ECONOMY AND ENVIRONMENT PROGRAM FOR SOUTHEAST ASIA

Forestry Policy, Non-timber Forest Products and the Rural Economy in the Wet Zone Forests in Sri Lanka

Cyril Bogahawatte

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FORESTRY POLICY, NON-TIMBER FOREST PRODUCTS AND THE RURAL ECONOMY IN THE WET ZONE FORESTS IN SRI LANKA

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1.0   FORESTRY AND THE ECONOMY

In 1995 the contribution of the forestry sector to the Sri Lanka economy was nearly 1.3 percent of the Gross National Product (Central Bank of Sri Lanka, 1995). Its contribution to the national economy declined from 1.7 percent in 1988 to 1.4 percent in 1994 as can be seen in Table 1. The marginal decline of the forestry sector reflected diminishing timber resources which has resulted from over exploitation of forests during this period due to population growth and economic development. The total employment in forestry and wood-based industries in 1995 were around 331,000 persons. Of the total 67 percent biomass energy produced in the country, nearly 66 percent was mainly from fuelwood, a main product of natural forests in the dry and wet zones of the country. This means fuelwood provided nearly 44 percent of the total energy produced in the country.

Table 1. Contribution of agriculture, forestry and fisheries to GNP, 1982 base price

Sector	Percentage share of GNP							
	1988	1989	1990	1991	1992	1993	1994	1995
Agriculture	20.4	19.6	20.4	19.6	18.3	17.9	17.6	17.2
Forestry	1.7	1.7	1.6	1.6	1.6	1.4	1.4	1.3
Fishery	2.0	2.0	1.8	1.9	1.9	1.9	1.8	1.8

Source: Central Bank of Sri Lanka, 1995

Table 2 shows the extent of natural forests by districts and the decline of forest cover between 1983-1992. The total area of natural forests in the country decreased from 1,777,995 ha in 1983 to 1,582,756 ha in 1992. The highest declines were reported in Gampaha (69.7%), Kilinochi (68.1%), Badulla (53.5%) and Hambantota (43.6%) districts. However some districts conversely shows an increase of forest cover. In Ratnapura, the change of forest cover was 3.5 percent between 1983-92. In Kandy district, the decline of forest cover over the same period was 2,284 ha (-1.2%). In Matara the increase of forest cover was nearly 3,101 ha (or 1.4%). The forest cover in the country has declined from 44 percent of the total land area in 1956 (2.87 million ha) to 23.9 percent of the land area (1.33 million ha) in 1992 with an annual rate of deforestation of nearly 40,000 ha (Table 2). The average annual planting during this period was around 2,000 ha. The forest area per capita has declined from 1.3 ha in 1900 to less than 0.1 ha in 1992.

Table 3 shows the estimated loss of forest from boundary encroachments in selected forests in the country. The results show that nearly 12-18 percent of the Hakgala, Horton Plains, and the total area of Kanneliya have been lost due to encroachments along the boundaries.   Much of this area has been converted to agriculture. During the period 1956-1983, nearly 12 percent of the Sinharaja was deforested almost entirely on the periphery. Further only 66 percent of the World

Heritage site remains as primary forest, the balanced being disturbed to varying extents (Barnyard and Fernando, 1988). The results of the National Conservation Review showed that more forests in the wet zone have been deforested than in the dry zone. The smaller forests, (<1,000 ha) tended to be more disturbed compared to arger forests (>1,000 ha).

Table 2. Changes of natural forest cover by districts, 1983-1992

District	Total Area (ha)	Forest Cover 1983		Forest Cover 1992		Changes of cover 1983-1992	
		ha	%	ha	%	ha	%
Ampara	450,031	149,330	33.2	124,908	27.8	-24,422	-5.4
Anuradhapura	722,178	190,890	26.4	180,083	24.9	-11,807	-1.5
Badulla	285,673	56,720	19.9	26,428	9.3	-30,292	-10.7
Batticoloa	263,983	44,810	17.0	36,493	13.8	-8,317	-3.2
Colombo	68,496	1,490	2.2	1,832	2.7	342	0.5
Galle	161,256	17,980	11.1	19,089	11.8	1,109	0.7
Gampaha	141,840	1,305	0.9	409	0.3	-941	-0.6
Hambantota	262,307	43,250	16.5	24,377	9.3	-18,874	-7.2
Jaffna	107,847	680	0.6	1,081	1.0	401	0.4
Kalutara	164,391	13,860	8.4	20,310	12.4	6,450	4.0
Kandy	192,808	29,529	15.3	27,241	14.1	-2,284	-1.2
Kegalle	168,328	12,575	7.5	15,664	9.2	2871	1.7
Kilinochchi	132,499	102,590	77.4	32,686	24.7	-69,904	-52.7
Kurunegala	489,787	13,110	2.7	9,980	2.0	-3,301	-0.7
Mannar	200,148	107,910	53.9	133,445	56.7	5,535	2.8
Matale	206,050	66,760	32.4	74,809	36.3	8,049	3.9
Matara	130,829	16,800	12.8	19,909	15.2	3,101	1.4
Moneragala	576,763	219,955	38.1	182,601	31.7	-37,394	-6.4
Mullativu	260,946	100,290	38.4	154,323	59.1	53,942	20.7
Nuwaraeliya	174,109	39,390	22.6	39,646	22.8	-284	0.2
Polonnaruwa	344,988	161,755	46.9	115,881	33.6	-45,854	-13.3
Puttalam	315,485	77,900	24.7	82,529	26.2	4,629	1.5
Ratnapura	337,034	52,445	15.6	62,337	19.1	9,717	3.5
Trincomalea	267,991	115,070	42.9	113,812	42.5	-1,258	-0.4
Vavuniya	200,836	119,800	59.7	103,187	51.4	-16,619	-8.3
All Island	6,616,628	1,757,995	26.6	1,582,756	23.9	-175,240	-2.7

Table 3. Decline of natural forests in Sri Lanka (percent of total land area)

Year	Extent of Natural Forest Cover (Percent of total)
1881	80.0
1900	70.0
1950	50.0
1956	44.0
1992	23.9

Source: Forestry Department, Sri Lanka, 1995.

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Deforestation and degradation of forestlands are the major causes of this decline. The main causes of deforestation include: 1) shifting cultivation; 2) forest conversion to agricultural uses; 3) forest conversion, through state support, to organized form of settlement (e.g. plantations, transmigration, refugee rehabilitation); and 4) forest conversion for major infrastructures and other developments like reservoirs, hydro electric schemes, roads, urbanization, mining.

The practice of shifting cultivation (chena cultivation) has increased in the country from 1 million ha in 1956 to 1.2 million ha in the late 1980s. Shifting cultivation is a form of rainfed agriculture in the southern and dry zone districts in the country. The main types of crops grown in shifting agriculture include upland rice, spice crops, (chillis), pulses, legumes and cereals. There is a growing concern in the country on the extent of illegal crops (e.g. Cannabis) grown under shifting agriculture.

Officially, nearly 900,000 ha of natural forests in the country has been converted to other land uses as a result of expansion of irrigation, human settlements, agricultural development, and other non-forest development activities such as hydro electric generation. For example, agricultural development projects in Mahaweli, Kirindi oya, and Udawalawe have had a major impact on natural forests. Agricultural production has increased in the extended areas for major crops such as paddy, tea, and few other cash crops. Lack of proper land use practices has led to the continuous degradation (e.g. soil erosion, loss of soil fertility) of these farmlands.

Table 4. Estimated loss of forest area from boundary encroachment in selected protected forests

Protected Forest	Year Established	Forest Area (ha)		Loss of forest area due to encroachment	
		Original	1992	ha	% loss
Hakgala Strict National Reserve	1938	Wazzu 1,141	960	181	15.9
Horton Plains Natural Forest	1969 (NF in 1988)	3,519	2,889	630	17.9
Kanneliya Forest Reserve	1934	6,088	5,345	743	12.2

The main causes of degradation of natural forests in the country include:

1. Over exploitation (beyond the limit of natural recovery) and damage to standing trees due to inappropriate logging practices (legal and illegal). The damage to soil (compaction and erosion) due to use of equipment (tractor skid trails), timber cutting, and landing also leads to degradation.

2. Non-sustainable use of forest resources such as illicit felling, excessive extraction of non-timber forest resources (fuelwood, medicinal herbs) has led to qualitative changes in the forests.

3. Grazing and lopping of trees for animal feeding

4. Forest fires

5. Insects pests and diseases

6. Natural disasters such as hurricanes, typhoons, floods

7. Mining related damages

As can be seen from above, most of the causes of deforestation and degradation of forestland are closely related to population growth, poverty, landlessness, and poor productivity in peasant agriculture.

Serious consequences of deforestation and degradation include: 1) erosion of biodiversity in the forest and loss of valuable genetic resources; 2) irregular water flows and drying up of natural springs and reduction of base flow of streams; 3) shortened life span of irrigation channels and reservoirs; 4) soil erosion and associated loss of soil fertility which reduces agricultural productivity; 5) scarcity of timber and non-timber forest products (fuelwood, medicinal herbs) resulting in rapid rural and urban market price increase; and 6) climatic changes.

More than 28 percent of the total forest land area is reserved and administered by either the Forest Department (FD) or the Department of Wild Life Conservation (DWLC). With an adjustment for possible overestimation, the actual percent of total land area under FD is between 15.1-16.1 percent. At present, FD manages 111,099 ha for conservation or 1.7 percent of the total land area (Table 5). The national system of protected area covers nearly 14 percent of total land area.

Table 5. Extent of protected area administered by Forest Department

Name	Number	Extent (ha)
International biosphere reserve	2	9,376
National biosphere reserve	39	63,384
Knuckles conservation forest	1	16,000
Wetzone conservation forest	13	24,038
Total	55	112,798 111,099*

* corrected/adjusted value

1.1 Wet Zone Conservation Forests of Sri Lanka

This study is mainly focused on the wet zone conservation forests in the country. Most of the dry zone forests are smaller and are found in different places due to the opening of new lands for agriculture, human settlements, infrastructure for irrigation systems and more intensive cultivation of rice and other subsidiary food crops.

The varied climate and diverse ecological structure, land form and soils found in Sri Lanka has led to the evolution of a rich and distinctive plant cover, wild life and complex ecosystem with a high level of biodiversity. Much of the diversity is found in the southwest and the central highlands where conditions are wet and temperatures quite varied. The major wet zone types of natural forest ecosystem and their distribution are shown in Table 6. Tropical rain forests occur in the lowland wet zone with an altitude of about 900m. The dominant tree form a closed canopy at 25-30 m

with emergent rising to 45 m. The undergrowth is relatively sparse, but rich in epiphytes and lianas. Lower montane (900-1,350m) and upper montane (>1,350m) forests have a lower canopy and denser undergrowth. The intermediate evergreen forest of the transition zone between the wet and dry zones has its own characteristic species [e.g. Lunumidella (*Melia dubia*), Pihimbiya (*Fillicium decipens*), Katu imbul (*Bombax ceiba*) and Murutha (*Lagerstroemia speciosa*)] as well as some common species in the adjacent zones.

Table 6. Main types of natural wet zone forests, dominant communities or species and bio-climatic distribution

Forest Type	Dominant Communities or Species	bio-climatic zone
Wet Evergreen Forest (tropical rain forest)	Dipterocarpus (low/mid altitudes) Mesua-Doona-Shorea (mid altitudes) Campnosperma zeylanica (Adams peak) Vitex-Wormia-Chaetocarpus-Anisophyllea (low altitudes)	low/mid country wet
Tropical Montane Forest	Syzgium-Calophyllum-Gordonia-Michelia (widespread) Stemonoporus (Adams peak)	Montane wet
Intermediate Evergreen Forest	Intermediate between wet evergreen and dry mixed evergreen forests	Low/mid country intermediate Montane intermediate

Source: Wijesinghe, et al., and 1993

Table 7 shows the extent of coverage of various forest types in the country. Closed canopy forest cover nearly 24 percent of the island, while the open canopy forests cover 7 percent. The dry monsoon forests are extensive in the north and southeast of the country. Fragments of tropical rain forests, few larger than 10,000 ha, remain in the southwest zone where the species diversity is highest.

Studies have shown that threatened, endemic woody species is poor in selectively logged forests even after eight years (de Zoysa et. al., 1990). Similar observations have been made for endemic small mammals (de Zoysa and Raheem, 1990). Intensive surveys recently in Hindigama, Ritigala, and Sinharaja forests have led to the discovery of new species. Recent study in Kanneliya-Dediyagala-Nakiyadeniya group of forests have shown that in some cases, logged over areas could regenerate well and posses ample biodiversity (IUCN, 1993). Table 8 shows the species of vascular plants, vertebrates and some invertebrates that are threatened and endemic to Sri Lanka. Many of the flowering plants (26%); land snails (76%); amphibians (60%); reptiles (40%) are endemic to Sri Lanka. Little is known about the distribution and status of these species.

Table 7. Natural forest cover by type of forests, Sri Lanka, 1992

Forest types	Area (ha)	% of forest	% of total land area
Montane	3,108	0.15	0.05
Sub-montane	68,106	3.35	1.05
Lowland rain	141,506	6.91	2.16
Moist monsoon	243,856	11.91	3.72
Dry monsoon	1,090,981	53.30	16.64
Dry zone riverine	22,435	1.10	0.34
Mangrove	12,500	0.61	0.19
Sparse	464,076	22.67	7.08
Total	2,043,296	100.00	30.89

Source: Legg and Jewell, 1994.

Table 8. Species of vascular plants, vertebrates and selected invertebrates, levels of endemism and threat

Group	Species Threatened			Endemic Species Threatened		
	Number	National criteria	Global criteria	Number	National criteria	Global criteria
		Percent			Percent	
Pteridophytes	314	29	11	18	53	61
Gynosperms	1	1	0	0	0	0
Angiosperma	3,368	14	12	26	26	45
Butterflies	>242	33	1	6	79	21
Spiders	>400	4	0	0	0	0
Land Molluscs	266	57	0	76	76	0
Freshwater Fish	65	46	29	45	97	66
Amphibian	48	60	0	60	100	0
Reptiles	162	70	6	49	99	1
Birds	419	13	2	6	71	25
Mammals	89	44	10	13	92	0

Source: Fernando, et al., 1994

Natural forests, particularly the tropical rain forests and montane forests contain a large proportion of Sri Lanka's species. Preliminary result of the National Conservation Review shows that 20 to >50 percent of species of selected plant and animal groups are found in the lowland rain forests and moist monsoon forests of Galle, Matara, Kalutara, and Ratnapura districts of the country. Many of these are endemic, 40 percent for woody plants and other groups. Nearly 119 woody plant species (8%) are restricted to single forests and 49 (41%) of these rare species are extinct already. For example, of the 58 endemic dipterocarps, one species is thought to have become extinct. At least 11 percent of endemic snake fauna has not been recorded since 1950. Satinwood (*Chloroxylon swietenia*), ebony (*Diospyros ebenum*), salamander (*Diospyros quaesita*), and nedum (*Pericopsis mooniana*) are now rare, having been selectively removed for valuable timber. Of the 170 orchids found in the forests, 13 species (e.g. *Dendrobium maccarthiae*, *D. heterocarpum*, *Ipsea speciosa*, *Rhynchostylis retusa*) are thought to have become extinct.

Table 9 shows some of the distance of the wet zone conservation forests managed by the Forest Development (FD). These forests are mainly important in safeguarding lowland rain forest (except in Knuckles range which protects sub-montane or montane forests). Of these Knuckles (Kandy district), Gilimane-Eratne (Ratnapura district), and Kekanadura (Matara district) were included in the study. These forests were classified as conservation forests after extensive studies done by the FD on the nature of the forests, biodiversity, deterioration, and other socio-economic characteristics of forest occupants.

Table 9. Extent of natural forests in conservation forests managed by the
Forest Department (ha)

Name of Forest	Type	Registered Area		Area calculated by	
		Declared	Present	Forest	Total
Knuckles	CF	16,000.0	16,000.0	11,863.0	18,792.0
Sinharaja	NHWA	11,187.0	11,187.0	10,191.0	11,022.0
Bambarabotuwa	FR	5,440.3	5,440.3	2,004.0	3,400.7
Dellawa	PR	2,034.0	2,236.3	2,199.0	2,232.4
Delwela	PR	1,560.9	1,560.1	1,437.0	1,531.9
Gilimale-Eratne	PR	5,832.7	4,838.8	3,312.0	6,237.7
Kalugala	PR	4,630.1	4,288.0	96.0	3,194.3
Kandawattegoda	PR	404.7	358.6	169.0	410.1
Kekanadura	FR	401.7	379.9	295.0	453.5
Kombala-Kottawa	PR	2,289.7	1,624.6	877.0	1,923.9
Madampe	FR	237.3	224.8	205.0	248.5
Madampe	PR	40.5	40.5	29.0	33.8
Messana	FR	724.4	433.8	589.0	705.8
Oliyagankele	FR	488.6	486.0	401.0	437.0
Viharakele	FR	825.1	625.1	499.0	861.6
Welihena	FR	333.1	296.1	226.0	337.4
Total		52,430.0	50,021.0	34,392.0	51,778.0

Note: CF - Conservation Forest; NHWA - National Heritage Wilderness Area
FR - Forest Reserve; PR - Proposed River

1.2   Role of NTFP's in the Rural Economy

Earlier studies have shown the importance of non-wood forest products in rural economies of Sri Lanka. Gunatilake (1991) reported that the annual income derived from non-timber forest products (NTFP) by those living in the periphery of Sinharaja National Heritage wilderness area amounted to US$13 per ha. Communities living in the Peak Wilderness Sanctuary derive up to 53 percent of their income from NTFP's or up to 58 percent, if subsistence products are taken into account (Wickremasinghe, 1993). Families living within 1 mile of the Knuckles Conservation forest obtain 62 percent of their total income from forest based activities, namely collection of NTFP (16%); shifting cultivation (20%); and cardamom cultivation (26%). There was an inverse relationship between total family income and proportion of income from NTFP's. The NTFP plays a greater role in the low income families accounting up to 31 percent of their total income (Gunatilake et. al., 1991).

In Kanneliya-Dediyagala-Nakiyadeniya forest reserves, the local dependence on forest products has diminished since 1960s due to degradation of forests by logging and increase in encroached tea smallholdings (IUCN 1994).

1.3   Government Policies in Forestry Sector

The first step towards an explicit forestry policy was taken in 1929 by the government. The main objectives of this forestry policy were 1) providing for self-sufficiency in timber and fuelwood and export of timber and other forest produce; 2) conservation of water supplies, preservation of soil erosion, and coordination of forestry operations with the requirement for the prevention of indigenous flora and fauna. Some steps to implement these objectives were taken. The mapping of forest reserves was initiated in 1931 and practical forest management plans were introduced. In 1938, all forests areas above 1,500 m were regarded as climatic and protective resources.

In 1953, the Forestry Department introduced comprehensive sectoral policy objectives. These are.

1) to maintain, conserve, and create a forest for the preservation and amelioration of the environment and the soil and water resources; and for the protection of the local fauna and flora when required for aesthetic, scientific, historical, and socioeconomic reasons;

2) to ensure and increase the supplies of small wood for agricultural requirements and fuelwood for domestic consumption; and

3) to maintain a sustained yield of timber and other forest produce for general housing, industrial, communication, and defense requirements of the country.

From 1950-1970, the FD conducted a large number of development activities of conservation, industrial plantation establishments, forest administration, legislation, research and education activities. In 1980, the objectives were slightly modified with the involvement of rural communities in the development of private woodlots and forestry farms through a program of social forestry. Between 1982-1990, the implementation of the Community Forest Projects with funding from the Asian Development Bank (ADB) reflected the change in government policy. However, the people's involvement in forestry development was not institutionalized. In 1991, a draft National Forest Policy introduced by the FD considered the role of the forest in the environment. It touched on various topics such as: forest land tenure, forestry and land use, sustainable development, conservation, forest ecosystem, forestry education, inter-institutional links, and people and forests. However this plan was overshadowed by the implementation of the Forestry Sector Master Plan (FSMP) in 1995.

The policy objectives of FSMP were 1) to conserve forests for posterity, with particular regard to biodiversity, soil, water as well as historical, cultural, religious and aesthetic values; and 2) to increase the tree cover and productivity of the forests to meet the needs for forest products and services of present and future generations. The earlier forestry policies have been criticized for their bias towards the production

objectives of forestry management. Most of these policies have been ineffective or unenforceable and failed to provide lasting solutions to major problems prevailing in the forestry sector. These policy statements in most cases were criticized in terms of their unrealistic assessment of the current needs of the forestry sector and lack of long term vision.

The FSMP acknowledges the heavy depletion of natural forests and expresses concern for safeguarding the remaining natural forests for posterity in order to conserve biodiversity, soil and water resources. It emphasizes the importance of retaining the present natural forest cover and increasing overall tree cover. The lack of a balance between commercial and social objectives was highlighted in the past forestry policies. The policy of management of state forests in the FSMP states that all state forests will be brought under sustainable management area to be used sustainably to provide for the ever increasing demand for bio-energy, wood and non-wood forest products and services for the benefit of the rural communities. It was realized that most of the national forestry policies introduced in the past tend to reflect concerns, aspirations, and professional views of the FD. This has resulted in narrow perspectives and preoccupation with the agency's functions, its concerns and the territory under its control, thus leaving the communities far removed from the decision making process. In most cases, the communities were not consulted to express their interests, concerns and ideas. Therefore attempts to conserve forests have been ineffective due to lack of participation.

In the FSMP, a more people-centered participatory approach has been adopted. This policy recognizes that government agencies alone cannot protect and manage forests effectively. People's participation in forestry development and conservation are promoted. The overall goal is to bring all forests under management committees with representations from FD, user groups, rural communities, non-government organizations, estate sector and people from local industries.

The design is for the forests to be managed by those in the FD with the participation of the local people and communities and the assistance of the NGOs through the Forest Protection Committees. The guiding principles are: to involve local people in the planning and management of forests; accommodate traditional resource use patterns and land rights; direct the benefits of the conservation efforts of the Village Protection Committees towards local communities; integrate management plans with socioeconomic development of the communities; and incorporate all products obtainable from forest land in management practices. Here the premise is that communities living in or near the natural forests would protect it if clearly authorized by the government. Ownership would continue to remain with the government but the usufruct would be transferred to the people. Communities will not take over this responsibility of management, unless the government provides them with economic returns on their time.

The FSMP also promotes a combination of forestry management and activities designed to create alternative income in peripheral areas. Such programs will be based on the development of village level, site-specific microplans through a participatory process. FSMP also plans to set up a multi-sectoral National Forestry Policy Committee which will have representation from all relevant ministries, implementing agencies, national forest industries, NGOs and others. According to

the FSMP, the state forestlands would be allocated for management Classes I, II, and III forests. The Class I forest will be strictly conserved or preserved to protect the biodiversity, soil, and water, and historical, cultural, religious and aesthetic values. Research will be allowed in this area. Class II forest will be mainly for non-extractive uses (scientific research, protection of watersheds and habitats for wildlife, regulated nature based tourism). Controlled extraction of NTFP's by local communities will be allowed in these forests. The Class III forests are mainly for multiple uses for sustainable production of wood on the basis of management plans and sustainable production of wood and NTFP for the benefit of the local communities. This will include the buffer zones to protect Class I and Class II forests. The FSMP programs on multiple use forests cover this category. The Class IV forests consists of plantations and agro-forestry systems on state lands. These will be managed for production of wood and NTFP's. Deforested and lands suitable for plantations are included in this class. According to the FSMP, large investors who own privately managed forests, will be allowed in areas that are not critically important in terms of biodiversity and watershed protection. The FSMP allows for the possibility of pilot testing the abilities of the private sector in the management of forests.

1.4   Objectives of the Study

The implications of the policies of FSMP on the conservation of the wet zone forests is to limit the consumption of the NTFPs to sustainable levels, ban encroachments of the forests and their conversion to agriculture (shifting agriculture, encroachments on the boundary) and to increase the tree cover through proper management and productivity (e.g. ban on illegal timber felling, improved logging techniques). In the FSMP, the government expects community participation for its conservation efforts through the formation of Forestry Protection Committees (FPC) for each forest. The FPC is composed of representatives from the FD, local people, users, and some NGOs. However, local community participation and their cooperation in conservation efforts may not be forthcoming unless they are provided with some economic incentives such as those derived from NTFP extracted from the forests. If the economic incentives from NTFPs are small, there may not be much community participation in forestry conservation. In addition to the economic incentives there may be social factors such as family traditions, religious beliefs, indirect values (e.g. education, photography, and ecotourism), and option values of forest products leading to participation of local communities in the conservation of wet zone forests in the country. Hence, this study sought to:

1. quantify and value the NTFP obtained from the forests by the local communities;

2. estimate the share of income from NTFP to total household income;

3. assess how the formation of Forest Protection Committees in villages will affect the level of NTFP collection in the villages; and

4. determine other non-economic functions of the forests that will encourage participation of rural communities in forest conservation.

2.0   STUDY AREA AND SAMPLING METHODOLOGY

Kandy (Knuckles Range), Ratnapura and Matara districts were selected purposively as representatives of the wet zone conservation forests managed by the FD (Table 7). These forests represented different ecological zones in the wet zone based in the rainfall pattern, temperature, vegetation, and other physical characteristics (e.g. terrain). Knuckles Range covers 16,000 ha and has been declared as a conservation forest by the FD. Gilimale-Eratne in Ratnapura is proposed as a forest reserve and is about 4,838 ha. From Matara district, Kekenadura (forest reserve) of 380 ha was selected for the study. From these wet zone forests, the following villages were selected based on their location (direction from the forest and distances from the nearest town) with respect to the selected forests zones.

Table 10. Characteristics of the selected sampled villages in the wet zone
        conservation forests

District	Name of the forests	Sampled villages	Distance from the nearest town (km)	Direction from the forest
Kandy	Knuckles (16,000 ha)	Kalugala Tawalantenne Puwakpitiya	10 20 6	East West North
Matara	Kekanadura (380 ha)	Kekanadura Diyagaha Agarawela	3 1 4	Northeast Southwest East
Ratnapura	Gilimale-Eratne (4,388 ha)	Gilimale Lassakanda Palabadalla Sudagala	6 4 7 9	Southeast West Northeast East

The households in each of the selected villages in the districts were stratified on the basis of the distance from the boundary of the conservation forests to "Near", "Intermediate" and "Far". The near households were those living within a radius of 0-3 km from the forest boundary. The far households were those living outside 5 km radius from the forest boundary. The others were designated as intermediate households. Nearly 30 percent of the total households were then randomly selected from each village with equal representations from the near, intermediate and far categories. The total number of sample households for each of the villages in the districts for the field survey are shown in Table 13.

The field survey of the village households was done between May 1996 - April 1997 by using a structured questionnaire. The interviews of the selected households were done by personal visits to the households by graduate research assistants specially trained for the purpose. The field survey questionnaire was designed mainly to obtain adequate information on extraction of forestry resources, household use of these resources, prices, incomes derived from these resources, implementation of forestry policies, and other farm and household characteristics.

In addition to the household field survey, participatory surveys were also held with the FD officers such as the District Forestry Officer (DFO), Assistant District Forestry Officer (ADFO), other field level forestry officers, and village level administrative officers (GS), village leaders, religious leaders, physicians, and village elders regarding the effectiveness of present forestry policies and implementation of the FSMP for conservation of wet zone forests.

Table 11. General characteristics of the sampled villages in wet zone conservation forests

District/villages	Total household size	Average family size	Employment (% reporting)		Land use pattern (extent of farm in ha)	
			farm	non-farm	lowland	high land
Kandy						
Kalugala	105	4-5	99.0	1.0	0.4	0.50
Tawalantenne	120	4-5	78.2	11.8	0.2	0.05
Puwakpitiya	108	3-4	94.2	5.8	1.2	1.00
Matara						
Kekanadura	135	3-4	63.2	26.8	0.6	0.16
Diyagaha	104	3-4	3.5	96.5	1.6	0.26
Agarawela	101	4-5	52.6	47.4	0.2	0.07
Ratnapura						
Gilimale	95	3-4	100.0		0.03	5.10
Lassakanda	103	3-4	98.0	2.0	0.04	2.80
Palabadalla	105	4-5	100.0		0.10	1.60
Sudagala	108	3-4	100.0		0.03	9.90

Table 12. Selection of the households for field surveys in sampled villages in wet zone conservation forests

District/villages	Total household size	Number of households selected for the field survey	Selection of samples by distance from forest boundary (km)		
			Near (0-3)	Intermediate (3.1-4.9)	Far (>5)
Kandy					
Kalugala	105	30	10	10	10
Tawalantenne	120	31	11	10	10
Puwakpitiya	108	32	11	10	11
Matara					
Kekanadura	135	45	15	15	15
Diyagaha	104	23	8	8	7
Agarawela	101	23	8	8	7
Ratnapura					
Gilimale	95	23	8	8	7
Lassakanda	103	23	8	7	8
Palabadalla	105	23	8	8	7
Sudagala	108	23	8	8	7

Table 13. Households characteristics, all districts

District	Sample Size	Total Population	Average family size	Age (years) percent reporting				Male: female ratio
				<14	15-45	46-70	>70	
Kandy	93	378	4.1	24.3	57.7	16.0	2.0	1:1.89
Matara	91	362	4.0	22.3	54.7	22.4	0.7	1:1.17
Ratnapura	92	352	3.8	15.7	60.6	22.9	0.8	1:0.96
All	276	1,092	4.0	20.8	57.8	20.4	1.2	1:1.34
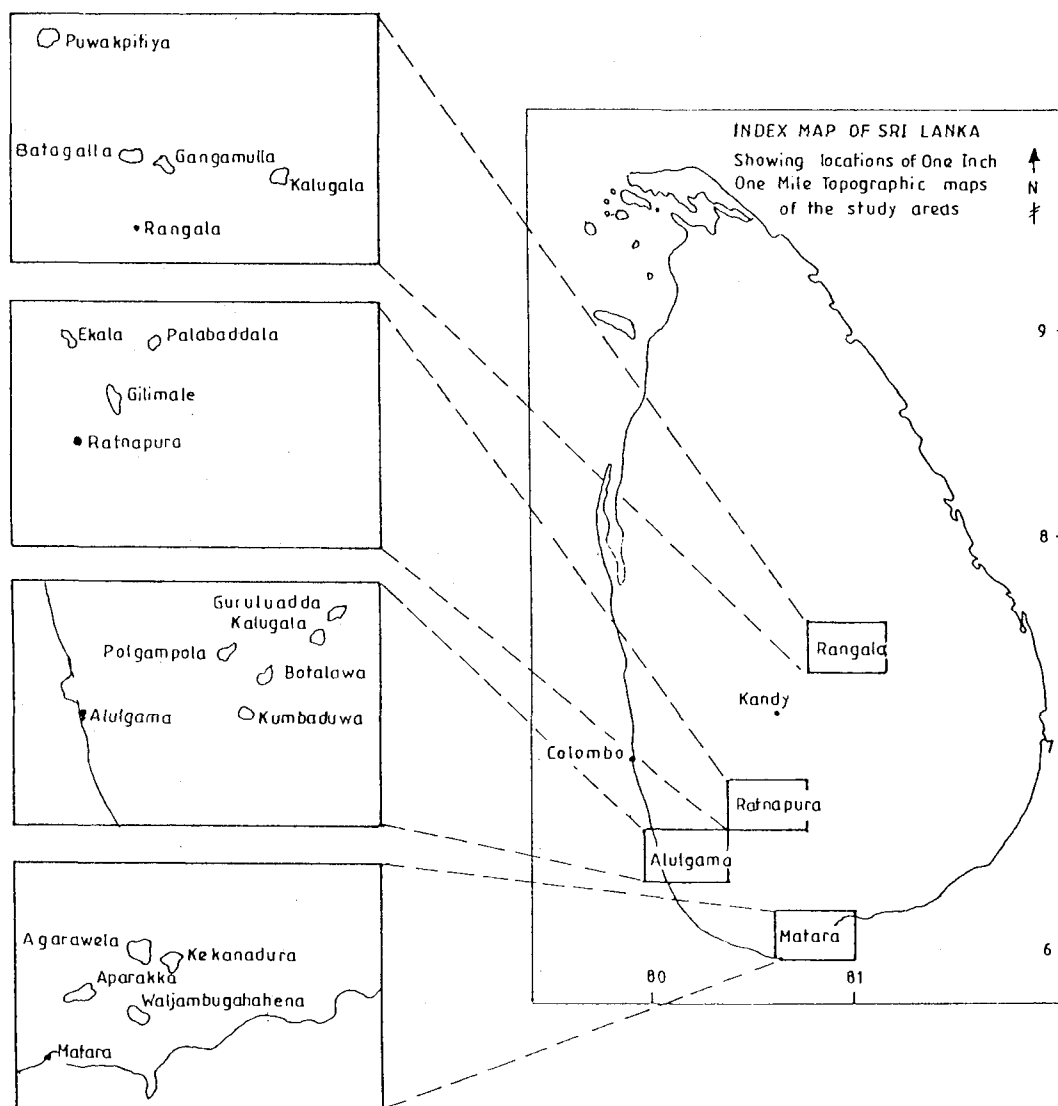
Figure 1. Map showing the study areas

/ Roads) Streams ⌀ Study areas   80 35   0   1 Mile
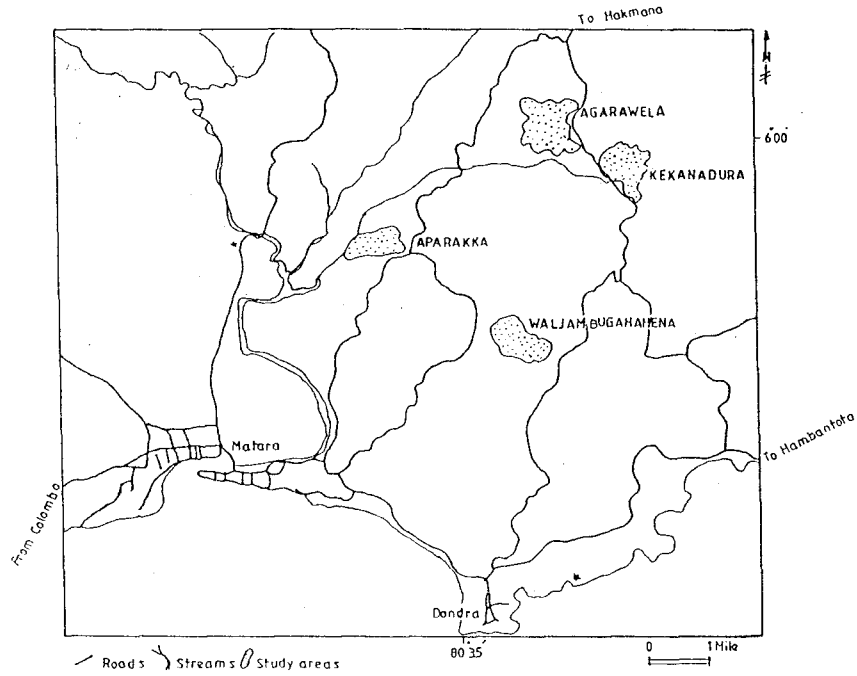
**Figure 2. Map showing the surveyed villages adjacent to
Knuckles forest in Kandy district**

── Roads ⫽ Streams ⌂ Peaks ⊘ Study areas   0   1 Mile
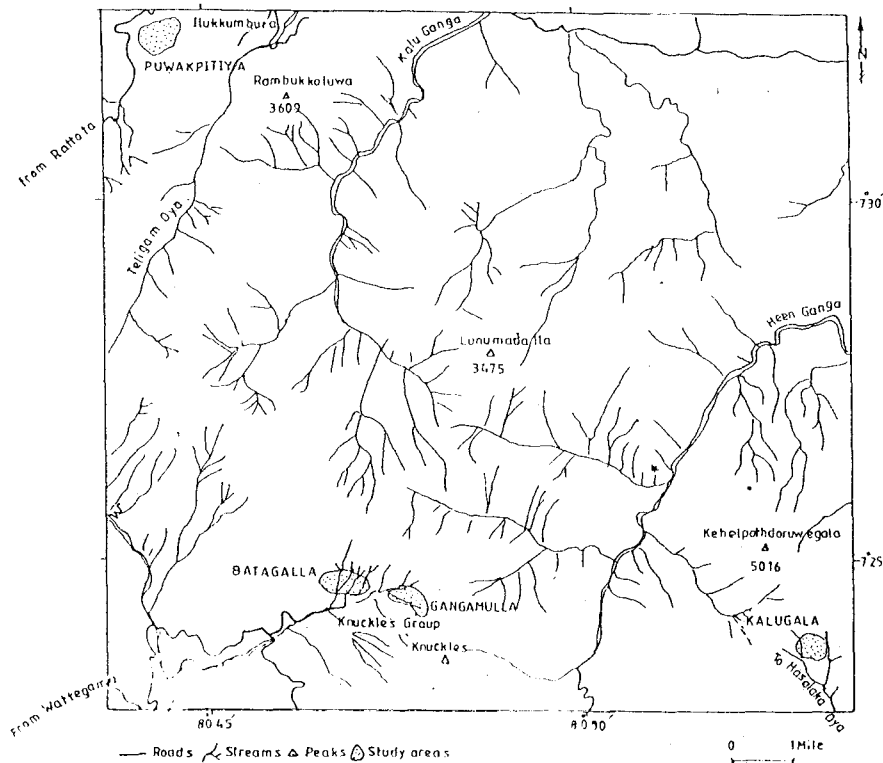
**Figure 3. Map showing the surveyed villages adjacent to
Kekanadura forest in Matara district**
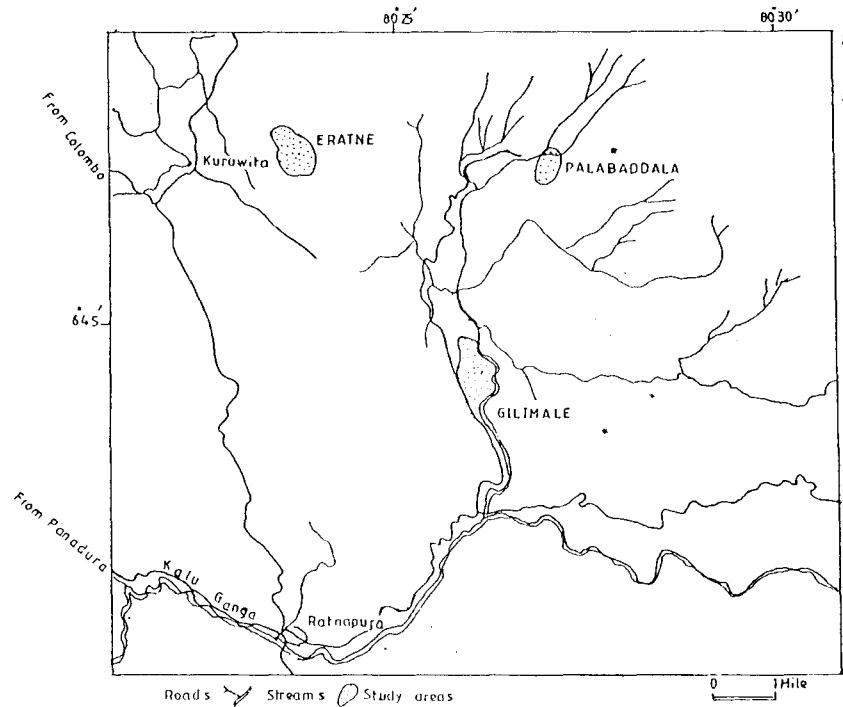
Figure 4. Map showing the surveyed villages adjacent to
Gilimale-Eratne forest in Ratnapura district

Figure 5. Monthly distribution of forest extraction of non-timber forest products

NTFP Extracted	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Fuelwood	**********	******	******	******	******	******	******	******	******			
Fruits		******	******	******		******	******					
Vegetables					******	******	******	******	******			
Mushrooms									******	******	******	******
Yams	******	******	******	******	******	******	******	******	******	******		
Meats	******	******	******	******								
Bee honey		******	******	******		******	******	******				
Kitul	******	******	******	******								
Medicinal plants	******	******	******	******	******	******	******	******	******	******		
Spices								******	******	******	******	
Thatching/roping	******	******	******	******	******							
Poles	******	******	******	******	******							
Cane	******	******	******			******	******	******				
Clay	******	******	******	******	******	******	******	******	******	******		
Resins/gums							******	******	******	******		
Ornamental plants			******	******	******							
Pasture/fodder									******	******	******	******
Gems	******	******	******	******				******	******	******	******	

3.0   RESULTS AND DISCUSSION

This consists of three sections. The first section describes the demographic features, education levels, and land use patterns of the village communities living in each district. The second section includes an analysis of the role of NTFP in the rural economy. The last section discusses the role of the village communities in the conservation of wet zone forests and what incentives are required to enhance community participation in forest protection.

3.1   Characteristics of the Rural Economy

This includes a brief description of demographic characteristics, education, employment pattern, and land use pattern. The interdependence between village communities and the forests may often be related to these characteristics.

The average family size in the districts is nearly 4.0 with slight variations in the districts. The dominance of female over male in the family is seen for Kandy and Matara as compared to Ratnapura districts. More than 74 percent consisted of working population of 15-70 years and majority of them are youth of 15-45 years (Table 14). The literacy levels of the communities are relatively high with nearly 35 percent of the households reaching at least primary education levels, and majority of them received secondary education (Table15).

Table 14. Educational characteristics, all districts

District	Sample size	Total population	Education						Special training (percent)
			not yet sch	No sch		prim	sec	tert	
				a	b				
Kandy	93	378	4.0	5.4	2.9	40.2	47.3	0.3	0.6
Matara	91	362	5.6	3.7	0.8	32.5	56.8	0.6	0.3
Ratnapura	92	352	-	4.9	0	31.1	57.0	7.0	4.9
All	276	1,092	3.2	4.7	1.2	34.6	53.7	2.6	1.9

Not yet sch: below school age
No sch a: No schooling done, cannot read or write
No sch b: No schooling done, could read and write
Prim - Primary Grade 1-5; Sec- Secondary Grade 6-10; Tert - Tertiary Grade >10

Table 15. Employment characteristics, all districts

Districts	Sample size	Farming				Non-farming			
		Full time		Part time		Full time		Part time	
		% report	income/ month (Rs)	% report	Income/ month (Rs)	% report	income/ month (Rs)	% report	income/ month (Rs)
Kandy	93 (378)	52.2	744.7	12.2	583.3	47.8	3,345.0	54.4	1,597.3
Matara	91 (362)	3.6	1,468.8	41.8	425.0	96.4	4,967.8	33.3	3,875.0
Ratnapura	92 (352)	16.6	2,131.5	83.2	3,984.8	29.6	8,356.8	5.7	837.5
All	276 (1,092)	24.1	1,446.2	45.8	1,664.4	57.9	5,556.5	31.1	2,103.3

Note: Figures in parentheses are the total population of households.

The household heads may be employed in farming or non-farming activities on a full-time or part-time basis. During the cultivation seasons between planting and harvesting operations, majority of the farmers may be involved in skilled (carpentry, masonry, trade, other farms) or non-farming (hired labor) activities for their secondary sources of income. The average incomes derived by village households in full and part-time farming is shown Table 16. The monthly average income from farming and non-farming in the districts amounted to Rs10,772/household.

Table 16. Land use pattern in lowland paddy and vegetables, all districts

Districts	Percent farmers reporting	Average extent/ha	Paddy		Vegetables	
			Production (kg)	Income (Rs)	Production (kg)	Income (Rs)
Kandy (92)	46.8	0.6	490.8	3,217.9	8.3	227.0
Matara (91)	12.2	0.6	2,237.5	13,131.3	25.0	350.0
Ratnapura (92)	1.1	0.025	300.0	1,625.0	-	-
All	20.0	0.410	1,009.4	5,991.4	11.1	192.3

The land use pattern in lowland paddy and vegetables in lowland are shown in Table 16. The cultivation of lowland paddy is limited particularly in Matara and Ratnapura districts. The average lowland land area ranged from 0.6 ha in Kandy and Matara to 0.025 ha in Ratnapura districts. The cultivation of lowland vegetables is limited to Kandy and Matara districts. The annual average household income earned from paddy amounted to Rs 5,991/household as compared to Rs 192 for vegetables. Other than in Kandy, the other entire lowland farm lands in the districts were owner cultivated (Table 17).

Table 17. Land tenancy in lowland paddy, all districts

District	Owner cultivation		Tenancy					
	% report	Average area (ha)	jointly		rented		encroached	
			a	b	a	b	a	b
Kandy (92)	8.4	0.600	23.4	0.2	1.0	0.2	0.1	0.003
Matara (91)	11.0	0.600	-	-	-	-	-	-
Ratnapura (92)	1.1	0.025	-	-	-	-	-	-
All	6.9	0.410	7.8	0.06	0.3	0.06	0.03	0.001

a - refers to percent of farmers reporting
b - average area (ha) cultivated

The land use pattern in the highlands and home gardens are shown in Table 18. The average area of highlands ranged from 0.22 ha in Matara, 1.6 ha in Kandy to 7.4 ha in Ratnapura. In Kandy and Ratnapura, most of the highlands were cultivated with tea. However, the variety of other crops grown may be related to the agro-ecology of the zones. For example, crops such as vegetables, tobacco, and highland paddy are mainly grown in Kandy as compared to banana and coconut in Matara. Most of the home gardens in the districts were mainly cultivated with horticultural crops such as mango and banana. The annual income derived was high for highland paddy in Kandy (Rs14,138/household) and tea cultivation (Rs 98,839/household) in Ratnapura districts. In these districts, most of the cash crops were grown in the

encroached boundaries of the conserved forests. Due to the landlessness prevailing in the village communities and the high income from these crops (mainly tea and highland paddy), the demand for forestland for agriculture is high in these rural communities.

3.2   Non-timber Forest Products (NTFP) and the Rural Economy

The NTFP derived from the conserved forest by the village communities are shown in Table 19. The NTFP include fuelwood; fruits, vegetables, mushrooms, yams, meat, spices as food for households; bee honey; medicinal plants as food and medicines; poles, thatching and roping materials; clay for construction; cane for furniture or basket manufacture; and pasture for livestock feeding. The ornamental plants and gems are mainly for the market.

Table 18. Land use patterns in home garden and highlands, all districts

Districts	Type of crops	Percent reporting	Average extent/no. of trees	Production (kg)	Amount sold (kg)	Income/ year (Rs)
Kandy (93)	Paddy	33.3	0.4	1,804	1,760	14,138.4
	Vegetables	1.2	0.1	29	14	1,400.0
	Tobacco	1.1	1.0	300	300	2,100.0
	tea*	11.0	0.05	140	140	1,680.0
	Average		1.55			
Matara (91)	Banana	8.1	0.09	544.3	350.0	781.3
	Coconut	84.8	0.13	669.8	386.3	1,540.0
	Average		0.22			
Ratnapura (92)	Banana	36.2	/145	1,644	1,185	4,106.3
	Mango	50.0	/9	477	94	31.3
	Coconut*	42.0	/158	3,738	1,575	7,812.3
	Tea	79.3	/4.8	15,814	15,814	98,839.8
	Average		7.4			

* main highland crops

Some of the NTFP (fuel wood, yams, medicines, clay) are derived throughout the year from the forests as compared to some products (fruits, vegetables, mushrooms, meat, bee honey, spices, cane, poles, thatching and roping, resin and gums, ornamental plants, gems) where seasonality of extraction was noted. A brief discussion of the NTFP extracted from the forests is presented below.

3.2.1   Fuelwood

Fuelwood is the main source of energy used for household cooking in the village communities of the districts It is relatively cheaper than the closest substitutes such as kerosene (cooking, lighting) and electricity (lighting). It is readily available to all the households in the districts as compared to electricity (Table 20). In villages of Kandy district, the forests are the major source of fuelwood. In the other districts, the main source of fuelwood was from non-forest sources such as from trees grown along the roads, pathways, home gardens, and plantations. The amount of fuelwood extracted monthly from the forest ranged between 26 kg/household in Ratnapura to 57 kg/household in Kandy. This represented nearly 87 percent of the total household

monthly requirement of fuelwood in Kandy as compared to 42 and 57 percent of the total household requirements in Matara and Ratnapura districts, respectively. The frequency of visits to the forest by the households ranged between 3-4 times per month (Table 21). The collection of fuelwood was done mainly by the wives and the participation of other household members was minimal (Table 22). The species of fuelwood extracted by households differed widely in the wet zone forests in the districts. Majority of the households indicated that bulk of the fuelwood collected consisted of chopped wood from trees as compared to low volume of dead wood. Due to the high demand of fuelwood, the amount of dead wood available was not sufficient to cater to the number of collectors from the forests.

Table 19. Extraction of forest products in the villages of all districts, by purpose and use

Forest produce	Purpose	Home consumption	Market	Kandy	Matara	Ratnapura
Fuelwood	cooking	*	*	*	*	*
Fruits	food	*	*	*	*	*
Vegetables	food	*		*	*	*
Mushrooms	food	*		*	*	*
Yams	food	*	*	*	*	*
Wild meat	food	*	*	*		
Bee honey/ bee colony	food/ medicine	*	* *	*	*	*
Kitul products	food	*	*	*	*	*
Medicinal plants	medicine	*	*	*	*	*
Spices	food	*	*	*		
Thatching and roping materials	farming, house construction	*		*	*	*
Poles	farming, house construction	*		*	*	*
Cane	furniture		*	*		
Clay	house construction		*	*	*	
Resins/gums			*	*		
Ornamental plants			*	*		
Pasture, fodder	animal feed	*		*	*	*
Gems			*		*	*

Table 20. Extraction of forest products: fuelwood energy sources of households, all districts

Districts	Fuelwood				Electricity				Kerosene			
	a	b	c	d	a	b	c	d	a	b	c	d
Kandy (92)	100.0	56.6	-	1	-	-	-	-	100	2.9	36.0	2
Matara (91)	97.8	29.1	11.3	1	32.7	10	17.8	2	67.4	2.7	34.2	2
Ratnapura (92)	100.0	26.2	52.4	1	27.1	4.0	31.8	2	72.8	2.5	128.9	2
All	99.3	37.3	21.2	1	19.9	4.7	16.5	2	80.1	2.7	66.4	2

a = refers to percent household reporting   b = refers to amount used/week (kg, litres, kW)
c = refers to cost/month (Rs)   d = refers to purpose (1 = cooking; 2 = light)

Table 21. Extraction of forest products, fuelwood, all districts

District	Contribution from		Distance from forest (km)	travel time (hr)	Amount collected/ month	No. of days/ month	Amount sold (kg)	Price/kg (Rs)	Non-cash income/ year (Rs)
	forest	Non-forest*							
Kandy (92)	98.9	89.4	1.46	2.1	236.0	4	-	0.80	1,888.0
Matara (91)	36.4	63.6	0.60	1.4	117.1	4	-	1.20	1,686.2
Ratnapura (92)	42.6	57.5	0.45	1.4	103.3	4	-	0.50	671.5
All	59.3	70.2	0.84	1.6	152.1	4	-	0.83	1,415.2

* Non-forest resources includes roadsides, home gardens and plantations
Figures in parentheses are the sample size of households in the villages

Figure 6 shows the fuelwood extraction from the forest in Kandy, Matara, and Ratnapura districts between 1987-1996. The results showed a general decline in the availability of fuelwood in the wet zone forests in the districts. It showed that the extraction of fuelwood from the forests by the village communities was not sustainable. This result may be due to the relatively high availability of close substitutes to fuelwood for household cooking (kerosene, gas) or due to the non-availability of fuelwood in the forests over time due to the high demand created by the village communities in the districts. It may also be a reflection of restrictions adopted by the FD in limiting forest extraction of NTFP's.
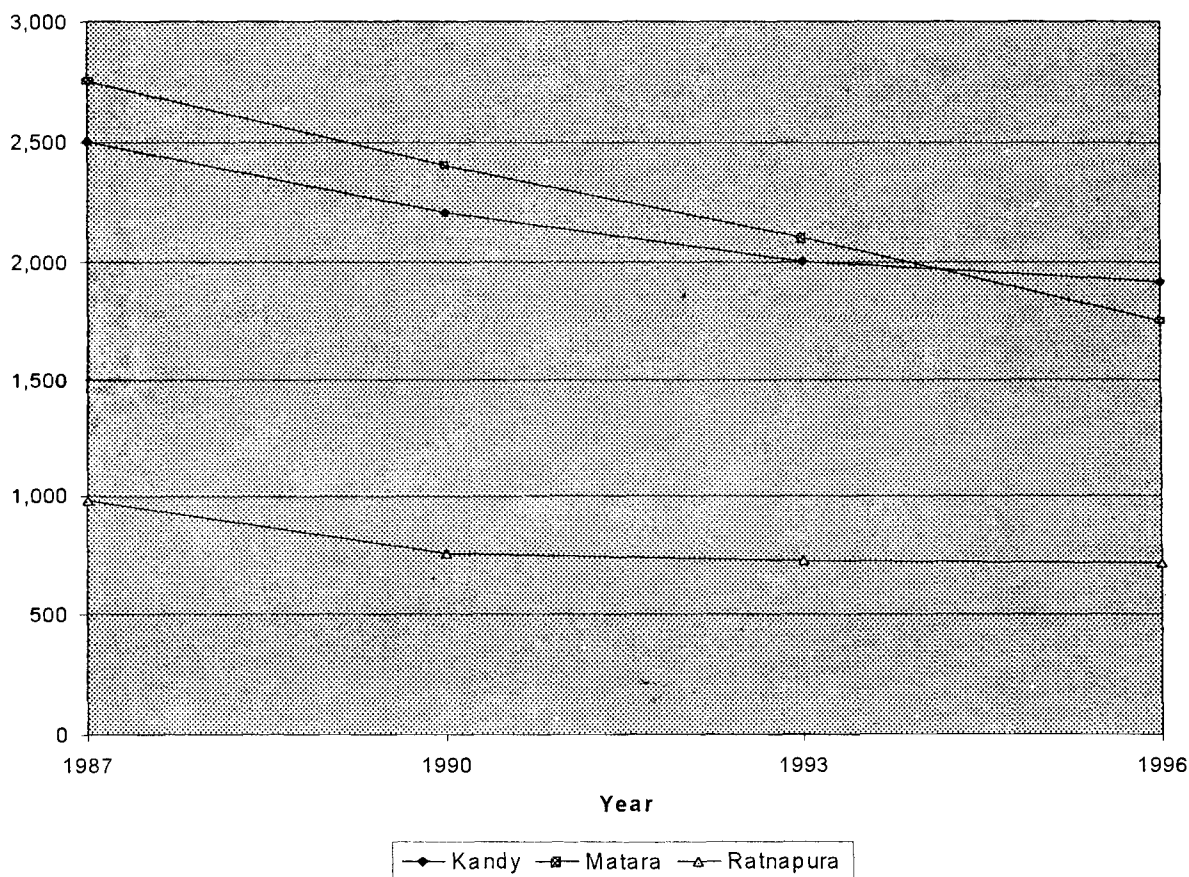
Figure 6. Fuelwood extraction from forests in all districts

Table 23 shows the distribution of annual household income and fuelwood consumption in all districts. In general, the average fuelwood consumption increases with an increase in level of household income in the districts and then decreases. However, this relation may not be exact in some districts (Ratnapura). The average distance traveled by the villagers in the districts to the forest sites was nearly 0.8 km. The time consumed to collect fuelwood varied from 1.4-2.1 hours. Assuming a wage rate of Rs100 per woman/day, the opportunity cost of collecting fuelwood ranged from Rs17.5-26.3 per day in the districts.

Table 22. Type of fuelwood used in all districts

District	Types of fuelwood	Percent Reporting	Participation		
			husband	wife	other
Kandy (92)	Pelan	30.2	6.7	100	3.3
	Pihimbiya	18.7			
	Kududaula	24.4			
	Mattu	27.9			
	Albizzia	8.9			
	Kinna	33.3			
	Madol	30.0			
	Mora	17.2			
	Kanda	1.1			
Matara (92)	Pelan	33.1	5.8	90.2	10.9
	Milla	51.9			
	Hora	42.8			
	Bandi del	36.1			
	Kakuna	7.6			
	Halmilla	29.8			
	Godapara	43.0			
	Goraka	5.4			
	Kone	18.2			
	Attamba	32.0			
	Pihimbiya	17.6			
Ratnapura (101)	Welan	1.1	12.8	84.9	2.3
	Nika daula	1.1			
	Attamba	66.3			
	Hadone	45.7			
	Karaw	50.0			
	Godapara	1.3			
	Pinna	20.7			
	Liyang	1.1			
	Diyapara	52.2			
	Dan	3.3			
	Alubo	2.2			
	Kumbuk	1.1			
	Hadoka	1.1			
	Urakapu	2.2			

The average price of fuelwood ranged from Rs0.50 in Ratnapura to Rs 1.20/kg in Matara districts. Due to the constant range of prices existing over a wide range of the sample, this variable did not turn out significant in the demand equation for fuelwood estimated by ordinary least squares. In general, the demand equation for fuelwood showed a poor fit in the districts (Table 24).

Table 23. Annual household income and fuelwood consumption in all districts

Household Income (Rs)	Kandy		Matara		Ratnapura	
	Percent Reporting	kg	Percent Reporting	Kg	Percent Reporting	kg
<10,000	6.5	1,029.6	-	-		
10,001-20,000	6.7	1,928.4	-	-		
20,001-30,000	20.7	1,646.0	7.7	780.0	4.4	1300.0
30,001-40,000	13.0	1,836.2	11.0	1,914.0	5.7	1196.0
40,001-50,000	35.9	1,904.0	24.3	1,903.0	21.9	1409.0
>50,001	15.2	2,234.0	57.1	1,523.0	21.9	1328.0
	100.0	1,762.2	100.0	1,530.0	100.0	1,308.3

Table 24. Regression coefficients for demand for fuelwood, all districts

District		
Kandy (91)	$\log D = 11.2969 - 0.3323 \log$ income (0.8578) (0.0822)	$R^2 = 0.15$ $F = 15.3$
Matara (90)	$D = 1,665.351 - 0.0036$ income (124.3740) (0.0015)	$R^2 = 0.16$ $F = 5.37$
Ratnapura (91)	$D = 1,342.6825 - 0.0011$ income (156.779) (0.0024)	$R^2 = 0.10$ $F = 2.20$

3.2.2 Fruits

The fruits are seasonally produced in the moist monsoon forest of the wet zone districts; they are a source of non-cash income to the village communities. The amount collected by a household was nearly 8.0 kg/day for 6 days/year mainly for home consumption of households (except in Matara). The household head traveled a distance of 0.8 km from forest and spent around 3 hours in collection. On the basis of a wage rate of Rs100/woman per day, the average value of fruits collected from the forest ranged from Rs235 in Kandy to Rs1,740/household in Matara (Table 25). The types of fruits extracted by village communities from the forests differed in the districts (Table 26)

Table 25. Extraction of forest products: fruits, all districts

District	Percent reporting	Amount collected/ day (kg)	No. of days/year	Collection		Amount sold (kg)	Price/kg (Rs)	Income/ year (Rs)
				distance (km)	time (hr)			
Kandy (92)	17.0	4.98	4.0	1.30	2.40	-	7.96	235.1
Matara (91)	54.6	17.4	5.0	0.60	3.30	25.4	22.4	1,740.0
Ratnapura (92)	30.4	1.51	9.3	0.40	1.95	-	20.5	338.1·
All	34.0	7.96	6.1	0.76	2.55	8.5	16.95	771.1

Table 26. Types of fruits used in all districts

District	Types of fruits	Percent reporting	Amount extracted (kg/day)
Kandy (92)	Etamba	5.0	0.2
	Nelli	4.8	0.3
	Hal	3.1	
	Mora	9.4	
	Weralu	3.1	
	Udahalu	3.1	
	Welambilla	12.5	
Matara (91)	Himbutu	13.0	17.4
	Dan	38.9	
	Goraka	21.9	
	Etamba	13.0	
Ratnapura (92)	Dan	66.7	3.5
	Himbutu	37.5	2.9
	Goraka	18.8	11.5
	Etamba	18.8	2.3

3.2.3 Vegetables and greens

The forest is a source of vegetables and greens used in household cooking. The amount of vegetables collected per day amounted to 1 kg/day for all districts (Table 27), and the annual frequency of collection ranged from 3-12 days. The villagers travel a distance of 1.4 km for collecting vegetables from the forest and spent nearly 1.4 hours (opportunity cost of Rs 17.5/day) for this purpose. The non-cash income for collection of vegetables ranged from Rs 22.5 in Matara to Rs 361.5 in Ratnapura districts. The vegetables species collected by villagers from the forest were many and differed from each other (Table 28). The amount of vegetables collected by the village communities from the forests over the years has declined by nearly 57 percent between 1987-1996. This result indicated that the extraction of vegetables from the wet zone forests was not sustainable. The relationship between household income and vegetable extraction was not very apparent in the results (Table 29).

Table 27. Extraction of forest products: vegetables and greens, all districts

District	Percent reporting	Amount collected /day (kg)	No. of days/year	Collection distance (km)	time (hr)	Amount sold (kg)	Price/kg (Rs)	Income (Rs)
Kandy (92)	48.3	1.43	3.0	1.26	2.43	-	40.0	170.8
Matara (91)	5.40	0.25	3.0	0.20	0.40	-	7.3	203.2
Ratnapura (92)	81.5	0.60	8.8	0.40	1.40	-	8.9	38.6
All	70.8	0.94	5.3	0.70	1.98	-	15.4	110.9

Table 28. Types of vegetables used in all districts

District	Types of vegetables	Percent reporting	Amount extracted (kg/day)
Kandy (92)	Thambu	31.2	1.4
	Karakola	43.9	
	Embulkola	19.0	
	Bendurukola	4.8	
	Anuga	9.5	
	Neraludalu	4.8	
	Thibbutu	9.5	
Matara (91)	Thambu	0.3	0.3
Ratnapura (92)	miena koku	43.5	4.3
	patara koku	2.8	0.2
	madu koku	26.2	2.9
	thibbutu	16.4	1.7
	mawara	1.4	0.1
	keena	25.0	1.3

Table 29. Annual household income and vegetable consumption in all districts

Household Income (Rs)	Kandy		Matara		Ratnapura	
	Percent Reporting	kg	Percent Reporting	kg	Percent Reporting	kg
<10,000	6.5	0.3	-	-	-	-
10,001-20,000	6.7	3.5	-	-	-	-
20,001-30,000	20.7	4.0	-	-	5.6	30.0
30,001-40,000	13.0	1.9	-	-	5.6	10.5
40,001-50,000	35.9	3.1	-	-	16.6	13.8
>50,001	15.2	4.3	-	-	72.2	4.8
	100.0	2.9	-	-	100.0	14.8

3.2.4 Mushrooms

Mushrooms collected from the forest were a source of food for the households. The average amount of mushrooms collected was nearly 0.9 kg and the annual frequency of collection was 5 days. The villagers traveled a distance of 0.7 km from the forest and spent nearly 2.0 hours (opportunity cost of Rs25) for this purpose. The annual non-cash farm income gained by the villagers from collecting of mushrooms in all districts was Rs110 (Table 30). The amount of mushrooms extracted by the villagers declined by nearly 30 percent between 1987-1996 showing that it is not sustainable. The species of mushrooms extracted by villagers in the district varied between forests in each district showing biodiversity (Table 31). The mushroom consumption in the village communities increased with the increase of household income and then declined in the wet zone districts (Table 32).

Table 30. Extraction of forest products: mushrooms, all districts

District	Percent reporting	Amount collected /day (kg)	No. of days	Collection distance (km)	Collection time (hr)	amount sold (kg)	price/kg (Rs)	income /year (Rs)
Kandy (92)	71.6	1.23	4.0	1.2	2.43	-	30.0	90.9
Matara (91)	59.4	1.00	3.0	0.5	2.10	-	7.3	203.2
Ratnapura (92)	81.5	0.60	8.8	0.4	1.40	-	8.9	38.6
All	70.8	0.94	5.3	0.7	1.98	-	15.4	110.9

Table 31. Types of mushrooms extracted in all districts

District	Types of mushrooms	Percent reporting	Amount extracted (kg/day)
Kandy (92)	Kiri	42.3	1.1
	weli	34.8	
	goraka	1.2	
	kanda	19.0	
	lena	9.7	
	yala	12.5	
Matara (91)	indalolu	45.2	1.0
	heenweli	3.3	
	oluweli	1.1	
	weli	16.5	
	lena	28.8	
	athuru	1.1	
	kiri	1.1	

Table 32. Annual household income and mushroom consumption in all districts

Household Income (Rs)	Kandy Percent Reporting	Kandy kg	Matara Percent Reporting	Matara kg	Ratnapura Percent Reporting	Ratnapura kg
<10,000	6.5	2.0	-	-	-	-
10,001-20,000	6.7	3.0	-	-	-	-
20,001-30,000	20.7	3.1	2.8	2.10	5.4	1.1
30,001-40,000	13.0	2.3	11.1	1.50	6.8	1.2
40,001-50,000	35.9	1.7	24.3	1.95	21.6	2.2
>50,001	15.2	2.4	57.1	1.90	66.2	2.4
	100.0	2.4	100.0	1.86	100.0	1.7

3.2.5 Yams

Yams are used by villagers as source of food and contributes to their daily energy intake. Nearly 25 percent of the households in the districts extracted yams from the forest in all the districts. The amount of yams collected by a household ranged between 0.6 kg in Ratnapura to 4.1 in Kandy district. The annual frequency of collection was around 6 days. The villagers traveled a distance of 1 km to the forest and used 2.8 hours (opportunity cost of Rs35) for collecting yams from the wet zone forest. The amount of yams collected in the forest has not declined much over the years. However, the villagers indicated that they travel a longer distance into the forest to extract this food resource. The annual non-farm cash income derived from yams was Rs208/household in the districts (Table 33). Some species of yams collected were common (Katuala) among the forests (Table 34).

Table 33. Extraction of forest products: yams, all districts

| District | Percent reporting | Amount collected/ day (kg) | No. of days | Collection | | Amount sold (kg) | Price/kg (Rs) | Income /year (Rs) |
				distance (km)	time (hr)			
Kandy (92)	41.5	4.1	5.0	1.90	3.3	-	11.25	241.1
Matara (91)	19.8	3.7	5.0	0.70	2.8	-	19.90	351.8
Ratnapura (92)	14.1	0.6	7.5	0.46	2.3	-	9.50	33.2
All	25.1	2.8	5.8	1.02	2.8	-	13.55	208.7

Table 34. Types of yams used in all districts

District	Types of yams	Percent reporting	Amount extracted (kg/day)
Kandy (92)	katuala	45.2	4.3
	kukuala	9.5	
	hingurala	1.6	
Matara (91)	kaluala	19.8	3.7
Ratnapura (92)	katuala	41.7	12.5
	walala	8.3	1.3
	habarala	8.3	1.3
	gonaala	25.0	12.5

3.2.6 Spices

Wild spices are obtained by villagers in Kandy district mainly as a source of food. The main types of spices collected from Knuckles forest in the Kandy district consisted of cardamom (ensal) and cinamon (Tables 36 and 37). However, only 4 percent of the households are involved in the spice collection mainly due to its non-availability in the forest and cultivation of high yielding local and hybrid varieties in the highlands. The amount of wild spices collected by a household was 3 kg/day with an annual frequency of collection of 3 days. The villagers traveled a distance of nearly 1.4 km for collection and the time utility of collection was around 2 hours (or opportunity costs Rs25). The household non-cash farm income derived from extraction of spices was nearly Rs267.

Table 35. Extraction of forest products: spices, all districts

District	Percent reporting	Amount collected/ day (kg)	No. of days	Collection		Amount sold (kg)	Price/kg (Rs)	Income /year (Rs)
				distance (km)	time (hr)			
Kandy (92)	4.4	2.0	3	1 43	2 0	0.67	31.7	266.7
Matara (91)	-	-	-	-	-	-	-	-
Ratnapura (92)	-	-	-	-	-	-	-	-
All	1.5	0.7	3	1.43	2.0	0.22	31.7	88.9

Table 36. Types of spices extracted in all districts

District	Types of spices	Percent reporting	Amount extracted (kg/day)
Kandy (92)	ensal	2.5	0.5
	cinnamon	0.8	1.0
Matara (91)	-	-	-
Ratnapura (92)	-	-	-

3.2.7 Wild animal products

Hunting of wild animals was practiced by villagers in Kandy and Matara districts. The main type of animals hunted included wild boar, porcupine, deer, and keballawa for meat (Tables 38 and 39). The meats (particularly wild boar) are mainly for selling in the local market and these fetch a price of around Rs32/kg. The annual frequency of hunting was around 2 days and the distances traveled ranged between 0.25-2.0 km from the forest. The time spent for hunting ranged from 5.6 hours in Kandy (opportunity cost of Rs70/day) to 2.0 hours (opportunity cost of Rs25/day) in Ratnapura forest. The annual average cash income derived from selling meat was around Rs1,643/household in both districts.

Table 37. Extraction of forest products: wild animal products, all districts

District	Animal product	Percent reporting	No. of days hunting/year	Collection		Amount sold (kg)	Price/kg (Rs)	Income /year (Rs)
				Distance (km)	time (hr)			
Kandy (92)	meat	10.7	2.1	1.95	5.6	24.3	31.7	1,593.3
Matara (23)	meat							
Ratnapura (92)	meat	1.1	2.0	0.25	2.0	2.0	25.0	50.0
All	meat	3.9	2.1	1.10	3.8	8.8	18.9	547.8

Table 38. Types of meats extracted in all districts

District	Types of meats	Percent Reporting	Amount used (kg/year)
Kandy (92)	wild boar porcupine deer kaballawa	36.7 8.9 6.7 6.7	30.1
Matara (91)	-	-	-
Ratnapura (92)	porcupine	1.1	2.5

3.2.8 Bee colonies/bee honey

Bee colonies/bee honey serve as food as well as medicine to the village communities in Kandy and Matara districts. The amount of bee colony/bee honey collected from the forests was low but due to the high demand, these products fetch high prices in the local markets. Generally, bee honey is available only in the forests for 1.5-2 months of the year during the flowering season. In Kandy, the villagers travel a distance of 2.5-3.5 km in the forest to collect bee honey and the time spent for collection ranged from 4.1 hours (opportunity cost of Rs 50/day) in Kandy district to 2.5 hours (opportunity cost of Rs31/day) in Ratnapura district. Some bee honey was marketed and the annual cash and non-cash income earned from this product amounted to nearly Rs 588-600/households in the districts (Table 39).

3.2.9 Kitul/kitul products

The nectar extracted from the inflorescence of the Kitui palm is used to prepare an alcoholic beverage (toddy), and are further processed to form high value added products such as trecle and jaggery. The skill required in preparing the inflorescence and converting nectar to toddy and other forms makes it a specialized job participated by few households in the districts (Table 40). The amount of toddy collected ranged from 19 litres in Matara to 183 litres/month in Ratnapura. The number of kitul palms tapped in the districts varied from 1-4. The seasonal production of kitul nectar lasts for nearly 4 months. As collection of toddy is done over the entire day, the time required in collection (1.3 hours or opportunity cost of Rs16.7/day) was mainly for travelling the average distances to the forest (0.3 km) and climbing the kitul palm trees to obtain the kitul extract. Most of the value added products such as trecle and jaggery were sold in the markets and the cash income gained by the villagers from this crops ranged from Rs775 in Matara to Rs6,333/household in Kandy district.

Kitul could be considered to be one of the main forest cash crops in the districts. However the amount of toddy extracted from forest kitul palms in the district has declined over the years (Figure 7). This may have been caused by the reduction in the number of forest trees and poor management of the kitul trees, leading to loss of productivity. The other sources of kitul tapping included those grown within the village (rented from others) and in home gardens (Table 41). None of the villagers in the districts has obtained any license from the FD for tapping of kitul farms located within the forest boundary.
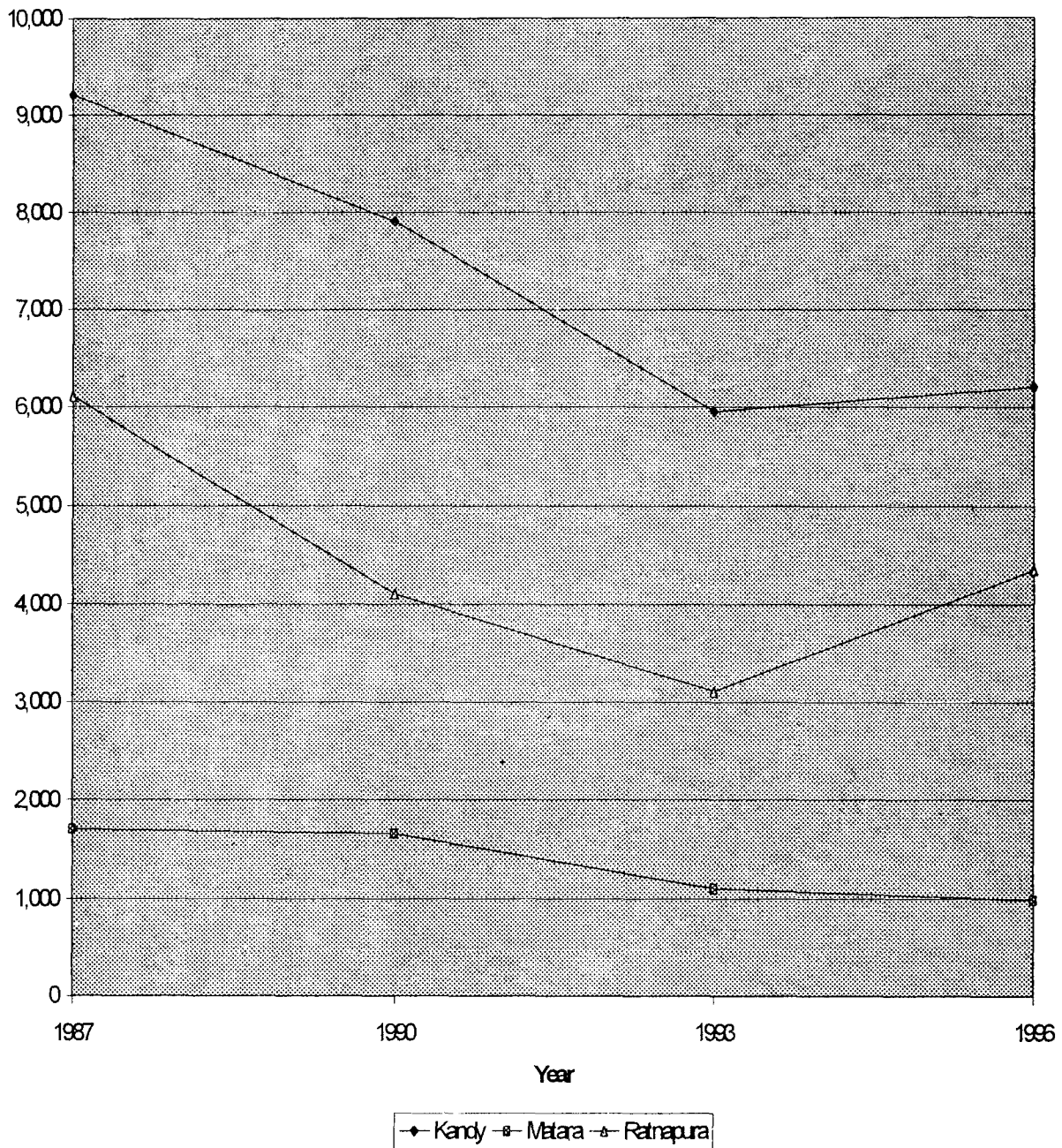
Figure 7. Farm income from kitul toddy from forests in Rs/year

Table 39. Extraction of forest products: bee colonies/bee honey, all districts

District	Percent reporting		Amount collected/ month		No. of months /yr	Collection				Amount sold/year (kg)		Price/kg (Rs)		Income/year (Rs)
						distance (km)		time (hr)						
	a	b	a	b		a	b	a	b	a	b	a	b	
Kandy (92)	14.0	19.5	0.53	1.23	2.0	2.7	3.5	3.0	4.1	-	1.3	80	136.7	588
Matara (91)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ratnapura (92)	-	5.4	-	1.6	1.5	-	0.7	-	2.5	-	4.0	-	150.0	600
All	4.7	8.3	0.18	0.9	1.2	2.7	2.1	3.0	3.3	-	0.6	80	143.4	396

Note: a - bee colonies (kg); b - bee honey (litres)

Table 40. Extraction of forest products: kitul products, all districts

District	% report	Amount collected/month			No. of months /yr	Collection						Amount sold (kg)			Price/kg (Rs)			Income /year (Rs)
						distance (km)			time (hr)									
		a	b	c		a	b	c	a	b	c	a	b	c	a	b	c	
Kandy (92)	8.8	152.0	1.7	-	4.0	0.20	-	-	1.7	0.7	-	44.6	1.3	-	10	26.7	-	633.3
Matara (91)	3.2	19.4	-	-	4.0	0.19	-	-	1.3	-	-	21.3	-	-	10	-	-	775.0
Ratnapura (92)	7.6	183.3	2.5	-	3.0	0.40	-	-	1.0	-	-	428.0	6.5	-	10	80.0	-	4,797.0
All	6.5	118.2	1.4	-	3.7	0.26	-	-	1.3	0.7	-	164.6	2.6	-	10	53.4	-	3,968.4

Note: a - toddy (litre)
b - jaggery (kg);
c - trecle (litre)

Table 41. Extraction of forest products: kitul/kitul products, all districts

District	Extraction from (% reporting)			Extraction from (no of trees/year)			License for tapping (% reporting)	
	within forest	within village	home garden	within forest	Within village	home garden	yes	no
Kandy (92)	89.6	7.2	3.2	4.0	6.7	5.00		100
Matara (91)	66.7	15.7	17.6	1.0	-	-		100
Ratnapura (92)	31.3	31.3	34.8	1.5	2.5	3.25		100
All	62.5	18.1	21.5	2.1	3.1	2.80		100

3.2.10 Medicinal plants

The average amount of herbal plants collected daily ranged from 1.2 kg in Matara to 3.2 kg in Kandy with an annual frequency of 3.2 days (Table 42). The distance covered by the households in collection was around 2 km in the forest with a daily time of collection of 2.7 hours (opportunity cost of Rs33.8). Some of the medicinal plants collected from Knuckles ranges was marketed by villagers in Kandy district. The annual average non-cash income from medicinal plants was Rs67.3. The species of medicinal plants collected from the wet zone forests in the districts by the village communities varies indicating high level of biodiversity existing in the wet zone forests (Table 43). The annual consumption of medicinal plants in relation to the income distribution is shown in Table 44 (Figure 8).

Table 42. Extraction of forest products: medicinal products, all districts

District	Percent reporting	Amount collected/ day (kg)	No. of days	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				distance (km)	time (hr)			
Kandy (92)	40.6	3.2	2.8	2.8	3.2	2.1	12.5	118.9
Matara (91)	95.7	1.2	4.0	2.4	3.6	-	10.5	49.2
Ratnapura (92)	96.7	0.9	2.8	0.7	1.2	-	37.7	33.7
All	77.7	1.8	3.2	2.0	2.7	0.7	20.2	67.3

3.2.11 Thatching and roofing materials

Roping materials are used by villagers in binding roof rafters and in other farm activities as a substitute for ropes (e.g. fences). Thatching materials from forests are substitutes for roofing materials such as straw and coconut palm leaves used by the villagers. The demand for thatching and roping materials from the forests were low as only less than 10 percent of the households reported to be extracting it. The amount of non-cash income gained by the villagers was therefore minimal for these products. The species of thatching and roping materials varied between forest and the results indicated high level biodiversity among the wet zone forests (Tables 45 and 46).

Table 43. Types of medicinal plants extracted in all districts

District	Types of plants	Percent Reporting	Amount extracted (kg/month)
Kandy (92)	Polpala	3.4	
	Pawatta	3.4	0.3
	Bulu	14.1	10.6
	Bomi	21.4	0.2
	Nawahandi	22.5	0.5
	Monara-kudumi	7.1	
	Kalukitul	1.1	0.7
	Nawahandi	22.5	0.2
	Bin kohomba	5.2	0.2
	Rukattana	1.0	0.3
	Aralu	1.0	4.0
	Nelii	1.0	1.0
	Bati	1.0	10.0
Matara (92)	Sathsanda	48.2	7.5
	Magul karanda	6.5	
	Athdembatu	33.1	7.5
	Indi bada	3.3	0.1
	V. Kranthi	4.4	0.1
	Iramusu	9.8	
	Weniwel	72.6	0.8
	Hathawariya	19.7	0.5
	Ratmal	57.2	0.5
	Ath kanda	38.7	
	Kudumberiya	29.0	0.5
	Babila	13.1	
	Pelan	1.1	
	Pawatta	1.1	0.2
Ratnapura (92)	Weniwul	50.3	5.2
	Iramusu	44.3	1.0
	Rasakinda	44.7	2.9
	Dembata	4.5	0.1
	Sathsanda	44.9	1.8
	Wal angiriya	26.7	2.6
	Ath kenda	34.3	1.3
	Hathawariya	13.1	0.7
	Ath dembata	25.7	1.3
	Kuda hedaya	12.1	0.5
	Maha hedaya	7.8	0.5
	Mee	20.1	2.2
	Hondala	8.3	0.2

Table 44. Annual household income and medicinal plants' consumption in all districts

Household Income (Rs)	Kandy		Matara		Ratnapura	
	Percent Reporting	kg	Percent Reporting	kg	Percent Reporting	kg
<10,000	6.5	1.7	-	-	-	-
10,001-20,000	6.7	2.2	-	-	-	-
20,001-30,000	20.7	2.6	2.8	0.9	4.6	0.2
30,001-40,000	13.0	3.3	11.1	1.4	7.0	0.7
40,001-50,000	35.9	2.4	24.3	1.4	21.8	0.8
>50,001	15.2	1.7	57.1	1.5	66.6	1.0
	100.0		100.0	1.3	100.0	0.7
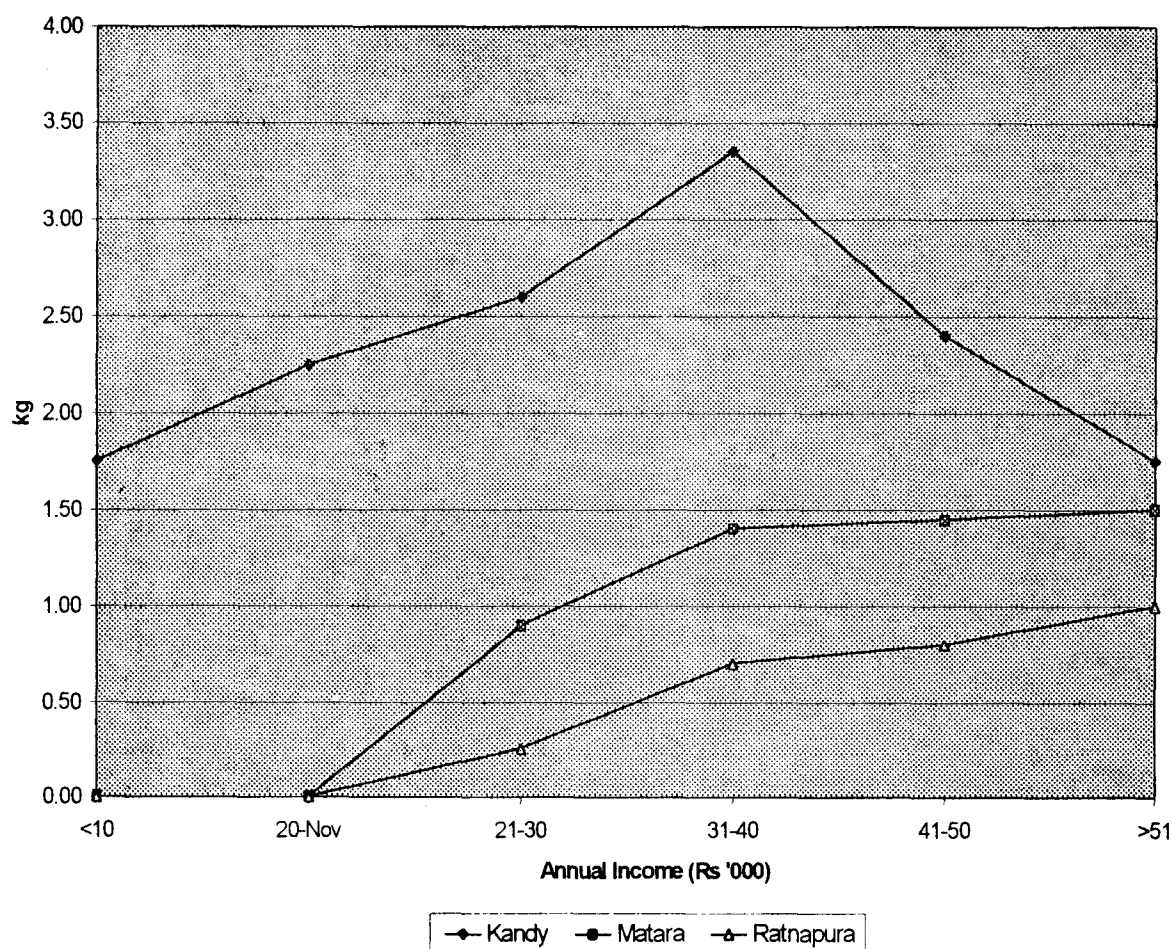
Figure 8. Consumption of medicinal plants and income distribution

Table 45. Extraction of forest products: thatching and roping materials, all districts

District	Percent reporting	Amount collected/ day (m)	No. of days	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				distance (km)	time (hr)			
Kandy (92)	10.7	2.5	4.0	2.7	4.5	-	0.67	11.3
Matara (91)	7.6	5.8	5.0	0.8	2.0	20.5	0.97	27.3
Ratnapura (92)	6.5	66.3	4.0	0.5	1.6	-	1.00	268.8
All	8.3	24.9	4.3	1.3	2.7	6.8	0.80	102.5

Table 46. Types of thatching and roping materials extracted in all districts

District	Types of Plants	Percent Reporting	Amount Extracted
Kandy (92)	Bata	6.3	3.3
	Kalawel	1.1	2.0
	Wewal	4.2	4.0
Matara (91)	Thunhiriya	2.2	45.0
	Pan	2.2	17.5
Ratnapura (92)	Kahawel	100.0	243.8

3.2.12 Poles

Poles are used by the villagers in the construction of fences (animal fences, farm fences) and farm cultivation (support of vines, handles of farm equipment such as mammoties). The poles were made from mature branches of trees in the forest. The extraction of poles from the forest was relatively low and the non-cash income gained was not significant (Table 47). The species of trees used in making poles in the districts are shown in Table 48. Some of the species used are expensive in the domestic markets. Harvesting and transport of timber for construction and furniture industries are regulated by the government through a permit scheme.

Table 47. Extraction of forest products: poles, all districts

District	Percent reporting	Amount collected/ day (m)	No. of days/yr	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				Distance (km)	time (hr)			
Kandy (92)	15.3	23.3	3.0	0.8	1.27	-	1.00	319.0
Matara (91)	9.3	13.0	2.0	0.8	1.50	14.0	1.90	45.0
Ratnapura (92)	-	-	-	-	-	-	-	-
All	8.2	12.1	1.7	0.8	1.40	4.7	0.96	121.3

3.2.13 Cane, resin and gums

Cane was obtained by 2 percent of households from Knuckles range of forest in Kandy district (Table 49). It is mainly used in furniture industry and weaving of basket for household use. The non-cash income gained was minimal based on the results. Resins and gums extracted from the forests are also minimal (Table 50).

Table 48. Types of poles used in all districts

Districts	Types of Plants	Percent reporting	Amount extracted/month (no)
Kandy (92)	Kudidaula	10.0	0.7
	Kudumberiya	12.2	1.1
	Eraminiya	2.2	0.3
	Ginisuriya	2.1	46.7
	Welan	1.0	8.3
	Nikadaula	1.0	8.3
Matara (92)	Godapara	3.2	6.3
	Milla	6.5	
	Badidel	1.1	
	Halmilla	1.1	
	Hora	1.1	2.5
	Kone	1.1	4.5
	Petan	1.1	12.5
	Kudumberiya	1.1	6.3
	Muguna	1.1	
Ratnapura (92)			

Table 49. Extraction of forest products: cane as raw material, all districts

District	Percent reporting	Amount collected /day (m)	No. of days/yr	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				distance (km)	time (hr)			
Kandy (92)	2.1	0.3	3.0	0.1	0.3	-	6.7	26.0
Matara (91)	-	-	-	-	-	-	-	-
Ratnapura (92)	-	-	-	-	-	-	-	-
All	0.7	0.1	1.0	0.3	0.1	-	2.2	8.7

Table 50. Extraction of forest products: resin and gums, all districts

District	Percent reporting	Amount collected /day (m)	No. of days/yr	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				distance (km)	time (hr)			
Kandy (92)	4.4	0.35	4.0	1.0	2.4	-	4.5	6.3
Matara (91)	-	-	-	-	-	-	-	-
Ratnapura (92)	-	-		-	-	-	-	-
All	1.5	0.12	1.3	0.3	0.8	-	1.5	2.1

3.2.14 Clay

Clay is extracted mainly from the forest sites in Kandy and Matara districts, transported to kilns, and used for preparing bricks used in the construction industry. The brick industry is highly specialized. Hence, collection of clay from forests was practiced by few households in the villages (Table 51). The preparation of bricks continued annually over 5-10 months and provided annual average incomes of Rs 2,600-3,350/household in these districts. Some of the fuelwood required was purchased from outside markets.

Table 51. Extraction of forest products: clay/clay products (bricks), all districts

District	Percent reporting	Amount collected /day (m)	No. of days/yr	Collection		Amount sold (kg)	Price/kg (Rs)	Income (Rs)
				distance (km)	time (hr)			
Kandy (92)	3.3	67.0	10.0	-	-	67.0	5.0	3,350.0
Matara (91)	4.4	102.0	4.5	-	-	450.0	5.8	2,600.0
Ratnapura (92)	-	-	-	-	-	-	-	-
All	2.6	56.3	4.8	-	-	172.3	3.6	1,983.3

3.2.15 Gem mining

Majority of the villagers in Matara and Ratnapura district practiced illegal gem mining in the forests. The income gained from these practices were relatively high and the cash income based from the survey may be underestimated (Table 52). Accurate data pertaining to these practices were difficult to obtain from the villagers in the districts.

Table 52. Extraction of forest products: gems, all districts

District	Percent reporting	Amount produced/year (carats)	Collection		Amount sold (kg)	Income (Rs)
			distance (km)	time (months)		
Kandy (92)	-	-	-	-	-	-
Matara (91)	2.2	32.3	0.25	1.5	32.3	3,010.9
Ratnapura (92)	-	-	-	-	-	-
All	0.7	6.7	0.08	0.5	10.8	1,003.6

3.2.16 Pasture and fodder

The forests are the major sources of fodder for the cattle and buffalo owners of the village communities. Cattle are reared mainly for milk production and buffaloes for crop cultivation practices (tilling soil, threshing of harvested paddy). The size of cattle and buffalo herds were low and were mainly free-grazed by majority of the owners. The fodder consisted of young branches of trees, cut and fed to animals. The free grazing of animals was regularly done on the outskirts of the forests without much supervision (Table 53).

Table 53. Extraction of forest products: pasture and fodder for cattle/buffalo, all districts

Village	Percent reporting		Type of feeding (% report)			Collection		Source of pasture/fodder (% report)		
	cattle	buffalo	cut and feed	Free grazing	both	distance (km)	time (hr)	forest	home	village
Kandy (92)	25.5 (2.0)	4.3 (1.0)	24.4	66.8	8.8	0.7	1.40	72.2	4.3	23.5
Matara (91)	10.0 (1.3)	-	8.8	90.1	1.1	0.6	0.75	69.9	7.0	23.1
Ratnapura (92)	12.5 (1.0)	-	29.4	70.6		0.3	1.00	63.8	9.3	26.9

Figure in parentheses are the number of animals/household

3.3 Household Income from NTFPs and Other Farm and Non-Farm Activities

The annual cash flow of the households of Kandy, Matara and Ratnapura districts are shown in Tables 54, 55, and 56. The cost component included those of labour, transport and other activities (materials and equipment). Fuelwood contributed the highest net total income from NTFPs, followed by Kitul in Kandy and Ratnapura districts. In Matara, the main net income from NTFPs was derived from fruits followed by fuelwood (Figures 10 and 11). Fuelwood and Kitul contributed to 38.17 percent of total net cash and non-cash income, respectively from NTFPs in all districts. The annual net income gained from all NTFPs ranged from Rs1,117/household in Ratnapura to Rs3,226/household in Kandy district.

Figures 10 and 11 show the comparison of farm, off-farm and NTFPs in all villages of Kandy, Matara, and Ratnapura districts. The off-farm income was the highest source of income followed by farm income and income from NTFP's in all districts. The variation of total income of NTFPs was from 1.1 percent in Ratnapura to 9.6 percent in Kandy district. In all districts, income from NTFP's was 4.7 percent of the annual household income. The results indicated that the incomes derived from NTFPs may not be substantial enough for the village communities to participate in conservation efforts in the wet zone forests as required by the FSMP.

Kandy

6.9   4.6

16.5

50.5

4.1

- 🔲 bee honey
- ⬛ meats
- ◻ kitul
- ◻ vegetables
- ⬛ fuelwood
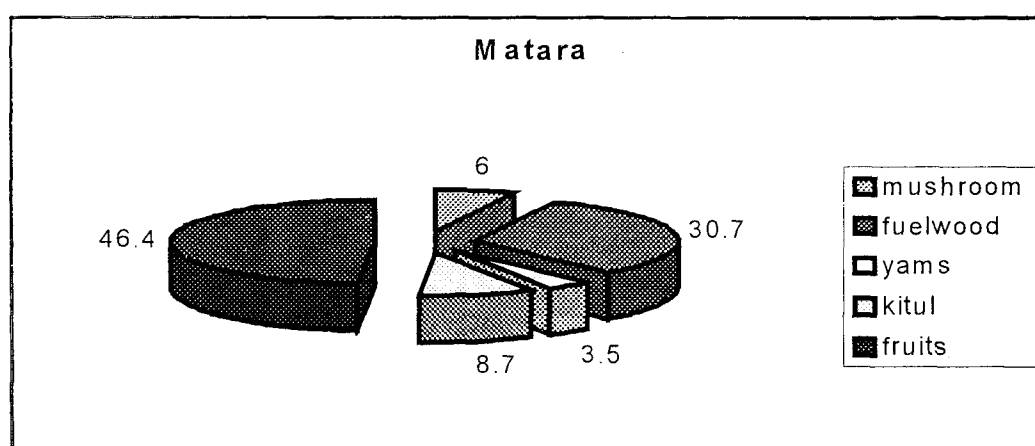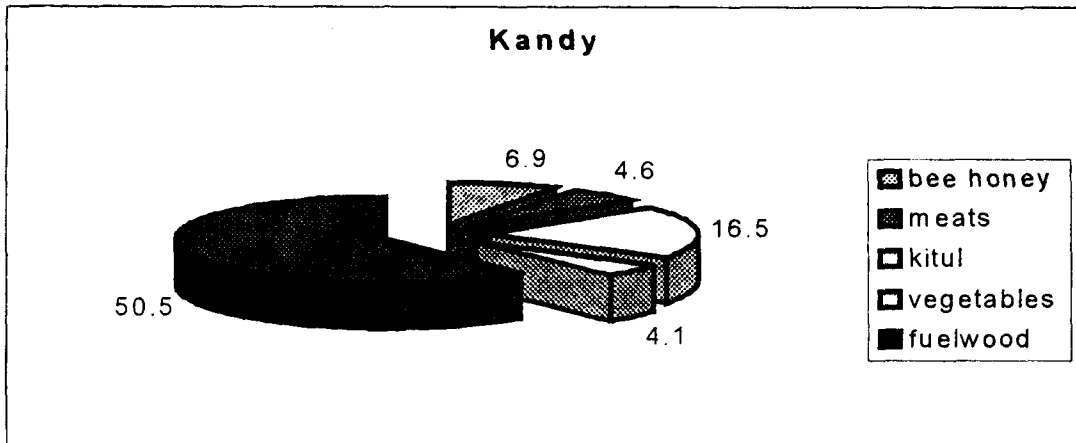
Figure 9. Net income earned from NTFP in all districts
(percent of total income of NTFP)

All Districts

15.5   3.2

35.6

19

10

- 🔲 fuelwood
- ⬛ vegetables
- ◻ fruits
- ◻ kitul
- ⬛ bee honey

Ratnapura

30.1   25.6

9.2   24.6

- 🔲 fuelwood
- ⬛ vegetables
- ◻ fruits
- ◻ kitul
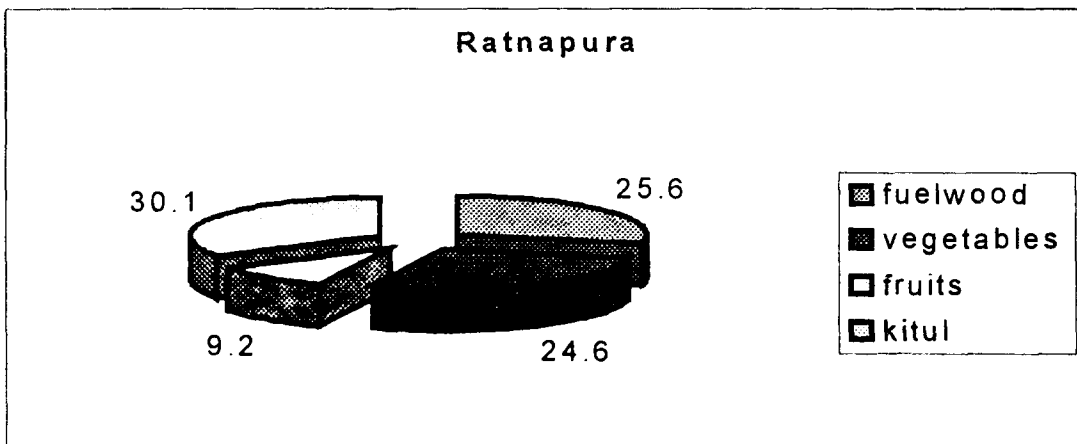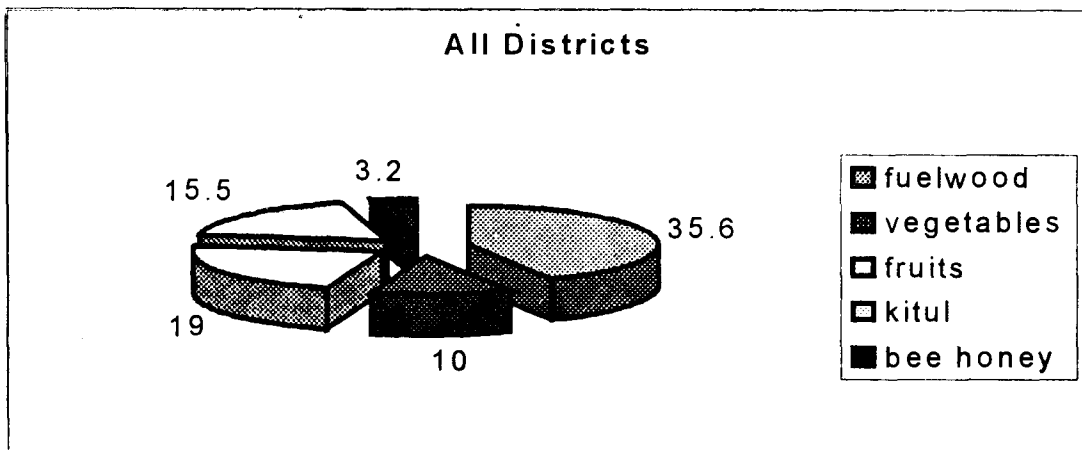
Figure 10. Net income from NTFP in the districts

Table 54. Annual gross income, net income earned by households from forest extracts in villages in Kandy districts, (n = 92)

Forest produce	Gross income (Rs/household)	Cost of produce			Net income (Rs)	Percent of total income
		Transport	Labor	Other		
Fuelwood (100)	1,888.00				1,888.0	50.5
fruits (17.0)	39.96				39.96	1.2
vegetables (49.0)	130.90				130.9	4.1
mushroom (71.0)	65.30				65.3	-
yams (41.5)	100.00				100.0	3.1
wild meat (10.7)	170.50	19.0	3.2		148.3	4.6
bee honey/ colony (46.5)	273.40			50.0	223.4	6.9
kitul products (9.0)	557.30	9.0		26.3	522.0	16.5
medicinal plants (40.6)	21.10				21.1	0.7
thatching and roping materials (10.7)	1.20				1.2	-
poles (15.3)	49.00				49.0	1.5
spices (4.4)	9.97				9.97	0.3
ornamental plants (1.0)	0.33				0.33	-
cane products (2.1)	0.42				0.42	
clay/products (3.3)	36.90	1.32	7.9	2.2	25.5	0.9
Resins/ gums (4.4)	0.27				0.27	
Total (100.0)	3,344.24	29.0	11.0	79.0	3,225.20	

Table 55. Annual gross income, net income earned by households from forest extracts in villages in Matara districts, (n = 91)

Forest produce	Gross income (Rs/household)	Cost of produce			Net income (Rs)	Percent of total income
		Transport	Labor	Other		
Fuelwood (36.4)	613.77				613.77	30.7
Fruits (54.6)	939.71		12.30		927.40	46.4
Vegetables (5.4)	1.20				1.20	
Mushroom (59.4)	119.40				119.40	6.0
Yams (19.8)	69.65				69.65	3.5
Kitul products (22.6)	173.25				173.25	8.7
Medicinal plants (95.7)	47.10				47.10	
Thatching and roping materials (7.6)	2.07				2.07	
Poles (9.3)	4.10				4.10	
Clay/products (4.4)	113.15		48.40	3.90	60.85	3.0
Gems (2.2)	65.51		17.74		47.77	2.4
Total (100.0)	2,083.40		78.44	3.90	2,001.10	

Table 56. Annual gross income, net income earned by households from forest extracts in villages in Ratnapura districts (n = 92)

Forest produce	Gross income (Rs/household)	Cost of produce			Net income (Rs)	Percent of total income
		Transport	Labor	Other		
fuelwood (42.6)	286.05				286.05	25.60
fruits (30.4)	102.78				102.80	9.20
vegetables (76.1)	275.10				275.10	24.60
mushroom (81.5)	31.45				31.45	2.80
yams (14.1)	4.70				4.70	-
wild meat (1.1)	0.55				0.55	
bee honey/ colony (5.4)	32.40	0.20	0.40	1.20	31.60	2.80
kitul products (7.4)	364.60	2.10	18.70	7.20	336.60	30.10
medicinal plants (96.7)	32.60				32.60	2.90
thatching and roping materials (6.5)	16.20				16.20	1.50
Total (100.0)	1,146.40	2.30	19.10	8.40	1,116.70	
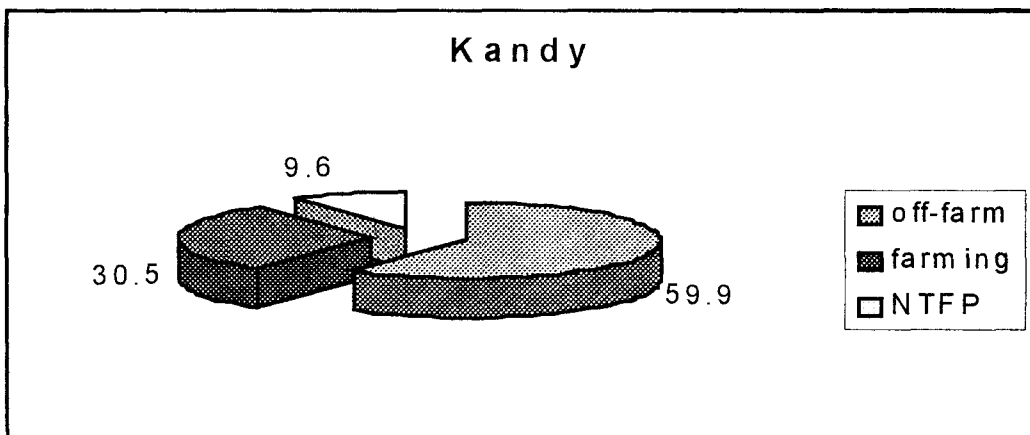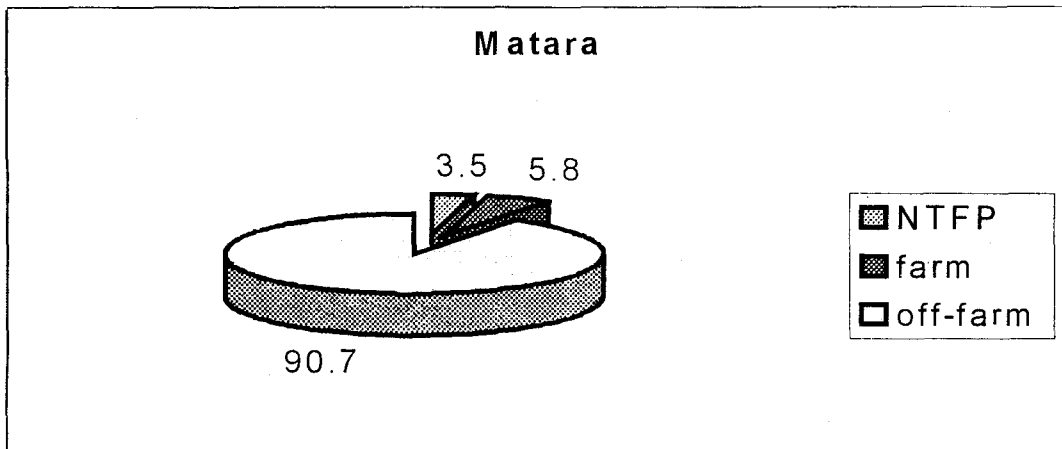
Figure 11. Farm income, off-farm income and NTFP income (percent of total income)
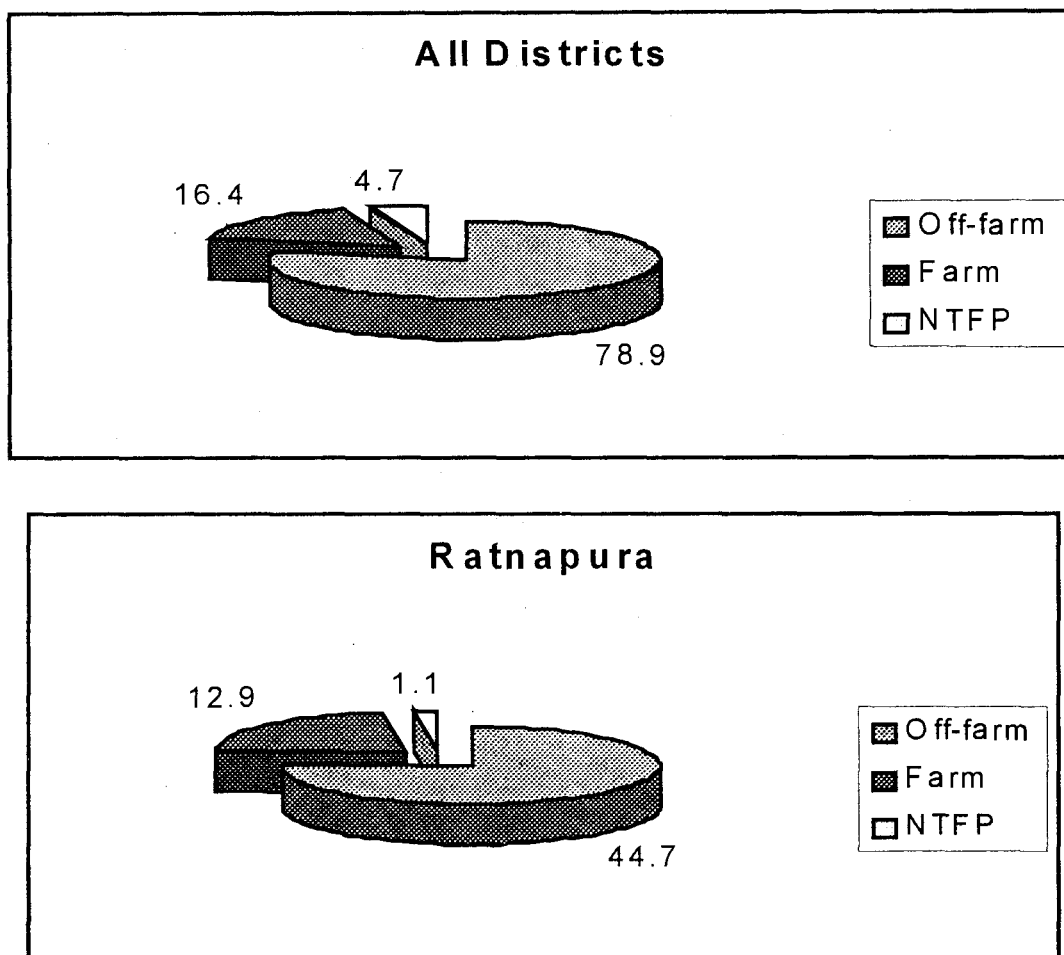
Figure 12. Net income from farm, off farm income and NTFP income
(percent of total income)

Table 57 shows the net incomes derived from the NTFP's on the basis of the location of farms from the forest. The analysis showed that the annual net incomes derived from NTFPs by the villagers were not significantly different in near, intermediate, and far farms. The results indicate that the location of farms may not be a major consideration in evaluating the level of participation of villagers for Forest Protection Committees in the conservation of wet zone forests.

Table 57. Net income from NTFPs by location of household farms in all districts

District	Annual Net Income from NTFPs		
	near farms (<3 km)	Intermediate farms (3-5 km)	far farms (>5 km)
Kandy (92)	4,397.9 (30)	3,891.4 (30)	3,705.3 (32)
Matara (91)	2,785.6 (31)	2,800.6 (28)	2,537.3 (32)
Ratnapura (92)	2,332.1 (33)	2,109.0 (27)	2,302.5 (32)

Figure in parentheses are the sample sizes

3.4 Social Factors Related to Conservation of Forests in the Wet Zone

3.4.1 Religious Beliefs

There are several religious beliefs of the village communities linked to the forests. Most of the villagers conduct religious rituals (e.g. hanging branches of trees as they enter forest; alms giving, offering of flowers, food, fruits; offering of animals) in the forest regularly to gods in charge of forests and trees. This is done to overcome personal difficulties; to be safe from enemies and to obtain personal favours for themselves and their families (e.g. employment, marriage, child birth, cure from diseases such as chicken pox). Some of the ritualistic items such as branches of special trees (banyan, eraminiya, velan), cane, poles, velan, resins, and flowers mainly used in household ceremonies (alms giving yaga, bali, funerals) are also obtained from the forests.

3.4.2 Recreational and Aesthetic Value

Majority of the villagers treat the forests as recreation sites and eternally enjoy the aesthetic value (scenic beauty, water falls) common to all the wet zone forests. Some use it as meditation sites during periods of mental stress. Hunting and hiking in the forests are done also for recreational and aesthetic values.

3.4.3 Family Traditions

Some of the village families have specialized in supplying some forest products to the villagers and traders as a matter of tradition. Such resources include materials such as kitul toddy, jaggery, medical herbs (in aryuvedic medicinal form), bricks, gems, and resins. Families engage in the trade perform replanting activity on a regular basis led by elders of the family

4.0 CONSERVATION POLICIES AND THE ROLE OF VILLAGE COMMUNITIES IN FOREST CONSERVATION OF WET ZONE FORESTS RESOURCES

The National Forestry Policy (1995) has acknowledged the interdependence between the village communities and forests. Earlier results have shown the importance of forestry's contribution to the rural economy. The overall goal of the FSMP is to institute participatory forest management with the village communities in order to maintain the forests, and enable them to continue contributing towards sustained rural development.

Currently, the FSMP is being implemented in all the wet zone conservation forests identified by the FD in cooperation with the Divisional Forestry Officers (DFO) under the guidance of the Conservator of Forests. The Participatory Forestry Management has initiated the baseline studies.

According to the policies that are being implemented, the communities are entitled to the benefits that would accrue from their management of forests. Although the ownership of the forest would continue with the state, the usufruct would be transferred to the local communities. However, the local communities will not manage and participate in conservation unless they will be provided with economic and social returns over their time utility. The attachment of village communities to their land and their affinity for existing ecosystems may be positive forces in piloting long term forest management. The involvement of forestry management in creating employment opportunities or in income generation would motivate communities to collaborate in protecting the resource.

The following discussion is in relation to the participation of village communities on the conservation of wet zone forest, and conditions that may be required to motivate village communities on the conservation of wet zone forests, and conditions that may be required to motivate village communities to use a participatory approach as suggested by national forestry policies.

4.1   Attitudes of Village Communities on Forest Conservation

The villagers in the districts identified several advantages of FSMP as compared to the National Forestry Policy implemented by the government earlier. The advantages included: 1) prevention of shifting cultivation (boundary encroachments); 2) reforestation of conservation forests in the wet zone; 3) employment opportunities for villagers in reforestation activities in the conservation forests; 4) beneficial effects to future generations; and 5) restriction of illegal felling of timber and mining in the forests. The disadvantages recognized by the villagers of the FSMP were the lack of alternative plans to replace shifting cultivation or boundary encroachments (in view of the prevalent landlessness in the villagers); difficulties in the management of reforested lands; and lack of availability of poles and other forms of small wood required for farming and house constructions. Some of these may result in lower returns to the households, making them worse off than before participation to the FSMP.

Majority of the village communities in the districts were keen to participate in the FSMP activities to conserve the wet zone forests (Table 58). However, they were of the opinion that the present forestry policies though adequate do require some flexibility in implementation. Majority of the households in the districts were willing to serve in the Forestry Protection Committees to be set up in the conservation forests. They wanted villagers to be given the full authority to protect forests (Table 59). The selection of members should follow a democratic process, with all active villagers given a chance to serve on regular periods. However, majority felt that some training and further understanding of the forestry laws maybe necessary for better implementation of the forest conservation activities through the Forestry Protection Committees. The strict enforcement of the present legal procedures should be followed in dealing with the illegal felling of timber (and mining in Ratnapura and Matara districts) in the conservation forests in the wet zone. In addition, the village communities require the participation of the Forest Officers of the Forest Department in the form of more frequent visits to the forest sites.

As an incentive for participation in these activities, the villagers expected employment opportunities in the forest tree planting campaigns to be conducted by the Forest Department in the conservation forests. Other demands for such participation included continuous access to forests products mainly to extract resources such as fuelwood, medicinal plants and food products which are of economic significance; the implementation of village development projects such as temples, roads through funds provided under FSMP; and the provision of free seedlings (e.g. acacia, kubuk, tuna, mahogany, jak, pihimbiya, mango and fruit) for replanting.

There is also a demand for implementation of the proposals in the Social Forestry Project, such as the provision of 0.5 acre of land area/household for replanting for a monthly land rent of Rs250-300. The NTFP resources that may be restricted due to implementation of the FSMP to the villagers may include materials that are currently used in construction industry (poles, bricks), farm activities (poles), and some medicinal plants. Majority of the villagers may purchase these from the local markets, if need arises.

Table 58. Attitude of community towards forest laws and the Forest Department

Districts	Participation in FSMP		Present Forest Laws Implemented		Adequate but require flexibility
	yes	no	adequate	Inadequate	
Kandy (92)	97.9	2.1	79.6	7.6	12.8
Matara (91)	97.8	2.2	85.5	11.3	3.3
Ratnapura (92)	98.9	1.1	88.5	11.5	-
All	98.2	1.8	84.5	-	15.5

4.2 Present Status of FSMP (as viewed by Forestry Officials)

A participatory survey was conducted among field level officers (RFO, ADRO, DFO, BFO, Forestry extension officers) in the forestry divisions of Kandy (Kandy, Teldeniya, Nawalapitiya); Matara (Akuressa, Matara, Kamburupitiya) and Ratnapura (Ratnapura, Kalawana and Sinharaja). The main objective of this survey was to determine 1) weaknesses and strengths of the FSMP as compared to the previous forestry policies; and 2) present implementation of the FSMP. Table 60 shows the strength and weaknesses of the FSMP and previous policies on encroachment, felling of timber, transport of timber, extraction of NTFPs, issue of permits and licensing of timber saw mills; and deforestation in the districts as indicated by the forestry officials. According to the forestry officers, the policies with the exception of those for NTFPs are heavily restricted in the FSMP as compared to earlier policies. However, according to them evaluation of these new policies would require a few more years.

Table 59. Participation of Forestry Protection Committees in conservation of
forests in villages

Proposals	Districts		
	Kandy	Matara	Ratnapura
Willingness to become members	66.1	70.3	100
Willingness to be involved in forest protection	59.6	61.9	65.2
Conditions expected by villagers from the Forest Department for their participation: Forest Department officers should visit forest more often	39.8	29.7	31.8
Provide employment through tree planting campaign	65.0	51.9	56.3
Access to forest products such as food crops, medicines and fuelwood	99.2	100	100
Implementation of village level developmental projects such as temple, road developments	74.8	84.5	91.0
Provide free seedlings such as tuna, kambuk, mahogany, acacia for planting	69.8	73.2	70.9
Social Forestry project to provide 0.5 acres of land for tree planting for a rent of Rs250-300/month per household	100	100	100

Table 61 shows the procedures adopted, and the implementation of the FSMP in the districts. These included training of villagers through seminars and workshops on various topics in forestry conservation and social forestry. According to the officials, the participation of the villagers in these training programs was relatively poor.

4.2.1 Village Protection Committee (VPC)

The formation of a VPC in the wet zone conservation forestry project was initiated soon after the FSMP was implemented in the districts. In Kandy district 26, VPC has been formulated till end of 1996 as compared to 42 in Matara, and 43 in Ratnapura districts. The expected participation per village is 50-60 members per VPC, consisting of persons of all age groups (i.e., young adults, adults, old) of both sexes. The committee consisted of village leaders (Buddhist priest, native physician, school teachers, and principal of schools), forest departmental officers (RFO, BFO, forestry extension officers) and others (AGA, Samurdhi niyamakas) in the different forestry divisions. The main functions attributed to the VPC is mainly to guide and organize forestry protection activities and help in the implementation of new laws and regulations as indicated in the FSMP. The different functions of the VPC in the village communities included mainly rural development activities such as construction of roads, culverts and temple development; supply of books to schools; development of schools; and supply of sports equipment to youth clubs and schools. These different functions contributed by the VPC funding was provided through the Participatory Wet Zone Conservation Extension Project (ADB, World Bank, NORAD). These activities were supervised by the forestry department and other members of the VPC.

Table 60. Strengths and weaknesses of the FSMP as viewed by
Forestry Officials in all districts

Policies	Weakness and Previous Policies	Strengths of FSMP
Encroachment of forest	1. temporary permits issued to encroachers 2. few court action and court decisions take long time to settle 3. political influences 4. actual boundaries of the forests are not shown 5. illegal crops grown (heroin, ganja)	1. restricted through legal fines and court action 2. boundaries of state forest designated by new surveys 3. setting up of village protection committees
Illegal felling of timber	1. fewer laws and regulations 2. long time in waiting for court actions 3. political influences 4. inadequate number of forest officers to take charge of illegal timber felling	1. heavy legal fines for illegal felling of several timber varieties 2. heavily restricted on value timber (jak, mahogany, teak) even in private lands
Transport of timber	1. night checking of transport of timber not done due to insufficient number of forestry officials 2. political influences	1. restricted through legal fines and court action 2. issue of permits for transport restricted for valuable timber varieties
Exhaustive tapping of NTFPs	1. fire hazards due to activities of villagers	1. allowed to continue under the guidelines set by the Village Protection Committees
Issue of permits for felling of timber, transport of timber and encroachments	1. issue of permits by AGA offices 2. extensive administrative procedure and time taken 3. political influences	1. heavily restricted on valuable timber varieties
Licensing of timber mills	1. increase of saw mills without license 2. environmental regulations for mills not properly adhered 3. regulations of the locations of saw mills not adhered (3-5 miles from government forest land) 4. political influences	1. location of saw mills restricted to distance greater than 5 miles from closest government forest 2. environment regulations imposed
Deforestation	1. timber felling allowed without permits on private lands with few restrictions (e.g., jak) 2. activities of State Timber Corporation are allowed 3. political influences	1. heavily restricted even on private lands

Table 61. Present implementation of FSMP in all districts

Procedure	Descriptions
Training of village communities	Forestry conservation Nursery management Participatory Forestry Project workshops
Number of workshops and training classes	45
Topics of workshops	Social Forestry Leadership and Social Aspects Forest Protection and Forest Management Sustainable Use of Forests
Number of villagers attended	200

5.0 POLICY IMPLICATIONS

This study discusses the role of the NTFP to the rural economy of the wet zone conservation forests in Sri Lanka. It shows that the economic value of the NTFP to the villagers in the vicinity of the forests, measured by income from sales of the products or by the opportunity cost of the time spent in forest product collection, is relatively small when compared to gross income received from farm and off-farm activities. Furthermore, there is no significant difference in the income derived by villagers living near or far from the forests. In spite of this seemingly low importance of NTFP to the rural economy, majority of the respondents have signified willingness to participate in efforts to manage and protect the forest resources. This could be due in part to the important role of the forest and NTFP in some religious practices of the people; the forest is also recognized as important for its aesthetic and recreational value to the community.

Nonetheless, the study pointed out the people expect some benefits from their participation in the form of employment to forest-management undertakings, and continuous access to some NTFP that are important to their livelihood. They also expect to receive rural infrastructure support in the form of road developments and assistance in building their temples. In addition, they do expect government counterparts from the forestry department to do their share in the implementation of the Forestry Sector Master Plan (FSMP) – such as giving technical assistance and material support to the people.

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