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BIODIVERSITY IN TROPICAL MOIST FORESTS : A STUDY OF SUSTAINABLE USE OF NON-WOOD FOREST PRODUCTS IN THE WESTERN GHATS, KERALA

P.K. Muraleedharan
N. Sasidharan
K.K. Seethalakshmi

KERALA FOREST RESEARCH INSTITUTE
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ABSTRACT

Today, importance of sustainable management of Non-Wood Forest Products (NWFPs) is highlighted in the literature and in the public discussions. This may be due to increasing awareness on the major role that they play in the generation of income and employment, especially in the rural areas, as well as in the conservation of biodiversity. An attempt is made in this study to explore ways to maintain sustainable extraction of NWFPs and biodiversity. This is done by analysing some selected ecological and socio-economic factors that affect their sustainable management, on the basis of the results of studies carried out in three moist forest areas (viz., Wayanad, Nilambur and Attappady) of Kerala part of the Western Ghats.

Altogether 229 NWFPs were recorded from the study areas, of which less than 50 species were commercially exploited. It appeared that high rate of extraction (60 to 100 per cent) of NWFPs by the gatherers resulted in poor density, sparse distribution of species and depletion of biodiversity. Of the total commercially exploited species, about 50 per cent showed comparatively better density and distribution in the population. Their opportunity cost was also relatively low. NWFP species, capable of regenerating through vegetative means, registered more than 100 per cent regeneration even when 95 per cent of the plants were harvested in the previous season. On the other hand, species which are regenerated through seeds showed poor regeneration when the harvest in the previous season was only about 30 to 50 per cent. It indicates that an understanding of the regeneration potential at different levels of harvest is needed for the sustainable extraction of NWFP plants. In the study sites, the stage has not yet reached whereby an increase in the basal area of tree community would lead to reduction in the basal area of understorey plant community. Thus, enrichment planting of NWFP species like *Phyllanthus emblica,* in these sites could lead to an increase in the cover of NWFP plants. To produce planting stock of NWFPs, studies were conducted to standardise propagation by seeds and vegetative methods for selected species. The preliminary trials indicated that there is enough scope for propagating some of the NWFP species by seeds or vegetative methods. An attempt made to carry out enrichment planting in the study sites showed that survival of selected species ranged between 20 and 50 per cent.

The study indicated that certain socio-economic and institutional factors have contributed much to the present state of unsustainable extraction and depletion of biodiversity of NWFPs in the study areas. In the past, the collection and marketing of NWFPs in the state were controlled by the private traders. With the aim of eliminating middlemen from the collection and marketing chains of NWFPs and ensuring a fair price to gatherers, the government established institutions such as tribal societies and an apex body of tribal societies viz., Kerala State Scheduled Caste Scheduled Tribe Development Co-operative Federation Ltd. (called, Federation). Before the establishment of these institutions the tribal people practised more or less subsistence extraction of NWFPs, in keeping with its sustainability. However, the commercial extraction of selected NWFPs by the Federation led to their over-exploitation. The Federation and societies could streamline the collection and marketing of NWFPs effectively. But they could not solve problems such as prevalence of intermediaries, illegal collection by the non-tribals, vague property rights and inadequacy of funds for carrying out collection at proper time, all of which affected the sustainable extraction and biodiversity of NWFPs. .

The review of present management practices of NWFPs was revealing. A number of institutions or groups, such as MFP committee, the State Forest Department, the Federation, tribal societies and tribal people participate at different levels in the management of NWFPs in Kerala. But mostly, the participation is of mobilisational type and marked by participation from above, in which decisions regarding various aspects of management are taken from above and thrust upon various parties at local level. The tribal people and societies who have to implement various management decisions at the grass root level, have no voice in the management of NWFPs and consequently, do not show much interest in protecting the resources.

The study has suggested an effective system of participatory management by the interest groups at the local level for sustainable management of NWFPs and conservation of biodiversity. It has also presented a participatory management action plan for the sustainable management of NWFPs in Kerala.

1. INTRODUCTION

In recent decades, the fast depletion of forest resources in the country has been a major source of concern of planners, policy makers, intellectuals and people at large, as it leads to a number of ecological and socio-economic problems. With the increased pressure on land, the degradation of forest continues unabated in the country. This combined with increased commercial exploitation of forests contributes to a variety of ecological impact, including biodiversity loss. The degradation has resulted in a number of socio-economic problems as well. In particular, the socio-economic impact has been severe on tribal communities, who depend mainly on Non-Wood Forest Products (NWFPs) for their livelihood. For, forest degradation has been decreasing the availability of NWFPs.

NWFPs include all goods of biological origin as well as services derived from forests or any land under similar use and exclude wood in all its form (Chandrashekaran, 1995). They consist of a variety of versatile, diversified and seasonal products. They are the source of food, fibre, manure, construction materials, cosmetics and cultural products. There are many users for these products ranging from individuals to multinational firms. NWFPs play an important role in generating income and employment to the rural communities.

In olden days, the tribal communities in India used the forest resource-base without destroying it. Tribal communities followed subsistence extraction of NWFPs which was a sustainable practice and policy. With the onset of British rule, there had been significant changes in the forest resource use in the country. The British first exercised their control over forest products and then owned the entire forest land which led to large-scale deforestation, conversion of land for other purposes and restriction on resource use by local communities. In forest management plans, the development of timber resources was given preference due to their commercial importance and NWFPs including wildlife were neglected. The forest resources other than wildlife and timber were classified as minor forest products in the working plans indicating their less importance. Further, development of NWFPs did not receive any attention in the forest policies formulated by the British government. During the post-independent period too, the governments continued more or less the same policies with respect to NWFPs.

With the development of new uses and products based on NWFPs there has been significant increase in the demand for certain NWFPs since the 1970s. This paved the way for commercial exploitation of NWFPs which indiscriminately and adversely affected their sustainable extraction, regeneration and ultimately, their biodiversity.

In recent times, the importance of sustainable management of these products has been highlighted both nationally and internationally due to growing awareness of protecting biodiversity, increasing concern about livelihood systems of the local communities and expanding commercial demand (Arnold, 1995). However, socio-economic and ecological factors affecting the sustainable management of NWFPs vary from country to country and even region to region within a country. Therefore, micro-level studies are needed to formulate appropriate strategies for the development NWFPs.

In Kerala, forests account for 28 per cent of the total geographical area (38863 km2). Of the total forest area, 80 per cent constitutes tropical moist forests, consisting of evergreen, semi-evergreen and moist deciduous types (Govt. of Kerala, 1992). Apart from the major products (e.g. timber, firewood and small wood) the moist forests in the state provide a variety of NWFPs. Broadly, they can be classified as edible products, medicinal plants, toiletries, tans and dyes, gums and resins, rattan, bamboo, grasses and animal products. In Kerala forests, 500 species providing NWFPs are found (Nambiar *et al.*, 1985). Out of these 119 items are listed as commercially important by the Forest Department.

Tribal communities have been engaged in the collection of NWFPs since time immemorial. Initially, collection was solely for self-consumption. However, from 17th century onwards the tribal communities began to trade the collected products by barter system. Items such as black pepper, ginger, turmeric, dammar, myrobalans, cinnamon, honey, bee wax, gooseberry, lemon grass oil, etc. were the important NWFPs collected for barter.

The period since the arrival of British witnessed a change in the collection scenario. Besides the tribal people, private contractors were allowed to collect NWFPs on an annual lease basis. The right to collect rattan was leased out either by tender or auction and bamboos in the forest were sold on payment of seignorage. Since 1915 the local people were issued free passes to collect thatching materials. The local people were allowed to collect products like bamboos, reeds, canes, manure leaves, etc. under the

cover of seignorage permits (Anjana, 1997). In the 1940s, the extraction of honey and wax, skins, ivory and gurjan balsam was done by the government departmentally for ,a stipulated period and other items were leased to private traders. The lessee was interested in the collection of only those items that fetch good returns.

In 1970, the government granted the right of NWFP collection to the tribal people in the state. In 1978, a number of Tribal Service Co-operative Societies (TSCS) were started with membership reserved only for the tribal people in order to ensure a fair deal for their products and to free them from the clutches of middlemen and thereby, aiming at their increased welfare. In spite of TSCS there was no noticeable change in the conditions of the gatherers of NWFPs. In 1981, the government established an apex body of tribal societies viz., The Kerala State Scheduled Caste Scheduled Tribe Development Co-operative Federation Limited (called, Federation) and it was entrusted with the right of monopoly procurement and sale of all NWFPs collected by the societies.

Recently, due to a variety of reasons such as population pressure, shrinking resource base, and increasing demand, the tribal people, quite often, exploit these forest resources in an unsustainable manner. On top of it, the large-scale conversion of natural forests for developmental works, implementation of plantation programs and illegal collection by non-tribal, etc. have further depleted NWFPs In short, today NWFPs are not properly exploited and managed in Kerala. Some species are over exploited and some others are not fully extracted, resulting in a change in the species composition, density, regeneration and availability and level of biodiversity.

Many factors may have been acting as constraints in the sustainable management of NWFPs in the state. To illustrate, NWFPs are neglected by the foresters and policy makers in the traditional forest management system, Further, there has been significant resource depletion in NWFPs due to extensive gathering and inappropriate management regulations. Unplanned land-use changes, lack of integration of wood and non-wood products in the forest management, processing and storage technology, proper method for raising seedlings for enrichment planting and marketing strategies are some of the other constraints to sustainable management of NWFPs in Kerala. It is obvious that studies of these constraints and measures for their resolutions are useful to design correct policies and practices of sustainable management of NWFPs in the state.

Studies on NWFPs in the state are very few and are mostly concentrated on enumeration of plants with their botanical descriptions, identification of useful products and their possible utilization (CSIR, 1948; Chopra, *et. al*, 1956; Nambiar *et al*., 1985; Basha, 1990; Basha and Nair, 1993 and Nair, 1996). A study by Thomas (1996) provides an overview of collection and marketing of NWFPs in Kerala. A few studies are available on bamboos (Nair and Muraleedharan, 1983; Surendran and Seethalakshmi, 1985; Seethalakshmi, 1991, 1996; Jayasankar and Muraleedharan, 1995), rattans (Renuka, 1992; Muraleedharan and Seethalakshmi, 1993) and selected medicinal plants (Sasidharan *et al.*, 1996). However, a comprehensive study on the sustainable management of NWFPs, along with their conservation and propagation in Kerala is a major gap in the literature on the subject. The present study is a modest attempt to fill in the gap.

OBJECTIVES

The main objective of the study is to explore the ways to maintain biodiversity and sustainable extraction of NWFPs in the moist forests. To be more specific, the study attempts to:

- identify NWFPs and record their uses with the help of tribal communities and other interest groups,
- study sustainable extraction methods of NWFPs and develop methods for propagation of selected species,
- examine socio-economic aspects of collection, marketing and utilisation of NWFPs, and
- prepare a participatory management action plan for maintaining biodiversity and ensuring sustainable use of NWFPs and examine its possible impact on various interest groups.

2. MATERIALS AND METHODS

Setting the above specific objectives, the study was carried out in three moist forest areas viz., Wayanad, Nilambur and Attappady, of Kerala part of the Western Ghats. A profile of the study areas is in order.

PROFILE OF THE STUDY AREAS

Western Ghats constitute a range of hills running parallel to the Arabian sea with a length of about 1300 km and passing through the states of Kerala, Tamil Nadu, Kamataka, Goa and Maharashtra. The forests of the Western Ghats can mainly be grouped into two types: Tropical moist forests and Tropical dry forests (WRI, 1985).Generally, the moist forests are found in high rainfall zone (ranging between 1500 and 3500 mm).

The Kerala part of the Western Ghats covers about 450 km long stretch, accounting for 56 per cent of the geographical area of the state (Nair, 1986). The tropical moist forests in the Kerala part of the Western Ghats account for 80 per cent of the forest area in the state. These moist forests are characterised by the presence of a large number of species, providing both wood and non-wood forest products. A profile of each study area (Figure 2.1) is given below.

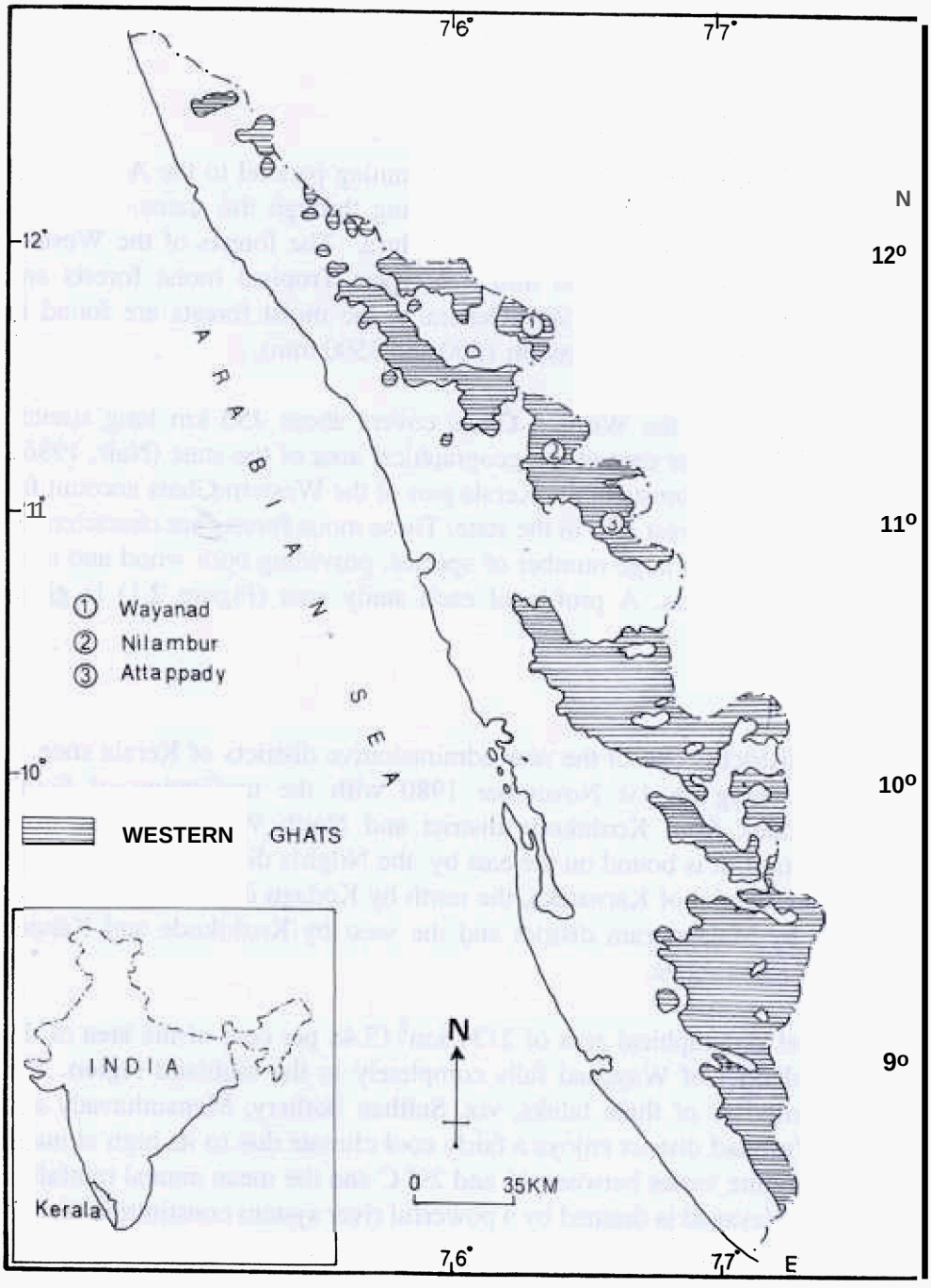
Wayanad

Wayanad district is one of the new administrative districts of Kerala state. It came into being on 1st November 1980 with the unification of South Wayanad taluk from Kozhikode district and North Wayanad taluk from Kannur district. It **is** bound on the east by the Nilgiris district of Tamil Nadu and Mysore district of Karnataka, the north by Kodagu district of Karnataka, the south by Malappuram district and the west by Kozhikode and Kannur districts of Kerala state.

With a total geographical area of 2131 km^2 (5.48 per cent of the area of the state) the district of Wayanad falls completely in the highland region. The district comprises of three taluks, viz. Sulthan Bathery, Mananthavady and Vythiri. Wayanad district enjoys a fairly cool climate due to its high altitude. The temperature varies between 15 and 29^o C and the mean annual rainfall is 3000 mm. Wayanad is drained by a powerful river system constituting Kabini

Figure 2.1

Location of the study areas



and her tributaries. Kabini, a mighty perennial east flowing river, flows into Karnataka and thereby joins the river Cauvery. The total area under forests in Wayanad is 539 km2. The forest can be classified into evergreen, semi-evergreen, moist deciduous and dry deciduous forests. The forests are enriched with some commercially important trees such as *Tectona grandis* (teak), *Dalbergia latifolia* (rosewood), *Lagerstroemia microcarpa* (venteak), *Xylia xylocarpa* (irul), *Terminalia alata* (karumaruthu) and *Ailanthus triphysa* (matti). The eastern section of Wayanad plateau, which is relatively flat, is covered with moist and dry deciduous trees. A sizeable area is under bamboo brakes that stretch from the Nilgiris in the south to the Brahamagiris in the north.

Apart from timber, NWFPs form an important source of revenue from the forests. They include dammar, honey, wax, gall-nuts, soap-nuts, ginger, cinnamon, pepper etc. Wayanad wildlife sanctuary (344.44 km^2) forms part of the western portion of the Nilgiri Biosphere Reserve (Gopinathan, 1990).

Total population of Wayanad district enumerated in the 1991 census is 6.72 lakhs constituting 2.31 per cent of the total population of the state. The most characteristic demographic feature of the district is its highest proportion of tribal population. The total tribal population in the district, according to the 1991 census, was 114969, forming 17.10 per cent of the total population of the district and 35.82 per cent of the total Scheduled Tribe population of the state. Mullakurumas, Uralikurumas, Kurichians, Kattunaickan and Paniyans are the important tribal communities in Wayanad.

Nilambur

The Nilambur valley is situated in the Nilambur taluk of Malappuram district. The valley is bound on the north by the south Wayanad taluk of Wayanad district, on the south by Nilambur village, on the west by Malappuram district and on the east by the Nilgiri district of Tamil Nadu.

The Nilambur valley is connected by all-weather roads from forest headquarters at Nilambur and several hazardous footpaths from the Nilgiris and south Wayanad. The valley has an elevation ranging between 40m and 2500 m above MSL. The mean annual rainfall ranges from 2500 mm to 3500 mm. The temperature varies between 17 and 37^oC throughout the year. The Chaliyar and the Karimpuzha are the major rivers of the valley.

Total area under forests is 760 km^2 comprising of evergreen forests, semi-evergreen, moist deciduous forests and plantations. The Nilambur valley is famous for teak plantations. The forests of Malabar owe their commercial importance and their financial success wholly to the well-known Nilambur teak plantations that started in 1882. Trees of high commercial value and several species of rattan and reed bamboos are abundantly found in the valley.

Cholanaickans, Pathynaickans and Aranadan are the major tribal groups inhabiting the Nilambur valley. It is on the banks of the rivers most of the tribal settlements are found. The Cholanaickans inhabit the reserve forests of Karulai and Vazhikadavu ranges.

Attappady

Attappady is one of the two extensive east sloping plateau on the Western Ghats of Kerala. With an area of 731 km^2, it is situated in the north of the Palakkad gap and at the south-western base of the Nilgiris.

Attappady is considered as one of the driest parts of the Kerala Western Ghats (ESRG, 1989) and this is partly attributed to the rain shadow effect of the mountains. Mean annual rainfall varies from above 900 mm in the eastern boundary to above 3000 mm in the western half. Based on rainfall, the area can be grouped into high, medium and low rainfall areas.

Bhavani and Siruvani are the two major rivers of Attappady. While the Bhavani originates from the Nilgiris, the river Siruvani descends from the southern portion of Attappady at Muthikulam. Both the rivers have been dammed and the water is diverted to Tamil Nadu. The land use can be classified as dense forests (18%), degraded forests (29%), grasslands (6%), agricultural plantations (1 1%), agriculture and habitations (35%), rock (0.7%) and water bodies (0.6%) (Muraleedharan and Sankar, 1991). The dense forests exist only in Attappady Block I and Block VI, which were reserved in the early 1900s. Degraded forests, cover an area of 210 km^2, mostly the erstwhile private forests vested with the government in 1971.

The population in Attappady consists of tribal people and non-tribals and the latter constitute the settlers from Tamil Nadu and other parts of Kerala. The tribal communities identified in the study area are Kurumbas, Mudugas and Irulas of whom the Kurumbas are a primitive tribal group.

SELECTED TRIBAL COMMUNITIES

A tribe is a small, distinctive and isolated group, consisting of members who tend to become serf-sufficient (Childyal, 1982). Tribal people in the state have been living in forests from time immemorial in harmony with nature. Some tribal groups are cultivators. They have extraordinary skill in the collection of NWFPs. Gathering of food, hunting and fishing supplement their agricultural practices.

There are about 35 tribal communities in Kerala with a population of 300,000 accounting for about 1 per cent of the total population in the state. Literacy rate among the tribal people in Kerala is 30 per cent as against 95 per cent for general population (Government of Kerala, 1988). The tribal community with a pre-agricultural stage of development, stagnant population and very low literacy rate is categorised as primitive by the Government of India. The Cholanaickans, Kurumbas, Kattunaickans, Kadars and Koragas are the primitive tribal groups in Kerala, accounting for about 3 per cent of the tribal population of the state (Government of Kerala, 1988).

In the study, three tribal communities have been selected for detailed examination. Their socio-economic conditions are presented in Appendix I. A brief sketch of each of the three selected tribal communities is given below.

Kattunaickans

Kattunaickans are considered the descendants of a nomadic primitive hunter-gatherer group who roamed the hill tops and caves instead of settling down. The Kattunaickans of Wayanad are said to have migrated from the neighbouring forests of Mysore and are settled either inside the forest or in its periphery. Traditionally, they are honey-collectors, food-gatherers and hunters. In Wayanad district, there are 2003 Kattunaickan families living in 242 settlements of which 73 are situated in the forest areas (755 families) and the remaining in the peripheral region. They live in small low huts, thatched with grass, which are clustered on the forest land. The majority of them subsists on roots, herbs and honey available in the forests. Except for the limited number employed by the Forest Department as mahouts and watchers, the rest lead the life of food gatherers. Nearly 75 per cent of Kattunaickans depend on forests for their sustenance (Anitha, 1996). In the past, these people led a nomadic life in the interior forests subsisting with shifting cultivation and the natural resources available within the forest. The Government policy restricting their free movement has altered the situation

completely. They have abandoned shifting cultivation and have turned to trade in NWFPs.

Cholanaickans

Cholanaickans, the cavemen of Kerala, reside in the Nilambur valley. They are said to have migrated from the neighbouring forests of Mysore. They speak a mixture of Kannada and Tamil. They are food gatherers and hunters and are leading a completely isolated life. The Cholanaickan family is nuclear and it does not in any way represent the joint family system of Hindus. Cholanaickans are the most primitive tribal community in the state and are organised as self sufficient family groups.

Cholanaickans continue their traditional economic pursuits such as food gathering, hunting and fishing. The Government has constructed houses for them but they mostly prefer to live in the rock caves in the interior forests. They wander in the forests in search of tubers, roots, seeds and NWFPs. The Cholanaickans are averse to cultivation and collection of NWFPs turns out to be their major source of income.

Irulas

Irulas are scattered all over peninsular India with different customs and life styles. Those in the Attappady area are believed to have migrated from Tamil Nadu. Numerically dominant and relatively advanced group among the three tribal groups in Attappady, Irulas are found residing in 104 hamlets. They constitute about 82 per cent of the total tribal population in the area.

The traditional Irula houses are made up of mud, bamboo and grass and are built in a row. Recently, a number of tiled and concrete houses were constructed by the Integrated Tribal Development Project (ITDP) in certain Irula hamlets. Unlike Kattunaickans and Cholanaickans, the Irulas own land. The land is under community ownership, but community life does not exist in the Irula hamlet. Originally, they were shifting cultivators. Because of land alienation that was brought about mainly by the encroachment of the settlers in the area, they have taken to settled agriculture. In addition to agriculture, collection of NWFPs provides a significant part of their income.

SOME BASIC CONCEPTS

In the study some basic concepts have been used at many places. The meaning of each basic concept is given below to make the study free from ambiguity.

Biodiversity and sustainability are two concepts which are frequently used in the study and therefore, need to be defined. Biodiversity refers to the variety and variability of all animals, plants and micro-organisms on earth and is considered at three levels, genetic diversity, species diversity and habitat diversity (Haeruman, 1995). This study gives more emphasis to species diversity.

Sustainability refers to a state in which there is a steady improvement in productivity and benefits of a system (forests), in such a way that posterity can continue to receive the benefits at least at the same level as is being enjoyed by the present generation (Chandrashekaran, 1996).

One of the aims of this study is to understand the sustainable use of NWFPs. This, to a great extent, is determined by sustainable harvesting. Harvesting is said to be sustainable if it does not provide any long term negative effects on plant community. In order to assess sustainable harvesting of NWFPs, the knowledge of some ecological characteristics such as availability, distribution, species composition, regeneration dynamics of species, etc., and how these vary between the habitats, is essential. Further, sustainable harvesting significantly determined by some socio-economic factors such as, market forces, pricing, etc. In order to formulate policies to maintain biodiversity and ensure sustainable use of NWFPs, all these factors must be taken into consideration.

METHODS OF STUDY

This study deals with botanical, phenological and propagation techniques and socio-economic aspects of NWFPs. The methods adopted to study each of these aspects are given below.

Botanical aspects

This part covers the aspects such as ecological status, distribution, availability, species diversity and regeneration capacities and sustainable methods of extraction. For gathering data for botanical study, a survey was

carried out for two years 1995-1996 and 1996-1997) before and after the monsoon seasons.

Inventory of NWFPs

A list of NWFPs in the study areas was prepared based on sample enumeration of plants by laying transects and also from the sales records of the tribal co-operative societies. Three replicate transects of 1 km length and 10 m wide were laid at random to represent all vegetation types in each site. All the plants including herbs, shrubs, climbers and trees in the transects were identified. Enumeration of NWFP plants was carried out with the assistance of tribal people engaged in the collection of NWFPs.

Vegetation structure and composition of NWFPs

NWFP species exploited from each study area were selected for detailed study in terms of their floristic composition and phytosociology. For this purpose, in the vegetation map (scale 1: 1,25,000) grids of 2 x 2 cm were taken. Thus, the 2 x 2 cm covered by one grid was 6.25 km2. On the basis of species-area curve developed by studying in such grids, the size of quadrat was fixed as 20 x 20 m in Wayanad, 15 x 15 m in Nilambur and 10 x 10 m in Attappady. Fifteen quadrats in Wayanad, ten quadrats each in Nilambur and Attappady were laid randomly. However, each quadrat was laid in the centre of the grid.

The vegetation data of NWFPs population were quantitatively analysed for abundance, density and frequency (Curtis and McIntosh, 1951). The importance value index (IVI) for the NWFP species was determined as the sum of the relative frequency, relative density and relative dominance following Phillips (1980).

The ratio of abundance to frequency was used to interpret the distribution pattern of the species. The ratio of abundance to frequency indicates regular distribution if it is below 0.025, random distribution if between 0.025 and 0.05 and contiguous distribution if more than 0.05 (Curtis and Cottam, 1956).

Species diversity of each study site was calculated using a formula given by Magurran (1988).

$$H' = - \Sigma p_i \ln p_i$$

Where pi is the proportional abundance of the i th species $= (n_i / N)$.

For comparing the diversity of the different study sites, t - test (Hutchenson, 1970) was employed.

$$t = \frac{H'_1 - H'_2}{(\text{Var } H'_1 + \text{Var } H'_2)^{1/2}}$$

where, H'_1 is the diversity of site 1 and Var H'_1 is its variance, H'_2 is the diversity of site 2 and Var H'_2 is its variance.

Similarities of any two given study sites in terms of number of NWFP plant species encountered in both sites were quantitatively measured using Sorenson's similarity index (Bray and Curtis, 1957).

$$C_N = \frac{2Nj}{(Na+Nb)}$$

where, C_N = Sorenson quantitative index, Nj = Number of species common to both sites, Na = Number of species found in site 1, Nb = Number of species found in site 2.

Regeneration capacity of the selected NWFP species

Capacity of the NWFP plant species to regenerate after harvest was estimated using Regeneration Index method. The study was restricted to 10 species (annuals and biennials). Plants of each species were harvested from the permanent quadrats at different density levels, 25, 50, 75, 85 and 95 percentages of total number of individuals of a given species. For each harvest intensity, three replicate quadrats were used. Number of new individuals of a given species regenerated was enumerated. Regeneration index was calculated from the mean of plants harvested in the previous season and the number of plants subsequently regenerated.

$$\text{Regeneration index} = \frac{\text{Number of plants regenerated}}{\text{Number of plants harvested}} \times 100$$

Maximum percentage of harvesting at which maximum value for regeneration index recorded was considered as the sustainable harvest rate of the given species.

The relationship between regeneration rate and harvest intensity was worked out for ten species. Scatter plots of regeneration rate with harvest intensity of each species indicated linearity and accordingly linear models were fitted to know the relationship between these variables. The model is of the following form.

$$Y = a + b X$$

Where Y = Regeneration rate
X = Harvest intensity
a and b are constants

An attempt was also made to compare regeneration rate with the actual collection rate. In order to ascertain the actual collection rate of NWFPs, a control experiment was carried out in the study area. In the experiment, a group of gatherers was asked to collect exploitable NWFPs from the selected plots (10 plots in Wayanad and 5 each in Attappady and Nilambur) as they generally do in other areas. Then the percentage of actual harvesting or collection was estimated.

Collection and preservation of NWFP specimens

Voucher specimens were collected from the study sites with the help of tribal medical practitioners and people engaged in the collection of NWFPs. The specimens were processed and identified with relevant literature and by comparing with authentic specimens. Fleshy tubers and fruits were preserved in Formaldehyde-Acetic Acid-Alcohol solution (FAA) or Formaldehyde. Woody specimens like dry fruit, seed, root etc., were oven-dried and stored in bottles. The specimens are deposited in the Institute.

Phenology and propagation of selected plants yielding NWFPs

To develop simple and cheap methods for raising planting stock in bulk, attempts were made to standardise propagation methods for selected medicinal plants. Seed as well as conventional vegetative propagation methods were tried depending on the nature of regeneration of species. Based on successful method, planting stock was prepared in bulk and enrichment planting in the study area was

carried out to assess the performance. Planting materials were also distributed to the interested organisations and individuals for growing in non-forest areas.

The phenological events for NWFP species in the selected plots were observed and recorded every month for a period of one year.

Propagation

Seed characteristics and germination response of six species were studied under laboratory conditions. The selected species, year and locality of seed collection are given in Table 2.1.

Table 2.1. The selected species, year and locality of seed collection

SPECIES	MALAYALAM NAME	YEAR	LOCALITY
Aegle marmelos	Koovalam	1995	Attappady
Asparagus racemosus	Sathavari	1996	Nilambur
Crotalaria pallida	Kilukkampetty	1996	Wayanad
Gymnema sylvestre	Chakkarakolli	1996	Nilambur
Rauvolfia serperitina	Sarppagandhi	1997	Wayanad
Stereospermum chelonoides	Poopathiri	1997	Wayanad

Number of seeds in a fruit and per kilogram was counted. Three replicates of samples were taken for all the estimations. The number of seeds per replication was taken based on seed size and availability. The seeds were oven-dried (100-104^{o} C, for 24 hours) to determine the moisture content. The difference between fresh and dry weights of seeds indicated the weight loss due to moisture.

For determining the viability, three replications of the seed samples were drawn at random and germination test was conducted. The seeds were sown in trays containing vermiculite or soil as medium and kept in a glass house. The number of seeds germinated were counted everyday till the germination ceased and percentage of germination was calculated. Seeds with seed coat dormancy were soaked in hot water before sowing.

Vegetative propagation

Vegetative propagation of selected species (Table 2.2) by shoot cuttings was tried. Cuttings of desired type were taken from the mother plants and brought immediately to the propagation site. While transporting the cuttings, care was taken to avoid desiccation.

Two rooting media, vermiculite (M/s. Dugar Vermiculites, Karnataka) and pure sand collected from the adjacent river were used for most of the experiments. Indole butyric acid (IBA) and naphthyl acetic acid (NAA), known for inducing root formation in a variety of plants, were used for induction of rooting in cuttings. Two methods of application for growth regulating substances (GRS) were used: (i) Quick dip in alcoholic solution: A concentrated stock solution was prepared by dissolving the weighed quantity of the GRS in 50 per cent ethyl alcohol. To prepare 100 ml of 5000 ppm solution, 500 mg of GRS was dissolved in 50 per cent alcohol and made up to 100 ml. The lower concentrations were prepared from the stock solution by diluting with 50 per cent ethyl alcohol. Treatment of cuttings was done by dipping approximately 1.5 cm of the basal end of the cutting for 30 seconds in the solution and (ii) Powder preparation: The required GRS was weighed and mixed thoroughly with talcum powder using a mixer (For preparing 1 g of 5000 ppm mixture 5 mg of the GRS was mixed with 995 mg of talcum powder). The basal end of the cutting was dipped in the powder and excess powder sticking at the base removed by tapping it gently.

The treated cuttings were planted in trays along rows after making a trench or hole in the rooting medium before insertion of cutting. The trays were placed in a mist chamber. Humidity was adjusted between 80 and 90 per cent using automatic timer control and the temperature was maintained between 30 and 37^{o} C.

A preliminary screening for rooting response was done using a combination of suitable rooting medium, growth regulator treatment and rooting environment. While rooting, percentage of rooting, number of roots per cutting, length of longest root, and rooting region were observed. Since the plants tried were of different habit, for root induction suitable experimental conditions were provided for each species. The selected species and the experimental conditions used for each species are given in Table 2.2.

Table 2.2. The selected species and the experimental conditions used for vegetative propagation by shoot cuttings

SPECIES	MALAYALAM NAME	TYPE OF CUTTINGS	GRS *(PPM)	SEASON	ROOTING MEDIA	REPLICATES**
Aegle marmelos	Koovalam	Medium size cuttings	NAA - 500, 1000, 1500, 2000,2500 and control	June - October 1996	Sand and Vermiculite	2 x 10
Aristolochia indica	Garudakodi	Tender cuttings	NAA - 500, 1000, 1500, 2000,2500 and control	July 1996	Vermiculite	2 x 10
Baliospermum montanum	Nagadandhi	Terminal tender cuttings	NAA - 2000 and control	May 1997	Vermiculite	3 x 10
Coscinium fenestratum	Maramanjal	Tender cuttings 2 - 2.5 cm	NAA - 1000, 2000 and control	Nov 1996	Vermiculite	2 x 10
		Mature cuttings 5 - 10cm			Vermiculite and sand	2 x 10
Desmodium velutinum	Orila	Tender cuttings	NAA - 1000, 2000 3000 and control	June 1997	Vermiculite	2 x 25
Gymnema sylvestre	Chakkarakolli	Axillary branches	NAA - 500, 1000, 1500, 2000,2500 and control	June & December 1996	Vermiculite and sand	3 x 25
Phyllanthus emblica	Nelli	Tender cuttings	NAA - 1000, 1500, 2000 and control	June 1996	Vermiculite	2 x 15
		Coppice cuttings	NAA - 1000, 2000 and control	1996	Vermiculite	2 x 15
Stereospermum chelonoides	Poopathiri	Tender cuttings	NAA - 1000, 2000, 3000 and control	June 1997	Vermiculite	2 x 25
Terminalia chebula	Kadukka	Terminal tender cuttings	IBA - 1000, 2000, 3000 and control	June 1997	Vermiculite	3 x 18

* Growth Regulating Substances; ** No. of blocks x No. of cuttings per block

Enrichment planting: Planting stock of *Gymnema sylvestre* raised from the propagation trials was used for field planting to asses their establishment. Planting was done in Wayanad, Nilambur and Attappady where twenty cuttings were planted in each selected plots. Forty five days old rooted cuttings were planted in September 1996 and observation on percentage of Survival was taken in July 1997.

Socio-economic aspects

The socio-economic aspects of the study covered collection, marketing and utilisation of NWFPs. The study, based on both primary and secondary data, was carried out among the three tribal groups in Wayanad, Nilambur and Attappady viz., Kattunaickan, Cholanaickan and Irulas respectively. Three tribal hamlets, one each from three study areas viz., Wayanad, Nilambur and Attappady were selected at random for the collection of primary data. The selected hamlets were located at Kumuzhi (Muthanga, Wayanad), Punchakolly (Nilambur) and Paloor (Attappady). The primary data were collected through a questionnaire survey, participatory rural appraisal (PRA) and interview. Secondary data were gathered from such sources as the Forest Department, Federation and tribal service co-operative societies.

3. RESULTS AND DISCUSSION

The analysis of the materials, using the methodology outlined above, yielded some interesting results on the botanical, phenological and propagation techniques and socio-economic aspects. These analytical results and discussions thereon constitute the core of the study and are presented in this section.

BOTANICAL ASPECTS

From the three study sites of Wayanad, Nilambur and Attappady, a total of 229 NWFP species were recorded (Table 3.1). Among these three sites, the most species-rich site is Wayanad (151 species). It is followed by Attappady (111 species) and Nilambur (91 species). However, only about 20 to 50 per cent of the NWFP species are being exploited for sale (37 species in Wayanad, 40 in Attappady and 43 in Nilambur).

About 22 to 25 items, mostly in the form of fruits, seeds, leaves, young shoots are traded through co-operative societies. Another 15 to 20 items, of which majority is bark of trees or whole plants, are sold to private traders. Several items are also used as food by the tribals (1 species in Wayanad, 9 each in Nilambur and Attappady), for medicine (18 species in Wayanad, 7 in Nilambur and 16 in Attappady), and for household articles and general use (10 species in Wayanad, 4 each in Nilambur and Attappady).

Table 3.1. NWFP species recorded from three study areas, their useful part, uses and distribution

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Abrus precatorius	Kunnikuru	Climber	Seed	M	P	A	A
Abutilon indicum	Oorakara	Shrub	Root	M	P	A	A
Acacia caesia	Incha	Climber	Stem	T	A	P	A
Acacia concinna	Cheevakkai	Climber	Fruit	T	A	P^1	P^1
Acampe praemorsa	Maravazha	Herb	Root	M	P^2	A	A
Acanthospermum hispidum	Njerinjil	Herb	Fruit	M	P	A	A
Achyranthes aspera	Kadaladi	Herb	Entire plant	M	P	A	A
Aerva lanata	Cherula	Herb	Root	M	P	A	A
Acronychia pedunculata	Muttanari	Tree	Root	M	P	A	P
Adhatoda zeylanica	Adalodakam	Shrub	Leaf and Root	M	P	A	A
Aegle marmelos	Koovalam	Tree	Fruit and Root	M	A	A	P
Ageratum conyzoides	Appa	Herb	Leaf	M	P	A	P
Alangium salvifolium	Ankolam	Tree	Leaf	M	A	P	A
Albizia lebbeck	Nemmenivaka	Tree	Bark	M	A	P	P
Alloyhylus cobbe	Mukkannanpezhu	Shrub	Root	M	A	A	P
Alstonia scholaris	Ezhilampala	Tree	Bark	M	A	P^2	A
Anamirta cocculus	Kollakkai	Climber	Seed	I	A	P^1	A

ote : P = Present
A = Absent
1 = Trade through Co-operative Societies
2 = Trade through private agencies
T = Toiletries
M = Medicinal
H = Household article
C = Cottage industries
I = Industrial raw material
F = Food
B = Pesticide
S = Spices

Table 3.1 Contd...

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Anogeissus latifolia	Kalkanjiram	Tree	Bark	M	P	A	A
Aristolochia indica	Garudakodi	Climber	Entire plant	M	P	A	A
Artemisia indica	Kattupacha	Shrub	Root and leaves	M	A	A	P
Artocarpus heterophyllus	Plavu	Tree	Fruit	F	A	P	
Artocarpus hirsuta	Aanjili	Tree	Bark	M	P	A	A
Asclepias curassavica	Parvathipoo	Herb	Entire plant	M	A	A	P
Asparagus racetnosus	Sathavari	Climber	Tuberous root	M/F	P^1	P^1	P^1
Atylosia goensis	Kattuzhunnu	Herb	Entire plant	M	P	A	A
Atylosia lineata	Kattuthuvara	Herb	Entire plant	M	A	A	P
Baliospermum montanum	Nagadandhi	Herb	Root	M	A	P^1	A
Bambusa bambos	Mula	Bamboo	Stem and young shoot	H/C/F	P	P	P
Bauhinia racemosa	Mandharam	Tree	Bark	M	P^2	P^2	P^2
Biophytum sensitivum	Mukkutty	Herb	Entire plant	M	P^2	P^2	P^2
Bischofia javanica	Cholavenga	Tree	Bark	M	P	A	P
Blainvillea rhomboidea	Murikutty	Herb	Leaf	M	P	P	P
Boerhaavia diffusa	Thazhuthama	Herb	Entire plant	M	A	P^2	P
Bombax ceiba	Mullilavu	Tree	Fruit	H/C	P	A	A

Table 3.1 Contd...

able 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Bridelia retusa	Mulluvenga	Tree	Seed	P	P[1]	A	A
Bridelia scandens	Kanjikottam	Scandent shrub	Bark	M	A	P	A
Butea monosperma	Plasu	Tree	Bark	M	P	P[2]	P
Calamus hookerianus	Chooral	Climber	Stem	H/C	A	A	P
Calamus thwaitesii	Chooral	Climber	Stem	H/C	A	P	P
Callicarpa tonientosa	Thaiteak	Shrub	Root	M	P	P	P
Calotropis gigantea	Erukku	Shrub	Leaf	M	A	A	A
Calycopterisfloribunda	Pullani	Climber	Stem	M	A	A	A
Canarium strictum	Pantham, Kunthirikkam	Tree	Resin	I	A	P[1]	A
Canscora diffusa	Jeerakapullu	Herb	Entire plant	M	A	P	A
Cassia fistula	Kanikonna	Tree	Bark	M	P[2]	P[2]	P[2]
Cassia tora	Thakara	Herb	Entire plant	M	P	P	P
Centella asiatica	Muthal	Herb	Entire plant	M	P	P	P
Chassalia ophioqloides	Amalpori	Shrub	Root	M	A	A	P
Chenopodium ambrosioides	Kattayamodakam	Herb	Root	M	A	A	P
Chromolaena odorata	Communistpacha	Shrub	Leaf	M	P	A	P

Table 3.1 Contd...

T'able 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Cinnamomum malabatrum	Karuva patta	Tree	Bark	S/M	A	P	A
Clematis gouriana	Nikidakodi	Climber	Entire plant	M	A	A	P
Clerodendrum serratum	Cheruteak	Shrub	Root	M	P[1]	P[1]	P[1]
Clerodendruin viscosum	Perumba	Shrub	Bark	M	A	A	P
Clitoria ternatea	Shangupushpam	Climber	Entire plant	M	P	A	A
Colebrookea oppositifolia	--	Shrub	Bark	M	A	P	A
Commelina benghalensis	Thavalapottil	Herb	Entire plant	M	P	A	A
Cordia wallichii	Virimaram	Tree	Barkandroot	M	P	P	A
Coscinium fenestratum	Maramanjal	Climber	Stemandroot	M	A	P1	A
Costus speciosus	Channakoova	Herb	Rhizome	M	P	A	P
Crotalaria pallida	Kilukkampetty	Herb	Root	M	P	A	P
Crotalaria retusa	Kilukiluppa	Herb	Entire plant	M	A	P	A
Cryptolepis buchananii	Vallippala	Climber	Latex	M	P	A	A
Curculigo orchioides	Nilappana	Herb	Rhizome	M	P2	P2	P2
Curcuma aroinatica	Kasthurimanjal	Herb	Rhizome	S/M	P[1]	A	A

Table 3.1 Contd...

Table 3.1 Contd..

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART(S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Cycles peltata	Padakizhangu	Climber	Root	F/M	P[1]	P[1]	P[1]
Cymbidium aloifolium	Maravazha	Epiphytic herb	Root	M	P	A	A
Dalbergia latifolia	Veeti	Tree	Bark	M	P	P	P
Dendrocalamus strictus	Kallanmula	Bamboo	Stem	H/C	P	P	P
Dendrophthoefalcata	Ithikanni	Parasitic shrub	Flowers and bark	M	A	P	A
Desmodium velutinum	Orila	Herb	Root	M	P	P[2]	A
Desmodium heterophyllum	Nilambaranda	Herb	Root	M	A	P	A
Desmodium motorium	Thozhukanni	Herb	Root and leaf	M	P	P	P
Desmodium pulchellum	Moovila	Herb	Root	M	P	A	A
Desmodium triflorum	Nilambaranda	Herb	Root	M	A	P	A
Desmodium triquetrum	Orila	Herb	Root	M	P	A	A
Desmodium velutinum	Orila	Herb	Root	M	P[1]	P[1]	P[1]
Dioscorea hispida	Nara	Climber	Tuber	F	A	A	P
Dioscorea oppositifolia	Noora	Climber	Tuber	F	P	P	A
Dioscorea spicata	Chaval	Climber	Tuber	F	P	A	A
Diploclisia glaucescens	Vattoli	Climber	Root	M	P	A	A
Dalichos trilobus	Kattupayar	Climber	Fruit	F	A	A	P

Table 3.1 Contd...

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Eclipta alba	Kanjunni	Herb	Entire plant	M	P	A	A
Elephantopus scaber	Aanachuvadi	Herb	Root	M	P^2	P^2	A
Emilia sonchifolia	Muyalcheviyan	Herb	Entire plant	M	P	A	P
Entada rheedii	**Kakkumkai**	Climber	Seed	M	P	P	A
Eucalyptus grandis	Eucaly	Tree	Leaf	M	P	A	A
Euphorbia hirta	Nilappala	Herb	Entire plant	M	P	A	P
Evolvulus alsinoides	Vishnukranthi	Herb	Entire plant	M	A	P	A
Exacurn bicolor	Poochedi	Herb	Entire plant	M	P	P	A
Ficus beddornei	Kallal	Tree	Bark	M	A	A	P
Ficus benghalensis	Peral	Tree	Bark	M	A	A	P^2
Ficus racemosa	Athi	Tree	Bark	M	A	A	P^2
Flerningia rnacrophylla	Korakattachedi	Herb	Root	M	A	P	A
Flemingia sernialata	--	Herb	Root	M	P	A	A
Garcinia morella	Kattupuli	Tree	Bark and fruit	M	A	P	A
Globba ophioglossa	Kattinchi	Herb	Rhizome	F/M	P	A	A
Gloriosa superba	Menthonni	Herb	Tuber	M	P	A	P
Glycosrnispentaphylla	Panalam	Shrub	Bark	M	P^2	P^2	P^2
Grnelina arborea	Kumizhu	Tree	Root	M	P	A	P^2
Grewia abutilifolia	Cheruchadachi	Shrub	Bark	M	P	A	A

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART(S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Grewia tiliifolia	Chadachi	Tree	Bark	M	P	A	P
Gymnema sylvestre	Chakkarakolli	Climber	Leaf	M	A	A	P
Habenaria sp.	--	Herb	Tuber	M	P	A	A
Helicteres isora	Edampiri-Valampiri	Shrub	Fruit	M	P[1]	P[1]	P[1]
Hemidesmus indicus	Nannari	Climber	Root	F/M	P[1]	P[1]	P[1]
Heteropogon contortus	Kathipullu	Herb	Entire plant	M	P	A	A
Holarrhena pubescens	Kudakapala	Shrub	Bark	M	P	P	A
Holigarna arnottiana	Cheru	Tree	Root	M	P	A	A
Holostemma ada-kodien	Adapathiyan	Climber	Root	M	P	A	A
Hydnocarpus pentandra	Marotty	Tree	Seed	M/I	P[1]	A	A
Hydrocotyle javanica	--	Herb	Whole plant	M	P	A	A
Hygrophila auriculata	Vayalchulli	Herb	Root	M	P	A	A
Hyptis suaveolens	Mukkattachedi	Shrub	Root	M	A	A	P
Ichnocarpus frutescens	Palvalli	Climber	Root	M	P	A	P
Impatiens chinensis	Kashuthumba	Herb	Entire plant	M	A	P	A
Impatiens sp.	Kashuthumba	Herb	Entire plant	M	P	A	A

Table 3.1 Contd...

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Imperata cylindrica	Kathipullu	Herb	Entire plant	M	P	P	P
Indigofera cassioides	Manali	Shrub	Leaf and flowers	M	P	A	P
Ipomoea pes-tigridis	Pulichuvadi	Herb	Root	M	P	A	P
Jasminum sp.	Kattumulla	Shrub	Root	M	P	A	A
Justicia betonica	Odichukutthi	Shrub	Leaf	M	A	A	P
Justicia simplex	Odichukutthi	Herb	Leaf	M	P	A	A
Kingiodendron pinnatum	Kulavu	Tree	Root and bark	M/I	A	P	A
Kydia calycina	Vellachadachi	Tree	Bark	H	P	P	P
Lagenandra toxicaria	Neerchengazhi	Herb	Root	M	P	A	A
Lagerstroemia parviflora	Manimaram	Tree	Bark	M	P	A	P
Lannea coromandelica	Kalash	Tree	Bark	M	A	A	P
Lantana camara	Aripoo	Shrub	Leaf and root	M	P	P	P
Leea wightii	Njellu	Shrub	Root	M	P	A	A
Leucas aspera	Thumba	Herb	Entire plant	M	A	P	P
Leucas hirta	Thumba	Herb	Entire plant	M	P	A	A
Lobelia nicotianiifolia	Kattupukayila	Herb	Leaf and young flower	M	P	A	A

Table 3.1 Contd...

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Macaranga peltata	Vatta	Tree	Leaf	C	P2	P'	
Malaxis rheedii	Jeevakam	Herb	Entire plant	M	P	**A**	A
Mallotus philippensis	Chenkolli	Tree	Bark and fruit	M	A	P	**A**
Mangifera indica	Mavu	Tree	Fruit	F	P	**A**	P
Mimosa pudica	Thottavadi	Herb	Entire plant	M	P	P	P
Mitragyna parvifolia	Neerkadambu	Tree	Root	M	P	**A**	A
Momordica charantia	Kattupavakkai	Climber	Fruit	F/M	A	P2	**A**
Monochoria vaginalis	Neerambal	Herb	Leaf	M	P	A	A
Mucuna gruriens	Kattupayar	Climber	Seed	M	A	A	P
Murraya paniculata	Kattuvepu	Tree	Bark	M	P	A	P
Mussaenda laxa	Vellilam	Shrub	Leaf	M	P	**A**	**A**
Myristica dactyloides	Pathiripoo	Tree	Aril, seed and fruit	**S/M**	**A**	A	P
Myristica malabarica	Ponnampoovu	Tree	Aril, seed and fruit	S/M	**A**	P	A
Myxopyrum smilacifolium	Chaduramulla	Climber	Bark	M	**A**	P	A
Naregamia alata	Nilanarakam	Herb	Whole plant	M	P	A	A
Naringi crenulata	Narinarakam	Tree	Bark	M	P	**A**	A

Table 3.1 Contd...

'able 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART(S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Nervilia aragoana	Orilathamara	Herb	Root tuber	M	P	**A**	**A**
Ochlandra travancorica	Eetta	Reed bamboo	Stem	H/C	**A**	P	P
Olea dioica	Edana	Tree	Bark	M	P	A	A
Oroxylum indicum	Palakapayyani	Tree	Bark and root	M	A	P	A
Orthosiphon aristatus	Poochameesha	Herb	Root	M	A	A	P
Memecylon umbellatum	Kashavu	Shrub	Root and flower	M	P	A	A
Osbeckia aspera	Kalampetty	Herb	Root	M	A	A	P
Oxalis corniculata	Puliyaral	Herb	Entire plant	M	P	A	P
Pandanus tectorius	Kaitha	Shrub	Leaf	H/C	P	A	A
Parmelia dilatata (lichen)	Kalpasham	Epiphyte	Entire plant	S	P[1]	A	A
Pavetta indica	Manjapavatta	Shrub	Bark	M	P	A	A
Persea macrantha	Kularmavu	Tree	Bark	M	P [2]	P [2]	A
Phyllanthus emblica	Nelli	Tree	Fruit and bark	F/M	P1	P1	
Pimpinella heyneana	Kattumalli	Herb	Seed	M	A	P	P
Piper argyrophyllum	Kattukurumulaku	Climber	Stem, fruit and root	S/M	P1	A	A
Piper longum	Thippali	Climber	Stem, fruit and root	S/M	P1	P1	P[1]

Table 3.1 Contd...

'able 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Piper spp.	Kattukurumulaku	Climber	Stem, fruit and root	S/M	P^1	P^1	P^1
Plumbago zeylanica	Koduveli	Herb	Root	M	A	P^2	P^2
Polygala arvensis	Kodashari	Herb	Root	M	P	A	A
Pongamia pinnata	Ungu	Tree	Bark and seed	M	A	P	A
Pothos scandens	Paruvakodi	Climber	Entire plant	M	A	P	A
Pseudarthria viscida	Moovila	Herb	Root	M	P^1	P^1	P^1
Pterocarpus marsupium	Venga	Tree	Bark	M	A	A	P
Radermachera xylocarpa	Vedemkorana	Tree	Fruit and bark	M	P	A	P
Rauvolfia serpentina	Sarppagandhi	Herb	Root	M	P^1	P^1	P^1
Remusatia vivipara	Marachembu	Herb	Root	M	P	A	A
Rhynchosia rufescens	Moovila	Climber	Root	M	P^1	A	A
Ricinus communis	Avanakku	Shrub	Seed and root	M	P^1	A	P^1
Rubia cordifolia	Manjatti	Herb	Root	M	P	A	P^2
Ruta graveolens	Arutha	Herb	Leaf	M	P	A	A

Table 3.1 Contd...

Table 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Sapindus laurifolius	Ulurinjikkai	Tree	Fruit	M/T	A	P1	P1
Schleichera oleosa	Poovam	Tree	Bark and seed	M	P	A	P
Sconaria dulcis	Kallurukki	Herb	Entire plant	M	P	A	**A**
Semecarpus anacardium	Alakkucheru	Tree	Fruit	M	**A**	P	**A**
Sida acuta	Kurinthotty	Herb	Root	M	P	A	A
Sida cordifolia	Kurinthotty	Herb	Root	M	P	A	A
Sida rhombifolia	Kurinthotty	Herb	Root	M	P1	P1	P1
Sigesbeckia orientalis	Ottadachedi	Herb	Root	M	A	A	P
Smilax zeylanica	Valiyaksnni	Climber	Root	M	A	P	A
Solanum indicum	Chunda	Shrub	Root	M	P[1]	P1	P1
Spilanthes acmella	Vedhanachedi	Herb	Flower	M	P	P	P
Spondias pinnata	Ambazham	Tree	Fruit and bark	M/F	A	A	P
Stachytarpheta indica	Kadapananthu	Shrub	Leaf	M	A	A	P
Sterculia guttata	Kavalam	Tree	Bark	M	P	**A**	A
Sterculia villosa	Vadam	Tree	Bark	H	P	A	**P**
Stereospermum chelonoides	Poopathiri	Tree	Flower and bark	M	A	A	P2

table 3.1 Contd.

Table 3.1 Contd…

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Stereospermurn colais	Poopathiri	Tree	Flower and bark	M	P	P^2	A
Strobilanthes ciliatus	Karinkurinii	Shrub	Root	M	P^1	A	A
Strobilanthes sp.	Karinkurinji	Shrub	Root	M	P	A	P
Strychnos nux-vomica	Kanjiram			I	P^1	P^1	P^1
Symplocos cochinchinensis	Pachotti			M	A	A	P
Syzygium cumini	Njaval			M	P^2	P^2	P^2
Tamarindus iridica	Puli	Tree	Fruit	F/M	A	A	P^1
Tectona grandis	Teak	Tree	Young shoot	M	P	P^2	P^2
Teuhrosia purpurea	Kozhijal			M	P	A	P
Terminalia bellirica	Thani	Tree	Fruit	M	P^1	A	P^1
Terminalia chebula	Kadukka	Tree	Fruit	M	P^1	A	A
Terminalia crenulata	Karimaruthu	Tree	Bark	M	P	P	A
Terminalia paniculata	Maruthu	Tree	Bark	M	A	P	P
Thespesia lampas	Kattuparathy	Shrub	Bark	M	P	A	P
Tinosporn cordifolia	Amrithu	Climber	Entire plant	M	P	A	A
Tribulus terrestris	Njerinjil	Herb	Fruit	M	A	A	P^1
Trichosanthes cucumerina	Kattupadavalam	Climber	Entire plant	M	P^1	A	A

Table 3.1 Contd…

able 3.1 Contd...

BOTANICAL NAME	MALAYALAM NAME	HABIT	USEFUL PART (S)	USES	NAME OF THE STUDY AREAS		
					Wayanad	Nilambur	Attappady
Triumfetta rhomboidea	Oorothumkkai	Herb	Root	M	**A**	A	P
Uraria hamosa	Moovila	Herb	Root	M	P	P	P
Urena lobata	Uthiram	Herb	Root	M	P	**A**	**A**
Uvaria narum	Karivalli	Climber	Young stem and root	M	P	A	A
Vateria indica	Kunthirikkam	Tree	Resin	I	P[1]	P[1]	P[1]
Vernonia cinerea	Poovamkurinila	Herb	Entire plant	M	P	A	P
Vigna trilobata	Kattupayar	Herb	Fruit	M	A	A	P
Viola betonicifolia		Herb	Entire plant	M	P	A	A
Viscum orientale	Ithikanni	Parasitic herb	Stem and bark	M	P	A	A
Wedelia chinensis	Manjakurinji	Herb	Root	M	**A**	P	**A**
Wrightia tinctoria	Dandhapala	Tree	Leaf	M	**A**	P2	**A**
Xylia xylocarpa	Irul	Tree	Seed and bark	M	P	**A**	**A**
Zanthoxylum rhetsa	Mullilam	Tree	Bark and seed	B	P	**A**	**A**
Ziziphus mauritiana	Elanthatta	Tree	Fruit	M	P	**A**	P
Ziziphus rugosa	Kotta	Climber	Root	M	P	**A**	**A**

The diversity of NWFP species ranged from 3.434 to 3.914 while the species dominance from 0.033 to 0.052 (Table 3.2). The species diversity value was comparatively higher in the Wayanad site than in the Nilambur site where opposite trend was recorded for species dominance value.

Table 3.2. Density (number of individuals ha^{-1}), species diversity and dominance of NWFP species in three study areas

PARAMETERS	LOCATION		
	Wayanad	Nilambur	Attappady
Density of the tree species	9.731	10.700	9.800
Density of the non-tree species	239.895	342.900	241.600
Species diversity (Shannon diversity index H')	3.914	3.434	3.883
Species dominance (Simpsons index 1- D)	0.033	0.052	0.035

The Sorenson's similarity index was calculated to determine the similarity between pairs of study sites. The value was found higher in the case of Wayanad and Attappady (0.4122) followed by Nilambur and Attappady (0.3960) and Wayanad-Nilambur (0.3140). Similarly, the Hutchenson's t-test to determine the similarity between pairs of study sites in terms of species diversity was calculated. The value was higher for the pair - Wayanad and Nilambur sites (19.9204) followed by Nilambur and Attappady sites (14.9104) and Wayanad-Attappady sites (1.2583).

The distribution pattern and phytosociological characteristics of commercially important NWFP species were studied in all three sites. *Sterculia villosa* the principal NWFP species in Wayanad exhibited the highest mean IVI (33.75). *Strobilanthes ciliatus* (IVI=25.93), *Phyllanthus emblica* (IVI= 18.38) and *Sida rhombifolia* (IVI= 17.52) were the common associates (Table 3.3). The basal area was 3.59 m^2 ha^{-1} of which 2.89 m^2 ha^{-1} was contributed by tree community while the rest was by understorey plants. Tree community contributed about 34.5 per cent to the total IVI of NWFP species.

In Nilambur, *Vateria indica* with a mean IVI value of 26.23 was co-dominated with *Stereospermum colais* (IVI = 22.56) and *Curculigo*

orchioides (IVI=22.41). Here the total basal area of NWFP species was 12.38 $m2\ ha^{-1}$ where 9.99 $m^2\ ha^{-1}$ was contributed by the NWFP tree species (Table 3.4). Tree species shared about 33.5 per cent of the total IVI of NWFP species.

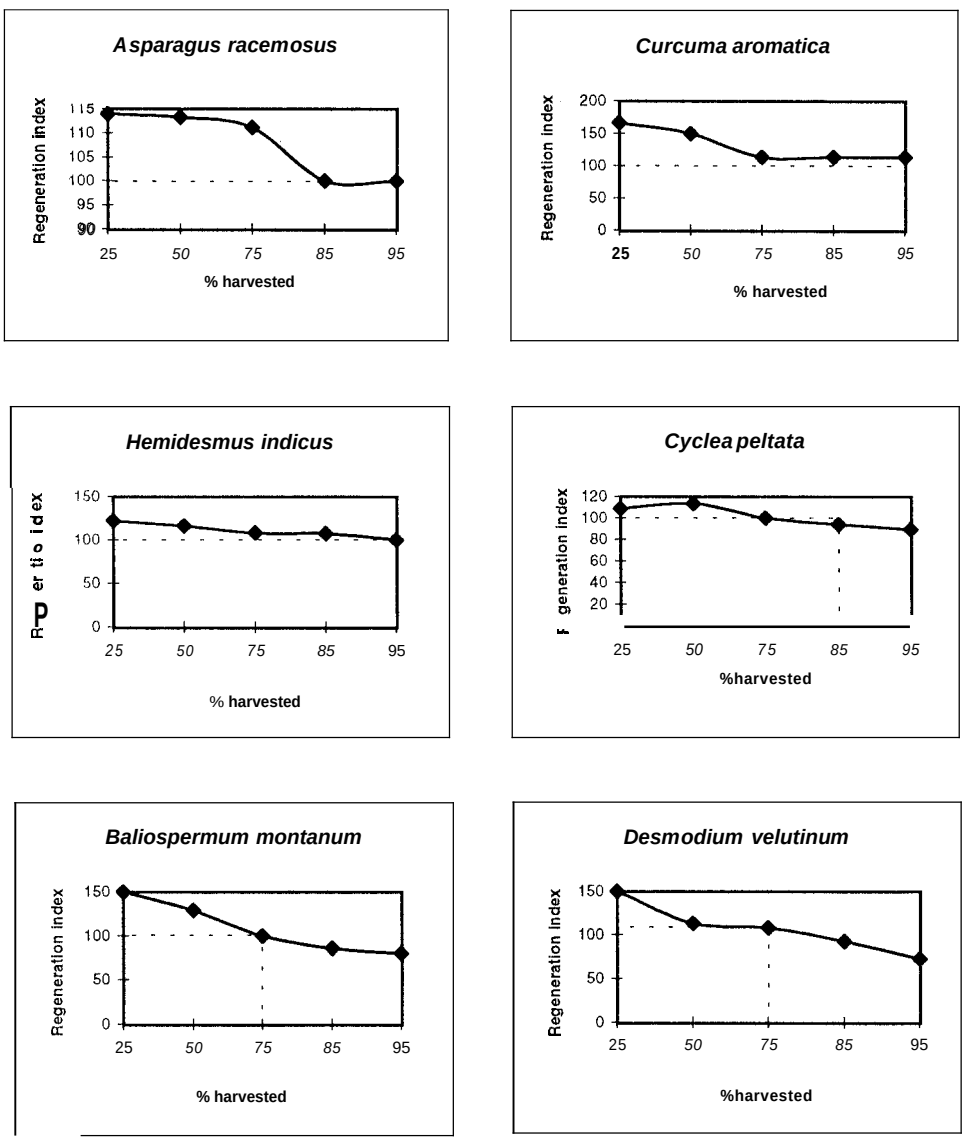
In Attappady, *Terminalia bellirica* (IVI=48.12), *Sida rhombifolia* (29.74) and *Curculigo orchioides* (17.90) were the dominant NWFP species (Table 3.5). Total basal area of NWFP species was 29.25 $m^2\ ha^{-1}$ of which 24.5 $m2ha^{-1}$ was by tree species. About 33.3 per cent of total IVI of NWFP species was shared by tree species.

Different distribution patterns of NWFP species were recorded in each study site. Contiguous distribution of about 79 and 97 per cent was seen in Wayanad and Attappady respectively (Table 3.3 and 3.5). However, only 68 per cent of species showed such distribution in Nilambur (Table 3.4). In Nilambur, of the remaining species, about 7 per cent showed regular distribution while about 25 per cent showed random distribution. In the case of Wayanad and Attappady, none of the species showed regular distribution.

In case of *Asparagus racemosus*, *Curcuma aromatica* and *Hemidesmus indicus*, regeneration rate was more than 100 per cent even when 95 per cent of plants were harvested. However, in the case of *Desmodium velutinum*, *Baliospermum montanum*, *Sida rhombifolia*, *Cyclea peltata* and *Pseudarthria viscidu*, the rate of regeneration was 100 per cent when only 75 per cent of the plants were harvested. *Rauvolfia serpentina* and *Strobilanthes ciliatus* showed poor regeneration, if harvest was between 30 and 50 per cent (Figure 3.1).

Figure 3.1

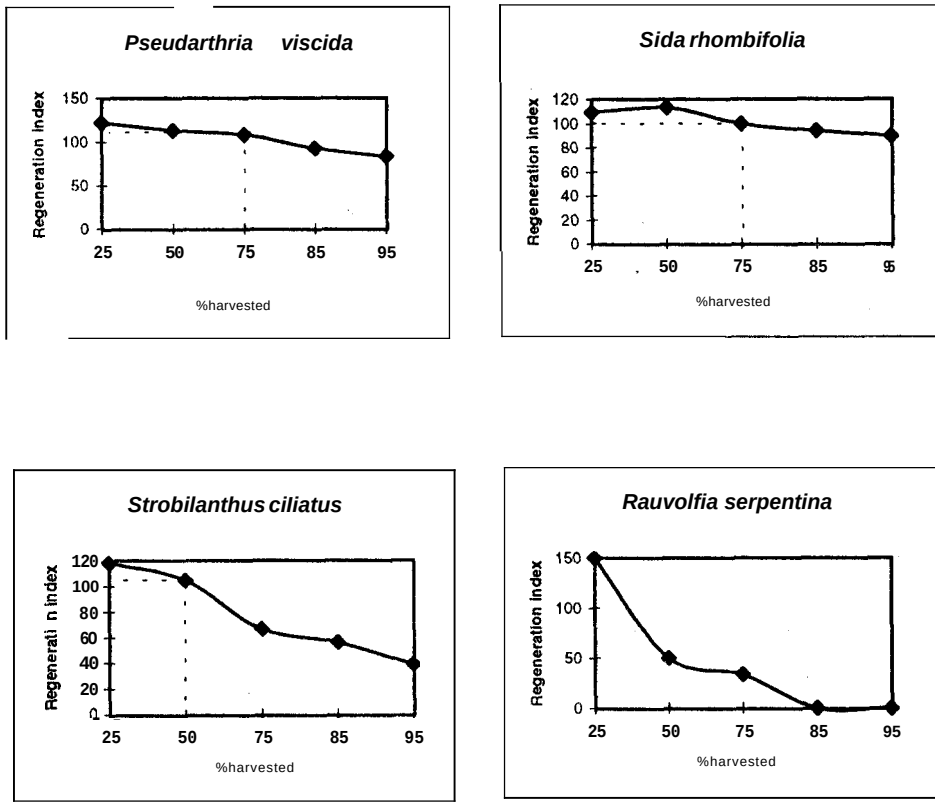
Regeneration index at different intensity of harvest of selected NWFP species in Kerala



Point at which broken line drawn from X and Y axis meet represents the sustainable harvest rate of a given species

Figure 3.1

Regeneration index at different intensity of harvest of selected NWFP species in Kerala



Point at which broken line drawn from X and Y axis meet represents the sustainable harvest ratc of a given species

Table 3.3. Density (individual ha^{-1}), basal area (cm^2/ha), percentage frequency, A/F ratio and importance value index of commercially important NWFP species in Wayanad

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA (cm^2 ha^{-1})	% FREQUENCY	A/F RATIO	IVI
Sterculia villosa	Tree	3.320	11465.309	13.33	0.126	33.7450
Phyllanthus emblica	Tree	29.050	3399.795	63.33	0.029	18.3810
Vateria indica	Tree	2.490	4601.872	10.00	0.126	14.1678
Terminalia bellirica	Tree	1.660	3538.373	6.67	0.126	10.7563
Persea macrantha	Tree	1.660	2338.069	6.67	0.150	7.4104
Cassiafistula	Tree	5.8 10	618.946	20.00	0.058	4.4303
Stereospermum colais	Tree	2.490	1090.443	10.00	0.126	4.37%
Bauhinia racemosa	Ttee	2.490	953.162	10.00	0.100	3.9970
Terminalia chebula	Tree	4.150	279.831	16.67	0.126	3.0120
Cinnamomum malabatrum	Tree	3.320	356.382	10.00	0.133	2.3594
Hydnocarpus pentandra	Tree	1.000	161.842	3.33	0.300	0.8971
Strobilanthes ciliatus	Shrub	527.050	1802.043	33.33	1.126	25.9312
Helicteres isora	Shrub	87.980	1351.725	53.33	0.124	13.2800
Coffea arabica	Shrub	14.110	980.809	16.67	0.204	5.2810
Solanum indicum	Shrub	38.180	31.315	20.00	0.126	3.8183

Table 3. 3 Contd...

Table 3. 3 Contd...

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA ($cm^2\ ha^{-1}$)	% FREQUENCY	A/F RATIO	IVI
Clerodendruni serratum	Shrub	16.600	19.945	10.00	0.667	1.7376
Sida rhombifolia	Herb	332.000	99.133	53.33	0.126	17.5233
Curculigo orchioides	Herb	361.880	87.508	43.33	0.774	17.1769
Desmodium velutinum	Herb	134.460	76.049	50.00	0.333	13.0910
Biophytum sensitivum	Herb	249.830	185.919	36.67	0.746	13.0593
Elephantopus scaber	Herb	224.930	82.555	33.33	0.813	11.5621
Pseiidarthria viscida	Herb	192.560	60.690	33.33	0.696	10.4752
Curcuma aromatica	Herb	93.790	813.672	20.00	0.942	7.7621
Desmodium motorium	Herb	58.930	12.100	20.00	0.592	4.4227
Rauvolfia serpentina	Herb	27.390	35.483	23.33	0.126	3.9079
Rhynchosia rufescens	Climber	224.930	75.503	40.00	0.126	12.3825
Cyclea peltata	Climber	100.430	1.892	53.33	0.142	9.9113
Hemidesmus indicus	Climber	149.400	7.620	23.33	1.102	7.6982
Asnaragus racemosus	Climber	115.370	1.557	30.00	0.515	7.4406
Piper *sps.*	Climber	48.140	21.689	23.33	0.355	4.5275
Dendrocnlamus strictus	Bamboo	28.220	1202.280	6.67	2.549	5.0864

Table 3.4. Density (individual ha^{-1}), basal area (cm^2/ha),percentage frequency, A/F ratio and importance value index of commercially important NWFP species in Nilambur

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA (cm^2 ha^{-1})	% FREQUENCY	A/F RATIO	IVI
Bauhinia racemosa	Tree	13.320	1336.192	30	0.033	3.0125
Phyllanthus emblica	Tree	39.960	4599.644	40	0.056	6.4841
Sapindus laurifolius	Tree	48.840	3337.778	50	0.020	5.9176
Sterculia villosa	Tree	4.440	9550.345	20	0.075	9.0429
Stereospermum colais	Tree	13.320	26325.233	20	0.050	22.5566
Strychnos nux-vomica	Tree	13.320	20530.558	30	0.033	18.5200
Vateria indica	Tree	22.200	29225.092	40	0.031	26.2264
Wrightia tinctoria	Tree	48.840	4925.775	70	0.022	8.6426
Glycosmis pentaphylla	Shrub	128.760	396.674	60	0.081	5.0655
Helicteres isora	Shrub	182.040	4288.831	80	0.064	9.8810
Baliospermum montanum	Herb	896.880	1597.259	80	0.315	13.8635
Biophytum sensitivum	Herb	1127.760	69.372	100	0.254	15.8290
Clerodendrum serratum	Herb	79.920	136.193	40	0.113	3.2220
Curculigo orchioides	Herb	1855.920	449.731	100	0.418	22.4083

Table 3.4 Contd...

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA (cm^2ha^{-1})	% FREQUENCY	A/F RATIO	IVI
Cyclea peltata	Herb	519.480	25.428	100	0.117	10.5545
Desmodiuin velutinum	Herb	630.480	204.645	70	0.290	9.8373
Pseudarthria viscida	Herb	634.920	213.626	80	0.223	10.4886
Rauvolfia serpentina	Herb	128.760	134.277	50	0.116	4.2475
Sida rhombifolia	Herb	1354.200	379.923	100	0.358	19.7899
Uraria hamosa	Herb	275.280	401.121	90	0.077	8.1491
Acacia concinna	Climber	48.840	1165.560	50	0.044	4.3927
Anamirta cocculus	Climber	17.760	444.465	30	0.044	3.1380
Asparagus racemosus	Climber	177.600	14.835	40	0.250	3.9660
Calamus thwaitesii	Climber	35.520	442.960	30	0.088	2.4818
Hemidesmus indicus	Climber	959 040	49.233	80	0.338	13.1478
Piper longum	Climber	1798.200	825.697	80	0.633	21.0031
Piper sps	Climber	168.720	21.308	50	0.048	3.5062
Bambusa bambos	Bamboo	319.680	11683.401	40	0.450	14.6162

Table 3.5. Density (individual ha^{-1}), basal area (cm^2/ha), percentage frequency, A/F ratio and importance value index of commercially important NWFP species in Attappady

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA ($cm^2\ ha^{-1}$)	% FREQUENCY	A/F RATIO	IVI
Bauhinia racemosa	Tree	40.000	18224.928	30	0.044	8.8277
Cinnamomum malabatrum	Tree	130.000	9340.375	40	0.081	7.2128
Phyllanthus emblica	Tree	80.000	12087.956	50	0.032	8.5590
Tamarindus indica	Tree	20.000	42032.683	20	0.050	16.0508
Terminalia bellirica	Tree	20.000	135846.525	20	0.050	48.1186
Vateria indica	Tree	20.000	27413.965	20	0.050	11.0537
Clerodendrumserratum	Shrub	240.000	480.337	50	0.096	5.7522
Glycosmis pentaphylla	Shrub	90.000	318.845	30	0.100	3.0700
Helicteres isora	Shrub	290.000	7194.886	60	0.081	9.1784
Strobilanthes Sps.	Shrub	490.000	535.504	50	0.276	9.1090
Ochlandra travancorica	Reed bamboo	410.000	3415.448	30	0.456	6.4505
Curculigo orchioides	Herb	1810.000	444.749	60	0.503	17.9020
Desmodium motorium	Herb	250.000	73.093	40	0.156	4.9160
Desmodium velutinum	Herb	1300.000	492.101	80	0.203	15.7562

Table 3. 5 Contd.,.

Table 3. 5 Contd...

BOTANICAL NAME	HABIT	DENSITY (ha^{-1})	BASAL AREA (cm^2ha^{-1})	% FREQUENCY	A/F RATIO	I V I
Plumbago zeylanica	Herb	120.000	127.452	30	0.133	3.2226
Pseudarthria viscida	Herb	780.000	256.346	60	0.217	10.3626
Rauvolfia serpentina	Herb	100.000	125.700	30	0.111	3.0770
Rubia cordifolia	Herb	210.000	3.736	40	0.131	4.6023
Sida rhombifolia	Herb	3000.000	801.104	100	0.300	29.7368
Solanum indicum	Herb	310.000	505.244	40	0.194	5.4997
Acacia concinna	Climber	30.000	1247.422	30	0.033	2.9524
Asparagus racemosus	Climber	1040.000	74.442	80	0.163	13.7264
Calamus hookerianus	Climber	90.000	835.768	30	0.100	3.2467
Calamus thwaitesii	Climber	50.000	262.390	20	0.125	1.9907
Cyclea peltata	Climber	660.000	19.504	80	0.103	10.9507
Hemidesmus indicus	Climber	870.000	30.261	80	0.136	12.4773
Piper sps.	Climber	330.000	174.799	50	0.132	6.3008
Bambusa bambos	Bamboo	610.000	21078.245	30	0.678	13.9400
Dendrocalamus strictus	Bamboo	680.000	9104.553	20	0.425	5.8842

Kerala has 22 per cent of the angiosperm species reported in India (i.e. 3800 species out of 17,000 species) (Nayar, 1997). The exact number of species that are used for different purposes is not documented in India. However, according to CSIR (1986), as a whole, every third species has some use. Therefore, it is possible to estimate that in Kerala about 1000 flowering plant species are utilised. The distribution and the uses of these species vary enormously depending upon the ecological and socio-economic conditions. For example, NWFP species recorded in the present study areas are the components of moist forest. It may be pointed out here that the number of NWFP plant species in the study areas (229 species) is comparable to that recorded from the north-western Ghats of India (Godbole, 1996: 219 species). However, as in the case of north- western Ghat region and in Biligiri Rangan Hills in Karnataka (Godbole, 1996; Murali *et. al.,* 1996), here also only a few species (20% to 50% of NWFP species) are being exploited on a commercial scale. Exploitation of only a few selected species can be attributed primarily to the fact that, in general, they are the common species in the community. Since the opportunity cost for common species is less than those for uncommon species (Godoy and Bawa, 1993), one can expect intensive harvest of latter group of species. However, the opportunity cost is also dependent upon the market price of the product gathered. Therefore, the number of species traded declines. As a result, in the study areas, only 42 NWFP species are commercially being exploited. Furthermore, often density (number of individuals per unit area) and the frequency of distribution of given species are also limiting factors for their extraction and marketing. For example, in the present study area species such as *Adhatoda zeylanica, Aegle mannelos, Eclipta alba, Holostemma ada-kodien* and *Malaxis rheedii* were recorded. However, at present, they are not being extracted commercially. The poor density and distribution of these species may be a result of the existing environmental condition in the site or their over-exploitation in the past.

Differences in the density and frequency distribution of NWFPs in a given location may also lead to diverse range of ways in which the people exploit the vegetation. In the study areas, commercially important species are mostly traded and other NWFP species are partly marketed and partly used by the local people as food, medicine, household articles and for general uses.

The surge of interest in NWFP is based on assumptions like – (a) commercial exploitation of NWFPs is less ecologically destructive than timber harvesting and (b) local communities (and particularly tribal) exploit forest resources

wisely and sustainably. However, this study provides enough evidence to challenge these assumptions. For example, repeated and unscientific method of removal of bark of NWFP trees to sell the products illegally to private traders can gradually eliminate such species from the forest.

Phytosociological studies on NWFP species demonstrated the existence of difference among three study sites in terms of species diversity, species composition and species distribution pattern. As shown by the similarity coefficients calculated on the basis of species number, Wayanad and Nilambur areas do not show much similarities in terms of species composition. A marked variation in the environment (see profile of the study areas), general vegetation type and the level of management of the area can be attributed to such differences. Wayanad has a large population of NWFPs and also a high species diversity value. This could be partially attributed to the occurrence of both deciduous and evergreen species in response to the prevailing favourable microclimatic conditions. According to Whittaker (1956), the dominance of one stratum may affect the diversity of another stratum. Present study shows that although, the contribution of NWFP tree species to the total IVI of the community is almost the same in all the three areas (33.3 to 34.5%), the number of understorey species has varied greatly. Therefore, the dominance of upper stratum may not necessarily reduce the number of understorey species. Furthermore, Whittaker (1965) also observed an inverse relationship between tree and understorey cover in forests. In the present study, increase in the basal area of tree community (Wayanad: 2.89 m^2 ha^{-1}; Nilambur: 9.99 m^2 ha^{-1}; Attappady : 24.49 m^2 ha^{-1}) did not reduce the basal area of understorey plant community (Wayanad:0.70 $m^2 ha^{-1}$; Nilambur: 2. 69 m^2 ha^{-1}; Attappady:4.76 m^2 ha^{-1}). Therefore, it is apparent from the present study that an inverse relationship between two life forms has not yet occurred and may occur only after attaining a certain limit. Thus, the promotion of cultivation of NWFP tree species in such areas can lead to an increase in the cover of NWFP species without reducing the availability of understorey NWFP species.

The distribution pattern of NWFPs in the study area indicated that 68 to 97 per cent species are contiguously distributed. Apart from over-exploitation of the resources, this kind of contiguous distribution pattern of NWFPs calls for the sustainable methods of resource utilisation. For sustainable resource use, one needs to consider the replenishment (regeneration) rate of resources (Peters, 1996). The present study demonstrated that in the case of plants propagated vegetatively, the regeneration index is between 100 and 33 at the

harvest rate of 95 per cent *(Asparagus racemosus, Curcuma aromatica and Hemidesmus indicus)*. On the other hand, for the species which depend mainly on seed production for regeneration *(Rauvolfia serpentina* and *Strobilanthes ciliatus)*, the regeneration index is between 104 and 150 when the rate of harvest is as low as 52.38 to 37.5 per cent. A study conducted in Biligiri Rangan Hills (Murali and Hegde, 1996) also indicated that 50 per cent harvest is the sustainable way to use *Phyllanthus emblica* as this species also regenerates mainly through seeds. It may be mentioned here that in present study area, out of 42 commercially important NWFP species 23 regenerate through seeds, 17 by both vegetative method and seeds and 2 by vegetative method. Therefore, for the sustainable harvest of a given NWFP species, apart from its density, distribution pattern, commercial value and opportunity costs, its regeneration potential at different levels of harvest should also be considered.

PHENOLOGY AND PROPAGATION OF SELECTED NWFPS PLANTS

Phenology

The phenology of different species found in Attappady, Nilambur and Wayanad is given in the Table 3.6.

Table 3.6. Flowering, fruiting and collection period of NWFPs in Wayanad, Nilambur and Attappady

NAME OF SPECIES	MALAYALAM NAME	LOCALITY	PERIOD OF FLOWERING	PERIOD OF FRUITING	NWFP COLLECTION
Acacia concinna	Cheevakkai	Nilambur	Sep-Mar	Nov-Mar	Jan- Mar
Adhatoda zeylanica	Adalodakam	Wayanad	Oct-Feb	NR	Jun-Oct
Albizia lebbeck	Nenmeni vaka	Nilambur	Feb-Apr	Apr - July	NC
Allophylus cobbe	Mukkannan	Attappady	Aug-Dec	Sep-Dec	NC
Anamirta cocculus	Kollakai	Nilambur	Sep-Jan	Nov-Feb	Nov-Dec
Anogeissus latifolia	Kalkanjiram	Wayanad	Apr-Jun	Jun-Aug	Throughout
Asclepias curassavica	Parvathipoovu	Attappady	Throughout	Throughout	NC
Asparagus racemosus	Sathavari	Wayanad	Jul-Nov	NR	Aug-Feb
Bauhinia racemosa	Mandharam	Wayanad	Mar-Jul	Aug-Dec	Throughout
Bridelia scandens	Kanjikottam	Nilambur	May-Sep	NR	NC

Table3.6

Table 3.6 Contd...

NAME OF SPECIES	MALAYALAM NAME	LOCALITY	PERIOD OF FLOWERING	PERIOD OF FRUITING	NWFP COLLECTION
Callicarpa tomentosa	Thaiteak	Wayanad	Mar-Apr	Mar-May	Jun-Sep
Canarium strictum	Kunthirikkam	Nilambur	Mar- Apr	Apr Onw	Throughout
Centella asiatica	Muthal	Wayanad	Throughout	Throughout	Throughout
Clerodendrum serratum	Cherutheak	Wayanad	Jan-Mar	NR	Jul-Dec
Crotalaria pallida	Kilukkampetti	Wayanad	Jul-Jan	Throughout	Jun-Jul
Curcuma aromatica	Kasthurimanjal	Wayanad	Nov-Dec	NR	Aug_Sep
Cyclea peltata	Padakizangu	Attappady	Feb-Mar	Mar-May	Dec-Jan
Desmodium velutinum	Orila	Wayanad	Aug-Jan	Sep-Jan	Jul-Dec
Eclipta alba	Kanjunni	Wayanad	Dec-May	Dec-May	Sep.
Emilia sonchifolia	Muyalcheviyan	Wayanad	Dec-Apr	NR	NC
Entada rheedii	Kakkumkai	Nilambur	Apr-Jul	Jun-Jul	Jun-Aug
Garcinia morella	Kattupuli	Nilambur	Mar-May	NR	NC
Glycosmis pentaphylla	Panalam	Nilambur	Feb-Apr	Mar Onw	Throughout
Gmelina arborea	Kumizhu	Wayanad	Jan-Jun	Feb-Jun	Throughout
Grewia tiliifolia	Chadachi	Wayanad	Apr	NR	Throughout
Holostemma ada-kodien	Adapathiyan	Wayanad	Sep-Oct	Apr-May	NC
Helicteres isora	Idampiri-valampiri	Wayanad	Aug-Dec	Sep-Dec	Oct-Jan
Hemidesmus indicus	Nannari	Attappady	Nov-Feb	Jan Onw	Jul-Dec
Holarrliena pubescens	Kodakapala	Nilambur	Mar-May	Apr-Oct	NC
Murraya paniculata	Kattuveppu	Attappady	Aug-Sep	Sep	Throughout
Myristica malabarica	Pathiripoovu	Nilambur	Dec-Feb	NR	NC
Olea dioica	Edana	Wayanad	Jan-Mar	Mar Onw	Throughout
Phyllanthus emblica	Nelli	Wayanad	Sep-Jan	Sep Onw	Nov-Jan
Piper spp.	Kattukurumulagu	Nilambur	Nov-Feb	NR	Throughout
Plumbago zeylanica	Koduveli	Attappady	Dec-Mar	Jan-Apr	NC
Pongamia pinnata	Ungu	Nilambur	Apr-Jul	May-Sep	Throughout
Pseudarthria viscida	Moovila	Wayanad	Aug-Jan	Sep-Jan	Jul-Sep

Table 3.6 Contd...

Table 3.6 Contd...

NAME OF SPECIES	MALAYALAM NAME	LOCALITY	PERIOD OF FLOWERING	PERIOD OF FRUITING	NWFP COLLECTION
Rauvolfia serpentina	Sarppagandhi	Wayanad	Jun-Sep	Jul Onw	Sep
Rhynchosia rufescens	Moovila	Wayanad	Jan-Apr	Feb-Jun	Jul-Sep
Ricinus communis	Avanakku	Attappady	Aug-Feb	Aug Onw	NC
Sapindus laurifolius	Ulurgikkai	Nilambur	Jan-Apr	Mar-Apr	NC
Schleichera oleosa	Poovam	Nilambur	Feb-May	Apr-Jul	Throughout
Sida rhombifolia	Kurumthotti	Wayanad	Jun-Jan	Aug-Jan	Jul-Sep
Solanum indicum	Chunda	Wayanad	Jul-Dec	Sep-Feb	Jul-Sep
Stereospermum colais	Poopathiri	Wayanad	Jun-Sep	Aug Onw	Throughout
Strobilanthes ciliatus	Karimkurinji	Wayanad	Sep-Feb	Dec Onw	Jun-Sep
Strychnos nux-vomica	Kanjiram	Nilambur	Mar-Apr	NR	NC
Tamarindus indica	Puli	Attappady	Jun-Nov	Jul-Nov	NC
Terminalia bellirica	Thani	Wayanad	Mar-Apr	NR	NC
Terminalia chebula	Kadukka	Wayanad	Mar-Jun	Jun-Aug	Aug-Dec
Terminalia crenulata	Karimaruthu	Wayanad	May-Jul	NR	Throughout
Terminalia paniculata	Maruthu	Wayanad	Jul-Oct	NR	Throughout
Tribulus terrestris	Njarinjal	Attappady	Jan-Apr	NR	Mar-Apr
Trichosnnthes cucumerina	Kattupadavalam	Wayanad	Jun-Feb	NR	NC
Wrightia tinctoria	Dandhapala	Nilambur	Feb-Apr	May-Sep	Throughout

Note : NC - Not collected during the study period, NR - Not recorded

Propagation

Propagation by seeds : fruit and seed characteristics

Aegle marmelos: Fruits are globose, yellowish grey with hard rind and 150 to 200 seeds are seen in one fruit. The seeds are embedded in a sweet pulp which is edible. The seeds are to be washed with water and air dried before sowing.

Asparagus racemosus: Though flowering is frequent, fruit set is more in older plants. Up to 2000 fruits are formed in one plant. The berries are dark red and eaten by birds. Seeds are black and shining with hard seed coat.

Crotalaria retusa: The fruit is a pod and each pod contains 10 to 12 seeds. The seed coat is very hard and only 8 per cent of seeds germinated while sown directly. Of the two treatments, that were undertaken with acid and hot water to enhance germination, the latter was found effective. Maximum germination observed was 32 per cent.

Gymnema sylvestre: Although flowering was profuse, fruit formation was very rare. Observations of five plants grown in Peechi and Thrissur during 1996 showed that only one fruit per plant was developed. The fruit is a follicle and the number of seeds per fruit varies from 5 to 12. The length and the breadth of seed are 1.03 cm and 0.4 cm respectively. Follicle was enclosed in polythene cover for the collection of seeds before dehiscence, as the seeds are dispersed by wind.

Rauvolfia serpentina: Fruit is a drupe and slightly connate which generally contains two seeds. Fruits were soaked in water overnight and the seeds were extracted and then sown in sand medium. Heat pre-treatment was tried for breaking the hard seed coat.

Stereospermum chelonoides: Fruit is a capsule, cylindrical and straight with elevated white specks. The number of seeds varied between 45 and 60. The seeds were sown in vermiculite.

Weight of seeds, moisture content and germination: Details on the number of seeds per kilogram, moisture content and germination are given in Table 3.7.

Table 3.7. Number of seeds (in thousands) per kilogram, moisture content and germination of seeds of different NWFP plants tested.

NAME OF SPECIES	NO. OF SEEDS/kg	MOISTURE CONTENT (%)	GERMINA-TION (%)	PRE-TREAT-MENT IF ANY
Aegle marmelos	99.0± 0.8	19.0+0.5	65.2±0.4	Nil
Asparagus racemosus	14.3±0.2	19.9± 0.8	70.7 ± 0.8	Nil
Crotalaria retusa	58.3±0.2	26.2 ± 0.4	32.0 ±0.8	Hot water
Gymneina sylvestre	117.7±1.9	2.6±O.1	Nil	Nil
Rauvolfia serpentina	20.7±1.4	27.7 ± 0.5	C	Heat, Soaking
Stereospermum chelonoides	35.4±0.3	27.5 ± 0.4	C	Nil

Vegetative propagation: Based on the rooting response of cuttings, the plants can be classified into three types: *easy to root* (rooting above 80 per cent with or without treatment of GRS) *slow to root* (30 to 40 per cent of rooting with treatment of GRS). and difficult *to root* (rooting response less than 10 per cent under ideal conditions in the experiment).

Easy to root: Of the nine species tried, *Gymnema sylvestre* and *Baliospermum montanum* rooted easily. The responses shown to different treatments by each species are given below.

Gymnema sylvestre: The rooting responses obtained with treatment of different concentrations of NAA and control with or without mist are given in Tables 3.8 (a,b,c,d). The difference in rooting response of cuttings kept in mist and no mist conditions was statistically significant. Observations on percentage of rooting showed that the response of growth regulating substances was not seen when mist was provided. In contrast, under no mist condition the treated cuttings showed a better response. Mean number of roots per treated cuttings also increased when mist was provided (Table 3.8b). The length of roots and rooting region were enhanced by both GRS treatments and mist. Maximum root length was observed in cuttings treated with NAA 1000 ppm. Rooting region increased from 0.9 cm (control) to 1.5 cm (NAA 2500 ppm). Analysis of variance showed that there is no difference between treatments with respect to all the parameters observed.

Table 3.8a. Rooting response of *Gymnema sylvestre* with treatment of NAA and mist : Percentage of rooting

EXPERIMENTAL CONDITIONS	CONCENTRATION OF NAA (ppm)					
	Control	500	1000	1500	2000	2500
Mist	94 ± 6	88 ± 0	88±4	90±1	84±8	88±0
No Mist	66±14	76±8	70±6	82±10	80±0	64±8

Table Mean number of roots per rooted cutting

EXPERIMENTAL CONDITIONS	CONCENTRATION OF NAA (ppm)					
	Control	500	1000	1500	2000	2500
Mist	8.1±0.7	7.0±0.6	10.5±0.8	9.6±0.7	7.8±0.6	9.0±0.7
No Mist	4.8±0.2	5.2±0.4	5.9±0.4	6.2±0.5	5.9±0.4	6.3±0.3

Table 3.8c. Mean length of longest root (cm) per rooted cutting

EXPERIMENTAL CONDITIONS	CONCENTRATION OF NAA (ppm)					
	Control	500	1000	1500	2000	2500
Mist	6.5±0.6	5.0±0.5	8.3±0.5	7.2±0.5	6.0±0.5	6.4±0.5
No Mist	4.7±0.4	4.1±0.3	4.9±0.4	4.9±0.3	5.1±0.5	5.7±0.3

Table 3.8d. Mean rooting region (cm) for rooted cutting

EXPERIMENTAL CONDITIONS	CONCENTRATION OF NAA (ppm)					
	Control	500	1000	1500	2000	2500
Mist	1.2±0.1	1.5±0.1	1.8±0.1	2.0±0.1	1.8±0.1	2.0±0.1
No Mist	0.6±0.1	0.8±0.1	0.9±0.1	1.0±0.l	1.2±0.1	1.2±0.1

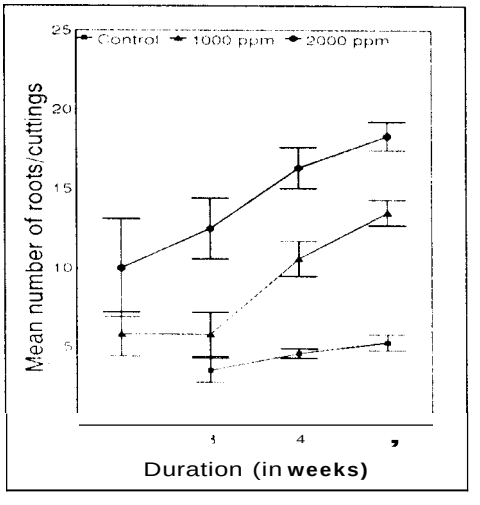
± Standard error is shown

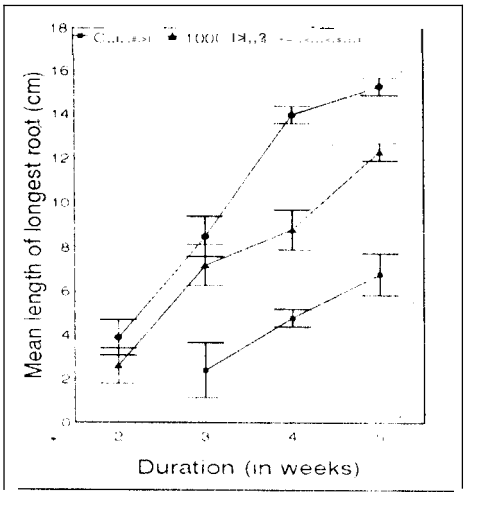
In the above experiment the observations were taken after 20 days and rooting in all the treatments was completed by then. To know whether the GRS treatments have any effect on the time taken for root initiation in cuttings, the experiment was repeated with two treatments, NAA 1000 and 2000 ppm with control and mist. Since the effect of mist was significantly different from no mist conditions for further experiments only mist was used. The observations were taken weekly. The results showed that root induction was earlier in NAA treated cuttings than that in control (Figure 3.2).

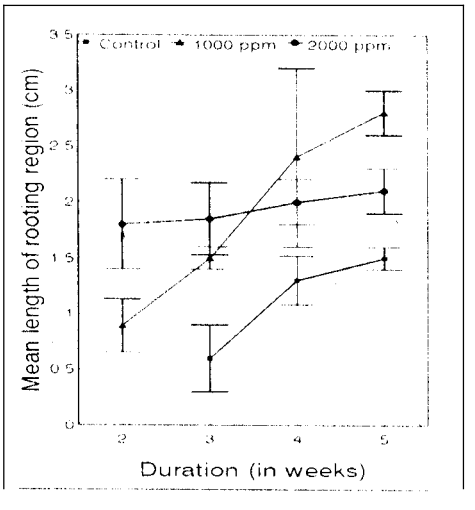
In order to know whether the effect of GRS is influenced by the season of application the experiment was repeated after six months (December) with three treatments of NAA, 1000 and 2000 ppm and control. The results showed that the difference between treated in NAA and with control is significant in all the parameters observed. The percentage of rooting enhanced from 62 to 91 by NAA. Although the difference between two concentrations of NAA was not statistically significant, the treatment with 2000 ppm NAA was found superior (Table 3.9).

Figure 3.2

Root developement in cuttings of Gymnema sylvestre treated with NAA and control







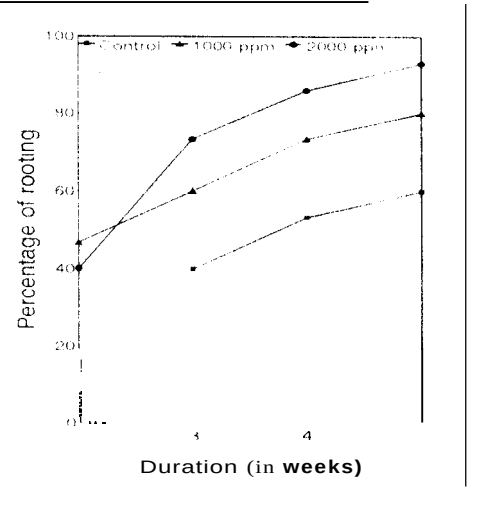


Table 3.9. Effect of season on rooting of *Gymnema sylvestre*

ROOTING RESPONSE	CONCENTRATION OF NAA (ppm)					
	Control		1000		2000	
	June	Dec.	June	Dec.	June	Dec.
Percentage of rooting	94.0±6.0	61.8±1.3[a]	88.0±4.0	82.5±2.5[b]	84.0±8.0	90.6±3.1
Number of roots/ rooted cutting	7.2±0.3	5.3 ± 0.3[a]	7.2±0.4	13.1± 0.7[b]	8.3 ± 0.4	18.3 ± 0.8[c]
Longest root/ cutting (cm)	5.49.3	6.7 ± 0.6"	5.3±0.4	12.8 ±0.4[b]	6.3 ± 0.3	15.3± 0.4[b]
Rooting region (cm)	0.9±0.1	0.7 ±0.1"	1.1±0.1	1.5 ± 0.2[ab]	1.3 ± 0.1	2.2 ± 0.2[b]

± Standard error is hown and the figures superscribed by same letters in rows are not significantly different.

Enrichment planting: The survival percentages of the planted cuttings of *Gymnema* after ten months were 47 in Wayanad, 26 in Nilambur and 20 in Attappady.

Baliospermum montanunt: Preliminary screening with control and treatment (NAA) and vermiculite as rooting medium showed that it is easy to root the tender cuttings with terminal bud intact (Table 3.10). The NAA treatment enhanced the number of roots but no effect on percentage of rooting. About 94 per cent of the cuttings rooted without NAA. Further experiments are needed to know the effect of season and other parameters on rooting response.

Table 3.10. Rooting of shoot cuttings of *Baliospermum montanum*

TREATMENT NAA (ppm)	PERCENTAGE OF ROOTING	MEAN NO. OF ROOTSICUTTING	LENGTH OF LONGEST ROOTICUTTING (em)	ROOTING REGION (em)
Control	93.7	14.0±1.6	6.9 ± 0.6	0.8 ±0.06
1000	*87.5*	27.0±3.7	4.3±0.55	2.0±0.2

± Standard error is shown

Slow to root: *Aegle marmelos, Aristolochia indica* and *Coscinium fenestratum* indicated the possibility of rooting by cuttings, but the percentage of rooting

obtained under present experimental conditions was low. Thus, further work is required to standardise methods for their large scale propagation. Observations on the trials conducted are given below.

Aegle marmelos: The effect of two media - vermiculite and sand, concentrations of NAA from 0 to 2500 ppm; effect of mist and the influence of season on rooting of medium sized cuttings of *Aegle mamelos* were investigated. The results indicate that it is possible to root the cuttings with treatment of NAA 1000 and 1500 ppm. Of the two media used, vermiculite was found to be better, while all the cuttings planted in sand decayed. Similarly, it was found that mist is essential for rooting of cuttings. This was evident from the fact that no cuttings planted outside (no mist) survived more than a week. The rooting response was observed only in cuttings treated in July and not in cuttings treated in August and December. No rooting was observed in cuttings treated with NAA 500 and 2500 ppm (Table 3.11).

Table 3.11. Rooting response of shoot cuttings of *Aegle mamelos* in response to various treatments

TREATMENT NAA(ppm)	PERCENTAGE OF ROOTING	MEAN NO.OF ROOTS /CUTTING	MEAN LENGTH OF ROOTS/CUTTING(cm)	ROOTING REGION(cm)
Control	5.0	5.0±1	6.2 ±0.4	3.0
1000	20.0	6.0 ± 0.4	8.6 ±0.5	2.9 ± 0.1
1500	30.0	6.8 ±0.6	8.7 ±0.4	2.9±0.09
2000	7.5	6.7 ±0.6	8.5 ±1	3.0± 0.3

Aristolochia indica: Of the five treatments given to tender shoot cuttings, rooting was observed only in treatment with NAA 1000 and 1500 ppm. The response of rooted cuttings is given in Table 3.12.

Table 3.12. Rooting response of shoot cuttings of *Aristolochia indica* in response to treatment of NAA

TREATMENT NAA (ppm)	PERCENTAGE OF ROOTING	MEANNO OF ROOTSICUTTING	MEAN LENGTH OF ROOTSICUTTING (cm)	ROOTING REGION (cm)
1000	30	6..0 ± 0.9	7.3±0.5	2.0±0.0
1500	20	9.0±0.5	9.0±1.5	2.8±0.3

± Standard error is shown

Cosciniumfenestratum: Two types of cuttings with diameter above and below 2.5 cm were treated with two concentrations of NAA 1000 and 2000 ppm with a control. The cuttings were planted in vermiculite and maintained in the mist chamber. The results are given in Table 3.13. Only cuttings with diameter below 2.5 cm and treated with NAA showed rooting.

Table 3.13. Rooting response of shoot cuttings of *Cosciniumfenestratum*

TREATMENT NAA (ppm)	PERCENTAGE OF ROOTING	MEAN NO. OF ROOTS/CUTTING	MEAN LENGTH OF ROOTS/CUTTING (cm)	ROOTING REGION (cm)
Control	0	0	0	0
1000	30	6.0±0.6	6.4 ±0.5	2.8 ± 1.6
2000	40	6.0 ± 1.2	6.5 ±0.5	3.7 ±0.2

± Standard error is shown

Difficult to root: *Desmodium velutinum, Phyllanthus emblica, Stereospermum chelonoides* and *Terminalia chebula* did not respond to any of the treatments given in the preliminary screening. Recent experiment with coppice cuttings of *P. emblica* in July has indicated the possibility of root induction with NAA treatments. Further experiments are needed to standardise the methods for large scale propagation.

Observations on phenology of NWFP plants from the study plots showed that majority of the plants flowered annually and produced seeds. The study indicated that simple and cheap methods can be developed on the propagation of selected NWFP plants. Of the six species treated for seed germination, seeds of *Aegle marmelos* and *Asparagus racemosus* were easy to germinate and about 70 per cent of germination was observed without any seed treatments. Seeds of *Crotalaria retusa* appeared to have seed coat dormancy,

since soaking in hot water enhanced the germination response. The response of the other species was not promising in the initial trials. Studies on seed maturity, dormancy and seed pre-treatments are imperative.

Of the nine species tried for vegetative propagation by rooting of shoot cuttings, two species *Gymnema sylvestre* and *Baliospermum montanum* could be propagated easily. For G. *sylvestre* rooting above 90 per cent was observed when axillary shoots were kept in mist propagation system. The response of growth regulating substances varied according to the season of application. In June, when the mother plant was in vegetative phase, the effect of GRS was not obvious. In December when flowering occurred, the variations in rooting response of cuttings in control and GRS treated plants were significantly different. The difference between two concentrations (1000 and 2000 ppm) NAA was not significant with respect to percentage of rooting, length of roots and rooting region. Hence, 1000 ppm NAA treatment can be used for large scale propagation. The rooted cuttings formed good planting stock which were used for field trials. In the field their establishment was found to be satisfactory. Rooting of *B. montanum* was tried only in one season and the application of GRS enhanced number of roots and rooting region in treated cuttings. Shoot cuttings of *A. marmelos, A. indica, C. fenestratum* and *P. emblica* indicated the possibility of rooting with GRS application. Maximum response received in initial trials was 30 per cent. In the case of other four species, rooting was found to be difficult with mature cuttings and the treatments provided. Further investigations on the nature of suitable cuttings, effect of different GRS, season of application and rooting environment are required to develop commercially viable methods.

SOCIO-ECONOMIC ASPECTS

In this section, analytical results on some socio-economic aspects are discussed. These include the collection, marketing, pricing etc. of NWFPs in the study-areas.

Collection

The tribal people in Kerala state are legally permitted to collect NWFPs. They form co-operative societies in different localities to organise collection. The Federation, an apex body of the societies, takes over all the collected products from the societies for marketing. Also, NWFPs are collected illegally by the agents of private traders, mostly non-tribals. However, data on

self-consumption and quantity collected by the non-tribals are not available. The study is, therefore, confined only to the collection of NWFPs organised by the Federation.

Minor Forest Products Committee: The Government of Kerala has set up a high level committee, viz. Minor Forest Products Committee (MFP Committee) to take decisions on various aspects in relation to the collection of NWFPs in the state. The committee consists of the Chief Conservator of Forest (Development) as Chairman and the Registrar of Co-operative Societies, the Director of Tribal welfare, the Managing Director of Kerala Pharmaceutical Corporation, the Health Secretary, the Managing Director of Kerala State Scheduled Caste and Scheduled Tribe Development Co-operative Federation Ltd, as members. The committee meets annually before the beginning of the collection seasons and takes decisions on issues such as allotment of ranges, amount of lease rent to be paid by the societies, and prices of products. The decisions of the committee regarding various aspects of collection of NWFPs are intimated to the Forest Department and the Federation.

Collection process: NWFP collection by the society begins after the agreement on range allotment is signed in the presence of the concerned Divisional Forest Officer before July 31st every year. Collection permits are then issued to the members of the societies. Collection agents are appointed for the collection period and funds are advanced for making necessary infrastructure facilities. Once the collection depots exhaust their storage capacity, the goods are transported to the societies and then to the Federation's godowns for marketing.

Items collected: Of the 119 commercially important NWFPs listed by the Forest Department (Appendix 2), only a few easily marketable items are collected by the selected societies. For instance, the tribal service societies collected only 32 items at Wayanad, 27 items at Nilambur and 38 items at Attappady during 1995- 1996.

Before the establishment of co-operative societies, the tribal people collected more items and sold them to the private traders. But the collection is now restricted to premium items by the societies because the collection of other items is said to be unprofitable due to high wage cost and low product demand. This brought about two major problems in the field of collection.

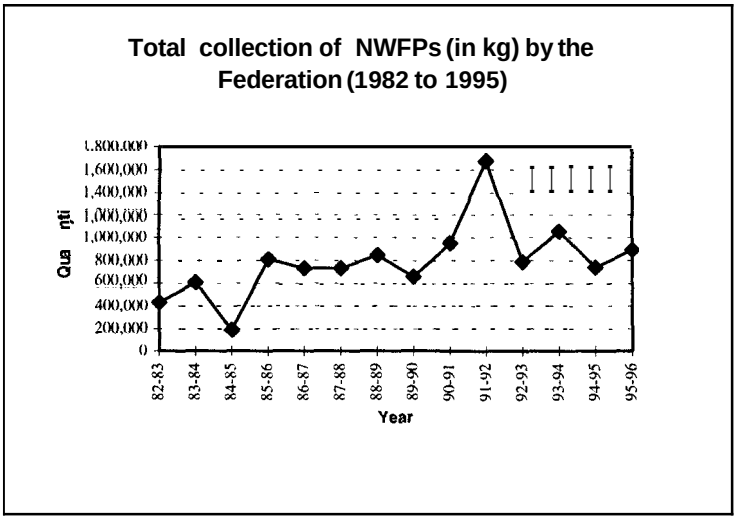
- The younger generation of the tribal communities gets familiar with only those items which are regularly collected, and consequently, their knowledge-base for identification of other NWFPs is eroded.
- **A** large quantity of NWFPs is still illegally collected by non-tribals and sold to the private traders. They collect both items purchased by the societies and other traders. This often leads to competition between tribal people and non-tribals for collecting the products, resulting in over extraction and depletion of biodiversity of NWFPs.

Collection trend: In the transaction of NWFPs from the tribal people there is a chance of all the collected products not reaching the Federation. This is because the gatherers may either sell part of the products to the private traders or retain part of it for self-consumption or because the societies sell the products locally. The analysis of the collection trend showed the following patterns at the levels of the Federation, society and selected hamlets.

The Federation: During early years of its establishment, the Federation was engaged mainly in the collection of NWFPs and the societies engaged in the collection were permitted to buy the products from the tribal people at the price fixed by the Federation. This continued till 1989-90. Since open market prices of the products were slightly higher than that fixed by the Federation, tribal people used to sell a part of the products to the private traders. In order to prevent this, the societies were asked to collect the products at the open market price since 1990-91. The trend of collection of NWFPs during 1982 to 1995 by the Federation is shown in Figure 3.3. Two broad inferences could be drawn:

- There are wide fluctuations in the quantity collected during the period of analysis.
- The quantity available with the Federation has increased since 1990-91 mainly because it started purchasing the products from the tribal people at the market price.

Figure 3.3



In order to discern whether collection of individual items followed the above trends, the collection trends of some items belonging to the broad groups of NWFPs such as edible products, medicinal plants, toiletries, gums and resins and tans and dyes were worked out (Figure 3.4). By and large, individual items under each group also showed the same trend of the total quantity.

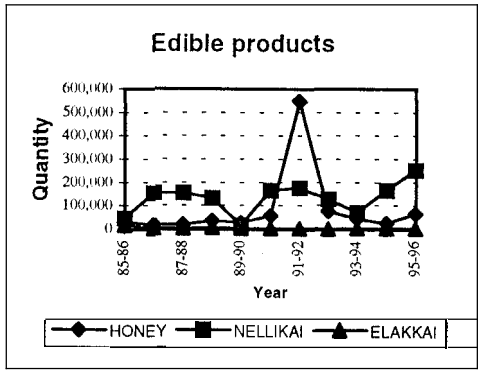
What factors affected variations in the collection of NWFPs? These included climatic changes, forest fire, seasonal fluctuations in output, unsustainable and unscientific harvesting practices like lopping of branches and lighting fire, administrative delay in issuing passes for collection and allotment of ranges, excess collection of certain products due to their high demand and illegal collection by the non-tribals (Anjana 1997).

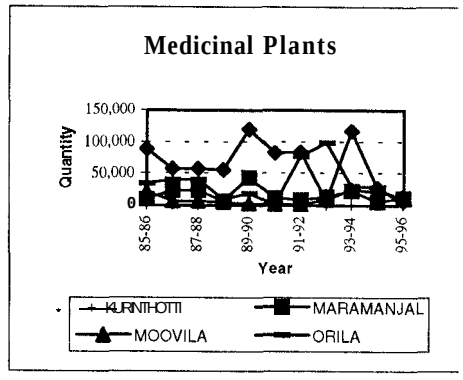
Societies: The collection trends of NWFPs by the selected societies at Wayanad, Nilambur and Attappady are shown in Figure 3.5. As in the case of Federation, the quantities collected by the societies also showed variations.

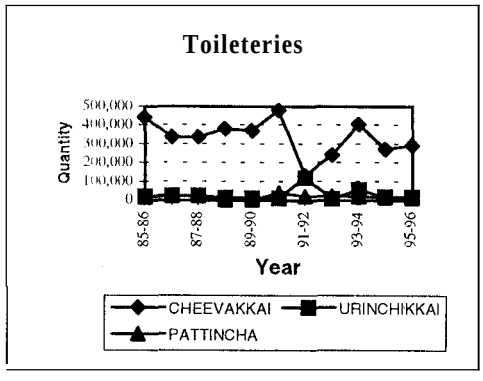
Households: The total quantities of NWFPs collected by the three selected tribal hamlets are given in Table 3.14. There were variations in the quantity collected among the hamlets and within hamlets in different years. For instance, the selected hamlet in Wayanad collected 63,000 kg of NWFPs in 1995, but only 61,000 kg in the next year. Similarly, in Nilambur, it was 1,600 kg in 1995, but 4,000 kg in 1996. In Attappady, the quantity collected was 3,300 kg in 1995 which fell to 2,800 in 1996.

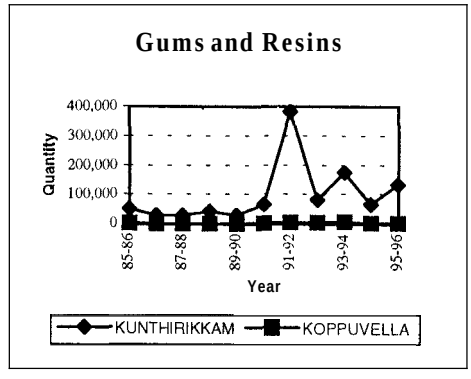
Figure 3.4

Total quantity (kg) collected of major groups of NWFPs (1985-1996)









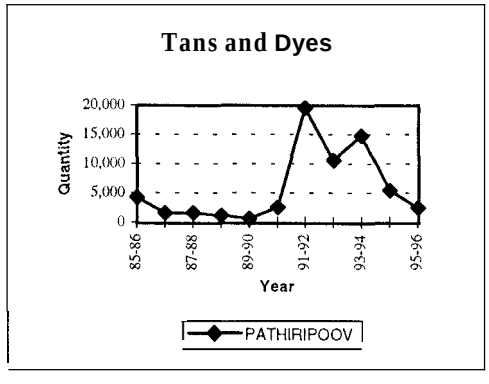


Figure 3.5

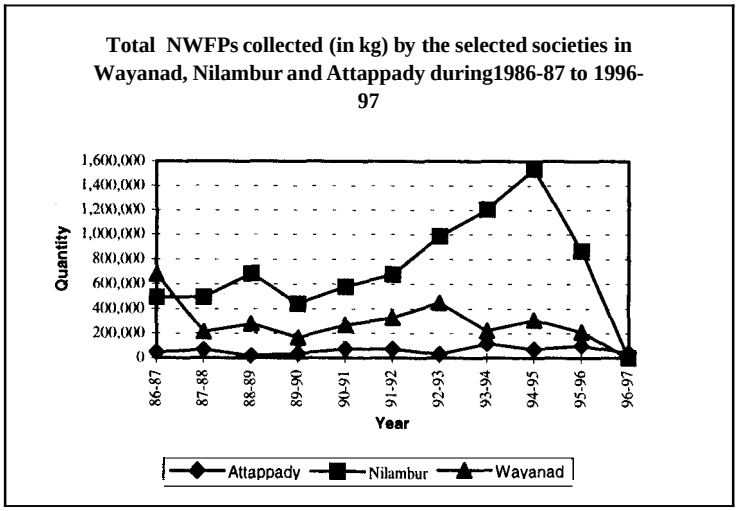


Table 3.14. NWFPs collected by the selected tribal hamlets (in kg)

YEAR	WAYANAD	NILAMBUR	ATTAPPADY
1995	63305	1694	3312
1996	61813	3998	2879
1997*	1678	1168	720

The distance covered by the households for collection is reported to have increased recently. For instance, about 8 per cent of Cholanaickans and 52 per cent of Kattunaickans of the study sample, travelled 5 to 10 km earlier, but 54 per cent of Cholanaickans and 31 per cent of Kattunaickans now travel 10 to 20 km for the collection of NWFPs. The tribal people have to travel longer distance now to gather the same products for which years back they travelled only short distance.

The study findings of longer distance now travelled by the tribal people for collection and the wide variations in the quantity collected at all the levels tend to suggest that the NWFPs yielding plants are sparsely distributed and products are not harvested in a sustainable manner.

Collection charges

The collection charges paid by the Federation and the societies increased over a period of time. For instance, during the period from 1982-83 to 1995-96 the collection charge of *Hemidesmus indicus* (nannari), a medicinal plant, increased from Rs.12.50 to Rs.30, *Curcuma aromatica* (kasthurimanjal) from Rs.3.75 to Rs.15 and honey from Rs.25 to Rs.45 (Table 3.15a). There were variations in the total collection charges both at the levels of Federation and the society (Figures 3.6a & 3.6b) due to fluctuations in the quantity collected.

Since the selected tribal groups especially Kattunaickans and Cholanaickans mostly depend on the collection of NWFPs for their livelihood, the collection charges received constituted their major source of income. Indeed, the collection charges increased and hence, the current income of the gatherers also increased over a period of time. With a view to ascertain whether the real income has increased, the collection charges were deflated with 1981-82 prices (Table 3.15b). The result indicates that the real income has not increased. Probably, this is one of the reasons for their poor economic conditions.

Sale value

Except for certain years, the sale value realised by the Federation increased from Rs.20.98 lakhs in 1982-83 to Rs.196.71 lakhs in 1995-96. The sale value realised by the selected societies also showed more or less a similar trend (Figures 3.7a & 3.7b).

Figure 3.6a

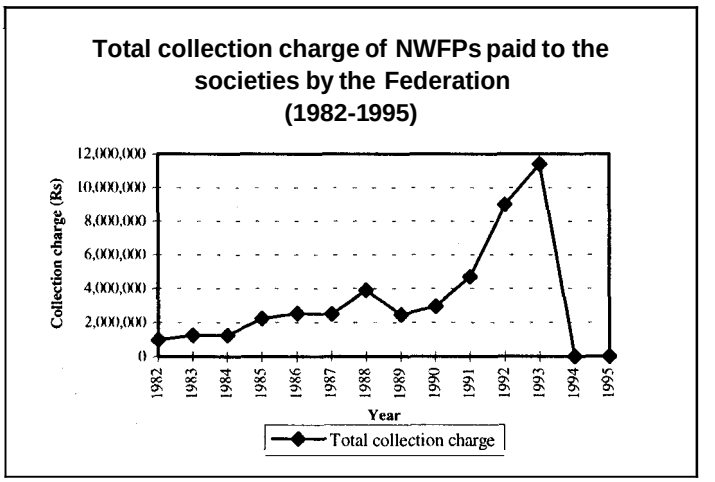


Figure 3.6b

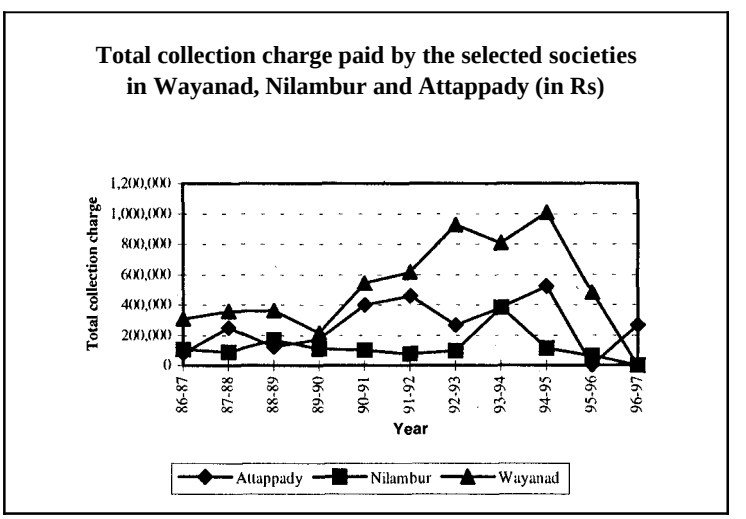


Table 3.15a. Collection charge of selected (per kg) for the period 1982-83 to 1995-96 (in Rs.)

SL. NO.	ITEM	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97
1	Honey (processed)	25.00	20.00	12.00	14.00	13.00	14.00	14.00	18.00	18.80	21.60	60.00	60.00	45.00	47.50	45.00
2	Nellikka	1.00	1.00	0.75	1.00	1.20	2.00	1.00	1.50	1.50	2.25	2.50	2.50	5.20	3.60	3.00
3	Kunthirikkam	9.00	10.00	10.00	12.00	14.00	16.00	18.00	20.00	20.00	25.20	25.20	25.20	32.25	71.00	25.00
4	Maramanjal	2.50	2.00	1.75	2.00	2.50	3.00	3.00	4.00	4.50	4.85	4.50	4.50	9.50	11.40	12.50
5	Cheevakkai	3.25	3.25	3.50	4.00	5.00	4.00	3.50	4.00	4.50	6.30	6.30	6.30	11.40	14.25	16.00
6	Kasthurimanjal	3.75	3.75	3.25	4.00	9.00	9.00	9.00	9.00	9.00	10.80	10.60	10.60	13.30	15.20	15.00
7	Pathiripoovu	12.00	12.00	13.00	16.00	20.00	24.00	26.00	30.00	36.00	45.00	45.00	45.00	47.50	75.00	60.00
8	Orila	4.00	3.00	2.50	3.00	3.50	4.00	4.00	4.50	4.50	4.95	7.50	7.50	8.25	11.40	2.50
9	Kurumthotti	3.25	3.75	3.00	2.00	0.50	0.60	0.60	3.00	3.00	3.40	6.00	6.00	7.60	11.40	2.00
10	Kadukka	1.25	1.25	1.00	1.20	1.00	1.00	1.50	2.00	2.00	3.60	6.00	6.00	3.80	4.20	4.00
11	Moovila	4.00	3.50	3.00	3.00	3.00	4.00	4.10	4.25	4.25	4.85	8.00	8.00	8.55	14.25	2.50
12	Karimkurinji	0.70	1.20	1.00	1.50	1.00	0.30	0.30	1.50	1.50	2.05	8.00	8.00	4.75	6.65	9.50
13	Thainmezhugu	28.00	28.00	24.00	25.00	20.00	20.00	25.00	40.00	40.00	43.20	60.00	60.00	62.70	85.50	60.00
14	Urinchikkai	2.50	1.25	1.50	2.00	2.00	1.75	2.00	2.00	2.00	3.40	3.40	3.40	3.80	6.65	5.00
15	Kalpasam	1.00	1.00	0.75	2.50	5.00	6.00	7.00	8.00	8.00	8.65	8.65	8.65	9.50	38.00	38.00
16	Nannari	12.50	6.00	5.00	6.00	6.50	6.25	7.00	8.00	8.00	9.45	10.00	10.00	11.40	47.50	30.00

Table 3.15b. Deflated collection charge of NWFPs (per kg) for the period 1982-83 to 1995-96 (in Rs.)

ITEM	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96
Honey (processed)	24.37	17.81	9.98	11.01	9.71	9.72	9.05	10.86	10.29	10.39	26.24	24.21	16.38	16.06
Nellikka	0.97	0.89	0.62	0.79	0.89	1.39	0.65	0.91	0.82	1.08	1.09	1.01	1.89	1.22
Kunthirikkam	8.77	8.90	8.31	10.22	10.46	11.10	11.65	12.07	10.95	12.13	11.02	10.17	11.74	24.00
Maramanjal	2.44	1.78	1.45	1.57	1.87	2.08	1.94	2.41	2.46	2.23	1.97	1.82	3.46	3.85
Cheevakkai	3.17	2.89	2.91	3.14	3.73	2.78	2.26	2.41	2.46	3.03	2.75	2.54	4.15	4.82
Kasthurimanjal	3.65	3.34	2.70	3.14	6.72	6.25	5.82	5.43	4.93	5.19	4.63	4.28	4.84	5.14
Pathiripoovu	11.69	10.69	10.81	12.58	14.97	16.66	16.80	18.11	19.70	21.66	19.68	18.16	17.29	24.35
Orila	3.89	2.67	2.08	2.36	2.61	2.78	2.59	2.72	2.46	2.38	3.28	3.03	3.00	3.85
Kurumthotti	3.17	3.34	2.49	1.57	0.37	0.42	0.39	1.81	1.64	1.64	2.62	2.42	2.77	3.85
Kadukka	1.21	1.11	0.83	0.94	0.75	0.69	0.97	1.21	1.09	1.73	2.62	2.42	1.38	1.42
Moovila	3.89	3.12	2.49	2.36	2.24	2.78	2.65	2.56	2.31	2.33	3.49	3.23	3.11	4.82
Karimkurinji	0.68	1.07	0.83	1.18	0.75	0.21	0.19	0.91	0.82	0.99	3.49	3.23	1.73	2.25
Thainmeezhugu	27.29	24.93	19.95	19.65	14.94	13.88	16.16	24.14	21.89	20.79	26.24	24.21	22.82	28.90
Urinchikkai	2.44	1.11	1.25	1.57	1.49	1.21	1.29	1.21	1.04	1.64	1.49	1.37	1.38	2.25
Kalpasam	9.70	0.89	0.62	1.97	3.73	4.16	4.52	4.83	4.37	4.16	3.78	3.49	3.46	12.85
Nannari	12.18	5.34	4.16	4.78	4.85	4.34	4.52	4.83	4.43	4.55	4.37	4.04	4.15	16.06

Figure 3.7a

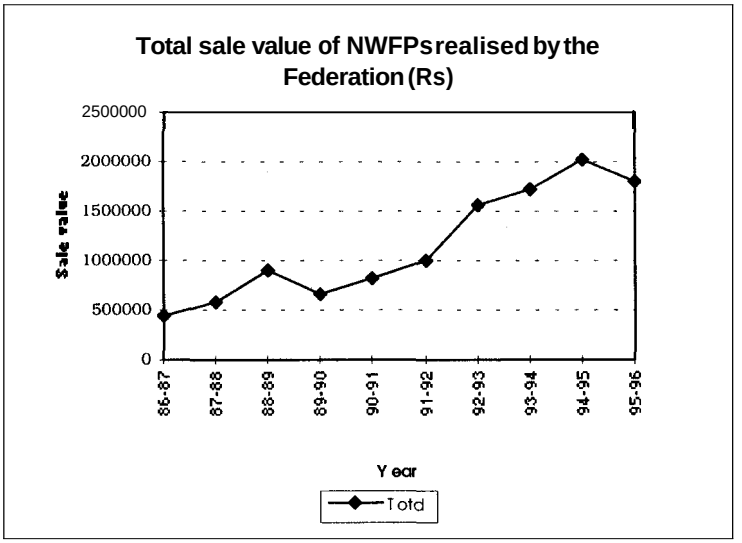
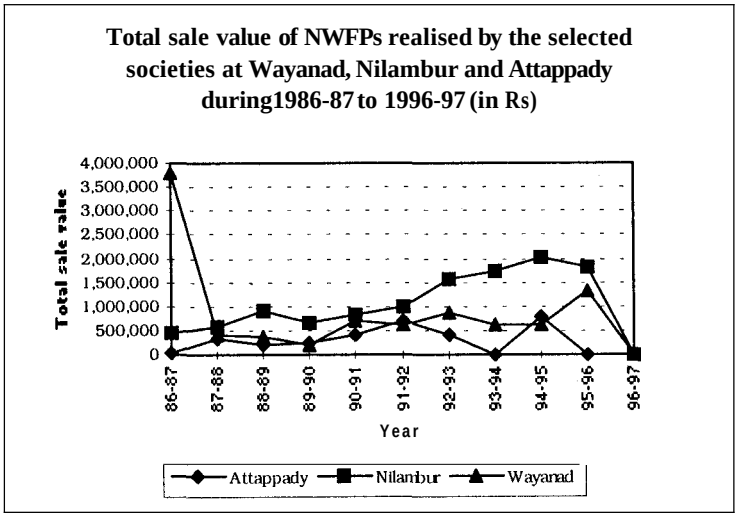


Figure 3.7b

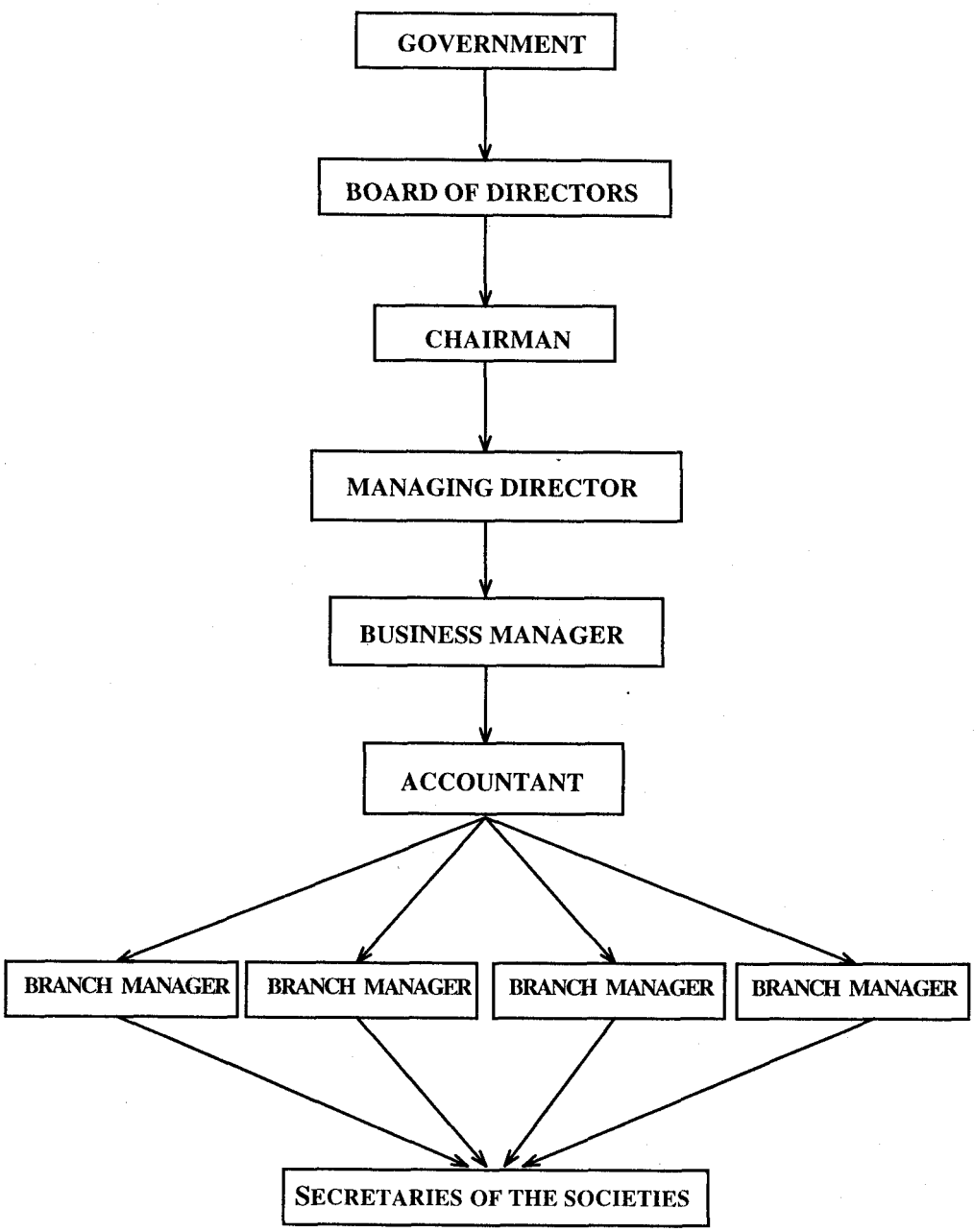


Institutions involved in the collection of NWFPs

Fedemtion: The Federation functions as an apex body of all Schedule Caste and Schedule Tribe Service Co-operative Societies in the state. About 525 societies are affiliated with the Federation of which 83 are Schedule Tribe Societies and rest Schedule Caste Societies. The organisational set up of the Federation is depicted in Figure 3.8.

Figure 3.8

ORGANISATIONAL SET UP OF THE FEDERATION



It can be seen that the Federation has a vertical structure, consisting of government at the top and societies at the bottom. The Federation has a Board of Directors with the Minister of Co-operation as Chairman. Also, it has a Managing Director appointed by the Government. Day-to-day administration in the Federation is attended to by the Managing Director. There are four branches to the Federation, located at Thiruvananthapuram, Adimaly, Thrissur and Wayanad with separate branch managers.

Based on the guidelines issued by the MFP Committee, the Federation gives instructions to the societies regarding various aspects of collection and marketing of NWFPs. Further, issues such as prices to be paid to the collectors and selling price of NWFPs are also determined by the Federation. The financial requirement of the societies relating to the collection of NWFPs is met by the Federation. Each member society is given interest free advances to pay the collection charges to the gatherers. It also gives sales tax when society sells the products and pays lease rent and security deposit to the Forest Department on behalf of the member societies who engage in the collection of NWFPs.

Financial viability

Although the Federation has undertaken different programmes to assist various Schedule Caste and Schedule Tribe Societies affiliated with it, at present, the collection and marketing of NWFPs are its major activities. Various items of cost and benefits of the Federation arising from the activities relating to NWFPs, are given below.

ACTIVITIES	COSTS	INCOME
• Collection and marketing of NWFps	• Interest free advance to societies • Salary to staff • Transportation and storage • Payment of lease rent • Tax	• Income from the sale of NWFPs.

The Federation has advanced an amount of Rs. 13.60 million to the tribal societies engaging collection of NWFPs to purchase the products from the tribal people and received an amount of Rs.14.86 million from its sale, netting a profit of Rs.1.26 million during 1995-96. However, the profit and loss account of the Federation for the above year shows that the Federation incurred a loss of Rs. 17,963 and the accumulated loss in that year was Rs.6.5 million (Appendix 3).

The total share capital paid by both the member societies and the government amounts to Rs.25.54 million. Even if 5 per cent return on share capital is considered reasonable, the corporation should have earned a profit of Rs. 1.25 million per year before taxes. Considering the fact that the corporation has an accumulated loss of Rs.6.5 million, its financial viability is at stake. This often affects the collection of NWFPs because the Federation is not able to provide adequate funds to the societies for undertaking collection at the appropriate time.

As is evident from the financial structure of the Federation, the two major factors affecting its viability are mounting loan over dues (Rs.2.4 million) and cost of management (Rs.2 million). The major achievements, weaknesses and constraints of the Federations are summarised below.

Achievements, weaknesses and constraints of the Federation

ACHIEVEMENTS	WEAKNESSES	CONSTRAINTS
• An increase in collection charge and gives 80 per cent price as coliection charge to the gatherers. • As the Federation gives reasonable price to the gatherers, the private traders are forced to pay higher prices for the same products. • The gatherers face no marketing problems as the Federation acts as a marketing agency.	• Absence of professional managers in the organisation. • Federation does not function as a business concern and hence lacks marketing efficiency. • Could not eliminate intermediaries from the collection and marketing chain. • Inadequate supervising staff-resulting in prevalence of mal-practices at the societies level and illegal collection by the non-tribals. • No proper pricing policy is followed. • Collects only a few items which are high in demand resulting in illegal collection and erosion of knowledge base of tribal people. • No value addition is undertaken.	• No elected Board of Directors. Administrators take decisions. • Lack of adequate funds to undertake collection at the appropriate time. • Inadequate co-operation from the Forest Department. • Not much control over the working of the tribal co-operative societies, resulting in mal-practices.

Societies: The Tribal Service Co-operative Societies in the state are established with the aim of implementing various schemes and programmes relating to tribal development. In addition to tribal people, some government departments (e.g. co-operation and tribal welfare) and National Co-operative Development Corporation are members of the tribal societies. The share capital of the members, both tribal people and government departments, constitutes the major source of funds. This is supplemented with working capital grant from Tribal Welfare and Co-operative Departments, National Co-operative Development Corporation and NWFP collection advance from the Federation.

The tribal societies are linked together with the Federation and are working between the Federation and the tribal people for carrying out collection of NWFPs. Various achievements, weakness and constraints of the societies are enumerated below.

Achievements, weaknesses and canstraints of Tribal Service Co-operative Society

ACHIEVEMENTS	WEAKNESSES	CONSTRAINTS
• Co-ordinates the tribal people and organises the collection of NWFPs. • Offers more or less same price proposed by the Federation and protects the tribal people from the exploitation of private traders.	• Depends on agents to organise collection of certain items. • Most of the members are illiterate and not exposed and are not able to contribute much to its development. • Less rapport with the Forest Department. • Except collection of NWFPs, not much tribal development programmes are implemented.	• No adequate capital to carry out collection. • Due to financial stringency, work advance from the Federation is often delayed, affecting the collection.

Marketing of NWFPs

In sustainable forest utilisation, marketing provides a means for maximising the values and distributing it among the participants in forestry activities (Lintu, 1995). Marketing is the process of identifying, stimulating and

satisfying customer's demand which connects the customer with the producer and supplies the products at a profit (FAO, 1996).

In olden days, NWFPs were collected and marketed by the tribal people and their marketing was mostly through bartering the products with others. Consequently, earlier marketing of NWFPs was on a small scale and mostly localised. With the reservation of forests, the marketing of NWFPs was taken over by the Forest Department. In the absence of an effective organisational set-up and marketing strategies, the Forest Department could not carry out marketing effectively for a long time and hence, they permitted the private traders to do the job.

The tnarketing of NWFPs by the private traders has been existent since a long time and their supremacy in this area continued till the establishment of Tribal Service Co-operative Societies and the Federation. At present, the Federation is one of the major organised marketing agencies of NWFPs in Kerala. An attempt is made below to examine the different aspects of marketing of NWFPs in Kerala.

Box 3.1

NWFP characteristics and marketing

NWFPs and their characteristics arc a compromise between the available resources and marketing requirements. NWFPs represent one of the most challenging products groups from the marketing point of view due to their number, versatility, end use variations and resource richness. NWFPs comprise such a varied group of products that meet the needs and wants of all kinds of end users. Being nature based, NWFPs can never be totally uniform in their characteristics nor can their supply be regular and fully reliable. The products are collected depending on their seasonal availability or nature determined conditions which can affect both the quantity and quality of products available. It also means that their availability can vary considerably from year to year and from location to location. From the marketing point of view, this is, of course, a major disadvantage because many customers prefer sustained and secure supply of even quality products.

[source : Lintu,1995 p.201]

Marketing practices of the Federation

The marketing practices generally resorted to by the Federation are : auction, quotation and negotiations.

Auction: This is the most common marketing practice of the Federation for sale of NWFPs, especially non-perishable items. When collection of each item is completed, the societies transfer the products to the Federation which

transports the same to its nearest branch offices for marketing. The process of auction is generally initiated at the branches of the Federation where the products are kept. The auction notices, stipulating various conditions, time and place of auction, are sent to all the registered traders of NWFPs. With a view to getting a fair price, an upset price, based on last years auction price, is fixed by the Federation at the beginning of the auction. If the auction rate is very low due to such reasons as ring formation by the traders, low demand, etc., the auction may be cancelled and held on some other occasion.

Quotation: In the case of repeated cancellations of auction, the quotation method is resorted to by the Federation to market the product. In this case, the traders are requested to submit the application stating the highest price that they are willing to pay. The person who quotes the highest price is given the product.

Negotiation: This method is adopted in the case of marketing of easily perishable items such as *Phyllanthus emblica, Myristica dactyloides, Pseudurthria viscida,* and *Strobilunthes ciliatus.* Since they are perishable and cannot be stored for a long time, the Federation enters into an agreement with parties interested in the purchase of these items and supply the same at the rate mutually agreeable (Anjana Shankar and Muraleedharan, 1996).

Major NWFPs marketed by the Federation

Out of the 119 items listed as commercially important NWFPs by the Forest Department, the Federation collects regularly only less than 35 items which have high demand in the market. Out of this, about 10 items constitute 90 per cent of the total value realised by the Federation (Table 3.16).

Table 3.16. Major NWFPs marketed by the Federation

ITEM	TOTAL QUANTITY (kg)	VALUE (Rs.)	% TO TOTAL VALUE
Acacia concinna (Cheevakkai)	4,01,703	86,53,213	43.27
Canarium strictum (Kunthirikkam)	1,65,323	45,00,735	22.50
Honey	42,554	21,20,207	10.60
Myristica dactyloides (Pathiripoo)	16,901	9,97,387	4.99
Sida rhombifolia (Kurumthotti)	1,69,188	6,86,601	3.43
m (Orila)	29,712	3,11,085	1.56
Strobilanthes ciliatus (Karinkurinji)	51,648	2,96,666	1.48
(Moovila)	24,707	2,95,174	1.48
Phyllanthus emblica (Nelli)	70,273	2,48,876	1.24
Coscinium fenestratum (Maramanjal)	33,193	1,27,607	0.64
Others	---	17,96,155	8.97
Total	---		100.00

A brief description of the major 10 items marketed by the Federation is given below:

***Acacia concinna* (Cheevakkai):** A large woody climber found in semi-evergreen and moist deciduous forests. The fruits are collected during March-April when they are ripe. It is a non-perishable item that can be stored till there is good demand for the product. Society sells this to the wholesalers, who again sell the product to the retailers. This product is marketed within and outside the state.

***Canarium strictum* (Kunthirikkam):** A large tree found in the evergreen forests. Resin is collected by making wounds on the bark of mature trees. The resin gets hardened and black in colour after a few days. It is gathered in all seasons except during heavy rains. The dried resin is non-perishable in nature and hence can be stored for years. This is widely used as an industrial raw material, mainly to produce varnish, paints and toiletries. The product is sold at two levels of wholesalers who either export it to other states or to other countries like Sri Lanka and Singapore or sell it to the retailers.

Honey: Honey is produced by the honey bees and is collected during March to May before the onset of the monsoon. Honey bees make their honey combs mostly on trees like *Bombax ceiba* and *Tetrameles nudiflora* found in the moist deciduous and semi-evergreen forests. The honey is collected before the formation of larvae in the honey combs. The product is sold at two levels of wholesalers and finally to retailers either within or outside the state.

Myristica dactyloides **(Pathiripoo):** This is a medium sized tree found in the evergreen and semi-evergreen forests. The aril is collected from mature fruits in the months from March to June. Pathiripoo is used in the preparation of herbal medicine and also for making natural dyes. This product is either exported to other states or to other countries (e.g. Malaysia, Singapore) and is sold at two levels of wholesalers within or outside the state and finally, to retailers.

Sida rhombifolia **(Kurumthotti):** This is an annual or biennial herb found in the moist deciduous forests, mostly in disturbed areas getting adequate sunlight. The roots of Kurumthotti are used in the preparation of several Ayurvedic medicines. The roots are collected during the months from August to December and dried before marketing. Since it is a semi-perishable item, intermediaries are less in the marketing chain of this product. The society sells this product to the first wholesalers who sell it to the consumers, mainly Ayurvedic medicine manufacturers.

Desmodium velutinum **(Orila):** Orila is one of the '*dashamoola*' in Ayurveda. It grows in moist deciduous forests as well as in forest plantations. The roots are collected during the period from August to December and are dried before marketing. The dried roots can be stored up to 3-4 months. The roots of orila are also required in large quantities in Kerala, as an ingredient of many Ayurvedic medicines. It is a semi-perishable item of NWFPs and the marketing chain constitutes societies, wholesalers and consumers.

Strobilanthes ciliatus **(Karinkurinji):** This is a shrubby species growing in the semi-evergreen and evergreen forests. The roots along with basal portion of stem are collected during the months of August and September and are dried before marketing. It is also an important ingredient of certain Ayurvedic medicines. This is mostly marketed within the state and marketing chain consists of society, wholesaler and consumer.

***Pseudarthria* viscida(Moovi1a):** Moovila is one of the constituents of *'dashamoola'* in Ayurveda. It is a perennial herb, found in the moist deciduous forest. The roots are collected during August to December and are dried before marketing. Moovila root is an ingredient of many Ayurvedic preparations and is required in large quantities in Kerala. This is marketed within the state.

***Phyllanthus emblicu* (Nelli):** The tree is fairly well distributed in deciduous forest and occasionally in grasslands. Nellikka is used as a food item and also for preparation of medicines. The ripe fruits are collected during the period between September and January. Since the fruit is highly perishable, it is sold immediately. The marketing chain consists of society, wholesaler and consumer and this is marketed within the state.

***Coscinium fenestratum* (Maramanjal):** This is a woody climber found in the evergreen and semi-evergreen forests. The stem is chopped into pieces and dried before marketing. Consequent to heavy exploitation for medicinal use, this plant is becoming rare now-a-days. This is marketed within and outside the state and marketing chain forms a number of intermediaries.

Market structure

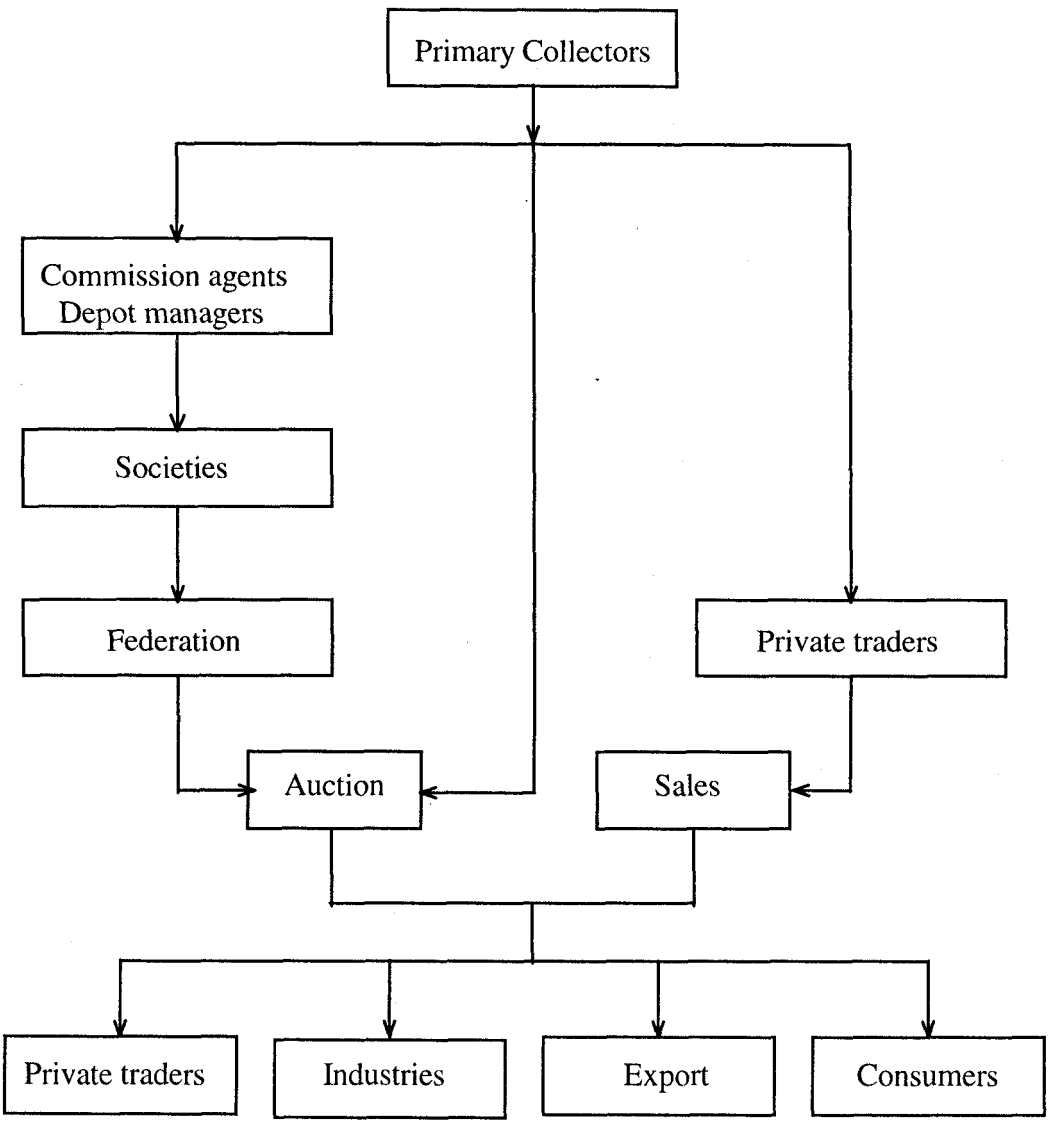
The structure of market is defined as those characteristics of the organisation of the market that seem to exercise strategic influence on the nature of competition and pricing within the market (Bain, 1969). It also includes the manner of operation of the market (Acharya and Agarwal, 1987). Thus, an understanding of the market structure is essential for identifying the imperfections in the performance of a market. The structure of NWFP market is shown in Figure 3.9. Its major features are discussed below.

a. Concentration of market power: The Federation is the major marketing agency which determines the quantities to be sold and the sale prices of the products. It is true that the prices of products fluctuate during the auction. But the upset price set in the auction by the Federation significantly affects the price structure of NWFPs. The primary wholesalers, who collect the products from the Federation directly or through agents are few in number, and have a major say in price determination. At this stage, NWFP markets exhibit the features of oligopsony which is marked by geographically narrow market and scattered producers, a few buyers and dominance of

price factor in the marketing system (Meade, 1966; Muraleedharan, 1989; Jayasankar and Muraleedharan, 1993). At this stage, this causes a significant increase in the marketing margin and consequently, price increase.

Figure 3.9

MARKETING STRUCTURE OF NWFPS IN KERALA



[Source : Anjana Shanker and Muraleedharan, 1996]

b. Conditions for entry of new traders in the market: By rules, the NWFPs have to be collected by the societies and sold to the Federation for marketing. The collection and marketing of these products by private traders or their agents are treated as an illegal activities. Legally, there exists restriction on the entry of new traders (firms) into the wholesale markets.

c. Heterogeneity of the products: NWFPs are nature based and as a result they are generally heterogeneous unlike plantation products. As mentioned earlier, there are 119 commercially important NWFP items as per the Forest Department's list. Grading is done even within an item. For example, there are three grades of *Canarium strictum* (Kunthirikkam) and two types of honey. Due to this heterogeneity, there exists price variation within the products, which calls for formulation of separate marketing strategies.

d. Market integration: The integration of market is another factor which determines its structure and prices of the products. The NWFP markets are least integrated and consequently, traders can influence the factors affecting supply, demand and prices in each stage of marketing.

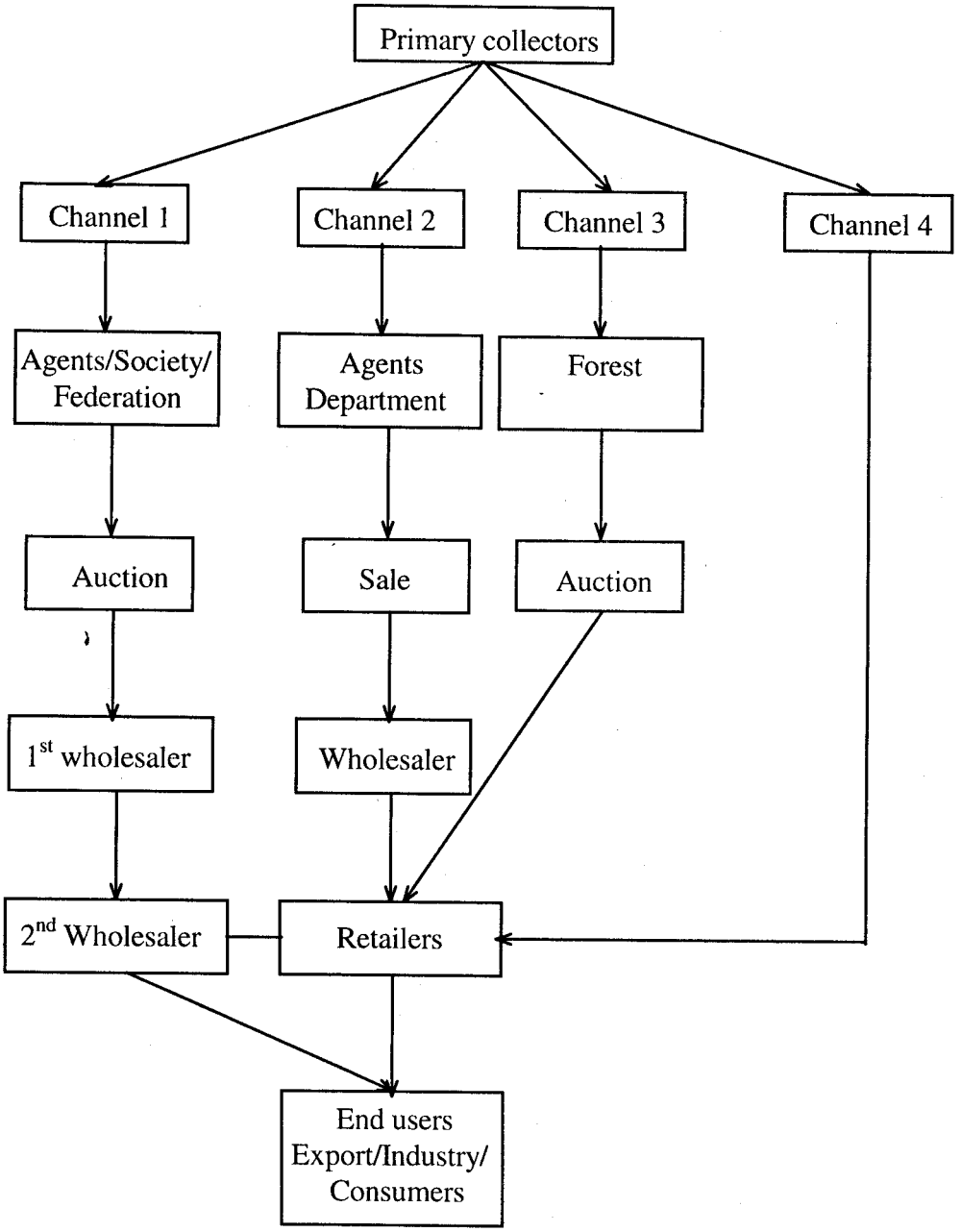
Marketing channels

With a view to eliminate intermediaries and to offer a fair price to both gatherers and consumers, some selected NWFPs are marketed by the Federation. In the case of certain perishable items such as *Phyllanthus emblica* and medicinal plants, the societies have been allowed to sell the products directly using the bill book of the Federation.

Agents are often engaged by the societies to gather perishable/semi-perishable products from the tribal people who either pass on the products to society or sell it to retailers. In the former case, the collected products are transported to the Federation's branch offices where the products are auctioned off. In most cases the auction is attended by the wholesalers who, after auction, sell the same either to the second wholesaler or retailer for marketing the products. In order to know the commodity flow, it is essential to identify important marketing channels, that is, the routes through which the products move from gatherers to consumers. The major marketing channels of NWFPs are depicted in Figure 3.10.

Figure 3.10

MARKETING CHANNELS OF NWFPS IN KERALA



The major marketing channels of NWFPs in Kerala consist of :

Channel I : Gatherers → Agents → Society → Federation → First wholesaler → Second wholesaler → Retailer → Consumer
Channel 2 : Gatherers → Agents → Wholesalers → Retailers → Consumers
Channel 3 : Gatherers → Forest Department → Retailers → Consumers
Channel 4 : Gatherers → Retailers → Consumers

Channel 1: Considering the quantum of products marketed and value realised, this is the most important marketing channel of NWFPs in Kerala. The distinct feature of this channel is that the tribal societies, the Federation and private traders play an important role.

The number of intermediaries depends on the nature of the products; the number will be more in the case of non-perishable products and less in the case of perishable goods. The agents, who purchase products from the tribal people, work in between the gatherers and society.

Generally, the auction of the Federation is attended by the first wholesaler (or his agent), who sells the products to the second wholesaler. The latter either exports it to other states or countries or sells to retailers who market the product locally. In the case of bulk purchase, the consumers, especially the agents of industrialists or pharmaceutical companies, prefer to purchase the products from either first or second wholesalers due to obvious reasons.

Channel 2: The second channel mainly consists of private traders. About 90 per cent of the items collected by the tribal people are sold to the societies and the rest to the private traders. In the case of NWFP items, which are not purchased by the societies. the private traders are the buyers. The second channel consisting of mainly private traders constitutes gatherers, agents, wholesalers, retailers and consumers. Unlike channel 1, there is no organised marketing of collected items in this channel. The quantity of products marketed is found to be less but more items are exchanged. Absence of the second wholesaler is another important feature of this channel.

Channel 3: This channel includes gatherers, the Forest Department, retail traders and consumers. The products collected by the gatherers are brought to a particular place and are auctioned by the officials of the Forest Department.

Generally, these products are purchased by the local retailers who are mostly owners of provision stores.

Channel 4: The fourth marketing channel of NWFP prevalent in many places in the state, comprises gatherers, retailers and consumers. The retailers are mostly owners of small provision stores, who, in addition to provisions, sell the NWFPs. Generally, the tribal people sell NWFPs for buying day to day provisions.

Price spread

The difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of products is often known as price spread (Acharya and Agarwal, 1987). This is, in fact, another way of looking into the margins taken by various parties involved in the marketing of NWFPs. The study of price spread assumes importance when the aim is to protect the interest of producers and consumers. These objectives can be ensured only if the services of intermediaries are made available at reasonable cost (Sharma and Tewari, 1996).

The price spread was worked out for a few selected items of NWFPs which are marketed through the first and second channels (Tables 3.17 & 3.18). The second channel did not market all the items marketed through channel 1. For the comparative purpose, price spread was estimated for only those items which are marketed through both the channels. Thus, in channel 2, the items selected are *Acacia concinna* (cheevakkai), *Phyllanthus emblica* (nellikka), *Desmodium velutinum* (orila), *Sida rhombifolia* (kummthotti) and honey.

The gatherer's share in the consumer's rupee is found to be slightly higher in channel **2** than that in channel 1. While this varied between 40 and 60 per cent for the selected products in channel 2, it was only between 24 and 58 per cent in channel 1. This could be due to the fact that the private traders were prepared to offer a price higher than that was offered by the societies to attract the products. Probably, this was due to the presence of the societies/Federation in the market as their price acted as a minimum price below which the private traders could not offer to collect the products. In the absence of the Federation, the private traders would offer only nominal amount to the gatherers and thus, to that extent, the societies/Federation held to maintain an attractive price in the market.

In channel 1, the Federation's share in the consumer's rupee varied between 3 and 29 per cent while it was between 5 and 42 per cent in the case of the first-wholesaler. The second wholesalers and retailers in the channel took more or less the same share in the consumer's rupee.

The absence of the second wholesaler was one of the main features of channel 2. But, the total margin generated by the intermediaries matches with that of channel 1 and is shared by the intermediaries in channel 2. The wholesalers and retailers were the two groups of intermediaries who take maximum margins in channel 2. The consumer prices were the same in the two channels, because the retailers in channel 2 could not follow different pricing in the market.

Marketing cost and margin

Generally, agencies involved in marketing vary, depending upon a variety of factors such as nature of the product, demand, distance of the market, etc. In the process of delivery of goods from producing centre to consuming centres, the marketing agencies have to incur certain costs such as cost on transportation, storage, handling, packing, etc., which are termed as marketing costs. The marketing margin is the remuneration taken by the marketing agencies for extending their services. An attempt is made here to analyse the margin and costs involved in the marketing of NWFPs because they will indicate the efficiency of the institutions involved in the marketing and will help to frame effective policies on marketing and pricing.

Table 3.17. Price spread, marketing cost and marketing margins in Channel 1

(Piice/l00 k g)

AGENCY	KUNTHIRI-KKAM	MARAM-ANJAL	CHEEVA-KKAI	KASTHU-RIMANJAL	GOOSE-BERRY	PATHIRI-POOV	ORILA	KURUM-THOTTI	HONEY	KADUKKA\
Gatherer's sales price	2520	450	630	1330	630	4500	825	600	4500	380
	(58.60)	(24.32)	(38.18)	(55.41)	(48.46)	(52.94)	(48.52)	(57.14)	(54.21)	(36.19)
Purchase price of Federation	2520	450	630	1330	630	4500	825	600	4500	380
	(58.60)	(24.32)	(38.18)	(55.14)	(48.46)	(52.94)	(48.52)	(57.14)	(54.21)	(36.19)
Marketing cost	20.00	26.00	24.00	25.00	15.00	37.00	30.00	30.00	23.00	28.00
	(0.46)	(1.40)	(1.45)	(1.04)	(1.15)	(0.43)	(1.76)	(2.85)	(0.27)	(2.66)
Sales price of Federation	3200	600	700	1600	850	7000	1050	750	6000	450
	(74.41)	(32.43)	(42.42)	(66.66)	(65.38)	(82.35)	(61.76)	(71.42)	(72.28)	(42.85)
Net margin realised	660	124	46	245	205	2463	195	120	1477	42
	(15.34)	(6.70)	(2.78)	(10.20)	(15.76)	(28.97)	(11.47)	(11.42)	(17.79)	(4.00)
Purchase price of first wholesaler	3200	600	700	I600	850	7000	1050	750	6000	450
	(74.41)	(32.43)	(42.42)	(66.66)	(65.38)	(82.35)	(61.76)	(71.42)	(72.28)	(42.85)

Figures in the parenthesis are percentage to consumer price)

Table 7 Contd..

Table 3.17 Contd…

AGENCY	KUNTHIRI-KKAM	MARAM-ANJAL	CHEEVA-KKAI	KASTHU-RIMANJAL	GOOSE-BERRY	PATHIRI-POOV	ORILA	KURUM-THOTTI	HONEY	KADUKKA
Marketing cost	34.00	36.00	33.00	35.00	38.00	32.00	30.00	30.00	30.00	31.00
	(0.79)	(1.94)	(2.00)	(1.45)	(2.92)	(0.61)	(1.76)	(2.85)	(0.36)	(2.95)
Sales price of first wholesaler	3500	1400	1200	1900	1050	7500	1500	900	7500	800
	(81.39)	(75.67)	(72.72)	(79.16)	(88.23)	(88.23)	(88.23)	(85.71)	(90.36)	(76.19)
Net margin of first wholesaler	266	764	467	265	162	448	420	120	1470	319
	(6.18)	(41.29)	(28.36)	(11.04)	(12.46)	(5.27)	(24.70)	(11.42)	(17.71)	(30.38)
Purchase price of second wholesaler	3500	1400	1200	1900	1050	7500	I500	900	7500	800
	(74.41)	(75.67)	(72.72)	(79.16)	(88.23)	(88.23)	(88.23)	(85.71)	(90.36)	(76.19)
Marketing cost	16.00	11.00	18.00	12.00	14.00	12.00	--	--	23.00	8.00
	(0.37)	(0.59)	(1.09)	(0.50)	(1.07)	(0.14)	--	--	(0.27)	(0.76)
Sales price of 2nd wholesaler	4200	1650	1450	2100	1155	8200	--	--	8000	900
	(97.67)	(89.18)	(87.87)	(87.50)	(88.84)	(96.47)	--	--	(96.38)	(85.76)

Table. 7 Contd...

Table 3.17 Contd …

AGENCY	KUNTHIRI-KKAM	MARAM-ANJAL	CHEEVA-KKAI	KASTHU-RIMANJAL	GOOSE-BERRY	PATHIRI-POOV	ORILA	KURUM-THOTTI	HONEY	KADUKKA
Net margin of second wholesaler	684	239	232	188	91	688	--	--	477	92
	(15.90)	(12.91)	(14.06)	(7.83)	(7.00)	(8.09)	--	--	(5.74)	(8.76)
Purchase price of retailer	4200	1650	1450	2100	1155	8200	--	--	8000	900
	(97.67)	(89.18)	(87.87)	(87.50)	(88.84)	(96.47)	--	--	(96.38)	(85.76)
Marketing cost	5.00	4.00	10.00	7.00	2.00	4.00	2.00	2.00	3.00	2.00
	(0.11)	(0.21)	(0.60)	(0.29)	(0.15)	(0.04)	(0.11)	(0.19)	(0.03)	(0.19)
Sales price of retailer	4300	1850	1650	2400	1300	8500	1700	1050	8300	1050
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Net margin realised	95	196	190	293	143	296	198	148	297	148
	(2.20)	(10.59)	(11.51)	(12.20)	(11.00)	(3.48)	(11.64)	(14.09)	(3.57)	(14.09)
Consumers price	4300	1850	1650	2400	1300	8500	1700	1050	8300	1050
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Table 3.18. Price spread, marketing cost and marketing margins in Channel *2*

(Price/100 kg

	CHEEVAKKAI	NELLIKKA	ORILA	KURUMTHOTTI	HONEY
1 Gatherer's sales price	650	650	830	610	5000
	(39.39)	(50.00)	(48.82)	(58.09)	(60.24)
Marketing cost	--	--	--	--	--
Net price received by the gatherers	650	650	830	610	5000
	(39.39)	(50.00)	(48.82)	(58.09)	(60.24)
2 Agent's purchase price	650	650	830	610	5000
	(39.39)	(50.00)	(48.82)	(58.09)	(60.24)
Marketing cost	10	8	20	20	15
	(0.60)	(0.61)	(1.17)	(1.90)	(0.18)
Agent's sales price	690	830	1040	745	5950
	(41.81)	(63.84)	(61.17)	(70.95)	(71.68)
Net margin realised	30	172	190	115	935
	(1.81)	(13.23)	(11.17)	(10.95)	(11.26)
3 Wholesaler's purchase price	690	830	1040	745	5950
	(41.81)	(63.84)	(61.17)	(70.95)	(71.68)
Marketing cost	30	32	29	28	30
	(1.81)	(2.46)	(1.70)	(2.66)	(0.36)

'able3.18 Contd…

	CHEEVAKKAI	NELLIKKA	ORILA	KURINTHOTTI	HONEY
Wholesaler's sales price	1200	1050	1500	900	7500
	(72.72)	(80.76)	(88.23)	(85.71)	(90.36)
Net margin realised	480	188	431	127	1520
	(29.09)	(14.46)	(25.35)	(12.09)	(18.31)
4 Retailer's purchase price	1200	1050	1500	900	7500
	(72.72)	(80.76)	(88.23)	(85.71)	(90.36)
Marketing cost	10	3	2	3	3
	(0.60)	(0.23)	(0.11)	(0.28)	(0.03)
Retailer's sales price	1650	1300	1700	1050	8300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Net margin realised	440	247	198	147	797
	(26.66)	(19.00)	(11.64)	(14.00)	(9.60)
5 Consumer's price	1650	1300	1700	1050	8300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Marketing cost: The gatherers of NWFPs do not incur any marketing cost as they do not use any sophisticated equipment for gathering or transportation or storage facilities to preserve their products for a long time. But the societies which purchase products from the tribal people incur both transportation and storage costs. The societies have to arrange temporary storage facilities in the collection areas and also at their headquarters. The collected products are to be transported from collection centres to society's headquarters and further to regional offices of the Federation. The cost incurred by the society for transporting the products from collection centre to the Federation's headquarters is met by the Federation and thus it is included under the item of cost of transportation of the Federation. During the successive stages of marketing, the transportation cost is met by the respective buyers, that is, first wholesaler, second wholesaler, retailer, etc.

Storage cost, which consists of godown charges and storage loss, constitutes another important item of marketing cost. The Federation has worked out storage loss for each of the items of NWFPs and this has been accounted for in the marketing cost.

The cost of marketing of the Federation, that includes transportation cost, storage cost, commission, handling and auction charges, etc. amounts to Rs.15 to 37 per unit (100 kg), depending upon the nature of the product (Table 3.17). In the successive stages of marketing, this varies from Rs.30 to 38 per unit for the first wholesaler, Rs.8 to Rs.23 for second wholesaler and Rs.2 to Rs.10 for the retailer. The Federation and the first wholesaler incur higher marketing costs because of longer distance of transportation and more storage loss in the initial period of marketing of NWFPs.

Marketing margins: There are two concepts of marketing margins viz., concurrent margin and lagged margin and the difference between these two mostly lies in their estimation. In the concurrent margin, the difference between prices prevailing at successive stages of marketing at a given point of time is taken whereas the difference between the price received by a seller at a particular stage of marketing and the price paid by him at the preceding stage of marketing is considered in the lagged margin (Acharya and Agarwal, 1987). In this study the concept of concurrent margin is used to estimate marketing margin.

Percentages of marketing margin taken by different market participants at different stages of marketing of selected NWFPs are shown in Table 3.19 given below.

Table 3.19. Marketing margins of selected items of NWFPs (%)

ITEMS	FEDERATION	FIRST WHOLESALER	SECOND WHOLESALER	RETAILER
Canarium strictum (Kunthirikkam)	20.63	7.60	16.29	2.21
Coscinium fenestratum (Maramanjal)	20.66	54.56	14.47	10.50
Acacia concinna (Cheevakkai)	6.57	38.91	16.00	11.51
Curcuma arornatica (Kasthurimanjal)	15.31	13.95	8.95	12.21
Phyllanthus emblica (Nellikka)	24.12	15.43	7.88	11.00
Myristica dactyloides (Pathiripoov)	35.18	5.97	8.39	3.48
Desmodium velutinum (Orila)	18.57	28.00	--	11.65
Sida rhombifolia (Kurumthotti)	16.00	13.33	--	14.09
(Honey)	24.62	19.60	5.96	3.58
Terminalia chebula (Kadukka)	9.33	39.87	10.22	14.09

It is obvious that the Federation and the first wholesaler take the highest margins in the marketing of selected products. In the first stage of marketing, the products are exchanged between one seller (Federation) and a few buyers (first wholesalers). The Federation, the single largest seller of selected NWFPs, enjoyed some monopoly power in the sale of their products and consequently, could have taken maximum margin. Due to a variety of reasons such as lack of adequate storage facilities, holding capacity, marketing set up and perishability of the products, it is not in a position to take this, but restricts itself to a moderate margin. The first wholesalers of NWFPs, who are very few, often collude and try to keep the auction price low. Further, they generally consult each other in determining the prices at the time of sale that provide them with a higher margin. Because of high competition and purchase price, marketing margins are less at the level of second wholesalers and retailers.

Economic efficiency of marketing of NWFPs

The marketing efficiency can broadly be classified into technical or operational efficiency and economic efficiency. The improvement of marketing efficiency as a result of adoption of better techniques is denoted as operational or technical efficiency. The marketing efficiency can also be attained or enhanced by the pricing mechanism that takes place in the various stages of marketing. This is generally known as marketing efficiency. An attempt was made to study economic efficiency of marketing in terms of value of goods sold, marketing margin and costs.

The economic efficiency of marketing of selected products has been examined with the following formula developed by Shephered (1965).

$$ME = \frac{V}{I} - 1$$

Where ME = Index of marketing efficiency
V = Value of goods sold
I = Total marketing cost including margin

The indices of economic efficiency worked for selected products are presented in Table 3.20. As is evident, the indices are low and vary between 100.20 and 141.50, indicating poor economic efficiency.

The indices showing economic efficiency of marketing which are worked out for selected products within and outside the state do not show much difference, although the same for outside the state is marginally higher (Table 3.21). This indicates that marketing efficiency outside the state is slightly better.

Table 3.20. Index for economic efficiency of marketing of selected NWFPs

ITEM	INDEX
Canarium strictum (Kunthirikkam)	141.500
Coscinium fenestratum (Maramanjal)	100.350
Acacia concinna (Cheevakkai)	100.617
Curcuma aromatica (Kasthurimanjal)	124.200
Phyllanthus emblica (Nellikka)	100.940
Myristica dactyloides (Pathiripoov)	112.500
Desmodium velutinum (Orila)	100.942
Sida rhombifolia (Kurumthotti)	100.200
Honey	118.400
Terminalia (Kadukka)	100.588

Table 3.21. Index for economic efficiency of marketing of selected NWFPs within and outside state.

ITEM	WITHIN STATE	OUT SIDE STATE
Canarium strictum (Kunthirikkam)	103.000	191.000
Acacia concinna (Cheevakkai)	100.892	124.000
Curcuma aromatica (Kasthurimanjal)	102.000	189.200
Myristica dactyloides (Pathiripoov)	101.400	162.300
Honey	114.200	132.700

NWFPs are 'free goods' to the gatherers as they are not paying money to any agency as collection charge. The collection charge paid to them by the societies is, at least theoretically, the cost of labour involved in the collection of these products. What they receive as collection charge is a nominal amount compared to the consumer price of these products and the difference constitutes marketing margin and costs incurred by different marketing agencies. Total marketing margin realised and cost incurred by the intermediaries are unduly high and it results in higher consumer prices and low collection charge for the gatherers. Thus, the cherished goals of the society and the Federation, that is, to avoid the middlemen from the marketing channels and to offer fair price to the gatherers and consumers, are not achieved. This has much implication on depletion of biodiversity of sustainable extraction that will be discussed later.

4. UTILISATION OF IMPORTANT NWFPS IN KERALA

Majority of NWFPs collected in the state is medicinal plants that are mostly used by the pharmaceutical companies within and outside the state. The pharmaceutical companies in the state require about 750 items of which 450 items are obtained within the state. Of these, only less than 50 items are supplied by the Federation (Ramanathan, Personal com. 1997). The rest of the items are supplied by the private traders within and outside the state. The utilisation of important NWFPs collected by the Federation is shown in Table 4.1.

Table 4.1. Utilisation of important NWFPs collected by the Federation

ITEM	USEFUL PART	USES	CONSUMERS	
			WITHIN STATE	OUT SIDE THE STATE
Honey		Food, medicine	Local people, Pharmaceuticals, Food industry	Pharmaceuticals, Food industry
Canarium strictum (Kunthirikkam)	Resin	Paint and varnish manufacturing, medicine, etc.	Paint and varnish industry, Pharmaceuticals	Pharmaceuticals
Bee wax	Bee comb	Preparation of molds, carpentry. medicinal balm	Cottage industry, Pharmaceuticals	Pharmaceuticals
Parmelia dialatata (Kalpasam)	Whole plant	Natural dyes, flavouring agent (spices)	Paint industry	Paint industry, local peoples
Myristica dactyloides (Pathiripoov)	Aril	Natural dyes, medicines, flavouring agent	Paint industry, Pharmaceuticals and common people	Paint industry
Phyllanthus emblica (Nellikka)	Fruit, bark	Food, medicines	Common people, Pharmaceuticals	Pharmaceuticals
Sapindus laurifolius (Urinchikkai)	Fruit	Cleaning metals, glasses etc.	Cottage industries, Toiletries, etc.	Exporters

Table 4.1 Contd...

Table 4.1 Contd..

ITEM	USEFUL PART	USES	CONSUMERS	
			WITHIN STATE	OUT SIDE THE STATE
Acacia concinna (Cheevakkai)	Fruit	Toiletries	Soap and shampoo manufacturing	Soap and shampoo manufacturing
Acacia caesia (Kolincha)	Bark	Toiletries	Pharmaceuticals	Pharmaceuticals
Acacia spp. (Pattincha)	Bark	Toiletries	Pharmaceuticals	Pharmaceuticals
Honey (small) (Apies sps.)	Honey	Food, medicine	Local people, Pharmaceuticals	Pharmaceuticals
Maranta spp. (Kuva)	Tubers	Food	Food manufactures	Food manufactures
Garcinia gummi-gutta (Kudampuli)	Fruit	Flavouring agent, medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Elettaria cardamomum (Cardamom)	Fruit	Spices and medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Hemidesmus indicus (Nannari)	Root	Flavouring material and medicine	Local people, Pharmaceuticals	Pharmaceuticals
Ricinus communis (Avanakkin veru)	Root	Medicine	Pharmaceuticals	Pharmaceuticals
Bridelia retusa (Mullilamkkuru)	Seed	Bio -insect repellent	Local people	Agriculturist
Piper sps. (Wild pepper)	Fruit, root	Spices and medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals

Table 4.1 Contd..

Table 4.1 Contd...

ITEM	USEFUL PART	USES	CONSUMERS	
			WITHIN STATE	OUT SIDE THE STATE
Asparagus racemosus (Sathavari)	Tuber	Food, medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Sida rhombifolia (Kurumthotti)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Rauvolfia serpentina (Amalpori)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Solanum indicum Chundaveru)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Clerodendrum serratum (Cherutheak)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Piper longum (Kattumulakuveru)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Holostemma ada-kodien (Adapathian)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Strobilanthes ciliatus (Karimkurinji)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Curcuma aromatica (Kasthurimanjal)	Rhizome	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Terminalia chebula (Kadukka)	Fruit	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals

Table 4.1 Contd...

ITEM	USEFUL PART	USES	CONSUMERS	
			WITHIN STATE	OUT SIDE THE STATE
Terminalia bellirica (Thanikka)	Fruit	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Entada rheedii (Kakkumkai)	Seed	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Rphidophora perrusa (Athithippali)	Fruit	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Desmosteachya bipinnata (Dharba)	Entire plant	Thatching	Local people	-
Pseudarthria viscida (Moovila)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Desmodium velutinum (Orila)	Root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Cyclea peltata (Padakizhangu)	Rhizome	Food, medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Coscinium fenestratum (Maramanjal)	Stem and root	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals
Curcuma aungustifolia (Manjakoova)	Rhizome	Medicine	Local people, Pharmaceuticals	Local people, Pharmaceuticals

5. MORE ON SUSTAINABLE EXTRACTION AND BIODIVERSITY

Ten NWFP species (annual and biennial) were selected to study their post-harvest regeneration pattern. The relationship between regeneration rate and harvest intensity was worked out with a linear regression model. The results indicates a negative relationship between the two variables in the selected species (Table 5.1).

Table 5.1. Regression analysis for predicting relationship between regeneration rate and harvest intensity

SPECIES	Est (a)	Se (a)	Est (b)	Se (b)	Adj R^2
Asparagus racemosus	121.7753	5.3305	- 0.2134	0.0754	0.7277
Hemidesmus indicus	130.3410	2.2188	- 0.2970	0.0314	0.9568
Sida rhombifolia	121.7616	6.6752	- 0.3115	0.0944	0.7840
Cyclea peltata	148.1931	14.7087	- 0.6036	0.2080	0.7373
Pseudarthria viscida	138.2114	8.0318	- 0.5181	0.1136	0.8320
Strobilanthes ciliatus	152.8368	8.7523	- 1.1498	0.1238	0.9552
Desmodium velutinum	171.2937	11.4018	- 0.9673	0.1612	0.8974
Curcuma aromatica	188.1834	9.6603	- 0.8614	0.1366	0.9064
Rauvolfia serpentina	182.9710	27.7568	- 2.0652	0.3925	0.8696
Baliospermum montanum	177.6975	3.6027	- 1.0431	0.0510	0.9905

Est (a) & Est (b) - Estimates of 'a' & 'b'
Se (a) & Se (b) - Standard error of 'a' & 'b'
Adj. R^2 - Adjusted R^2

Percentages of actual and proposed harvesting (based on regeneration index) of 10 selected commercially important species in the study area are worked out and shown in Table 5.2. The comparison shows that actual harvesting is significantly higher than the proposed harvesting, indicating unsustainable exploitation of NWFPs.

Table 5.2. Percentages of proposed and actual harvesting of NWFPs in the study areas and reasons for high/low harvesting

SPECIES	PROPOSED	ACTUAL	REASONS
			lect
Curcuma aromatica	95	100	Easy to collect
Hemidesmus indicus	95	59	Difficult to collect and low price
Cyclea peltata	*85*	*75*	Difficult to collect and low price
Baliospermum montanum	*75*	100	Easy to collect and high price
Desmodium velutinum	*75*	99	Easy to collect
Pseudurthria viscida	*75*	93	Easy to collect and high.price
Sida rhombifolia	*75*	93	Easy to collect and high price
Strobilanthes ciliatus	50	90	Easy to collect and high price
Rauvolfia serpentina	*25*	80	High price

In the context of commercial extraction, the prime consideration of the gatherers is to earn more income in the shortest time possible. They will resort to any method of collection whether it is sustainable or unsustainable. The collection of fruits of *Phyllanthus emblica, Myristica dactyloides, Mangifera indica* and *Hydnocarpus pentandra* is done by the lopping of branches. A more destructive way of collecting fruit is observed in the case of *Acacia concinna*. The base of the woody climber was cut off to avoid the effort of climbing. A few days later the fallen fruits are gathered from the ground. Collection of the bark, though not legal, is being done according to its demand. Bark is collected mostly in a destructive manner by removing as much quantity as the gatherers can remove. The bark of *Persea macrantha* is difficult to remove completely from the wood. Such bark is cut into small pieces and collected. It has been observed that trees with easily peeling bark like *Cassia fistula, Stereospermum colais* and *Butea monosperma* are affected most. On the other hand, species with brittle and easily non-separable bark like *Persea macrantha, Knema attenuata, Alstonia scholaris* and *Holarrhena antidysenterica* are found to withstand removal of a fair amount of bark if not girdled. Based on the observation made on the percentage of bark removed by the gatherer in the study area, it may be concluded that the removal of 15-20 per cent of bark in linear strips may not affect the trees as new bark will be formed in the stripped portion during the following years. While collecting rattans, both mature and immature ones over 1.5 m are collected. For extracting resins, cuts are made in the bark and the hardened resin is collected later. Sometimes fire is lit at the base of the trees to promote speedy exudation of resins. Consequent to over-exploitation,

fenestratum is getting depleted from the forests. Though the mature stem is the preferred medicinal part, due to its rarity even the roots are collected.

In general, the population of commercially exploited herbaceous species is not affected much by the present rate of extraction, largely due to the efficient and diverse regenerative methods capable of overcoming the exploitation rate. It is observed that while collecting roots of *Sida rhombifolia, Pseudarthria viscida, Rhynchosia rufescens* and *Desmodium velutinum* the smaller and weaker plants are left out and only robust plants are collected. The smaller and weaker plants could grow and become the seed source for the next growing season. The long and tuberous roots of *Hemidesmus indicus, Asparagus racemosus, Plumbago zeylanica* etc. are difficult to remove completely. These species are also capable of regenerating from left out roots. *Curculigo orchioides* regenerates through tuberous roots, leaf apices and seeds. The collection of *Curculigo orchioides, Hemidesmus indicus, Asparagus racemosus, Plumbago zeylanica, Curcuma aromatica* and *Cyclea peltata* does not affect the population. However, the genetic diversity is affected by the removal of vigorous plants. Thus, most of these species showed regeneration rate of 100 per cent, even when the harvest rate was 95 per cent. The availability of these plants can be further enhanced by replanting them immediately after collecting the tuberous

Collection of honey is also unsustainable because collection is done before the formation of larvae in the honey combs. Honey is collected usually during night in order to escape the attack of bees. A lighted torch is held close to the honey combs to drive away the bees. In this process some of the bees also get killed. Later, the lighted torch is put down and the bees go after the torch.

Unsustainable extraction is one of the major causes for the depletion in the biodiversity of NWFPs. It has long term adverse effects on the population, which will be detected only in the long run (Bawa and Hall, 1992).

Reasons: In olden days NWFPs were gathered by the tribal people merely for subsistence and local sales. They harvested a variety of products, but in small quantities partly because of low demand and partly due to the consideration of sustainable use. However, NWFPs are a part of larger forest ecosystem and its sustainability, to a great extent, depends upon sustainability of forest ecosystem. Because of large scale deforestation due to selection and clear felling in order to make land available for developmental works, encroachment and implementation of plantation programmes in the past, the

NWFP resources also depleted drastically. Furthermore, the demand for NWFPs on a commercial scale has increased.

It may be pointed out here that the right of collection of NWFPs in the state is restricted to the tribal communities who have traditionally followed a set of rules and practices regarding collection. For instance, each tribal hamlet is allotted a particular area in the forests for collection and members of other hamlets are not allowed to collect the products from that area, aiming to avoid competition among them and consequent over exploitation. With increase in population and mounting economic pressures, these rules as well as the sustainable way of harvesting NWFPs are often neglected by them.

As less than 50 items are gathered by the tribal people for the Federation, other items are gathered by non-tribals for private traders. The non-tribals seldom observe the rules of sustainable harvesting. As the tribal people have no property rights or voice in the management of NWFPs, they are not interested in preventing illegal collection by the non-tribals. Many a time the tribal people are forced to compete with the non-tribals in the collection of certain items of NWFPs. This makes NWFPs an open access resource and for that reason results in its depletion.

The institutions such as the Federation and societies are established mainly to formulate and implement extraction strategies, to streamline the management of NWFPs and to uplift the socio-economic conditions of tribal people. In the context of increased demand for certain products and consequent changes in prices, the institutions are forced to collect products having high demand. Lured by high prices, the gatherers have undertaken intensive harvesting of premium items which resulted in changes in the species composition. This has some cumulative effect on biodiversity of the location and depletion of the resource (Peters, 1996). Further, due to lack of proper policies and programmes, the objectives of the institutions have not been achieved. For example, they do not attempt to make sure that the products are being sustainably harvested without affecting ecological set-up of the landscape as well as socio-economic conditions of the tribal people. In the absence of proper management, intermediaries are playing a very important role in both collection and marketing chain. Similarly, with the lack of proper pricing policy, the gatherers are getting low collection charge compared to final consumer price. As a result, their real income has not increased over time. In order to maintain their standard of living, they resort to an intensive extraction of NWFPs which affects its biodiversity and sustainable use.

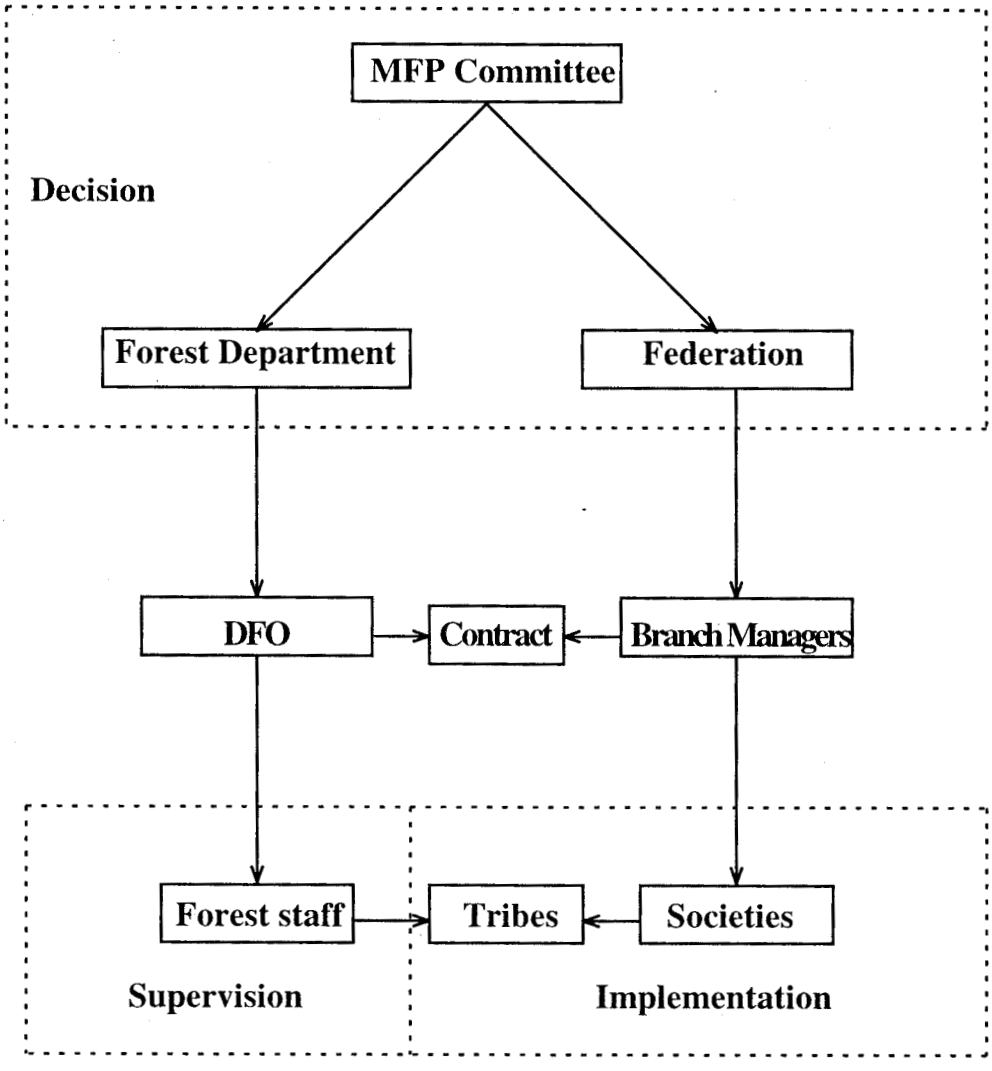
Remedy: Now the question is how to prevent the unsustainable extraction and depletion of biodiversity of NWFPs. A number of remedies like creation of awareness among the tribal people, control over middleman, better pricing of products etc., can be suggested for this, but they can at best be a temporary preventive. Most of the problems in this sector originated from the present management system that needs to be reoriented.

In Kerala, timber resources in the forest are managed by the Forest Department, whereas a number of institutions or groups are involved in the management of NWFPs. The decision regarding collection of NWFPs is taken by a state level committee viz., the MFP committee. It is then passed on to the Forest Department and the Federation. Based on this, the Forest Department and Federation give instructions to the local Divisional Forest Officers (DFO) and branch managers respectively for signing a contract for collection. Then the branch managers of the Federation engage tribal societies for collection and the tribal people are employed for the same. Generally, the officials of the Forest Department at the collection area are supposed to supervise the collection. Thus it may be concluded that, unlike timber resources, there is the participation of different groups in the management of NWFPs.

There are different types of participation of which the most important are participation from above and participation from below. While the former is mobilisation from above, the latter constitutes distribution of power at the grass root level. Mobilisation has an element of force and mobiliser gives direction to be accepted without questioning. The present system of management of NWFPs can be categorised as participation from above in which the decisions regarding collection and marketing are taken by the MFP committee, the Forest Department and the Federation and thrust upon societies and tribals, who obey the same (Figure 5.1). Unless they feel that they are a part of the system they will not show much interest to conserve the biodiversity. This calls for adoption of a better and alternative system of management of NWFPs, giving more power to groups at the grass root level. An appropriate system of management for maintaining biodiversity and sustainable use of NWFPs is presented in the next section.

Figure 5.1

PRESENT MANAGEMENT SYSTEM OF NWFPs IN KERALA



6. PARTICIPATORY MANAGEMENT OF NWFPs

ORIGIN OF PARTICIPATORY FOREST MANAGEMENT

India's first Forest Policy dates back to over hundred years. Under the British rule, the state established monopoly control over forests, reserved large tracts for extraction of timber, and other developmental activities and encouraged plantation of commercially profitable species. After independence, state monopoly over forests continued with the extension and strengthening of the British policies, including curtailment of the local people's rights to collect NWFPs, which gave hurdles to forest conservation (Guha, 1989). Further, with the degradation of forest, the life of the local people, who live inside or in the periphery of forest land depending on its resources for their sustenance deteriorated, as the socio-economic and cultural systems of these people are inter-linked with the ecology of the forest. The traditional forest management that relied on forces and fences to protect the forests left a lot to be desired. The forest management programmes have to be re-oriented so as to respond to the local community's needs also. Only when the preservation need coincides with the interests of the local communities can forests be effectively protected. Thus, the local communities must be motivated to identify themselves with the development and protection of forests by making the forest produce available to them preferentially and continuously.

The success in protecting natural sal *(Shoreu robusta)* forests with community participation under participatory management scheme in the Arabari Block of Midnapur district in West Bengal and the 'chipko' and similar movements elsewhere in 1970's, marked the origin of participatory forest management in the country. The new forest policy of 1988 which shifted the focus from commercial forestry to environmental forestry, satisfying minimum needs of the people and strengthening tribal-forest linkages, suggested the implementation of participatory forest management (Bhise and Metha, 1996). Now 20 states in the country have implemented this programme to protect their forests.

Box 6.1

Main features of participatory forest management

In a major shift from the earlier system of forest management the Ministry of Environment and Forests, Government of India issued policy instructions to all the State Forest Departments on June 1st 1990, promoting active participation of local communities and NGOs in regeneration, management, protection of degraded forest tracts. The major provisions of these guidelines are summarised below.

1. The programme should be implemented under an arrangement among the voluntary agency/NGO, the village community (beneficiary) and the State Forest Department.
2. The beneficiaries should be entitled to a share in usufructs to the extent and subject to the condition prescribed by the state government.
3. Access to forest land and usufructory benefits should be only to the beneficiaries who get organised into a village institution, specifically for forest regeneration and protection.
4. Areas to be selected for the programme should he free from claims of any person who is not a beneficiary under the scheme. The selected site should be worked out in accordance with a working scheme which should he prepared in consultation with the beneficiaries.
5. For raising nurseries, preparing land for planting and protecting the tree after planting, the beneficiaries should hc paid hy the Forest Department.
6. It should be ensured that there is no grazing at all in the forcst land protected by the village community and stall feeding is to be promoted. No agriculture should bc permitted on the forest land.
7. Along with trees lor fuel, fodder and timber, the village community may he permitted to plant fruit trees, medicinal plants and trees helping soil and water conservation.
8. The benefit of people's participation should go to the village communities and not to commercial or other interests.
9. The Forest Department should closely supervise the works of the

Participatory forest management is a new system of forest management based on the co-operative interaction between Forest Department and local communities to protect forest lands from degradation which is taking place at an alarming rate. In this system of management the Forest Department and the local communities become equal partners in the protection, regeneration, management and benefit-sharing. The strategy is to create employment

opportunities for the local communities through resource building activities and sharing of benefits. Resource development activities are identified taking into consideration their needs and priorities and the physical potential of their environment. Micro plans are thus prepared in consultation with community members giving them a variety of options to choose from (Palit, 1993). In participatory forest management emphasis is given on regeneration of natural forests through protection rather than afforestation, as it is monetarily beneficial and more effective.

ISSUES

An understanding of the major issues involved in the implementation of participatory forest management in other states helps frame a better strategy for Kerala. One of the major issues is found to be the lack of co-operative interactions between the officials of Forest Department and the local communities. Traditionally, there has been a rift between both these groups in the country. The officials of Forest Department consider that the local communities are a problem in implementing policies and programmes of the Department. Conversely, the local communities treated the forest officials as usurpers of their legitimate right. Over the years, the misunderstanding continued and the rift between them widened. However, participatory forest management anticipates a totally different approach from the forest officials as well as local communities and envisages opening of new communication channels between the two and establishing mutually beneficial co-operative activities.

The nature and extent of participation of the local communities in forest management programmes is another issue. Participation is a continuous process and this can be identified as a process to release people from being the subject of development and to make them agents of modernisation and change. For effective implementation of programmes of participatory forest management, an active participation at the grass root level is called for. But this is lacking in many places where participatory forest management is implemented.

In order to achieve participatory forest management, the area selected for implementation must be need-based. The participation of local communities is high when their demand for the forest products is more. Thus, this system of management may be more successful, if it is implemented in degraded

areas, where the local communities are starved of the forest products or in areas, where the local communities highly depend on forests for their livelihood.

Similarly, the objective of the management should be defined clearly. For instance, it has to be clear as to whether the focus of management is regeneration of forests or water conservation or biodiversity conservation. Lesser the number of objectives, more are the chances for success of the programmes. Further, the participating communities at the local level, must be homogeneous groups with common interests, as this helps to lessen the internal conflict.

PARTICIPATORY FOREST MANAGEMENT IN KERALA

Although a number of states in the country have adopted participatory forest management, Kerala has not yet initiated steps to introduce this system. Recently, Kerala Forestry project submitted to the World Bank by Kerala Forest Department for funding has given high priority for the implementation of participatory forest management in the state, allotting about 40 per cent of the total project fund for this programme (Ouseph, Personal Com.). Therefore, an action plan for participatory management of NWFPs in Kerala is outlined here keeping in background the findings of the present study.

PARTICIPATORY MANAGEMENT OF NWFPs : AN ACTION PLAN

A number of institutions or groups, starting from MFP committee to the tribal people, which are interested in the development of NWFPs, are involved at different levels of its management in Kerala. But this is characterised mostly as participation from above (i.e, mobilisation type), in which decisions regarding various aspects of management are taken from above and thrust upon various parties at local levels. Since the tribal people have no voice in the management of NWFPs they are not very much interested in protecting the resources or in preventing illegal collection of the products by the non-tribals. There is a competition between tribal and non-tribal in the collection of products resulting into unsustainable extraction and depletion of biodiversity. On top of it, a number of intermediaries are associated with the collection and marketing of NWFPs in addition to the societies and the Federation. This affects the interests of the gatherers adversely with the result that they pay less attention for the development of

NWFPs. All these indicate the inherent weaknesses of the present system of management and it calls for an alternative. This lies in the implementation of a very effective system of participatory management by the interest groups at the local levels for sustainable management of NWFPs along with conservation of biodiversity.

Given the foregoing types of issues faced by some other states, a participatory management action plan for the sustainable management of NWFPs for Kerala is proposed here.

Focus: The participatory management action plan proposed here focuses on sustainable management of NWFPs, consisting of sustainable harvesting and regeneration, along with biodiversity conservation, with the active participation of interest groups regarding the development of these products.

Strategies: As part of the preparation of participatory action plan the following strategies are suggested to tackle some of the issues which may crop up:

- Management of NWFPs is to be carried out by the interest groups, giving more emphasis to local level planning.
- Stress should be given for opening new communication channels between the Forest Department officials and the local communities for establishing mutually beneficial co-operative activities.
- The areas selected for implementing participatory management should be need based.
- Participating communities, as far as possible, must be homogeneous groups with common interest and socio-economic conditions.
- The objectives of the participatory management should be limited. The micro plans in the participatory management must be prepared on the basis of elaborate pre-plan survey with the help of participating communities.
- Since the ownership of forest is vested with the Forest Department it must expedite official formalities on various issues such as permission for collection of NWFPs and its transportation from the collection centres to the Federation's godown, etc. at the appropriate time.

COMPONENTS OF THE ACTION PLAN

The following are the important components of the proposed action plan:

Constitution of committees

Two committees, one at state level and other at local level are proposed to be set up to implement the programme effectively.

a. State-level Steering Committee: On the lines of MFP Committee, a separate committee at state level, consisting of representatives of interest groups may be formed to prepare rules and regulations and guidelines regarding various aspects of participatory management of NWFPs. The committee is to be headed by a top official of the Forest Department. It has only advisory role and has to evaluate the progress of the programmes at state level.

b. Resource Management Committee (RMC): The RMC is to be constituted at the grass root level with the aim to formulate and implement plans and programmes of participatory management. This is more or less similar to the Forest Protection Committees constituted in other states to implement participatory forest management. The major difference between these two committees lies in their focus of management and membership. While forest protection committee gives emphasis to protection of forests and extraction of its products, the resource management committee focuses on sustainable management of NWFPs along with its biodiversity conservation. Further, in participatory management implemented in other states, members of the Forest Protection Committee are mainly the Forest Department and the local communities whereas, the representatives of other interest groups (Range Officers, secretaries of tribal societies, branch managers of Federation, tribal people, employees of pharmaceutical companies) constitute the members of Resource Management Committee. However, both envisage better socio-economic conditions of the participating communities. This Committee may be registered with the local DFO, who allots forest ranges for collection of NWFPs. Rights and responsibilities of RMC may be defined and their performance and progress achieved may be evaluated at the local level. This committee is responsible for preparing and implementing micro plans in the participatory management programme. Since this committee constitutes a large number of people, an executive committee for day-to-day administration and management may be elected from the general body.

Training and education

Training and education must be organised both for forest officials and participating communities for the successful implementation of participatory forest management. In the training, orientation should be given to the forest officials to sensitise the needs of the people and to develop co-operative interaction between the forest officials and participating communities. Similarly. mass education and environmental awareness programmes should be organised for the local communities to develop management skill and to ensure effective participation. Special training should also be given to the members of resource management committee for:

- identification of NWFPs
- scientific extraction, proper harvest assessment and harvest adjustments
- pre-processing and semi-processing activities
- propagation and planting of various NWFPs
- conducting socio-economic survey and marketing studies
- preparation of micro plans.

The necessary curriculum for training may be developed and a group of resource persons for giving training may be identified.

Preparation and implementation of micro plans

A micro plan is a written document that is prepared through a consultative process, involving interest groups (Mehta and Verdhan, 1996). In a participatory management system, the micro plan primarily aims at improving socio-economic conditions of participating community by managing the available forest resources. The micro plan is slightly different from the working plan prepared by the Forest Department. While the former is more time bound, covering a small unit like a village, the later covers the entire forest divisions with emphasis on long term benefits (Mamita Bora, 1997). Since technical aspects of preparation of micro plan are known, not much attention is paid here to deal with'.

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1 Based on experienccs of some of the northern states that have implemented participatory management, the Tata Energy Research Institute has brought out a series of publications on Joint Forest Management of which a publication is devoted for the preparation of the microplanning (Mehta and Verdhan, 1996).

Box 6.2

Microplan - form and character

- The microplan should he a written document.
- The document should be written in the regional language, so that it can be understood by the field staff and villagers, the main players concerned with implementation of the plan.
- The document should he written in simple language; it should he brief and objective.
- The microplan should be flexible. There should he a provision to review the plan and scope for amendment, if required. After modifications at different stages, the prerogative of finalisation and adoption of the plan should rest with the General Body of the village institution.
- Microplans should he prepared for a period of five years.
- There should he one microplan for each village institution, since a village institution is the unit which will take responsibility for implementation of the plan.
- A system of monitoring should he built within the plan.

[Source : Mehta and Verdhan (1996) p.22]

Good micro plan will be simple and flexible. It should ensure people's participation and equitable distribution of resource and satisfy priority needs of various interest groups (Mehta and Verdhan, 1996; Mamita Bora, 1997).

A micro plan for the development of NWFPs may contain details on :

- socio-economic conditions of the participating communities
- details of biophysical conditions of the management sites and availability of species
- present management practices
- allocation of the area for different activities
- regeneration status and various silvicultural practices and time table for various operations
- man power requirements and planning
- collection, marketing and pricing policies
- duties and responsibilities of the interest group working in the resource management
- methods of evaluation of the programme

Box 6.3

Process of development and implementation of a micro plan

- The unit of a micro plan should be a socially viable unit of organisation. It could be a hamlet. a sub-group, a village, a revenue village, or a cluster of villages.
- The micro plan should be the basis for planning at the Divisional level, where such activities as allocation of resources and scheduling of activities will he taken into considerations.
- The FD along with the local NGO should play a prominent role as facilitator and help the community in developing the micro plan.
- While preparing a micro plan, discussions and deliberations should take place at a sub-group level (of class, caste, gender, etc.). However, the entire General Body of the village institution has to he involved in order to ensure transparency, consensus, and meaningful participation.
- While preparing a micro plan, such factors as existing use patterns of the community, and their nature and extent of dependence on resources should be taken into consideration.
- While preparing a micro plan, such socio-economic factors as equity, gender sensitivity, and subsistence needs of the user groups should be taken into consideration.

[Source : Mehta and Uerdhan (1996)p.21]

Micro plan must be prepared on the basis of detailed pre-resource survey with the help of all the interest groups.

Institutional support

The Forest Department and the Federation have to play an important role in the participatory management programme by giving institutional support in terms of people and money. They can assist the resource management committee through utilisation and equitable distribution of resources and conducting timely election of managing committee. A part of the development fund of the Forest Department and a portion of profit earned by the Federation from the sale of NWFPs have to be set apart for the implementation of the programme. The fund allotted for local level planning by the state government for the development of NWFPs may also be used for this purpose. In each region, a Non-Governmental Organisation (NGO) may be identified to work in the programme as a facilitator which can assist

resource management committee by keeping records of the meeting, maintaining accounts and resolving the conflict between different interest groups.

Research support

Research institutions like the Kerala Forest Research Institute, the Kerala Agricultural University, the Tropical Botanical Garden and Research Institute, etc. can actively participate in the programme by undertaking studies on various technical, socio-economic, ecological, conservation of biodiversity and institutional problems relating to this programme. Impact of this programme on sustainable management and biodiversity conservation of NWFPs has to be assessed. They can also undertake inventory survey and develop/demonstrate suitable planting techniques.

Evaluation

Evaluation must he undertaken at different stages of implementation of the programme by various agencies and a copy of the report must be given to resource management committee. The evaluation should be focused on at least three aspects: improvement of socio-economic conditions of the participating groups, the level of biodiversity of the NWFPs and availability of resources to the users.

POSSIBLE IMPACTS OF PARTICIPATORY MANAGEMENT ON INTEREST GROUPS

Results of an attempt made to elicit the opinion of various interest groups regarding the participatory concept in the management of NWFPs show an encouraging sign. Invariably, the representatives of all the interest groups supported the idea of participatory management. The possible impacts of this type of management on interest groups, as conceived by them, are listed below.

INTEREST GROUPS	IMPACTS
Forest Department	Conserves biodiversity of NWFPs and enhances the value of forests, more co-operation from participating communities for implementing various programmes
Federation	Increase in the quantity collected, avoidance of middlemen from marketing chain, increase of sale value and profit.
Societies	Avoidance of agents from collection chain, direct dealings with tribal people, increase in the quantity collected and income, less corruption and more co-operation from the Forest Department.
Tribal people	Direct dealings with societies, sustainable harvesting, increase in employment opportunities and income, prevention of illegal collections and protection of NWFPs.
Users : Industry	Increase in the availability of products, leading to sustained Supply and enhance income and employment.
Consumers	Availability of products at low prices.

Implementation of the proposed participatory management programme is comparatively easy in Kerala due to a number of reasons. Firstly, it is mainly focused on the development and management of one group of products. Secondly, the conflicts among the interest groups of NWFPs are less. Further, it requires only re-orientation of the existing management programmes, giving more emphasis to local level planning and management. Since collection of NWFPs by tribal communities is legally permitted, the official formalities to implement the programme are less.

7. SUMMARY OF RESEARCH FINDINGS

The report is concluded by highlighting the major research findings of the study of the three areas of tropical moist forests of Kerala.

1. In the study areas, 229 NWFP species are recorded of which only about 50 species are commercially being exploited. High rate of extraction of these products carried out by the gatherers results in poor density, sparse distribution and depletion of biodiversity.

2. Illegal, unscientific and frequent harvest of bark and whole plants of many NWFP species and high rate of extraction represent unsustainable exploitation of resources being practiced by the local people in tune with the increasing market demand for such items and changing socio-economic situations. Variations in the annual collection of NWFPs observed in the analysis give further support to the inference of unsustainable exploitation of resources.

3. Phytosociological studies indicate that in the study sites, a stage has not yet reached whereby the tree cover reduces the understorey plant cover. It stands to reason that there is an opportunity to promote increased production of both tree and understorey NWFPs in sites similar to the study areas.

4. For sustainable resources use, one needs to consider the regeneration rate of resources also. However, post-harvest regeneration capacity varies among species depending upon the method of their regeneration. The study demonstrates that in the case of vegetatively propagating species, the regeneration index is 100 per cent or above even when the harvest is as high as 95 per cent, On the other hand, in the case of plants regenerated through seeds, 35 to 50 per cent harvest is the sustainable limit.

5. No attempt is made by any agencies relating to collection of NWFPs to prevent its depletion by undertaking enrichment planting of any species in the study areas. Thus, studies were conducted to standardise propagation of selected plants yielding NWFPs. The preliminary trials indicates that cost effective and simple methods of propagation could be developed for certain species of NWFPs. The enrichment planting undertaken in the study areas indicates positive results.

6. The study has observed that certain socio-economic and institutional factors have contributed much to the present state of unsustainable extraction and depletion of biodiversity of NWFPs in the study areas.

7. The Federation, the apex body of co-operative societies, gathers only premium products and thus, is not able to supply other items required by the user groups. This further results in the decline of knowledge base of the tribal communities regarding NWFPs and the increase of illegal collection by the non-tribals. The Federation has no professional managers. Marketing is its weakest link. The NWFP trade is profitable. But the Federation is running on loss as it has engaged in other unprofitable activities. Due to financial stringency, it is not in a position to carry out more programmes for the development of NWFPs.

8. The collection charge has increased over time but the real income of the tribal people from the collection has not increased. In order to maintain their standard of living they have to earn more income. This is effected through over exploitation of premium products, which leads to depletion of biodiversity.

9. Although the Federation and societies are established to eliminate intermediaries, the latter still .play a key role in the production and marketing chains and take maximum profit. Thus, the institutions are unable to protect the interest of the gatherers and consumers.

10. Since societies and tribal people have no voice in the management of NWFPs, they do not show much interest in protecting and conserving these products. Given the shortcomings of present management system, participatory management at local level is considered the best management system for the development of NWFPs. For, it focuses on the management of one group of products, provides less conflicts among the interest groups and requires only re-orientation of the existing management system, and gives emphasis on local level planning.

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APPENDIX 1

SOCIO-ECONOMIC CONDITIONS OF SELECTED TRIBAL COMMUNITIES

The socio-economic details of the selected tribal communities, viz., the Kattunaickan, Cholanaickan, and lrulas are presented in Table A-I. Of the total sample of 349 tribes, Cholanaickans constitute 32.66 per cent while Kattunaickans and Irulas form 37.53 per cent and 29.79 per cent respectively. Among the target groups, Kattunaickans and Cholanaickans represent primitive tribal communities.

Literacy level is highest among the Cholanaickans (51%).This is attributed to the regular functioning of a school in the settlement. Illiteracy among the Kattunaickans (92%) is mainly due to lack of interest and proper motivation.

With an average ground space of 45 sq feet, most of the Cholanaickans live in 1-2 rooms-hut. Most of their structures are tiled with the help of Integrated Tribal Development Project (ITDP). The Irulas live on their own land and with the help of ITDP and Tribal Department many have replaced their age old traditional thatched structures with concrete houses. The Cholanaickans and Kattunaickans live in houses thatched with leaves or grasses. The floor is generally layered with mud or cow-dung. Given exception to the concrete structures, the houses of Kattunaickans and Cholanaickans are not strong structured while those of the Irulas are far better off.

The tribal economy is purely an agrarian one, based primarily on the collection of NWFPs and agriculture. As is evident from the table A.l only the Irulas among the target groups possess land and undertake cultivation. Nearly one half (47 per cent) of them are semi-medium holders of land and the rest are marginal holders. The main crops are Finger millet, Little millet, Cotton, Bengal gram, Pigeon pea, Maize. About 38 per cent of the cultivation is dominated by Cotton followed by Finger millet and Little millet.

Table A-1. Details of socio-economic conditions of selected tribal communities

SELECTED VARIABLES	CHOLANAICKAN	KATTUNAICKAN	IRULAS
Households (Nos)	24	29	25
Population (No.)			
Male	65 (57)	65 (49)	58 (56)
Female	49 (43)	66 (51)	46 (44)
Literacy level (No.)			
Literate	58 (51)	11 (8)	32 (31)
Illiterates	56 (49)	120 (92)	72 (69)
Housing structure			
Room: 1	20 (83)	--	7 (28)
2	4 (17)	--	9 (36)
3	--	8 (28)	8 (32)
4	--	9 (31)	--
5 & above	--	12 (41)	1 (4)
Roof: Tiles	22 (92)	10 (35)	5 (20)
Thatched with grass	1 (4)	--	--
Thatched with leaves	--	--	14 (56)
Concrete/sheet	1 (4)	19 (65)	6 (24)
Floor : Cemented	13 (54)	5 (17)	11 (44)
Cow dung/mud	11 (46)	24 (83)	14 (56)
Wall : Mud	3 (13)	19 (65)	--
Wood andmud	--	--	10 (40)
Bamboo	1 (4)	--	--
Bricks	12 (50)	--	15 (60)
Cemented	8 (33)	10 (35)	--
Healthcare and Medicine			
Allopathy	12 (50)	27 (96)	24 (100)
Ayurveda	12 (50)	--	--
Mooppan	--	1 (4)	--
Land holdings (size of holdings in ha.)			
0-1.0	--	--	4.25 (12)
1.0-2.0	--	--	15.18 (41)
2.0-3.0	--	--	17.41 (47)
Cropping pattern			
Finger millet	--	--	8.70 (33)
Little millet	--	--	5.77 (22)
Cotton	--	--	10.12 (38)
Bengal gram	--	--	1.42 (5)
Pigeon pea	--	--	0.30 (1)
Maize	--	--	0.40 (1)

Table A-1

Table A-I Contd…

SELECTED VARIABLES	CHOLANAICKAN	KATTUNAICKAN	IRULAS
Livestock (No.)			
Goat	-	-	4 (9)
cow	--	7(19)	21 (47)
Hen	-	23 (64)	20 (44)
Bull	-	6 (17)	--
Income : Different sources			
NWFPs collection (1996)	3824 (79)	8333 (88)	1697 (26)
Agriculture (1996)			3210 (49)
Wage labour (1996)	1020 (21)	1110 (12)	I705 (25)
Total Income: 1996	4844	9443	6612
Indebtedness (Rs.)			
Total amount horrowcd	47885	2260	--
Amount paid	3575	470	--
Amount not paid	44310	1790	--
Amount balance as % for amount taken	93	79	--
Average debt of households	1995	77	--
No of borrowings	28	13	—
Average amount of borrowings	1710	176	
Source of borrowings			--

Note : Figures in parenthesis represent percentages to respective total

NWFPs, on which both the Cholanaickans and Kattunaickans depend for their livelihood (they are traditionally NWFP collectors) form the major source of their income. The Collection of NWFPs accounts for 79 per cent and 88 per cent of the total income of Cholanaickans and Kattunaickans respectively. Besides NWFP collection, they also engage in wage labour employment. Apart from NWFP collection and agriculture, the Irulas engage themselves in daily wage employment in the non-tribal's fields and in the Forest Department on such works as tree cutting, loading, fire-line, etc. It is during the monsoon seasons that they seek employment elsewhere. In all the three communities, women perform routine household chores and help in selected agricultural tasks. Such activities which require venturing farther away from their settlement (e.g. marketing, food collection etc.) are taken care of by the men. The collection of fuel wood is undertaken equally by both men and women.

Livestock population is high among the Irulas. They engage in cattle rearing also. Cattle population is low among the Kattunaickans as they live within the Reserve Forest and thus are exposed to wildlife threat.

Incidence of morbidity is high among the Kattunaickans followed by Cholanaickans and Irulas. Common ailments found among them are skin diseases, heart disease, rheumatic compliant, fever, head ache, cough, etc. The traditional mode of treatment of depending on the Ooru mooppan (tribal chief) is replaced by their dependence on Allopathic and Ayurvedic treatment.

Indebtedness is a curse among the tribal communities. Average debt among the Cholanaickans and Kattunaickans amounts to Rs. 1995 and Rs.77 respectively during 1995-1996. They borrow mainly to meet their day to day requirements. The private provision shops form a main source of borrowing. Indebtedness though prevalent among the Irulas, has not been reported.

APPENDIX 2

Table A-2. List of NWFP collected from the forests of Kerala
(Prepared by the Forest Department)

SL. NO.	MALAYALAM NAME	SCIENTIFIC NAME
1	Adapathian	*Holostemma ada-kodien*
2	Athithippali	*Raphidophora pertusa*
3	Amalpori (red)	*Rauvolfia serpentina*
4	Amalpori (white)	*Rauvolfia serpentina*
5	Adalodakam	*Adhatoda zeylanica*
6	Edampiri-Valampiri	*Helicteres isora*
7	Eenthappana	*Cycas circinalis*
8	Urinchikai	*Sapindus laurifolius*
9	Eramkol (grade 1)	*Oxytenanthera monostigma*
10	Eramkol (grade 2)	*Oxytenanthera monostigma*
11	Elakkai	*Elettaria cardamomum*
12	Odamaram	*Sarcostigma kleinii*
13	Orila	*Desmodium velutinum*
14	Kacholam	*Kaempferia galanga*
15	Kadukka	*Terminalia chebula*
16	Kadukkathode	*Terminalia chebula*
17	Kannadivella (low quality)	*Vateria indica*
18	Kannadivella (low quality)	*Vateria indica*
19	Kannadivella (high quality)	*Vateria indica*
20	Kakkumkai	*Entada rheedii*
21	Kayyonni (kunjunni)	*Eclipta alba*
22	Karinkurinji	*Strobilanthes ciliatus*
23	Karinkurinji	*Strobilanthes ciliatus*
24	Karinthen	--
25	Kalpasam	*Parmelia dilatata*
26	Kasthoorimanjal	*Curcuma aromatica*
27	Kazhanji	*Caesalpinia bonduc*
28	Kattar vaazha	*Aloe vera*
29	Kaanjiram	*Strychnos nux-vomica*
30	Kaattinchi	*Zingiber zerumbet*
31	Kaatukurumulaku	*Piper nigrum*
32	Kaattuthippali	*Piper longum*
33	Kaattuthulasi	*Ocimum gratissimum*
34	Kaattupayar	*Vigna trilobata*
35	Kaattupavakka	*Momordica charantia*
36	Kaattupunnakka	*Calophyllum inophyllum*
37	Kaanthaarimulaku	*Capsicum minimum*

Table A-2 Contd...

Table A-2 Contd...

SL. NO.	MALAYALAM NAME	SCIENTIFIC NAME
38	Kaattumanjal	*Curcuma aromatica*
39	Kaattumulaku	*Piper sps.*
40	Kiriyaatu	*Andrographis paniculata*
41	Keezharnelli	*Phyllanthus airy-shawii*
42	Kungillyam, Kungiliam	*Boswellia serrata*
43	Kudampuli (unakka)	*Garcinia gummi-gutta*
44	Kudampuli (pacha)	*Garcinia gummi-gutta*
45	Kunthirikkom (grade I)	*Canarium strictum*
46	Kunthirikkom (grade II)	*Canarium strictum*
47	Kunthirikkom (grade II)	*Canarium strictum*
48	Kumizhu	*Gmelina arborea*
49	Kurunthotti	*Sida rhombifolia ssp. retusa*
50	Kodithuva	*Tragia involucrata*
51	Koduveli	*Plumbago indica*
52	Kopuvella	*Vateria indica*
53	Kolarakku	--
54	Kolinchi	*Alpinia galanga*
55	Garudakodi (eswaramooli)	*Aristolochia indica*
56	Changalamparanda (green)	*Cissus quadrangularis*
57	Chappanga	*Caesalpinia sappan*
58	Chittirapoovu	*Euphorbia thymifolia*
59	Chittaratha (dry)	*Alpinia calcarata*
60	Chittamruthu (green)	*Tinospora cordifolia*
61	Chittelam	*Heracleum ringens*
62	Cheevakkai/shekkakkai	*Acacia sinuata*
63	Chemparathi	*Hibiscus rosa-sinensis*
64	Cheruthekku	*Callicarpa tomentosa*
65	Jeevakom	*Malaxis rheedii*
66	Jnaaval	*Syzygium cumini*
67	Thakara	*Cassia tora*
68	Thazhuthama	*Boerhaavia diffusa*
69	Thanni (bark)	*Terminalia bellirica*
70	Thanikka (fruit)	*Terminalia bellirica*
71	Thanarakizhangu	*Nelumbium speciosum*
72	Thaen	*Apies sps.*
73	Thaen mezhuku	*Apies sps.*
74	Thaen mezhuku (processed)	*Apies sps.*
75	Thepprakkayu	*Semecarpus anacardium*
76	Thettamparal	*Strychnos potatorum*
77	Darbha	*Desmostachya bipinnata*
78	Naruneendi, Nannari	*Hemidesmus indicus*

Table A-2 Contd...

Table A-2 Contd...

SL. NO.	MALAYALAM NAME	SCIENTIFIC NAME
79	Naankinkuru	*Mesua ferrea*
80	Naaykkuruna	*Mucuna pruriens*
81	Neela amari	*Indigofera tinctoria*
82	Neeruvalakkuru	*Croton tiglium*
83	Nellikka (dry)	*Phyllanthus emblica*
84	Nellikka (green)	*Phyllanthus emblica*
85	Nellikka (fruit wall)	*Phyllanthus emblica*
86	Panjikkaya	*Ceiba pentandra*
87	Padavalam	*Trichosanthes cucumerina*
88	Pattincha	*Acacia caesia*
89	Paachotti	*Symplocos cochinchinensis*
90	Paadakizhangu	*Cyclea peltata*
91	Paathiripoovu (Ist quality)	*Stereospermum colais*
92	Paathiripoovu (IInd quality)	*Stereospermum colais*
93	Paali	*Palaquium ellipticum*
94	Paalmuthukku	*Ipomoea mauritiana*
95	Peenari	*Nothapodytes nimmoniana*
96	Putharichunda	*Solanum indicum*
97	Punnapoovu	*Dillenia pentagyna*
98	Pulthylum	*Cymbopogon flexuosus*
99	Puli (with seed)	*Tamarindus indica*
100	Puli (without seed)	*Tamarindus indica*
101	Poovanathari	*Schleichera oleosa*
102	Pollakkaya	*Anamirta cocculus*
103	Plassu (Poovum, Kaayum)	*Butea monosperma*
104	Manjakkoova	*Curcuma angustifolia*
105	Mattippal	*Ailanthus triphysa*
106	Maramanjal	*Coscinium fenestratum*
107	Marotti (seed)	*Hydnocarpus pentandra*
108	Marotti (oil)	*Hydnocarpus pentandra*
109	Muthanga	*Cyperus rotundus*
110	Mullilam	*Zanthoxylum rhetsa*
111	Moovila	*Pseudarthria viscida*
112	Ramacham	*Vetiveria zizanioides*
113	Vankurumthotti	*Sida acuta*
114	Vayampu	*Acorus calamus*
115	Vazhana	*Cinnamomum verum*
116	Veluthavanakku	*Ricinus communis*
117	Vellathumba	*Leucas aspera*
118	Sathavari	*Asparagus racemosus*
119	Sithari (Vithari)	*Embelia ribes*

APPENDIX 3

Details of the financial position of the Kerala State Scheduled Caste Scheduled Tribe Development Co-operative Federation Ltd. as on 31-3-1996 (Rs. In 000's)

Membership - S.C. Societies	442
S.T. Societies	83
Govt.	1
Total	526
Paid up Share Capital : Total	13012
Govt.	12544
Reserves	257
Borrowings - Govt.	2714
Working Capital	16043
Loans Overdue	2462 (100%)
Cost of Management	1524 (9 months)
Gross Profit (Trade)	1310
Loss for the year	17
Accumulated Loss	6531

Source . The Federation

Aristolochia indica

Desmodium velutinum

Clitoria ternatea

Phyllanthus emblica

Symplocos cochinchinensis

Wrightia tinctoria

Piper longum

Ipomoea pes-tigridis

Mimosa pudica

Gloriosa superba

Rauvolfia serpentina

Tinospora cordifolia

Solanum indicum

Strobilanthes ciliatus

Baliospermum montanum

Sida rhombifolia

Myxopyrum smilacifolium

Parmelia dilatata

Aegle marmelos

Asparagus racemosus

Biophytum sensitivum

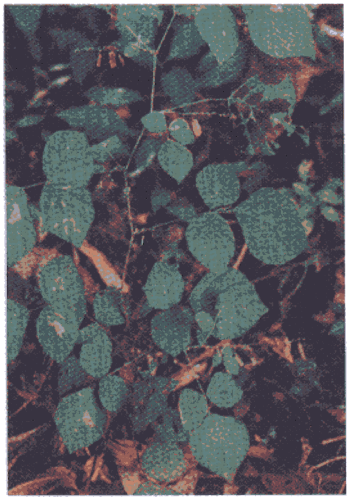
Clerodendrum serratum

Coscinium fenestratum

Desmodium motorium

Elephantopus scaber

Helicteres isora



Pseudarthria viscida