerala to sell off the trees or the forests at the best possible price before government take over. However, in May 1971 the Kerala government took over the remaining private forests by an ordinance and then through the Kerala private forests (vesting and assignment) Act 1971.

The industrial orientation of forestry began with the National Forest Policy of 1952. The policy statement included industries in the highest priority class along with the defence and communication. Further the growth of industries and government's commitments to supply the pre-determined quantity of raw materials from the forest, did as much damage as the war. Political developments in the post Independence period favoured the continued occupation of farmers in the leased lands they had developed. There was dramatic change in the social, political and economical spheres in the mean time. Population growth was spectacular; influence of political parties and other interests groups like migrants, agriculturists, industrialists etc also were very much noticeable. Reactions such as evictions and prosecutions had also been initiated during this period. Similarly under Five year Plans the power, irrigation, industries etc. set their

own sectoral priorities without consulting the forest department and claimed forest land as a matter of right. Various commodity boards like Rubber Board, Coffee Board , Cardamom Board etc. supported the expansion of these crops traditionally raised in the forest area. For better transportation, roads were developed to the Power projects and to the Hill stations. Inaccessibility was a constraint in the forest utilisation which was thus overcome. Various other government and Private plantations came up all along the developed roads. To add to the loss, deforestation in Cardamom Hill reserve in Idukki District arose out of the dual control of forest and Revenue departments and consequent general confusion, over and above the government's half hearted policy, left both the Revenue and Forest Department hesitant, reluctant and indifferent which ultimately helped the hordes of land grabbers in the vast areas of Cardamom Hill Reserves.

The National Commission on Agriculture (1972) emphasised the need for a departure from the conservation oriented forestry to an aggressive plantation programme designed to satisfy the projected requirements of the wood based industries. This led for the formation of autonomous Forest Development Corporations; and such a corporation was formed in Kerala with the principle objective of creating of pulpwood plantations. Similarly, National Commission on Agriculture emphasised the need of social forestry schemes also. Therefore the social forestry activities were started in the Kerala State since 1980-81. However, social forestry in Kerala during this period was confined only to the distribution of seedlings to the farmers and to the avenue planting.

During the Emergency period of 1976, forestry was brought under the concurrent list giving the Central Government, adequate powers to enact legislation over the forests of the states.

1.3.4. Ascent of conservation - 1980 and after

In the conservation history of India, the year 1969 is notable, because the fourth Plan document stated that ' it is necessary to include the environment and forest conservation aspects in planning and development'. Similarly, the world conservation strategy launched globally in 1980 was another important landmark in the forest conservation history of India because it greatly influenced for the shift of industry oriented forestry to conservation forestry. The Forest Conservation Act, 1980 enacted by the centre assumes wide ranging powers for regulating forest land use decisions. This Act required the state governments to seek prior permission from the central government before de-reserving forests and converting forest land for non-forest purposes. Following this Act and due to pressure of Chipco and other environment agitations, restrictions on clear felling of forests were imposed all over India since 1983. In Kerala, environmentalist's agitation for the protection of Silent Valley, ban on clear felling and criticism against expansion of eucalyptus plantation, were the reflections of forest conservation movements. Further, the new National Forest Policy document released in 1988 also gives much emphasis and commitment for forest conservation.

The National Forest Policy 1988 posses mature understanding of the current status of the forests and its potentials. It states that "the principle aim of the forest policy must be to ensure environment stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principle aim. Considering the contribution of forests in maintaining the essential ecological processes and life supporting systems and in preserving genetic diversity, forests should not be looked as a source of revenue. Forests are renewable natural resources. They are national assets to be protected and enhanced for the well-being of the people and nation." It specifically mentions that "Tropical rain/moist forests, particularly in areas like Arunachal Pradesh, Kerala and Andaman & Nicobar Islands should be totally safeguarded".

Despite the policies, facts and figures above mentioned, the extent of forests in Kerala has declined drastically during last few decades. Vast tracts of forests have been diverted for non-forestry purpose like development and settlement activities as well as by way of encroachments. The remaining forests have undergone qualitative change. In the pursuit of objectives of enhancing wood production and increasing revenue to the government, the interest of the forest dwellers particularly tribal people have been forgotten. On the other side, this reduction resulted in the destruction of the wild life habitat. On the whole, this calls forth a re-examination of forest management and especially on the important tool of forest management ie, 'working plan'.

1.3.5. Working Plan - The Tool for Forest Management

The concept of working plan in the early forest management derives from the notion of 'the plan to work the forest for timber'. The working plan can be considered as a perspective plan indicating broadly the goals to be achieved in a given situation and prescribed methods for attaining them*. The conventional instrument of planning in forestry is the working plan which was largely developed in Germany in the nineteenth century. U.V.Munro, conservator of forests in Travancore is credited with the preparation of the working plan for working forest tract in India. But it was Dr.D. Brandis who prepared the first working plan in the modern format in India.

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* Nair, C.T.S. (1988) A Guideline for Land Evaluation for District Level Forestry Planning, FAO.

working plans are:
1)watershed protection 2) Wood production to meet industrial demand 3)Production of non-wood produces such as bamboo, reeds etc and 4)Generation of revenue.

Since the introduction of scientific forestry, the working plan has been the basis of forest management for each division in Kerala. The first working plan in Kerala was prepared for the forests of Nilambur in 1895, for the forests of Travancore in 1912 and for the forests of Cochin in 1921. All the government forests have been covered by working plans subsequently. In the initial years of forestry in India, professional judgment of foresters were held in high esteem that prescriptions of the working plans were inviolable. During the first and second world wars the working plans were suspended. Gradually this caused a break with the traditions and values of scientific forestry taught by early German foresters. Moreover, the German traditions of forest management based on meticulous working plans and rigorous implementation of its prescriptions did not percolate to Cochin and Travancore.

The working plans are medium term plans for 10-15 years and cover the entire forests in a division. According to the Report of High Level Expert Committee on Forest Policy and Management in Kerala, the absence of synchronisation between the prescriptions in the working plans and five year plan programmes for forests is the major draw back and cuts at the very foundation of the forest management in Kerala. In this context a special focus on relevance of Working Plans in Kerala forest management is made upon because the reasons for the loss of the forest coverage in Kerala state may be attributed to the severe limitations of the Working Plan which is the major tool of the forest management.

The expert committee report on forest policy and management and other studies reveal that working plans are involved with number of severe limitations right from the formulation to the implementation. And they are:

1) The working plans are not dovetailed into a scientifically prepared perspective plan for forest development management at the State level. Moreover, it still follows the old German pattern for the preparation of working plan which is to be renovated in the changing contexts of human-forest dependency.

2) Often the stringent prescriptions mentioned in the working plans are not effectively implemented.

3) Differences in the approach in preparing working plans and Five Year Plans result in considerable inconsistencies which ultimately makes the working plans redundant.

4) Though Working Plan recommendations usually suggests the removal of a variety of species, one or two high value species account for bulk of actual removal.

5) No scientific criteria are taken for the allocation of forests into different circles.

6) The working plans do not consider the importance of conservation of genetic diversity, protection of ecosystem and bio-system etc as important policy objectives.

7) Among the objectives listed in Working Plans, watershed protection has a high priority. But in practice, it tends to be either ignored or relegated.

8) Working plan officers are not selected for the work considering their aptitude.

9) The Working Plan parties are not closely supervised.

10) Data and prescriptions are not researched thoroughly.

11) The working plans, often and above do not have aims and specific objectives which make it as a unscientific plan document.

12) Finally the word 'Working plan' sounds as ' forest plan document to workout the forest for timber'. Precisely, working plan does not involve the modern scientific forest planning methodologies. It is obsolete.

Apart from these issues of working plan, there are many inter-connected forest management difficulties, which make the situation worst and it is difficult to explain all of them within the limitations of this report. To say for example, the lack of plan co-ordination with other interrelated sectors and forest sector brings forth general confusions and repetitions. There has been little co-ordination between Tribal Welfare Department, Tribal sub-plan and Forest Department.

The present attempt is to introduce an innovative planning approach while preparing a perspective plan for the forestry sector of Kerala state which will replace the obsolete forest planning technique of the past. Unlike the traditional working plan approach the present planning attempt touch all thrust areas of the forestry keeping watershed as the basis.

1. Forest Inventory
2. Forest protection
3. Integrated watershed management
4. Biodiversity conservation
5. Production forestry
6. Non-timber forest products
7. Buffer zone management
8. Research needs
9. Education, training and extension
10. Institutions

THE PHILOSOPHY BEHIND PLANNING

Over the past decade, there has been a shift in the definition of the role of natural forests. Once considered as a source of industrial and domestic wood, forests are now valued for non-timber benefits like climatic amelioration, biodiversity conservation, hydrological regulation, soil conservation and non-wood products. Conversion of prime forest land to agriculture or even man-made forests has been dispensed off. Moreover, selection system in natural forests has been abandoned.

Although the major threats to deforestation have been overcome, there are still minor ones which can assume devastating proportions in the future. These are fire, illicit felling, encroachments, industrial needs and others. Therefore even today the forest wealth of the State is in a bad shape. Over 40% of the natural forests is degraded and sixty percent of the plantations are under productive. Fire, grazing and extensive NTFP collections are hampering sustainability. The watersheds of most rivers are degraded causing floods, drought, downstream siltation etc. The uplands in the Western Ghats have become so fragile that during monsoons landslides have become a common phenomenon.

Existing management practices are mostly aimed at fulfilling single objectives - essentially wood production. This attitude if continued will deepen imbalances between demand and supply and further claims on the remaining forest land are sure to appear. It is quite possible that in order to ensure efficient and assured supply of raw material, privatisation of extensive forest tracts is going to take place.

In contrast to the scenario depicted earlier, given rational management of forest resources is taken up based on a clear understanding of the social and environmental priorities, benefits from forests will not only accrue to all sections of the society but also to future generations.

A change in the management strategies and policies requires a shift in priorities. Intangible objectives like achieving watershed protection and wood production from a unit area have to be discarded. Although policy statements give low priority to the objective of revenue maximisation, in practice it is not so. At the implementation stage of plans the priorities get reversed and wood production and revenue maximisation come to the top. Watershed protection, Wildlife and NTFP management, Biodiversity conservation, if at all fulfilled, are accomplished incidentally.

Forestry is one of the many sectors in the economy. Its linkages with other sectors are both complementary and competitive. The major constraints in conservation and management of forest resources are technical and financial. These problems can be tackled with the help of multiple use management plan for forestry sector.

Technical know-how enables the manager to understand the relationships between components in the system and how they have to be manipulated to achieve cherished goals.

These issues relate to area, vegetation types, land capability, risk of degradation, growing stock and increment rates, forest hydrology, socio-political problems, man-wildlife interactions etc which are absolutely necessary for scientific forest management. Dearth of knowledge on these matters still constraints the forester. Even as regards area under forests, the figures furnished by different agencies are irreconcilable.

The second major constraint is low financial investment. Intensive management aimed at realisation of multiple benefits requires substantially higher investments than what is made now. India is notorious for the lowest investment in the forestry sector. The existing system of allocation of funds from general government budget has been identified as a major bottleneck in undertaking long-term forestry investments.

Taking into account the techno-ecological and socio-economic conditions, the major thrust areas have been identified as

1. Watershed management
2. Wood production
3. Biodiversity conservation
4. Social and participatory forestry
5. NTFP management

As forest management priorities shift from single use to multiple use, different zones (with in the forest areas) have been identified for protection, production and community use.

The degraded natural forest areas are designated for integrated watershed management. The areas under plantations are set apart for intensive management to raise productivity. The settlement areas and villages adjoining reserved forests are to be subjected to joint or Participatory Forest Management. Good natural forests and parks and sanctuaries are designated for biodiversity conservation, ecotourism and environmental awareness programmes. A strong forest protection programme too is recommended.

To support the above activities, provision for Geographic and Management Information Systems (GIS & MIS), Research, Development and Training and Institutions are made.

The overall philosophy behind the plan is "Intensive multiple use management" of forests for the well being of the present and future generations.

METHODOLOGY

Taking into consideration the various aspects mentioned in the earlier chapters a broad set of programmes are identified as follows:

1. *Forest Inventory*
2. *Forest Protection*
3. *Integrated watershed management*
4. *Biodiversity conservation*
5. *Production forestry*
6. *Non-Timber Forest products*
7. *Buffer zone management*
8. *Research needs*
9. *Education, Training and Extension*
10. *Institution*

To provide a basis for the programmes 3 and 5 which are site specific a survey was conducted using the proforma (Annexure I). All field forest officers responsible for the administration and management of Forest Divisions were contacted. Initially a Workshop at KFRI was conducted to elaborate the programme and the aim of the project. The proforma was later filled up at the level of individual Ranges and the information was cross checked both with official records and in the field. All officers were constantly encouraged to provide a management plan on a waterhshed basis.

The data was analysed using the programme DBase III and certain important results which have emerged, form the basis for recommendations. The Forest Division wise abstract of these results are given in Appendix II. All Wildlife Sanctuaries and National Parks have been excluded from activities 3 and 5 and only programme 4 Biodiversity conservation with limited site specific operations are proposed to be implemented there.

Within the other Divisions we have categorised the forest area into:

1. Dense natural forests
2. Degraded natural forests
3. Good plantations
4. Average plantations
5. Poor plantations and
6. Settlement areas

Area under each category is given Division wise in Table 2.

We have recommended

1. Biodiversity conservation programmes in dense natural forests
2. Integrated watershed management in degraded forests
3. Rehabilitation of average plantations
4. Replanting and management of poor plantations and
5. Buffer zone - participatory forest management in settlement areas with in the reserve and forest areas adjoining villages.

The Division wise stratification of the area for the concerned programme each year has been identified financial statements have been provided for every 5 year phase (three phases).

Activity and investment wise information is elaborated only for phase I as the same processes will follow during successive phases II and III.

In the end we have provided an abstract of investment for all the phases individually.

We have recommended the following rates for implementation of each element:

1. Planting (Plantations)	Rs. 10,000 ha
2. Rehabilitation (Plantations)	Rs. 8,000 ha
3. Mass seeding	Rs. 6,000 ha
4. Planting (Watershed)	Rs. 15,000 ha
5. Soil conservation	Rs. 18,000 ha
6. Participatory forest management	Rs. 20,000 ha

7. Management (in plantations and natural forests)

1st year	Rs. 3,000 ha
2nd year	Rs. 2,500 ha
3rd year	Rs. 2,000 ha
4th year	Rs. 1,500 ha

Further we have made provision for fiscal and financial contingencies and escalation following standard international rates of 6.5, 6, 5.5, 5 and 5% during successive years in each phase.

Table 2. Division wise area under different categories (ha)

Division	Total	DEF	DRF	GLD	SET	PLN	T1	T2	T3	E1	E2	E3	M1	M2	M3
Thiruvananthapuram	15691	5012	4594	450	1315	4320	0	0	176	0	2764	0	470	910	0
Thenmala	17774	6839	3296	130	2848	4659	1540	70	85	445	290	300	184	779	966
Punalur	15021	2350	4409	540	2200	5522	100	1178	100	1192	490	0	18	2344	100
Konni	19228	600	9800	1827	242	6759	5175	1200	240	0	0	0	144	0	0
Ranni	112886	56140	32500	8250	9594	6402	2253	846	1060	0	90	149	138	1018	848
Kottayam	49435	14711	19610	3200	5758	6156	30	2415	505	140	151	0	640	2068	207
Munnar	64759	24984	22672	300	7860	8943	240	140	167	969	1780	314	1919	3074	390
Kothamangalam	35935	3250	17913	825	8347	3494	600	1155	725	0	0	0	447	467	100
Vazhachal	46849	25930	7873	0	328	12718	6725	600	1077	0	129	711	788	1453	1235
Chalakudy	29815	15970	6836	500	0	6509	3500	1460	130	0	0	13	198	1047	161
Thrissur	32636	11793	9022	150	2530	9141	0	1948	975	0	1837	31	150	4100	100
Nemmara	44402	21303	12250	501	7917	2431	794	346	0	68	445	31	857	190	0
Mannarkad	36463	8100	22455	2000	1425	2483	0	1297	0	0	60	0	0	990	136
Nilambur South	36412	13500	15500	1000	323	6089	5387	0	0	202	0	0	0	0	500
Nilambur North	42376	21429	13692	500	1204	5551	4010	535	200	44	0	82	20	660	0
Kozhikode	27495	19951	5825	50	10	1659	0	157	80	0	334	97	0	614	377
Wayanad South	30928	17727	7178	1354	140	4529	0	2052	300	0	1985	0	0	192	0
Wayanad North	23081	6061	11298	2465	226	3031	0	517	0	0	639	100	359	1308	108
Kannur	33088	12900	7167	1365	927	10729	4	1175	0	0	0	0	3682	5739	129
Total	714274	288550	233892	25407	53194	111125	30358	17091	5820	3060	10994	1828	10014	26953	5357

DEF - Dense forest, DRF - Degraded forest, GLD - Grassland, SET - Settlement area, PLN - Total plantation area

T1 - Teak (good), T2 - Teak (average), T3 - Teak (bad), E1 - Eucalypt (good), E2 - Eucalypt (average), E3 - Eucalypt (bad)

M1 - Miscellaneous (good), M2 - Miscellaneous (average), M3 - Miscellaneous (bad).

IX

ACTION PROGRAMMES

PROGRAMME 1

FOREST INVENTORY

PROGRAMME 1
FOREST INVENTORY

Introduction: Forest Inventory is a fundamental prerequisite for reliable strategic resource planning and management of forest. After the preinvestment survey by Dr. C. Chandrasekharan in 1971, no comprehensive attempts have been made in these lines in the forests of Kerala. More than two decades have passed and lot of changes have been witnessed in the quantity and quality of forest cover both natural and man-made.

The State Forest Inventory (SFI) which will be commenced during Year 1 of the programme is of 5 year duration. Its immediate objectives are to implement a cost effective assessment system which will provide information on the location and extent of the main forest and landuse types; estimate volume and growth by forest and plantation type, species and marketing group; and capability to manage and operate the system:

The SFI has the following components:

i. Continuous monitoring of forest cover type and measurement of sample plots at five year intervals.
ii. Forest resource assessment including forest type mapping. Forest cover maps will be made at 1:250,000 scale, while forest type/subtype maps will be made at 1:50,000 scale.
iii. Development of Geographic Information System (GIS) for storing thematic maps and statistical data from forest inventories.
iv. Training for staff

The outputs will be:

i. A SFI system with adequate in-house capability to undertake and continue forest resource monitoring activities.
ii. Up-to date estimates (by area and volume) of the state's forest resources by size class, species group, forest type and location, in the form of maps and stand and stock tables by strata, and by state, Divisional and range levels.
iii. Assessment of the dynamics of these resources in terms of changes (losses/gains/growth/mortality)

The subprogrammes and their respective programme elements relating to Forest Inventory are discussed in the ensuing paragraphs.

Sub programme: Functional classification of forest land

The forests of Kerala have been classified earlier by vegetation types only and the functional classification is referred to in the Working Plans only. The area under protection forests is always subjected to changes in accordance with needs and improvement in accessibility.

The boundaries of the types are available in large scale maps and have not been set on the ground.

All the available figures on forest land are only estimates and are subject to correction when new figures are available from the SFI.

It is proposed that, as SFI progresses, the Department of Forests should review and reassess the functional classes of forest, based on SFI data. Accordingly new maps should be prepared and ground demarcation carried out.

The programme elements under the sub-programme are:

i. Determination of land-use categories
ii. Redefinition and mapping
iii. Demarcation of boundaries and
iv. Growing Stock inventory

Programme element: Determination of land-use categories

The expected outputs are maps at 1:50,000 scale showing major forest types, land-use classes, major contour lines (100m), major drainage pattern, major infrastructure, slope classes and overlay of major land systems.

Programme element: Redefinition and mapping.

Specific actions involved are: delineation on the 1:50,000 scale maps of forest land; production forests, protection forests, nature reserves, critical land and occupied land.

Redefinition is necessary because of changes in landuse since the past 40 years. Allocation of land will be possible by primary functions only, as the various categories are likely to occur in a mosaic rather than in single blocks. Integrity of protected areas within land allocated for production or conversion must be assured by law and monitoring.

Programme element : Demarcation of boundaries.

One of the main objectives of the SFI is to provide information on the location and extent of the main forest and landuse types. Continuous monitoring of forest cover types and measurement of permanent sample plots at 5 year intervals is envisaged.

Demarcation of forest boundary on the ground is of paramount necessity for understanding the extent of resource we have and help in devicing appropriate conservation strategy.

Protection forests and production forests will be demarcated. This will give an indication regarding the total resource and in a detailed manner the protection forest reserved for water and soil protection. Nature reserves and sanctuaries are another category of forest that will need to be recognised as a separate entity within forest lands. They are designed for the preservation of fauna and flora and to conserve biodiversity. Demarcation in the existing Sanctuaries and National Parks will help in strengthening them by adding new areas as buffer or developing corridors for large-animal movement.

Programme element: Growing Stock Inventory.

The growing stock inventory will consists of management inventories and growth and yield studies. Some 200 permanent sample plots will be established in natural forests and plantations. The forest cover and growing stock of timber and non-timber will be monitored thereafter every 5 years.

Sub programme: Geographic Information System

A system of continuous field enumeration/inventory has to be instituted as a tool for resource monitoring and management. For this purpose a Geographic Information System (GIS) is proposed to be instituted. Thematic maps and statistical data from forest inventories will be stored using a digital image analyzing system. It will integrate other sub-sectoral data for forestry planning, and prepare the results in the form of graphics, maps or tables.

All data on area, locality factors, volume, growth and yield will be put together in computer files for updating the database and information retrieval.

Activities and investment requirement for this programme are given in Tables 3, 4 and 5 respectively for each phase.

Table 3(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
1. FOREST INVENTORY					
1.1. Classification of Forest land					
1. Determination of land use	x	x	x	-	-
2. Mapping	x	x	x	-	-
3. Demarcation of boundaries	x	x	x	-	-
4. Growing stock inventory	x	x	x	x	x
1.2. Geographic information system					
1. Infrastructure	-	-	x	x	x

Table 3(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
1. FOREST INVENTORY						
1.1. Classification of Forest land						
1. Determination of land use	0.6	0.5	0.6	--	--	1.7
2. Mapping	0.1	0.2	0.1	--	--	0.4
3. Demarcation of boundaries	0.1	0.1	0.1	--	--	0.3
4. Growing stock inventory	0.1	0.1	0.1	0.1	0.1	0.5
1.2. Geographic information system						
1. Infrastructure	--	--	0.6	0.7	0.7	2.0
Total	0.9	0.9	1.5	0.8	0.8	4.9

Table 4(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
1. FOREST INVENTORY					
1.1. Classification of Forest land					
1. Growing stock inventory	-	-	-	-	x
1.2. Geographic information system					
1. Updating and management	x	x	x	x	x

Table 4(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
1. FOREST INVENTORY						
1.1. Classification of Forest land						
1. Growing stock inventory	--	--	--	--	0.06	0.06
1.2. Geographic information system						
1. Updating and management	0.04	0.04	0.04	0.04	0.04	0.20
Total	0.04	0.04	0.04	0.04	0.1	0.26

Table 5(a) . Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
1. FOREST INVENTORY					
1.1. Classification of Forest land					
1. Growing stock inventory	-	-	-	-	x
1.2. Geographic information system					
1. Updating and management	x	x	x	x	x

Table 5(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
1. FOREST INVENTORY						
1.1. Classification of Forest land						
1. Growing stock inventory	--	--	--	--	0.08	0.08
1.2. Geographic information system						
1. Updating and management	0.05	0.05	0.05	0.05	0.05	0.25
Total	0.05	0.05	0.05	0.05	0.13	0.33

PROGRAAMME 2

FOREST PROTECTION

PROGRAMME 2

FOREST PROTECTION

Introduction: High density of population (747 persons/KM^2) and settlements around the forests are exerting great pressure on the forest cover of the State. Over the years, encroachments are being regularised by succeeding governments. So a strong forest protection strategy is necessary to save the last chunks of heritage in the Western Ghats. Fire, grazing, felling and poaching are other serious issues. Attempt has been made to integrate all these aspects into one programme: Forest Protection.

Sub programme: Forest Fire management

One of the most damaging factor to forest resources is fire. Forest fire occurs mostly during the dry season from January to April. Natural fires are almost absent and the fires are man made. It may be a NTFP collector, a farmer, a herdsman or any other person who initiates the fire.

Conventional fire management practices are costly and ineffective. Hence it is proposed to evolve a scientific fire weather index so as to prevent fire rather than fight it. Hence the activities will include fire detection which requires meteorological data. Hence forest meteorology is given due importance. Modern fire fighting tools are not in vogue and it is proposed to introduce them. Sufficient training for staff also is envisaged.

A fire protection action programme will be implemented in all the Forest Divisions.

Sub programme: Encroachment prevention

Encroachment of forest land by squatters is a never ending menace. It is proposed to make investments to design early detection and prevention. For this the legal issues and institutional facilities will be strengthened. Permanent boundaries identified by Programme 1 will have to be demarcated in the field.

Sub programme: Illicit felling, grazing and poaching prevention

Community management of the buffer zone will help in alleviating pressure on natural and plantation forests.

Still rigorous protection against illicit activities and poaching in protected areas will be organised.

The activities and investment requirements are given in Tables 6, 7 and 8 for each phase.

Table 8(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
2. FOREST PROTECTION					
2.1. Forest fire management					
1. Fire detection	x	x	x	x	x
2. Protection systems, legal issues & methods	x	x	x	-	-
3. Forest meteorology					
1. Equipments	x	x	-	-	-
2. Data acquisition	x	x	x	x	x
4. Training & demonstration	x	x	x	-	-
5. Implementation	x	x	x	x	x
2.2. Encroachment prevention					
1. Detection	x	x	x	x	x
2. Legal issues	x	x	-	-	-
3. Institutions	-	-	x	x	-
4. Implementation	x	x	x	x	x
2.3. Illicit felling, poaching and grazing prevention					
1. Detection	x	x	x	x	x
2. Legal issues	x	x	-	-	-
3. Institutions	-	-	x	x	-
4. Implementation	x	x	x	x	x

Table 6(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
2. FOREST PROTECTION						
2.1. Forest fire management						
1. Fire detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Protection systems, legal issues & methods	0.4	0.6	0.8	--	--	1.8
3. Forest meteorology						
1. Equipments	1.7	0.4	--	--	--	2.1
2. Data acquisition	0.1	0.1	0.1	0.1	0.1	0.5
4. Training & demonstration	0.1	0.1	0.1	--	--	0.3
5. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
2.2. Encroachment prevention						
1. Detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Legal issues	0.1	0.1	--	--	--	0.2
3. Institutions	--	--	0.1	0.1	--	0.2
4. Implementation	0.6	0.6	0.6	1.0	1.0	3.8
2.3. Illicit felling, poaching and grazing prevention						
1. Detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Legal issues	0.1	0.1	--	--	--	0.2
3. Institutions	--	--	0.1	0.1	--	0.2
4. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
Total	5.7	4.6	4.4	3.9	3.7	22.3

Table 7(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
2. FOREST PROTECTION					
2.1. Forest fire management					
1. Fire detection	x	x	x	x	x
2. Forest meteorology					
1. Data acquisition	x	x	x	x	x
3. Training & demonstration	x	-	-	-	-
4. Implementation	x	x	x	x	x
2.2. Encroachment prevention					
1. Detection	x	x	x	x	x
2. Implementation	x	x	x	x	x
2.3. Illicit felling, poaching and grazing prevention					
1. Detection	x	x	x	x	x
2. Implementation	x	x	x	x	x

Table 7(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
2. FOREST PROTECTION						
2.1. Forest fire management						
1. Fire detection	0.1	0.1	0.1	0.1	0.1	0.5
2. Forest meteorology						
1. Data acquisition	0.1	0.1	0.1	0.1	0.1	0.5
3. Training & demonstration	0.1	--	--	--	--	0.1
4. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
2.2. Encroachment prevention						
1. Detection	0.1	0.1	0.1	0.1	0.1	0.5
2. Implementation	0.4	0.4	0.4	0.4	0.4	2.0
2.3. Illicit felling, poaching and grazing prevention						
1. Detection	0.1	0.1	0.1	0.1	0.1	0.5
2. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
Total	2.9	2.8	2.8	2.8	2.8	14.1

Table 8(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
2. FOREST PROTECTION					
2.1. Forest fire management					
1. Fire detection	x	x	x	x	x
2. Forest meteorology					
1. Data acquisition	x	x	x	x	x
3. Training & demonstration	x	-	-	-	-
4. Implementation	x	x	x	x	x
2.2. Encroachment prevention					
1. Detection	x	x	x	x	x
2. Implementation	x	x	x	x	x
2.3. Illicit felling, poaching and grazing prevention					
1. Detection	x	x	x	x	x
2. Implementation	x	x	x	x	x

Table 8(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
2. FOREST PROTECTION						
2.1. Forest fire management						
1. Fire detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Forest meteorology						
1. Data acquisition	0.2	0.2	0.2	0.2	0.2	1.0
3. Training & demonstration	0.1	--	--	--	--	0.1
4. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
2.2. Encroachment prevention						
1. Detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
2.3. Illicit felling, poaching and grazing prevention						
1. Detection	0.2	0.2	0.2	0.2	0.2	1.0
2. Implementation	1.0	1.0	1.0	1.0	1.0	5.0
Total	3.9	3.8	3.8	3.8	3.8	19.1

PROGRAMME 3

INTEGRATED WATERSHED MANAGEMENT

PROGRAMME 3

INTEGRATED WATERSHED MANAGEMENT

Integrated watershed management has assumed considerable importance in view of its role in improving agricultural productivity, soil and water conservation, control of floods and drought and development of lowland/downstream areas.

The State of Kerala is unique in that 44 rivers drain from the Western Ghats in a small area of 38863 Km^2. Moreover 48% of the area is in the rugged highland zone. Thus the status of forest cover in the region exerts great influence on the water regime of rivers, controls floods, alleviates droughts and sustains the agro-economy of the state.

Of late, there have been continuous instances of alternation of droughts and floods in all years. One of the reasons for this is the worsening status of the forest cover in the State. The degraded forests constitute nearly 40% of the forest area and investment to improve the quality and coverage is regarded as an important programme in this plan. Major objectives of integrated watershed management therefore are to stabilise watershed ecosystems, achieve improved forest cover, improved water resources and community participation in soil and water conservation. The watershed linkages are illustrated in Fig.4.

Watersheds have been identified in each Division for treatment during the Plan period. Activities in integrated watershed management will include surveys and studies, development of watershed management technology, upland conservation measures, institutional development and improvement of people's participation.

Sub programme : Surveys and studies

Identification of inputs for integrated watershed management has to be based on detailed information regarding soil and vegetation, climate, topography, status of degradation, human and animal population pressure.

Surveys and studies will be conducted in specific watersheds/sub watersheds in Forest Divisions to assess soil erodability, soil fertility, river flows, water quality, vegetation cover, settlement patterns, technology used by upland farmers. These surveys will help to identify critical inputs for improving watershed quality.

Specific studies will be undertaken on important aspects to support realistic planning and would include species selection, soil conservation, engineering aspects, economics of soil and water conservation.

Sub programme: Technology for watershed management

To improve watershed management technology, a continuous evaluation of appropriate technology and related research is needed. Check dams, contour terraces, gully plugging, river training, tree planting and other techniques are to be improved and propagated.

Sub programme: Upland conservation measures

Attention to uplands forming catchment of rivers are important in watershed management. Activities in upland should be controlled inorder to minimise soil erosion and reduce fluctuations.

Most important activities in upland areas are meant to evolve upland management technology at selected sites.

Sub programme : Institutional aspects

Institutional arrangements, including extension, demonstration, regulation and control, and coordination of inter sectoral activities are crucial for the success of integrated watershed management.

Sub programme :Implementation

Provision has been made for planting, mass seeding and soil conservation activities at present. Surveys and studies can lead to site specific variations and additions.

Sub programme : Management

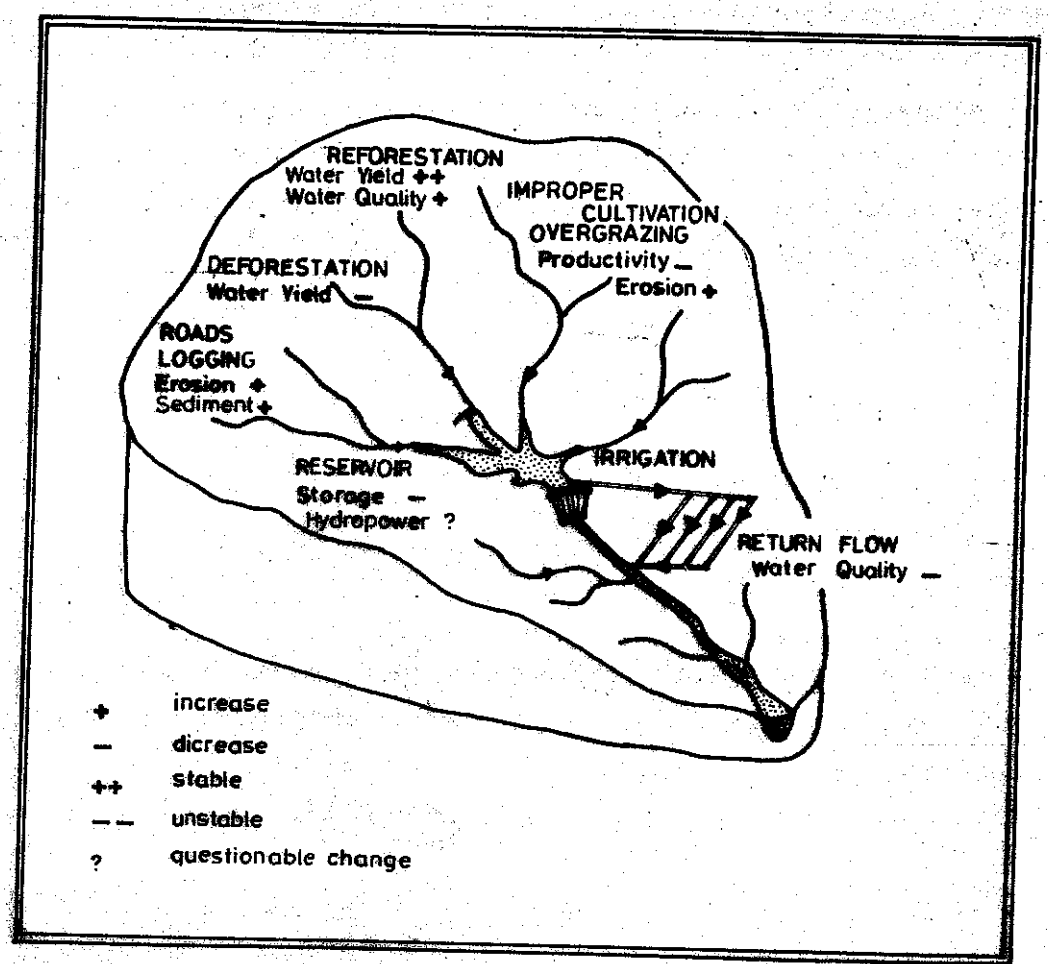
The continuous management of areas treated under integrated watershed management is necessary. Under management this can be carried out.

The activities identified for integrated watershed management are planting, mass seeding and soil conservation.

Nearly 500 micro-watersheds of 300-600 ha each have been identified in the 22 Forest Divisions during the preparatory phase of the plan. Taking into consideration the physical and financial constraints we are recommending integrated management programmes only in 104 watersheds. The area of the watershed will be the area designated for planting and mass seeding. The soil conservation works will be carried out within this area.

Over all 700 Km^2 of degraded natural forests will be treated. This will drastically enhance the qualities of the watershes, thereby improve the hydraulic regime and soil moisture storage. This in turn will help the agriculture production down below. Although quite difficult to assess quantum now, this activity will certainly upgrade the agro-economy of the State.

The activities and investment for this programme are given in Tables 10, 11 and 12.



Watershed Linkages

Table 9(a). Division wise area recommended for watershed conservation under Phase - I

Division	Planting (ha/Yr)	Mass seeding (ha/Yr)	Soil conservation (ha/Yr)	No. of Watersheds
Thiruvananthapuram	70	10	30	1
Thenmala	50	8	20	1
Punalur	70	12	15	1
Konni	150	20	30	1
Ranni	500	40	100	4
Achencoil	30	5	20	1
Kottayam	300	40	60	3
Munnar	340	60	100	3
Kothamangalam	160	80	50	3
Malayattoor	140	50	60	3
Vazhachal	120	20	30	1
Chalakudy	60	10	20	1
Thrissur	140	40	50	1
Nemmara	190	30	40	2
Palakkad	60	20	30	1
Mannarkad	340	20	60	3
Nilambur - S	240	40	80	2
Nilambur - N	210	30	60	2
Kozhikode	90	20	40	1
Wayanad - S	110	20	60	1
Wayanad - N	170	30	60	1
Kannur	110	30	40	1
Total	3650	635	1055	38

Table 9(b). Division wise area recommended for watershed conservation under Phase - II

Division	Planting (ha/Yr)	Mass seeding (ha/Yr)	Soil conservation (ha/Yr)	Watersheds (No./Yr)
Thiruvananthapuram	45	6	20	1
Thenmala	30	5	15	1
Punalur	40	7	10	1
Konni	90	15	20	1
Ranni	300	25	60	4
Achencoil	20	3	15	1
Kottayam	200	25	40	3
Munnar	220	40	60	3
Kothamangalam	160	50	30	3
Malayattoor	220	30	40	3
Vazhachal	80	15	25	1
Chalakudy	40	6	15	1
Thrissur	80	25	30	1
Nemmara	120	25	25	2
Palakkad	40	15	20	1
Mannarkad	200	15	40	3
Nilambur - S	150	25	50	2
Nilambur - N	130	20	40	2
Kozhikode	60	15	25	1
Wayanad - S	70	15	40	1
Wayanad - N	110	20	40	1
Kannur	70	20	25	1
Total	2475	422	685	38

Table 9(c). Division wise area recommended for watershed conservation under Phase - III

Division	Planting (ha/Yr)	Mass seeding (ha/Yr)	Soil conservation (ha/Yr)	Watersheds (No./Yr)
Thiruvananthapuram	60	10	25	1
Thenmala	40	6	16	1
Punalur	60	10	12	1
Konni	120	16	25	1
Ranni	400	35	80	4
Achencoil	25	4	16	1
Kottayam	250	35	50	3
Munnar	300	50	80	3
Kothamangalam	210	70	40	3
Malayattoor	300	40	50	3
Vazhachal	100	16	25	1
Chalakudy	50	8	16	1
Thrissur	130	35	40	1
Nemmara	160	25	35	2
Palakkad	50	16	25	1
Mannarkad	300	16	50	3
Nilambur - S	200	32	64	2
Nilambur - N	170	25	50	2
Kozhikode	75	16	35	1
Wayanad - S	90	16	50	1
Wayanad - N	140	25	50	1
Kannur	90	25	35	1
Total	3320	531	869	38

Table 10(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
3. INTEGRATED WATERSHED MANAGEMENT					
1. Survey and studies	x	-	-	-	-
2. Technology for watershed management	x	x	-	-	-
3. Upland conservation measures	-	x	-	-	-
4. Institutional aspects	x	x	-	-	-
5. Extension and demonstration	-	-	x	-	-
6. Implementation					
a. Planting	-	-	x	x	x
b. Mass seeding	-	-	x	x	x
c. Soil conservation	-	-	x	x	x
7. Management	-	-	x	x	x

Table 10(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
3. INTEGRATED WATERSHED MANAGEMENT						
1. Survey and studies	0.6	--	--	--	--	0.6
2. Technology for watershed management	1.2	1.2	--	--	--	2.4
3. Upland conservation measures	--	1.2	--	--	--	1.2
4. Institutional aspects	0.2	0.2	--	--	--	0.4
5. Extension and demonstration	--	--	0.6	--	--	0.6
6. Implementation						
a. Planting	--	--	60.0	60.0	60.0	180.0
b. Mass seeding	--	--	4.0	4.0	4.0	12.0
c. Soil conservation	--	--	19.0	19.0	19.0	57.0
7. Management	--	--	14.1	25.6	34.7	74.4
Total	2.0	2.6	97.7	108.6	117.7	328.6

Table 11(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
3. INTEGRATED WATERSHED MANAGEMENT					
1. Survey and studies	x	-	-	-	-
2. Upland conservation measures	-	x	-	-	-
3. Extension and demonstration	x	-	-	-	-
4. Implementation					
a. Planting	x	x	x	x	x
b. Mass seeding	x	x	x	x	x
c. Soil conservation	x	x	x	x	x
5. Management	x	x	x	x	x

Table 11(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
3. INTEGRATED WATERSHED MANAGEMENT						
1. Survey and studies	0.4	--	--	--	--	0.4
2. Upland conservation measures	--	0.8	--	--	--	0.8
3. Extension and demonstration	0.4	--	--	--	--	0.4
4. Implementation						
a. Planting	37.0	37.0	37.0	37.0	37.0	185.0
b. Mass seeding	4.0	4.0	4.0	4.0	4.0	20.0
c. Soil conservation	20.0	20.0	20.0	20.0	20.0	100.0
5. Management	16.9	16.9	16.9	16.9	16.9	84.5
Total	78.7	78.7	77.9	77.9	77.9	391.1

Table 12(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
3. INTEGRATED WATERSHED MANAGEMENT					
1. Survey and studies	x	-	-	-	-
2. Upland conservation measures	-	x	-	-	-
3. Extension and demonstration	x	-	-	-	-
4. Implementation					
a. Planting	x	x	x	x	x
b. Mass seeding	x	x	x	x	x
c. Soil conservation	x	x	x	x	x
5. Management	x	x	x	x	x

Table 12(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
3. INTEGRATED WATERSHED MANAGEMENT						
1. Survey and studies	0.5	--	--	--	--	0.5
2. Upland conservation measures	--	1.0	--	--	--	1.0
3. Extension and demonstration	0.5	--	--	--	--	0.5
4. Implementation						
a. Planting	50.0	50.0	50.0	50.0	50.0	250.0
b. Mass seeding	3.0	3.0	3.0	3.0	3.0	15.0
c. Soil conservation	16.0	16.0	16.0	16.0	16.0	80.0
5. Management	34.9	34.9	34.9	34.9	34.9	174.5
Total	104.9	104.9	103.9	103.9	103.9	521.5

PROGRAMME 4

BIODIVERSITY CONSERVATION

PROGRAMME 4

BIODIVERSITY CONSERVATION

Introduction: Concern for nature is deeply embedded in Indian tradition. Although India holds 15% of the human and 14% of the cattle population in the world and has barely 2% of the forests of the globe, there are 53 National Parks and 247 Wildlife Sanctuaries in the country. Over 100,000 Km^2 of protected area of which is 3% of the geographic and 15.6% of the total forest area of the country.

The State of Kerala has even gone a step ahead with 12 Wildlife Sanctuaries and two National Parks covering an area of 2312 Km^2 which is 6% of the total geographic area and 21% of the forest area (Table 13 and Fig. 5). There is one Biosphere Reserve, the Nilgiri Biosphere Reserve (with two core areas within Kerala: the Silent Valley National Park and Nilambur Kovilakam Reserve). The protected areas in Kerala are managed under Wildlife management plans for each area with central assistance supplemented by the state.

Through this programme new emphasis will be given to conservation and environmental protection activities. Accordingly the programme has been divided into 4 sub-programmes.

Sub programme: Conservation strategies

It is imperative to evolve sound conservation strategies in both notified sanctuaries and other areas which are rich in biodiversity. Forest areas with long term conservation value are shown in Fig.6. This is especially important for areas with dense population, like Kerala where man-Wildlife interaction often turns into conflicts. There is a strong need to investigate into the changing relationships, between Park and people. The 'nature in a bottle' philosophy of conservation is loosing hold.

Studies to evolve conservation strategies will concentrate on several fields such as feasibility of integrating conservation and local community development, park delineation, management needs of ecosystem conservation, enumeration and assessment of biodiversity and genetic resources, evaluation of nature reserves and eco-tourism development, awareness improvement and communication system.

Sub programme: Management of protected areas

Principles of park management and genetic and wildlife reserve management are well known. Yet, improvement is urgently needed to adjust them to varied situations. Continuous habitat protection and management is a must. Development of management models for selected areas and improvement of infrastructure is included in this sub programme.

Sub programme: Environmental awareness

The introduction of environmental awareness and education has been recognised and hailed as one of the most renovating innovations in educational systems. An environmental education based in part on the theme of rational management and use of natural resources begins with the child and continues through life, leading to an objective view of the way human societies in general and one's own in particular functions.

Thus it is proposed to develop and implement in protected areas environmental education programmes employing a comprehensive systemic and interdisciplinary approach to the environment. Continuous programmes in mass media, publication of booklets and pamphlets on the heritage and threats to it are also envisaged.

Sub programme : Eco-tourism

Environmental conservation can turn into an income generation activity and the most comprehensible benefit from an interesting and good quality environment is its value to the tourist industry. Large-scale commercial tourism is not suitable for all locations. Development of eco-tourism should be carried out wisely, considering ecosystem's carrying capacity and compatibility with tourism activities.

So far, there has been little attempt to generate any income from tourism, in the tropical forests of Kerala. Some sanctuaries like Periyar Tiger Reserve (Thekkady) are already attracting tourists in large numbers. Provided facilities are available (ie transportation, accommodation, food and water, trained guides etc) guided tours can be arranged to observe wilderness and interesting ecosystems.

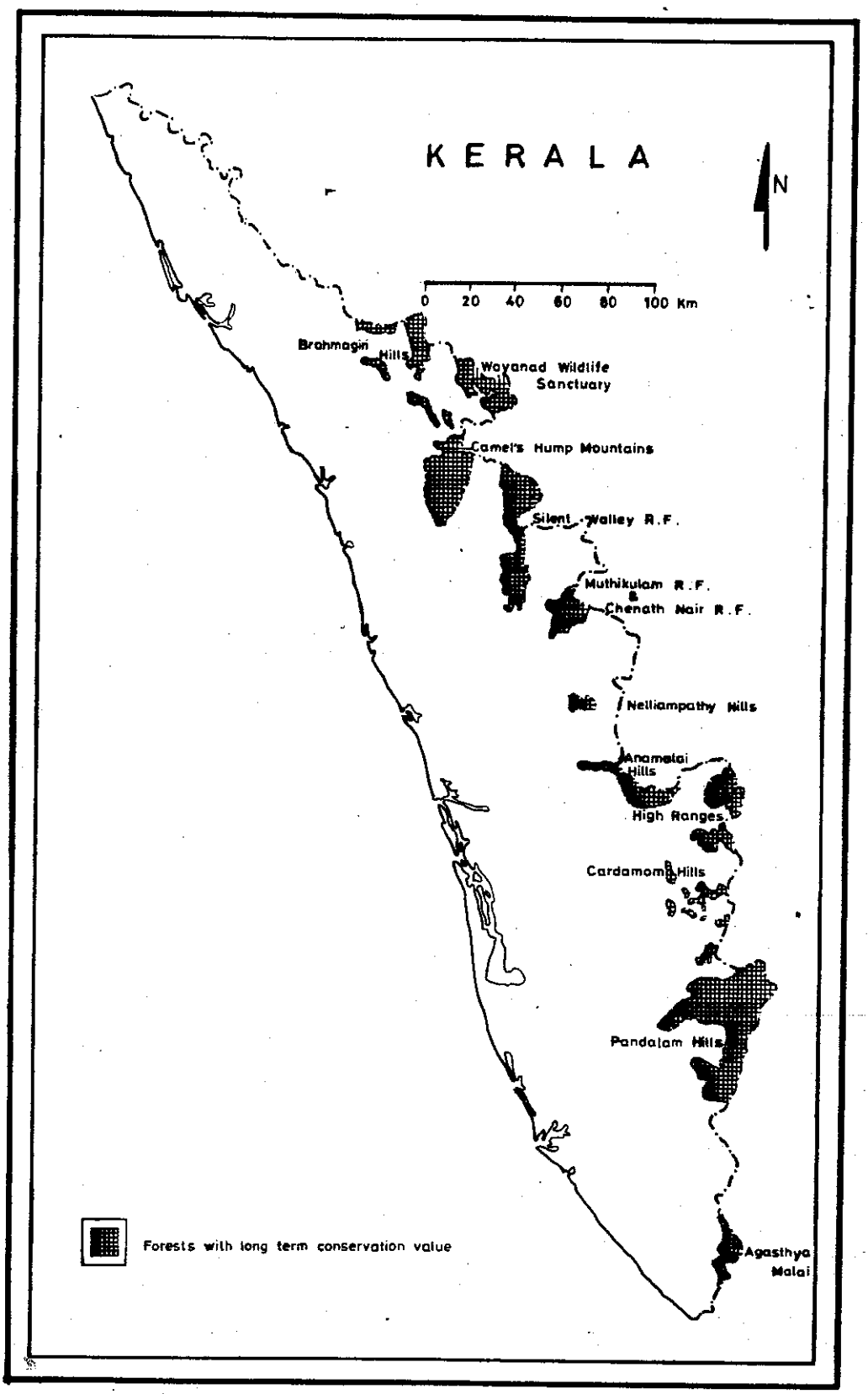
Development of tourism in Kerala needs promotion. Provision for facilities and cooperation with tour and travel agencies is of prime necessity. Priority development areas will be in all the sanctuaries except, Thattekkad Bird Sanctuary and the two National Parks, especially the Silent Valley.

The details of activities and investment are given in Tables 14, 15 and 16. Sanctuary wise detailed programmes and investment schedules may be chalked out during the implementation of the programme.

Table 13. List of Wildlife Sanctuaries and National Parks

Sl. No.	Name of Sanctuaries	Area in Sq.km	Year of Formation
1.	Neyyar Wildlife Sanctuary	128.00	1958
2.	Peppara Wildlife Sanctuary	53.00	1983
3.	Shenthuruni Wildlife Sanctuary	100.32	1984
4.	Periyar Wildlife Sanctuary (Tiger Reserve)	777.54	1934/77
5.	Chinar Wildlife Sanctuary	90.44	1984
6.	Idukki Wildlife Sanctuary	77.00	1976
7.	Eravikulam National Park	97.00	1975/78
8.	Thattekkad Bird Sanctuary	25.16	1983
9.	Chimmini Wildlife Sanctuary	75.00	1984
10.	Peechi Vazhani Wildlife Sanctuary	125.00	1958
11.	Parambikulam Wildlife Sanctuary	274.34	1973
12.	Silent Valley National Park	89.52	1984
13.	Wayanad Wildlife Sanctuary	344.46	1973
14.	Aralam Wildlife Sanctuary	55.00	1984
	Total :	2311.58	

Source: Government of Kerala, Forest Department, Administration Report 1991-92.


KERALA
N
0 20 40 60 80 100 km
Brahmagiri Hills
Wayanad Wildlife Sanctuary
Camel's Hump Mountains
Silent Valley R.F.
Muthikulam R.F. & Chenath Nair R.F.
Nelliampathy Hills
Anamalai Hills
High Ranges
Cardamom Hills
Pandalam Hills
Agasthya Malai
Forests with long term conservation value

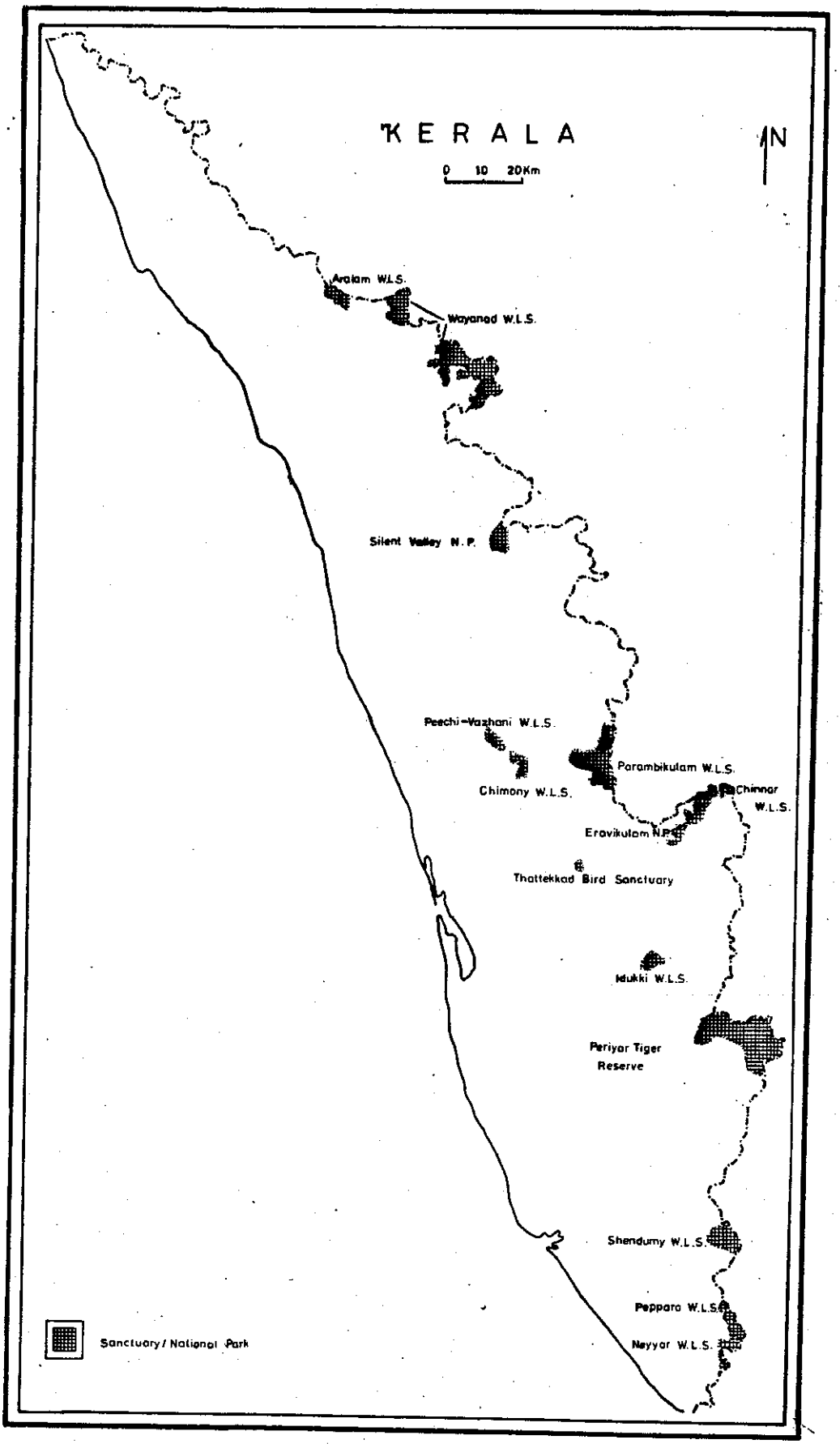

KERALA
0 10 20Km
N
Aralam W.L.S.
Wayanad W.L.S.
Silent Valley N.P.
Peechi-Vazhani W.L.S.
Parambikulam W.L.S.
Chimony W.L.S.
Chinnar W.L.S.
Eravikulam N.P.
Thattekkad Bird Sanctuary
Idukki W.L.S.
Periyar Tiger Reserve
Shendurny W.L.S.
Peppara W.L.S.
Neyyar W.L.S.
Sanctuary / National Park

Table 14(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
4. BIODIVERSITY CONSERVATION					
4.1. Conservation strategies	x	x	-	-	-
4.2. Management of protected areas	-	x	x	x	x
4.3. Environmental awareness	x	x	x	x	x
4.4. Eco-Tourism					
1. Building	x	x	x	-	-
2. Implementation	-	-	-	x	x
3. Co-ordination and publicity	x	x	x	x	x

Table 14(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
4. BIODIVERSITY CONSERVATION						
4.1. Conservation strategies	0.4	0.4	--	--	--	0.8
4.2. Management of protected areas	--	7.4	7.4	7.4	7.4	29.6
4.3. Environmental awareness	0.4	0.4	0.4	0.4	0.4	2.0
4.4. Eco-Tourism						
1. Building	1.3	1.3	1.3	--	--	3.9
2. Implementation	--	--	--	2.8	2.8	5.6
3. Co-ordination & publicity	0.5	0.5	0.5	0.6	0.6	2.7
Total	2.6	10.0	9.6	11.2	11.2	44.6

Table 15(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
4. BIODIVERSITY CONSERVATION					
4.1. Conservation strategies	x	-	-	-	-
4.2. Management of protected areas	x	x	x	x	x
4.3. Environmental awareness	x	x	x	x	x
4.4. Eco-Tourism					
1. Implementation	x	x	x	x	x
2. Co-ordination & publicity	x	x	x	x	x

Table 15(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
4. BIODIVERSITY CONSERVATION						
4.1. Conservation strategies	0.3	--	--	--	--	0.3
4.2. Management of protected areas	5.0	5.0	5.0	5.0	5.0	25.0
4.3. Environmental awareness	0.3	0.3	0.3	0.3	0.3	1.5
4.4. Eco-Tourism						
1. Implementation	1.8	1.8	1.8	1.8	1.8	9.0
3. Co-ordination & publicity	0.4	0.5	0.5	0.5	0.5	2.4
Total	7.8	7.6	7.6	7.6	7.6	38.2

Table 16(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
4. BIODIVERSITY CONSERVATION					
4.1. Conservation strategies	x	-	-	-	-
4.2. Management of protected areas	x	x	x	x	x
4.3. Environmental awareness	x	x	x	x	x
4.4. Eco-Tourism					
1. Implementation	x	x	x	x	x
2. Co-ordination & publicity	x	x	x	x	x

Table 16(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
4. BIODIVERSITY CONSERVATION						
4.1. Conservation strategies	0.3	--	--	--	--	0.3
4.2. Management of protected areas	7.5	7.5	7.5	7.5	7.5	37.5
4.3. Environmental awareness	0.5	0.5	0.5	0.5	0.5	2.5
4.4. Eco-Tourism						
1. Implementation	2.3	2.3	2.3	2.3	2.3	11.5
3. Co-ordination & publicity	0.7	0.7	0.7	0.7	0.7	3.5
Total	11.3	11.0	11.0	11.0	11.0	55.3

PROGRAMME 5

PRODUCTION FORESTRY

PROGRAMME 5

PRODUCTION FORESTRY

Introduction: Kerala Forest Department has raised 153757 ha of plantations. Bulk of the area belongs to teak, eucalypts and other soft wood trees. The productivity of these plantations is below average and the Department is unable to meet the demands of the growing population and industries. For example, the existing pulp and paper industries(2) in Kerala require 2, 90,000 tonnes of eucalypt per annum. The total production per year ranges between 107597 and 117378 tonnes only.

Surveys have revealed that nearly 60% of the plantations exhibit poor growth and some are under stocked. An ambitious planting programme will be necessary to make good the short falls.

Sub programme : Forest plantations

The rapidly increasing demands of the state in wood resources will compel to improve the productivity of plantations. As fresh areas will not be available for converting natural forests into plantations one has to think in lines of improving the productivity of the existing ones (Silvicultural systems. This is tied to the elements under the Programme Forestry Research).

Programme element : Plantation planning:

It is necessary to evolve a plantation programme for rational allocation/supply of timber spreading it over a longer period by regulating production. It is envisaged to undertake in-depth studies in this area.

Programme element: Replanting :

This element is designed for degraded plantations. Under this programme it is proposed to clearfell all degraded plantations and replant them with same or other suitable species. We have identified nearly 17000 ha of poorly stocked plantations of teak, eucalypt and mixed ones. Over a period of 15 years nearly 2800 ha will be replanted with better genetic stock and managed scientifically.

Programme element: Plantation rehabilitation:

A good part of the existing plantations have below average stocking. Through this programme it is envisaged to restock them. Nearly 9300 ha (of the 60,000 ha identified) of plantations will be rehabilitated for productivity improvement. The Division wise details of replanting and rehabilitation areas are given in Tables 17, 18 and 19 respectively. (a - replanting and b - rehabilitation). It is predicted that the productivity and revenue will increase atleast by 50%.

Programme element: Demonstration:

The Silvicultural Research Wing of the Department will establish model plantations of critical species in selected areas, with the scientific input of the Kerala Forest Research Institute.

Sup programme: Forest Industries

Forest based industries, both wood and non-wood, can help regional and rural development. They can generate considerable employment and income and supply some of the basic needs of the people.

The Kerala wood based industry spans from globally important major industries like saw milling, ply milling and pulp and paper to lesser ones like manufacture of packing cases, safety matches, bobben-ups and

others. The present status of wood based industries is below expectations due to:

a. Non-availability of wood raw material
b. Immense wastage due to out-moded technology
c. Competition from external markets.

Of the three pulp and or paper industries only two are functioning and the state is unable to supply requisite raw material. Further it has been reported that forests supply only 5-10% of the total wood consumed in the State. It is proposed to link the forest production to wood based industries and promote;

- Industries that can use logging and milling wastes and residues
- Industries that can use fast growing timber (conventional and non-conventional) for sawn wood and panels
- Small-scale industries producing speciality products.

The programme includes

Saw milling: This is the most traditional wood based industry in Kerala. Lot of waste is at present noticed. It is appropriate that sawmills reorient the technology to process small timber.

Wood based Panels, Plywood : At present there is no growth in this industrial sector due to non availability of wood from natural forests. The major unit under the State, The Travancore Plywood Ltd, Punalur is almost at the point of closure and sometimes depend on unsteady supply of improted timber. The Kerala Wood Industries is also under lock-out. The only functioning major concern is the Western India Plywood, Kannur which is in the Private Sector. It is proposed to investigate into the causes of closure of the Panel and Plywood industry in Kerala and attempt rational and viable alternatives.

Pulp and Paper: Only two pulp and paper units are functioning in the State. The Forest Department is finding it difficult to supply the required amount of raw material to them. Studies have indicated

growing inefficiency on the part of industries implying that the industry uses resources more than proportionate to the growth of output. It is proposed to search for alternative sources of raw material, technology upgradation and the capacity of industries. One industry which was using mainly reed as the raw-material has already been closed.

Development of appropriate industries: There is sometimes a conflict between the objectives of the forest service which may see its main task to be conservation of trees and the industry which wants the supply of raw material at a constant concessional rate on sustained basis. As the changing raw material base is facing the traditional wood based industries, it is proposed to look for appropriate industries. Small scale processing enterprises will receive attention for technology upgradation.

Marketing: Lack of information on markets and marketing are the main constraints. It is proposed to provide market information and trends on wood and wood products so as to enhance the economic efficiency and social justfulness of the wood based industry.

List of activities and expenditure are given in Tables 20, 21 and 22 for the three phases.

Table 17(a). Division wise area recommended for replanting of forestry plantations (ha/year)

Division	Phase - I				
	1	2	3	4	5
Thiruvananthapuram	-	10	25	-	-
Thenmala	-	10	15	15	20
Punalur	-	10	10	20	-
Konni	-	8	20	20	-
Ranni	-	20	20	20	30
Achencoil	-	10	20	20	10
Kottayam	-	10	15	15	20
Munnar	-	10	15	15	20
Kothamangalam	-	10	15	15	20
Malayattoor	-	20	20	30	35
Vazhachal	-	25	25	40	45
Chalakudy	-	10	20	30	-
Thrissur	-	10	10	14	17
Nemmara	-	-	6	-	-
Palakkad	-	10	25	35	35
Mannarkad	-	-	15	15	-
Nilambur - S	-	10	15	15	20
Nilambur - N	-	10	15	15	20
Kozhikode	-	10	15	15	20
Wayanad - S	-	10	15	15	20
Wayanad - N	-	10	10	-	-
Kannur	-	10	15	-	-
Peermedu GLA	-	10	15	15	20
Total	-	203	376	309	208

Table 17(b). Division wise area recommended for rehabilitation of forestry plantations (ha/year)

Division	Phase - I				
	1	2	3	4	5
Thiruvananthapuram	-	20	36	56	56
Thenmala	-	10	15	15	20
Punalur	-	30	30	60	60
Konni	-	20	30	30	40
Ranni	-	20	20	20	30
Achencoil	-	10	15	15	20
Kottayam	-	20	50	70	70
Munnar	-	30	60	60	65
Kothamangalam	-	20	20	36	38
Malayattoor	-	10	15	15	20
Vazhachal	-	20	20	24	32
Chalakudy	-	16	20	36	36
Thrissur	-	40	80	120	120
Nenmara	-	10	15	15	20
Palakkad	-	10	15	15	20
Mannarkad	-	20	24	28	36
Nilambur - S	-	-	-	-	-
Nilambur - N	-	10	15	15	20
Kozhikode	-	10	15	15	20
Wayanad - S	-	30	35	65	65
Wayanad - N	-	20	20	32	36
Kannur	-	40	66	106	106
Peermedu GLA	-	10	15	15	20
Total	-	406	601	833	910

Table 18(a). Division wise area recommended for replanting of forestry plantations (ha/year)

Division	Phase - II				
	1	2	3	4	5
Thiruvananthapuram	-	-	-	-	-
Thenmala	12	12	12	12	12
Punalur	-	-	-	-	-
Konni	-	-	-	-	-
Ranni	18	18	18	18	18
Achencoil	-	-	-	-	-
Kottayam	12	12	12	12	-
Munnar	12	12	12	12	12
Kothamangalam	12	12	12	12	12
Malayattoor	22	22	22	22	22
Vazhachal	28	28	28	28	28
Chalakudy	-	-	-	-	-
Thrissur	10	10	10	10	10
Nemmara	-	-	-	-	-
Palakkad	-	-	-	-	-
Mannarkad	-	-	-	-	-
Nilambur - S	12	12	-	-	-
Nilambur - N	-	-	-	-	-
Kozhikode	12	12	-	-	-
Wayanad - S	-	-	-	-	-
Wayanad - N	-	-	-	-	-
Kannur	-	-	-	-	-
Peermedu GLA	12	12	12	12	12
Total	162	162	138	138	126

Table 18(b). Division wise area recommended for rehabilitation of forestry plantations (ha/year)

Division	Phase - II				
	1	2	3	4	5
Thiruvananthapuram	35	35	35	35	35
Thenmala	12	12	12	12	12
Punalur	38	38	38	38	38
Konni	25	25	25	-	-
Ranni	18	18	18	18	18
Achencoil	12	12	12	12	12
Kottayam	44	44	44	44	44
Munnar	45	45	45	45	45
Kothamangalam	24	24	24	24	24
Malayattoor	12	12	12	12	12
Vazhachal	20	20	20	20	20
Chalakudy	22	22	22	22	22
Thrissur	75	75	75	75	75
Nemmara	12	12	12	12	12
Palakkad	12	12	12	12	12
Mannarkad	22	22	22	22	22
Nilambur - S	-	-	-	-	-
Nilambur - N	12	12	12	12	12
Kozhikode	12	12	12	12	12
Wayanad - S	40	40	40	40	40
Wayanad - N	22	22	22	22	22
Kannur	66	66	66	66	66
Peermedu GLA	12	12	12	12	12
Total	568	568	568	507	507

Table 19(a). Division wise area recommended for replanting of forestry plantations (ha/year)

Division	Phase - III				
	1	2	3	4	5
Thiruvananthapuram	-	-	-	-	-
Thenmala	16	16	16	16	16
Punalur	-	-	-	-	-
Konni	-	-	-	-	-
Ranni	25	25	25	25	25
Achencoil	-	-	-	-	-
Kottayam	-	-	-	-	-
Munnar	-	-	-	-	-
Kothamangalam	16	-	-	-	-
Malayattoor	30	30	30	30	30
Vazhachal	35	35	35	35	35
Chalakudy	-	-	-	-	-
Thrissur	15	15	15	15	15
Neamara	-	-	-	-	-
Palakkad	-	-	-	-	-
Mannarkad	-	-	-	-	-
Nilambur - S	-	-	-	-	-
Nilambur - N	-	-	-	-	-
Kozhikode	-	-	-	-	-
Wayanad - S	-	-	-	-	-
Wayanad - N	-	-	-	-	-
Kannur	-	-	-	-	-
Peermedu GLA	16	16	16	16	16
Total	153	137	137	137	137

Table 19(b). Division wise area recommended for rehabilitation of forestry plantations (ha/year)

Division	Phase - III				
	1	2	3	4	5
Thiruvananthapuram	45	45	45	45	45
Thenmala	16	16	16	16	-
Punalur	50	50	50	50	50
Konni	-	-	-	-	-
Ranni	25	25	25	25	25
Achencoil	16	16	16	16	-
Kottayam	60	60	60	60	60
Munnar	62	62	62	62	62
Kothamangalam	32	32	32	32	32
Malayattoor	16	16	16	16	16
Vazhachal	26	26	26	26	26
Chalakudy	30	30	30	30	30
Thrissur	100	100	100	100	100
Nemmara	16	16	-	-	-
Palakkad	16	16	16	-	-
Mannarkad	30	30	30	30	30
Nilambur - S	-	-	-	-	-
Nilambur - N	16	16	16	16	-
Kozhikode	16	16	16	-	-
Wayanad - S	55	55	55	55	55
Wayanad - N	30	30	30	30	30
Kannur	88	88	88	88	88
Peermedu GLA	16	16	16	16	16
Total	679	679	663	631	583

Table 20(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
5. PRODUCTION FORESTRY					
5.1. Forest plantations					
1. Silvicultural systems	x	x	x	x	x
2. Plantation planning	x	x	-	-	-
3. Plantation replanting	-	x	x	x	x
4. Plantation rehabilitation	-	x	x	x	x
5. Demonstration	-	-	x	x	-
6. Management	x	x	x	x	x
5.2. Forest based industries					
1. Saw milling	x	x	x	x	x
2. Plywood, Panel & Veneer	x	x	x	x	x
3. Pulp and Paper	x	x	x	x	x
4. Development of appropriate industries	-	-	x	x	x
5. Marketing	x	x	x	x	x

Table 20(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
5. PRODUCTION FORESTRY						
5.1. Forest plantations						
1. Silvicultural systems	0.4	0.4	0.4	0.4	0.4	2.0
2. Plantation planning	0.3	0.3	--	--	--	0.6
3. Plantation replanting	--	2.5	3.7	3.8	3.5	13.5
4. Plantation rehabilitation	--	3.4	5.0	7.1	8.0	23.5
5. Demonstration	--	--	0.3	0.3	--	0.6
6. Management	--	--	2.0	4.5	7.3	13.8
5.2. Forest based industries						
1. Saw milling	0.6	0.6	0.6	0.6	0.6	3.0
2. Plywood, Panel & Veneer	0.4	0.4	0.4	0.4	0.4	2.0
3. Pulp and Paper	0.8	0.8	0.8	0.8	0.8	4.0
4. Development of appropriate industries	--	--	0.5	0.5	0.5	1.5
5. Marketing	0.2	0.1	0.3	0.2	0.2	1.0
Total	2.7	8.5	14.0	18.6	21.7	65.5

Table 21(a) .Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
5. PRODUCTION FORESTRY					
5.1. Forest plantations					
1. Plantation planning	x	x	-	-	-
2. Plantation replanting	x	x	x	x	x
3. Plantation rehabilitation	x	x	x	x	x
4. Management	x	x	x	x	x
5.2. Forest based industries					
1. Development of appropriate industries	x	x	-	-	-
2. Marketing	x	x	x	x	x

Table 21(b) .Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
5. PRODUCTION FORESTRY						
5.1. Forest plantations						
1. Plantation planning	0.3	0.3	--	--	--	0.6
2. Plantation replanting	1.7	1.7	1.4	1.3	1.3	7.4
3. Plantation rehabilitation	4.8	4.8	4.8	4.6	4.6	23.6
4. Management	6.3	6.8	7.0	7.0	6.7	33.8
5.2. Forest based industries						
1. Development of appropriate industries	1.2	1.3	--	--	--	2.5
2. Marketing	0.1	0.1	0.2	0.1	0.1	0.6
Total	14.4	15.0	13.4	13.0	12.7	68.5

Table 22(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
5. PRODUCTION FORESTRY					
5.1. Forest plantations					
1. Plantation planning	x	x	-	-	-
2. Plantation replanting	x	x	x	x	x
3. Plantation rehabilitation	x	x	x	x	x
4. Management	x	x	x	x	x
5.2. Forest based industries					
1. Marketing	x	x	x	x	x

Table 22(b) .Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
5. PRODUCTION FORESTRY						
5.1. Forest plantations						
1. Plantation planning	0.4	0.4	--	--	--	0.8
2. Plantation replanting	1.6	1.5	1.4	1.4	1.4	7.3
3. Plantation rehabilitation	6.0	6.0	6.0	5.6	5.3	28.9
4. Management	8.7	8.5	8.3	8.3	8.0	41.8
5.2. Forest based industries						
1. Marketing	0.2	0.2	0.2	0.2	0.2	1.0
Total	16.9	16.6	15.9	15.5	14.9	79.8

PROGRAMME 6

NON TIMBER FOREST PRODUCTS

PROGRAMME 6

NON TIMBER FOREST PRODUCTS

Introduction: Over one hundred types of non-timber forest products are collected in the forests of Kerala. There has been no valuation studies of the products. In the Indian context it has been estimated that non-timber forest products (excluding timber and small wood) accounted for 40% of the net revenue originating from the forestry sector. It must be almost true for Kerala, where the tropical moist forest supply medicinal plants, dyes, waxes, resin, honey, lubricants, raw materials for lubricants and shampoos. There is dearth of information regarding the collection of bamboo, rattan and other products.

The very existence of large number of NTFP is threatened by ruthless exploitation, deforestation, fires and grazing, conversion to agriculture. Scientific exploitation of these products, have little or no deleterious effects on the environment.

The Sub programmes outline the investment needs and possibilities for development of NTFP.

Sub programme: Inventory

As a first step towards rational exploitation and proper management of a forest resource, it is essential that the distribution, quality and type of resource must be determined; through an inventory. Although, the same can be carried out during the inventory of timber resources, methodological modifications are warranted.

A five year inventory programme is included.

Sub programme: Harvesting and utilisation

Research on harvesting and utilisation and tool improvisation is envisaged.

Sub programme: Integrated management

At present the management of NTFP in natural forests is much neglected, partly because of high costs in managing them individually. Joint management of these crops minimize costs. One other factor that has caused the neglect of NTFP management is lack of sufficient knowledge of management techniques for integrated management. The programme envisages development of suitable management techniques. These activities are linked with some of those under programme 8 Research and Development.

Sub programme : Training and extension

It is necessary to provide skills in community organisation and communication methods to those who are involved in promoting NTFP with participation of local communities. Promotion and demonstration can be affected by training classes, seminars and exhibition.

Upgrading and expansion of existing facilities is also envisaged. These activities are linked to Programme 9 Educational Training.

Sub programme : Development of NTFP based industries

Although consumer industries for NTFP in the form of pharmaceutical and cosmetic are available, it is proposed to establish primary processing units of NTFP with aim of value addition. The main sectors are medicinal plants, honey and others. This is linked to the sub programme value addition aimed at increasing the earnings of the gatherers on the one hand and sustaining biodiversity on the other.

Sub programme: Establishment of NTFP plantations

Small scale plantations of rare but commercially valuable NTFP will have to be attempted. The pilot trials can lead to large scale plantations even outside the forest sector. Tribals and other forest dwellers can be involved in the programme. Pharmaceutical industries have to collaborate with production, conservation and marketing of NTFP.

Sub programme: Marketing

Marketing and realisation of just costs of NTFP is a serious problem. At present it is controlled by a few private monopolies who exploit the collectors and also ruin the biodiversity potential. It is proposed to regularise the demand and supply and control the market and also the collections.

Programme wise activities and investments are detailed in Tables 23,24 and 25.

Table 23(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
6. NON TIMBER FOREST PRODUCTS					
6.1. Inventory	x	x	-	-	-
6.2. Harvesting & Utilization	x	x	x	-	-
6.3. Integrated mangement	-	-	x	x	x
6.4. Training & extension	-	-	x	x	x
6.5. Development of NTFP based industries	-	-	x	x	x
6.6. Value addition	-	-	x	x	x
6.7. Marketing	-	-	x	x	x

Table 23(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
6. NON TIMBER FOREST PRODUCTS						
6.1. Inventory	0.1	0.1	--	--	--	0.2
6.2. Harvesting & Utilization	0.1	0.2	0.1	--	--	0.4
6.3. Integrated mangement	--	--	1.0	1.0	1.0	3.0
6.4. Training & extension	--	--	0.1	0.1	0.1	0.3
6.5. Development of NTFP based industries	--	--	2.0	1.9	0.9	4.8
6.6. Value addition	--	--	0.4	0.4	0.4	1.2
6.7. Marketing	--	--	0.1	0.1	0.1	0.3
Total	0.2	0.3	3.7	3.5	2.5	10.2

Table 24(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
6. NON TIMBER FOREST PRODUCTS					
6.1. Inventory	x	-	-	-	-
6.2. Integrated mangement	x	x	x	x	x
6.3. Training & extension	x	x	x	x	x
6.4. Development of NTFP based industries	x	-	-	-	-
6.5. Establishment of NTFP plantations	x	x	-	-	-
6.6. Marketing	x	x	x	x	x

Table 24(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
6. NON TIMBER FOREST PRODUCTS						
6.1. Inventory	0.02	--	--	--	--	0.02
6.2. Integrated mangement	0.10	0.10	0.10	0.06	0.16	0.52
6.3. Training & extension	0.02	0.02	0.08	0.02	0.02	0.16
6.4. Development of NTFP based industries	0.50	--	--	--	--	0.50
6.5. Establishment of NTFP plantations	0.34	0.06	--	--	--	0.40
6.6. Marketing	0.02	0.02	0.02	0.02	0.02	0.10
Total	1.00	0.20	0.20	0.10	0.20	1.70

Table 25(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
6. NON TIMBER FOREST PRODUCTS					
6.1. Inventory	x	-	-	-	-
6.2. Integrated mangement	x	x	x	x	x
6.3. Training & extension	x	x	x	x	x
6.4. Establishment of NTFP plantations	x	x	-	-	-
6.5. Marketing	x	x	x	x	x

Table 25(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
6. NON TIMBER FOREST PRODUCTS						
6.1. Inventory	0.08	--	--	--	--	0.08
6.2. Integrated mangement	0.10	0.10	0.10	0.10	0.10	0.50
6.3. Training & extension	0.10	0.10	0.10	0.10	0.10	0.50
6.4. Establishment of NTFP plantations	0.20	0.28	--	--	--	0.48
6.5. Marketing	0.02	0.02	0.1	0.1	0.1	0.34
Total	0.50	0.50	0.30	0.30	0.30	1.90

PROGRAMME 7

BUFFER ZONE MANAGEMENT

PROGRAMME 7

BUFFER ZONE MANAGEMENT

Introduction: Serious attention is to be paid to sustainable forest management of production and conservation areas. A most difficult environmental policy issue concerns the apparent incompatibility between conservation and economic utilization of resources. In Kerala there is a long line and islands of settlements adjoining and within reserved forests. Nearly 55000 ha of settlement area within the forest area is identified through our survey. The buffer zone management is proposed to be practised here and also in tribal areas. The programme includes two subprogrammes:

Sub programme: Social forestry/community forestry (Joint Forest Management)

This programme will be implemented in settlement areas within the forest and village forest interface areas. All the programmes will be carried out with community participation. Local technology and local resources will be utilised. Nearly 9000 ha areas has been identified in the State (Division wise break-up is given in Table 26) for JFM during the plan period.

This programme will comprise the following elements.

1. Surveys and studies: Initial surveys will be done to identify suitable areas and communities.

2. Models of participatory management: Appropriate models for participatory management and use of resources will be established at selected sites.

3. Extension and demonstration: The most important aspect of Joint Forest Management is the acceptance of local people. Appropriate extension and demonstration programmes will be conducted.

Programme element :Implementation

Surveys and studies, development of appropriate models will be carried out during the Phase I. Implementation will be attempted in the second and third phases only (during 6- 15 years of the programme).

Sub programme : Tribal development

Over 73,000 tribal and ethnic communities reside within the forest areas belonging 26 tribal groups (ST) and 5 scheduled castes (SC). Forests are their life support system. Development in the modern lines has displaced these original systems. Through this programme it is proposed to uplift the well being of this group and develop appropriate models for sustainable livelihood and development.

The Sub Programme comprises.

1. Surveys and studies: The basic information collected will be up dated and site specific and group specific appraisals will be carried out.
2. Development of appropriate programmes: Imposition of modern concepts, tools and technology on ethnic communities have been the main reasons for the deplorable condition among the tribal communities.. It is proposed to develop through participatory appraisal and learning appropriate programmes.
3. Extension and training: Tribal development requires change in attitudes and approaches. After the needs of the group are identified through micro planning, extensive training programmes will be conducted both for the target group and change agents.
4. Demonstration: Model development programmes will be conducted in selected communities/areas.
5. Implementation: Implementation is proposed only from 5th to 15th year.

Activities and expenditure under this programme are given in Tables 27, 28 and 29.

Table 26. Division wise area recommended for planting under Buffer zone management

Division	Planting (ha/Yr)		
	Phase I	Phase II	Phase III
Thiruvananthapuram	26	15	20
Thenmala	60	35	50
Punalur	24	25	40
Konni	5	3	4
Ranni	200	160	150
Achencoil	5	3	4
Kottayam	120	75	100
Munnar	150	95	120
Kothamangalam	170	100	140
Malayattoor	40	25	35
Vazhachal	7	5	6
Thrissur	50	30	40
Nemmara	160	100	130
Mannarkad	28	15	25
Nilambur - S	7	5	6
Nilambur - N	24	15	20
Kozhikode	2	2	2
Wayanad - S	3	2	2
Wayanad - N	5	3	4
Kannur	18	10	15
Total	1104	723	913

Table 27(a). Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
7. BUFFER ZONE MANAGEMENT					
7.1. Social forestry/Community forestry/Joint forest management					
1. Surveys and studies	x	x	-	-	-
2. Models of participatory management	-	x	x	x	x
3. Extension and demonstration	-	x	x	x	x
7.2. Tribal development					
1. Surveys and studies	x	x	-	-	-
2. Development of appropriate programmes	-	x	x	x	x
3. Training and extension	-	x	x	x	x
4. Demonstration	-	-	-	x	x
5. Implementation	-	-	-	-	x

Table 27(b). Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
7. BUFFER ZONE MANAGEMENT						
7.1. Social forestry/Community forestry/Joint forest management						
1. Surveys and studies	0.2	0.2	--	--	--	0.4
2. Models of participatory management	--	0.4	0.4	0.4	0.4	1.6
3. Extension and demonstration	--	0.2	0.2	0.2	0.2	0.8
7.2. Tribal development						
1. Surveys and studies	0.2	0.2	--	--	--	0.4
2. Development of appropriate programmes	--	0.4	0.4	0.4	0.4	1.6
3. Training and extension	--	0.3	0.3	0.3	0.3	1.2
4. Demonstration	--	--	--	0.2	0.2	0.4
5. Implementation	--	--	--	--	0.6	0.6
Total	0.4	1.7	1.3	1.5	2.1	7.0

Table 28(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
7. BUFFER ZONE MANAGEMENT					
7.1. Social forestry/Community forestry/Joint forest management					
1. Implementation	x	x	x	x	x
7.2. Tribal development					
1. Surveys and studies	x	-	-	-	-
2. Training and extension	x	x	x	x	x
3. Demonstration	-	-	-	x	x
4. Implementation	x	x	x	x	x

Table 28(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
7. BUFFER ZONE MANAGEMENT						
7.1. Social forestry/Community forestry/Joint forest management						
1. Implementation	6.0	6.0	6.0	6.0	6.0	30.0
7.2. Tribal development						
1. Surveys and studies	0.1	--	--	--	--	0.1
2. Training and extension	0.3	0.3	0.3	0.3	0.3	1.5
3. Demonstration	--	--	--	0.3	0.3	0.6
4. Implementation	0.3	0.3	0.3	0.3	0.3	1.5
Total	6.7	6.6	6.6	6.9	6.9	33.7

Table 29(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
7. BUFFER ZONE MANAGEMENT					
7.1. Social forestry/Community forestry/Joint forest management					
1. Implementation	x	x	x	x	x
7.2. Tribal development					
1. Surveys and studies	x	-	-	-	-
2. Training and extension	x	x	x	x	x
3. Implementation	x	x	x	x	x

Table 29(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
7. BUFFER ZONE MANAGEMENT						
7.1. Social forestry/Community forestry/Joint forest management						
1. Implementation	8.0	8.0	8.0	8.0	8.0	40.0
7.2. Tribal development						
1. Surveys and studies	0.2	--	--	--	--	0.2
2. Training and extension	0.5	0.5	0.5	0.5	0.5	2.5
3. Implementation	0.8	0.8	0.8	0.8	0.8	4.0
Total	9.5	9.3	9.3	9.3	9.3	46.7

PROGRAMME 8

RESEARCH NEEDS

PROGRAMME 8
RESEARCH NEEDS

Research and Development

The forestry sector in the State plays a very important role in providing over 1000 million Rs. a year to the exchequer. Given the intangible benefits of climate amelioration, watershed protection, biodiversity conservation and others, are given values, the benefits will be unpriced. But research funding is still lagging to less than 1% of the total benefit.

The role of research in development of forest management and utilization cannot be over emphasized. Almost in every aspect of forestry and forest products research needs strengthening, including related facilities. The combined effect of lack of facilities, budget, manpower and incentives is often serious.

The Kerala Forest Research Institute and Silvicultural Research wing of the Forest Department are the main organizations doing research. The forestry college under the Agriculture University is mainly involved in producing graduates and post-graduates in the field of forestry.

The Kerala Forest Research Institute is identified to carry out most of the research programmes envisaged. Therefore it is recommended that 50 % of the funds available under research be transfered to this agency.

The programme for research and management is to strengthen the capabilities of these organisations, suggest new vistas and provide a basis for future research to support the development plan as a whole.

Sub programme: Environmental Research

Ecological, Wildlife and waste management research are the main thrust areas. This will also cater to preparing environmental Impact Assessment Reports for proposed activities affecting forests.

Sub programme: Forestry Research

The ongoing forestry research in the organisations of the state has to be restructured to cope the challenge of the huge forestry development programme under consideration.

Research priorities include development of models for sustainable management of forests and plantations.

Silvicultural research is often lagging in the state.

A strong Genetics and Tree improvement Programme coupled with Seed technology is proposed here. Nursery management and site specific soil inputs can improve the growth rates. Growth and yield studies need be rejuvenated (after 1947 only few stands are measured) so as to help in management, yield regulation and finally achievement of higher productivity. The present pest and disease management research conducted in nurseries need be extended to older plantations.

Another area is research on NTFP which is totally neglected. As NTFP affects the livelihood of millions of people and also the forest cover the scope for research on sustainable utilisation, search for new products and chemicals, value addition and marketing is of paramount importance. This sector is also very important in the sense that sustainable extension is possible without damage to the ecosystem.

Sub programme: Forest Products Research

Research on Forest Products is weak. A few labs of private industries are carrying out prime necessary research only.

A comprehensive research programme on forest products is envisaged during the plan encompassing processing and preservative technology, improved raw materials use and pilot plant trials and training. Last but not the least a strong Forest economics programme taking into consideration economic incentives in environmental conservation landuse economics, supply-demand projections and balancing, economics of silvicultural management, intersectoral linkages, industrial structure and efficiency, environmental impacts, forest sector models trade and marketing studies, policies affecting forestry sector development etc. is planned.

Sub programme: Research Management

The way that research is organised and financed can influence the nature of research activities. A good research management will ensure that the Institution's goals are achieved efficiently and cost-effectively. The system should also permit the research worker the maximum scope for exercising creativity. This sub programme consists of improvement in skills and capabilities and concepts and tools. The Institution has to be improved in infrastructure and proper arrangements for the dissemination of information is necessary.

The activities and investment are given in Tables 30, 31 and 32.

Table 30(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
8. RESEARCH NEEDS					
8.1. Environmental research					
1. Ecological research	x	x	x	x	x
2. Wildlife research	x	x	x	x	x
3. Research on waste management	x	x	x	x	x
4. Environmental impact assessment	x	x	x	x	x
8.2. Forestry research					
1. Sustainable forest management	x	x	x	x	x
2. Soil studies	x	x	x	x	x
3. Genetics & tree improvement	x	x	x	x	x
4. Growth & yield studies	x	x	x	x	x
5. Integrated pest management	x	x	x	x	x
6. Non wood forest products	x	x	x	x	x
8.3. Forest products research					
1. Processing & preservative technology	x	x	-	-	-
2. Improved raw material use	x	x	-	-	-
3. Pilot plant trials & training	x	x	-	-	-
4. Forest economics & marketing	x	x	x	x	x
8.4. Research management					
1. Improvement in skills and capabilities	x	x	x	-	-
2. Concepts & tools	x	x	-	-	-
3. Institution (research)	x	x	x	-	-
4. Dessimination of information	x	x	x	x	x

Table 30(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
8. RESEARCH NEEDS						
8.1. Environmental research						
1. Ecological research	0.6	0.6	0.6	0.6	0.6	3.0
2. Wildlife research	1.0	1.0	1.0	1.0	1.0	5.0
3. Research on waste management	0.4	0.4	0.4	0.4	0.4	2.0
4. Environmental impact assessment	0.6	0.6	0.6	0.6	0.6	3.0
8.2. Forestry research						
1. Sustainable forest management	0.8	0.8	0.8	0.8	0.8	4.0
2. Soil studies	0.5	0.5	0.3	0.3	0.3	1.9
3. Genetics & tree improvement	2.0	1.0	1.0	1.0	1.0	6.0
4. Growth & yield studies	0.4	0.4	0.4	0.4	0.4	2.0
5. Integrated pest management	1.2	0.6	0.6	0.6	0.6	3.6
6. Non wood forest products	2.0	1.0	1.0	1.0	1.0	6.0
8.3. Forest products research						
1. Processing & preservative technology	0.6	0.6	--	--	--	1.2
2. Improved raw material use	0.4	0.4	--	--	--	0.8
3. Pilot plant trials & training	0.3	0.4	--	--	--	0.7
4. Forest economics & marketing	0.2	0.2	0.2	0.2	0.2	1.0
8.4. Research management						
1. Improvement in skills and capabilities	0.6	0.6	0.6	--	--	1.8
2. Concepts & tools	0.2	0.2	--	--	--	0.4
3. Institution (research)	1.2	1.2	1.2	--	--	3.6
4. Dessimination of information	0.2	0.2	0.2	0.2	0.2	1.0
Total	13.2	10.7	8.9	7.1	7.1	47.0

Table 31(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
6. RESEARCH NEEDS					
8.1. Environmental research					
1. Ecological research	x	x	x	x	x
2. Wildlife research	x	x	x	x	x
3. Research on waste management	x	x	x	x	x
4. Environmental impact assessment	x	x	x	x	x
8.2. Forestry research					
1. Sustainable forest management	x	x	x	x	x
2. Soil studies	x	x	x	x	x
3. Genetics & tree improvement	x	x	x	x	x
4. Growth & yield studies	x	x	x	x	x
5. Integrated pest management	x	x	x	x	x
6. Non wood forest products	x	x	x	x	x
8.3. Forest products research					
1. Pilot plant trials & training	x	-	-	-	-
2. Forest economics & marketing	x	x	x	x	x
8.4. Research management					
1. Improvement in skills and capabilities	x	-	-	-	-
2. Concepts & tools	x	-	-	-	-
3. Institution (research)	-	-	-	-	x
4. Dessimination of information	x	x	x	x	x

Table 31(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
8. RESEARCH NEEDS						
8.1. Environmental research						
1. Ecological research	0.25	0.25	0.25	0.25	0.25	1.25
2. Wildlife research	0.50	0.50	0.50	0.50	0.50	2.50
3. Research on waste management	0.13	0.13	0.13	0.13	0.13	0.65
4. Environmental impact assessment	0.25	0.25	0.25	0.25	0.25	1.25
8.2. Forestry research						
1. Sustainable forest management	0.38	0.38	0.38	0.38	0.38	1.90
2. Soil studies	0.18	0.18	0.18	0.18	0.18	0.90
3. Genetics & tree improvement	1.25	0.63	0.63	0.63	0.63	3.77
4. Growth & yield studies	0.13	0.13	0.13	0.13	0.13	0.65
5. Integrated pest management	0.31	0.31	0.31	0.31	0.31	1.55
6. Non wood forest products	0.38	0.38	0.38	0.38	0.38	1.90
8.3. Forest products research						
1. Pilot plant trials & training	0.40	--	--	--	--	0.40
2. Forest economics & marketing	0.13	0.13	0.13	0.13	0.13	0.65
8.4. Research management						
1. Improvement in skills and capabilities	0.63	--	--	--	--	0.63
2. Concepts & tools	0.25	--	--	--	--	0.25
3. Institution (research)	--	--	--	--	0.60	0.60
4. Dessimination of information	0.13	0.13	0.13	0.13	0.13	0.65
Total	5.30	3.40	3.40	3.40	4.0	19.50

Table 32(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
8. RESEARCH NEEDS					
8.1. Environmental research					
1. Ecological research	x	x	x	x	x
2. Wildlife research	x	x	x	x	x
3. Research on waste management	x	x	x	x	x
4. Environmental impact assessment	x	x	x	x	x
8.2. Forestry research					
1. Sustainable forest management	x	x	x	x	x
2. Soil studies	x	x	x	x	x
3. Genetics & tree improvement	x	x	x	x	x
4. Growth & yield studies	x	x	x	x	x
5. Integrated pest management	x	x	x	x	x
6. Non wood forest products	x	x	x	x	x
8.3. Forest products research					
1. Pilot plant trials & training	x	-	-	-	-
2. Forest economics & marketing	x	x	x	x	x
8.4. Research management					
1. Improvement in skills and capabilities	x	-	-	-	-
2. Concepts & tools	x	-	-	-	-
3. Institution (research)	-	-	-	-	x
4. Dessimination of information	x	x	x	x	x

Table 32(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
8. RESEARCH NEEDS						
8.1. Environmental research						
1. Ecological research	0.16	0.16	0.16	0.16	0.16	0.80
2. Wildlife research	0.50	0.50	0.50	0.50	0.50	2.50
3. Research on waste management	0.16	0.16	0.16	0.16	0.16	0.80
4. Environmental impact assessment	0.32	0.32	0.32	0.32	0.32	1.60
8.2. Forestry research						
1. Sustainable forest management	0.50	0.50	0.50	0.50	0.50	2.50
2. Soil studies	0.40	0.25	0.25	0.25	0.25	1.40
3. Genetics & tree improvement	1.70	0.88	0.88	0.88	0.88	5.22
4. Growth & yield studies	0.32	0.16	0.16	0.16	0.16	0.96
5. Integrated pest management	0.25	0.25	0.25	0.25	0.25	1.25
6. Non wood forest products	0.50	0.50	0.50	0.50	0.50	2.50
8.3. Forest products research						
1. Pilot plant trials & training	0.60	--	--	--	--	0.60
2. Forest economics & marketing	0.16	0.16	0.16	0.16	0.16	0.80
8.4. Research management						
1. Improvement in skills and capabilities	0.90	--	--	--	--	0.90
2. Concepts & tools	0.37	--	--	--	--	0.37
3. Institution (research)	--	--	--	--	0.80	0.80
4. Dessimination of information	0.16	0.16	0.16	0.16	0.16	0.80
Total	7.00	4.00	4.00	4.00	4.80	23.80

PROGRAMME 9

EDUCATION, TRAINING AND EXTENSION

PROGRAMME 9
EDUCATION, TRAINING AND EXTENSION

Introduction: A massive education, Extension and Training programme for the Department Staff is envisaged so as to gear them implement the plan efficiently taking into consideration the advancements made in the forestry sector.

This programme comprises

Sub programme: Inservice training/retraining/refresher courses

A training centre will be established with all facilities for in house training. All staff will undergo periodic training in all fields of forestry activities.

Sub programme: Forest industry training

This is a neglected field. It is proposed to offer Certificate and Diploma courses in forest industry planning, management and operations.

Sub programme: Extension

Although extension activities will be extended to field level, a central facility is envisaged to coordinate training and to disseminate the required information.

The activities and investment are detailed in Tables 33, 34 and 35.

Table 33(a). Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
9. EDUCATION, TRAINING AND EXTENSION					
9.1. Inservice training/retraining/ refresher courses	-	-	x	x	x
1. Infrastructural facilities	-	x	x	-	-
2. Teaching materials	-	x	x	-	-
3. Fellowships	-	-	x	x	x
9.2. Forests & Forestry products training					
1. Infrastructural facilities	x	x	-	-	-
2. Curriculum review	-	x	x	-	-
3. Materials & methods	-	x	x	-	-
4. Conduct of training activities	-	-	x	x	x
5. Fellowships	-	-	x	x	x
6. Support to Universities and Institutions	x	x	x	x	x
9.3. Extension					
1. Institutional arrangements	x	x	-	-	-
2. Training	-	x	x	-	-
3. Facilities	x	x	-	-	-
4. Communication skills	-	x	x	x	-
5. Systems & methods	-	x	x	x	-
6. Implementation	-	-	-	-	x

Table 33(b) . Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
9. EDUCATION, TRAINING AND EXTENSION						
9.1. Inservice training/retraining/ refresher courses	--	--	0.40	0.40	0.40	1.20
1. Infrastructural facilities	--	1.20	1.20	--	--	2.40
2. Teaching materials	--	0.10	0.10	--	--	0.20
3. Fellowships	--	--	0.20	0.20	0.20	0.60
9.2. Forests & Forestry products training						
1. Infrastructural facilities	0.20	0.20	--	--	--	0.40
2. Curriculum review	--	0.04	0.04	--	--	0.08
3. Materials & methods	--	0.04	0.04	--	--	0.08
4. Conduct of training activities	--	--	0.20	0.20	0.20	0.60
5. Fellowships	--	--	0.20	0.20	0.20	0.60
6. Support to Universities and Institutions	0.60	0.60	0.60	0.60	0.60	3.00
9.3. Extension						
1. Institutional arrangements	0.20	0.22	--	--	--	0.42
2. Training	--	0.10	0.12	--	--	0.22
3. Facilities	0.10	0.10	--	--	--	0.20
4. Communication skills	--	0.10	0.10	0.10	--	0.30
5. Systems & methods	--	0.20	0.10	0.10	--	0.40
6. Implementation	--	--	--	--	0.20	0.20
Total	1.10	2.90	3.30	1.80	1.80	10.90

Table 34(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
9. EDUCATION TRAINING AND EXTENSION					
9.1. Inservice training/retraining/ refresher courses	x	x	x	x	x
1. Fellowships	x	x	x	x	x
9.2. Forests & Forestry products training					
1. Conduct of training activities	x	x	x	x	x
2. Fellowships	x	x	x	x	x
3. Support to Universities and Institutions	x	x	x	x	x
9.3. Extension					
1. Implementation	x	x	x	x	x

Table 34(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
9. EDUCATION TRAINING AND EXTENSION						
9.1. Inservice training/retraining/ refresher courses	0.32	0.32	0.32	0.32	0.32	1.60
1. Fellowships	0.12	0.12	0.12	0.12	0.12	0.60
9.2. Forests and Forestry products training						
1. Conduct of training activities	0.12	0.12	0.12	0.12	0.12	0.60
2. Fellowships	0.12	0.12	0.12	0.12	0.12	0.60
3. Support to Universities and Institutions	0.50	0.50	0.50	0.50	0.50	2.50
9.3. Extension						
1. Implementation	0.12	0.12	0.12	0.12	0.12	0.60
Total	1.30	1.30	1.30	1.30	1.30	6.50

Table 35(a). Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
9. EDUCATION TRAINING AND EXTENSION					
9.1. Inservice training/retraining/ refresher courses	x	x	x	x	x
1. Fellowships	x	x	x	x	x
9.2. Forests and Forestry products training					
1. Conduct of training activities	x	x	x	x	x
2. Fellowships	x	x	x	x	x
3. Support to Universities and Institutions	x	x	x	x	x
9.3. Extension					
1. Implementation	x	x	x	x	x

Table 35(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
9. EDUCATION TRAINING AND EXTENSION						
9.1. Inservice training/retraining/ refresher courses	0.5	0.5	0.5	0.5	0.5	2.5
1. Fellowships	0.2	0.2	0.2	0.2	0.2	1.0
9.2. Forests & Forestry products training						
1. Conduct of training activities	0.2	0.2	0.2	0.2	0.2	1.0
2. Fellowships	0.2	0.2	0.2	0.2	0.2	1.0
3. Support to Universities and Institutions	0.7	0.7	0.7	0.7	0.7	3.5
9.3. Extension						
1. Implementation	0.2	0.2	0.2	0.2	0.2	1.0
Total	2.0	2.0	2.0	2.0	2.0	10.0

PROGRAMME 10

INSTITUTIONS

PROGRAMME 10
INSTITUTIONS

Introduction: A massive investment programme can be carried out only if an institution to monitor and evaluate the same is organised. This programme identifies the actions and estimates the investment necessary to improve the institutional structure and effectiveness. All the programmes will be implemented by the field level officers of the Forest Department.

The programme consists of:

Sub programme: Establishment costs

This identifies the costs of a core group of staff who will plan, monitor and evaluate the programme under the control of a Chief Conservator of Forests (Table 37). Provision has been made for hiring additional specialist staff, if necessary from other disciplines.

Sub programme: Policy and planning

Through this programme the staff involved in the plan activities will receive specialised training. A data bank will function. Provision has been made for sectoral review, project evaluation and monitoring once in 5 years and continuous resource development planning.

The activities and investments phase-wise are given in Tables 37, 38 and 39.

Table 37(a) . Activities during Phase - I

Programme	First Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
10. INSTITUTIONS					
10.1. Establishment costs					
1. Staff salaries	X	X	X	X	X
2. Specialists salaries	X	X	X	X	X
3. Running & maintenance of vehicles	X	X	X	X	X
4. TA & DA	X	X	X	X	X
10.2. Policy and planning					
1. Institutional arrangements	X	X	-	-	-
2. Data bank	X	X	X	X	X
3. Improvement of planning capability	X	X	X	-	-
4. Policy analysis	X	X	-	-	-
5. Sectoral review	X	-	-	-	-
6. Project evaluation & monitoring	-	-	-	-	X
7. Continuous resource development planning	X	X	X	X	X

Table 37(b). Investment requirements for Phase - I
(Million Rupees)

Programme	First Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
10. INSTITUTIONS						
10.1. Establishment costs						
1. Staff salaries	0.70	0.80	0.80	0.80	0.80	3.90
2. Specialists salaries	0.10	0.10	0.10	0.10	0.10	0.50
3. Running & maintenance of vehicles	0.40	0.40	0.40	0.40	0.40	2.00
4. TA & DA	0.02	0.02	0.02	0.02	0.02	0.10
10.2. Policy and planning						
1. Institutional arrangements	0.10	0.20	--	--	--	0.30
2. Data bank	0.20	0.20	0.20	0.18	0.20	0.98
3. Improvement of planning capability	0.10	0.10	0.08	--	--	0.28
4. Policy analysis	0.05	0.08	--	--	--	0.13
5. Sectoral review	0.13	--	--	--	--	0.13
6. Project evaluation & monitoring	--	--	--	--	0.18	0.18
7. Continuous resource development planning	0.30	0.30	0.30	0.30	0.30	1.50
Total	2.10	2.20	1.90	1.80	2.00	10.00

Table 38(a). Activities during Phase - II

Programme	Second Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
10. INSTITUTIONS					
10.1. Establishment costs					
1. Staff salaries	x	x	x	x	x
2. Specialists salaries	x	x	x	x	x
3. Running & maintenance of vehicles	x	x	x	x	x
4. TA & DA	x	x	x	x	x
5. Upkeep of buildings	-	-	x	-	-
10.2. Policy and planning					
1. Data bank	x	x	x	x	x
2. Improvement of planning capability	-	-	-	-	x
3. Policy analysis	x	-	-	-	-
4. Sectoral review	x	-	-	-	-
5. Project evaluation & monitoring	-	-	-	-	x
6. Continuous resource development planning	x	x	x	x	x

Table 38(b). Investment requirements for Phase - II
(Million Rupees)

Programme	Second Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
10. INSTITUTIONS						
10.1. Establishment costs						
1. Staff salaries	0.50	0.50	0.50	0.48	0.40	2.38
2. Specialists salaries	0.05	0.05	0.05	0.05	0.05	0.25
3. Running & maintenance of vehicles	0.30	0.30	0.30	0.30	0.30	1.50
4. TA & DA	0.02	0.02	0.02	0.02	0.02	0.10
5. Upkeep of buildings	--	--	0.40	--	--	0.40
10.2. Policy and planning						
1. Data bank	0.10	0.10	0.10	0.10	0.10	0.50
2. Improvement of planning capability	--	--	--	--	0.06	0.06
3. Policy analysis	0.02	--	--	--	--	0.02
4. Sectoral review	0.06	--	--	--	--	0.06
5. Project evaluation & monitoring	--	--	--	--	0.07	0.07
6. Continuous resource development planning	0.35	0.33	0.33	0.35	0.50	1.86
Total	1.40	1.30	1.70	1.30	1.50	7.20

Table 39(a) . Activities during Phase - III

Programme	Third Five Year				
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr
10. INSTITUTIONS					
10.1. Establishment costs					
1. Staff salaries	X	X	X	X	X
2. Specialists salaries	X	X	X	X	X
3. Running & maintenance of vehicles	X	X	X	X	X
4. TA & DA	X	X	X	X	X
5. Upkeep of buildings	-	-	X	-	-
10.2. Policy and planning					
1. Data bank	X	X	X	X	X
2. Improvement of planning capability	-	-	-	-	X
3. Policy analysis	X	-	-	-	-
4. Sectoral review	X	-	-	-	-
5. Project evaluation & monitoring	-	-	-	-	X
6. Continuous resource development planning	X	X	X	X	X

Table 39(b). Investment requirements for Phase - III
(Million Rupees)

Programme	Third Five Year					Total
	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
10. INSTITUTIONS						
10.1. Establishment costs						
1. Staff salaries	0.80	0.82	0.92	0.92	0.94	4.40
2. Specialists salaries	0.08	0.08	0.08	0.08	0.08	0.40
3. Running & maintenance of vehicles	0.50	0.50	0.50	0.50	0.50	2.50
4. TA & DA	0.05	0.05	0.05	0.05	0.05	0.25
5. Upkeep of buildings	--	--	0.60	--	--	0.60
10.2. Policy and planning						
1. Data bank	0.15	0.15	0.15	0.15	0.15	0.75
2. Improvement of planning capability	--	--	--	--	0.08	0.08
3. Policy analysis	0.04	--	--	--	--	0.04
4. Sectoral review	0.08	--	--	--	--	0.08
5. Project evaluation & monitoring	--	--	--	--	0.10	0.10
6. Continuous resource development planning	0.40	0.40	0.40	0.40	0.40	2.00
Total	2.10	2.00	2.70	2.10	2.30	11.20

ANNEXURE – I

DATA SHEET FOR .....RANGE OF

.....DIVISION

I. General

Total area	-	Ha.
Natural forests	-	Ha.
Plantations	-	Ha.
Settlements		
a) Tribal settlements	-	Ha.
b) Enclosures of non-tribals	-	Ha.
Population within forests		
a) Tribal settlement	-	Nos.
b) Others	-	Nos.
Elevation (Approx)	-	m.
Rainfall (Average)	-	mm.
Period of the current working plan	-	19..... - 19.....
Name of the Author of the Working Plan	-	
Whether working plan maps available in Range/Division	-	Yes/No
Scale of Range map	-	1:.....
Whether Ecorestoration programmes implemented	-	Yes/No
If 'Yes' the position may be marked in the map.		
Total area covered under the Ecorestoration programme	-	.....Ha.
The type of eco-restoration programme undertaken		Soil conservation Water conservation Afforestation Others (Specify)

Source of funds used - Plan funds/WGDP/Others (Specify)

Result of the programme implimented - Effective / Note effective

Details of projects, if any, available - Irrigation / Hydroelectric

Extent of waterspread area - .....Ha

Catchment area particulars - .....

II. Natural Forests

Type of forests

Evergreen	-	Ha
Semievergreen	-	Ha.
Moist deciduous	-	Ha.
Dry deciduous	-	Ha.
Grass lands	-	Ha.
Plantations	-	Ha.

Status of forests -

Evergreen & Semievergreen	good	.....Ha
	Degraded	.....Ha
Moist deciduous	good	.....Ha
	Degraded	.....Ha
Dry deciduous	good	.....Ha
	Degraded	.....Ha

Reasons for degradation
- Fire
- Grazing
- Unscientific working
- Illicit felling
- Encroachments
- Others (Specify)

Past management

Selection felling	-	.....Ha.
Clear felling	-	.....Ha
Others (specify)	-	.....Ha.

	Watershed Nos					
	1	2	3	4	5	6
a) Good area (Density >60%) (>0.6)						
b) Partly degraded (Density 40-60%) 0.4-0.6)						
c) Highly degraded (Density < 40%) (<0,4)						

Action proposed	Watershed Nos					
	1	2	3	4	5	6
a) Good area						
Planting (Ha)						
Mass seeding (Ha)						
Soil conservation (Ha)						
b) Partly degraded						
Planting (Ha)						
Mass seeding (Ha)						
Soil conservation (Ha)						
c) Highly degraded						
Planting (Ha)						
Mass seeding (Ha)						
Soil conservation (Ha)						

Amount proposed for the proposed action
(Rs,. per Ha)

Rs./Ha.

Good area

Planting
Mass seeding
Soil conservation

Partly degraded area

Planting
Mass seeding
Soil conservation

Highly degraded
Planting
Mass seeding
Soil conservation

Other actions suggested

Fire control .....Ha.....Rs/Ha.

Grazing control .....Ha.....Rs./Ha.

Others (Specify) .....Ha.....Rs./Ha.

VI. Details to be given in the Division Map.

1. Division map showing Range boundaries

2. Micro watersheds to be marked

3. Type of forests to be marked.

   a. Evergreen and semievergreen

   b. Moist deciduous

   c. Dry deciduous

   d. Grasslands

   e. Bamboo areas.

   f. Reed areas.

   g. Degraded forests

   h. Plantations.

4. Other details to be marked. (Appx)

   a. Tribal settlements.

   b. Non Tribal areas.

   c. Encroachments

   d. Rivers and streams.

   e. Road network.

   f. Hydro/irrigation projects with waterspread areas