

EFFECTIVENESS OF ESTABLISHING FOREST BUFFER ZONES AS A COMMUNITY FOREST MANAGEMENT APPROACH

A CASE STUDY FROM THE SRIPADA TROPICAL PEAK
WILDERNESS SANCTUARY IN SRI LANKA

CHAMINDA KUMARA HALVITIGALA IHALA GAMAGE

This Master Thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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Master Thesis

Title

Effectiveness of Establishing Forest Buffer Zones as a Community Forest Management Approach: A Case Study from the *Sripada* Tropical Peak Wilderness Sanctuary in Sri Lanka

By

Student Name: Chaminda Kumara Halvitigala Ihala Gamage

Student no: 147709

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Supervisor:

Christian Webersik

The University of Agder, Kristiansand

Date: 24. 05.2010

To my wife.....

Abstract

The *Sripada* Tropical Peak Wilderness Sanctuary (STPWS) in Sri Lanka which is located between latitudes 6° - 45' - 6° - 57' N and longitudes 80° - 27' - 80° - 50' E comes under the category of 'Wet Ever Green Tropical Rain Forests' and spreads over 224 square kilometers around the *Sripada* mountain range. In the peripheral areas of the forest sanctuary, there are a considerable number of villages and the forest has been utilized over centuries by the villagers on various purposes. Since over utilization of forest resources may easily induce forest degradation, the gradual swell of population in the forest periphery has threatened the survival of the forest. Given that aspect, the Forest Department of Sri Lanka has decided to establish Forest Buffer Zones (FBZs) in the periphery of the STPWS in 1972-73 with the aim of conserving of the dense forest via attempting to satisfy the communal needs for forest resources with the resources available within the FBZs themselves. Accordingly, while the main objective of the present research has been to analyze the effectiveness of establishing FBZs in the STPWS as an approach to Community Forest Management, the central research problem is to scrutinize whether both socioeconomic development of the rural community and conservation of the forest sanctuary can jointly be achieved through the establishment of FBZs. As the study area of the research, the STPWS, *Sripalabaddala* and *Guruluwana* GN divisions to the Southwest of the forest, as well as two FBZs, viz. #1 and #2, situated between the forest sanctuary and *Guruluwana* have been selected. Whereas there are no FBZs in between *Sripalabaddala* and the forest sanctuary, *Sripalabaddala* has been selected with the purpose of conducting a comparative study therewith. As regards sources and types of the data, both qualitative and quantitative data as well as primary and secondary data were collected. In order to collect primary data, questionnaire survey, case studies, quadrat analysis, observation, and discussion methods were employed. One of the key findings of the research was that forest resource utilization holds economical as well as social value to communities residing in the peripheral areas of the forest sanctuary. The villagers from *Sripalabaddala* have indifferently been utilizing the STPWS to gather forest produce due to the absence of any FBZ. However, the villagers from *Guruluwana* have utilized both the forest sanctuary and the FBZ #1 for the aforesaid purpose except the FBZ #2 which has been left behind owing to the scarcity of required forest resources therein. The FBZ #1 has been established by using *Albezia* (*Albezia molucana*), which grows in harmony with other local endemic plant species and fauna. Yet, the FBZ #2 established with *Araucaria* (*Araucaria cookie*) specie has hindered the growth of other local endemic species. When gathering of non-Timber Forest Produce, gem mining and poaching are entertained, the forest resource users have successfully been directed to the FBZ #1 from the STPWS. However, the forest sanctuary is continually being utilized by the villagers for timber extraction, gathering of costly resin varieties and spices since those are rarely available in the FBZ #1. In general, the FBZ #1 has considerably contributed to satisfy the needs of the community for forest produce. Underscored is that, when community involvement in the project is reflected on, the community participation in planning, monitoring, and evaluation phases is rather poor and consequently it has resulted in a number of project failures. The research concludes that the concept of establishing FBZs remains effective in both fulfilling the needs of the community that reside in the peripheral areas of the forest for forest produce and conserving the dense forest. Yet, realistically, the community involvement in every phase of such a project should be prioritized, regularly monitored and, prior to planning the project, every sphere of the patterns and needs of forest resource utilization by the community should thoroughly be examined. Moreover, the use of local, endemic, and commonly utilized plant species by community members in the establishment of FBZs would significantly increase the effectiveness of the project.

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LIST OF ABBREVIATIONS

CBFM – Community Base Forest Management

CFM – Community Forest Management

EFP- Edible Forest Produce

FBZ - Forest Buffer Zones

FBZ #1-Forest Buffer Zone – 1: [*Albezia* forest (*Albezia molucana*)]

FBZ #2 – Forest Buffer zone – 2: [*Araucaria* forest (*Araucaria cookii*)]

FD- Forest Department

FRMP- forest resource management plan

IUCN- The World Conservation Union (International Union for Conservation of Nature)

NEFP-Non-Edible Forest Produce

NE-NTFP – Non-Edible Non Timber Forest Produce

NFE -National Forest Estate

NGOs- Non-Government Organizations

NTFP - Non-Timber Forest produce

OFP – Other Forest Produce

STPWS - *Sripada* Tropical Peak wilderness Sanctuary

TFP – Timber Forest Produce

UNESCO-United Nations Educational Scientific and Cultural Organization

WWF- World Wildlife Fund

Chapter 1

1.1 Introduction

Over centuries, the peripheral areas of the rain forests in Sri Lanka have been inhabited by the local community and they have utilized forest resources on various purposes. Since over utilization of forest resources may easily induce forest degradation, the gradual swell of population in the forest peripheries has threatened the survival of the forest. Given that aspect, the Forest Department of Sri Lanka has decided to establish Forest Buffer Zones (FBZs) in the peripheral areas of rain forests. Accordingly, two forest buffer zones were established in the *Sripada* Tropical Peak wilderness Sanctuary (STPWS) in 1972-73 with the aim of conserving the dense forest via attempting to satisfy the communal needs for forest resources with the resources available within the FBZs themselves. Hence, while the main objective of the present research has been to analyze the effectiveness of establishing FBZs in the STPWS as an approach to Community Forest Management, the central research problem is to scrutinize whether both socioeconomic development of the rural community and conservation of the forest sanctuary can jointly be achieved through the establishment of FBZs.

The *Sripada* Tropical Peak Wilderness Sanctuary comes under the category of ‘Wet Evergreen Tropical Rain Forests’ and was declared a Forest Sanctuary in 1940 by the Forest Department of Sri Lanka. It is located between latitudes 6° - 45' - 6° - 57' N and longitudes 80° - 27' - 80° - 50' E. It consists of 223,799 hectares spread over an elevation range of 1000-7360 above sea level. The *Sripada* forest spans two administrative districts of Sri Lanka namely, Rathnapura and Nuwara Eliya and the length of the forest area from east to west is around 40 km and its width from North to South is about 8 km (Lankanath, 2008: 24).

Further, the *Sripada* Tropical Peak Wilderness Sanctuary spreads over 224 square kilometers of land around the *Sripada* mountain range. During the British colonial rule in Sri Lanka (1815-1948), a huge forest area of the Peak Wilderness was cut down and cleared to gain land for the massive tea estates that are still functioning in Nuwara Eliya district and on October 25, 1940 the remaining portion of the Peak Wilderness was declared a wildlife sanctuary.

The Peak Wilderness sanctuary possesses unusual geographical formations compared to the other natural reserves of the island due to variation of its contours from 1000 to 7360 feet above sea level. Bena Samanala (6579 ft), Dotalugala, Detanagala can be identified some of the higher mountains within the Peak Wilderness sanctuary. As well, the sanctuary is the origin of the Kelani, Kalu, Walave rivers and many tributaries of the river Mahaweli generating waterfalls such as Dotalu falls, Geradi falls, Galagama falls (655 ft), and Mapanana falls (330 ft) inside the sanctuary.

Out of the three access routes, namely Hatton, Kuruwita, and Palabaddala, which are used by Buddhist devotees and other tourists to reach Adam’s Peak, Kuruwita and Palabaddala routes go right across the Peak Wilderness sanctuary. The *Sripada* Tropical Peak Wilderness area is entirely under the control of Sri Lanka Wildlife Conservation Department (Divaina, 2009)

One of the community forest management approaches introduced to *Sripada* Tropical Peak Wilderness Sanctuary by the Sri Lanka Wildlife Conservation Department in 1980s is the ‘Establishment of Forest Buffer Zones’ (Lankanath, 2008: 24). The Forest Department has established buffer forest areas with the help of local communities residing at the peripheral areas of the *Sripada* forest. According to the forest policy, local communities are able to utilize the forest buffer areas for subsistence. However, entrance to dense forest for forest produce gathering is prohibited. When establishing forest buffer zones, policy makers prioritize flora species that are more useful in fulfilling villagers’ needs of forest resources. They focus on achieving two main goals through establishing forest buffer zones; forest management on one hand and the rural development on the other. According to the point of view of policy makers, establishment of forest buffer zones with local flora species can successfully prevent the peripheral communities from utilizing the dense forest area.

The research presented in this thesis focuses on analyzing effectiveness of establishing forest buffer zones in the *Sripada* Tropical Peak Wilderness sanctuary as an approach to Community Forest Management.

1.2 Research objectives

Main research objectives

- i. Analyzing the effectiveness of establishing forest buffer zones for community forest management in the *Sripada* Tropical Peak Wilderness Sanctuary.
- ii. Studying the nature of practices of forest resource utilization of peripheral communities in the *Sripada* Tropical Peak Wilderness Sanctuary.

Secondary research objectives

- i. Studying reasons for the establishment of forest buffer zones in the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary.
- ii. Studying the role of local community involvement in establishment of forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary.

1.3 Research problems

Below are four research questions used in the research.

- (i). What is the prevalent relationship between peripheral villagers and the *Sripada* Tropical Peak Wilderness with respect to forest resources utilization?
- (ii). Why are forest buffer zones established?
- (iii). What is the role of local communities in establishment of forest buffer zones?
- (iv). What are the environmental and socioeconomic effects of the establishment of forest buffer zones?

1.4 Hypotheses of the research

There are four hypotheses:

- (i). Both, the *Sripada* Tropical Peak Wilderness Sanctuary and forest buffer zones are used by peripheral villagers for forest resource utilization.
- (ii). Local community members have successfully participated in the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary.
- (iii). The project to establish forest buffer zones launched in the *Sripada* Tropical Peak Wilderness Sanctuary has achieved its environmental and socioeconomic goals.
- (iv). As a Community Forest Management Approach, the establishment of forest buffer zones is an effective method in achieving goals of forest management and rural development.

1.5 Rationale of the study

The Forest Department in Sri Lanka has established forest buffer zones within the study area as an approach to community forest management, but effectiveness of such establishments has not so far measured successfully. This research focuses on analyzing the effectiveness of establishment of forest buffer zones as a community forest management approach. It can be considered as one of the rationales of the study.

Additionally, the study examines the role of local community involvement in establishing forest buffer zones as this has been considered one of the main objectives of the project. Yet, sufficient research has not been done on this.

Further, the research focuses on analyzing environmental and socioeconomic effects of establishment of forest buffer zones. Establishment of forest buffer zones focuses mostly on achieving two main goals; firstly forest management, and then rural development. However, relevant literature and sufficient experiment on these issues are rare. Thus, the research aims on analyzing effectiveness of establishment of a forest buffer zone in achieving economic and environmental goals. Finally, weaknesses and strengths in the projects for establishing forest buffer zones as a community forest management approach are observed.

1.6 Challenges and limitation of the study

According to the research methodology, questionnaire survey method will be used in collecting both qualitative and quantitative information. Yet, through a questionnaire survey it is not always possible to collect accurate information. For example, villagers from peripheral areas of the forest sanctuary rarely admit their involvement in illegal forest resource utilization practices.

This barrier in collecting accurate information through a questionnaire survey is one of the research constraints and this will be minimized through some qualitative data collecting methods like participatory observation methods. I randomly selected seventy five households for the questionnaire survey. Also, this study area is situated in rural areas as well as houses are distributed within a large area scattering unevenly separating each other by miles.

Therefore, it is difficult to conduct a questionnaire survey within a limited time schedule. To face this challenge, I had the help of research assistants.

1.7 Structure of the thesis

The first introductory chapter provides research objectives, research questions, hypotheses, rationales of the study as well as challenges and limitations of the study.

The second chapter contains the literature survey and conceptual framework of the research.

The third chapter contains research methodology which includes determination of research methods, primary and secondary data collecting methodology, data analyzing as well as presentation of data.

The fourth chapter includes a description of socioeconomic and other factors concerning the study area.

The fifth chapter contains findings based on data collection with respect to the process of forest resource utilization and forest resource utilization practices of the rural communities residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness sanctuary.

The sixth chapter focuses on effectiveness of establishing forest buffer zones as a Community Forest Management approach. The chapter is based on the results of primary data, which is analyzed through SPSS software.

The seventh chapter comprises detailed research findings and hypotheses testing.

The eighth chapter concludes with conclusions and recommendations.

Chapter 2

Literature review and conceptual framework

2.1 Introduction

The second chapter includes the literature survey and development of the conceptual framework of the thesis establishing the research problem. The present chapter focuses on illustrating the forest management process in the Sri Lankan context in relation to the different eras of forest management and the international intervention therein is discussed in the second chapter as well. Moreover, the approach of Community Forest Management and importance of one of its forest management methods; 'Establishment of Forest Buffer Zones', is discussed. Finally, rationality of the research is defined through the literature survey along with the conceptual framework.

The *Sripada* Tropical Peak Wilderness Sanctuary is one of the wet evergreen rain forests in Sri Lanka and comes under the tropical forest biomes. Generally, over centuries, the tropical forests have been utilized by inhabitants at forest peripheral areas for subsistence. Presently, it is noted that the peripheral areas of tropical forests in the world are alarmingly populated. Simultaneous with the increasing population at the peripheral areas of forests, the rate of forest resource utilization is increasing and it has threatened the existence of tropical forests. Therefore, the rulers of Sri Lanka have attempted several times to prepare policies regarding forest utilization and forest management in the history of forest management.

2.2 Historical profile of forest management in Sri Lanka

Forest management in Sri Lanka has a long history and it is much affected by the policies of the rulers of ancient Sri Lanka and social beliefs, norms, and practices of the communities as well. Especially Buddhism – the religion of the majority of Sri Lankans has facilitated conservation of forests in the island. According to the teaching of Lord Buddha, afforestation and building temples are meritorious acts. In addition, forests are spiritual places in the minds of local community members in Sri Lanka. They respect the gods of the forests such as *Sumana Saman*, *Ayyanayaka* and believe in gods of land *Gambara*, *Mahasen* etc. A host of minor deities and spirits are also believed to inhabit the forests. The reverence for the forests is reflected in behaviour common for sanctified areas. Buddhist institutes in ancient Sri Lanka had also played an important role in forest management. For example, in Kandyan regime, forests together with land were delegated to people as well as to religious leaders aiming forest conservation. These lands were called *Gabadagam*, *Nindagam*, *Viharagam*, *Devalagam* following its ownership and additionally, there were more extensive forests sanctuaries and prohibited forests referred to by terms such as *Rakmahara* and *Thahanchi Kelle* (Codrington, 1938).

The ancient Sri Lankan rulers played a dominant role in forest management. Afforestation and regulations introduced by the Sinhala kings reveal that every effort had been taken towards conservation of the forests in Sri Lanka. The ancient scripts of the country and the chronicles like *Mahavamsaya* and *Rajawaliya* refer to the tree planting practices even during the regime of King Vijaya (Wikramasinghe, 2001). According to Nanayakkara, two main types of practices of forest resource utilization in ancient Sri Lanka can be identified. First is the forest resource utilization within the *Rajakari* system. That means the ruling king delegates the right of a forest to people for their service and loyalty for the state. The second

is the forest resource utilization with the permission of *Kela korala* (this designation is very much similar to the post of forest officer at present) (Nanayakkara, 1981).

These traditional forest management systems were used to ensure conservation and sustainable use of forest resource until the European invaded the Island. Even under the rule of the European these forest management and utilization practices were continued.

The *Sripada* Tropical Peak Wilderness Sanctuary, which is considered sacred by the ancient Sri Lankan as it being a part of the Adams' peak forest area, is supposed to be ruled by the god *Sumana Saman*. Even at present, the peripheral villagers hold the same idea after centuries. Therefore, some people still hesitate to take part in destructive practices of forest resource utilization such as commercial logging, poaching, gem mining etc., which are considered evil at their point of view. Thus, in the past as well as at present, the social beliefs, norms and practices passed through generations have brought a control over excessive and destructive forest resource utilization.

2.3 Policy interventions in forest resource utilization

This section focuses on nature and trends in policy interventions in forest resource utilization at national level. Policy interventions were started from colonial period and depended on global and national wise environmental needs. Hence, with changing environment, policy interventions were subjected to change. The history of policy interventions in forest resource utilization can be divided into three main stages.

1. The first phase of policy interventions (Colonial period)
2. The second phase of policy interventions (Post Independence)
3. The third phase of policy interventions (Comprehensive policy interventions since 1995)

2.3.1 Policy interventions of the first phase (Colonial period)

Europeans cleared a number of forest areas for their needs. For example, a large forest area was cleared by Europeans for mono crops cultivation and for timber extraction in upcountry (Wikramasinghe, 2001: 130). Therefore, forests in Sri Lanka gradually decreased during the European rule.

On the other hand, the British focused on conservation of forests, especially at the end of the European ruling period. At the end of the ruling period, they realized the value of forest coverage within the country. Even though the British paid attention to conservation of forests prior to 1920s, an authoritatively enunciated forest policy was not available until 1929s. Nanayakkara has identified two specific features in the nature of the forest policy before 1929:

‘Even though a National the forest policy had not been laid down and in spite of the fact the British colonial rulers permitted the vast destruction of our mountain catchments forests for planting coffee and subsequently tea. On their credit side they had considered the necessity for granting free collection rights to poor rural people both of fire wood and minor forest production within a three mile radius of their villages if located near forest areas.’ (Nanayakkara, 1981; cited Wikramasinghe, 2001:144)

The British rulers allowed the peripheral villagers to use the forest for forest produce. First authoritative enunciation of the forest policy was introduced in 1929 and that reflected the major trends in forest resource utilization in Sri Lankan context. This can be clearly illustrated through a brief overview of the framework of the forest policy of 1929.

A brief overview of the forest policy of 1929 is as follows.

1. *Make the island self supporting in timber (including fuel) and other forest produce, both by systematic exploitation of existing natural resources and the artificial reforestation of selected areas;*
2. *Provide for export such timber and forest produce as have a world markets*
3. *Conserve water supplies and prevent erosion; and*
4. *Co- ordinate forest operation with the requirements of the preservation of the indigenous fauna and flora*

(Forest policy framework, 1929; cited in Wikramashinghe, 2001: 144)

According to the forest policy of 1929, timber extraction for export purposes was encouraged and at the same time, forest conservation strategies were set. Yet, in the forest policy, utilization of the minor forest produce and villagers' needs for forest resource utilization at grass root level were neglected.

2.3.2 Policy interventions of the second phase (Post independence)

In 1948, Sri Lanka gained the independence from the British. However, until 1953 periodically prepared forest policies were not found in Sri Lanka. In 1953, a number of changes were introduced concerning the mapping of reservations, management, strengthening state authority and institutional capacity etc. The decisions were made for 'climate and protective forest' (Wikramashinghe, 2001) to prohibit felling of original mountain forest for reforestation with exotics within grasslands; and to conserve the plantations to valuable indigenous species where possible. These decisions taken during the intermediate period depict a change over to a greater conservation in comparison with the policy of 1929 that had encouraged timber harvesting for exports (Wikramashinghe, 2001).

It seems that every attempt has been made to conserve mountain forests at least in available remnants whether the policies have been enforced or not (Wikramashinghe, 2001:145). Compared with the forest policies of 1929, further improvements towards local needs can be seen in the forest policies of 1953.

Policy intervention related to forest resource utilization in 1953:

1. *Maintain, conserve and create forests for the preservation or amelioration of the resources including fauna and flora;*
2. *Ensure and increase as far as possible, the supplies of small wood for agricultural requirements and firewood for domestic consumption.*
3. *Maintain sustained yield of timber and other forest produce for housing and other requirements of the country; and*
4. *Maintain forest to the highest possible economic advantage*

(Wikramashinghe, 2001:145)

From 1929 to 1953, needs of the public and the political agendas gradually changed and that change influenced policy interventions in forest resource utilization. Under the British rule in 1929, the forest policies were established in accordance with those needs.

Yet, when Sri Lanka gained independence in 1948, the Sri Lankan government initiated large-scale development projects. Thus, the forests were focused as a source of resources for the development. In that period, environmental tribulations or rapid increase in population was not experienced compared to the present day.

Therefore, the peripheral villagers and even outsiders had the opportunity to utilize forest resources. On the other hand, the government also paid attention on maintaining forest in order to take highest possible economic advantages as a source of timber and other forest produce for development.

2.3.3 Policy interventions of the third phase (Comprehensive policy interventions since 1995)

At the dawn of the 1980s, objectives of policy intervention in forest resource utilization changed. For example, even though the governments before the 1980s considered forests as sources of resources for development, the forest resource was identified a valuable national treasure after the 1980s. Thus, the government focused on “bottom – up approaches” in forest conservation and management.

The changes in policy intervention in forest resource utilization were due to national and international issues. One of the important reasons was that, by the 1980s there were signs of global environmental degradation. The fact that natural resources were limited and some of the over exploited resources could never be regenerated was recognized. In this period, awareness campaigns to protect environment were launched globally and the international agreements were made to conserve environment, for instance, the Burudland Commission (Burudland, 1987). At the same time, many researchers have highlighted environmental problems and importance of 'eco friendly development'.

"The idea of environmental limits or constraints on development was explored by number of authors around the start of the 1980s under the label of 'eco-development' (Sachs, 1979; 1980; Riddell, 1981; Glaeser, 1984 cited in Adams, 2009), and it was a central concept in the *world conservation strategy* (WCS) published in 1980 (IUCN, 1980 cited in Adams, 2009). Most importantly, it was the foundation of the report of the World Commission on Environment and Development (WCED) seven year later (Burudland, 1987 cited in Adams, 2009). At its launch in April 1988, it was claimed that this report, *our common future*, set out a global agenda for change. This agenda soon began to command attention in the core of the development universe: in major shift of culture and policy, the present of World Bank spoke in May 1988 of the links between ecology and sound economics in a major statement Bank's policy on the environment (Hopper, 1988). The idea that development thinking needed to be 'greened' was a changing idea in the 1980s (Harrison, 1987; Conroy and Litvinoff, 1988 cited in Adams, 2009). In the 1990s this argument became stranded (Adams, 2009:03)"

Moving with current trends the Sri Lankan government had identified its responsibility to protect forests allowing multiple needs of forest resource utilization including utilization of Non-Timber Forest Produce of the communities residing at the periphery of forest areas.

‘Same policy has been reinforced in 1980, with one edition, that is to involve the local community in the development of private woodlots and forestry forms through social forestry programmes. In 1980s, a wave of enthusiasm has arisen with regard to an inventory of forests for management planning’ (Wikramasinghe, 2001:146).

The Forest Resource Development Project of 1983 was primarily formed for the preparation of the National Forestry Master Plan published in 1986. In preparation of a strategic plan for the country, the scenarios of wood fuel and industrial situation, wood demand, and contribution of non-forest production system to forestry needs had been considered. It proposed a concentrated management of forest plantations and priority was given to the management of productive natural forests, plantation forests, and conservation of natural forest eco-systems in preparation of policies by the Forest Department in the 1980s. The requisites for preparing systematic management plans for individual forests have arisen based on the National Forestry Inventory.

2.4 Forest conservation and utilization discourse at the dawn of 1980s in the world

At the dawn of 1980s, there was a global demand for forest conservation. Many scholars and scientists, focusing on environmental vulnerability, largely discussed about the importance of ‘Eco development’ (Sachs, 1979, 1980; Riddell, 1981: cited in Adams, 2008:3; Glaesers, 1984).

Alternatively, ‘Eco development’ was a challenging idea in the world context in the 1980s (Harrison, 1987; Conaroy and Litvinoff, 1988: cited in Adams, 2008:3). Hence, international organizations and many other governmental and non-governmental organizations tried to face this challenge, and as a result, the concept of ‘Sustainable Development’ was brought forward in the development discourse (IUCN, 1980; Brundtland, 1987; UN, 1993). In the middle of the 1990s, more than 170 countries (including Sri Lanka) had signed to support ‘Environmentally Sensitive Economic Development’ (Holmgerg *at all*, 1993; Chatterjee and Finger, 1994) and they had carried out several related projects and programs.

Presently, many researchers and policy makers are interested in the ‘Community Forest Management Approach’ as a method applicable in tropical rain forest conservation. Especially in many Asian countries, such as India, Sri Lanka, Nepal, Indonesia, Bangladesh, Thailand etc., ‘Community Based Forest Management Approaches’ and ‘Joint Forest Management Approaches’ are becoming more popular. For example, in Indian context, many researchers as well as policy makers focus on both conservation of forestland and empowerment and development of the communities living at the peripheral areas of forests through the ‘Community Forest Management Approaches’ (Mukherjee, 2003; Human and Pattanaik, 2009; Sundar, 2009).

From the 1990s, as a country, Nepal has conducted many community based forest management programs to ensure rights of local community to manage their own forest areas (USAID, 2009; Baginski, Dev, Yadav and Soussan, 2003; Branney and Dev, 1994).

In Indonesia and Thailand, which had many tropical forest resources, Community Forestry Approach has been applied from the principle that the authority of the state. The centralized nature of forest management and the state's refusal to rights are the major causes of deforestation and forest degradation as well as they have obtained many benefits from it (World Rainforest Movement, 2009; Inoue, 2008; Ali, 1997; Salam, Noguchi, Pothitan, 2004; The Center for People and Forest, 2009).

According to above experiences, linking ecological processes with social processes is more interesting for appreciating the relationship between biodiversity and ecosystem functioning (Ramakrishnan 1999:51-82). For instance, even though the tribal people in North Eastern India practice shifting (*chena*) cultivation, which results in clearance of forestland, they use sustainable traditional methods to clear forest areas for cultivation (Ramakrishnan, 2000:1998). Further, indigenous knowledge of tribal people about medicinal plant species in the *Nanda Devi* Biosphere Reserve in India and their use of medicinal plants in traditional medical treatments cannot be neglected (Maikhuri at all 1998:157-163). Hence, it is clear that prior to inventing policies of forest conservation, policy makers should understand the background of the communities at the buffer zones of tropical rain forests as well as their traditional rights, beliefs and practices.

The attempt of the institutes for tropical forest conservation to conserve forests by adopting policies and regulations with the collapse of traditional forest utilization system seem unsuccessful. Hence, presently most of the researchers interested in Ethno-forestry have focused their attention on 'Community Forestry Programmes'.

For instance, Khaleque and others have proposed Community Forestry Programmes to resolve the management problems of both forests as well as the peripheral forest user of forests. In their proposal, following conditions are included (Khaleque, 2000).

1. Multilateral and bilateral donors need to be more sensitive to local needs.
2. Investment strategies need to support the emergence of meaningful community management system.
3. Forest management strategies need to be divers to reflect the wide range of ecological and social conditions.
4. Community based management strategies relying on natural regeneration require priority as an approach to restoring degraded forestland.
5. Customary systems of land and forest tenure urgently require recognition.
6. Communal rights over common property need to be acknowledged with practical measures established to protect community rights against encroachment by government and other outside actors.
7. Industrial plantations should be restricted to truly degraded lands with highly limited potential for natural regeneration.

International institutes for forest conservation such as 'The international working group on community involvement in forest management' (WG – CIFM) has emerged within the last few years in order to raise awareness of the roles that communities play in many places around the world in sustainable management of forests (Poffenberger, 2000).

2.5 Community forest management and establishing forest buffer zones in Sri Lanka

In the Sri Lankan context, many researchers have focused their attention on community forest management approach and forest conservation processes (Wikramashinhe 1993a:105-123). According to their findings, anthropogenic factors play a main role in tropical forest management process in Sri Lanka (Wikramashinhe 1997a:87-110).

Concerning the present policy intervention process for sustainable forest resource utilization and forest management, by the Sri Lankan government "Forestry sector Master Plan" is important. The Forestry Sector Master Plan has given more attention to achieve rural development by enhanced sustainable forest utilization. The following objectives of Forestry Sector Master Plan depict its aim to achieve enhanced forest management system and sustainable forest utilization.

1. To conserve forests for posterity with particular regard to bio-diversity, soil, water and historical, religious and aesthetic values.
2. To increase the tree cover and productivity of forests to meet the needs of present and future generations for forest products and services.
3. To enhance the contribution of forestry to the welfare of the rural population and strengthen the national economy with special attention paid to equity in economic development (Vitarana, & Rakaganno, 1997).

In this background the Forest Department established a forest buffer zone within the *Sripada* Tropical Peak Wilderness Sanctuary as a community forest management approach (Lankanth, 2008). In establishing a forest buffer zone, the Forest Department has used their forestry sector master plan and they have planed to achieve two main goals. One is the rural development and the other is the forest management. Yet, according to some researcher findings, the policy makers have neglected community participation in the project (Lankanth, 2008).

Presently, establishment of a forest buffer zone is one of the community forest management approaches applied by the Sri Lanka Forest Department (Deaprtment of Environment Food and Rural Afires, 2009). However, 'lacking academic researches' on establishing of forest buffer zones has become one of the problems in identifying effectiveness of a such attempt in Sri Lanka. Therefore, the research mainly focuses on analyzing 'effectiveness of establishment of a forest buffer zone towards community forest management in the *Sripada* Tropical Peak Wilderness Sanctuary in Sri Lanka.

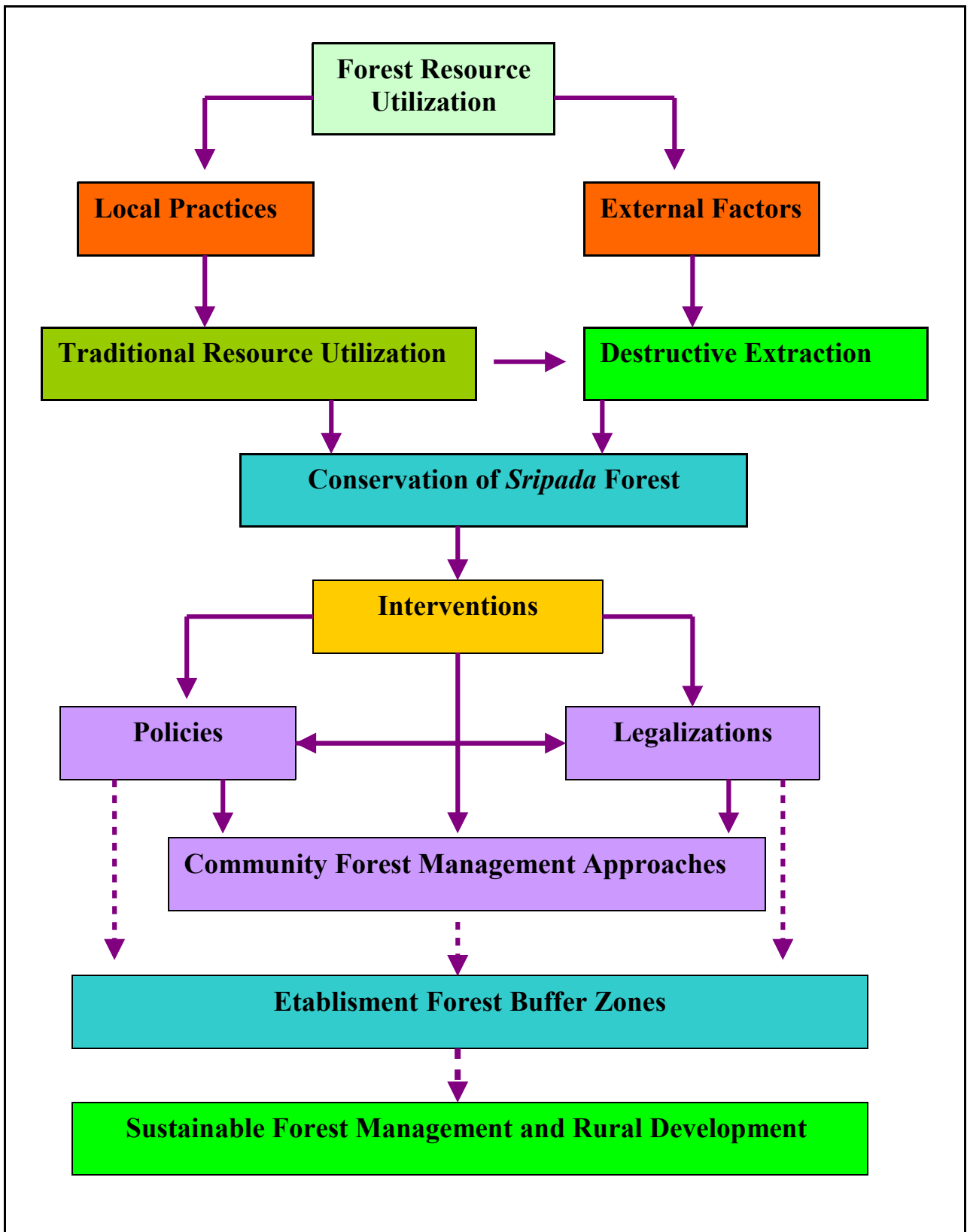
2.6 The conceptual framework

The conceptual framework, which was developed in establishing the research problem, was built up focusing on the interrelation between traditional forest utilization practices, trends in the local economy and attitudes and policy interventions.

Peripheral communities of *Sripada* Tropical Peak Wilderness Sanctuary have utilized the reserve over centuries for subsistence, and the traditional practices of forest resource utilization were dependent on social norms, beliefs, practices, faith etc. As the conceptual framework reveals, the interrelationship between the forest and its peripheral forest user

groups was healthy and harmonious due to traditional forest use practices and it led to sustainable forest utilization (Lankanth, 2008).

Figure 2.1: The conceptual framework_



At the end of the colonial period, *Sripada* Tropical Peak Wilderness Sanctuary was declared Crown lands and local communities had not the chance to utilize forest resources. Yet, this policy became unsuccessful, as local people cared less on the policy and they prevent themselves from helping the colonial rulers in achieving policy goals. After independence, the situation changed in consequent to the changes occurred in forest utilization practices. The population at the peripheral areas of *Sripada* drastically increased where as the traditional lifestyles of the villagers subjected to gradual change with open economy after the 1970s. After 1970, these areas experienced an economic boom owing to tea cultivation. Prior to establishment of other economic crops, tea in particular reduced the local dependence on forest for subsistence. It caused many changes in livelihood patterns, traditional forest consuming practices, people's beliefs, and social structure. For instance, during the period prior to the economic boom, people gathered edible fruit varieties available in the forest as they were not aware of other means of obtaining food for their daily needs. Yet, economic development had given them many occasions to consume modern food items, both local and imported, rather than forest produce. Therefore, at present they need not to enter the forest area in order to collect edible fruits, crop, or root varieties for subsistence.

Alternatively, the consequent rapid increase in human population in those areas with economic development created landless new generation that encroached on forest for land for tea plantation. In accordance to the changing context, harmful forest utilization practices, for instance, hunting, logging for timber etc., gradually increased in unsustainable phases. According to the conceptual framework, that resulted in over use of forest resource, environmental degradation, and environmental vulnerability (Lankanth, 2008).

At the end of the 1980s, the Sri Lankan government and its environment related departments and authorities like the Forest Department, the Wild Life Conservation Department, the Central Environmental Authority etc., paid attention to community Forest Management Approaches (Central Environmental Authority, 1988; Forestry sector master plan, 1995). It became one of the main reasons for explicit increase in forest management strategies, policies, as well as laws. International organizations, NGOs helped the Sri Lankan government to establish community forest management process. As a strategy to achieve sustainable forest management goals, the 'bottom-up' approach was used by the Sri Lankan government and hence, Community Forest Management programs, Agro-Forestry programmes were introduced (Ministry of Agriculture, Land and forestry, 1995). As a community forest management approach 'Establishing Forest Buffer Zones' has been applied to *Sripada* forest area and both forest management and rural development goals are focused to achieve through this approach.

Conclusion

The history of forest management in Sri Lankan context reveals how it is closely connected with folk beliefs, traditions, as well as religious rituals. Within such a locale, the *Sripada* Tropical Peak Wilderness Sanctuary, which was considered sacred, was previously well protected. However, with European invasions and during their different ruling periods, the forests were largely cleared for cultivation and the *Sripada* Tropical Peak Wilderness Sanctuary was no an escape. Forest conservation and conversational criterion became prominent issues during the post colonial era owing to forest degradation along with heavy population increase. Yet, during that era, 'top-down' approach of forest conservation was

applied and after the 1980s, 'bottom- up' approach was applied. The concept of 'Community Forest Management' is one of its important components.

Consequently, being pressed by global trends, Sri Lanka also introduced afforestation of forest buffer zones into *Sripada* Tropical Peak Wilderness Sanctuary. However, the effectiveness of establishment of such forest buffer zones is not efficiently measured hitherto and thereby the research is aimed to study the effectiveness of establishing of a forest buffer zone in *Sripada* as a Community Forest Management Approach.

Chapter 3

Research methodology

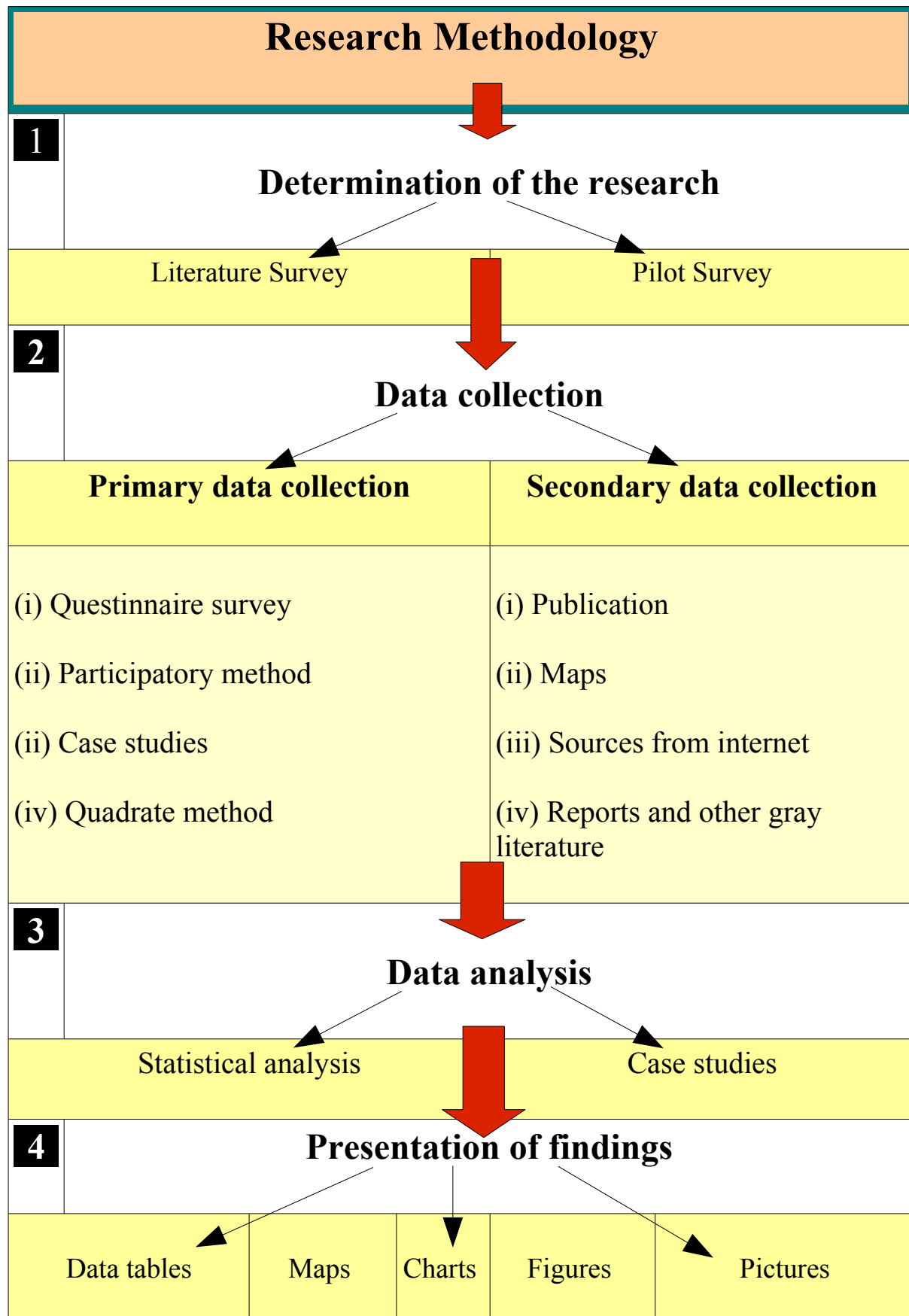
3.1 Introduction

The chapter aims at defining the research methodology. The methodology is of three sections. The first section is about the designing of the research and identification of research problems and hypotheses. In order to deal with this, pilot and literature surveys were carried out. The second section sees to information collection. In the research, both primary and secondary data as well as qualitative and quantitative data was collected. Secondary data was collected by publications, related internet sources, unpublished documents, maps etc., while primary data was collected via a questionnaire survey, participatory methods, and case studies. The data analysis is based on statistical analysis of data and case studies.

The research methodology can be divided into four sections such as;

- i. Determination of the research
- ii. Data collection
- iii. Data analyzing

Figure 3.1: Research methodology



3.2 Determination of the research

In order to collect data, both field surveys and literary surveys were used.

Literature Survey

Prior to settle on the research, a number of publications related to the field – practices of forest utilization and establishment of forest buffer zones as a community forest management strategy were comprehensively studied with the purpose of determining research problems as well as identifying the study area.

Pilot Survey

A pilot survey was carried out in order to determine the research area and methodology.

3.3 Data collection

3.3.1 Primary data collecting process

The research methodologies such as questionnaire surveying, participatory observation, discussions, case studies, and quadrat method will be used in the process of primary data collection.

(a) Questionnaire survey

The foremost objective of conducting a questionnaire survey is to collect quantitative data and based on this, data on practices and objectives of forest resource utilization by the villagers residing at the peripheral areas of the forest sanctuary, collected amount of forest produce, sites uses for forest resource gathering etc., was collected in general. As well, information related to level of community involvement in establishment of forest buffer zones in different phases of the project was gathered.

Forty-five (about 10% out of total households) households out of 447 of total households in *Guruluwana* GN division (Grama Niladari division = Village officers' division) and **twenty-eight** (about 10% out of total households) out of 227 of total households from *Sripalabaddala* GN division were covered through a household questionnaire survey. Lists of household numbers in the two selected GN divisions were received from the respective village officers. Households covered by the questionnaire survey were selected randomly.

(b) Participatory observation method

In this method, qualitative data was collected by staying at villagers' homes and participating in their practices of forest utilization. Participatory observation method was used in collecting qualitative data due to several advantages, as follows:

To gain firsthand experience

In most occasions, when questioned the villagers hesitated to provide information related to their personal lives owing to variety of reasons. For example, if they were asked of the

banned forest consumption such as gem mining, poaching, logging etc., they seemed reluctant to answer (Lankanth, 2008). Especially, as the villagers in the southern part of the *Sripada* Tropical Peak Wilderness Sanctuary were rather detached from each other, out of distrust they did not like to reveal practiced illegal forest utilization activities.

To clear doubts and clarify field situation

For instance, villagers do not often provide accurate information or they indicate low figures when they are asked about income. As these villagers seem being interviewed many a time by other researchers, the villagers possess prepared answers for frequently asked questions (Lankanth, 2008). This can be one of the major limitations in doing a questionnaire survey. In this respect, discussions are quite useful because the cross-questioning and classifications are possible. Thus, in data collecting, as a research method participatory observation is practically very useful.

To build mutual trust

When starting participatory observation, I could be included in several occasions of villagers' encroachment on the dense forest while they were being ignorant of persistence of the research. Hence, with the beginning of the season for gathering forest produce; for example *Beraliya* (edible seed) from May to August and *Hal* (seed) from August to September (Lankanth, 2008), I could take part in villagers' daily travels to the forest for gathering of forest produces.

Moreover, the villagers still believe in numerous superstitious practices such as *Kem krama* (Traditional furtive practices used in farming or in curing diseases), *Mantra* (charms) etc., which seem to be passed on over many generations, during the process of forest produce gathering. Usually, the knowledge of these superstitious practices is limited to descent and transmits from father to son or to any other close reliable relative and in such circumstances information about beliefs, superstitions, and traditional practices is difficult to be discovered by an outsider.

In general, when the villagers were interviewed they tended to present imaginary or false information. Therefore, use of the questionnaire survey method at times could provide the researcher with misleading information. The use of participatory observation method limited gathering of false data as it facilitated the researcher to collect data through his own experience. This was also one of the major advantages of this method.

In this regard, participatory methods were used in the research as one of the major qualitative data collecting methods.

(c) Discussions

Several discussion methods were used in the research whilst collecting both qualitative and quantitative data.

Semi-structural discussions

By using this method, both the researcher and the interviewee could limit the discussion to scheduled time and to the subject. This method helped to avoid dispensable information and data-analyzing process was undemanding.

As open discussion method demands for a great deal of time, its application in every situation is difficult (Bryman, 2009). For instance, in occasions of interviewing forest officers, police officers, clergymen etc., available time was limited. Thus, semi-structural discussion method was applied in those situations. This research method was useful in collecting data in formal settings.

Focus group discussions

In order to bring together a group of people, a common place where villagers often gather such as a temple, village societies, etc., was selected and the focus group discussion method was chosen for data gathering and assistance to meet people was obtained from the chief monk or the *Grama Niladari* (Villager officer). In this study, groups containing of 5 to 10 people were arranged, the research objectives were explained briefly, and people were encouraged to talk freely among themselves on the subject. Occasionally the process was disturbed if discussion seemed digressing. During their discussion and arguments, important data was recorded.

Organization of the gathered data by a focus group discussion was easy as it was applied on a group of people who were in similar age, gender, social class, or caste. As there was a group, it was expected that reliability of data was ascertained because if a person happened to state false data or figures, it was immediately corrected by others giving accurate information. In addition, when there was a group, incentive to provide information was high (Bryman, 2008: 472-491).

(d) Case studies for primary data collection

In this method, villagers who use the forest buffer zone and the forest for forest resource utilization were randomly selected and they were deeply interviewed on the scope of practicing of forest resource gathering. Then their life experiences were used as qualitative data. Case study method helped to collect data in depth and to study the behavior of the different forest resource users.

(e) Quadrante method

Quadrante method was used in the study to analyze flora diversity of both the forest and the buffer zones. "Studying biodiversity" was one of the fundamental profiles of the research, as an increase in flora diversity provides the peripheral villagers with extended opportunities in utilizing many forest resources that help their subsistence. For example, if the flora diversity is high in the established forest buffer zones, villagers do not want to enter the reserved dense forest for forest produce gathering and on the contrary, if the flora diversity is low villagers tend to encroach on the reserved forest seeking forest produce for subsistence regardless of the forest laws and rules.

In order to study flora diversity Six Quadrates have been randomly selected from the forest buffer zones and the reserved forest area (Table 3.1). Quadrate size was 5m x 5m.

Table 3.1: Number of selected quadrates by place

Place in which Quadrates Selected	Quadrates #
1. Reserved forest area	2
2. Forest buffer zone-1	2
3. Forest buffer zone-2	2
Total Quadrates	6

3.3.2 Secondary data collecting process

Secondary data in the research was extracted from the following sources.

A number of publications by local and international writers, especially which include information on trends in forest resource utilization, tropical forest, forest policy, man and forestry, joint forest management and community forestry etc., were used in the study. Mainly, those publications helped to get an idea about the research path and to develop the research problem and conceptual framework of the research. On the other hand, several publications about the *Sripada* Tropical Peak Wilderness Sanctuary in Sri Lanka and its peripheral villagers were used to gather significant facts.

A large number of maps of the study area were referred and some were used as base maps and other to get details of forest resources utilization, location of peripheral villages in the *Sripada* Tropical Peak Wilderness Sanctuary and variation in the forest area.

A number of websites related to forest resource utilization, traditional ecological knowledge, change and trends in forest resource utilization, forest policies and laws, joint forest management, community forest management activities etc., were used for secondary data collection.

Several government reports such as DS reports, reports of village officers and gray literature such as dissertations, personal diaries and records, institutional records etc., were used.

3.4 Data analyzing process

The following data analyzing research techniques were used for the data analyzing process.

(a) Statistical analysis of data

Primarily, SPSS software was used for data analyzing process in the research. A number of statistical analysis were done using SPSS data analyzing software.

(b) Case studies for data analyzing

Case studies were used to get personal outlooks of the villagers and to know how the villagers personally feel towards certain issues relating establishment of forest buffer zones and utilization of forest resources in the *Sripada* Tropical Peak Wilderness Sanctuary. Some of the case studies were presented in ‘separate boxes’ in the study.

Conclusion

The research methodology includes qualitative and quantitative methods. Hence, the research methodology can be enlisted neither as qualitative nor as quantitative, but as a mixed method research. Thus, it comes under combining qualitative and quantitative research (Brymen, 2009: 602-659).

The present chapter- Research methodology - comprises of three main sections, namely, determination of the research, the data collecting process, and the data analyzing process. Both pilot survey and literature survey are used to determine the research and subsequently research area, research problems, data collecting methods etc., were designed. The two components of the data collecting process, primary data collecting, and secondary data collecting reveal how information was gathered. Primary data is collected through questionnaire survey, quadrat methods, case studies, and participatory methods while secondary data is collected through publications, maps, reports and other unpublished documents, and sources from internet. Statistical analysis methods, and selected case studies are used for data analyzing process and maps, figures, table, pictures, etc., are used to present data.

Chapter 4

The Study area

4.1 Introduction

The study area of the research is focused in the present chapter. Considering the convenience of studying, the study area is divided into three main areas as follows;

1. The *Sripada* Tropical Peak Wilderness Sanctuary
2. Forest buffer zones
3. Peripheral villages selected for the study

4.2 The *Sripada* Tropical Peak Wilderness Sanctuary

Location

For its unequal natural beauty and religious importance that the *Sripada*'s peak holds, the *Sripada* Tropical Peak Wilderness Sanctuary has been appreciated locally and worldwide for centuries. It is situated in the centre of the western crest of the central highlands of Sri Lanka, between latitudes 6'44" and 6'54" North and longitudes 80'25" and 80'49" East in the Central province, *Rathnapura* and *Kegalle* districts (in *Sabaragamuwa* province) over total of 22,380 ha (Map 4.1) (Karunarathna, 2008: 34).

The elevation of the *Sripada* is above 450m and the *Sripada*'s Peak is the highest peak, which is about 2243m. The area receives mean annual rainfall 5123mm at *Hapugastenna* and 3081mm at *Maskeliya* while the mean annual temperature ranges between 27.20C in *Rathnapura* and 15.40C in *Nuwara Eliya* (Singhakumara, 1995; cited in Botanical Society, 2010).

Picture 4.1: The *Sripada* Tropical Peak Wilderness Sanctuary



The sanctuary serves as an important watershed for three major rivers: the Kelani, the Kalu and Walawe.

Biological importance and conservation planning

The *Sripada* Tropical Peak Wilderness was declared as a wilderness sanctuary in November 1940 owing to its outstanding biological, hydrological, and ecological value. The Forest Department has declared three forest reserves within the sanctuary viz., the Peak wilderness Proposed Reserve, *Walawe* Basin Forest Reserve, and *Borangammuwa* Forest Reserve. This is the only sanctuary in the island, which consists of so many 'attitudinally graded, structurally and physiognomically different, biologically diverse forest formations, including tropical lowland, lower or sub-montane, and upper montane rain forests' (Karunaratna, 2008; Singhakumara, 1995; Gunawardana, 1996:4-5). As well, the eastern part of the sanctuary consists of natural grasslands and there are some of intermediate floristic elements in the eastern boundary.

Picture 4.2: Vegetation types inside the forest



Vegetation

The *Sripada* Tropical Peak Wilderness contains its own forest vegetation. It has a continuous natural forest cover of attitudinally graded forest types, ranging from lowland mixed Dipterocarp forest to montane cloud forests. Thus, it is one of such handful remaining areas of Sri Lanka. 'The Dipterocarpaceae (especially *Dipterocarpus*, *Shorea* and endemic genus *Stemonoporous*) is the dominant families in the lower slopes of the Peak wilderness range and *Palaquium* spp. *Stemonoporous rigidis* and *S. cordifolius* show clear single species dominance. *S. gardneri* is found to be co-dominant with *Palaquium rubiginosm* ' (Singhakumara, 1995, Gunawardana, 1996).

Additionally, there are various other valuable flora species like *Kina* (*Calophyllum trapezifolium*), *Milla* (*Vitex altissima*), *Liyan* (*Homalium zeylanicum*), *Dan* (*Doona gurdanri*) *Na ibul* (*Pometia tomentosa*) *Hora* (*Dipterocarpus zeylanicus*) etc. As well, among the vine species available in the *Sripada* Tropical Peak Wilderness Sanctuary, some species like *Wewal* (*Calamus rotang*), *Kukulu wel* (*Calamus radiatus*), etc., are important resource for handicraft production (Gunawardana, 1996: 4-5).

Among the available condiment varieties *Wal Enasal* (*Elettaria ensal**), *Wal Kurundu* (*Cinamomum multifolium**), *Wal inguru* (*Zingiber cylindricum**), *Goraka* (*Garcinnia cambogia*), *Wal Gammiris* (*Piperargyrophyllum**) are commonly found within the sanctuary. Further, over generations people from the peripheral areas of the sanctuary have utilized the forest sanctuary for flora species of medicinal value. As herbs *Weniwelgeta* (*Coscinium fenestratum*)*, *Binkohoba* (*Munronia pumila*), *Iddi* (*Phaseolus aconitifolius**) *Kokum*

(*Kokoon zeylanica**), Kekuna (*Canarium zeylanicum*), Godamedella (*Barringtonia ceylanica**), Iruraja (*Zeuxine regia**), Godapara (*Dillenia triquetra**), Vanaraja, (*Anoectochilus setaceus**), Hathawariya [*Asparagus falcatus* & *Asparagus racemosus* (wild)] are commonly gathered (Gunawardana, 1996; Kurunaratna, 2008:26)

Picture 4.3: Streams inside the forest sanctuary



Fauna

There is high Fauna diversity in the *Sripada* Tropical Peak Wilderness Sanctuary and most of species are endemic to Sri Lanka. The most common mammals in this sanctuary are Ceylon leopard (*Panthera pardus kotiya*), Golden Mongoose (*Paradoxurus zeylonensis*), Sambhur (*Cervus unicolor*), Mouse Deer (*Tragulus meminna*), Baking Deer (*Muntiacus muntjak malabaricus*), Southern Indian Otter (*Lutra lutra nair*), Golden Palm Civet (*Paradoxurus zeylanensis*), Torque Monkey (*Macaca sinica aurifrons*), Sri Lankan Giant Squirrel (*Ratufa macroura melanochra*), Southern Purple Faced Leaf Monkey (*Trachypithecus vetulus*).

As well, the forest is a habitat for many bird species and in particular more than 24 birds species, which can be easily seen here are endemic to Sri Lanka (26 birds species are endemic to Sri Lanka). Among them, Sri Lankan Coucal (*Centropus chlororhynchus*), Sri Lankan Broad Billed Roller (*Eurystomus orientalis*), Achy headed Laughing Thrush (*Garrulax cinereifrons*), Sri Lankan Red Faced Mal Koha (*Phaenicophaeus pyrrhocephalus*) and Sri Lankan White eye (*Zosterops ceylonensis*) are more rare bird species.

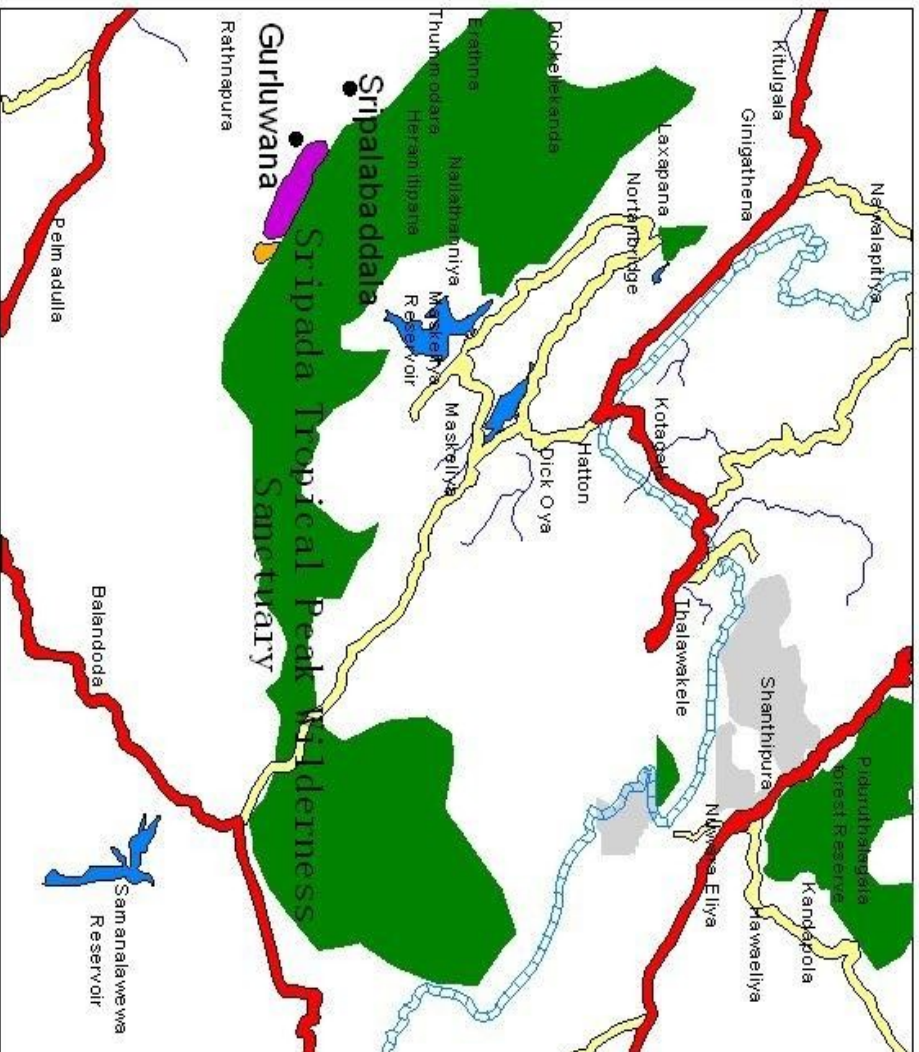
On behalf of that, 38 of reptile species, 16 fresh water fish species, and 21 Amphibious have been recorded from the *Sripada* Tropical Peak Wilderness Sanctuary (Kurunaratna, 2008).

Picture 4.4: Sun rising on the *Sripada* Peak Wilderness Sanctuary



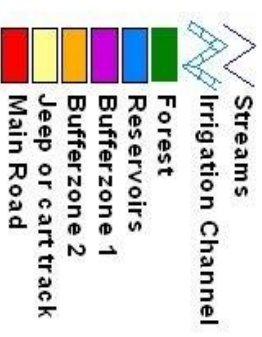
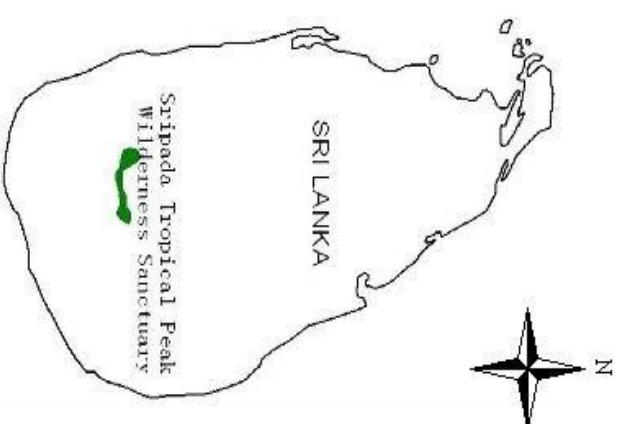
Map 4.1

Location of the Study Area

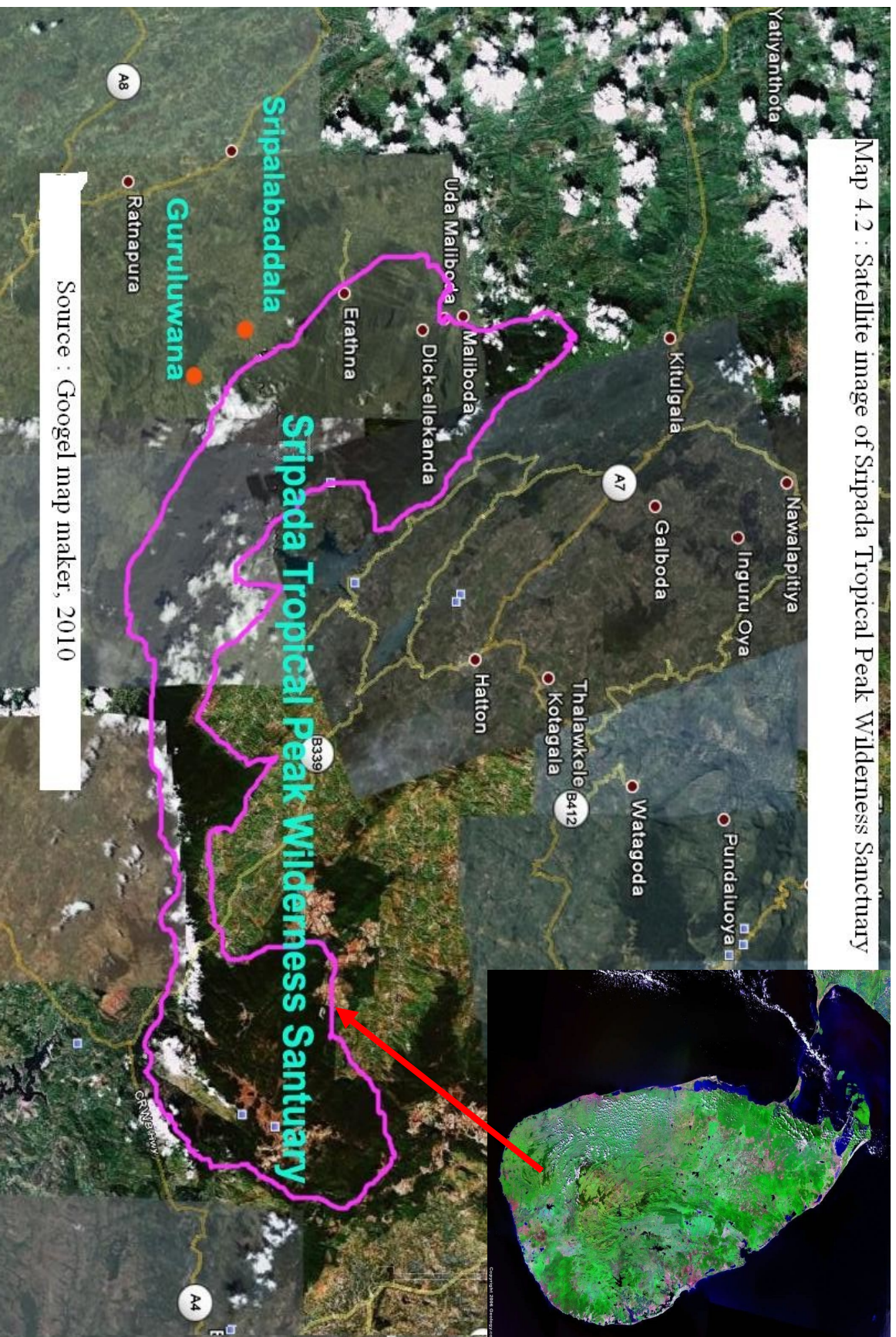


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Source : Google map maker, 2010



Map 4.2 : Satellite image of Sripada Tropical Peak Wilderness Sanctuary



4.3 Forest buffer zones

The term “Buffer Zone” can be interpreted as a “transitional area between two areas of different predominant land use” (Answercom, 2010). On the other hand, as the meaning of the word “Buffer” can be taken as 'security' or 'safety'; the term ‘Buffer zone’ can be defined as ‘Security Area’ situated between two conflict areas. The term 'Buffer Zones' can also be defined as follows.

“Buffer Zone can be define as a neutral territory: a neutral area that lies between hostile forces and reduces the risk of conflict between them or separating area: an area designed to form a barrier that prevents potential conflict or harmful contact (Encarta MSN, 2010)”

A Forest Buffer Zone can be generally defined as a 'security area' for the dense forest that consists of flora species and locates between problematic and sensitive land use areas. According to the two researchers, Sunito and Sitorus, ‘Ecological Buffer Zone’ is a ‘forest margin area’ between forest and villagers’ farmland. (Sunito and Sitorus, 2010). As well, there are ‘Repairing forest buffer zone’ projects that focus on safeguard of some sensitive areas of land surface. Here the term ‘Repairing forest buffer zone’ is taken in the sense of “An area of trees and shrubs located adjacent to streams, lakes, ponds, and wet lands” (USAD, 2010).

According to Vincent who has researched on effectiveness of creating and maintaining ‘healthy forest buffer zones’ in the sense of economic aspect of sustainability, a healthy forest buffer zone should be equal to the stands of the dense forest. At this point, he has meant that ‘buffer zone forest’ should be created around the dense forest.

In the economic aspect of sustainability (which translates into political sustainability) in creating and maintaining a healthy forest buffer zone is getting a forest industry established, which needs to be adapted to the forest stands in the buffer zone; adapted both in terms of sizes of trees to use and the rate of harvesting, which, once the room-to-grow state is achieved, must not exceed net growth (Vincent, 2010:01).

The government of Indonesia has carried out a ‘Community-Base Forest Management Project’ using the ‘buffer zone’ of Gunung Palung National Park. According to this project the ‘buffer zone’ area is used for sawed timber production and villagers from peripheral areas of the forest were legally empowered to use the forest buffer zone for logging for timber. Yet, the lumber jacks are liable to the conservation of the national park (World wildlife, 2010). At this point also ‘Forest Buffer Zone’ has been defined as a forest area situated in between the national park and the peripheral villages around it.

Hence, we can define “Forest Buffer Zone” as a ‘security forest area’ which is established in between dense forest and peripheral villages of it.

For the study two forest buffer zones situated in the southern peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary are selected.

1. Buffer zone – 1: [Albezia forest (*Albezia molucana*)]
2. Buffer zone – 2: [Araucaria forest (*Araucaria cookii*)]

4.3.1 Buffer zone –1: [Albezia forest (*Albezia molucana*)]

Forest buffer zone -1 has been established by the Forest Department in 1973 and it is located in between *Guruluwana* Grama Niladari Division (162-G) and southern part of the *Sripada* Tropical Peak Wilderness Sanctuary (Map 4.1 & Map 4.2).

Picture 4.5: Forest buffer zone -1



Guruluwana GN division consists of four villages namely, *Guruluwana*, *Kunugoda Hena*, *Diviyagala* and *Dhegahahena*. Prior to the establishment of forest buffer zone-1, most of the villagers from these villages utilize the *Sripada* Tropical Peak Wilderness Sanctuary for shifting cultivation. It became one of the foremost reasons for forest degradation and consequently the Forest Department of Sri Lanka decided to establish a forest buffer zone in between the dense forest and its peripheral villages (Karunarathna, 2009:29; forest department records, 2010).

Picture 4.6: Inside the forest buffer zone-1



Firstly, with the help of villagers, the degraded peripheral forest areas of the *Sripada* Tropical Peak Wilderness Sanctuary were cleared and then *Albezia* (*Albezia molucana*) plants were planted in 275 ha of land (Forest department record, 2010). At present, the ‘forest buffer zone -1’ is called by villagers as “Albezia forest”.

4.3.2 Forest buffer zone – 2: [Araucaria forest (*Araucaria cookii*)]

Forest buffer zone-2 was established in between several areas of the *Guruluwana* Grama Niladari division and the southern part of the *Sripada* Tropical Peak Wilderness Sanctuary by the Forest Department of Sri Lanka in 1976. It is located very close to the west of the forest buffer zone-1 (Map 4.1 & Map 4.2). The forest buffer zone -2 is smaller than the forest buffer zone-1 and it spans over 125 ha of land. When establishing forest buffer zone-2, the Forest Department has used ‘*Araucaria (Araucaria cookii)*’ plant and for this reason, villagers call the forest buffer zone “Araucaria forest”.

Picture 4.7: Forest buffer zone-2 Araucaria forest



4.4 Selected peripheral villages for the study

Two Grama Niladari (village officers) Divisions (GN Division) in the study area are selected for the study.

1. *Guruluwana*
2. *Sripalabaddala*

There are two forest buffer zones in between the *Sripada* Tropical Peak Wilderness Sanctuary and *Guruluwana*. However, there are no such forest buffer zones in *Sripalabaddala*. The patterns of forest resource utilization by the villagers from these two villages are compared and contrasted. Thus, the research is a comparative study in which the effectiveness of establishing forest buffer zones is measured.

4.4.1. *Guruluwana* GN division (162- G)

Guruluwana is situated in the southern periphery of the *Sripada* Tropical Peak Wilderness Sanctuary (Map 4.1 & Map 4.2). *Guruluwana* GN Division consists of four villages.

- i. *Guruluwana*
- ii. *Kunugodahena*
- iii. *Diviyagala*
- iv. *Dehigahahena*

Both forest buffer zones (Forest buffer zones - 1 and 2) are situated in between *Guruluwana* GN Division and *Sripada* Tropical Peak Wilderness Sanctuary.

Picture 4.8: *Guruluwana* GN division



Most of the villagers residing at *Guruluwana* GN division are Sinhalese Buddhists, but a few other ethnic and religious groups reside at this division (Table 4.1). Out of them 265 are Tamil and they have migrated to the area as laborers in tea plantations.

Table 4.1: Population records of *Guruluwana* GN division

01	Ethnicity	Female	Male	Total
	Sihnala	788	746	1539
	Sri Lankan Tamil	99	81	180
	Indian Tamil	46	39	85
	Other	00	00	00
	Total	938	866	1804
02	Population by age			
	5 years >	116	118	234
	5 -18 years	242	227	469
	19- 35 years	304	238	542
	36-60 years	234	243	477
	60 years <	42	40	82
	Total	938	866	1804
03	Total (# Families)			447
04	Total (# Households)			436

Source: *Guruluwana* Village officer's records, 2009

Out of 1804 residents, 703 are teenagers and it indicates that the population in the area is rapidly increasing. Most of the residents in the area have not received the higher education but only the primary education. Thus, most of them are unable to occupy in government or private sector. As a result, they depend on agriculture or forest resource utilization for subsistence (Table 4.2).

Table 4.2: Educational level, employment, and agriculture types

01	Educational level	Female	Male	Total
	No schooling	182	171	353
	Less than grade 11	692	572	1265
	Ordinary Level qualified	86	65	152
	Advance Level qualified	08	07	15
	Graduated or above	04	03	07
02	Employment type			
	Government sector	16	18	34
	Privet sector	22	29	51
	Service institute	11	13	24
	Self employment	10	24	34
	Housemaids	01	-	01
	Agriculture and/or forest resource utilizations			328
	Other	04	12	16
03	Agriculture type	Total land (acres)		
	Tea	686		
	Rubber	12		
	Coconut	09		
	Other	49		

Source: *Guruluwana* GN division reports, 2009

According to the table 4.2, most of the villagers depend on agricultural sector or/ and forest resource utilization and it is their main income source. In the agricultural sector in the area, tea plantation is prioritized. Even though the tea plantation is the main income source of the majority, many of them also engage in forest resource utilization for additional income or subsistence. If the types of houses at the *Guruluwana* GN Division are taken into account, more than 75% of people have permanent houses with electricity and proper sanitary facilities (*Guruluwana* GN reports, 2009; Karunarathna, 2008:31).

4.4.2 Sripalabaddala GN division (162B)

Sripalabaddala GN Division is also situated in the southern periphery of the *Sripada* Tropical Peak Wilderness Sanctuary (Map 4.1 & Map 4.2). This GN Division also comprises four villages namely;

- i. *Sripalabaddala*
- ii. *Edirikelle*
- iii. *Pawenalla*
- iv. *Mahawatta*

Sripalabaddala is located very close to the *Sripada* Tropical Peak Wilderness Sanctuary and there is not a forest buffer zone in between *Sripalabaddala* GN Division and the forest sanctuary. Similar to the *Guruluwana* GN division, most of the dwellers of this GN division are Sinhalese Buddhists. Only a few Tamil natives reside at this area and they have migrated to the area as workers in tea estates (Table 4.3).

Picture 4.9: *Sripalabaddala* GN division



Table 4.3: Population records of *Sripalabaddala* GN division

01	Ethnicity	Female	Male	Total
	Sihnala	493	521	1014
	Sri Lankan Tamil	01	01	02
	Burger	01	00	01
	Other	00	00	00
	Total	495	522	1017
02	Population by age			
	5 years >	38	45	83
	5 -18 years	137	115	252
	19- 35 years	136	161	297
	36-60 years	158	168	326
	60 years <	26	33	59
	Total	495	522	1017
03	Total Families			277
04	Total Households			269

Source: *Sripalabaddala* Village officer's records, 2009

Out of 1017 of total population in *Sripalabaddala*, 335 are teenagers. It indicates that the population in the area is rapidly increasing akin to the situation in *Guruluwana* GN division. Most of the villagers have obtained only primary education, and only a few villagers have obtained graduate level education (Table 4.3).

Even in *Sripalabaddala*, most of the villagers depend on agriculture and/ or forest resource utilization. Here also majority of the villagers depend on agriculture and they have prioritized tea cultivation. Similar to *Guruluwana*, even though the tea plantation is the main income source of the majority, many of them also engage in forest resource utilization as a minor income source or for subsistence. As well, more than 70% villagers have permanent houses and basic facilities like electricity, pure drinking water, water sealed toilets etc. (*Sripalabaddala* GN Davison reports, 2009).

Table 4.4: Educational level, employment, and agriculture types

01	Educational level	Female	Male	Total
	No schooling	00	00	00
	Less than grade 11	255	262	517
	Ordinary Level qualified	190	197	387
	Advance level qualified	52	58	110
	Graduated or above	01	02	03
02	Employment type			
	Government sector	07	09	16
	Privet sector	07	06	13
	Service institute	01	03	04
	Self employment	01	04	05
	Housemaids	02	00	02
	Agriculture and/or forest resource utilizations	-	-	573
	Other		02	02
03	Agriculture type	Total lands (acres)		
	Tea	338		
	Coconut	04		
	Other	63		

Source: Sriplabaddala GN division reports, 2009

Conclusion

The chapter aims at describing the study area. The study area is mainly divided into three areas; the *Sripada* Tropical Peak Wilderness Sanctuary, the forest buffer zones, and the selected peripheral villages. The *Sripada* Tropical Peak Wilderness Sanctuary holds a foremost place among the tropical rain forests of Sri Lanka as an ecological site that shelter many endemic fauna and flora species. Only two buffer zones, which are located in between the *Guruluwana* Grama Niladari division and the *Sripada* Tropical Peak Wilderness Sanctuary, are studied. The 'Forest Buffer Zone-1' is established with 'Albezea' plant while the 'Forest Buffer Zone-2' with 'Arakeria' plant. Between the two GN divisions namely, *Guruluwana* and *Sripalabaddala*, the latter is situated closely attached to the *Sripada* Tropical Peak Wilderness Sanctuary without a forest buffer zone. The dwellers of both these GN divisions mainly occupy in agriculture and forest resource utilization. There is a current trend in increasing of population in these GN divisions and the majority of villagers engage in agriculture and forest resource utilization. These two facts should be taken into account in future attempts in forest and wildlife conservation.

Chapter 5

Forest resource utilization

5.1 Introduction

The purpose of this chapter is to explain the nature of forest resources utilization by peripheral communities of *Sripada* Tropical Peak Wilderness sanctuary. Villagers residing at *Guruluwana* have utilized both forest sanctuary and established forest buffer zones for forest resource gathering. Yet, the villagers of *Sripalabaddala* have utilized only the *Sripada* Tropical Peak Wilderness sanctuary for that purpose (there are no forest buffer zones between the forest and the *Sriplabaddala* village).

The patterns of forest resource utilization by the villagers at the peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary can be divided into three major categories as utilization of Non-Timber Forest produce (NTFP), Timber Forest Produce (TFP), and Other Forest Resource (OFR) (Wikramasinghe, 2003; Karunarathna, 2008).

This chapter focuses on categorization of practices of forest resource utilization as well as on analyzing prevalent practices, objectives, average amounts gathered of forest produce, and average income generated in relation to forest resource gathering.

5.2 Major categories of forest resources

Practices of forest resource utilization can be categorized into three groups:

1. Non-Timber Forest Produce (NTFP)
2. Timber Forest Produce (TFP)
3. Other practices of forest resource utilization (except NTFP and TFP)

Non-Timber Forest Produce (NTFR) is grouped into three sub categories like, Edible Forest Produce (EFP), Species of Medicinal Value, and Non-Edible Forest Produce (NEFP). Gathering of species of medicinal value is grouped into a separate category as these species can come under both groups - Edible or Non-Edible Forest Produce (Table 5.1 and 5.2).

Utilization of forest resources are listed by major categories in the Table 5.3. Collected data on practices of forest resource utilization of both selected GN divisions are used in preparation of the table.

Table 5.1
Major categories of forest resource utilization

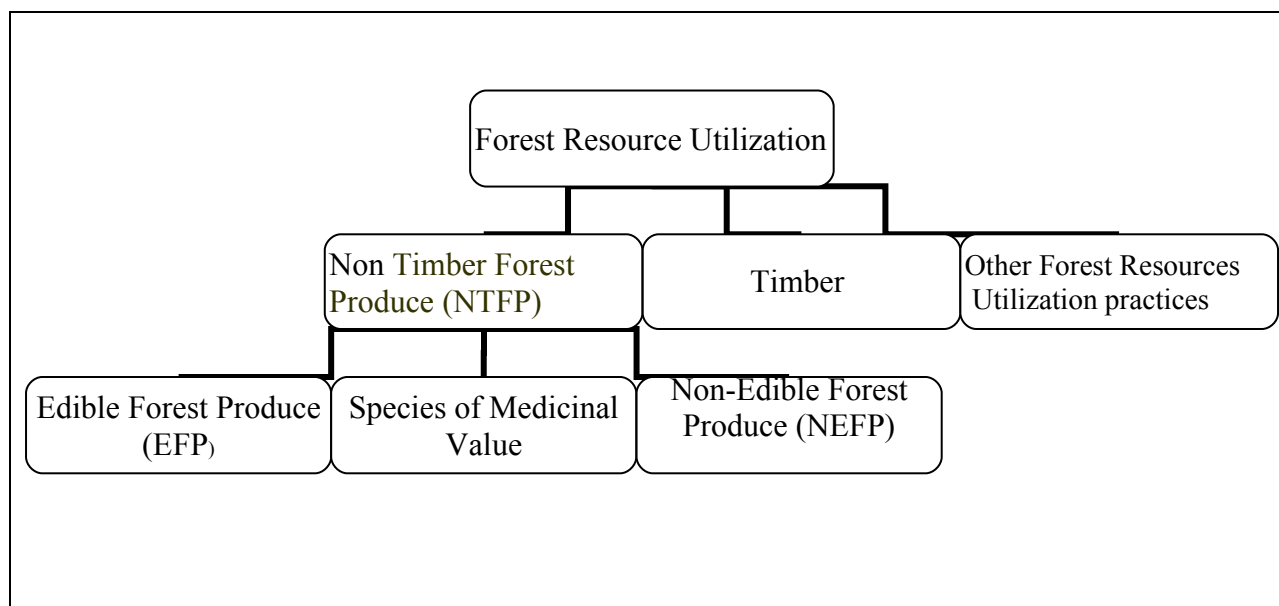


Table 5.2
Forest resource utilization by major categories

Category	Sub category
1. Non-Timber Forest Produce (NTFP)	<p>1.1 Edible Forest Produce</p> <ul style="list-style-type: none"> i. <i>Kitul</i> tapping for sweet toddy ii. Substitute food for staple food iii. Green vegetables iv. Collecting forest produce for porridges v. Collecting forest produce for beverages vi. Fruits vii. Condiments viii. Other <p>1.2 Species of Medicinal Value</p> <p>1.3 Non-Edible Forest Produce</p> <ul style="list-style-type: none"> i. Binding materials ii. Resins iii. Fuel wood iv. Thatching leaves

2. Timber Forest Produce (Logging and sawing for timber)	
3. Other	3.1 Poaching 3.2 Gem mining 3.3 Clearance of forestland for cultivation

Source: questionnaire survey and discussions

5.3 Forest resource utilization: Non-Timber Forest Produce (NTFP)

Collecting of Non-Timber forest produce can be categorized into three main sections: Edible Forest Produce, species of medicinal value, and Non-Edible Forest Produce

5.3.1 Edible Forest Produce

Collecting of Edible Forest Produce can again be divided into two sub categories (Table 5.2).

- i. *Kitul* tapping for sweet toddy
- ii. Edible Forest Produce (except *Kitul*)

i. *Kitul* (*Caryatid urns*) tapping for sweet toddy

Kitul tapping is one of the major practices of forest resource utilization by villagers residing at the vicinity of the forest over years. Thus, the process of *Kitul* tapping is illustrated in detail.

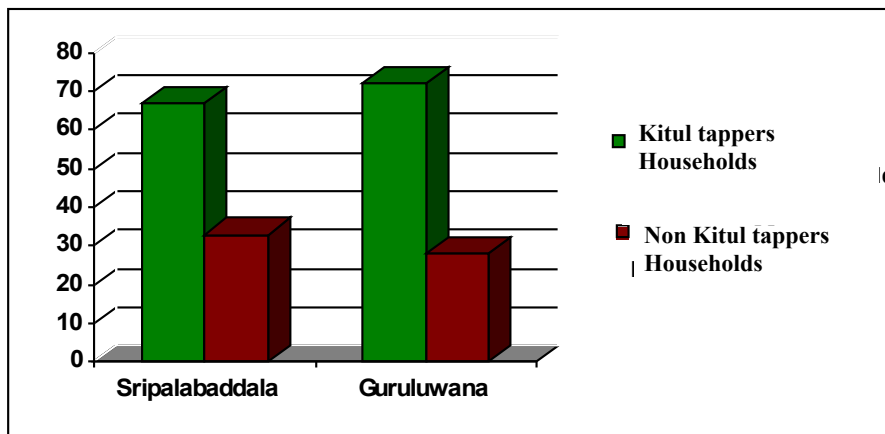
Kitul palm belongs to *palmate* plant species and they occur in several areas of the country especially in the wet zone of the country. In Topical Rain Forests like *Sripada* Tropical Peak Wilderness Sanctuary, it is one of the common species. In late 1970, tea economy rapidly spread at the peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary and subsequently tea plantation became the major economic activity in those areas. Prior to the 1970s, the income sources of the villagers mostly depended on the vending of products made of *Kitul* like jaggery and treacle and *chena* cultivation was practiced for day-to-day provisions (Karunarathna, 2008, Forest department records, 2009; field data of the research).

The villagers of *Sripalabaddala* use *Kitul* trees available in the *Sripada* Tropical Peak Wilderness Sanctuary for tapping. However, most of the *Kitul* tappers from *Guruluwana* GN division use *Kitul* trees inside the forest buffer zone-1 for tapping.

Picture 5.1 *Kitul* tapping inside the *Sripada* Tropical Peak Wilderness Sanctuary



Figure 5.1 Percentage of households involved in *Kitul* tapping (*Kitul* tapping inside the forest/ forest buffer zones)



Source: SPSS Analysis of data - Questionnaire survey

Nearly 70% of households participate in *Kitul* tapping inside the forest or forest buffer zones (Figure 5.1). Hundred percent of *Kitul* tappers in *Sripalabaddala* uses *Sripada* Tropical Peak Wilderness Sanctuary for *Kitul* tapping, even without legal permission. They produce *Kitul* jaggery, treacle, and toddy using collected sweet toddy by *Kitul* tapping. Most of the *Kitul* tappers have produced *Kitul* jaggery and treacle for both subsistence and marketing and averagely a *Kitul* tapper earns an annual income of 158,500 Rs by *Kitul* tapping. Even though *Kitul* tappers from *Sripalabaddala* produce *Kitul* toddy for marketing, they do not gain much income by *Kitul* toddy (Table 5.3).

Picture 5.2: *Kitul* tapping in forest buffer zone-1 (*Guruluwana*)



However, *Kitul* tappers of *Guruluwana* produce *Kitul* jaggery, treacle, and toddy for both subsistence and sale. Averagely, a *Kitul* tapper from *Guruluwana* earns 187,400 Rs per year by *Kitul* tapping (comparing with income of a *Kitul* tapper of *Sripalabaddala* it is a large sum of money). Most of the *Kitul* tappers use forest buffer zone-1 for tapping and they have legal permission for tapping the *Kitul* palms inside forest buffer zones. Villagers from both GN divisions participate in *Kitul* tapping (Table 5.3). Many researchers as well as policy makers have identified ‘*Kitul* tapping’ as one of the main economic activities of the peripheral villagers of *Sripada* Tropical Peak Wilderness Sanctuary (Wikkrumashinge, 2003; Sinhekumara, 1995; Krunarathna, 2008).

Picture 5.3: Process of *Kitul* jaggery making

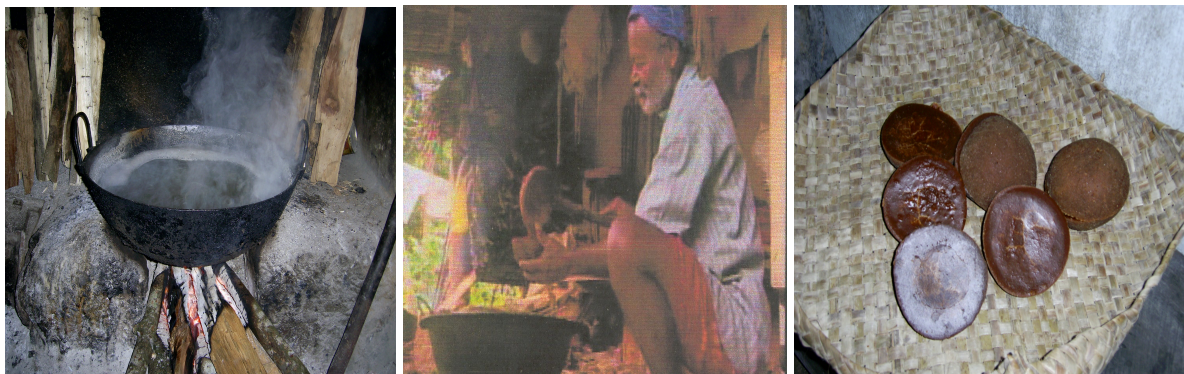


Table 5.3 Information about *Kinul* tapping and *Kinul* tappers in the study area

GN Division	Used Species	Collected material	Production	Collecting area & Collected Percentage		Purpose & percentage		Average of produced Amount (by a collector per year)	Average annual income of a collector (Rs)	
				F	B ₁	B ₂	1			2
<i>Sripalab addala</i>	<i>Kinul</i> palm (<i>Caryatid urns</i>)	Sweet toddy	<i>Kinul</i> jaggery	√100%	×	×	√11%	√89%	550 kg	110,000.00
		Sweet toddy	<i>Kinul</i> treacle	√100%	×	×	√23%	√77%	240 kg	48,500.00
		Sweet toddy	<i>Kinul</i> toddy	√100%	×	×	√100%	×	482 L	NA (Total) 158,500.00
<i>Gurulu wana</i>	<i>Kinul</i> palm (<i>Caryatid urns</i>)	Sweet toddy	<i>Kinul</i> jaggery	√23%	√77%	×	√06%	√94%	520 kg	104,000.00
		Sweet toddy	<i>Kinul</i> treacle	√19%	√81%	×	×	√100%	342 kg	68,400.00
		Sweet toddy	<i>Kinul</i> toddy	√12%	√88%	×	√77%	√23%	560 L	15,000.00 (Total) 187,500.00

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

F = *Sripalada* Tropical Peak Wilderness Sanctuary

B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]

B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Objectives

1 = Only for Subsistence

2 = Only for Marketing

√ = Use

× = Not use

- = Not available

NA = Not applicable

ii. Edible forest produces (except *Kitul*)

Collecting Edible Forest Produce (EFP except *Kitul*) is one of the major practices of forest resource utilization by rural villagers residing in the study area (*Sripalabaddala* and *Guruluwana* GN divisions). Most of the rural communities from peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary are able to identify most of the edible food species available within the forest and also traits, due seasons of collecting forest produce and location of them (Anoja, 1997; 116).

Collecting Edible Forest Produce (except *Kitul*) can be divided into seven sub categories.

- i. Substitute food for staple food
- ii. Green vegetables
- iii. Forest produce for porridge
- iv. Forest produce for beverages
- v. Fruits
- vi. Condiments
- vii. Other edible foods

According to research findings, peripheral villagers have identified a large number of flora species as Edible Forest Produce (Appendices Table 1 and Table 5.4) and most of the villagers from the study area are involved in Edible Forest Produce utilization practices (Table 5.4). In other words, collecting Edible Forest Produce is an important activity in their day-to-day life.

Table 5.4: Percentage of households involved in edible forest produce collecting

Category	<i>Sripalabaddala</i> GN Division		<i>Guruluwana</i> GN Division	
	households (involved) (%)	Households (not involved) (%)	Households (involved) (%)	Households (not involved) (%)
Substitute food for staple food	81	19	74	26
Green vegetables	92	08	94	06
Produce for porridges	73	27	63	47
Produce for beverages	43	67	56	44
Fruits	96	04	87	13
Condiments	47	53	38	62
Other	86	14	92	08

Source: SPSS Analysis of data - Questionnaire survey

Villagers from *Sripalabaddala* GN division use *Sripada* Tropical Peak Wilderness Sanctuary for the practice of Edible Forest Produce gathering. Even though it is illegal, in most cases forest officers in duty less attend on villagers' practices of Edible Forest Resources gathering within the forest as it is considered a sustainable forest utilization practice. However, according to some researchers this practice can cause forest degradation (Perera, 2004; Karunarathna, 2008, Kumara and Karaunarathna, 2010; Hewage, Senavirathna, Karunarathna, Kumara, 2010).

Villagers from the *Guruluwana* GN division use both the *Sripada* Tropical Peak Wilderness Sanctuary and its buffer zones for Edible Forest Resources collecting. Yet, they mainly use forest buffer zone-1 for that purpose and they possess legal consent for it.

Picture 5.4 Edible Forest Produce (EFP)



Green vegetable: *Thebu* (*Costus speciosus*)



Substitute food for staple food: *Beraliya* (*Shorea megistophylla**)



Fruit: *Iddi* (*Phaseolus aconitifolius**)

* = endemic

Alternatively, the forest buffer zone-2 is rarely used by the villagers for Edible Forest Resource collecting, as many of these are not found in this area. Villagers from both *Sripalabaddala* and *Guruluwana* collect most of Edible Forest Resources for subsistence and some fruit and condiment species are collected for sale. Averagely, villagers from *Sripalabaddala* annually earn 35,000 Rs by selling Edible Forest Resources. However, income gained by the villagers of *Guruluwana* by selling Edible Forest Resources is lesser as 20,500 Rs per year. (Table 5.5) Since Edible Forest Produce of high market value such as condiment species or bees' honey is rare in the forest buffer zone, villagers from *Guruluwana* enter the *Sripada* Tropical Peak Wilderness Sanctuary to gather these. Yet, it is very difficult, as they ought to walk more than 8 km, through the forest buffer zone in order to enter the *Sripada* Tropical Peak Wilderness Sanctuary. Therefore, they seldom collect marketable Edible Forest Resources.

Picture 5.5 EFP: Condiment species



Wild pepper (*Piperargyrophyllum**)



Goraka (*Garcinnia cambogia*)



Wild cardamom (*Elettaria ensal**)

* = endemic

Table 5.5: Information about edible forest produce collecting and collectors (except *kinul*)

GN Division	Category	Number of used species	Collecting area & Collected			Collecting Purpose & Percentage		Average of collected Amount (by a collector per year)	Average annual income of a collector (Rs)	
			F	B ₁	B ₂	1	2			
<i>Sripalabadala</i>	Substitute food for staple food	13	√ 100%	-	-	√ 100%	×	*	NA	
	Green vegetables	27	√ 100%	-	-	√ 100%	×	*	NA	
	Forest produce for porridges	11	√ 100%	-	-	√ 100%	×	*	NA	
	Forest produce for beverages	09	√ 100%	-	-	√ 100%	×	*	NA	
	Fruits	32	√ 100%	-	-	√ 90%	√ 10%	*	1,500.00	
	Condiments	08	√ 100%	-	-	√ 27%	√ 73%	74 kg	21,000.00	
	Other	10	√ 100%	-	-	√ 62%	√ 38%	*	12,500.00	
									(Total) 35,000, 00	
	<i>Guruluwana</i>	Substitute food for staple food	18	√ 06%	√ 94%	×	√ 100%	×	*	NA
		Green vegetables	22	×	√ 100%	×	√ 100%	×	*	NA
Forest produce for porridges		08	×	√ 100%	×	√ 100%	×	*	NA	
Forest produce for beverages		09	×	√ 100%	×	√ 100%	×	*	NA	
Fruits		34	√ 23%	√ 77%	×	√ 97%	√ 03%	*	540.00	
Condiments		08	√ 45%	√ 55%	×	√ 19%	√ 73%	35 kg	11,500.00	
Other		09	√ 12%	√ 82%	√ 6%	√ 68%	√ 38%		8,500.00	
								(Total) 20, 540.00		

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

F = *Sripada* Tropical Peak Wilderness Sanctuary
 B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]
 B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Collecting objectives

1= For subsistence
 2= For marketing

√ = Use

× = Not use

- = Not available

* = No regular data

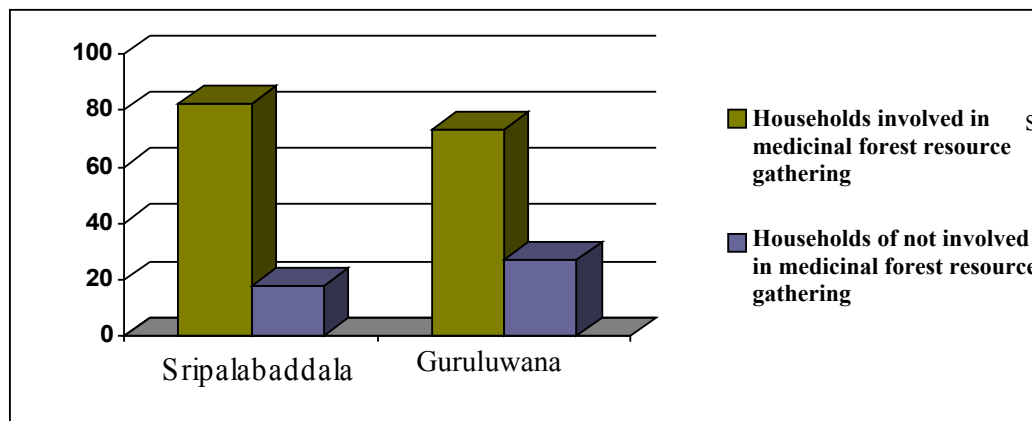
NA = Not applicable

5.3.2 Species of medicinal value

Ayurvedic as well as traditional Sinhala medical practices are very popular among the villagers residing at the peripheral areas of rain forests and commonly all over in Sri Lanka. Over years, the traditional Sinhala medical practitioners living in the peripheral areas of rain forests have used these forests as a source of medicinal resources. The flora species used in preparation of Sinhala or Ayurvedic medicines are rare and most of these plants are highly marketable. Hence, some peripheral villagers collect these species to gain income.

What should specially be noted here is that almost all the peripheral villagers are generally knowledgeable about local medicinal practices. They are familiar with many medicinal plant species and well aware of the ways of curing minor illnesses using medicines made of various herbs without consulting a Sinhala medical practitioner. Thus, most of the villagers collect species of medicinal value to prepare common medicines for their illnesses. Even though, western medical practices are popular in these areas, still local people use Ayurvedic and Sinhala medicines (Jayawardana, 2008; Hewage, 2010). Thus, collecting of species of medicinal value is one of the major forest utilization practices of local communities residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary (Wikramasinghe, 2003; Karunarathna and Kumara, 2010).

Figure 5.2: Percentage of households involved in medicinal forest resource gathering



Source: SPSS Analysis of data - Questionnaire survey

Here, a large number of flora species and some of their parts are used in preparation of remedy (Appendices Table 5.1; Table 5.6 and Table 5.7). Considering both research sites, percentage of the users of forest resource of medicinal value is noticeably higher than the number of non-users (Figure 5.2). Villagers from *Sripalabaddala* have used only the *Sripada* Tropical Peak Wilderness Sanctuary to gather medicinal forest resources even though this practice is prohibited. If caught while gathering medicinal species inside the dense forest the gatherers are punished by law. Accordingly, the villagers of *Sripalabaddala* are cautious to collect these medicinal forest resources slyly.

However, the villagers of *Guruluwanan* use the forest buffer zones for this purpose (Table 5.8). Even though gathering of medicinal species available within forest buffer zones on a large scale is also banned, the forest offices in duty are flexible regarding collecting of these plants for self-needs. Even though the *Sripada* Tropical Peak Wilderness Sanctuary is a

heavily protected reservation, the established forest buffer zones are not that much shielded (Lankanth, 2008).

Most of the villagers from both research sites collect medicinal forest resources for self-needs but a small percentage of collected herbs is marketed. However, selling of collected medicinal forest resources is not profitable (Table 5.6 and Table 5.7). Hence, gathering of forest produce of medicinal value is not a major income source of the peripheral villagers of the *Sripada* Tropical Peak Wilderness Sanctuary.

Picture 5.6: Very rare and endemic medicinal plants used in preparation of medicines against blood poisoning in snakebites



Iruraja (Zeuxine regia)*
* = endemic



Gondiwa (Elephantopus scaber)

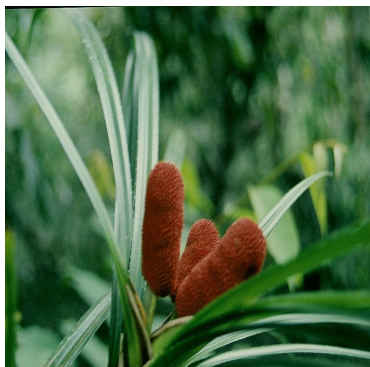


Vanaraja (Anoectochilus setaceus)*

One of the other important observations is that forest buffer zone-2 is seldom used by the villagers from *Guruluwana* for gathering of forest resources of medicinal value (Table 5.7) simply because many medicinal flora species cannot be found there. The forest buffer zone-2 is planted with 'Araucaria' (*Araucaria cookii*). As *Araucaria* species does not allow for rich bio-diversity within the area, flora species of medicinal value seldom grow in the buffer zone (Karunarathna and Kumara, 2010).

A decreasing trend in the practice of medicinal forest produce gathering is noticed due to several reasons. One of the major reasons is the popularity of western medicine. On the other hand, traditional knowledge regarding medicinal plants as well as the ways of curing has not flown to the new generation (Jaywardana, 2008).

Picture 5.7: Commonly used species of medicinal value in the forest buffer zone-1



*Okeiya (Pandanus celanicus) **
* = endemic



*Bandura (Nepenthes distillatoria) **



*Weniwelgeta (Coscinium fenestratum)**

Table 5.6 Information about species of medicinal value collecting and collectors: *Sripalabaddala* GN division

Purpose	Number of used species	Collecting area & Percentage			Objective & Percentage		Average of collected Amount (by a collector per year)	Average annual income of a collector (Rs)
		F	B ₁	B ₂	1	2		
i. Medicine against blood poisoning in snake bites	122	√100%	-	-	√52%	48%	60 kg	4500.00
ii. Remedy in orthopedic medicine	58	√100%	-	-	√100%	×	*	NA
iii. Remedy for minor injuries	28	√100%	-	-	√100%	×	*	NA
iv. Medicine for Diarrhea	23	√100%	-	-	√84%	16%	50 kg	1450.00
v. Medicine for Diab etes	12	√100%	-	-	√56%	44%	*	3000.00
vi. Medicine for Typhoid	11	√100%	-	-	√100%	×	*	NA
vii. Medicine for Hemorrhoid	13	√100%	-	-	√100%	×	*	NA
viii. Remedy for oral diseases	12	√100%	-	-	√92%	08%	*	*
ix. Remedy for eczema and other skin disorders	22	√100%	-	-	√76%	14%	*	*
x. Medicine for tonsillitis	08	√100%	-	-	√100%	×	*	NA
xi. Medicine for sore eyes and other eye related diseases	18	√100%	-	-	√84%	16%	*	*
xii. Medicine for diseases in nervous system and phlebitis	11	√100%	-	-	√96%	04%	*	*
Total average income by collecting of species of medicinal value (for a collector per year)								
8950.00								

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

- F = *Sripada* Tropical Peak Wilderness Sanctuary
- B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]
- B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Collecting objectives

- 1 = For self needs
- 2 = For marketing

- √ = Use
- × = Not use
- = Not available
- * = No regular/ considerable data
- NA = Not applicable

Table 5.7 Information about collecting of medicinal value and collectors: *Gurukulwana* GN division

Purpose	Number of used species	Collecting area & Percentage			Objective & Percentage		Average of collected Amount (by a collector per year)	Average annual income of a collector (Rs)
		F	B ₁	B ₂	1	2		
i. Medicine against blood poisoning in snake bites	38	√23%	√71%	06%	√68%	32%	36 kg	2200.00
ii. Remedy in orthopedic medicine	31	√12%	√88%	×	√100%	×	*	NA
iii. Remedy for minor injuries	11	√08%	√72%	×	√100%	×	*	NA
iv. Medicine for Diarrhea	23	√15%	√85%	×	√72%	28%	30 kg	1250.00
v. Medicine for Diabetes	12	√10%	√90%	×	√60%	40%	*	2260.00
vi. Medicine for Typhoid	19	×	√100%	×	√100%	×	*	NA
vii. Medicine for Hemorrhoid	08	√04	√96%	×	√72%	28%	46 kg	1430.00
viii. Remedy for oral diseases	16		√100%	×	√100%	×	*	*
ix. Remedy for eczema and other skin disorders	15	√06%	√94%	×	√76%	14%	*	*
x. Medicine for tonsillitis	09	×	√100%	×	√100%	×	*	NA
xi. Medicine for sore eyes and other eye related diseases	09	×	√100%	×	√84%	16%	*	*
xii. Medicine for diseases in nervous system and phlebitis	08	×	√100%	×	√96%	04%	*	*
Total average income by collecting of species of medicinal value (for a collector per year)								
7140.00								

Source: SPSS Analysis of data - Questionnaire survey

Keys -Collecting area

- F = *Sripada* Tropical Peak Wilderness Sanctuary
 B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]
 B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Collecting objectives

- 1 = For self needs
 2 = For marketing

- √ = Use
 × = Not use
 - = Not available
 * = No regular/ considerable data
 NA = Not applicable

5.3.3 Non-Edible Forest Produce (NEFP)

Collecting of Non Edible Forest Resources can also be identified as one of the major forest utilization practices of peripheral villagers who inhabit the peripheral areas of rain forests in Sri Lanka and this is even common to the present research sites. Peripheral villagers have collected Non-Edible Forest Resources for self-needs as well as for marketing. Some Non Edible Forest Resources like Dorana oil are highly marketable (Karunarathna, 2008; Anoja, 2003; Hewage, 2010, Kumara, 2007).

Non Edible Forest Resources gathered by the peripheral villagers residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary can be categorized into four sub categories (field data of the research).

- i. Binding material
- ii. Resin
- iii. Fuel wood
- iv. Thatching leaves

Table 5.8: Percentage of households involved in Non-Edible Forest Produce collecting

Category (Non Edible Forest Resource)	<i>Sripalabaddala</i> GN division		<i>Guruluwana</i> GN division	
	Households involved (%)	Households not involved (%)	Households involved (%)	Households not involved (%)
Binding materials	72	28	58	42
Resins	60	40	18	82
Fuel wood	68	32	92	08
Thatching leaves	10	90	12	88

Source: SPSS Analysis of data - Questionnaire survey

There is plenty of binding material and resin varieties within the *Sripada* Tropical Peak Wilderness Sanctuary than in forest buffer zones. Some species used as binding materials are available in the forest buffer zone-1 but in the buffer zone-2, these are unavailable and trees used to extract resin varieties cannot be seen either in forest buffer zones 1 or in 2.

Compared with *Guruluwana*, a higher percentage of villagers from *Sripalabaddala* are involved in collecting binding material and resin varieties (Table 5.8) as the villagers of *Sripalabaddala* are privileged with easy access to the *Sripada* Tropical Peak Wilderness Sanctuary. As there are forest buffer zones between *Guruluwana* and the *Sripada* Tropical Peak Wilderness Sanctuary, the villagers from *Guruluwana* have to reach the *Sripada* Tropical Peak Wilderness Sanctuary after a long walk through forest buffer zones, almost 8 km distance. Nevertheless, *Sripalabaddala* villagers are free from such traveling and consequently involvement of the villagers from *Sripalabaddala* in resin and binding material collecting is higher than that of the *Guruluwana* villagers (Lankanth, 2008, Karunarathna and Kumara, 2010).

However, concerning fuel wood gathering this is different. The percentage of *Guruluwana* villagers who are involved in fuel wood collecting is higher than that of *Sripalabaddala*. The

forest buffer zone-1 has been established with *Albezia* (*Albezia molucana*) plant, which is apposite as fuel wood, allowing the villagers from *Guruluwana* to collect fuel wood from the forest buffer zone-1 as much as they need. On the other hand, gathering of fuel wood in forest buffer zones is permitted. Owing to the absence of a forest buffer zone for the villagers of *Sripalabaddala*, they utilize the forest Sanctuary to fulfill the need for fuel wood even though it is illegal (Table 5.9).

At present a little percentage of villagers from both villages use leaves for thatching even though it was a common practice in the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary a few decades ago. Most of the villagers in these areas were able to build permanent houses owing to the income gained after the economic boom caused by the tea economy during the last two decades. Thus, a few villagers who reside in thatched houses utilize the forest for gathering of thatching leaves (field observation and data, Wikramasinghe, 2003).

Picture 5.8: Some of NEFP



Thatching leaves – *Batakola*(*Ochlandra stridula**)

Very expensive and rare resin species – *Dorana* resin (*Dipteracanthus glandulosus**)

Vine species that use as a binding meteriles - *Wewel* (*Calamus rotang**)

* = endemic

Resin varieties available within the forest, as a Non Edible Forest Resource, have high demand in the market. For example, a bottle of Dorana resin costs more than 5000 Rs. Villagers from *Sripalabaddala* earn much money by gathering and selling resins in comparison to villagers from *Guruluwan*. The income earned by the villagers from *Guruluwana* by selling resin varieties is lesser as they have accessibility problems to the forest to collect resins.

Villagers from both research sites collect fuel wood and thatching leaves only for self-needs. Considering the annual income of collectors of non-Edible Forest Produce from both research sites, collectors of non-Edible Forest Produce of *Sripalabaddala* averagely earn 26,500 Rs. by gathering and selling resins per year while villagers from *Guruluwana* averagely earn only 7,500 Rs per year (Table 5.9). Thus, in view of collecting Non Edible Forest Resources, forest buffer zones have become a barrier to villagers from *Guruluwana* to collect Non Edible Forest Resources like resins, which is highly marketable. On the other hand, the forest buffer zone-1 is useful for them in case of collecting forest resources for self-needs, for example fuel wood.

Table 5.9: Information about collecting of NEFP and collectors

GN division	Non-Edible Forest Produce	Number of used species	Collecting area & Percentage		Objective & Percentage		Average collected Amount (a collector per year)	Average annual income of a collector (Rs)	
			F	B ₁	B ₂	1			2
<i>Sripalabaddala</i>	Binding materials	23	√ 100%	-	-	√ 45%	√ 55%	17 (matured vines)	4,000.00
	Resins	03	√ 100%	-	-	√ 05%	√ 95%	45 kg	22,500.00
	Fuel wood	47	√ 100%	-	-	√ 100%	×	72 (bundle of fire wood)	NA
	Thatching leaves	03	√ 100%	-	-	√ 100%	×	*	NA
Total average income gained by a collector per year									
<i>Guruluwana</i>	Binding materials	14	√ 24%	√ 76%	×	√ 65%	√ 35%	14 (matured vines)	3,300.00
	Resins	03	√ 100%	×	×	√ 5%	√ 95%	08 kg	4,200.00
	Fuel wood	27	×	√ 100%	×	√ 100%	×	120 (bundle of fire wood)	NA
	Thatching leaves	03	×	√ 100%	×	√ 100%	×	*	NA
Total average income gained by a collector per year									
7500.00									

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

F = *Sripada* Tropical Peak Wilderness Sanctuary

B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]

B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Collecting objectives

1 = For self needs

2 = For marketing

√ = Use

×

- = Not available

* = No regular/ considerable data

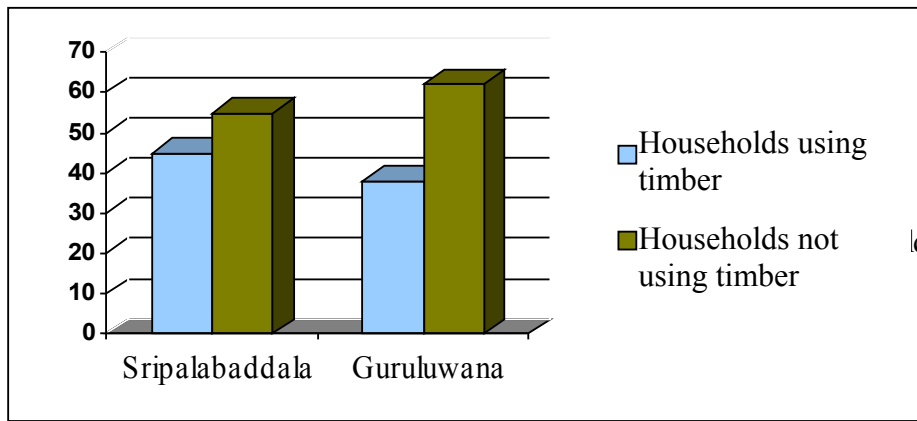
NA = Not applicable

5.4 Timber Forest Produce (TFP)

Timber extraction is one of the major forest resource utilization practices of villagers who reside at the peripheral areas of rain forests in Sri Lanka. They involve in logging inside forests for self-needs, as well as for market. This is identified as one of the unsustainable forest resource utilization practices as it directly causes forest degradation and consequently the biodiversity. Even if there is a strong legal background against timber extraction inside rain forests, still the effort to restrain illegal extraction of timber resource seems unsuccessful (Kumara, 2005; Hewage, 2010; Yamamoto, 2000; UNDP, 2009).

The *Sripada* Tropical Peak Wilderness Sanctuary is also used by peripheral communities, as a source of timber resource for self-needs as well as for sale over years. Hence, it has directly caused forest degradation (Wikramasinghe, 2003b, Lankanth, 2008, Karunarathna and Kumara, 2010).

Figure 5.3: Percentage of households involved in logging



Source: SPSS analysis of data - Questionnaire survey

Picture 5.9: Trees' girth and diversity among the *Sripada* Tropical Peak Wilderness Sanctuary and its buffer zones



Sripada Tropical Peak Wilderness sanctuary

Forest buffer zone-1

Forest buffer zone-2

Compared with Non Timber Forest resource collecting, the percentage of households that involve in timber extraction is lower (Figure 5.3) owing to the risk it involves as timber extraction is illegal and if caught the penalty is stern. On the other hand, it was observed that most of the villagers from both research sites have extracted timber mainly for self-needs (Table 5.10).

Even if villagers from *Sripalabaddala* have utilized only the *Sripada* Tropical Peak Wilderness Sanctuary for timber extraction, villagers from *Guruluwana* have used both the sanctuary and buffer zone-1. Villagers of *Guruluwana* also plenteously use the *Sripada* Tropical Peak Wilderness Sanctuary for timber extraction and they never use the forest buffer zone-2 for this purpose (Table 5.10) owing to following reasons.

- i. Even though trees that are commonly used for timber needs are available within the forest buffer zone-1, those are not mature enough for use (picture 5.9).
- ii. Forest buffer zone-2 is established with *Araucaria* trees (*Araucaria cookii*) and they are not valued as timber because of poor quality. On the other hand, *Araucaria* (*Araucaria cookii*) being the dominant species in the forest buffer zone-2 disrupts the growth of other species valued as timber (Picture 5.9).

Hence, establishment of forest buffer zones has failed to minimize logging inside the *Sripada* Tropical Peak Wilderness Sanctuary.

The annual average income of timber extractors from *Sripalabaddala* is about 42,000.00 Rs while income gained by timber extractors from *Guruluwana* is only about 23,200 Rs (Table 5.10). This is due to the difficulty undergone by loggers from *Guruluwana* when access the forest. The risk faced by loggers from *Guruluwana* is high than that of *Sripalabaddala* villagers since they have to go through forest buffer zone to reach the dense forest. As logging inside the forest and illicit transport of felled trees is done furtively, the distance from the forest to villagers' settlements affect the level of villagers' participation in tree felling within the forest. Therefore, involvement of *Guruluwana* villagers in timber extraction is poor. (Karunarathna and Kumara, 2010). On the other hand, owing to easy access to the forest sanctuary, timber extractors from *Sripalabaddala* have relatively high possibility to take part in logging and timber transportation. In comparison, timber extraction by the villagers of *Sripalabaddala* is higher than that of the *Guruluwana* villagers (Table 5.10). Considering all these, it can be stated that the establishment of forest buffer zones has controlled the tree felling by the villagers from *Guruluwana*.

Table 5.10: Information about logging/sawing for timber and timber collectors

GN division	Production	Used material	Number of flora species used	Timber felling area & percentage			Timber felling purpose & percentage		Average trees fallen (a collector per year)	Average annual income of a Timber collector (Rs)
				F	B ₁	B ₂	1	2		
Sripalabaddala	Furniture	Timber / Plank	21	√100%	-	-	√65%	√35%	11	20,250.00
	Row materials for construction	Timber / Plank	48	√100%	-	-	√88%	√12%	12	14,500.00
	Other	Timber / Plank	37	√100%	-	-	√92%	√08%	16	8,000.00
Total average income of a collector per year										
42,000.00										
Guruluwana	Furniture	Timber / Plank	12	√90%	√10%	×	√70%	√30%	06	9,500.00
	Row materials for construction	Timber / Plank	24	√95%	√05%	×	√92%	√08%	05	8,200.00
	Other	Timber / Plank	11	√45%	√55%	×	√80%	√20%	14	5,400.00
Total average income of a collector per year										
23,200.00										

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

- F = *Sripada* Tropical Peak Wilderness Sanctuary
- B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]
- B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Collecting objectives

- 1 = For self needs
 - 2 = For marketing
- √ = Use
 × = Not use
 - = Not available
 * = No regular/ considerable data
 NA = Not applicable

5.5. Other practices of forest resource utilization (Except TFP and NTFP)

Clearance of forestland for cultivation, gem mining, and poaching can be categorized under 'other' practices of forest resource utilization. Encroachment on forestland for new land for mono crop cultivation, especially tea cultivation is a common problem in the peripheral areas of rain forests in Sri Lanka, which cause forest degradation. The two facts that the Sri Lankan economy mainly depends on agriculture and gradually increasing population since the last few decades have caused rain forest degradation have enhanced the forest resource utilization and thereby the forest degradation (Kumara, 2007:15).

“Deforestation and forest degradation are the key issues facing the forestry sector. Sri Lanka has a predominantly agricultural economy, and agricultural production has increased to support the growing population mainly by expanding cropping areas. The forest resources in Sri Lanka diminished dramatically during the last century. The main causes of land-use change are rapid population growth, which has led to the conversion of forests to non-forest uses through agricultural plantations (e.g. tea, coconut and rubber) and shifting cultivation (Bandaratillake and Fernando, 2010: 275-277)”.

This situation no doubt is common to the study area of the research. Expansion of tea-cultivated land has occurred parallel to the increase in population in both *Sripalabaddala* and *Guruluwana* GN divisions, and villagers from both sites clear the forest sanctuary and forest buffer zone-1 while searching for new land for tea plantation or for expansion of prevalent small tea-lands. In particular, villagers from *Guruluwana* tend to encroach on the forest buffer zone-1 for this purpose. However, owing to the lacking of fertile land they seem to avoid the forest buffer zone-2. Soil infertility in the buffer zone-2 has occurred because of *Araucaria* plant species (*Araucaria cookii*) which reduces soil quality and hinders the growth of other plant varieties (Karunarathna and Kumara, 2010).

Moreover, the *Sripada* Tropical Peak Wilderness Sanctuary is situated in the region popular for precious stones. Therefore, utilization of forest sanctuary for illegal gem mining is commonly seen inside the sanctuary and in the buffer zone-1 (Ajantha, De Alwis, Dayawansa, Singhakumara, Devaka and Wijesinghe, 2007).

However, even if poaching has become one of the major threats against conservation of prevailing rain forests in Sri Lanka, it has not threatened the *Sripada* Tropical Peak Wilderness Sanctuary, as this sanctuary is considered sacred following the Sri Lankan mythology of Adam's Peak (Dhammika, 2009; Wikramasinghe, 2003b). Thus, in general, villagers inhabiting the peripheral areas of the sanctuary hesitate to enter the forest for poaching. Yet, it does not indicate that the villagers from the research areas do not participate in hunting in the forest.

What should specially be noted here is that even though people believe that the *Sripada* Tropical Peak Wilderness Sanctuary a 'Sacred Forest', they do not consider the forest buffer zones 'sacred'. Hence, peripheral villagers use forest buffer zone-1 for hunting.

Forest buffer zone-2 in which the dominant tree species is *Araucaria* (*Araucaria cookie*) is relatively poor in flora and fauna diversity and accordingly, the forest buffer zone-2 is not a popular hunting ground (Table 4.11).

Compared with *Guruluwana*, considerably lower percentage of households in the *Sripalabaddala* GN division has involved in ‘other’ practices of forest resource utilization such as clearance of forestland for cultivation, gem mining, and poaching, (Figure 5.4).

This is because forest buffer zones are not established between *Sripalabaddala* and the *Sripada* Tropical Peak Wilderness Sanctuary. Therefore, the villagers at the peripheral areas of the sanctuary use the dense forest for ‘other’ practices of forest utilization. Yet, there are two limitations for these activities.

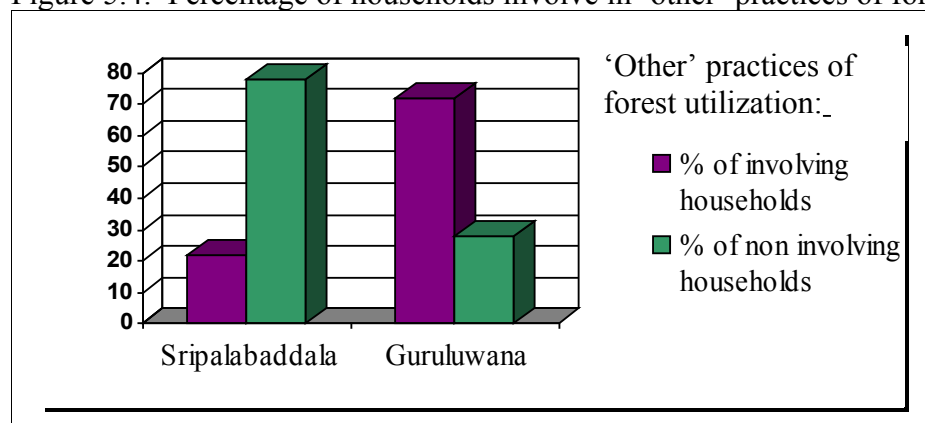
First, the forest sanctuary is strictly reserved and, practices of hunting, gem mining, or clearance of forestland for cultivation needs, which are the direct causes of forest degradation inside the sanctuary, is prohibited. The forest officers in duty are keen on keeping the rules for forest conservation obeyed even though they seem to appear lax on the minor practices of forest resource utilization such as Non-Timber Forest Resources gathering

Second, villagers dislike partaking in these 'other' practices of forest utilization inside the sanctuary, as they believe that the *Sripada* Tropical Peak Wilderness is a ‘sacred forest’ and it is guarded by the god *Sumana Saman*.

Hence, some villagers from *Sripalabaddala* seem using the forest buffer zone-1 which is located near by the *Guruluwana* GN division for hunting and gem mining. Yet, in order to carry out this they have to travel more than 8km (field data of the research). Therefore, only a few villagers from *Sripalabaddala* involve in ‘other’ practices of forest utilization.

As the forest buffer zone-1 is not strictly reserved like the forest sanctuary, villagers consider it as an appropriate ground for these practices and even the forest officers' attitude about these activities is observed slightly lax. Hence, the percentage of households involve in ‘other’ practices of forest utilization in *Guruluwana* is noticeably high (Figure 5.4).

Figure 5.4: Percentage of households involve in ‘other’ practices of forest utilization



Source: SPSS Analysis of data - Questionnaire survey

Additionally, villagers of *Guruluwana* earn averagely about 141,000.00 Rs annually through involvement in ‘other’ practices of forest utilization. However, this amount is about 60,400 Rs for the people from *Sripalabaddala* and it is considerably lesser (Table 5.11). This is mainly due to the difference in facility to access the forest buffer zone-1 (Lankanth, 2008).

Table 5.11 : Information about 'other' practices of forest utilization and users

GN division	Practices of forest utilization	Area & Percentage			Purpose & percentage		Number of used species	Average of utilization (a user per year)	Average annual income of a user per year (Rs)
		F	B ₁	B ₂	1	2			
<i>Sripalabaddala</i>	Poaching	√ 100%	-	-	√ 35%	√ 65%	10	05 animals	25, 400.00
	Gem mining	√ 100%	-	-	×	√ 100%	NA	*	35, 000.00
	Clearance of forestland for cultivation	√ 100%	-	-	√ 30%	√ 70%	NA	1/4 Acres	*
<i>Guruluwana</i>	Poaching	√ 02 %	√ 98%	×	√ 40%	√ 60%	12	16 animals	60, 400.00
	Gem mining	√ 10%	√ 90%	×	×	√ 100%	NA	*	76, 000.00
	Clearance of forestland for cultivation	×	√ 100%	×	√ 20%	√ 80%	NA	3/4 Acres	*
									141,000.00

Source: SPSS Analysis of data - Questionnaire survey

Keys

Collecting area

- F = *Sripada* Tropical Peak Wilderness Sanctuary
 B₁ = Buffer zone – 1: [Albezia forest (Albezia molucana)]
 B₂ = Buffer zone – 2: [Araucaria forest (Araucaria cookii)]

Utilization purposes

- 1 = For self needs
 2 = For marketing

- √ = Use
 × = Not use
 - = Not available
 * = No regular/ considerable data
 NA = Not applicable

Conclusion

The focus of this chapter is to examine how the villagers residing at the peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary utilize the forest resources available within the forest sanctuary as well as two buffer zones. Under the above theme, categorization of forest resource utilization, identification of location (which site is used for forest resource utilization - the forest sanctuary or two buffer zones) and examination of purpose of forest resource utilization and income gained are covered. Forest resource utilization is categorized into three major groups such as utilization of:

1. Non-Timber Forest Produce (NTFP)
2. Timber Forest Produce (TFP)
3. Other practices of forest resource utilization (Except TFP and NTFP)

Non-Timber Forest Produce (NTFP) utilization is discussed under three sub categories such as Edible Forest Produce (EFP), species of medicinal value, and Non-Edible Forest Produce (NEFP). What should specially be noted here is that under EFP utilization, *Kitul* tapping holds considerable importance and villagers from the study area earn large income by this practice. The villagers residing at the peripheral areas of the sanctuary use the other EFP except *Kitul*, only for subsistence and by gathering spices varieties villagers earn considerable income. The villagers from the *Sripalabaddala* GN division have utilized the resources in the *Sripada* Tropical Peak Wilderness Sanctuary due to the absence of buffer zones between the forest and the villages in the GN division and this has contributed to forest degradation to a certain extent. On the other hand, the villagers from *Guruluwana* GN division have utilized the forest resources available in the buffer zone-1 and that has effectively contributed to reduce the impact on the forest sanctuary by utilization of forest resources. The buffer zone 02 has been of little use to the villagers from *Guruluwana* in gathering EFP as this buffer zone is established with *Araucaria* plant species (*Araucaria cookii*) which does not develop soil fertility on one hand and hinders the growth of other plant varieties on the other hand.

Considering the purpose of establishing forest buffer zones, buffer zone-1 has effectively contributed to control the use of the dense forest for the distractive practices of forest resource utilization such as poaching, gem mining, and clearance of forestland for cultivation than forest buffer zone-2. The buffer zone-2 has become less effective due to lacking of flora and fauna diversity and its poor soil quality.

This situation is similar in case of gathering of plant species of medicinal value where the people from *Sripalabaddala* have used the *Sripada* Tropical Peak Wilderness Sanctuary while the villagers from *Guruluwana* have used the forest buffer zone-1 and the buffer zone-2 has rarely been used due to the lack of necessary plant varieties.

Under the category of Non-Edible Forest Produce (NEFP), gathering of resins seem profitable. Yet, due to the lacking of valuable resin varieties inside buffer zones people from both villages have used the *Sripada* Tropical Peak Wilderness Sanctuary.

To fulfill the need for fuel wood the villagers from *Sripalabaddala* have used the forest sanctuary while the villagers from *Guruluwana* totally depend on the forest buffer zone-1,

which is established with *Albezia*, species (*Albezia molucana*) for the need of fuel wood as *Albezia* is appropriate as fuel wood.

It is observed that the establishment of buffer zones is less useful in the case of timber extraction as both forest buffer zones contain *Albezia* (*Albezia molucana*) and *Araucaria* forest (*Araucaria cookii*) respectively. Both these species are less valued as timber. However, depending on the distance from the settlement to the forest sanctuary, timber extraction from the dense forest by the villagers of *Guruluwana* is limited.

Among 'other' practices of forest resource utilization, clearance of forestland for cultivation, poaching and gem mining are major. Yet, the *Sripada* Tropical Peak Wilderness Sanctuary has been rarely used as a hunting ground by the villagers from both GN divisions as the forest sanctuary is considered 'sacred' according to the traditional beliefs. Nevertheless, the villagers from *Guruluwana* earn considerable amount of money by poaching as they can easily go hunting in the forest buffer zone-1 while the villagers from *Sripalabaddala* earn a small amount by hunting, as it is difficult for them to travel a long distance in order to reach the buffer zone-1 situated in the *Guruluwana* GN division. This is similar even in the cases of clearance of forestland for cultivation and gem mining. However, the forest buffer zone-2 is almost neglected by the hunters or cultivators owing to the absence of commonly hunted animals and poor soil quality.

The two fact that the *Albezia* (*Albezia molucana*) species used in establishing the forest buffer zone-1, is apposite for many fauna and flora varieties and it increases soil quality, have reduced the need of the villagers from *Guruluwana* to utilize the forest sanctuary. Yet, the absence of such buffer zone for the people from *Sripalabaddala* has influence to increase the direct utilization of the resources in the forest sanctuary. This has become a threat to productive forest conservation. In addition, the *Araucaria* plant (*Araucaria cookii*) is inappropriate for both bio-diversity development and fulfillment of community needs for forest resource utilization.

Chapter 6

Effectiveness of established forest buffer zones

6.1 Introduction

The purpose of this chapter is to analyze the effectiveness of established forest buffer zones at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary as a community forest management approach. To measure the effectiveness, the data obtained by the quadrat samples, the questionnaire survey, and the case studies are analyzed.

The phrase “community forest management (CFM)” can be interpreted as ‘management of forest and its available resources via traditional practices of forest resource utilization of local people’.

“Community Forest Management (CFM) refers to community-based activities which are geared towards the sustainable use of forest (Asia forest network, 2010)”

“Community Forest Management (CFM) is defined as all forms of forest and forest products managements by the communities applying traditional methods, organized into a community unit, a community-based business unit (cooperative in wider sense) or an individual (house hold), with small scale up to medium scale, conducted in sustainable manner in their relation to production, ecological and social aspects (LEI, 2009:02)”

Thus, an effective community forest management project should address the following two areas:

1. Forest management
2. Community benefits (development)

In a well-planned forest management project, as key stakeholders, local community is given with more opportunities to participate in the project and thereby they are more benefited. Additionally, community members participate in decision-making and policy making (Nguyen, Dinh, Huynh, Hans and Pham, 1999).

“One important element of CFM is the intensive interaction of villages’ stakeholders with forest personnel right from the very beginning to gain as much as possible village level ownership on CFM plans and regulations. For those purpose inventory methods, harvesting calculation and silvicultural practices had to be simplified (Pham, 2006)”

Further, outside institutes, researchers, policy makers, project planers, donor agencies, NGOs (governmental or/ and non governmental) should be involved in implementation, achieving goals, monitoring and evaluation of community forest management projects (Asia forest network, 2010; Pham, 2006; LEI , 2009). Therefore, a successful analysis of the effectiveness of established forest buffer zone as a community forest management approach is concerned with how far above-mentioned two goals have been achieved. On the other hand, in such an analysis, the role played by community members, the government as well as other stakeholders of the project should be examined. Hence, this chapter focuses on covering the previously mentioned spheres.

6.2 Effectiveness of established forest buffer zones

Local communities residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary have utilized 'Non-timber', 'Timber' and 'Other' varieties of forest produce over centuries. Rapidly increasing population in these areas has resulted in rise of the number of people using the forest produce as well as the amount gathered. It has become a direct cause of forest degradation and unsustainable forest utilization (Karunaratna and Kumara, 2010, Perera, 2004). Therefore, in order to minimize the influence of forest resource utilization by increasing population on the dense forest, the Forest Department has established forest buffer zones in the peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary. They have aimed to direct users of forest produce from the dense forest to the established forest buffer zones for productive forest management and community development (Lankanth, 2008).

Commonly, practices of forest resource utilization depend on flora diversity because practices of gathering non-timber resources and timber extraction are directly connected with flora. As well, 'Other' forest utilization practices such as hunting indirectly depend on flora diversity (as flora types and diversity are major realities determining the animal habitats). Thus, in order to make forest buffer zones effective, flora species in these zones should almost be identical with flora in the forest sanctuary, i.e., in order to channel the users from use of forest sanctuary to use the buffer zones, these buffer zones should provide them with same benefits as done by the forest sanctuary.

The quadrat sample method is used to analyze available flora species, type of flora and flora diversity in the *Sripada* Tropical Peak Wilderness Sanctuary and its buffer zones. Data was collected via randomly selected six quadrat samples and each site namely forest sanctuary, forest buffer zone-1, and forest buffer zone-2 was covered by two quadrat samples. Different quadrat samples from each site were randomly selected considering the forest density and changing flora diversity (random selection of two samples from each site minimizes research bias). The size of the quadrat was 5m x 5m.

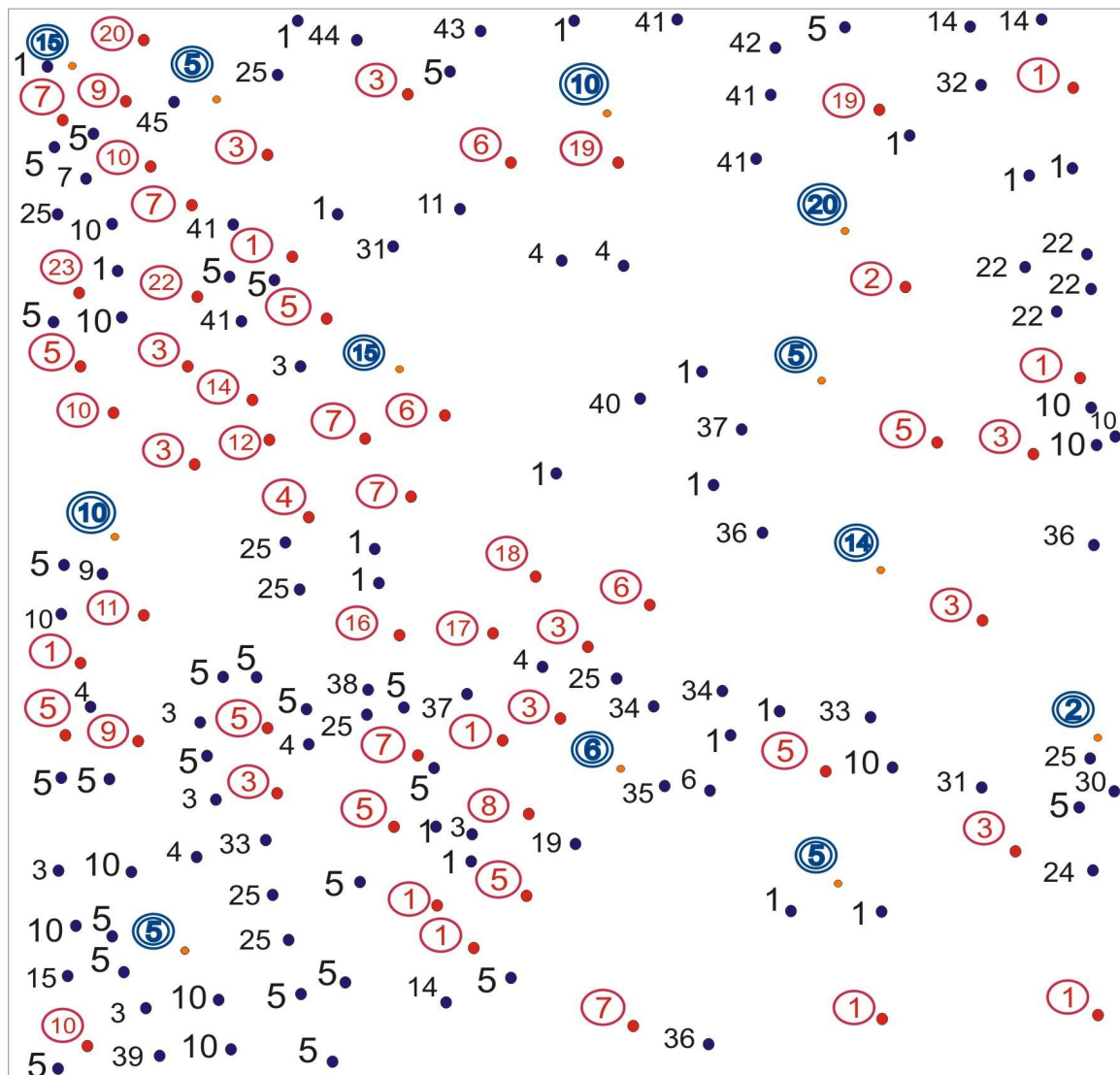
6.2.1. Analysis of flora in *Sripada* Tropical Peak Wilderness Sanctuary

Data was collected through the selected two quadrat samples in order to analyze flora in the *Sripada* Tropical Peak Wilderness Sanctuary.

i. Data analysis of quadrat sample 01

Flora diversity is high in sample 01. There are 45 flora species within the 5m x 5m quadrat, and total of flora species is also high (total number of flora = 160). What should specially be noted here is that the percentage of endemic species is high as 53% and most of these are used by local communities for self-needs as well as for sale. Therefore, the high percentage of endemic species signals the importance of the forest as a traditionally used forest by community (Karunaratna, 2009; Kumara, 2005). Most of the flora species available here (91%) are used by local communities for diverse needs, and 60% of flora species are mature enough for use. Hence, the *Sripada* Tropical Peak Wilderness Sanctuary has an extensive capacity to fulfill the needs of the users of forest resources as well as it is rich as a forest resources reservoir (Table 6.1: Quadrat analysis; sample 01).

Quadrates analysis: Sample 01-
 Flora diversity: The *Sripada* Tropical Peak Wilderness Sanctuary



3cm = 1m

Keys

- ① Girth (At ground level) 35cm < and more than 1.5 m in height
- ① Girth (At ground level) 35cm > and more than 1.5 m in height
- 1 Girth 35cm > and less than 1.5 m in height (Shrubs and plants)

Table 6.1: Quadrante sample 01: The Sripada Tropical Peak Wilderness Sanctuary: Flora diversity and use

Species	Scientific name	# of plants	used/ not used	Type of use	Species	Scientific name	# of plants	used/ not used	Type of use
1. Oloodiya	<i>Galphyllum calaba</i> *	31	×	×	24. Pinibaru	<i>Hopea jucunda</i> *	01	√#	T
2. Malaboda	<i>Myristica dactyloides</i>	01	√	NNE/T	25. Miwana	<i>Diplazium esculentum</i>	06	×	×
3. Gulumora	<i>Gelis cinnamomea</i>	19	√	NNE	26. Keran koku	<i>Acrostichum aureum</i>	01	√	E
4. Peradoba	<i>Psidium guajava</i>	04	√	NNE	27. Hinbovitaya	<i>Osbeckia octandra</i> *	01	√	E/M
5. Golmora	<i>Pometia tomentosa</i>	33	√	M/T	28. Monarakudumbi	<i>Vernonia cinerea</i> *	01	√	E/M
6. Etabaru	<i>Fagaraea ceilanica</i> *	06	√	M/T	29. Weniwel	<i>Coscinium fenestratum</i> *	01	√	M
7. Pelaliya	<i>Aporosa lindleyana</i> *	06	√	NNE	30. Kitul	<i>Caryatid urns</i>	01	√#	E
8. Goraka	<i>Garcinia cambogia</i>	01	√	E	31. Walenasal	<i>Elettaria ensal</i> *	02	√#	E
9. Dawata	<i>Garralluma adscendens</i> *	02	√	NNE	32. Datketiya	<i>Xylopia championii</i> *	01	√	M
10. Badulla	<i>Semecarpus coriacea</i> *	07	√	M	33. Katukenda	<i>Scolopia acuminata</i> *	01	√#	T
11. Kosgona	<i>Ficus altissima</i>	02	√	NNE	34. Hibutu	<i>Salicornia reticulata</i>	02	√#	E
12. Walkaduru	<i>Petchia ceylanica</i> *	01	√	M	35. Walla	<i>Gyrrinops walla</i> *	01	√	NNE
13. Thebu	<i>Costus speciosus</i>	01	√	M/E	36. Pelenga	<i>Kurrimia ceylanica</i> *	02	√#	T
14. Etaba	<i>Mangaijera zeylonica</i> *	05	√	E	37. Gonike	<i>Elephantopus scaber</i>	02	√	M
15. Madol	<i>Garcinia echinocapa</i>	01	√	NNE/T	38. Kirihebliya	<i>Palaguium petiolare</i> *	01	√#	T
16. Walbomu	<i>Symplocos toha</i>	03	√	NNE	39. Kiina	<i>Galophyllum thwaitesii</i> *	01	√#	T
17. Dodankaha	<i>Glycosmis pentaphylla</i>	01	×	×	40. Bowitiya	<i>Osbeckia octandra</i>	01	√	M/E
18. Tholol	<i>Ampelocissus indica</i>	01	√	M/E	41. Waduru wel	<i>Calamus zeylanicus</i> *	04	√	NNE
19. Walbiin	<i>Ailanthus triphyssa</i>	02	×	E	42. Welipiyanna	<i>Anisopyllea cinnamomoides</i> *	01	√#	T
20. welgetapan	<i>Scirpus squarrosus</i>	01	√	NNE	43. Walgammiris	<i>Piper siriboda</i> *	01	√#	E/M
21. Uruala	<i>Cyclea indicum</i>	01	√	E	44. Ugudupala	<i>Symplocos coronata</i> *	01	√#	E
22. Kukulu wel	<i>Calamus radiatus</i> *	05	√	NNE	45. Katugokatu	<i>Argemone mexicana</i>	01	√#	NNE
23. Timiya	<i>Doona congestiflora</i> *	01	√#	T	Spices mature enough for use = 27 (60%)				
Total number of endemic species = 24 (53%), Total number of using species = 41 (91%), Total number of flora = 160					*Endemic species to Sri Lanka				

Sources: Quadrante analysis, discussions and questionnaire survey of the research

Keys

Whether used or not used

× = not used √# = used but not mature
√ = used enough for use

Nature of usage

1. Non Timber Forest Produce - Edible = E 3. Non Timber Forest Produce - Non Edible = NNE
2. Non Timber Forest Produce - Medicinal = M 4. Timber Forest Produce = T

As the quadrat sample 01 reveals, 12 trees have 35cm < girth and 1.5 m < height. This is an important fact as only the trees of this size are used for timber. As well, most of the small plants cannot be used for timber (Karunarthna and Kumara, 2010). Therefore, availability of large trees is significant in forest resources utilization.

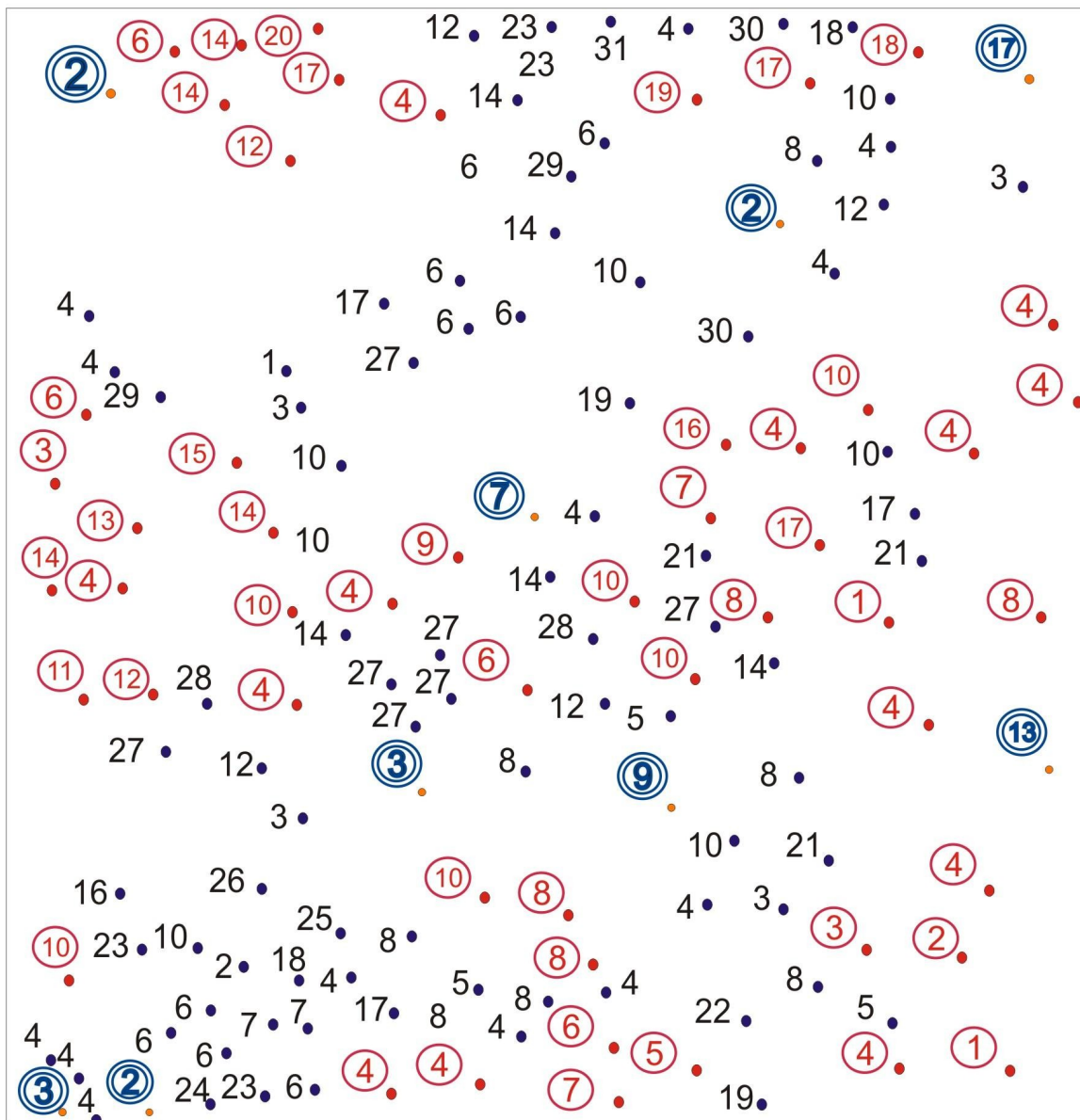
i. Data analysis of quadrat sample 02

Even though two different quadrat samples were randomly selected from each site considering forest density and changing flora diversity, quadrat sample 01 and 02 of the *Sripada* Tropical Peak Wilderness Sanctuary demonstrate same results. Similar to the quadrat sample 01, the percentage of endemic species is high (64.5%) in the quadrat sample 02 and the percentage of flora species used by local communities is also high (93.5%). This is proved by the percentage of the species mature enough for use (67.8%) (Table 6.2: Quadrat analyze sample 02). Thus, it can be concluded that availability of flora, flora diversity, forest density and availability of commonly used forest resources are similar all over the *Sripada* Tropical Peak Wilderness Sanctuary. Considering the quadrat sample 02, 09 trees have 35cm < girth and 1.5 m < height (Table 6.2: Quadrat analyze sample 02).

The sameness of both quadrat samples 01 and 02 of the *Sripada* Tropical Peak Wilderness Sanctuary is due to a number of reasons. One of the main reasons is that the forest sanctuary is a primary tropical peak wilderness area and most of the flora include in the “primary succession” biologically (Wikramasinghe, 2003). Because of that, high biodiversity and a large number of endemic species can be seen. Traditionally peripheral villagers have used those endemic plant species in several ways such as preparation of medicines, gathering of edible forest produce, timber extraction etc. Thus, these people are familiar with many endemic flora varieties within the forest.

Hence, in order to direct the forest resources users from the *Sripada* Tropical Peak Wilderness Sanctuary to the buffer zones, the established buffer zones should be same as the forest sanctuary.

Quadrant analysis: Sample 02-
 Flora diversity: The *Sripada* Tropical Peak Wilderness Sanctuary



3cm = 1m

Keys

- ① Girth (At ground level) 35cm < and more than 1.5 m in height
- ① Girth (At ground level) 35cm > and more than 1.5 m in height
- 1 Girth 35cm > and less than 1.5 m in height (Shrubs and plants)

Table 6.2: Quadrata analysis: Sample 02: The *Sripada* Tropical Peak Wilderness Sanctuary- Flora diversity and use

Species	Scientific name	# of available plants / trees	used / not used	Type of use
01 Godapara	<i>Dillenia retusa</i> *	03	√#	T
02 Badulla	<i>Semecarpus coriacea</i> *	04	√	M
03 Dabu	<i>Syzygium cordifolium</i> *	04	√	T
04 Gulumora	<i>Geltis cinnamomea</i>	23	√	NNE
05 Oloodiya	<i>Galphyllum calaba</i> *	02	×	×
06 Bedi del	<i>Artocarpus nobilis</i> *	11	√	T/M/E
07 Kosgona	<i>Ficus altissima</i>	05	√	NNE/T
08 Pelenga	<i>Kurrimia ceylanica</i> *	05	√	T
09 Porawamara	<i>Canthium dicoccum</i> *	02	√#	T
10 Mihiriya	<i>Palaquium grande</i> *	11	√	M
11 Etaba	<i>Mangaijera zeylonica</i> *	01	√	E
12 Liyan	<i>Homalium zeylanicum</i> *	06	√	M
13 Madol	<i>Garicinia echinocapa</i>	02	√	NNE/T
14 Datketiya	<i>Xylopiya championii</i> *	07	√	M
15 Kiina	<i>Galophyllum thwaitesii</i> *	01	√	T
16 Walla	<i>Gyrinops walla</i> *	01	√	NNE/T
17 Girthalla	<i>Argyrea populifolia</i> *	07	√	T
18 Milla	<i>Vitex pinnata</i>	03	√#	T
19 Bokeree	<i>Ouratea zelanica</i> *	02	√#	T
20 Dummella	<i>Trichosanthes cucumerina</i>	01	√	NNE
21 Gonike	<i>Elephantopus scaber</i>	03	√	M
22 Diyataliya	<i>Mastixia tetrandra</i> *	01	×	×
23 Hibutu	<i>Salaicornia reticulata</i>	04	√	E
24 Walhapu	<i>Michelia nilagirica</i>	01	√	M
25 Hal milla	<i>Berrya cordifolia</i>	01	√#	T
26. Malaboda	<i>Myristica dactyloides</i>	01	√	NNE
27 Walgammiris	<i>Piper siriboa</i> *	07	√	E/M
28. Welipiyanna	<i>Anisopyllea cinnamomoides</i> *	02	√#	T
29 Waduru wel	<i>Calamus zeylanicus</i> *	02	√	NNE
30. Kitul	<i>Caryatid urns</i>	02	√#	E
31. Walenasal	<i>Elettaria ensal</i> *	01	√#	E
Total number of endemic species = 20 (64.5%)		Total number of available flora = 126		
Total number of using species = 29 (93.5%)		Spices mature enough for use = 21 (67.8%)		

Sources: Quadrata analysis, discussions, and questionnaire survey of the research

Keys

Whether used or not used

× = not used

√ = used

√# = use but not mature enough for use

* = Endemic species to Sri Lanka

Type of use

1. Non Timber Forest Produce - Edible food = E

2. Non Timber Forest Produce - Medicinal = M

3. Non Timber Forest Produce - Non Edible = NNE

4. Timber Forest Produce = T

6.2.2 Analysis of flora diversity in the forest buffer zone-1 [*Albezia (Albezia molucana)*]

To analyze the flora diversity in the forest buffer zone-1, which is established with *Albezia (Albezia molucana)* species two quadrat samples were obtained.

i. Data analysis of quadrat sample 03: Forest buffer zone-1

Twenty-six flora species were identified in the quadrat sample 03 and this amount is lesser compared with quadrat sample 01 and 02. In other words, compared with the forest sanctuary, flora diversity and the total number of available flora in the forest buffer zone-1 are lesser. Thus, the forest buffer zone-1 does not benefit forest resource users largely as done by the forest sanctuary. On the other hand, percentage of flora species used by the local communities is very high in the forest sanctuary (it is 91% in quadrat sample 01 and 93.5% in quadrat sample 02). Yet, in the forest buffer zone-1 (quadrat sample 03) it is 73%, which is lesser but in a considerable level (Table 6.3: Quadrat analysis: Sample 03). Thus, as a whole, it can be stated that in the forest buffer zone-1 there are many flora species, which are useful as forest produces.

However, out of 73% of used flora species available in the forest buffer zone-1, only 38.5 % are mature enough for use and users of forest produce are confined to use only this amount. On the other hand, the percentage of flora mature enough for use is very high in the *Sripada* Tropical Peak Wilderness Sanctuary (Quadrat sample 01: 60% and quadrat sample 02: 67.8%). Compared with the *Sripada* Tropical Peak Wilderness Sanctuary the total number of endemic species in the forest buffer zone-1 is lesser (30.8%). As there is a strong relationship between forest utilization patterns and endemic flora species, high percentage of endemic flora species in the forest means that forest users are more benefited. Hence, even if the forest buffer zone-1 is comparatively capable of fulfilling needs of forest resource users (according to quadrat analyze sample 03), it is not an entirely preferable place for forest resource utilization as the forest sanctuary itself.

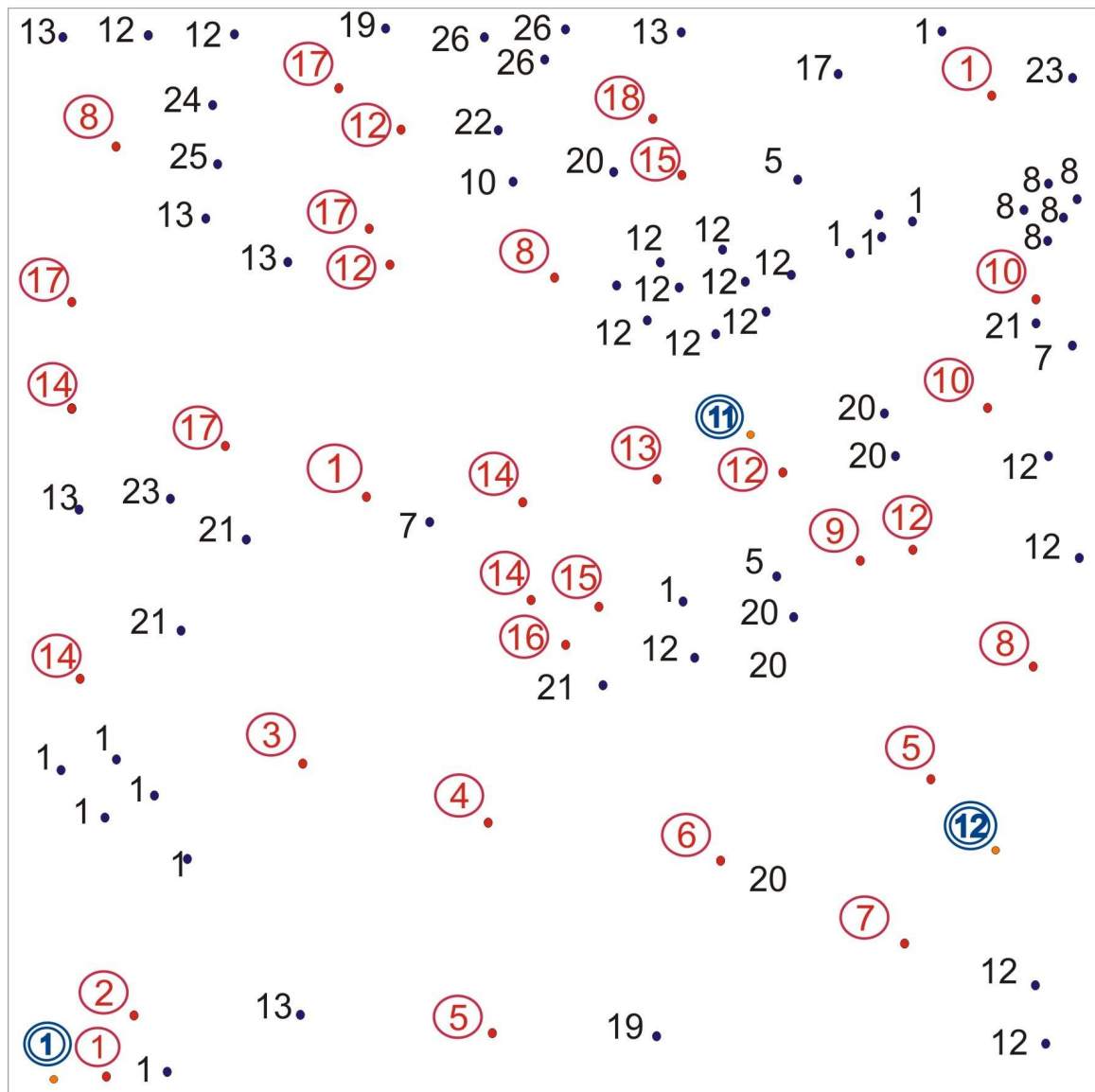
One of the other important findings is that in the forest buffer zone-1 only three trees have 35cm < girth and 1.5 m < height and only one tree is mature enough to be used as timber.

The forest buffer zone-1 has been established with *Albezia (Albezia molucana)* species and as it is the dominant species here, very large *Albezia* trees can be seen in the forest buffer zone-1 (Karunaratne and Kumara, 2010). However, *Albezia* is not valued as timber. Additionally, as the dominant species, *Albezia* hinders the growth of other flora species (especially species with timber value). Therefore, forest users cannot use forest buffer zone-1 for timber extraction and they still encroach on the forest sanctuary for timber.

However, as a place for gathering Non-timber forest produce, especially species of medicinal value and edible forest produce, the forest buffer zone-1 is efficient (Table 6.3: Quadrat analysis: Sample 03).

Quadrat analysis: Sample 03-

Flora diversity: Forest buffer zone 01 [Albezia forest (*Albezia molucana*)]



3cm = 1m

Keys

- ① Girth (At ground level) 35cm < and more than 1.5 m in height
- ① Girth (At ground level) 35cm > and more than 1.5 m in height
- 1 Girth 35cm > and less than 1.5 m in height (Shrubs and plants)

Table 6.3: Quadrata analysis: Sample 03: Forest buffer zone-1 [Albezia forest (*Albezia molucana*)] - Flora diversity and use

Species	Scientific name	# of available plants / trees	used or not used	Type of use
1. Kekiriwara	<i>Axinadra zeylanica</i> *	15	√	T
2. Bowitiya	<i>Osbeckia octandra</i>	1	√	M
3. Porawamara	<i>Canthium dicoccum</i> *	1	√#	T
4. Rukattana	<i>Alstonia sholais</i>	1	√	M
5. Hal milla	<i>Berrya cordifolia</i>	4	√#	T
6. Bokeree	<i>Ouratea zelanica</i> *	1	√#	T
7. Niyagala	<i>Gloriosa superba</i>	3	×	×
8. Badura	<i>Nepenthes distillatoria</i>	8	√#	M/NNE
9. Kaluwel	<i>Diospyros atrata</i>	1	√#	T
10. Datketiya	<i>Xylopiya championii</i> *	3	√	M
11. Albezia	<i>Albezia molucana</i>	1	√	NNE
12. Kalu Badulla	<i>Semecarpus coriacea</i> *	15	×	×
13. Hibu	<i>Salaicornia reticulata</i>	5	√#	E
14. Galkarada	<i>Humboldtia laurifolia</i>	4	×	×
15. Kiridi	<i>Coix lacryma</i>	2	√#	NNE
16. Poota	<i>Pothos scandens</i>	1	×	×
17. Radaaliya	<i>Connarus monocarpus</i>	5	√	NNE
18. Hatawariya	<i>Asparagus racemosus</i>	1	√	E/M
19. Babara wel	<i>Dalbergia pseudo</i>	2	√#	NNE
20. Balutana	<i>Pennisetum triflorum</i>	6	×	×
21. Malkera	<i>Ochna squarrosa</i>	4	×	×
22. Dan	<i>Syzygium aromaticum</i>	1	√	E
23. Bala	<i>Nothopegia beddomei</i>	2	×	×
24. Ratkela	<i>Litsea longifolia</i> *	1	√	M
25. Walkurudu	<i>Cinamomum multifolium</i> *	1	√#	E
26. Ginihiriya	<i>Excoecaria agallocha</i> *	3	√	NNE
Total number of endemic species = 08 (30.8%)		Total number of flora = 91		
Total number of using species = 19 (73%)		Spices mature enough for use = 10 (38.5%)		

Sources: Quadrata analysis, discussions, and questionnaire survey of the research

Keys

Whether used or not used

× = not used

√ = used

√# = used but not mature enough for use

* = Endemic species to Sri Lanka

Type of use

1. Non Timber Forest Produce - Edible food = E

2. Non Timber Forest Produce - Medicinal = M

3. Non Timber Forest Produce - Non Edible = NNE

4. Timber Forest Produce = T

ii. Data analysis of quadrat sample 04: Forest buffer zone-1

Compared with quadrat sample 03, flora diversity is different in the quadrat sample 04. In the quadrat sample 04, flora diversity is very high as same as in the forest sanctuary and the number of available flora species is high as well due to the following reasons.

- i. Even though flora diversity and forest density is same all over the forest sanctuary, in the forest buffer zone-1 flora diversity is different from place to place. Forest buffer zone-1 is active as a secondary forest, and its flora includes in the 'secondary succession' and uneven flora diversity is a common feature in secondary successions (Karunaratna and Kumara, 2010).
- ii. Even though forest buffer zone-1 is established with *Albezia* (*Albezia molucana*), in some areas *Albezia* trees have not grown strong. Therefore, other flora species have freely grown up in these spaces free of influence from the dominant species *Albezia*, (Karunaratna and Kumara, 2010).

However, the quadrat sample 04, which is similar to the quadrat sample 03 reveals that the forest buffer zone-1 is less capable of replacing the forest sanctuary as a ground for forest resource gathering since the percentage of endemic species is very low (34%). As well, the percentage of used flora species is low and it is similar to the quadrat sample 03. On the other hand, the percentage of spices mature enough for use is low (24%) than that in the forest sanctuary. There are only 04 trees, which have 35cm < girth and 1.5 m < height. However, only a tree can be used for timber needs (Table 6.4: Quadrat analysis: Sample 04).

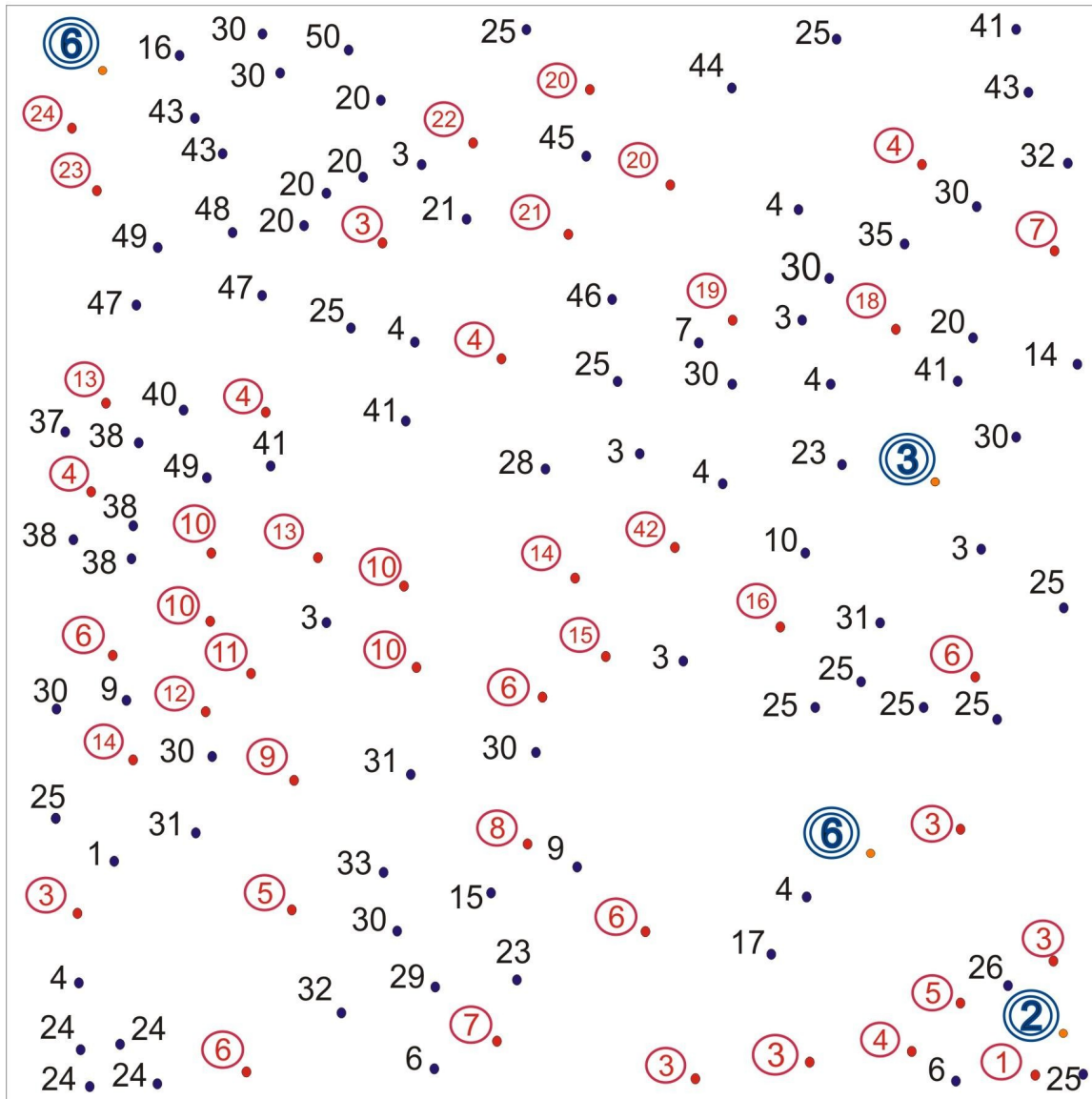
Even if flora diversity is higher in quadrat sample 04, its capacity to fulfil the needs of community members for forest produce is less compared with the *Sripada* Tropical Peak Wilderness Sanctuary. This situation is common in the quadrat sample 03. One of the key research findings is that even if there are very large *Albezia* trees as the dominant species, these trees are not valued as timber and villagers can use *Albezia* only as fuel woods (Table 6.4: Quadrat analysis: Sample 04).

In general, there are considerable amounts of forest resources in the buffer zone-1 such as medicinal plants, edible as well as inedible forest produce. As an edible forest produce gathering practice, *Kitul* tapping is prominent in the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary. It is the major income source of villagers. *Kitul* palms naturally grow anywhere in the forest buffer zone-1 (Table 6.3 and 6.4: Quadrat analysis: sample 03 and 04) and *Albezia* is incapable of hindering the growth and spread of *Kitul* palm (Lankanath, 2008). Therefore, peripheral villagers can easily use forest buffer zone-1 for *Kitul* tapping.

One of the other significant observations is the type of flora available in the forest buffer zone-1. These flora species facilitate animal habitats. Especially, there are many wild animals, which are commonly hunted in the buffer zone-1 such as wild pig (*Sus scrofa cristatus*) and Meminna deer (*Tragulus meminna*). Even though villagers hesitate to use the *Sripada* Tropical Peak Wilderness Sanctuary for hunting as it is considered a "sacred forest" (Dhammika, 2009; Wickramasinghe, 2003b) they frequently use forest buffer zone-1 for poaching.

Quadrat analysis: Sample 04

- Flora diversity: Forest buffer zone 01 [Albezia forest (*Albezia molucana*)]



3cm = 1m

Keys

- ① Girth (At ground level) 35cm < and more than 1.5 m in height
- ① Girth (At ground level) 35cm > and more than 1.5 m in height
- 1 Girth 35cm > and less than 1.5 m in height (Shrubs and plants)

Quadrat analysis: Sample 04

- Flora diversity: Forest buffer zone 01 [Albezia forest (*Albezia molucana*)]

Species	Scientific name	# of available plants / trees	used or not used	Type of use
01. Ginitana	<i>Panicum maximum</i>	2	×	×
02. Albezia	<i>Albezia molucana</i>	1	√	NNE
03. Pelenga	<i>Kurrimia ceylanica</i> *	10	√	T
04. Pinibaru	<i>Hopea jucunda</i> *	5	√#	T
05. Tiniya	<i>Doona congestiflora</i> *	2	√#	T
06. Kosgona	<i>Ficus altissima</i>	7	√	NNE
07. Gulumora	<i>Geltis cinnamomea</i>	2	√#	NNE
08. Netbedda	<i>Vitex leucoxyton</i>	1	×	×
09. Dan	<i>Syzygium aromaticum</i>	2	√#	E
10. Waljambu	<i>Syzygium dqueum</i>	5	×	×
11. Badulla	<i>Semecarpus coriacea</i> *	1	√	M
12. Panudan	<i>Syzygium aromaticum</i>	1	√#	
13. Walla	<i>Gyrinops walla</i> *	2	√	NNE
14. Kaduru	<i>Cerber manghas</i>	1	×	×
15. Alubo	<i>Syzygium makul</i> *	2	√#	T
16. Walkurudu	<i>Cinamomum multifolium</i> *	2	√#	E
17.. Malkera	<i>Ochna squarrosa</i>	1	×	×
18. Ketakeralla	<i>Bridelia retusa</i>	1	√#	T/M
19. Gontana	<i>Brachiaria mutica</i>	1	×	×
20. Ratkela	<i>Litsea longifolia</i> *	6	√	M
21.. Kitul	<i>Caryatid urns</i>	1	√#	E
22. Nugadediya	<i>Ficus arnottiana</i>	1	×	×
23. Dabu	<i>Syzygium cordifolium</i> *	2	√#	T
24. Na	<i>Mesuz ferrea</i>	5	×	×
25. Thebu	<i>Costus specious</i>	9	√	M/E
26. Mihiriya	<i>Palaquium grande</i> *	1	√	M
27. Kalatiya	<i>Abarema bigemina</i>	1	×	×
28. Monarapetan	<i>Dianella ensifolia</i>	1	√#	E
29. Oloodiya	<i>Galphyllum calaba</i> *	1	×	×
30. Walgammiris	<i>Piper siriboa</i> *	7	√#	E/M
31. Kabarassa	<i>Smilax zeylonica</i> *	3	×	×
32. Ketakeralla	<i>Bridelia retusa</i>	2	√	M
33. Apassa	<i>Paederia foetida</i>	1	×	×
34. Hinbowitiya	<i>Osbeckia octandra</i>	1	√	M/E
35. Kekiriwara	<i>Axinadra zeylanica</i> *	1	√	T
36. Eraminiya	<i>Zizyphus napeca</i> *	1	×	×
37. Mora	<i>Euphoria longana</i>	1	√#	E
38. Gambi	<i>Madhuca neriifolia</i>	4	×	×
39. Weniwelgeta	<i>Coscinium fenestratum</i> *	1	√#	M
40. Karw	<i>Phyllanthus indicus</i>	1	√#	T

Species	Scientific name	# of available plants / trees	used or not used
41. Kukuluwel	<i>Calamus radiatus</i> *	4	√#
42. Okeiya	<i>Pandanus celanicus</i> *	1	√
43 Hibutu	<i>Salaicornia reticulata</i>	3	√
44. Wewel	<i>Calamus rotang</i>	1	√#
45. Pus wel	<i>Entada phaseoloides</i>	1	√#
46. Dun	<i>Doon zeylanica</i>	1	√#
47. Mahbowitiya	<i>Melostoma malabathrica</i>	2	×
48. Niyagala	<i>Gloriosa superba</i>	1	×
49. Peertabala	<i>Gaertnera vaginans</i>	2	×
50. Pabaru	<i>Atalantia missionis</i>	1	×
Total number of endemic species = 17 (34%)		Total number of flora = 117	
Total number of using species = 32 (64%)		Spices mature enough for use = 12 (24%)	

Sources: Quadrante analysis, discussions, and questionnaire survey of the research

Keys

Whether used or not used

× = not used

√ = used

√# = used but not mature enough for use

* = Endemic species to Sri Lanka

Type of use

1. Non Timber Forest Produce –Edible food = E

2. Non Timber Forest Produce- Medicinal = M

3. Non Timber Forest Produce- Non Edible = NNE

4. Timber Forest Produce = T

6.2.3 Analysis of flora diversity in forest buffer zone-2:

[Araucaria forest (*Araucaria cookii*)]

Forest buffer zone-2 is established with *Araucaria (Araucaria cookii)* species. Two quadrat samples were obtained to analyze flora in the forest buffer zone-2.

i. Data analysis of quadrat sample 05: Forest buffer zone-2

Even though the Forest Department promotes the establishment of forest buffer zones with Pines (*Pinus pinaster*) and *Araucaria (Araucaria cookii)* species, these are not common or endemic to Sri Lanka. As dominant species, these do not allow local and endemic species to grow freely (Kumara, 2010b: 18). This situation is common even in the forest buffer zone-2. Accordingly, poor flora diversity is seen in the quadrat sample 05.

Compared with the *Sripada* Tropical Peak Wilderness Sanctuary and the forest buffer zone-1, the percentage of endemic species is very low here. Even if 41.7% of flora species is available here, only 4% are mature enough for use. Only *Araucaria* plants grow large and high (girth 35 cm < in ground level and more than 1.5m in height).

Another research finding is that *Araucaria* plant is not gathered as a forest produce for any purpose, not even for fuel wood (Table 6.5 Quadrat analysis: Sample 05).

ii. Data analysis of quadrat sample 06: Forest buffer zone-2

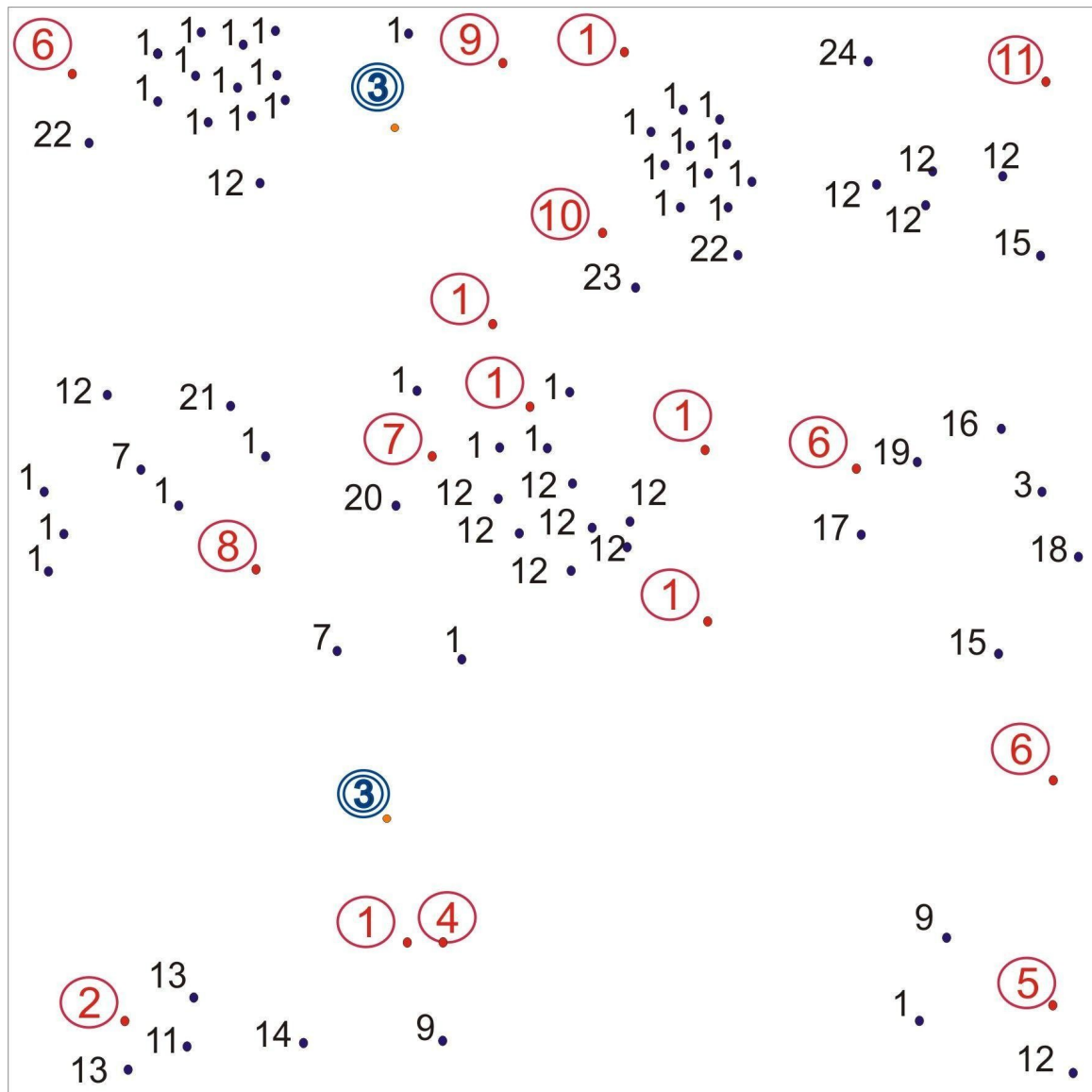
Quadrat sample 06 is similar to the quadrat sample 05. Flora diversity is very low and the percentage of endemic species is also low (18.2 %) compared with the forest sanctuary and the forest buffer zone-1. What should specially be noted here is that even though 31.8% flora species in the buffer zone-2 are used by peripheral villagers, these species are not mature enough for use. Only *Araucaria* plants grow large similar to quadrat sample 05 and all the other flora species are small (Girth 35 > in ground level and 1.5 m >). In addition, the forest buffer zone-2 is not popular as an animal habitat owing to poor flora diversity. Thus, it is not used for poaching.

On the other hand, growth of *Araucaria* plant tend to dry up water streams and springs and thereby soil condition is poor in the forest buffer zone-2 (Karunarthna, 2008). Therefore, villagers seem to neglect forest buffer zone-2 in their search for new land for cultivation. On the contrary, they encroach on the forest sanctuary or forest buffer zone-1 for new land.

The analysis of both these quadrat samples 05 and 06 vividly depicts that establishment of forest buffer zone-2 is unsuccessful as a community forest management approach and it has failed to reduce the use of *Sripada* Tropical Peak Wilderness Sanctuary by villagers and to contribute effectively to rural development.

Quadrat analysis: Sample 05

- Flora diversity: Forest buffer zone – 02: [Araucaria forest (Araucaria cookii)]



3cm = 1m

Keys

- ① Girth (At ground level) 35cm <and more than 1.5 m in height
- ① Girth (At ground level) 35cm >and more than 1.5 m in height
- 1 Girth 35cm >and less than 1.5 m in height (Shrubs and plants)

Table 6.5: Quadrata analysis: Sample 05: Forest buffer zone – 02: [Araucaria forest (Araucaria cookii)]- Flora diversity and use

Species	Scientific name	# of available plants / trees	used or not used	Type of use
01. Dabu	<i>Syzygium cordifolium</i> *	36	√#	T
02. Niyagala	<i>Gloriosa superba</i>	01	×	×
03. Araucaria	<i>Araucaria cookii</i>	02	×	×
04. Apassa	<i>Paederia foetida</i>	01	×	×
05. Galweralu	<i>Elaeocarpus montanus</i>	01	×	×
06. Pelenga	<i>Kurrimia ceylanica</i> *	03	√#	T
07. Kaduru	<i>Cerber manghas</i>	02	×	×
08. Peertabala	<i>Gaertnera vaginans</i>	01	×	×
09. Walkurudu	<i>Cinamomum multifolium</i> *	03	√#	E
10. Mudumahana	<i>Sphaeranthus indica</i>	01	×	×
11. Kaluwalla	<i>Litsea moonii</i>	02	√#	T
12. Hinbowitiya	<i>Osbeckia octandra</i>	11	√	M/E
13. Pabaru	<i>Atalantia missionis</i>	02	×	×
14. Kekilla	<i>Gleichenia linearis</i>	01	√#	NNE
15. Gambi	<i>Madhuca neriifolia</i>	02	×	×
16. Walla	<i>Gyrinops walla</i> *	01	√#	NNE/T
17. Walkoopi	<i>Scyphostachys coffaeoides</i>	01	×	×
18. Gadapana	<i>Nothopodytes foetida</i>	01	×	×
19. Nidikumba	<i>Mimosa pudica</i>	01	√#	M
20. Niyagala	<i>Gloriosa superba</i>	01	×	×
21. Etaba	<i>Mangaijera zeylonica</i> *	01	√#	E
22. Tuttiri	<i>Chrysopogon aciculatus</i>	02	×	×
23. Pegirimana	<i>Cymbopogonardus</i>	01	×	×
24. Ginikuru	<i>Murraya paniculata</i>	04	√#	T
Total number of endemic species = 05 (20.8%)		Total number of flora = 82		
Total number of using species = 10 (41.7%)		Spices mature enough for use = 01 (04%)		

Sources: Quadrata analysis, discussions, and questionnaire survey of the research

Keys

Whether used or not used

× = not used

√ = used

√# = used but not mature enough for use

* = Endemic species to Sri Lanka

Type of use

1. Non Timber Forest Produce –Edible food = E

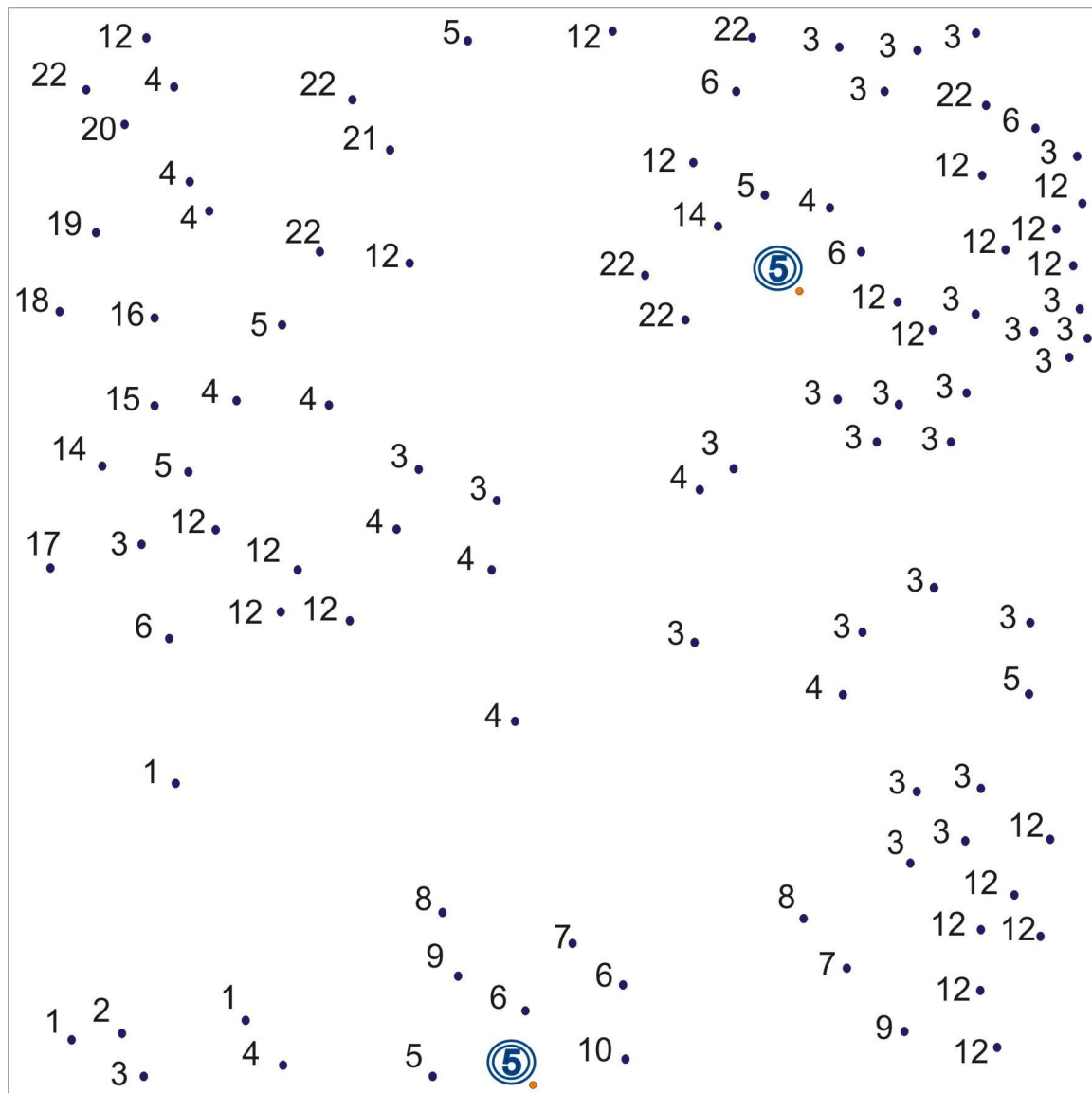
2. Non Timber Forest Produce- Medicinal = M

3. Non Timber Forest Produce- Non Edible = NNE

4. Timber Forest Produce = T

Quadrat analysis: Sample 06

- Flora diversity: Forest Buffer Zone – 02: [Araucaria forest (Araucaria cookii)]



3cm = 1m

Keys

- ① Girth (At ground level) 35cm <and more than 1.5 m in height
- ① Girth (At ground level) 35cm >and more than 1.5 m in height
- 1 Girth 35cm >and less than 1.5 m in height (Shrubs and plants)

Table 6.6: Quadrata analysis: Sample 06: Forest Buffer Zone – 2: [Araucaria forest (Araucaria cookii)] Flora diversity and use

Species	Scientific name	# of available plants / trees	used or not used	Type of use
01. Pabaru	<i>Atalantia missionis</i>	03	×	×
02. Walkoopi	<i>Scyphostachys coffaeoides</i>	01	×	×
03. Bowitiya	<i>Osbeckia octandra</i>	27	×	×
04. Walkurudu	<i>Cinamomum multifolium</i> *	12	√#	E
05. Araucaria	<i>Araucaria cookii</i>	08	×	×
06. Pelenga	<i>Kurrimia ceylanica</i> *	05	√#	T
07. Liyan	<i>Homalium zeylanicum</i> *	02	√#	M
08. Bokere	<i>Ouratea zeylanica</i> *	02	×	×
09. Eatakiridiya	<i>Strychnos cinnamomifolia</i>	02	×	×
10. Gadapana	<i>Nothopodytes foetida</i>	01	×	×
11. Apassa	<i>Paederia foetida</i>	01	×	×
12. Gadapana	<i>Nothopodytes foetida</i>	21	×	×
13. Hatawariya	<i>Asparagus racemosus</i>	01	√#	E/M
14. Mudumahana	<i>Sphaeranthus indica</i>	02	×	×
15. Pegirimana	<i>Cymbopogonardus</i>	01	×	×
16. Ginikuru	<i>Murraya paniculata</i>	01	√#	T
17. Kekilla	<i>Gleichenia linearis</i>	01	√#	NNE
18. Peertabala	<i>Gaertnera vaginans</i>	01	×	×
19. Nidikumba	<i>Mimosa pudica</i>	01	√#	M
20. Niyagala	<i>Gloriosa superba</i>	01	×	×
21. Tuttiri	<i>Chrysopogon aciculatus</i>	01	×	×
22. Kaduru	<i>Cerber manghas</i>	07	×	×
Total number of endemic species = 04 (18.2%) Total number of using species = 07 (31.8%)		Total number of flora = 102 Spices mature enough for use = 00 (0.0%)		

Sources: Quadrata analysis, discussions, and questionnaire survey of the research

Keys

Whether used or not used

× = not used

√ = used

√# = used but not mature enough for use

* = Endemic species to Sri Lanka

Type of use

1. Non Timber Forest Produce –Edible food = E

2. Non Timber Forest Produce- Medicinal = M

3. Non Timber Forest Produce- Non Edible = NNE

4. Timber Forest Produce = T

Thus, we can summarize the analysis of above quadrat samples follows. If we consider the *Sripada* Tropical Peak Wilderness Sanctuary, there is high flora diversity and high percentage of endemic flora species. Moreover, the percentage of the availability of trees used by villagers is high and most of these trees are mature enough for use. According to these facts, the capacity of the forest sanctuary to fulfill the needs of the communities for forest resource utilization is high. The quadrat analysis of the forest buffer zone-1 shows that the flora diversity in the buffer zone-1 is rather high and there is a considerable level of flora species that can be used and mature enough for use. Nevertheless, the flora diversity and amount of usable flora in the buffer zone-1 is lesser than that in the forest sanctuary. The main weakness in the buffer zone-1 is that this cannot be used for extraction of timber, resins and condiments as the dominant species- *Albezia* (*Albezia molucana*) - in the buffer zone-1 does not allow these flora varieties to grow mature to the usable level. Yet, the buffer zone-1 can be used for gathering of other forest resources. However, the state of the buffer zone-2 is different. In the buffer zone -2, the flora diversity and availability of mature usable flora species is very low. Thus, there is a very little ability to use the buffer zone-2 instead of the forest sanctuary for forest resource utilization.

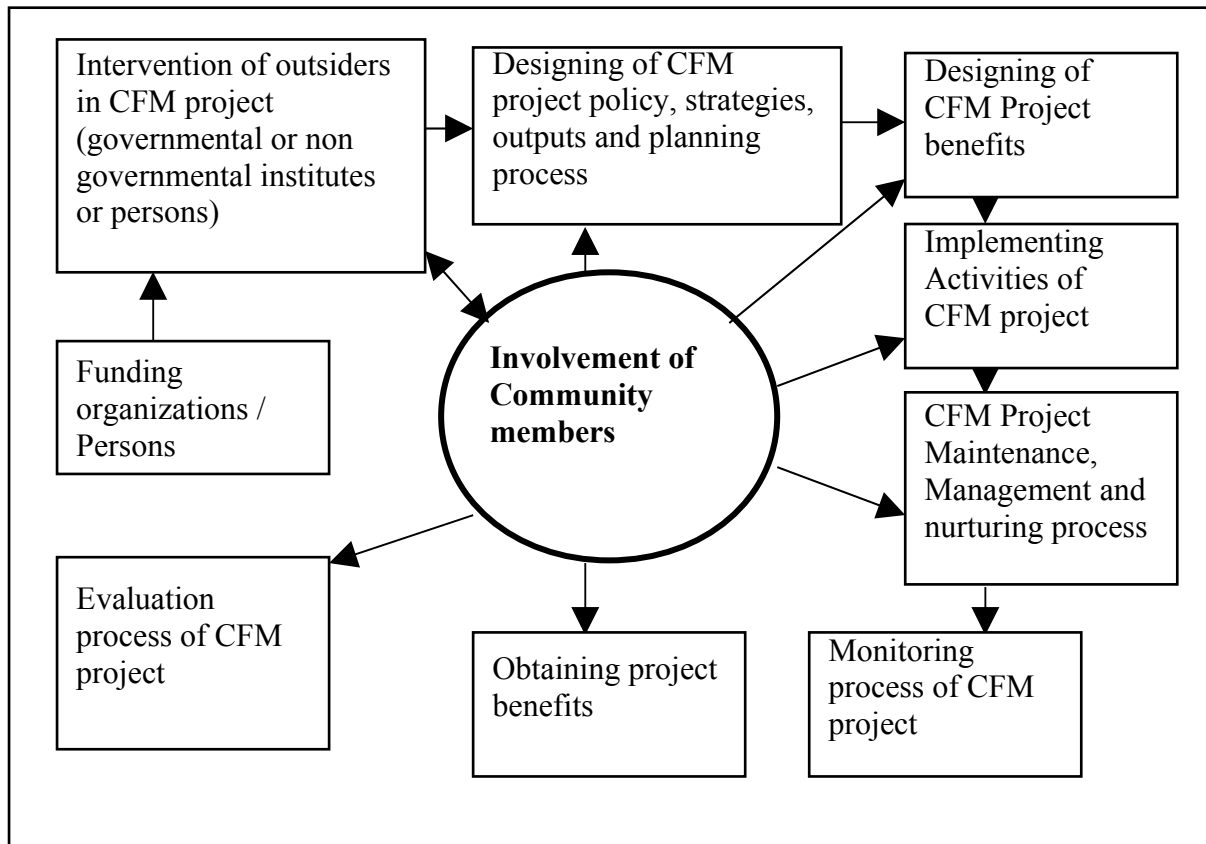
6.3 Effectiveness of community participation in establishing forest buffer zones

Community Forest Management (CFM) is a systematic process and it should essentially focus on community-based activities, which are geared towards the sustainable use of forest. There should be two main goals for CFM viz., forest management/ conservation and community development (Asia forest network, 2010). On the other hand, community members as well as outsiders like governmental or non-governmental bodies should intervene in various phases of the project such as designing project plans, activities of project, achieving project goals, monitoring and evaluation process etc. (LEI, 2009; Pham, 2006). In this section of the chapter, effectiveness of community participation is examined.

As community members play a key role in a community forest management project, their involvement cannot be avoided. The possible ways of obtaining their involvement in a project is depicted in the figure 6.1.

The Forest Department is the key benefactor of the project of establishing forest buffer zones at the periphery of the *Sripada* Tropical Peak Wilderness Sanctuary and as well, it handles the project. Community members from *Guruluwana* GN division are deemed 'actively involving members' of the project (The Forest Department, 2009).

Figure 6.1: Community members' role in a CFM project



Source: Nguyen, Dinh, Huynh, Hans, and Pham, 1999 Duncan, HPMP (2009)

6.3.1 Community participation in designing of the project to establish forest buffer zones

Participation of community members in the project designing process is examined in this section by means of data obtained by questionnaire survey and case studies.

One of the major findings is that the villagers from *Guruluwana* have not participated in discussion process of project policy, strategies, and determination of stakeholders. As well, only 22% of households have participated in the scheming of the project objectives and benefits (Table 6.7) and participation is weak. Even though a minimum number of members have participated in the scheming of the project objectives and benefits, many have worked as labourers in the project (case study 01). Thus, it is clear that the Forest Department is not concerned with the importance of community members' participation in designing process of project policy, strategies, and objectives as well as in project benefits.

However, the project planers from the Forest Department have organized meetings at the *Guruluwana* GN division to explain the role of community in the project. The level of participation of the households is weak because only 28% of households have participated in that meeting and 42% of households have participated only in one or two meetings (Table 6.7).

Even though a number of households have participated in above meetings, they seem unable to identify or understand the project or their responsibility in the project, as they are not familiar with such projects (case study 02).

In the process of selecting flora species to plant in the buffer zones the Forest Department has totally neglected the involvement of community members (Table 6.7).

Table 6.7: Community participation in designing process of projects for establishing forest buffer zones

Procedures	Level of community participation and percentage of participants from <i>Guruluwana</i> GN division			
	1	2	3	4
i. Discussing project policy, strategies and stakeholders	×	×	×	100%
ii. Discussing project objectives and benefits	×	×	√ 22%	78%
iii. Discussing the role of the community in the project	×	√ 28%	√ 42%	30%
iv. Flora species selecting to plant in the buffer zones	×	×	×	100%

Source: SPSS Analysis of data - Questionnaire survey

Keys

- Participation
- 1 = very good
- 2 = Satisfactory
- 3 = Feeble
- 4 = not-involved

- × = no participation
- √ = participated

Case study 01: **Community participation in project designing process**

Gender: Male

GN division: *Guruluwana*

Age: 59 years

Occupation: tea planter, forest resource collector

“As villagers we knew nothing about the project on establishment of forest buffer zones until the Forest Department informed us to join the project as labourers. Some of our villagers have worked for the Forest Department, and they informed us about this project but we could not understand it. When ‘Albezia seed-plot’ was being established in our village we joined it as labourers and we got good income”.

“While Albezia seed- plot was being planted forest officers have organized several meetings in the village to educate us about the importance of establishing forest buffer zones, and they said ‘how we could join the project’. Many of our villagers did not participate in those meetings. I once went to one of the meetings, but I could not understand anything said there. So I never joined any other meetings that they have organized to explain about the project”.

Case study 02: **Community participation in project designing process**

Gender: Male

GN division: *Guruluwana*

Age: 65 years

Occupation: tea planter, forest resource collector

“Parallel to the planning of establishment of forest buffer zones, there was a parliament election in the country and I too was supporting a political leader in his political campaign. After he won the election, I met him to ask for an available government occupation. He said that the Forest Department would start forest planting project in my area, and I could work as a labour in that project. Thereby I joined the project in its early stages with his recommendation.

“I don’t know why the Forest Department has decided to plant *Albezia* and *Araucaria* in the forest buffer zones. As I think, *Albezia* is pretty ok, but *Araucaria*? We cannot use that tree at least for firewood and no other valuable tree would grow in the same land with *Araucaria* trees, not even animals would be there and most of the all springs dry up in *Araucaria* forest. If only forest officers had asked us before selecting *Araucaria*, we never had agreed to plant *Araucaria* in the forest buffer zone 02. Unfortunately, they did ask us for nothing in selection of flora species for forest buffer zones”

6.3.2 Community participation in activities of the project to establish forest buffer zones

Even if the participation of community members in project designing process is poor, they have actively involved in many of the project activities. When considering flora species planting process in the buffer zones, 76% of villagers have involved in it. Of them all, 22% has involved actively. The participation of 32% of villagers in maintenance process of planted trees is satisfactory and all together 62% of villagers have involved in that process in different levels (Table 6.8). Therefore, we can identify that community members' participation as labourers is very high in establishing forest buffer zones and they were all well paid for the work (case study 03).

Yet, a year later establishing forest buffer zones, the Forest Department has neglected the project and consequently both community members and forest officers failed in managing established forest buffer zones. Thus, only 10% of community members have joined in management and looking after the established buffer zones. Established forest buffer zones naturally grew up without better management and other wild flora species gradually sprouted among the planted flora species. Even if the forest buffer zone-1 and the forest sanctuary shares similar features in flora and fauna diversity, forest buffer zone-2 is far behind the forest sanctuary in its quality and ability to satisfy the needs of community for forest produce (case study 04).

Table 6.8: community participation in the project

Activities of the project	level of community participation and percentage of participants from <i>Guruluwana</i> GN division			
	1	2	3	4
i. Labour and contribution during the tree planting process in the buffer zones	√ 22%	√ 30%	√ 24%	24%
ii. Maintenance process of planted trees	×	√ 32%	√ 40%	28%
iii. Management and looking after the established buffer zones	×	×	√ 10%	90%
iv. Use of forest resources in the forest buffer zone-1	√ 48%	√ 22%	√ 18%	12%
v. Use of forest resources in the forest buffer zone-2	×	×	√ 04%	96%
vi. Monitoring and evaluation process of the project	×	×	×	100%

Source: SPSS Analysis of data - Questionnaire survey

Key

Participation

1 = very good

2 = satisfactory

3 = weak

4 = not-involved

× = no participation

√ = participated

Gradually the community members are used to utilize the forest buffer zone-1 for forest produce; they still do not use the forest buffer zone-2 as it lacks necessary forest produce. Nevertheless, the Forest Department or community members or any other institute are not involved in monitoring or evaluation of the project and it can be identified a main weakness of the project (Table 6.8; case study 04).

Case study 03: **Community participation in project activities**

Gender: Female

GN division: *Guruluwana*

Age: 62 years

Occupation: tea planter

“More than two years I worked as a planter of *Albezia* trees in the project to establish forest buffer zone 01 with many other men and women. We could earn good income from that project. When the planting was over we lost our jobs and only a few people had jobs as maintainers of planted trees. Yet, within a year they also lost their jobs, as the Forest Department did not pay them for their duty after a year of plating trees”.

"Gradually both the Forest Department and community members forgot the established forest buffer zones. However, planted trees grew up with other wild plants in the forest buffer zone 01 but wild plants did not spread in the buffer zone 02 with planted *Araucaria* trees. Even though our family members use the forest buffer zone 01 for gathering of various forest produces, we never use the forest buffer zone 02 as there is almost nothing to find"

Case study 04: **Community participation in project activities**

Gender: Male

GN division: *Guruluwana*

Age: 54 years

Occupation: tea planter/ Traditional Sinhala medical practitioner

“I am a Sinhala medical practitioner in the village. Therefore, I gather various plant species to prepare medicines and some are very rare. Usually I go to the forest buffer zone 01 to gather plants. At times, I have to enter the *Sripada* Tropical Peak Wilderness Sanctuary also as some medicinal plants are unavailable in the forest buffer zone-1. But most of the medicinal plants can be found in the buffer zone-1. As flora species of medicinal value are very rare in the forest buffer zone-2, I never go to the buffer zone-2”

"Collecting medicinal plants in the forest buffer zones is not prohibited legally, but whenever I have to gather these plants from the *Sripada* Tropical Peak Wilderness Sanctuary, I have to get permission from the Forest Department. As it is difficult I'm happy of the establishment of the forest buffer zone-1'. However, establishment of forest buffer zone-2 seems a failure, as I suppose"

6.3.3 Community members' suggestions about effectiveness of established forest buffer zones

Community members' suggestions about effectiveness of established forest buffer zones were obtained via questionnaire survey and case studies and this section focuses on examining their suggestions.

More than 95% of community members accept that forest buffer zone-1 is effective in fulfilling their needs for forest produce. However, no community member has accepted that effectiveness of established forest buffer zone-1 is 'extremely high'. On the other hand, 100% of community members believe that establishment of forest buffer zone-2 is ineffective (Table 6.9; case studies 05 and 06).

All community members have identified that establishing forest buffer zone-1 has served the conservation of the *Sripada* Tropical Peak Wilderness Sanctuary and 15% of people think its effectiveness is 'extremely high' in conservation of the forest sanctuary. Simultaneously, all community members believe in the idea that establishment of the forest buffer zone-2 is effective neither in conservation of the forest sanctuary nor in fulfilling the needs of the community members for forest produce (Table 6.9; case studies 07 and 08).

Table 6.9: Community members' suggestion about effectiveness of established forest buffer zones (villagers of *Guruluwana* GN division)

Effectiveness of forest buffer zones	Forest buffer zones	Level of effectiveness of established forest buffer zones and percentage of participants giving suggestions				
		1	2	3	4	5
Forest buffer zones are effective in fulfilling villagers' needs for forest resource utilization	Forest buffer zone-1	×	√ 35%	√ 60%	√ 05%	×
	Forest buffer zone-2	×	×	×	×	√ 100%
Forest buffer zones are effective in conserving the <i>Sripada</i> Tropical Peak Wilderness Sanctuary	Forest buffer zone-1	√ 15%	√ 65%	√ 20%	×	
	Forest buffer zone-2	×	×	×	×	√ 100%

Source: SPSS Analysis of data - Questionnaire survey

Keys

Level of effectiveness

1. Extremely high
2. High
3. Satisfactory
4. Average
5. Poor

Effectiveness of forest buffer zones

- × = No
√ = Yes

Case study 05: **Community members' suggestions about effectiveness of establishing forest buffer zones**

Gender: Male

GN division: *Guruluwana*

Age: 48 years

Occupation: tea planter/ *Kitul* tapper

“Primary income source of my family is tea cultivation but I obtain considerable income by *Kitul* tapping. I entirely depend on the forest buffer zone-1 for *Kitul* tapping, as there are plenty of *Kitul* palms. To tan *Kitul* flowers, I use certain plant species and as these plants are available within the forest buffer zone-1, I face minimum difficulties in finding these plant species. I even have a license from the Forest Department for *Kitul* tapping inside the forest buffer zone-1”.

“However, I do not use the forest buffer zone-2 for *Kitul* tapping, simply because there are no *Kitul* palms inside it. If the Forest Department have designed to plant *Kitul* trees within the forest buffer zone-2, it would have been more effective than the *Araucaria* plantation”.

Case study 06: **Community members' suggestions about effectiveness of establishing forest buffer zones**

Gender: Male

GN division: *Guruluwana*

Age: 56 years

Occupation: tea planter/ *Kitul* tapper/ hunter

“Even though I go hunting, my primary income source is tea cultivation. During my leisure times, I like go hunting. However, if I tell hunting is not a good income source, it is false. If I hunt a wild pig, I can earn almost more than 25, 000 Rs. I usually go hunting in the forest buffer zone-1, as commonly hunted animals such as the wild pig, the deer, the porcupine, etc., are frequent in the forest buffer zone-1. I use licensed shotgun for hunting. I never go hunting in the forest buffer zone-2, as animals are seldom seen there; even birds are rarely seen in the forest buffer zone-2. I never go hunting in the *Sripada* Tropical Peak Wilderness Sanctuary. I am a Buddhist and I believe that the forest sanctuary is a “sacred forest” as Lord Buddha's sacred footprint is at the summit of Adam's Peak (*Sripada* Mountain). Therefore, I believe that the forest sanctuary is guarded by the god *Suman Saman* as it is his residence. Not only me, but also many other hunters never go hunting in the forest sanctuary. But we use forest buffer zone-1 for hunting”.

Conclusion

The present chapter focuses on examining the effectiveness of established forest buffer zones at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary. Analysis of the quadrat samples taken to examine the effectiveness of established buffer zones reveals several important facts. First, even if the forest buffer zone-1 is not as beneficial as the forest sanctuary, it has high flora diversity and considerable number of flora species commonly used as forest produce. However, it is obvious that the villagers at the peripheral areas of the forest sanctuary cannot fulfill timber needs by the buffer zones. The major reason is that even if the trees like *Albezia* (*Albezia molucana*) grow high and large, they have no timber value.

Second, the percentage of available as well as used flora species in the forest buffer zone-2 is lower. Especially, the percentage of trees, which are mature enough for use, is very low in the buffer zone-2. The quadrat analysis reveals that the forest buffer zone-1 is satisfying the needs of villagers for forest produce and can direct the users of forest resources from the forest sanctuary to the buffer zone-1 while the forest buffer zone-2 lacks that capacity.

In any community forest management approach, the community plays the central role. As the role played by the community members in projects on establishing forest buffer zones can have vast impact on the effectiveness of such projects, the present chapter examines the community involvement in different phases of project to establish forest buffer zones. Data analysis depicts that participation of community members is less in the designing phase of the project. However, a considerable number of community members have participated in the project as laborers and maintainers of the established buffer zones. What should especially be noted here is that both groups, the Forest Department and the respective community have neglected post-maintenance of the buffer zones. As well, the monitoring and evaluation processes are absent in these projects.

Studying the suggestions of community members about the established forest buffer zones it can be stated that the forest buffer zone-1 has positively contributed the accomplishment of community needs for forest produce as well as conservation of the *Sripada* Tropical Peak Wilderness Sanctuary. Yet, the villagers still utilize the forest sanctuary for timber extraction and gathering of resin varieties as the buffer zone-1 is still incapable of supplying them. Overall, the forest buffer zone-1 has the ability to fulfill the needs of the community for forest produce and thereby to conserve the *Sripada* Tropical Peak Wilderness Sanctuary.

However, owing to lack of flora diversity as well as flora species, which are usable and mature enough for use the forest buffer zone-2 is incapable of satisfying above two objectives at least to a considerable level. Thus, it is obvious that the project of establishing forest buffer zone-2 with *Araucaria* (*Araucaria cookie*) has become ineffective.

Chapter 7

Research findings and hypotheses testing

7.1 Introduction

Rationale of this chapter is to explain the findings of the research and to analyze the results of the research hypotheses. The first section of the chapter discusses the main research findings and subsequently hypotheses are tested.

7.2 Findings of the research

According to the outcome of analyzed data in the fifth and the sixth chapters several significant finding can be identified.

i. Forest utilization plays a key role in livelihood of rural communities at the research site

Even though forest resource utilization is not the major income source of the people residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary, most of these people have utilized the forest produce over years for either subsistence or sale or for both. In general, forest resource utilization has economical as well as social value as it depends on traditional knowledge about forest resources. Especially, several forest utilization practices, for instance, *Kitul* tapping for sweet toddy play a main role in rural economy. As well, practices of forest resource utilization depend on socio-cultural beliefs. For example, communities inhabiting at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary are reluctant to use it for hunting as the forest is considered “sacred” (See chapter 05).

Hence, a strong mutual relationship can be identified between the forest and its users concerning practices of forest resource utilization. In addition, the forest holds a very important place in the lives of villagers at its periphery as it is socially and economically vital for them.

ii. Practices of forest resource utilization can be categorized into three main groups

According to the collected data from the two research sites, forest resource utilization practices can basically be categorized into three main groups namely, practices of Non-Timber Forest Produce, Timber Resource, and ‘Other’ forest resources (except Timber and Non-Timber forest resources) utilization. Utilization of Non-Timber forest resource can again be divided into three sub categories as Edible Forest resource, Medicinal forest resource, and Non-Edible forest resource utilization (See chapter 5).

iii. Both *Sripada* Tropical Peak Wilderness Sanctuary and forest buffer zone-1 have been used for forest resource gathering

Villagers from *Sripalabaddala* do not have forest buffer zones to collect forest resources and thereby they tend to use the forest sanctuary for gathering of forest produce. However, there are two forest buffer zones (buffer zone-1 and 2) in between the *Guruluwana* GN division and the forest sanctuary. Villagers from *Guruluwana* use both the forest buffer zone-1 and

the forest sanctuary for forest produce. Even so, they rarely use the forest buffer zone-2, as it is deficient in traditionally used forest resources (Chapter 5).

iv. The Non-Timber forest resources users can be directed from the forest sanctuary to forest buffer zone-1

As many researches have discovered, practices of forest resource utilization is a major cause of rain forest degradation in Sri Lanka and this situation is common even to the study area. As well, the gradually increasing rural population enhances this problem (Perera, 2004; Hewage, 2010; Lankanth, 2008, Kumara, 2005). However, established forest buffer zone-1 has capacity to minimize the practices of Non-Timber forest resource utilization in the *Sripada* Tropical Peak Wilderness Sanctuary and it has a direct impact on management and conservation of the forest sanctuary.

When practices of gathering of Edible forest resources (including *Kitul* tapping), plants of medicinal value and Non-Edible forest resources is considered, a very low percentage of villagers from *Guruluwana* has used the *Sripada* Tropical Peak Wilderness Sanctuary. Instead, most of them have used the forest buffer zone-1. Yet, 100% of villagers from *Sripalabaddala* who gather Non-Timber forest produce have used only the forest sanctuary. Therefore, the impact caused by the collectors of Non-Timber forest produce from *Guruluwana* is least and it has helped minimizing degradation of the *Sripada* Tropical Peak Wilderness Sanctuary (See chapter 05).

In addition, collectors of Non-Timber forest produce at *Guruluwana* enjoy easy access to the forest buffer zone-1 and they are legally permitted to use forest resources available within the buffer zones. However, access to the forest buffer zones is difficult for the villagers from *Sripalabaddala* owing to distance, and thereby they tend to use forest resources available inside the forest sanctuary illegally and furtively.

At times, Non-Timber forest resource users of forest buffer zone-1 have more opportunities than the users of forest sanctuary. For example, *Kitul* tappers from *Guruluwana* GN division who mainly use forest buffer zone-1 for *Kitul* tapping earn more than earned by *Kitul* tappers from *Sripalabaddala* who use only the forest sanctuary (See chapter 05). This is due to the abundance of *Kitul* trees and legal permission to *Kitul* tapping within the forest buffer zone-1.

However, on occasion Non-Timber forest resource users of forest buffer zone-1 face the problem of scarcity of several Non-Timber forest resources. For instance if practice of gathering resin varieties of market value is considered, the villagers from *Sripalabaddala* have added opportunities than that of the *Guruluwana* villagers since *Sripalabaddala* villagers are able to gather such resin varieties easily as they utilize the forest sanctuary but these highly marketable resins are very rare in both forest buffer zones. (See chapter 05).

v. Establishment of forest buffer zones has failed to minimize logging inside the *Sripada* Tropical Peak Wilderness Sanctuary

Tree felling for timber need is one of the major unsustainable forest resource utilization practices that directly contributes to forest degradation in Sri Lanka (EEPSEA, 2002) and that is even common to the *Sripada* Tropical Peak Wilderness Sanctuary (Karunarthna and

Kumara, 2010). Gradually increasing population and economic boom occurred due to tea economy in the research sites have increased the demand for timber. During the last decades, it is observed that most of the villagers look for permanent houses and luxury wooden furniture. In order to fulfill the need for timber for construction of houses and wooden furniture, the villagers illegally utilize the forest. Hence, the increasing demand for timber has become a major threat to the *Sripada* Tropical Peak Wilderness Sanctuary.

If the established forest buffer zones to be effective, it should have the capacity to fulfil villagers' timber needs. Yet, trees that are mature enough as lumber are not available in forest buffer zones (See chapter 05). While establishing forest buffer zones-1 and 2 the Forest Department has used *Albezia* (*Albezia molucana*) and *Araucaria* (*Araucaria cookie*) respectively and these are worthless as timber. On the other hand, as dominant species these flora seldom allow the growth of other flora species which can be used for timber (chapter 06- quadrat analyzed).

Therefore, the establishment of the forest buffer zones has failed to minimize logging inside the *Sripada* Tropical Peak Wilderness Sanctuary.

vi. Forest buffer zone-1 is popular among hunters than *Sripada* Tropical Peak Wilderness Sanctuary

Peripheral villagers are reluctant to go hunting in the *Sripada* Tropical Peak Wilderness Sanctuary owing to two main reasons. First, these villagers believe in the idea that the forest is “sacred”. Second, the forest sanctuary is an excessively reserved forest area and forest officers forbid villagers from poaching in the forest (Dammika, 2009; Wikramashinhe, 2003).

However, the forest buffer zones are not that much reserved or not considered 'sacred'. Forest buffer zone-1 is a habitat of many commonly hunted wild animals such as the wild pig, the porcupine, the deer etc. Additionally, as villagers have easy access to the forest buffer zone-1, hunters can easily enter the forest buffer zone, and even though hunting in the forest buffer zone is illegal, practically the rules are less attended. Owing to all these, the average income of a hunter from *Guruluwana* is much higher than the income of hunters from *Sripalabaddala* as there is no forest buffer zone between the village and the forest (See chapter 05).

vii. Forest buffer zone-1 has become the most suitable place to gather fuel wood than *Sripada* Tropical Peak Wilderness Sanctuary

Gathering fuel wood is one of the major activities of women living at the peripheral villages of the *Sripada* Tropical Peak Wilderness Sanctuary and the villagers have adapted to use a lot of fuel wood as energy. Especially, *Kitul* tappers use large amounts of fuel wood in the process of boiling sweet toddy to prepare *Kitul* treacle and jaggery. Even if villagers can use both forest buffer zones and the forest sanctuary to gather fuel wood, villagers from *Guruluwana* can easily access the forest buffer zone-1 in their search for fuel wood.

Albezia (*Albezia molucana*) which is the dominant species in the forest buffer zone-1 is one of the best trees used as fuel wood. As decayed *Albezia* branches are abundant within the forest buffer zone-1, villagers from *Guruluwana* have plenty of opportunities to use forest buffer zone-1 for fuel wood gathering (chapter 05).

vii. Community involvement is very low in the designing phase of the project for establishing forest buffer zones

Community involvement should be stronger in the planning process of a project which aims at 'community forest management' and project planners must prioritize the ideas, feelings, traditional forest utilization practices etc., of the community (Nguyen, Dinh, Huynh, Hans, and Pham, 1999 Duncan, HPMP , 2009).

However, while establishment of the forest buffer zones, which aims at community forest management, the project planners have not considered this issue. Especially in the designing process of the project goals, objectives, policy, and strategies, the community involvement seems very low. Most of all, prior to implementation of the project, the project planners have neglected to discuss the flora species that were intended to be planted in the forest buffer zones (See chapter 06).

This is one of the critical weaknesses in the project for establishing forest buffer zones at the periphery of the *Sripada* Tropical Peak Wilderness Sanctuary.

ix. Community involvement in implementing phase is considerable

Even if involvement of the community members in the scheming process is low, their involvement in the project activities is considerable. Most of the villagers at *Guruluwana* have joined the project as labourers in flora planting process and project planners have prioritized involvement of the community members residing nearby the project site. Additionally, community members have participated in the maintenance process of planted trees.

More than 70% of the community members have been involved in gathering forest resources (obtain benefits) within the forest buffer zone-1, but most of the villagers have not obtained benefits from forest buffer zone-2 (chapter 06). If community participation in project activities were considered, participation of community members in the project implementation would be at a considerable level.

x. Consequent management and conservation of the established forest buffer zones seem neglected

Community involvement in the process of consequent management and conservation of the established buffer zones is very poor. This seems due to the little attention paid by the Forest Department (project planners) on post management and looking after of the established forest buffer zones (See chapter 06).

Still the forest buffer zones are under the control of the Forest Department. The community members or any outsiders are banned on clearing of forest buffer zones for cultivation or other destructive practices of forest resource utilization such as gem mining in the forest buffer zones. However, community members participate in such illegal practices of forest resource utilization but forest offices are less alert on these occasions as the forest buffer zones are not excessively reserved as the forest sanctuary (Lankanth, 2008).

xi. Project monitoring and evaluation processes seem neglected

One of the main weaknesses of the project is the less attended monitoring and evaluation phases. Among all, project planners neither have visited the established buffer zone after implementation nor have obtained necessary feedback about the effectiveness of the project (See chapter 06).

xii. Forest buffer zone-2 is abandoned by peripheral villagers

The forest buffer zone-2 is established with *Araucaria* (*Araucaria cookie*) species and neither *Araucaria* plant nor any part of it is valued as forest produce. As well, as the dominant species in the buffer zone-2, *Araucaria* does not allow the growth of any other useful plant species (See chapter 05: quadrat analyzed sample 05 and 06). Thus, villagers have no opportunity to use forest buffer zone-2 to gather forest produce instead of the forest sanctuary (chapter 06).

xiii. Established forest buffer zone-1 has effectively contributed to achieve project goals

95% of villagers of *Guruluwana* accept that the effectiveness of the forest buffer zone-1 in fulfilling the needs of the villagers for forest resource utilization is satisfactory. At the same time, most of them believe that the forest buffer zone-1 has successfully contributed to the management of the *Sripada* Tropical Peak Wilderness Sanctuary (See chapter 06).

It was observed that most of the villagers from *Sripalabaddala* still use the *Sripada* Tropical Peak Wilderness Sanctuary for forest resource gathering while a low percentage of villagers from *Guruluwana* use the forest sanctuary for that purpose as majority of the forest resource users from *Guruluwana* have shifted from the forest sanctuary to forest buffer zone-1. In other words, the forest buffer zone-1 has effectively contributed to the management of the *Sripada* Tropical Peak Wilderness Sanctuary and simultaneously it assists the community to fulfill their need for forest produce (See chapter 05).

Thus, it is obvious that establishment of the forest buffer zone-1 has contributed to achieve both environmental and socioeconomic goals of the project.

xiv. Established forest buffer zone-2 has failed to achieve project goals

100% of villagers from *Guruluwana* accept and believe that the established forest buffer zone-2 is not effective in fulfilling their needs for forest resource utilization or according to them it has failed to assist the *Sripada* Tropical Peak Wilderness Sanctuary conservation (See chapter 06).

Regarding forest resource gathering, most of the villagers from *Guruluwana* have not used the forest buffer zone-2 for forest produce gathering (chapter 06).

Hence, the forest buffer zone-2 has not contributed to achieve both environmental and socioeconomic goals of the project.

7.3 Hypotheses testing

Hypotheses used in the study are presented in this section of the chapter. Mainly, four hypotheses were used.

- (v). Both the *Sripada* Tropical Peak Wilderness Sanctuary and forest buffer zones are used by peripheral villagers for forest resource utilization.
- (vi). Local community members have successfully participated in the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary.
- (vii). The project to establish forest buffer zones launched in the *Sripada* Tropical Peak Wilderness Sanctuary has achieved its environmental and socioeconomic goals.
- (viii). As a Community Forest Management Approach, the establishment of forest buffer zones is an effective method in achieving goals of forest management and rural development.

Results of hypotheses are presented below based on previous findings.

Hypothesis (i) *‘Both the Sripada Tropical Peak Wilderness Sanctuary and forest buffer zones are used by peripheral villagers for forest resource utilization’.*

According to the research findings forest resource utilization plays a main role in the livelihood of villagers residing at the peripheral areas of *Sripada* Tropical Peak Wilderness Sanctuary. Relying on the traditional knowledge about the forest and its resources, these villagers utilize varieties of forest resources both for subsistence and for sale. Even if forest resource utilization is not the primary income source of the peripheral villagers, they earn considerable income through selling gathered forest produce.

According to aforementioned context, hypothesis (i) can be accepted.

Hypothesis (ii): *“Local community members have successfully participated in the project to establish forest buffer zones in the Sripada Tropical Peak Wilderness Sanctuary”.*

The Forest department is the key financial supporter as well as the planner of the project to establish forest buffer zones at the *Sripada* Tropical Peak Wilderness Sanctuary. Project planners have neglected the role of community members in designing process of the project policy, objectives, expected goals, strategies, benefits and most of the all, in selection of tree species intended to be planted in the buffer zones.

On the other hand, project planers have organized several discussion rounds about ‘role of the community members in the project’ and the percentage of villagers participated in these is very low.

However, when the project is launched community members have joined it as laborers and the Forest Department have decided to prioritize the community members in this phase. Under this policy, peripheral villagers have participated in the process of tree planting and maintenance of planted trees and community members have gained the benefits of the project through utilization of forest resources available in the forest buffer zone-1.

Yet, neither project planners nor community members have been involved in consequent management and conservation of the established forest buffer zones to a satisfactory level. As well, both groups have ignored monitoring and evaluation of the project.

Hence, even if community members have been involved in certain areas of the project, their overall participation in the project is unsatisfactory.

Therefore hypothesis (ii) can be rejected.

Hypothesis (iii): *"The project to establish forest buffer zones launched in the Sripada Tropical Peak Wilderness Sanctuary has achieved its environmental and socioeconomic goals".*

The hypothesis (iii) can neither be fully accepted nor be fully rejected. It depicts two different results in relation to the forest buffer zone-1 and 2. Even if the forest buffer zone-1 has productively contributed to achieve both environmental and socioeconomic goals of the project to a considerable level, forest buffer zone-2 has failed in its contribution to achieve the project goals.

Thus, in relation to the forest buffer zone-1, hypothesis (iii) can be accepted while for the forest buffer zone-2 the hypothesis (iii) can be rejected.

Hypothesis (iv): *"As a Community Forest Management Approach, the establishment of forest buffer zones is an effective method in achieving goals of forest management and rural development".*

The project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary has many weaknesses. Especially, community involvement in project designing and planning processes is poor. As well, in the phases of project management and monitoring and evaluation the community participation is considerably low. Even with these weaknesses, the project has achieved both forest management and rural development goals to a significant level.

Especially, if established forest buffer zone-1 is considered, it has a considerable level of capacity to shift forest users from the *Sripada* Tropical Peak Wilderness Sanctuary to the buffer zone. Therefore forest buffer zone-1 has effectively contributed to forest management and rural development.

The research reveals the vitality of the community involvement in the designing phase of the project, which is a community forest management approach.

Particularly, the needs of the community members, their beliefs and opinions as well as practices of forest resource utilization should be considered while planning a community forest management project and especially in selecting flora species to be planted in proposed forest buffer zones.

If these issues are considered further, establishment of forest buffer zones as a community forest management approach is a successful and effective method in achieving goals of forest management and rural development. Hence, the hypothesis (iv) can be accepted.

Chapter 8

Conclusions and recommendations

8.1 Introduction

The following concludes the thesis and gives recommendations drawn from the overall research findings.

8.2 Main research findings

The research was carried out with the objective of analyzing the effectiveness of establishing forest buffer zones as a community forest management approach in the *Sripada* Tropical Peak Wilderness Sanctuary and studying the nature of practices of forest resource utilization of communities residing at the peripheral areas of the forest.

Further, the research focuses on studying reasons for establishment of forest buffer zones in the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary and examining the role of local community in establishment of forest buffer zones in the forest sanctuary.

The following are the research conclusions:

(i). Forest resource utilization significantly contributes to rural development

The economic state of the people residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary has positively changed during the last few decades mainly due to the spread of tea cultivation and the considerable income gained by it. As well, the study vividly depicts that forest resource utilization has played a major role in the development of economic state of these villagers. Especially, the practice of *Kitul* tapping which comes under the category of non-timber forest resource utilization significantly contributes to this. In addition, the percentage of people who participate in *Kitul* tapping is high. In addition, practice of gathering resin varieties, spices, medicinal herbs, and creeper varieties for weaving has contributed to the economic development of villagers at the forest vicinity to a considerable level. Additionally, the practices of timber extraction and poaching that come under non-timber forest resource utilization have contributed significantly to the economic development of these people.

Thus, it is obvious that the practice of forest resource utilization has significantly contributed to rural development and there is possibility to develop this further with efficient and systematic interventions. In particular, providing market opportunities for gathered forest produce and accessibility to the market can further assist villagers.

(ii). Forest resource utilization holds an economic as well as a social value

Forest resources utilization plays a major role in economic development of the villagers. Besides, many beliefs, customs, and indigenous knowledge are related to practices of forest resource utilization. Forest resource utilization has encouraged the establishment and well-being of the lives of the community. For instance, the majority of villagers have collected

various edible food and herbal plants, which fall under non- timber forest produce utilization for subsistence.

The practice of gathering fuel wood should especially be considered as it covers a large percentage of the needs for energy. As village women are attributed to gather fuel wood in this community, this practice is closely connected with gender issues. Village women face many difficulties when there is a scarcity of fuel wood. Easy access to gather fuel wood hence makes their life easier. The study reveals how forest resource utilization is important in villagers' social life.

Thus, it is clear that not only as an economic activity but also as a social task, forest resource utilization is important for these villagers.

(iii). Forest resource utilization can directly cause forest degradation

Forest resource utilization practices such as timber extraction, poaching, gathering of resin varieties, clearance of forest for cultivation, and gem mining increase forest degradation. Even other less destructive practices of forest resource utilization slightly increase forest degradation. Villagers from *Sripalabaddala* almost entirely depend on the *Sripada* Tropical Peak Wilderness Sanctuary for forest produce.

Moreover, the population in the study area is seemingly increasing and accordingly there is a trend in the increase in forest resource utilization. Eventually, this might result in acceleration of forest degradation.

Thus, it is important to minimize forest degradation. One of the alternatives for this is to prevent people from forest resource utilization or to provide them with a forest substitute.

(iv). Establishment of forest buffer zones is an effective Community Forest Management Approach

As mentioned above, in order to minimize forest degradation, either people should be prevented from utilizing the forest sanctuary for its produce or they should be provided with a substitute for forest resource utilization. Preventing people from forest resource utilization might result in collapse of the rural economy. Additionally, as forest resource utilization is connected with social values of the community, prevention can create social problems.

Hence, considering all these facts, it is obvious that the most deserving solution is the application of an approach, which allows forest resource utilization and minimizes forest degradation concurrently. Establishing forest buffer zones in the peripheral areas of the forest sanctuary can be considered an effective Community Forest Management approach. As the present study reveals, forest buffer zone-1 established at *Guruluwana* has considerably contributed to minimize forest degradation by shifting the forest resource users from the forest sanctuary to the buffer zone. For instance, people at *Guruluwana* use forest buffer zone-1 to gather most of the non-timber forest produces than the dense forest. Yet, the establishment of forest buffer zone-2 has become ineffective. This is due to defects in project planning and implementation rather than a weakness in the approach. This project has not contributed to the development of the rural economy.

(v). Before implementing a Community Forest Management project, needs of the community for forest produce should be examined

The present study reveals that studying the needs of the community for the forest resource prior to implementing a community forest management project is vital. If the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary is considered, such systematic study seems ignored before the project implementation. As a result, the goals of the project are not properly achieved.

Especially the planted *Albezia* (*Albezia molucana*) and *Araucaria* (*Araucaria cookie*) in the forest buffer zone-1 and 2 respectively have no timber value. The entire failure of forest buffer zone-2 in fulfilling the needs of the community for forest produce or in achieving project goals are due to the lack in study of *Araucaria* (*Araucaria cookie*) species prior to establishment of forest buffer zone-2.

Araucaria (*Araucaria cookie*) as dominant species does not allow any other plant to grow in forest buffer zone-2 and consequently fulfilling of the needs of the community for forest produce has been hindered. Considering all these, it can be concluded that before implementing a Community Forest Management project, patterns and practices of the forest resource utilization and socioeconomic background related to it should be vigilantly examined.

(vi). Active involvement of community members in the planning process of a Community Forest Management project is vital

In the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary as a Community Forest Management approach, the active involvement of the community members in different project phases is minimal and this has become the foremost weakness of the project. For instance, the selection of the flora species to be planted in the buffer zones has been done by the Forest Department ignoring the importance of community involvement in this phase. If the ideas of the community had been inquired in advance and their preferences had been prioritized, there would have been a possibility to plant other flora species, which would be more productive in fulfilling their needs for forest produce.

Additionally, community involvement is very important in designing goals, challenges, policies and strategies of the project as well as this is one of the leading factors that determine the success of the project. When all these facts are considered, it can be stated that community involvement is vital in a Community Forest Management project and it can be taken as the conclusive proof of the productivity of the project.

(vii). Contribution of 'community' as well as other 'external organizations' and 'individuals' as stakeholders of a Community Forest Management project is essential

In the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary, only two parties have contributed namely the Forest Department and the respective community members. Out of them, only the Forest Department has participated in the project-planning phase. One of the major causes for the project failure is the lack of adequate stakeholders. In order to meet the project goal, involvement of other organizations and individuals in the project such as governmental/non-governmental organizations,

research institutes, community organizations, environmentalists and financial organizations, which can represent various project profiles, is important.

The study demonstrates how unilateral decision making and planning can end in project failure. Hence, it can be concluded that in order to make a Community Forest Management project successful, the involvement of various stakeholders in each project phase is essential.

(viii). There should be a systematic approach for post- management and watching over of a Community Forest Management project

Even though the established forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary have been managed and looked after for about a year, subsequently the buffer zones have been visited by neither a responsible organization nor an official. As forest buffer zone-1 contains commonly used forest produce, villagers have used it improperly. Yet, there is not a process to manage or streamline the buffer zone. The Forest Department has terminated the project after a year of planting the tree species.

As the present study reveals, the lack of proper management, conservation, as well as streamlining the practices of forest resource utilization have lessened the effectiveness of the project. The involvement of community members, intervention of a variety of stakeholders and experts in these processes is important to increase the productivity of the project.

(ix). Monitoring and evaluation processes can increase the effectiveness of a Community Forest Management project

In the project to establish forest buffer zones in the *Sripada* Tropical Peak Wilderness Sanctuary, monitoring and evaluation processes were absent. In order to obtain the maximum productivity of a Community Forest Management project, these two processes are essential. If there were monitoring and evaluation processes, the foremost project goals - achieving rural development through encouraging forest resource utilization and conservation of the forest sanctuary- would have been achieved. Especially, the data obtained by monitoring and evaluation could stabilize the existence of forest buffer zone-2. Through such processes, the project to establish forest buffer zone-2 could have been modified and other useful tree species could have been planted. Yet, the absence of monitoring and evaluation processes made the project an utter failure.

The above-discussed facts depict that monitoring and evaluation processes are vital in such a Community Forest Management project, which aims at rural development and conservation of the forest sanctuary.

(x). Endemic flora species should be prioritized while establishing forest buffer zones

When the patterns and practices of forest resource utilization of villagers residing at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary are examined, it is noted that there is a coherent relationship between practices of forest resource utilization and endemic flora species. It is observed that the villagers depend more on endemic species than on the exotic species.

Further, the endemic flora varieties are not novel to the eco-system and grow harmoniously with other species and thereby the forest buffer zones can become a natural eco-system

within a very short period. However, the exotic species- *Araucaria (Araucaria cookie)* - planted in the forest buffer zone-2 hinders the growth of both endemic as well as other exotic plant species.

Thus, it can be concluded that the use of endemic flora species in a project like this is more effective when the two facts - endemic species are commonly used and they grow harmoniously with other flora species- are considered.

(xi). Systematic planting of several useful flora species in forest buffer zones is more productive

The planted flora species in the forest buffer zones have directly influence the effectiveness of the project. Even though the dominant *Albezia (Albezia molucana)* species in forest buffer zone-1 is not much useful in fulfilling most of community needs for forest produce, it has facilitated the existence of the forest buffer zone allowing the other useful endemic and exotic plants species to grow harmoniously with it. As well, as *Albezia* species is not harmful to the growth of fauna there are plenty of commonly hunted animals in the forest buffer zone-1. However, as these qualities are lack in planted *Araucaria (Araucaria cookie)* forest (buffer zone-2), it has led to project failure.

Hence, it is obvious that planting of single dominant species in a buffer zone can create relatively uncertain, ineffective, and risky condition. This can be prevented by a systematic planting of several flora species, which are capable of fulfilling the needs of forest resource utilization. For instance, planting of trees such as Hal (*Vateria copallifera**), Milla (*Vitex pinnata*), Hal milla (*Berrya cordifolia*), Uru hoda (*Kurrimia ceylanica**), Weli piyanna (*Anisophyllea cinnamomoides**) etc., which have timber value, and trees like jack (*Artocarpus heterophyllus*), del (*Artocarpus nobilis*) and Kitul palm (*Caryatid urns*) which have multiple uses mixing with creeper varieties such as Waduru wel (*Calamus zeylanicus**) Wewel (*Calamus rotang*), Kukulul wel (*Calamus radiatus**), Tambotu wel (*Calamus ovoideus**), Weniwel (*Coscinium fenestratum**) etc., which can be used in weaving and as medicines for minor illnesses can be more effective.

8.3 Concluding remarks

To sum up, it can be stated that even though forest resource utilization directly contributes to forest degradation its contribution to rural development and its socioeconomic value are significant. Further, project to establish forest buffer zones is an effective Community Forest Management Approach if such projects are implemented after examining the needs of the respective community for forest produce and as stakeholders 'community' as well as other 'external organizations' and 'individuals' should actively contribute to it. Especially, active involvement of community members in the planning process is essential. Moreover, there should be a systematic approach for post- management and watching over of a Community Forest Management project as well as constant monitoring and evaluation can increase the effectiveness of the project. While establishing forest buffer zones, endemic flora species should be prioritized and systematic planting of several useful flora species in forest buffer zones is more productive than planting single species.

8.4 Recommendations for policy makers

(i). Systematic storage of information and data related to practices of forest resource utilization

The use of the *Sripada* Tropical Peak Wilderness Sanctuary for its resources is limited through permitting only gathering of certain forest produces with special legal consent. Yet, practically this is improbable. Especially, people from *Sripalabaddala* who do not have forest buffer zones utilize the forest illegally for its various resources and this has become one of the main difficulties in policy making for sustainable forest management. Hence, it is important to collect data and information about forest resource utilization systematically. Especially information on forest produce gathered in the established forest buffer zones should be included in a database. Community organizations can fulfill this task.

(ii). Establishment of community organizations responsible for conservation and proper use of the forest buffer zones

Forest buffer zones established in the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary are being used by various people without proper management. If we can establish community organizations to deal with the use of forest buffer zones with the help of forest conservation officers, we can systematize the use of forest produce available in the forest buffer zones. As well, by forming policies, rules and constitutions in these community organizations, the harmful practices of forest resource utilization can be minimized. These organizations can collectively take decisions on conservation of the forest buffer zones.

(iii). Empowerment of community organizations in forest buffer zone management

In order to increase the effectiveness of forest buffer zones, community organizations should be accredited in management of buffer zones while keeping only the forest sanctuary under the control of the Forest Department. For instance, it is very important to establish a system to levy reasonably forest buffer zone users on profitable practices of forest resource utilization such as *Kitul* tapping, poaching, extraction of timber etc. This would make community organizations financially stable and on the other hand, collected money could in return be spent on development activities of the community. What should especially be noted here is that performance of these organizations should be systematic, transparent, and based on apparent and firm policies.

(iv). Expansion of market opportunities for gathered forest produce

It is important to create a solid market for regularly collected forest produces. For instance, a procedure is necessary to expand the capacity of *Kitul* tappers to reach the market directly and sell their produce without intervention of an intermediary. The Forest Department, other related governmental organizations, as well as community organizations can be involved in these activities.

(v). Need for a procedure to increase of the effectiveness of forest buffer zone 01

Out of the two forest buffer zones established at the peripheral areas of the *Sripada* Tropical Peak Wilderness Sanctuary, forest buffer zone-1 is more effective than buffer zone-2. Even though buffer zone 01 contains huge *Albezia* (*Albezia molucana*) trees, it lacks any other large trees, which can be used to extract timber or resin varieties. The reason for this situation is the fully-grown *Albezia* (*Albezia molucana*) canopy. Thus, to minimize the impact of *Albezia* (*Albezia molucana*) canopy, throughout the buffer zone *Albezia* trees should be removed at intervals. Removing of trees can be implemented through a community based programme and removed trees can be given for the use of community members in return. Hence, other flora species can grow in forest buffer zone-1 freely.

As well, planting of endemic and indigenous flora species, which are commonly used by villagers is very important and these varieties, for example, jack, *kitul*, mango, dorana, hal. weval, hora, wenivel etc., should be introduced into the established forest buffer zones in excess. The forest resource users can be involved in maintenance of these trees at their plant stage.

(vi). Need for systematic removal of available trees in forest buffer zone-2

The planted *Araucaria* (*Araucaria cookie*) species in the forest buffer zone-2 is ineffective as a forest resource and even it hinders the development of a secondary forest. Hence, this species should be systematically removed from forest buffer zone-2 and useful species as forest produces should be replanted in the buffer zone through a community based programme.

(vii). Establishment of an organization to monitor and assess the state of forest buffer zones

An organization, which is responsible for monitoring and assessment of the well-being and productivity of the established buffer zones should be set up within the site with the involvement of the Forest Department as well as community members.

(viii). Establishment of a research unit

It is important to set up a unit within the pertinent sites, which can research on the effectiveness of forest buffer zones and to assist researchers carrying out research on the established forest buffer zones. While accomplishing project goals this knowledge could help to increase effectiveness and well-being of the established forest buffer zones.

Moreover, the establishment of such a research unit can assist in rural development and forest conservation using multiple approaches such as the conduct of community awareness and educational programmes and encouragement of eco-tourism industry related to forest buffer zones.

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Appendices

Chapter 05 Appendices Tables:

Utilization of forest resource by major categories

1. Non-Timber Forest Produces (NTFP)

1.1 Edible Forest Produce

Appendices Table 01: i. *Kitul* tapping for sweet toddy

Widely used species	Using Material or Part	Production or Using Methods
<i>Kitul</i> palm only (<i>Caryatid urns</i>)	Sweet toddy	<i>Kitul</i> jaggery, <i>Kitul</i> Honey, <i>Kitul</i> toddy

Source: Observations, discussions and questioner survey of the study

Appendices Table 02: ii. Substitute foods for staple foods

Widely used species	Using Material or Part	Production or Using Methods
Hal (<i>Vateria copallifera</i> *)	Fruit	Hal <i>Pittu</i>
Bearliya (<i>Shorea megistophylla</i> *)	Seeds	<i>Beraliya rotty</i> , <i>Beraliya Helapa</i> , <i>Beraliya Pittu</i>
Bedi del (<i>Artocarpus nobilis</i> *)	Seeds	Cooked seeds are used as a staple food
Goonala (<i>Dioscorea intermedia</i>)	Root	Boiled roots are used as a staple food
Katuala (<i>Dioscorea pentaphylla</i>)	Root	Boiled roots are used as a staple food
Tholol (<i>Ampelocissus indica</i>)	Seeds	Cooked seeds are used as a staple food
Uruala (<i>Cyclea indicum</i>)	Root	Boiled roots are used as a staple food

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

Appendices Table 03: iii. Green vegetables

Widely used species	Using Material or Part	Production or Using Methods
Wenila (<i>Coscinium fenestratum</i> *)	Leaves and tender twigs	Leaves and tender twigs are used to make curries
Thebu (<i>Costus speciosus</i>)	Leaves and tender twigs	Leaves and tender twigs are used to make a curries
Keran koku (<i>Acrostichum aureum</i>)	Leaves and tender twigs	Leaves and tender twigs are used to make curries
Hinbovitiya (<i>Osbeckia octandra</i>)	Leaves and tender twigs	Leaves and tender twigs are use to make curries
Kohila (<i>Monochoria hastate</i>)	Leaves and tender twigs	Leaves and tender twigs are used to make curries
Monarakudumbiya (<i>Vernonia cinerea</i>)	Leaves and tender twigs	Leaves and tender twigs are used to make curries
Hatawariya (<i>Asparagus racemosus</i>)	Leaves and tender twigs	Leaves and tender twigs are used to make curries
Wenila(<i>Coscinium fenestratum</i> *)	Leaves and tender	Leaves and tender twigs are used to make curries

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 04: iv. Collecting forest produce for porridges

Widely used species	Using Material or Part	Production or Using Methods
Weniwel(<i>Coscinium fenestratum</i> *)	Stem	Parts of stem are boiled to make fluid
Eramusu (<i>Hemidesmus indicus</i>)	Leaves and roots	boiled leaves and roots are used to make a fluid

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 05: v. collecting forest produce for beverages

Widely used species	Using Material or Part	Production or Using Methods
Weniwel(<i>Coscinium fenestratum</i> *)	Stem	Parts of stem are boiled to make fluid
Eramusu (<i>Hemidesmus indicus</i>)	Leaves and roots	boiled leaves and roots are used to make a fluid
Bearliya(<i>Shorea megistophylla</i> *)	Seeds	boiled seeds are used to make a fluid
Kotalahibutu (<i>Salacia reticulate</i>)	lianas	Parts of these medicinal plant are used to make beverages

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 06: vi. Fruits

Widely used species	Using Material or Part	Production or Using Methods
Wal aba (wild mango) (<i>Mangifera zeylanica</i> *) Bedi del (<i>Artocarpus nobilis</i> *) Kekuna (<i>Ganarium zeylanicum</i> *) Hibutu (<i>Salacia reticulate</i>) Etaba (<i>Mangifera zeylanica</i> *) Vralu (<i>Elaeocarpus laevis</i>) Dan (<i>Syzygium aromaticum</i>) Eraminiya (<i>Zizyphus napeca</i> *) Gokatu (<i>Garcinia morella</i>) Gambi (<i>Madhuca neriifolia</i>) Mihiriya (<i>Palaquium grande</i> *) Mora (<i>Euphoria longana</i>)	Fruit	when ripped used as fruits

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 07: vii. Condiments

Widely used species	Using Material or Part	Production or Using Methods
<i>Wal Enasal (Elettaria ensal*)</i>	<i>Wal Enasal</i> capsules	<i>Enasahl</i> (After sun drying send to market as condiments)
<i>Wal Kurundu (Cinamomum multifolium*)</i>	stem of <i>Walkurudu</i> tree	<i>Kurudu Potu</i> (bundled shale of Walkurudu stem are send to market)
<i>Wal inguru (Zingiber cylindricum*)</i>	Root crop	<i>Inguru</i> (after sun drying, use as a condiment)
<i>Goraka (Garcinnia cambogia)</i>	Ripe Fruit	Goraka (after sun drying the peel of Ripe Goraka fruits are used as a condiment)
<i>Wal Gammiris (Piperargyrophyllum*)</i>	<i>Wal Gammiris</i> capsules	Gammiris (after sun drying, use as a condiments)

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 08: viii. Other edible foods

Widely used species	Using Material or Part	Production or Using Methods
Mushroom species Adavi hatu Idalolu Kadan hatu Lenahatu Weli hatu Hin weli hatu	Mushrooms	Use to make curries
Bee honeys Mee peni Babara peni Kana me peni Daduwel be peni Debara peni	Bees' honey	Use as a food, preservative or medicine

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 09: 1.2 Species of Medicinal Value

Widely used species	Using Material or Part	Production or Using Methods
<p>Weniwelgeta (<i>Coscinium fenestratum</i>)* Binkohoba (<i>Munronia pumila</i>) Iddi (<i>Phaseolus aconitifolius</i>*) Kokum (<i>Kokoon zeylanica</i>*) Kekuna (<i>Canarium zeylanicum</i>) Godamedella (<i>Barringtonia ceylanica</i>*) Iruraja (<i>Zeuxine regia</i>*) Godapara (<i>Dillenia triquetra</i>*) Vanaraja (<i>Anoectochilus setaceus</i>*)</p>	Barks, leaves, lianas	Barks, leaves, lianas are used in several ways to make medicines against blood poisoning in snake bites
<p>Binkohoba (<i>Munronia pumila</i>) Tabutu wel (<i>Calamus ovoideus</i>*) Pus wel (<i>Entada phaseoloides</i>) Hathawariya [<i>Asparagus falcatus</i> & <i>Asparagus racemosus</i> (wild)] Rathsada (<i>Pterocarpus santalinus</i>) Walkobo (<i>Allophylus zeylanicus</i>)</p>	Barks, leaves, lianas	Barks, leaves, lianas are used in several ways to make remedy in orthopedic medicine
<p>Weniwelgeta (<i>Coscinium fenestratum</i>)* Kothalahibutu (<i>Salacia reticulate</i>) Goda medella (<i>Barringtonia ceylanica</i>*) Gediba (<i>Trema orientale</i>) Godapara (<i>Dillenia triquetra</i>*)</p>	Barks, leaves, lianas	To make remedy for minor injuries
<p>Beraliya (<i>Shorea megistophylla</i>*) Godamedella (<i>Barringtonia</i>*) Kirimavarana (<i>Holarrhena mitis</i>*)</p>	Seeds, Barks, leaves, lianas	Parts of these medicinal species are used to make medicine for Diarrhea
<p>Kotalahibutu (<i>Salacia reticulate</i>) Weniwelgeta (<i>Coscinium fenestratum</i>*) Beraliya (<i>Shorea megistophylla</i>*)</p>	Seeds, Barks, leaves, lianas	Parts of these medicinal species are used to make medicine for Diabetes

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Widely used species	Using Material or Part	Production or Using Methods
Kekuna (<i>Canarium zeylanicum</i>) Hora (<i>Dpiterocarpus zeylanicus*</i>) Ginihiriya (<i>Exacum trinerva*</i>) Godamedella (<i>Barringtonia*</i>)	Seeds, Barks, leaves, lianas	Parts of these medicinal species are used to make medicines for Typhoid
Badulla (<i>Semecarpus coriacea*</i>) Kalu Badulla (<i>Semecarpus coriacea*</i>) Galdemata (<i>Impatiens repens</i>) Kohila (<i>Lasia spinosa</i>)	Seeds, Barks, leaves, lianas	Use as a remedy for Hemorrhoids
Wenivelgeta (<i>Coscinium fenestratum*</i>) Hora (<i>Dpiterocarpus zeylanicus*</i>) Sudu idda (<i>Wrightia antidysenterica*</i>) Kekuna (<i>Canarium zeylanicum</i>)	Seeds, Barks, leaves, lianas	Use as a remedy for oral diseases
Rathkeliya (<i>Litsea longifolia*</i>) Dorana (<i>Dipterocarpus glandulosus</i>) Badulla (<i>Semecarpus coriacea</i>) Kalu Badulla (<i>Semecarpus subpeltata*</i>) Aththora (<i>Atylosia trinervia</i>) Nidikumba (<i>Mimosa pudica</i>) Ketakeralla (<i>Bridelia retusa</i>) Pathkella (<i>Bridelia moonii*</i>)	Seeds, Barks, leaves, lianas	Use as a remedy for eczema and other skin disorders
Godamedella (<i>Barringtonia*</i>) Ginihiriya (<i>Exacum trinerva*</i>) Sudu idda (<i>Wrightia antidysenterica*</i>)	Seeds, Barks, leaves, lianas	Use as a medicines for tonsillitis
Okeiya (<i>Pandanus celanicus</i>) Aththora (<i>Atylosia trinervia</i>) Nidikumba (<i>Mimosa pudica</i>) Sudu idda(<i>Wrightia antidysenterica*</i>)	Barks, leaves, lianas	Use as a remedy for sore eyes and other eye related diseases
Rathkeliya (<i>Litsea longifolia*</i>) Girithalla (<i>Argyreia populifolia*</i>)	Barks, leaves, lianas	Use as a remedy for diseases in nervous system and phlebitis

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

1.3 Non-Edible Forest Produce (NEFP)

Appendices Table 10: i. Binding material

Widely used species	Using Material or Part	Production or Using Methods
Bandura (<i>Nepenthes distillatoria</i>) Pus wel (<i>Entada phaseoloides</i>) Ban wel (<i>Coscinium sativum</i> *)	Vine	As Binding Materials
Waduru wel (<i>Calamus zeylanicus</i> *) Wewel (<i>Calamus rotang</i>) Kukulu wel (<i>Calamus radiatus</i> *) Tambotu wel (<i>Calamus ovoideus</i> *) Wewel (<i>Calamus rotang</i>)	Vine	Use as a row material for weaving baskets, furniture etc

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

Appendices Table 11: ii. Fuel wood

Widely used species	Using Material or Part	Production or Using Methods
Kekuna (<i>Canarium zeylanicum</i>) Yakahalu (<i>Doona trapezifolia</i>) Ketakeralla (<i>Bridelia retusa</i>) Hal milla (<i>Berrya cordifolia</i>) Welipiyanna (<i>Anisophyllea cinnamomoides</i> *) Kekariwara (<i>Schumacheria castaneifolia</i>) Gulumora (<i>Prunus walkeri</i>) Polhedawaka (<i>Chaetocarpus coriaceus</i>) Albezia (<i>Albezia molucana</i>)	Parts of tree	Fuel wood

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

Appendices Table 12: iii. Resins

Widely used species	Using Material or Part	Production or Using Methods
Dummala (<i>Shorea oblongifolia</i> *) Dorana (<i>Dipteracanthus glandulosus</i>)	Resins	Use in ceremonial dance and traditional painting industries

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

Appendices Table 13: vi. Thatching leaves

Widely used species	Using Material or Part	Production or Using Methods
Beru (<i>Agrostistachys coriacea</i> *) Mahaberu (<i>Agrostistachy hookeri</i> *) Iluk (<i>Imperata cylindrica</i>) Batakola (<i>Ochlandra stridula</i> *)	Leaves	For thatching

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

2. Timber (logging and sawing for timber)

Appendices Table 14: logging and sawing for timber

Widely used species	Using Material or Part	Production or Using Methods
Milla (<i>Vitex pinnata</i>) Hal milla (<i>Berrya cordifolia</i>) Uru hoda (<i>Kurrimia ceylanica</i> *) Weli piyanna (<i>Anisophyllea cinnamomoides</i> *) Hora (<i>Dpiterocarpus zeylanicus</i> *) Beraliya (<i>Shorea megistophylla</i> *) Pelenga (<i>Putranjiva zeylanica</i> *)	Timber	Use as building or furniture materials, etc

Source: Observations, discussions and questioner survey of the study
(* Endemic species to Sri Lanka)

3. Other (Excepts Non-Timber and Timber forest resources)

Appendices Table 15: i. Poaching

Widely used species	Using Material or Part	Production or Using Methods
Wild pig (<i>Sus scrofa cristatus</i>) Sambhur (<i>Cervus unicolour</i>) Mouse Deer (<i>Tragulus meminna</i>) Baking deer (<i>Muntiacus munttajak malabaricus</i>) Leopard (<i>Panthera pardus fusca</i>) Black monkey (<i>Canis aureus lanka*</i>) Western purple- faced leaf monkey (<i>Macaca sinica aurifrons</i>) Jungle fowl (<i>Gallus lafayetii</i>)	Meat and skin	Meat and skin

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

Appendices Table 16: ii. Gem mining

Widely used gem verities	Using Material or Part	Production or Using Methods
cat's eye, turquoise, ruby, tourmaline	Precious stones	Precious stones

Source: Observations, discussions and questioner survey of the study
 (* Endemic species to Sri Lanka)

A copy of questionnaire that used for the study

The Effectiveness of Establishment of forest Buffer Zones for Community Forest Management (A Case Study from Sripada Tropical Peak Wilderness Sanctuary in Sri Lanka)

Researcher

HIGC Kumara

Lecturer, University of Ruhuna

Matara, Sri Lanka

SECTION 1

Village/ Grama Niladari Division

HH No.

Interviewer

Date

Interviewee Name/s

HHH's² Name

SECTION 2: HOUSEHOLD DETAILS (list in order of age beginning with the HHH, put asterisk beside HH member numbers that are present during interview)

	1. Relation-ship to HHH	2. Age [years]	3. Gender [M/F]	4. Marital status	5. Resident in HH (yes/no)	6. Education level	7. Monthly income	Occupation	
								8. Main	9. Secondary
1	HHH								
2									
3									

¹ House Hold

² House Hold Head

4									
5.									
6.									
7.									
8.									
9.									
10.									

SECTION 3: INFORMATION OF HOUSEHOLD ASSETS & HOUSING STANDARDS

Land Ownership

1. Relationship to HHH	2. Amount of HH land (acres/perch)	3. Distance to forest from HH	4. Ownership of land	5. Paddy land	6. Distance to forest from HH	7. Ownership of land	8. Other (specify)	9. Distance to forest from HH	10. Ownership of land

Household living standards

HOUSING STANDARDS		SERVICES/AMENITIES				
	1. Standard	If yes x	2. Service/amenity	If yes x	3. Consumer goods owned by household	If yes x
1.	Permanent		Piped water		Bicycle	
2.	Semi-permanent		Pit latrine		Motorbike	
3.	Temporary		Flush toilet		Motor vehicle (car or pick-up)	
4.	Mud walls		Electricity		Mobile phone	
5.	Brick or cement walls		Air-conditioning		Landline phone	
6.	Thatched roofing		Other (specify)		Radio	
7.	Permanent roofing		Other (specify)		TV	
8.	Large size (4 or more rooms)				Internet access	
9.	Medium size (2-3 rooms)				Other (specify)	
10.	Small (1 room)					
11.	Other (specify)					

SECTION 4: INFORMATION OF FOREST RESOURCE UTILIZATION

1. Do you gather (Edible) Non Timber Forest Produces? Yes No
 If yes, how often
 Occasionally used to often

2. Information of Non Timber Edible Forest Produce (NTEFP) gathering –

Category	NTEFP Forest produce	Collector	Place of extraction			Amount collected (per annual) period	Collecti ng period	Purpose ³	Income (Rs)
			Forest	Buffer zone 01	Buffer zone 02				
Kitul tapping									
Fruits									
Spices									
Vegetables/ green leaves									
Root crops									
Mushrooms									
Bee's honey									
Other									

³ Purpose = 1 only for subsistence 2. Only for sale 3. Both for subsistence and sale

3. Do you gather (Non Edible) Non Timber Forest Produces? Yes No
 If yes, how often
 Occasionally used to often

4. Information of Non Timber Non Edible Forest Production gathering (NTNEFP)

Category	NTNEFP Forest production	Collector	Collecting place			Amount collected (per annual)	Collecti ng period	Purpose	Income (Rs)
			Forest	Buffer zone 01	Buffer zone 02				
Fire woods									
Vines									
Thatching leaves									
Other									

5. Do you collect medicinal plant species in the forest? Yes No
 If yes, how often
 Occasionally used to often

6. Information of Medicinal Plant gathering

Category	Medicinal Plants			Collector	Place of extraction			Amount collected (per annual)	Collecting period	Purpose	Income (Rs)
	Forest produce				Forest	Buffer zone 01	Buffer zone 02				

7. Do you extract timber from the forest? Yes No
 If yes, how often
 Occasionally used to often

8. Information of Timber extraction from the forest

Category	Timber			Collector	Place of extraction			Amount collected (per annual)	Collecting period	purpose	Income (Rs)
	Forest produce				Forest	Buffer zone 01	Buffer zone 02				

9. Other forest resource utilization practices

9.1 Do you participate in poaching within the forest Yes No

If yes, how often

Occasionally used to often

9.2 Do you participate in gem mining within the forest Yes No

If yes, how often

Occasionally used to often

9.3 Do you clear the forest for cultivation? Yes No

If yes, how often

Occasionally used to often

10. Information of Other practices of forest resource utilization

Category	Other Forest produce	Collector	Place of extraction		Amount collected (per annul)	Collecti ng period	Purpose	Income (Rs)
			Forest Buffer zone 01	Buffer zone 02				
Poaching								
Gem Mining								
Clearance of forest								
Other								

SECTION 05: COMMUNITY FOREST MANAGEMENT AND ESTABLISHMENT OF FOREST BUFFER ZONES

1. Is there an established forest buffer zone in your area? Yes No

2. If yes, your involvement in different phases in the project of establishment of the buffer zone

(i) Level of your involvement in discussions about project policy, strategies and stakeholders of the project is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(ii) Level of your involvement in discussions about objectives, and benefits of the project is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(iii) Level of your involvement in discussions about role played by the community within the project is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(iv) Level of your involvement in selecting of flora species which are intended to be planted in establishing forest buffer zones is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(v) Your willingness of the establishment of forest buffer zones:

High	<input type="checkbox"/>
Fair	<input type="checkbox"/>
Low	<input type="checkbox"/>
Don't mind	<input type="checkbox"/>

(vi) Specify your answer for the above

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.....

(vii) Level of your contribution and your labour during the process of implementation of the project is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(viii) Level of your involvement in maintenance process of planted trees is:

Good	<input type="checkbox"/>
Satisfactory	<input type="checkbox"/>
Feeble	<input type="checkbox"/>
Non	<input type="checkbox"/>

(ix) Level of your involvement in management and looking after of the establish buffer zones is:

Good
Satisfactory
Feeble
Non

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(x) Level of your involvement in using forest resources in the forest buffer zone 01 and 02 is:

01

Good
Satisfactory
Feeble
Non

--	--	--	--

02

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(xi) Level of your involvement in monitoring and evaluation of the project is:

Good
Satisfactory
Feeble
Non

--	--	--	--

03. Legality of forest resources utilization in the forest buffer zones is:

Extremely high
High
Satisfactory
Average
Poor

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04. Effectiveness of the forest buffer zone 01 and 02 in fulfilling your needs for forest resource utilization is:

- Extremely high
- High
- Satisfactory
- Average
- Poor

01

02

05. Effectiveness of forest buffer zones 01 and 02 in conservation of the *Sripada* Tropical Peak Wilderness Sanctuary is:

- Extremely high
- High
- Satisfactory
- Average
- Poor

01

02

06. Any other viewpoints regarding the establishment of forest buffer zones to conserve the dense forest?

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