DEPENDENCE ON NON TIMBER FOREST PRODUCTS (NTFP) FOR THE SUSTAINABLE LIVELIHOOD ENHANCEMENT OF TRIBALS OF WESTERN ATTAPPADY

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled **"Dependence on non timber forest products (NTFP) for the sustainable livelihood enhancement of tribals of Western Attappady"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, fellowship or other similar title, of any other University or Society.

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INTRODUCTION

Non Timber Forest Products (NTFP's) play a crucial role in the daily life and welfare of the people all over the world. The livelihoods of the people living close to the forest and within the forests are inextricably linked to the forest ecosystem. Non timber forest products gained global attention in recent times through its contribution to food security, income and employment for the indigenous communities, enabling forest based enterprises, potential for export market and biodiversity conservation. About 25 per cent of the world population depends on various degrees on the forest resources to meet their livelihood. Most of the NTFP's are collected to support every day livelihood of indigenous people as supplementary foods during food scarcity periods and to generate additional income during off- farm seasons. The 350 million people living near the forest areas are depending heavily on the forest resources for sustaining their livelihood. NTFP species can have both consumptive and non-consumptive benefits at the household level. The forest products which are edible add colour, flavour and ensures that the nutrient and dietary requirements are met. The rhizomes, leaves, tubers, nuts and fruits will make their diet more delicious. The medicinal plants, resins, tans, dyes, oils and gums have their own significant contribution to the life of the people. Thus after recognizing the important contribution of NTFP's to the livelihood of the people, its name was changed from minor forest produce to non- timber forest products.

The tribal populations are having a life based on the natural environment and have cultural patterns pertaining to their physical and social environment. Their health, customs, beliefs and entire livelihood are linked to the forests. Most of the tribal groups have a good knowledge of their surrounding flora and fauna. They do have a well developed medicinal system developed through the long years of trial and error methods. This vital knowledge about the utilization of these plant resources are orally transformed to the next generations. From their frequent interaction with the nature,

they had developed the skill to identify or differentiate between the useful plants and harmful plants.

India has 2 per cent of the world's forest cover and has to serve about 15 per cent of the world population. The tribal population in India according to the 2011 census is 104.3 million. It is estimated that the 275 million rural poor in India depend on NTFP to a certain extent as part of their subsistence or cash livelihoods. Since our forests are diverse enough there are large number of non-timber forest products (NTFP's), such as medicinal and aromatic plants, leaves, fruits, seeds, resins, gums, bamboos and canes that offer various uses and employment to the indigenous people. The medicinal plants serve as an important component of the plant resource wealth of our country. The collection and trade in medicinal plants constitute a major share of the livelihood activities of the forest dwellers in India. There are about 3000 NTFP yielding plants species in our forests. Out of these, 325 species are commercialized, 1500 species are used locally and 1343 species are lesser known. Our forests provided year round employment to 20 million people who belonged to 250 tribal communities in India. The Western Ghats which constitute less than 6 per cent of India harbors over 3500 species. About 1900 species are endemic and atleast 300 NTFP species occur in the diverse forest ecosystem. The wild food plants are used as common household food and make a substantial contribution to the subsistence livelihood of the tribal people in many parts of Nilgiri Biosphere Reserve. They consume a variety of seasonal fruits, vegetables and tubers quite frequently to enrich their diets. The tribes of Western Ghats region depend around 50-60 per cent on NTFP's as a major source of income and employment. Most of the tribal groups try to get involved in the NTFP collection as means of subsidiary source of income for them.

The Western Ghats one among the twelve bio diversity hot spots in the world occupies 56 per cent area of Kerala. In the forests of Kerala, there are about 750 tree species of which 35 per cent are endemic to Western Ghats. There is about 540

species that yield non- timber forest products in Kerala. The majority of the NTFP's are medicinal plants. According to the Kerala Forest Department 900 species found in Kerala are having medicinal value. Among those, 540 species are reported to occur in the forests. Nearly 60-65 per cent of the plants required for ayurvedic medicine and almost 80 per cent of plants used in Sidha medicine are found in forests of Kerala.

The tribal population in Kerala according to the 2011 census is 4,84,839, which constitute 1.5 per cent of the overall population of the state. The 3 main tribal districts in Kerala are Wayanad, Idukki and Palakkad. Out of 4000 tribal settlements, 671 are forest settlements. The Cholanaickans, Koraga, Kadar, Kattunaikkan and Kurumbas are the primitive tribes in Kerala who leads a foraging way of life. These people living around the forest area depend heavily on the forest resources for sustaining their livelihood. The collection of NTFP's is the major occupation of more than 68 per cent of the tribals in Palakkad, Thrissur, Wayanad and Kannur districts. The tribes residing in the interior areas depend on the forest resources for food, medicine, construction, religious ceremonies, firewood purpose and commercial collection of NTFP. The tribal communities make use of 2000 species of lesser known wild plants for the medicinal purpose. Some of the studies have shown that the NTFP collection contributed 58 per cent of total income of the tribes. The tribals of Wayanad make use of 434 flowering plants for various purposes, of which 184 are used for food, 244 for medicinal use and 68 plants are used for other purposes. These studies point towards the dependence of the tribal people on NTFP species and highlight the contribution of NTFP sector to the livelihood of the tribes. This emphasizes the need for conserving the forest resources, especially the NTFP species. Through the conservation of NTFP species, we could sustain and enhance the livelihood opportunities of the tribes for a better life.

In India out of 3000 NTFP species, only 126 products have well developed marketing channels. The Forest Development Corporation (FDC), Girijan Cooperative Corporation (GCC), Large-scale Adivasi Multi-purpose Society (LAMPs) and Minor

Forest Products Federation (MFP) are involved in the procurement of NTFP's in different states of India. The Kerala State SC/ST Federation, private traders and tribes are the three main marketing agents dealing with the marketing of NTFP in the state. About 36 Tribal Service Co-operative Societies (TSCS) are engaged in the NTFP collection, which cover about 398 tribal settlements. The marketing of NTFP are the only source of income for the tribes who are settled in the interior areas of the forest. The studies show the Cholanaickans in Nilambur and Kattunaickans in Wayanad, who are particular vulnerable tribes, depend heavily on marketed NTFP for sustenance and earned an annual income of Rs. 3824 and Rs. 8333 respectively. According to the Kerala Forest Department the sales of NTFP through SC/ST Federation during 2011-12 was around Rs. 45,770,667 and total quantity of NTFP procured was 1,199,304 Kg. Even though the Federation is showing an increase in the every year turn over, the benefits have not been ploughed back to the gatherers. Inadequate storage facilities and lack of funds during the peak collection season are the main limitations of the societies. The private traders offers higher price to the tribes, but cheat them through under weighing of the products. Some of the studies show that the 50 per cent of the final consumer price is captured by the various marketing channels. Even if there are some studies dealing with marketing of NTFP's in Kerala, the data regarding efficiency of various marketing channels and contribution to the collectors are lacking in these studies.

Attappady is a tribal dominated area in Kerala. The tribal population which constituted 90 percent of the total population of Attappady in 1951 reduced to 41 percent by 2011, because of high influx of settlers. The ethno botanical studies carried out in Attapady hills of Western Ghats found that a total of 301 plant species were used as medicine, wild food, agricultural crop, wood, timber, fiber and fuel. The collection, consumption and marketing of NTFP's are livelihood strategy of the tribal and rural populations living in and around the forest areas. There is very little information on the role played by the NTFP in the livelihood of the tribal people and the tribal economy in Kerala. Even though there were ethno-botanical studies among the tribes of Attappady, no studies have looked into the contribution of NTFP's to the

tribal economy and livelihood. The present work looks into the level of dependence of tribal people on NTFP and probe the marketing mechanism of NTFP's in Western Attappady. The different NTFP's collected, utilized for sustaining and enhancing the tribal livelihood will also be documented as part of this study.

Review of Literature

REVIEW OF LITERATURE

2.1. DEFINITION AND CLASSIFICATION OF NTFP

Non-Timber Forest Product (NTFP) have been defined as 'all the biological material other than industrial round wood and derived sawn timber, wood chips, wood-based panels and pulp that may be extracted from natural ecosystems, managed plantations, etc., and be utilized within the household, be marketed, or have social, cultural or religious significance' (Wickens, 1991). FAO (1995) definition for NTFP was NTFP's consist of goods of biological origin other than wood, as well as services, derived from forests and allied land uses. Another definition by Arnold and Perez (1996) states NTFP as any non-timber product that was dependent on a forest environment. Chamberlain *et al.* (1998) defined non-timber forest products are plants, parts of plants, fungi, and other biological materials which are harvested from within and on the edges of natural, manipulated or disturbed forests. Later FAO (1999) defined NTFP as 'goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests'. Non timber forest products may be gathered from the wild, or produced in forest plantations, agroforestry schemes and from trees outside forests.

Primarily NTFP can be classified as plant and animal products based on their sources. The various sources of NTFP's include trees, shrubs, herbs, grasses, palms, insects, reptiles and animals. The plants are further classified into annual, biennial and perennial. The animals are classified into lower and higher groups. Once they are broadly classified as per their source, then classification is done based on their uses (Muraleedharan, 2003). NTFP includes a wide range of food, fodder, fiber, fertilizer, organic construction materials, non-wood ligno-cellulosic products, natural dyes, tannins, gums, resins, latex and other exudates, waxes, essential oils, spices, edible oils, medicinal extracts, phyto-chemicals, aroma-chemicals, decorative articles, horns, bones, pelts, plumes, hides and skins (MNRTFBD, 2000). Upadhyay and

Pandey (2003) categorized NTFP into those that are raised in forest areas and those that grow in the forests naturally.

2.2. THE STATUS OF NTFP

Non Timber Forest Products (NTFP) play a crucial role in the daily life and welfare of people all over the world. NTFP have attracted considerable global interest recently due to its contribution to food security, income and employment generation for the forest dwellers, providing opportunities for forest based enterprises, potential for export market and support to biodiversity conservation (Kamboj, 2008). Killman (2003) estimated that of the 6.2 billion people on the planet, 25 per cent depend to varying degrees on the forest's resources for their livelihood and 350 million people living in or near dense forest depend highly on it for their subsistence or livelihood. Livelihood was defined by Ellis (2000) as 'the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household'.

According to Marshall *et al.* (2006) the well-being of more than half of the 1.2 billion people who live in poverty depends to a significant degree on the availability of non-timber forest products. Non timber forest products are often one of the few income opportunities, contributing anything up from 6 per cent to 95 per cent of a household's annual income, providing a safety net when other activities fail to provide income and opportunity to generate cash for rural communities and their food security (Shackleton *et al.*, 2007). Food and Agriculture Organization (1997) estimated that 80 per cent of the population of the developing world use NTFP's to meet some of their health and nutritional needs. According to Belcher *et al.* (2005) NTFP's are important as an additional source of cash income and its production has often been considered more compatible with biodiversity conservation than timber extraction or agriculture. NTFP production rarely competes with other agricultural

activities because forest products are usually collected when labour requirements for agriculture are low (Belcher and Kusters, 2004).

2.2.1. NTFP in international trade

International trade in NTFP's composed of imports and exports of numerous products at different stages of processing (FAO, 2004). Worldwide over 150 NTFP's were identified as significant commodity in international trade and among them the most important tropical products are rattan, Brazil nuts, gum arabic, bamboo and spices (Stark *et al.*, 2008). Walter (2003) reported that the most important NTFP's contributing to international trade are medicinal plants, nuts, ginseng roots, cork and cork products and essential oils. Food and Agriculture Organization (2007) identified China as the exporter of the largest quantities of wild plants and animals and estimated the value of international trade of NTFP as US$11 billion per annum. The international trade of NTFP significantly generated income for the resource harvesters and collectors as well as many other actors in the commodity chain. FAO estimated that NTFP's are capable of generating 4 million man-years of employment annually (FAO, 2002; FAO, 2005). World production of essential oils (excluding turpentine oil) is estimated to be about 105000 tones to the tune of US$ 922 million (Varshney *et al.*, 2001).

The products such as tara, algarrobos and brazil nut are the main traded products that constitute 62 per cent of the total value of Peru's NTFP sector. They obtained an amount of US$ 163 million through export of NTFP (Lvanova, 2012). In Nigeria the NTFP's indicated by the households include mushroom (20 %), gathered fuel wood (15 %), wrapping leaves (15 %), herbs (5 %), vegetables (5 %), snails (5 %), bushmeat (5 %), fuel wood products (5 %), building Poles (5 %), honey (5 %), fruits and nuts (10 %) (Odebode, 2003). Most of the NTFP's are gathered rather than cultivated and there is usually limited value addition at source. However, they are a significant source of cash income generation for the rural poor. Their total cash and subsistence value is likely of the order of over $100 billion a year (INBR, 2005).

Every year between 10,000 and 15,000 tonnes of NTFP's are harvested in Nepal; the trade of these 161 NTFP species contributes an estimated equivalent of US $ 8.6 million to its economy (Binayee and Gyawali, 2007). About US$ 10 million of medicinal and aromatic plants are exported from Nepal annually (UNEP, 2012). Pervez (2002) revealed that in Dhading district of Nepal, the NTFP sector generated maximum employment (60.72 %), followed by agriculture (22.30 %), allied activities (15.83 %) and other sources (1.16 %). The alternative income earning opportunities have substantially reduced the dependency on NTFP (Senerate *et al.*, 2003).

In Cameroon the 500 plus species of NTFP's that are recorded are being used as food, medicine and fuel. About 50 per cent of these species are for subsistence or used locally and about half of the species are known to be traded, with 25 per cent having national or international markets (Walter, 2001). Food and Agriculture Organization (2007) have estimated the annual commercial value of highly traded NTFP such like bush mango (*Irvingia spp*) and African plum or safou fruit (*Dacryodes edulis*) as US$ 7 billion and US$ 825714 respectively. A study by Shackleton (2004) in South African context showed that, 85 per cent of rural households use NTFP's for consumption purposes and women collected 73 per cent of total NTFP's, whereas men gathered only 27 per cent (Paumgarten, 2005). Another study of Cernea and Soltau (2006) found that the forest communities generated 67 per cent of their total income from gathering and only 33 per cent from agriculture, labour and employment in Central Africa.

2.2.2. NTFP status in India

India has 2 per cent of the world's forest cover and has to serve about 15 per cent of the world population. Our forests provide year round employment to 20 million people. Forests form a part of the tribal culture and had been a natural way of life for the tribes. It was estimated that 275 million poor rural people in India, 27 per cent of the total population depend on NTFP's for at least part of their subsistence and cash livelihoods (Malhotra and Bhattacharya, 2010). Hegde (2005) reported that the

forests in India provide about 50-60 million tons of forage and a wide range of food oilseeds, medicinal herbs and aromatics every year. Since our forests are diverse enough there are large number of NTFP's, such as medicinal and aromatic plants leaves, fruits, seeds, resins, gums, bamboos and canes that offered employment and provided up to half the income of about 25 per cent of the country's rural labour force (Rasul *et al.*, 2008). There are more than 3000 plant species that provide economically useful NTFP's in India (Dubey 2007). According to FAO (2002) in India, 325 species of NTFP's which are very common and commercial have a base in major industries; 879 species are used locally; 677 species are potentially useful only locally and 1343 species can be described as others lesser known. About 100 million people living in and around forest area depend on collection and marketing of NTFP for their subsistence and cash income (Saxena, 2003). More than 100 million rural people depend on the sale of NTFP's for their livelihoods. It is estimated that NTFP based small-scale enterprises provide up to 50 per cent income for 20 - 30 per cent of the rural labour force (MoEF, 2010b). Shiva and Mathur (1996) estimated that 1.4 million person-years of employment in India are derived from NTFP's, while the forestry sector in total provides 2.3 million person-years of employment.

The commercial value of the NTFP's in India is currently estimated at an average of $11 billion but the NTFP trade distortions and poor marketing account for 70 per cent average loss in returns to these communities (Choudhury, 2007). A recent statistics of RCDC (2006) says export of gums and resins from India were to the tune of Rs. billion per annum and more than 85 per cent of the total gums and resins produced in the country are exported. The oleoresin production ranges between 25000-30000 tons per year, out of which about 10000 tons was the share of Himachal Pradesh (Sharma *et al.*, 2005). A study by Hegde and Sirsi (2006) in Uttar Kanada district found *Pterocarpus marsupium, Aegle marmelos, Garcinia morella, Butea monosperma* and *Boswellia serrata* are the important gum and resin yielding species. About 8 different oil-seed producing tree species exist in India (FAO, 2002). In case of non

edible oilseeds such as Neem, hardly 20 per cent of the total production is collected and utilized while the remaining quantity is wasted (Hegde, 2005).

Bhattacharya (2007) have reported that Madhya Pradesh is the largest producer of tendu leaves in the country, accounting for 58.01 per cent of the country's total production. In the dry deciduous forests of central India, NTFP's are the major source of livelihood and income generation to the local people (Bhattacharya and Hayat, 2004). Nearly 75 percent of the NTFP's are collected from the central Indian states such as Maharashtra, Madhya Pradesh, Chhattisgarh, Orissa, Jharkhand and Andhra Pradesh. The major NTFP's commercially exploited in the country include bamboo, tendu leaf, mahua flower and seed, sal leaf and seed, gum karaya (kullu gum), lac resin, aonla or amla fruit, tamarind, *Buchanania lanzan* (Chironji), myrobalans, honey and *Strychnos nux-vomica* (Dogra, 2012). Ministry of Environment and Forest (2010a) reported among the NTFP's, the leaves of *Diospyros melanoxylon* (tendu leaves) used as wrappers for making bidies (country cigarettes) are the most important and this cottage industry provides job for about 10 million people. The first NTFP brought under state control was tendu leaves. Nearly half of the country's forest revenue and 70 per cent of export forest revenue comes from NTFP's (Tiwari and Cambell, 1997; UNDP, 2007). The estimates show that tribal households get around 23 per cent of their total income from NTFP's resources from the forest areas (Behera, 2009).

The hill ranges of Western Ghats cover less than 6 per cent of India's landmass but harbor more than 30 per cent of the world's plant and vertebrate species and are thus considered to be one of the global biodiversity hotspot (Myers *et al.*, 2000). Bag *et al.* (2010) have reported the Western Ghats harbors over 3500 species and about 1900 species are endemic, at least 310 NTFP species are collected and the major commercial NTFP's are rampatre (*Myristica malabarica*), dhoop (*Vateria indica*) and *Garcinia gummigatta*. *Elettaria cardamomum* (Elakkai) occurs in its natural state only in the tropical evergreen forests of Western Ghats (Partasarathy and Saji, 2006).

2.2.3 **NTFP status in Kerala**

In Kerala, it is estimated that there are about 540 species yielding NTFP of which majority of them are medicinal (Sharma, 2003). Nair (2000) reported that many characteristic items of NTFP's come from the evergreen and semi-evergreen forest areas; it was the moist deciduous forest tracts which are more rich and diverse in species belonging to this plant group in general. Among the forest types of Kerala, 40 per cent of the NTFP's are extracted from the moist deciduous forests (Basha, 1990). Nair (1996) found that 26 per cent of the medicinal plants of the state are found in the ever green forests, 44 per cent in the moist deciduous forests, 17 per cent in the dry deciduous forests and 5 per cent in the semi ever green forests. The right of collection and removal of the NTFP (except bamboo and reeds) is leased out to co-operative societies belonging to Harijans and hill tribes (Muraleedharan *et al.*, 1991). Gubbi and Macmillan (2008) found that in PTR black dammar resin from the tree *Canarium strictum* (61.3%) and mace from *Myristica dactyloides* (35.5 %) were the most commonly collected NTFP's and the most valuable NTFP's were honey from *Apis cerana indica*, cardamom (*Elettaria cardamomum)* and *Myristica dactyloides.*

Out of 5000 plant species identified from Kerala part of Western Ghat, 549 species are recognized as NTFP's. Out of these, 119 are collected seasonally and utilized for domestic purpose as well as marketing. Out of 119 species, 46 species are collected regularly and marketed by the tribal societies (Vidyasagaran, 2012). Sathyapalan and Reddy (2010) reported that as per the government list, 145 different types of NTFP's are collected from the forest areas of Kerala, where as the primary survey data collected from the tribal settlement showed collection of 278 non timber forest products. According to the Kerala Forest Department (2012) the sales of NTFP's through SC/ST Federation during 2011-12 was around Rs. 45,770,667 and total quantity of NTFP procured was 1,199,304 kg. Sharma (2003) estimated that ayurvedic medicine worth Rs. 200 crores was produced annually in Kerala. In all, 500 species providing NTFP's are found in the forests of Kerala of which 250 species

have been identified as medicinal plants (Nambiar et al., 1985). Muraleedharan (2003) reported a significant increase in the collection of NTFP's during the period 1982-83 to 1997-98. The value of total quantity of NTFP's collected during 1982-83 was only Rs. 13.93 lakh, which has increased by more than 18 times to Rs. 258.56 lakhs in 2000-2001.

2.3 NTFP AND TRIBES

In Indian context, forest resources largely NTFP's, play a pivotal role in the viability and subsistence of forest dwellers because of the significance of forests in their social, cultural and economic survival (Das, 2005). The tribal people are often called as ecosystem people who live in harmony with the nature and maintain a close link between man and environment (Xavier *et al.*, 2012). According to the 2011 census the tribal population in India is 104.3 million, which is 8.6 per cent of overall population of India (GOI, 2011). Mitchell *et al.* (2003) reported that about 70 per cent of the NTFP collection in India took place in the tribal belt of the country. NTFP contributed about 20 per cent to 40 per cent of the annual income of the forest dwellers who are mostly disadvantageous and landless communities with a dominant population of tribals (Rawat, 2011). FAO (2009) found that more than 80 per cent of forest dwellers depend on NTFP's for basic necessities. The collection of NTFP's comprises the main source of wage labour for 17 per cent of landless labourers and 39 per cent or more are involved in NTFP collection as a subsidiary occupation. For the 33 scheduled tribal communities in Manipur NTFP are the means of their subsistence, consumption and income generation (Chhetry, 2010). The tribes of Bengal used different NTFP's of which 113 are derived from plant species and 76 from animal and bird species. Out of the 113 plant resources, 27 were used for commercial purposes, 39 were consumed at home as food, 47 used for medicinal purposes (Shit and Pati, 2012). Singh *et al.* (2010) reported that the contribution of NTFP's to the forest dwellers of Sundarban was quite high as it contributed almost 79 per cent (Rs. 80,000) on an average to the annual income of the collector's family. The indigenous communities at Arunachal Pradesh collect NTFP's such as fuelwood,

house building materials, wild edible vegetables and medicinal plants, which contributed 11 to 23 per cent to the annual household income (Sarmah and Arunachalam, 2011). A study by Tynsong and Tiwari (2011) in Meghalaya reported that the leaves of *Phrynium capitatum* were collected for packing food items because of its capacity in retaining moisture and keeping the packed edibles fresh and lasting longer.

In the tribal areas of Orissa more than 60 per cent of the households depended on the forests for 15 - 50 per cent of their annual income (Babu *et al.*, 2005). The collection of tendu leaves generated employment of about 16 million person days per season and the total turnover of tendu leaf trade is around Rs 1.5 billion in Orissa (Patnaik, 2007). A study by Mahapatra *et al.* (2005) at Orissa and Jharkhand identified the three major NTFP's such as tendu leaf, sal leaf and mahua flower accounted for more than 90 per cent of the NTFP based income in Orissa, whereas in Jharkhand, lac, mahua flower and tamarind contributed more than 75 per cent of their annual income. The average income derived from various NTFP's in the Sathy Forest Range of Western Tamil Nadu was found to be Rs. 9000 per household (Sekhar *et al.*, 1996). The Gonds of Chhattisgarh maintained their livelihood from the sale of fuel wood, NTFP and forest labour. The major NTFP's collected are fruits of *Diospyros melanoxylon, Madhuca longifolia, Ficus glomerata, Shorea robusta, Pongamia pinnata, Azadirachta indica* and honey for income and self subsistence (Mollick, 2010). India is a major producer of three important products derived from insects such as honey, silk and lac (Ramani, 2010). Mahanta and Tiwari (2010) documented that the ethnic tribal communities of Arunachal Pradesh traditionally used the natural dyes extracted from the locally available plant resources for dyeing cloth, carpets, cane and bamboo crafts, wood carving and potteries etc. About 124 plant species were used by the people living around the forest area of the Madhya Pradesh for fuel wood, fodder and medicinal purpose (Purushothaman *et al.*, 2000).

The main livelihood activities of tribes ranged from natural resource gathering for income generation, cultivation for subsistence and limited employment with the Forest department and private plantations (Chandi, 2008). Biswal (2009) reported that the wild food plants are used as common household food and make a substantial contribution to the subsistence livelihood of the tribal people in many parts of Nilgiri Biosphere Reserve. They consumed a variety of seasonal fruits such as *Phyllanthus emblica, Syzygium cumini, Scutia myrtina, Eriobotrya japonica, Mangifera indica,* fig, Thodali *(Ziziphus rugosa)* and the leafy vegetables like *Alangium salvifolium* are quite commonly and widely used in their daily diet. The tribes in Western Ghats region depend to an extent of 50 per cent on NTFP as a source of income and as the major source of employment (Hegde *et al.*, 1996). Bharathkumar *et al.* (2011) have found that due to the relatively limited stock and increased seasonal variability in supply, the rural households depending on NTFP extraction are highly prone to the vagaries of poverty due to low incomes in the dry tracts. NTFP based livelihoods are often associated with extreme poverty and deficient economic skills, so the households with lower annual income; social status and education would be likely to show greater resource interest in the forest due to poorer livelihood options (Wunder, 2001). The indigenous communities make use of *Cycas circinalis* as a multiuse NTFP, the pith and male cone are used for their medicinal value where as the young leaves and fruits are used as food as well as medicine (Saneesh, 2009). Ramachandran and Udhayavani (2013) reported that the Kurumbas of Nilgiri have subsisted as food gatherers whose staple foods are wild tubers, wild fruits, other minor forest products and they are well versed in honey collection techniques.

The forest dwellers of Sudikonda Range of East Godavari District in Andra Pradesh, extracted 38 different plant species as NTFP's, of the widely exploited 38 species, 5 were food products, 4 were used as fodder, 13 were commercial important, about 8 were used for household purpose, 2 plants were having medicinal properties and the rest were used as fuel (Bhavananarayana *et al.*, 2012).

In Uttara Kannada district in overall 235 NTFP's are collected and *Garcinia gummi-gutta* was the most widely extracted NTFP by all sections of the society (Kumara and Santhosh, 2014). One of the studies by Murthy *et al.* (2005) estimated the value of NTFP's realized per household in Uttara Kannada varies between Rs. 3445/household in the evergreen zone and Rs 1233/household in the dry deciduous zone. Similarly, the financial value realized per hectare ranged from Rs. 634 in the dry deciduous zone to Rs. 1801 in the evergreen zone, with a mean of Rs 1159/ha/yr. When the cash income per household from NTFP was considered, *Acacia concinna* contributed the most with Rs. 998.16 (14.5%) towards total cash income from NTFP's and followed by honey with Rs. 913.26 (13.33%) in the interior forest areas (Kumar, 2010). Sinha and Bawa (2002) have found the Soliga households in Karnataka derived 50 per cent of their cash income from the extraction of NTFP's. The most heavily harvested NTFP's are fruits from *Phyllanthus emblica* and *Phyllanthus indofischeri* which have a high potential for boosting the household economy by generating a good source of cash income. A study by Ramachandran (2007) identified nearly 74 species including 25 leafy vegetables, 4 fruit yielding and 45 fruit/ seed yielding varieties being utilised by different tribal communities of Anamalai hills of Tamilnadu. The Palliyans and Pulayans, the two primitive tribes of Palni hills of Tamil Nadu were collecting 30 commercially important NTFP's for their livelihood (Kennedy, 2006). In case of Jenukurumba tribes of South India, the collection of NTFP's provided the maximum employment to the extent of 50.98 per cent of the total employment of the households followed by wage employment (33.95 %), agriculture (11.65 %) and allied sector (3.42 %) (Ravi *et al.*, 2006).

The collection of NTFP's is the main occupation of more than 68 per cent of the tribals in four districts of Kerala such as Palakkad, Thrissur, Wayanad and Kannur (Shanker, 1999). According to Kerala Scheduled Tribe Development Department (2009) in Kerala there are 36 scheduled tribes. They together constitute a population of 0.4 million, that is 1.5 per cent of the overall population of the state. Cholanaickans, Koraga, Kadar, Kattunaikkan and Kurumbas are the primitive tribes in Kerala who

led a foraging way of life and constituted a population of 4.8 per cent of the total tribal population of the state (Shanavaskhan *et al.*, 2012).

The Muthuvan tribe in Edamalakkudy, one of the most isolated forest tribes in the state of Kerala (Manjusha, 2013) spend most of their time collecting honey, edible fruits, plant products, medicinal plants, wild tubers, mushrooms, bamboo and fire wood (Manithottam and Francis, 2007). Thomas (1996) estimated that NTFP trade provided 58 per cent of the total income of the tribes in Kerala. NTFP collection is a supplementary source of income to the majority of the tribal population in Kerala. Even today, there exist a few tribal settlements in the interior forests, for whom NTFP collection is the only source of income (Shankar and Muraleedharan, 1996). Sajeev and Sasidharan (1997) reported that gooseberry (*phyllanthus emblica*), mango (*Mangifera indica*), kodamppuli (*Garcinia gummi- gutta*) and honey are the major NTFP's collected and marketed by the hill pulayas and the muthuvans of Chinnar Wildlife Sanctuary. Many tribal and rural families of Wayanad district in Kerala used a wide range of species for their food and medicinal needs (Narayanan *et al.*, 2011a). There are 434 flowering plants used by the tribal people of Wayanad of which 184 are used for food (Hema *et al.*, 2006), 244 are of medicinal use (Silja *et al.*, 2008) and 68 plants are recorded for other uses like fish poisoning, magico-religious purposes (Pramod *et al.*, 2003) .

Irulars, Mudugars and Kurumbars are the three tribal communities inhabiting the Attappady valley (Manilal *et al.*, 2002). Muraleedharan *et al.* (1991) documented that the tribal population which constituted 90 per cent of the total population of Attappady in 1951 has been reduced to 33 percent by 1981, because of high influx of settlers. The Irulas inhabiting the plains and low elevations constituted the majority tribal population at Attappady (Padmanabhan and Sujana, 2008). There are two divisions among the Kurumbas, Palu-Kurumbas and Alu-Kurumbas. The Kurumbas of Attappadi are Palu-Kurumbas and they are concentrated in the higher elevations of the Western ghats (Poyil, 2013). The Kurumba subsist on shifting cultivation and non timber forest products. The collected NTFP's are sold through Kurumbar Girijan

Service Co-operative Society (Kakkoth, 2005). Kurumbas are the primitive tribal group in Kerala who have experienced extreme poverty among three tribal groups in Attappady (Sujith *et al.*, 2014). Tharakan (2003) reported that the Mudugas and Kurumbas are mainly depending on shifting cultivation supplemented by gathering, collection and trade of forest produce and at times working as wage labourers outside forest.

A study by Muraleedharan *et al.* (2005) have reported that 111 NTFP species in Attappady, out of which 40 species are exploited. The important NTFP's include white dammer, shikakkai, honey, gooseberry and medicinal plants (Kumar *et al.*, 1993). Tharakan (2007) found that the collection of honey is done only by men usually in groups who are highly skilled in activities such as climbing big trees, driving away the bees and also tracing the bees and locating the honey comb in the thick forest. While collecting *Sida rhombifolia, Pseudarthria viscida* and *Desmodium gangeticum* small and weaker plants are left out and only the robust plants are collected. These plants could grow and become the seed source for the next growing generation (Yeshodharan, 2010).

In the field of employment, agriculture provided 50.97 per cent jobs, NTFP collection 44.06 per cent, government employment 0.51 per cent, private employment 0.13 per cent and all other categories 4.33 per cent (Sankar and Muraleedharan, 1990). Surendranath (2010) have reported that in Wayanad district the income from non-forestry sources and NTFP collection constituted 70 and 30 per cent respectively. Muraleedharan *et al.* (1997) found the Irulas of Attappady, who are cultivators and wage labourers received an annual income of Rs 1697 from NTFP collection during 1996- 97. Based on an ethno botanical survey carried out in Attapady hills of Western Ghats, it was found that a total of 301 plant species were used as medicine, wild food, agricultural crop, wood, timber, fibre and fuel (Nandanakunjidam, 2004). Ethnobotanical investigations among the Kurumba tribes of Edavaniyoor have documented the traditional use of 46 plants (Anilkumar and Udayan, 2013).

2.4. NTFP FOR FOOD SECURITY

The forest foods contributed to the food security as a way of ensuring safety nets during the periods of shortage in rural households (Nkem *et al.*, 2007). Sunderland (2011) reported that around one billion people rely on wild harvested products for nutrition and income and the invisible trade in wild resources is estimated to generate $90 billion/annum. In Northern and Central Siberia, up to 40 per cent of the indigenous families engaged in mushroom collection. Most are gathered for home consumption, but some people engaged in processing and sales of mushrooms in local markets (Vladyshevskiy *et al.*, 2002). Honey is a good source of sugar and an important ingredient in many traditional medicines. Food and Agriculture Organization (2011) found that in Zambia, honey production is an important aspect of rural livelihoods, providing up to 25 per cent of total annual income for tens of thousands of people and supplementing the diets of at least 250000 households. The reported value of non-timber forest product removals amounts to about US$18.5 billion for 2005, in which food products account for the greatest share (FAO, 2010).

The NTFP's have an important role to play in alleviating poverty, dietary shortfalls of the forest dependent people during particular lean seasons in the year. NTFP's constituted an integral component of food for the communities dependent on forests (Bhattacharya *et al.*, 1999). In many States of India, especially, Bihar, Orissa, Madhya Pradesh and Himchal Pradesh, 80 per cent of forest dwellers depend on forests for 25-50 per cent of their annual food requirements. Fifty three NTFP's have been reported to be collected by the villagers in Chadha out of which 46 are used for domestic consumption and remaining NTFP's are collected for sale (Bhattachariya *et al.*, 2002). Tiwari and Cambell (1997) reported that about 60 per cent of the NTFP harvested goes unrecorded because they are consumed at the households itself which serve as a safety net during the seasonal food shortages and other economic crises. In Arunachal Pradesh 86 species of edible fruits having high nutritive values were used by the traditional local communities (Rethy *et al.*, 2010). Biswal (2009) have reported that the wild food plants are used as common household food and make a substantial

contribution to the subsistence livelihood of the tribal people in many parts of Nilgiri Biosphere Reserve. They consumed a variety of seasonal fruits such as gooseberry, *Syzygium cumini, Scutia myrtina, Eriobotrya japonica*, mango, fig, *Ziziphus rugosa* and the leafy vegetables like *Alangium salvifolium* are quite commonly and widely used in their daily diet.

Among the tribal groups in Wayanad, the Paniya community possesses knowledge regarding 136 taxa of wild edible plants, the Kattunaikkans coming next with knowledge of 97 taxa and the Kurumas are at the bottom of the knowledge-ladder with knowledge of 42 taxa of wild edible plants (Narayanan *et al.*, 2011b). Narayanan and Anilkumar (2007) found that the wild leaves are the most widely consumed wild foods; the Paniya families consumed about 88 species of green leaves followed by Kattunaikka who consumed 43 species and kuruma consumed 21 species. The tribe Cholanaickkens residing in Nilambur forest of Southern Western Ghats, Kerala consumed 40 species of wild edible plants as food including leaves, fruits, roots, tubers, rhizomes, seeds etc. for maintaining their dietary equilibrium (Thomas *et al.*, 2012). A study in Parambikulam by Yesodharan and Sujana (2007a) reported that the tribes made use of 82 species out of that 30 species were used as leafy vegetables, 31 species as fruits, 16 species as seeds and 10 species as food in the form of rhizomes, tubers, corms and 6 plants as food from stem or shoot. Thirty eight species of wild edible fruits belonging to 25 genera and 17 families were used by *Muthuvans* of Idukki (Ajesh *et al.*, 2012). Anitha (2010) reported that the maximum dependence of the tribals on forests was for housing material followed by income and fuel wood in Agasthyamala Biosphere Reserve. The five ethnic tribes of the Periyar tiger reserve utilized 159 species of plants for self use and income generation (Sasidharan and Augustine, 2006). Riyas (2011) identified that the Kadar tribes made use of 73 wild edible plants, out of which only 7 items were marketed. The Kadar and Malayans tribal groups of Vazhachal consumed 7 edible *Dioscorea* species, the collection of tubers involved digging out the soil and a small piece of tuber was left out there for regeneration (Narayanan, 2012). Yesodharan and Sujana (2006) reported that the

Malamalsar tribes of Parambikulam used locally available materials like bamboos, canes, branches of trees and thatching materials like grasses and leaves of *Ochlandra* and *Phoenix* species.

2.5 NTFP FOR HEALTH

The forest is a bank of various medicinal plants, which are applied successfully to treat and cure various ailments. Today alternative medicines are in vogue and they are derived from forests (Ofuoku and Agbogidi, 2011). According to WHO (2002) the majority of the world's human population, especially in developing countries, depends on traditional medicine based on medicinal and aromatic plants (MAP). The monetary value of medicinal and aromatic plant related global trade is over 60 billion USD (Karki and Nagpal, 2004). Tiwari and Bharat (2010) reported that China, France, Germany, Italy, Japan, Spain, UK and US are the largest global markets for medicinal and aromatic plants and Japan has the highest per capita consumption of botanical medicines in the world. The ethnobotanical knowledge on useful medicinal and aromatic plants are being transformed into commercial gains, whereas, the traditional practices and methods developed by local people for sustainable harvesting and conservation of MAPs are generally overlooked (Kala, 2010).

India has 16 agro-climatic zones, 45000 different plant species and 15000 medicinal plants that include 7000 plants used in Ayurveda and over 700 in Unani medicines (Naithani, 2004). Medicinal plants are NTFP's that are of particular importance to the rural poor, who harvest these from the wild to meet their primary healthcare needs as well as their livelihood needs (Krishnakumar *et al.*, 2012). The value of MAP related trade in India is to the order of $5.5 billion (WHO, 2002). India supplies 12 per cent of the world's requirements of medicinal plants. The highly demanded medicinal plants traded in India are *Aconitum heterophyllum* (Atis), *Commiphora wightii* (Guggul), *Aconitum violaceum* (Bachnag) and *Coptis teeta* (Mishmi bitter) (Kayang and Kharbuli., 2010). Today 90 per cent of the medicinal plants consumed

domestically and exported are collected from the wild and only 70 out of around 700 species in the trade are obtained from cultivation (Bhattacharya *et al.*, 2009). Udayan *et al.* (2007) reported that in India, over 9500 wild species are being used by the tribal groups for meeting various purposes. Out of which 7500 wild plant species were used for treating various ailments. Rodrigues (2010) have documented 62 medicinally important legumes from Goa. The important medicinal plants seen in West Bengal are *Asparagus racemosus, Hemidesmus indicus, Alstonia scholaris, Terminalia arjuna, Rauvolfia serpentina, Vitex negudo* etc (Tah and Chakraborty, 2010). A study by Venkatachalapathi and Nagarajan (2013) found that the tribal groups in Anamalai hills made use of 45 species of flowering plants for treating various diseases. Based on the parts used as medicine there were total of 51 uses and of this leaf stands top with 19 uses, followed by whole plant use (10), root (7) and others.

The North–Eastern region of India with an abundance of medicinal plants had a long standing tradition on use of plants as a source of medicine, especially among the 280 tribal groups for their primary health care (Unni *et al.*, 2010). The tribal communities in north east used 343 NTFP's for diverse purposes like medicinal (163 species), edible fruits (75 species) and vegetables (65 species) (Saha and Sundriyal, 2012).The tribal groups around Dampa Tiger Reserve in Mizoram, made use of 89 ethno medicinal species including trees, shrub, herb and climbers (Sahoo *et al.*, 2010).

Forests are the main source for medicinal plants which are collected by the tribes and local communities. The tribes collected the medicinal plants from the natural habitat and never cultivated them for their use (Poyil, 2013). *Sida rhombifolia* and *Phyllanthus emblica* are most abundantly consumed medicinal plants in Kerala (Sasidharan and Muraleedharan, 2009). According to Kerala Forest Department (2010) about 60-65 per cent of plants required for ayurvedic medicine and almost 80 per cent of plants used in sidha medicine are found in forests of Kerala. The kadar tribes of Parambikulam Tiger reserve earned their livelihood only through NTFP collection and forestry works from October to March when they are free from their

agriculture works (Yesodharan and Sujana, 2007b). Thomas *et al.* (2013) found the Arnatan tribes of Nilambur region utilized various parts like leaves, bark, roots and rhizome of 30 species of medicinal plants for both internal and external applications in the treatment of various ailments in their daily life. The Malaarayans of Idukki made use of 31 plant species for their medical requirements (Sudeesh, 2012). Binu (2011) found that the tribes of Pattanamthitta are aware of the indigenous or traditional knowledge of employing *Asparagus racemosus*, *Flemingia strobilifera*, *Helicteres isora* and *Myristica malabarica* for relieving body pain. Ijinu *et al.* (2011) found that a single plant may be used for curing more than one ailment. For example *Andrographis paniculata* was used for curing fever and diabetes, where as *Asparagus racemosus* was used for lactation, post natal care, urinary problems and dysentery. The Kani tribes of Agasthyavanam consumed the seed paste of *Strychnos nux-vomica* mixed with self urine against snake bite (Vijayan *et al.*, 2007). The Kurichyar tribes of Wayanad were found to be depending more heavily on leaves for medicinal preparations as compared with other plant parts (Thomas and Rajendran, 2013).

2.6 HARVESTING OF NTFP

Human populations have harvested NTFP for thousands of years for subsistence and trade (Ticktin, 2004). Most NTFP's are by-products or end-products such as seeds, fruits and leaves which will go waste if not collected at the appropriate time. By promoting collection by gatherers we not only assure their income, but also allow proper utilization of NTFP's (Johnson *et al.*, 2013). Sharma (2001) reported that the methods followed for tapping chir pine (*Pinus roxburghii*) for oleo resin extraction are French cup and lip method and Rill method which have been extensively practiced. Currently a method called the borehole method introduced as it does not need any bark shaving and simply a hole made at the base of tree serves the purpose of resin extraction (Sharma, 2010). Gums are collected by making an incision in the stem region of the tree and on the bark. Incisions are done only on surface not deep in such a way that vascular parts are not damaged (Tiwari and Bharat, 2010).

Commiphora wightii (Guggul) was collected during the months of November-January by making incision on the trunks of trees. The gum was ready for collection 7-15 days after the first incision. About 200-500g of dry guggul is obtained from a plant in one season (Arya and Kumar, 2010). Ganesan (2003) demonstrated that excessive commercial harvesting of NTFP's can denude forest ecosystems by destructive collection practices for valued target species such as *Garcinia gummi-gutta, Phyllanthus indofischeri, Phyllanthus emblica, Boswellia serrata* and *Sterculia urens*.

Non timber forest products extraction can contribute positively to sustainable forest management because it provides tangible economic benefits to poor rural communities whilst simultaneously conserving biodiversity (Kaushal and Melkani, 2005). The collection of NTFP's has been promoted in India as a strategy to aid wildlife conservation whilst simultaneously alleviating poverty and recent legislation now gives communities living within protected areas the legal right to collect NTFP's (Gubbi and Macmillan, 2008). The increased demand of NTFP's is met by the over exploitation of the stock of natural capital without corresponding to the sustainability of the ecosystem (Ravi *et al.*, 2006). A perfect example for this is *Canarium strictum* which is a large, resinous tree species, commercially harvested for dammar, throughout South and South East Asia, due to its over exploitation and the loss of habitat; it was found to be an endangered species (Meena *et al.*, 2012). Unsustainable harvesting and collection of NTFP's has reduced their availability in the natural forest, which is threatening the livelihood of the tribal collectors (Bhattachriya and Hayath, 2004). A number of NTFP's are harvested on the convenience of the collectors without considering the quality and maturity of these NTFP's. Due to lack of quality control in collection, grading, unscientific and wasteful methods of collection and post harvest handling have resulted in adulteration at all levels (Sood and Mahajan, 2010). According to Wagh *et al.* (2010) now a days the NTFP's are not easily available in the forests, the collectable quantity of NTFP's is decreasing day by day as compared to past years.

The NTFP use of an organism can range from destructive harvesting of an individual to non-destructive removal of a small part such as a flower or snake venom (Wong, 2000). Increased demand, however, has transformed the traditional low-impact patterns and techniques of resource extraction into more intensive forms. Extraction pattern of certain NTFP's such as honey, soap nut *(Sapindus emarginatus)* and Indian gooseberry *(Phyllanthus emblica)* have, thus, changed from the subsistence mode to large-scale commercial removals in the recent past (Muraleedharan *et al.*, 1997). A study by Rai (2004) showed that if the current trend of intense fruit harvest of *Garcinia gummigatta* continues, the species and the forest ecosystem might experience grave impacts. In Nilgiri biosphere reserve, Varghese and Ticktin (2008) found the tribal communities are following three types of resin collection from *Canarium strictum.* The first type involves the collection of resin formed naturally through fissures on the tree. Second type involves making incisions to promote resin flow and the third type of resin collection consists of setting a low fire followed by incisions and resin Collection. Udayasooryan (2011) reported that in Vazhachal forest division white dammar (*Vateria indica*) are collected from the naturally formed injuries on the trees above 75 cm diameter during September to March.In southern India, presumably because of extraction pressures, as many as 110 species of medicinal plants are reported to have become rare, endangered and threatened (Ved *et al.*, 2001). Molur *et al.* (2001) documented that in Nilgiri Biosphere Reserve *Asparagus racemosus* is collected in the months of June, October, November and December and the harvesting technique used are digging and uprooting. Non-sustainable harvesting of forest resources had led to loss of forest cover and degradation in the Western Ghats (Davidar *et al.*, 2007).

Opportunity costs of harvesting resources have been shown to decrease with increasing distance to the forest and therefore the distance to the forest boundary would be an important predictor of resource interest in the forest (Gunatilake and Chakravorty, 2002). From the analysis of Hegde and Enters (2000) the level of education was also found to be an important variable in reducing the forest

dependence. If the product was harvested for household consumption, then accessibility was an important constraint, since the time and effort required to transport the product increased with increasing distance and at greater distances more expensive market substitutes probably become more attractive. However, if collected for earnings, accessibility was not an important limitation (Davidar *et al.*, 2008). Adhikari (2003) expected that resource harvesting would be negatively associated with household wealth and educational status. As occupation and caste could have an important role in the decision making to harvest forest products. Fuelwood is a major forest resource collected in different regions of the Western Ghats because of a stable local market (Davidar *et al.*, 2007). Fuel-wood is an important source of domestic energy for households and a low cost alternative to commercially available wood, kerosene and LPG (Arjunan *et al.*, 2005).

Narayanan *et al.* (2011a) found that due to high demand and less access and availability of forest resources, these people are forced to go for unsustainable harvest of resources. The actual harvesting of NTFP's is significantly higher than the optimum level, resulting in depletion of biodiversity. Due to scarcity of resources, the collectors have to travel longer distance for collection, there is wide variation in the quantity collected and income of gatherers (Muraleedharan *et al.*, 2003). The tribes in Wayanad Wildlife Sanctuary have to travel at least 6 km and spend 5 hours/day to gather NTFP's. This distance travelled was an indication of the depletion of resources in the periphery (Muraleedharan and Sreelakshmi, 2007). For instance in the case of *Coscinium fenestratum* (Mara Manjal) the wood is the medicinally useful part and the gatherers used to cut the whole plant for maximum extraction. The dioecious nature and late flowering of the plant joined with the ruthless harvesting methods resulted in enlisting *Coscinium fenestratum* among the endangered plants (Dan and Nair, 2003). Balachandran (2006) found the herbs and shrubs like *Sida rhombifolia*, *Pseudarthria viscida and Desmodium gangeticum* where the roots are the exploitable part; the whole plant is uprooted before flowering or seed setting. This mode of collection before seed dispersal, leads to extermination of the species from that area. While

harvesting the roots of plants such as *Stereospermum colais* (Pathiri) and *Gmelina arborea* (Kumizhu) only the roots grown towards the north should be removed. But in practice, the entire root is collected and this causes the death of the tree (Abraham, 2003).

2.7 MARKETING OF NTFP

Out of the 3000 NTFP species in India, only 126 have developed the marketability (FAO, 2005). These include medicinal plants, edible plants, starches, gums and mucilages, oils & fats, resins and oleo-resins, essential oils, spices, drugs, tannins, insecticides, natural dyes, bamboos and canes, fibers and flosses, grasses, tendu leaves, animal products and edible products. According to FAO (2005) the commercial NTFP's are estimated to generate Rs. 3 billion (US$ 100 million) annually in India and also have a 42 per cent share of total removals in the category of other plant products, such as tendu leaves and lac, followed by Brazil and Mexico. India holds monopoly in world trade over some of the NTFP's such as Karaya gum (*Sterculia urens*), myrobalans (*Phyllanthus emblica, Terminalia chebula*), Sandalwood chips and dust (*Santalum album*) (Yadav and Basera, 2013). Total export value of Ayush and Herbal products during 2009-10 from India is estimated as Rs. 764.25 and 570.76 crores respectively (Ved and Goraya, 2008).

The marketing of NTFP's was regulated by different mechanisms in different states. Under the Forest Produce (Control and Trade) Act 1981, trading is largely controlled through public institutions, such as State Development Corporations, Federations, Co-operatives and tribal societies. Some states granted monopoly rights for NTFP items to private companies (Prasad *et al.*, 1996). There is little or no opportunity for local semi-processing or standard-setting to enhance their value. This state of affairs is exacerbated by the involvement of too many intermediaries, the lack of regulated market information and networks and the limited capacity of the local people, all of which further contributed to their vulnerability and exploitation (Murthy *et al.*, 2005). Similarly, Chopra (2006) estimated the all India average value of NTFP to be Rs

1671.54 per hectare and Rs. 41.89 billions as the estimate of gross value of NTFP's harvested on average in India.

Nationalized NTFP are the one for which the trade monopoly lies with the state government or its authorized agent. Chhattisgarh MFP Federation does the collection and sale of nationalized forest produce only. The Federation sold the collected produce through tenders and auctions on behalf of the state government (Baldewa, 2011). The nationalized products of NTFP in Chhattisgarh are tendu leaf, sal seed, *Terminalia chebula*, dhawad, babul, khair and gums and non nationalized NTFP's are lac, honey, tree borne oil seeds, chironji, medicinal plants based herbal products, mahul patta, mahua and imli. In Chhatisgarh 200 economically important NTFP species are found and trades of non nationalized products are managed by the private individuals and institutes for profit making (Tiwari and Bharat, 2010). The major NTFP's of Gujarat are mahua flowers and seeds, gums, tendu leaves and honey which are marketed through GSFDC. Some NTFP's of medicinal value have been processed for value addition by the use of simple technologies under the Dhanvantari project to manufacture ayurvedic as well as tribal preparations by GSFDC (Tewari, 2006).

The FDCs (Forest Development Corporation) were established with a view to professionally organize the collection and marketing of NTFP's and eliminate the middlemen so that maximum benefits from the market are passed on to tribal collectors. In Andhra Pradesh, the annual revenue from tendu leaves traded by the Andhra Pradesh Forest Development Corporation (APFDC) and other NTFP's traded by the Girijan Cooperative Corporation (GCC) are estimated to be Rs 620 million (Rao, 2002). The Girijan Cooperative Corporation(GCC), a public sector undertaking, procured NTFP's from about 5.6 million tribal primary collectors even in most inaccessible areas. It has embarked on value addition of several of these NTFP's like rock bee honey, tamarind and amla etc. and sold them with 'Girijan brand'(Rawat, 2011). Masters *et al.* (2004) suggested another way to add value the NTFP by the commercial development of products from naturally occurring species.

Most important problems associated with marketing of NTFP's are price fluctuation, being paid much less than the actual market value, in general prices are too low, availability of products everywhere in the same season drives the market further down, lack of resources like transport, manpower, sudden rainfall reduces demand and also disrupts the market (Gharai and Chakrabarthi, 2009). Carr *et al.* (2008) found that the NTFP gatherers receive much less than 10 per cent of the selling price of the final product. The NTFP's are low-value goods with small profit margins whose collection and trade systems are not well suited for wide scale commercialization (Pierce *et al.*, 2003). The local people are less aware about the market value of many produce and therefore not able to generate significant income from NTFP's though they offer huge opportunities. The collectors do not even manage to get the official minimum wage. For example, in Andhra Pradesh, it has been estimated that at the minimum wage rate, the value of labour input for collecting one kilogram of mahua flower is Rs 7.15. However, the procurement rate is only Rs 6 per kilogram (Saigal, 2008). Sustainable collection, use and commercialization are the main drivers in the promotion of NTFP's for community development, poverty reduction and livelihood and socio economic improvement (Maske *et al.*, 2011).

In Biligiri Rangaswamy Temple Wildlife sanctuary (BR Hills) in Karnataka tribal cooperatives and the Large-scale Adivasi Multi-purpose Society (LAMPs) involving the local collectors were responsible for the marketing of NTFP's. But where as in Malai Mahadeshwara Hills (MM Hills) in Karnataka, NTFP's were harvested through private traders on short-term (two year) monopoly contracts awarded by the Karnataka Forest Department. The contractor is free to also employ collectors from within or outside the forest dwelling communities (Shaanker *et al.*, 2004). In southern Tamil Nadu the Gram Mooligai Company Ltd (GMCL) set up with the support from the Ford foundation has started a processing unit for herbal medicines and honey which provides a higher return from NTFP products to the villagers (Key Stone Foundation, 2004). Prasad *et al.* (1999) suggested that the simple value addition

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options which can be easily carried out at primary collector's level are washing, cleaning, drying, proper storage and grading.

In Kerala, the NTFP's are marketed through different channels depending upon a variety of factors such as nature of the product, demand, distance of the market etc. (Muraleedharan *et al.,* 1999). Shylajan and Mythili (2007) have identified there are mainly three marketing channels for the trade of NTFP's in Kerala. In the first channel, the products are marketed through the federation. In the second channel, the products are marketed through private traders. In some part of the State, Forest Department also undertakes marketing of some products. The main activity of the Federation is the marketing of NTFP. There are two stages in the marketing of NTFP's in Kerala, sale of collected products by the tribes to federation through society and marketing of the collected products by the federation (Sasidharan *et al.*, 2008). The Federation gave 95 per cent of the sale price to the member societies. The societies are passing 80 per cent of the same to the tribals towards collection charges (Bhaskaran, 2006). Muraleedharan *et al.* (2001) reported that, though there has been an increase in the sales value of the Federation over the years, the benefits have not been ploughed back to the gatherers. The federation adopted direct negotiation practiced in case of a few products like *Sida rhombifolia, Desmodium gangeticum, Pseudarthria viscida, Phyllanthus emblica* and *Nilgirianthus ciliates* mainly because these plants are needed in the raw form and cannot be stored for long periods (Muraleedharan and Sreelakshmi, 2006). Anitha and Muraleedharan (2002) looked at the marketing scenario in Peechi-Vazhani WLS which showed a dominant role of private traders that has led to large-scale commercial exploitation of the resources compared to that of Chimmoni WLS. The Cholanaickens of Nilambur collected mainly honey, black dammer, mosses, nutmeg, *Acacia concinna* and sold it to the cooperative society in Nilambur (Ashraf, 2008). Siddhik (2008) study at Vazhachal forest division found that among the 11 commercially important NTFP's collected, honey contributed maximum share to the livelihood of the trbals and the maximum quantity collected was *Curcuma aromatica.*

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3.1. STUDY AREA

The present study was conducted in the tribal settlements in Western Attappady which falls within Mannarkkad Taluk of Palakkad district (Fig.1). The study area lies within the 76° 24' - 76° 29' East Longitude and 11° 4' - 11° 13' North Latitude. Western Attappady occupied an area of 237.52 km².

3.1. 1. **Topography and Vegetation**

Most of the areas are having undulating hilly terrain and steep slopes. The elevation ranges from 900 m to 2,300 m above MSL with the highest peak being Anginda peak. The main river that flows through the tribal settlement areas is the Bhavani river. Western Attappady receives an annual rainfall of 3000mm. The western part of Attappady is under denser vegetation. The major forest types found in the area include west coast tropical evergreen forest and southern tropical semi-evergreen forests.

3.1.2. **People**

Attappady is one among the three tribal centres of the state. The three tribal groups viz. Irula, Kurumba and Muduga constitute the tribal population of Western Attappady. The Kurumbas are one among the particular vulnerable tribal groups in Kerala. Their settlements are located in the interior areas of the forest. The Mudugas and Irulas settled in the lower plains of the valley, whereas the Kurumbas in upper tracts. The Kurumbas are the dominant population and the Mudugas are the least populated tribal community in the western part of Attappady. The Irulas are basically wage labourers, whereas Mudugas and Kurumbas are more involved in agriculture. The Kurumbas are the earliest group of tribes who settled in Attappady. The Kurumbas followed the practice of shifting cultivation.

3.2 SAMPLING DESIGN

The study was conducted in the 9 settlements in Western Attappady namely Mukkali, Karuvara, Chindakki, Thadikundu, Anavayi and Thudukki. The details about the settlements are shown in Table1. The Irula hamlets are at Karuvara, Chindakki and Mukkali. The Mudugas occupied the Karuvara and Chindakki settlements. The Kurumba settlements are at Thadikundu, Anavayi, Palappada and Thudukki. A simple random sampling method was adopted for the selection of samples, the unit of study being the household. From the three tribal groups, fifty households from each community were randomly selected for the study. In total one hundred and fifty households were surveyed as part of the study.

Table1: Description of the hamlets of tribes in Western Attappaddy

Sl.No	Hamlet	Tribal group	Population (Nos)	No.of houses	Distance from *Mukkali (km)
1	Chindakki	Muduga	108	30	5
2	Karuvara	Muduga	158	45	4
3	Karuvara	Irula	111	26	4
4	Chindakki	Irula	253	72	3
5	Mukkali	Irula	178	45	0.1
6	Thadikundu	Kurumba	129	36	7
7	Palappada	Kurumba	11	5	7
8	Anavayi	Kurumba	411	110	14
9	Thudukki	Kurumba	378	60	18
Total			1737	459	

(Source: ITDP Office, Agali) * denotes nearest township

Fig. 1 The map showing the study areas in Western Attappady

Plate 1. Conducting questionnaire survey among the Irula tribe of Western Attappady

3.3. DATA COLLECTION

The study was mainly based on primary data collection and was supplemented with secondary data wherever necessary. A pre-tested questionnaire survey and semi-structured interview was conducted with the help of local persons in the representative households of each tribal settlement (Plate 1). The data regarding collection, utilization, role of NTFP on the livelihood and marketing channels were collected using the pre-tested questionnaire survey (Appendix I) and semi-structured interview. The secondary data like quantity of NTFP collected and sold, procurement price and sales price over the years were collected from the Chindakki Kurumba Co-operative Society, SC/ST Federation and Wildlife Warden's Office at Mannarkkad. The details regarding the population were collected from ITDP office at Agali.

3.4. TOOLS AND TECHNIQUES

Simple statistical tools like frequency, percentages were employed for the analysis of socioeconomic data. In order to measure the socioeconomic standards of the selected communities, educational status, income, employment and expenditure pattern were analysed. Chi square test was used to compare the different parameters like education, income and expenditure among the three tribal communities.

3.4.1. Price Spread

The price spread was estimated to understand the share of final price going to the primary collectors. The difference between the price paid by the final consumer and price received by the primary collector is Price spread (Smith, 1992). It includes the costs and margins of different marketing agencies. The costs of transportation, storage, grading and handling comprise the marketing costs. The returns to the intermediaries for their functions were included in the margin.

Price spread= Price paid by the consumer- Price received by the primary collector

Or

Price spread = Marketing costs + Marketing margin

3.4.2. The Collectors Share on Sales Price

It is the price received by the primary collector expressed as a percentage of sales price of NTFP (i.e. the retail price paid by consumer) (Smith, 1992).

$$\text{Collector's share on sales price} = \frac{\text{Collectors price}}{\text{Sales price of NTFP}} \times 100$$

Results

RESULTS

The results of the study which deal with the major NTFP's collected by the tribes, their system of marketing and the extent of dependence on NTFP's by the tribes of Western Attappady are furnished in this chapter.

4.1 SOCIAL STATUS OF TRIBES

There are three tribal communities in Western Attappady namely, Irula, Muduga and Kurumba. The Irulas and Mudugas are residing on the lower plains of the valley and Kurumbas on the hilly tracts. The socio economic status of the tribes are described below.

4.1.1 Educational status of the tribes

Those who haven't gone to the school were considered as illiterates in this study. There was more number of female illiterates than the male illiterates in all the three communities (Table 2). The Irulas had the highest literacy rate with 73 per cent, followed by Kurumbas (72 %) and Mudugas (58 %).The women literacy rate among Irulas, Mudugas and Kurumbas were 66, 55 and 66 per cent respectively (Fig. 2). However there is no significant difference among the educational status among the tribes ($P = 0.115$)

4.1.2. Occupation of the tribes

The occupational details of the tribes are presented in Table 3. The Irula community who settled on the lower plains of the valley was involved mostly in the daily wages work (Fig.3). Fifty per cent of the households were involved in daily wages work. They had the higher percentage (20 %) of government jobs compared to other communities. Eighteen per cent of the Irula houses depended on NTFP collection. The Mudugas occupational status involves a combination of agriculture, daily wages and forest based labour. The majority of Muduga houses followed a combination of daily wages and NTFP collection (38 %).

Table 2. The educational status of the tribes of Western Attappady

Educational status / Group	Illiterate (%)		Lower Primary (%)		Upper Primary (%)		High school (%)		Higher secondary (%)		College level (%)		Literacy rate (%)
	M	F	M	F	M	F	M	F	M	F	M	F	
Irula	10	17	10	6	12	5	12	16	6	5	1	-	Overall: 73 Female: 66
Muduga	17	25	5	7	6	9	12	10	4	3	0.5	1.5	Overall: 58 Female: 55
Kurumba	12	16	11	9	9	8	15	8	5	5.6	1	0.4	Overall: 72 Female: 66

(P= 0.115574), - Denotes NA

Table 3. Occupational status of the tribes of Western Attappady

Sl. No.	Job type	Tribal communities involvement (%)		
		Irula	Muduga	Kurumba
1	Agriculture	2	2	0
2	Daily wages	50	24	4
3	Agriculture + Dailywages	0	12	0
4	Agriculture + NTFP collection	0	0	42
5	Daily wages + NTFP collection	18	38	0
6	Agricultrue + Dailywages + NTFP collection	0	14	34
7	Government jobs	20	10	12
8	Others	10	0	8
	Total	100	100	100

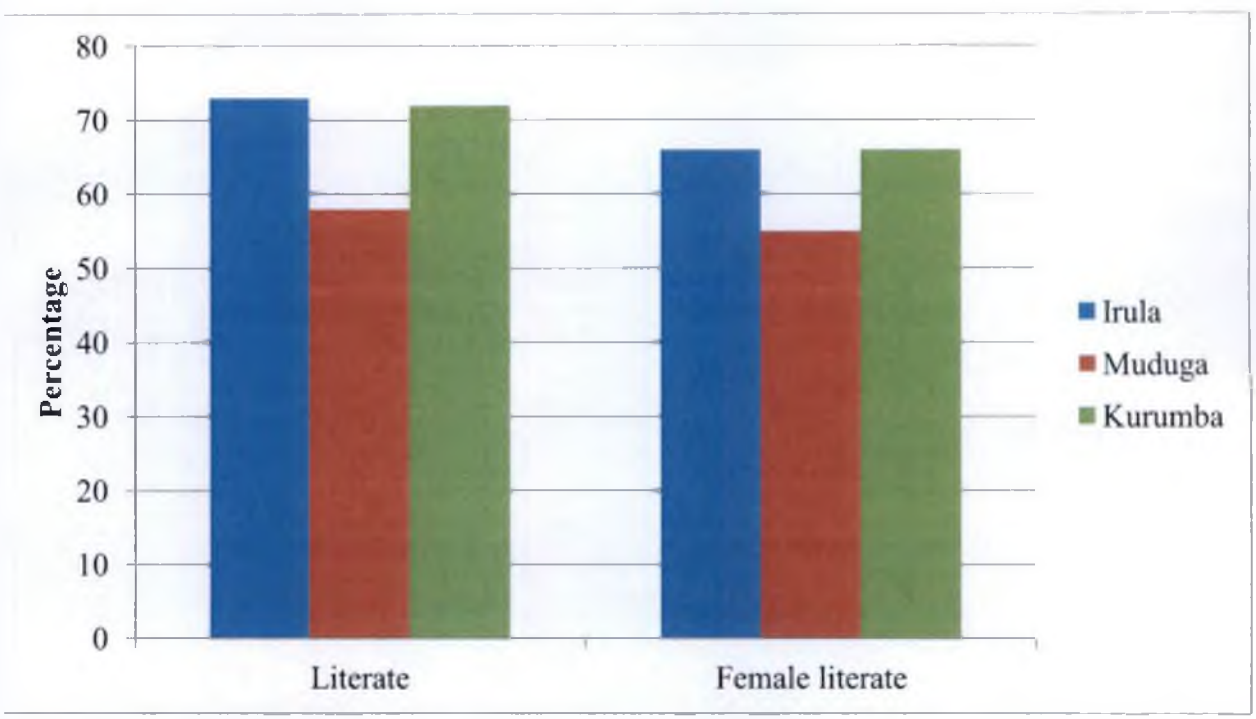
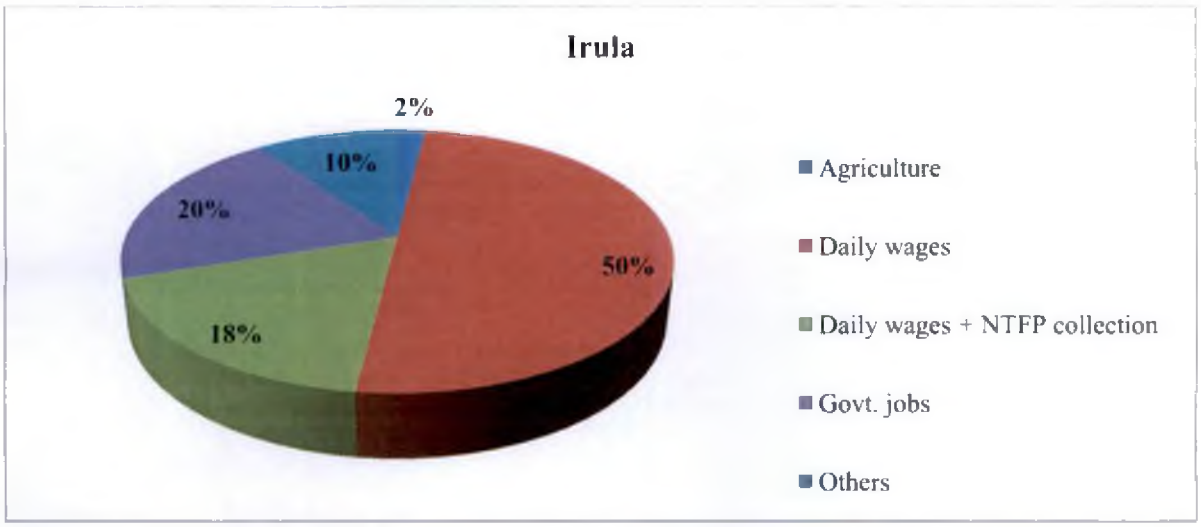
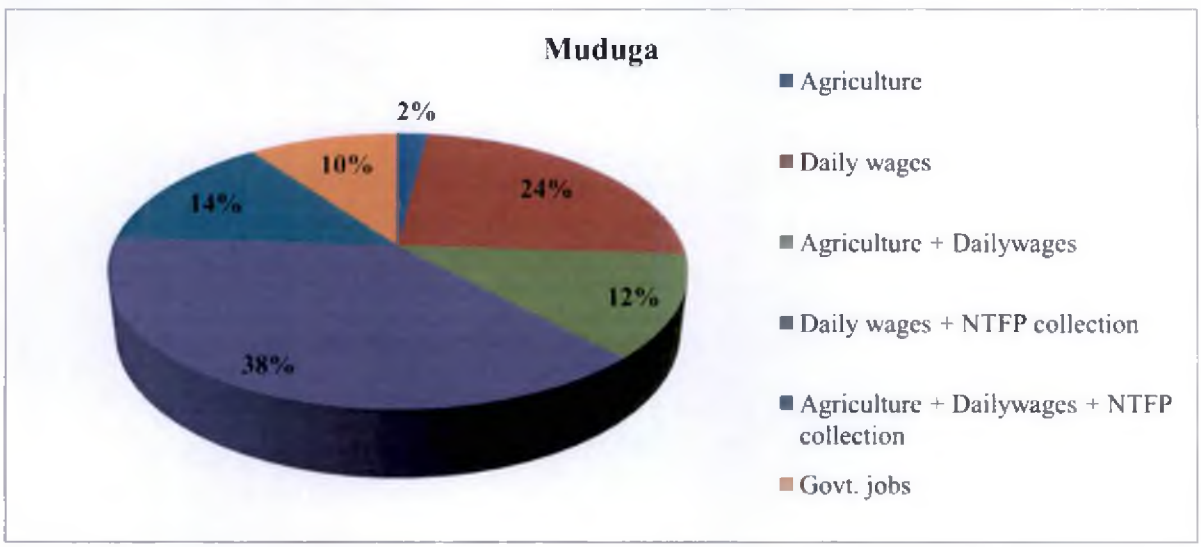


Fig. 2 The literacy rate among the different tribal groups in Western Attappady





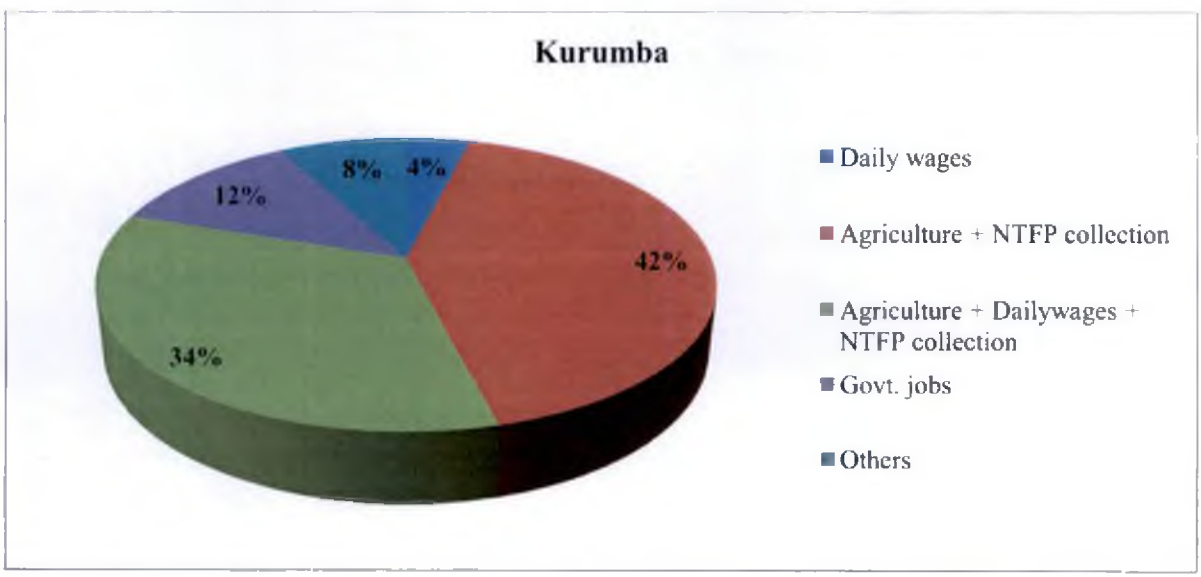


Fig.3 Occupational status of the tribes in Western Attappady

Ten per cent of the Muduga houses were employed in the government sector and 24 per cent were daily wage labourers. The Kurumbas who settled in the interior areas of forest primarily depended on NTFP collection and agriculture for the subsistence of their life. Forty two per cent of their households were doing jobs pertaining to agriculture as well as NTFP collection. Thirty four per cent of their jobs were contributed in combination with agriculture, NTFP collection and daily wages. In the government sector 12 per cent of the Kurumbas were employed.

4.1.3. Land holdings of the tribes

The details of the land owned by the tribal communities are given in Table 4. Sixty six per cent of the Irula households were landless and only four per cent had upto three acres of land. In Muduga community 42 per cent of the households were landless and eight per cent households were having more than three acres of land. All the Kurumba families had an area of four acres of common property resource, which they called as *panchakadu*. There is significant difference in the land holdings among the tribal groups.

Table 4. Average land holding among the tribal groups of Western Attappady

Sl. No.	Group	Land holding (Acres)			
		LL (%)	<1 (%)	1-3 (%)	>3 (%)
1	Irula	66	30	4	-
2	Muduga	42	26	24	8
3	Kurumba	-	-	-	100

LL: Landless (P= 0.000 *), - Denotes Not Applicable

4.1.4. Income of the tribes

The major sectors that have contributed to the tribal income were daily wages, agriculture, Govt. jobs and NTFP collection (Table 5). The Irula and Muduga women were mainly involved as daily wage workers, especially in the farm which provided them an annual income of Rs. 67,262 (69 %) and Rs. 63,707 (64 %) respectively (Fig. 4). The contribution of government sector to the Irulas annual income was Rs. 18,912

(19 %). The agriculture and forest based labour contributed the least to the Irula income. The Mudugas got an annual average income of Rs. 12,760 from agriculture and an amount of Rs. 9,116 (9 %) from NTFP collection. The NTFP had contributed significantly to the annual income of the Kurumbas. The NTFP collections have provided an annual average income of Rs. 31,516 (44 %) to the Kurumba households. The contribution of daily wages work was Rs. 13,788 (19 %). The agriculture sector had contributed an income of Rs. 1,968/annum. Through Government jobs, the Kurumbas have earned an amount of Rs. 16,920 (24 %) per annum.

Table 5. Sources of income for the tribes in Western Attappady

Sl.No.	Tribal group	Sources of income	Average Annual Income (Rs.)	Percentage of income (%)
1	Irula	Daily wages	67262	69
		Agriculture	960	1
		Govt jobs	18912	19
		NTFP collection	835	1
		Others	10024	10
2	Muduga	Daily wages	63707	64
		Agriculture	12760	13
		Govt jobs	13080	13
		NTFP collection	9116	9
		Others	1416	1
3	Kurumba	Daily wages	13788	19
		Agriculture	1968	3
		Govt jobs	16920	24
		NTFP collection	31516	44
		Others	6984	10

The contributions of different jobs to the house hold income of Irula, Muduga and Kurumba are shown in Tables 6, 7 and 8 respectively. Thirty eight households of Irula got more than 90 per cent of their income from daily wages. Though 13 households got income from the forest resources, their contribution to the income was less than 10 per cent. In Mudugas, 23 houses obtained 60-90 per cent of their income from daily wages. Nine houses got 30-60 per cent of their income from agriculture. The NTFP collection contributed upto 20 per cent of the income for 15 Muduga houses and 20-30 per cent income for 9 Muduga houses. In case of the Kurumbas, 42

households had an income from NTFP collection. Six houses got less than 30 per cent of their income from NTFP collection and 20 houses got 60-90 per cent of their income from NTFP collection. For six households, NTFP collection had contributed more than 90 per cent of their income. There is significant difference in the income contribution of different sectors to the income of the Irulas, Mudugas and Kurumbas.

Table 6. Contribution of different occupations to the income of Irula house holds

Contribution to income	No. of houses				
	Agriculture	Daily wages	NTFP	Government job	Others
<30 %	1	1	11	2	1
30-60 %	-	2	2	2	6
60-90%	-	3	-	1	2
>90	-	32	-	5	2
Total	1	38	13	10	11

(P= 0.000*), - denotes Not Applicable

Table 7. Contribution of different occupations to the income of Mudugas households

Contribution to income	No. of houses				
	Agriculture	Daily wages	NTFP	Government job	Others
Upto 30 %	6	3	24	-	3
30-60 %	9	12	2	1	1
60-90%	1	23	-	2	
>90	-	10	-	2	
Total	16	48	26	5	4

(P= 0.000*), - denotes Not Applicable

Table 8. Contribution of different occupations to the income of Kurumbas households

Contribution to income	No. of houses				
	Agriculture	Daily wages	NTFP	Government job	Others
Upto 30 %	25	17	6	-	2
30-60 %	-	11	10	1	2
60-90%	-	3	20	3	-
>90%	-	1	6	3	4
Total	25	32	42	7	8

(P=0.000*), - denotes Not Applicable

4.1.5. Expenditure of the tribes

The average annual expenditure of Irulas, Mudugas and Kurumbas were found to be Rs. 76950, 75300 and 57300 respectively (Table 9 and 10). Major part of the expenditure incurred was for food, transportation and miscellaneous. The majority of the Irula houses (42 %) were having an annual expenditure of Rs. 50000-75000. Fifty eight per cent of the Muduga houses were having an annual expenditure of Rs. 50000-75000. In case of Kurumbas also majority of the houses (50 %) annual expenditure was ranging from Rs. 50000-75000.The Irula spent 34 per cent of their income for food, whereas Mudugas and Kurumbas spent 32 and 31 per cent respectively of their income for the same (Fig. 5). The expenditure for treatments registered 8, 7 and 5 per cent for Irula, Muduga and Kurumba respectively. Transportation cost was also found to be a major item in the tribal expenditure. Irula and Kurumba had spent 10 per cent each whereas Mudugas spent 12 per cent of their expense for transportation. The miscellaneous expenditure (alcohol, smoking, soap, paste etc) was 20 per cent each for Irulas and Mudugas, whereas for Kurumbas the expenditure incurred was 24 per cent. Thirty two per cent of the Irula families were having an annual expenditure more than Rs. 75000/annum, whereas it was 26 and 18 per cent for Muduga and Kurumba respectively. None of the Muduga families spent less than Rs. 25000/annum for meeting family expenses.

Table 9. Expenditure pattern of tribes in Western Attappady

Sl.no.	Item	Average Annual Expenditure (Rs)		
		Irula	Muduga	Kurumba
1	Food	26000 (34)	24000 (32)	18000 (31)
2	Cloth	7000 (9)	6500 (9)	5000 (9)
3	Health	6000 (8)	5500 (7)	3000 (5)
4	Education	5000 (6)	5000 (7)	5000 (9)
5	Transportation	8000 (10)	9000 (12)	6000 (10)
6	Power	850 (1)	800 (1)	300 (1)
7	Festival	7000 (9)	7000 (9)	5000 (9)
8	Farm expenses	2100 (3)	2500 (3)	1000 (2)
9	Miscellaneous	15000 (20)	15000 (20)	14000 (24)
Total		76950	75300	57300

Figures in parenthesis shows percentage to total expenditure

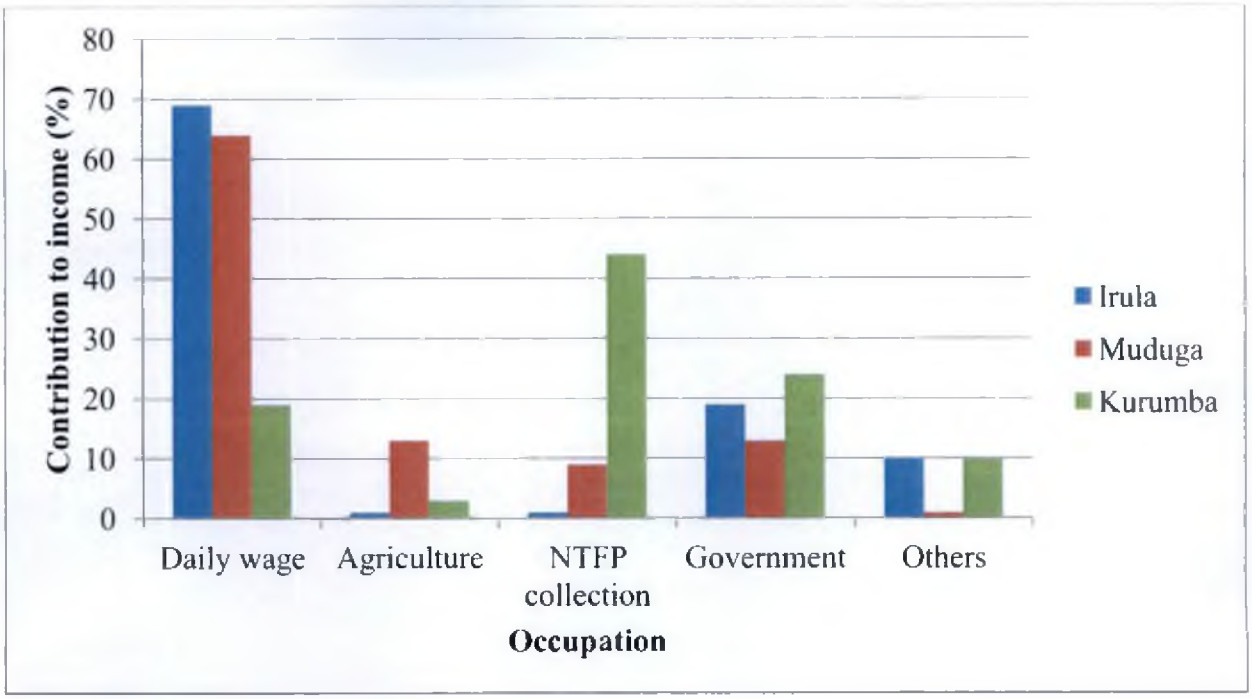


Fig. 4 The contribution of different occupations to the income of the tribes of Western Attappady

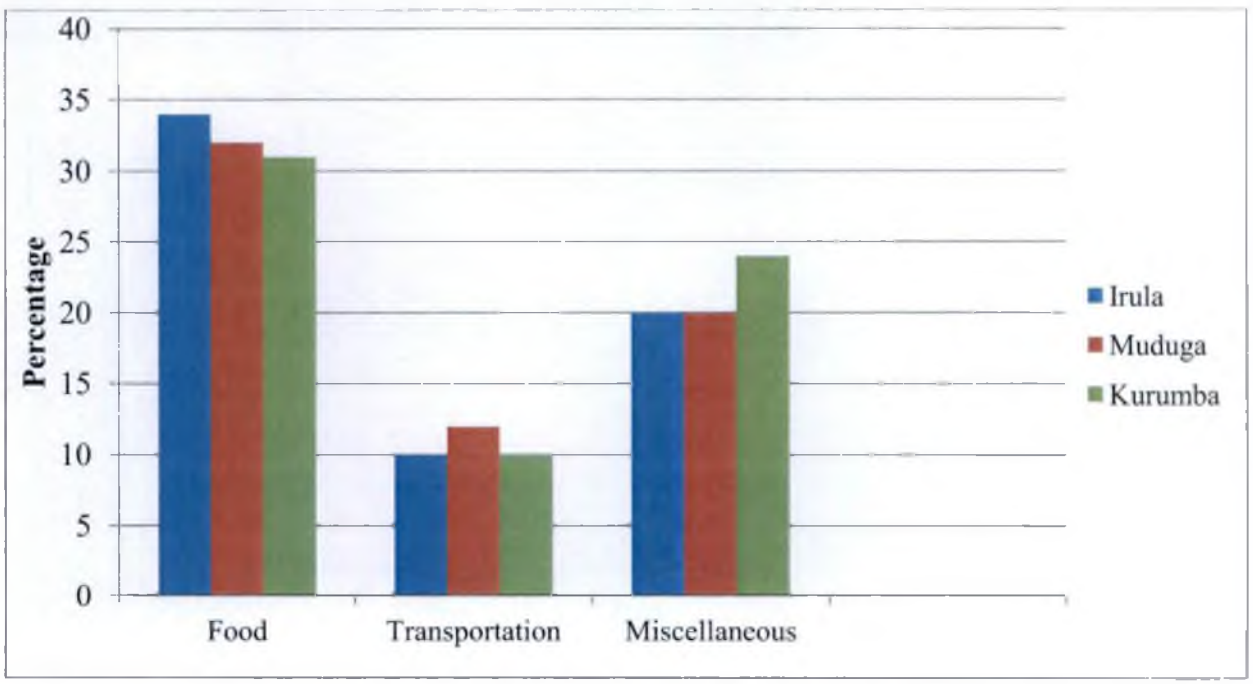


Fig. 5 Major expenditure incurred by the tribes of Western Attappady

Table 10. Expenditure among the tribal households in Western Attappady

Sl.No.	Annual Expenditure (Rs)	No.of houses (%)		
		Irula	Muduga	Kurumba
1	<25000	6	-	4
2	25000-50000	20	16	28
3	50000-75000	42	58	50
4	>75000	32	26	18
Total		100	100	100

- denotes none

4.2. DEPENDENCE ON NTFP

The tribes of Western Attappady depended on 52 NTFP's (Appendix II) for meeting their various requirements (Fig. 6). The level of dependence on the forest resources among the Irulas, Mudugas and Kurumbas of Western Attappady are furnished below.

4.2.1. NTFP as food

All the three tribal groups had shown their dependency to certain NTFP's for food (Plate 2) to fulfill their dietary requirements (Table 11). All the three tribal groups together consumed 17 edible plants. The 17 species constituted of 4 leaves, 9 fruits, 3 tubers and honey. The leaves of *Amaranthus spinosus, Murraya koenigii, Mesua ferrea, Solanum torvum* and fruits of *Artocarpus heterophyllus, Capsicum frutescens, Garcinia gummigatta, Grewia tillifolia, Mangifera indica, Syzygium cumini, Cycas circinalis* and *Tamarindus indica* were used by the tribes (Fig. 7). *Colocasia antiquorum, Dioscorea oppositifolia* and *Dioscorea pentaphylla* were the tuber species used. Honey was the popular edible product among all the 3 tribal groups. The species like *Amaranthus spinosus, Colocasia antiquorum, Dioscorea oppositifolia, Dioscorea pentaphylla, Grewia tiliifolia, Mesua ferrea* and *Ziziphus rugosa* were used only by the Kurumba community. The other NTFP's were used by all the three tribal communities as food. The Irulas and Mudugas did not prefer using

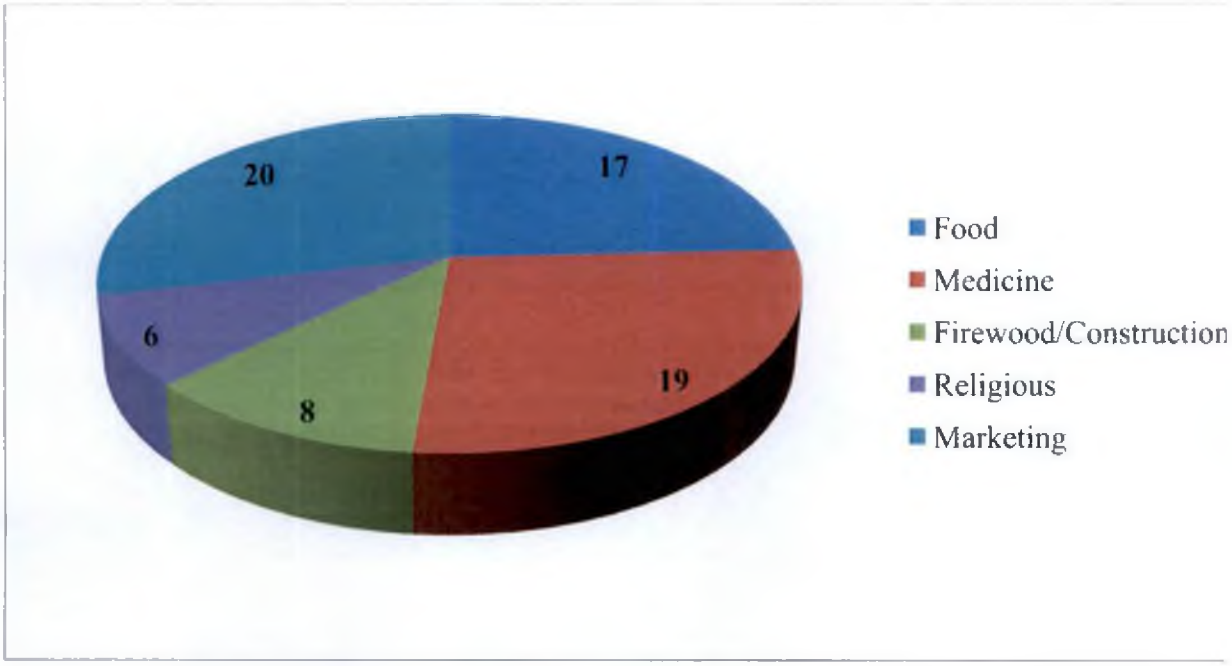


Fig. 6 NTFPs utilized by the tribes of Western Attappady

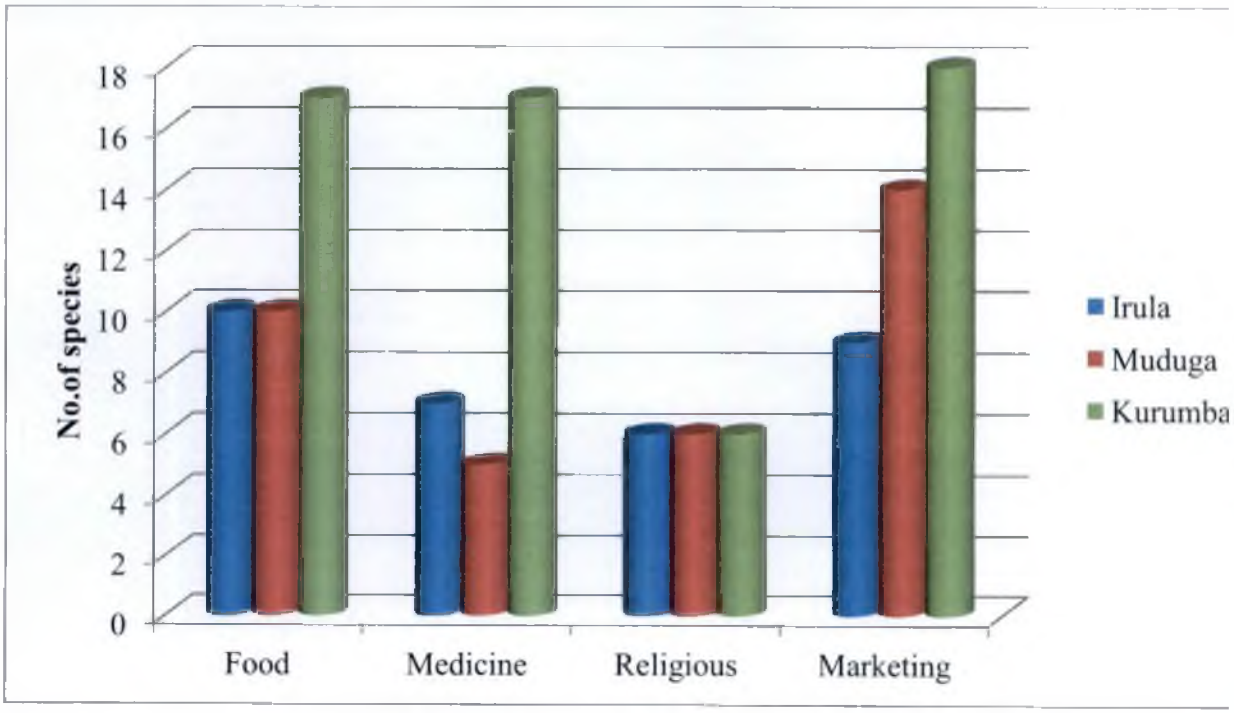


Fig.7 NTFPs utilized for various purposes among the tribes of Western Attappady

the tubers. The Kurumbas depended more on the forest resources for food inorder to ensure that their food requirements were met.

Table 11. NTFP's used as food among various tribal groups in Western Attappady

Sl.no.	Item	Local name	Community involved	Part used
1	*Amaranthus spinosus*	Kattu keera	K	Leaves
2	*Artocarpus heterophyllus*	Sakke	I, M,K	Fruit
3	*Capsicum frutescens*	Jeenimula	I,M,K	Fruit
4	*Colocasia antiquorum*	Kattu kilangu Sola kilangu	K	Tuber
5	*Cycas circinalis*	Eenthu	I,M,K	Fruit
6	*Dioscorea oppositifolia*	Erraikodi	K	Tuber
7	*Dioscorea pentaphylla*	Noora kilangu	K	Tuber
8	*Garcinia gummigatta*	Kudampuli	I,M,K	Fruit
9	*Grewia tillifolia*	Uluma	K	Fruit
10	Honey (*Apis dorsata*)	Then	I,M,K	Honey
11	*Mangifera indica*	Mave	I,M,K	Fruit
12	*Murraya koenigii*	Karampa	I,M,K	Leaf and fruit
13	*Mesua ferrea*	Churula	K	Leaf
14	*Solanum torvum*	Kanka	I,M,K	Leaves
15	*Syzygium cumini*	Njaval	I,M,K	Fruit
16	*Tamarindus indica*	Puli	I,M,K	Fruit
17	*Ziziphus rugosa*	Juli	K	Fruit and bark

I: Irula, M: Muduga, K: Kurumba

4.2. 2. NTFP as medicine

Though the dependence on the medicinal plants had drastically reduced among the younger generations, the older people have been using certain medicinal plants for treating various ailments (Plate 3). Altogether 19 medicinal plants were used by the tribes of Western Attappady (Table 12). The barks of species like *Acacia caesia, Calophyllum polyanthum, Dalbergia latifolia, Grewia tillifolia, Mallotus philippensis, Terminalia bellerica* and roots of *Cajanus albicans, Helicteres isora, Ocimum americanum* were used for treating various ailments. The various medicinal preparations were made using the leaves of *Cyclea peltata, Desmodium gangeticum, Senna hirsuta, Sida rhombifolia, Bauhinia malabarica* and tubers of *Canavalia*

africana and *Gloriosa superba*. The flower of *Palaquium ellipticum* and whole plant of *Balanophora fungosa* were also used by the tribes. Among these, bark of *Acacia caesia* used against stomach ache and flower of *Palaquium ellipticum* were used by Irulas against kidney disorders. The species such as *Balanophora fungosa, Bauhinia malabarica, Cajanus albicans, Calophyllum polyanthum, Canavalia africana, Dalbergia latifolia, Gloriosa superba, Helicteres isora, Mallotus philippensis, Senna hirsute* were used only by Kurumbas. *Cyclea peltata, Desmodium gangeticum, Sida rhombifolia, Ocimum americanum* and honey were used by all the communities. The bark of *Acacia caesia, Terminalia bellerica, Grewia tillifolia, Dalbergia latifolia* and roots of *Helicteres isora* were used for curing the stomach problems.

4.2.3. NTFP for firewood and construction purpose

The various species that were used for household activities like construction of cattle sheds, firewood etc are furnished in Table 13. The solid bamboo, *Dendrocalamus strictus* was used for the construction of the cattle sheds (Plate 4), whereas the twigs of *Phoenix loureiroi* used for the thatching purpose. The rope for tying was made from the stem fibres of *Helicteres isora*, *Ochlandra travancorica* was used as the long handle for collecting *Acacia concinna* fruits. The twigs of *Sida rhombifolia* was used as brooms to sweep their houses (Plate 5). The firewood was the only source of energy for the households. *Grewia tillifolia, Artocarpus heterophyllus* and *Mangifera indica* were mainly utilized as firewood.



a. *Cycas circinalis* b. Honey c. *Dioscorea pentaphylla*

Plate 2. The NTFPs used as food among the tribes of Western Attappady



a. Balanophora fungosa b. Bark of *Calophyllum polyanthum* c. Roots of *Sida rhombifolia*

Plate 3. The medicinal plants used among the tribes of Western Attappady

Plate 4. Goat shed made of *Dendrocalamus strictus*

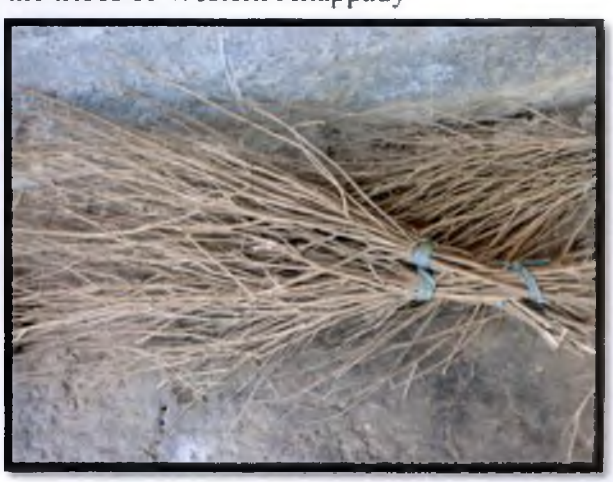


Plate 5. Broom made using twigs of *Sida rhombifolia*

Table 12. NTFP's used as medicine among tribes of Western Attappady

Sl.No.	Item	Local name	Part used	Community involved	Use
1	*Acacia caesia*	Erraksinka	Bark	I	Medicine for stomach ache
2	*Balanophora fungosa*	Nilabombu	Whole plant	K	Swellings
3	*Bauhinia malabarica*	Ashamaram	Twig	K	Against eye disease
4	*Cajanus albicans*	Parivasappa	Root	K	Wounds
5	*Calophyllum polyanthum*	Kattupunna	Bark	K	Veterinary medicine
6	*Canavalia africana*	Kilara	Tuber	K	To treat piles, wounds and swellings
7	*Cyclea peltata*	Padaberu	Leaves	I,M,K	Against leech bite, stomach pain, itching
8	*Dalbergia latifolia*	Etti	Bark juice	K	Against stomach pain
9	*Desmodium gangeticum*	Kaduppukodi	Leaves	I,M,K	Against loose motion
10	*Gloriosa superba*	Kodakizhangu	Tuber	K	Poison, used against snake bite
11	*Grewia tillifolia*	Chadachi	Bark	K	Stomach pain
12	*Helicteres isora*	Kavari	Root	K	Stomach pain
13	Honey	Then	Honey	I,M,K	Fever
14	*Mallotus philippensis*	Kathivettu	Bark	K	Knife wounds
15	*Ocimum americanum*	Thulasi	Root and leaves	I,M,K	Tooth ache
16	*Palaquium ellipticum*	Paalipoovu	Flower	I	Kidney disease
17	*Senna hirsuta*	Thakara	Leaves	K	Head ache
18	*Sida rhombifolia*	Kulamaru	Leaves	I,M,K	Rheumatism, swelling
19	*Terminalia bellerica*	Tanni	Bark	K	Stomach problems

I: Irula, M: Muduga, K: Kurumba

Table 13. NTFP utilized for household activities by the tribes of Western Attappady

Sl.No.	Item	Local name	Part used	Use
1	*Dendrocalamus strictus*	Moonka	Stem	Making cattle sheds
2	*Helicteres isora*	Kavari	Stem	To make coir
3	*Ochlandra travancorica*	Oda	Stem	Long handle
4	*Phoenix loureiroi*	Choolpullu	Twigs	To make brooms
5	*Sida rhombifolia*	Kulamaru	Twigs	To make brooms
6	*Artocarpus heterophyllus*	Sakke	Dried branches	Firewood
7	*Grewia tillifolia*	Chadachi		
8	*Mangifera indica*	Mave		

4.2.4 NTFP for religious purpose

Six species was used among the tribes for the religious purposes (Table 14). *Canarium strictum* was used during the occasion of poojas and remaining four species such as *Achyranthes aspera, Amaranthus spinosus, Aerva lanata* were used for Vishu Kani. A drink made out of *Catunaregam spinosa* was used as part of the religious ceremonies.

Table 14. NTFP's used for religious purpose among the three tribal communities.

Sl.No.	Item	Local name	Part used	Use
1	*Achyranthes aspera*	Irrumulli	Twigs	Vishu kani
2	*Amaranthus spinosus*	Cheera	Twigs	Vishu Kani
3	*Aerva lanata*	Kallipuvu	Twigs	Vishu Kani
4	*Calotropis gigantea*	Errukku	Twigs	Vishu Kani
5	*Canarium strictum*	Tumma	Resin	Pooja
6	*Catunaregam spinosa*	Kara	Root	A drink

4.2.5. NTFP as a source of income

Commercially important 20 NTFP species were collected by the tribes of Western Attappady (Table 15). The collection of 18 commercially important NTFP's provided a major source of income for the Kurumbas, who are settled in the interior areas of

the forests. The Irula collected nine commercially important NTFP species, whereas Mudugas collected 14 species (Fig.7). All the three communities were involved in the collection of fruits of *Acacia concinna,* tuber of *Cyclea peltata,* roots of *Desmodium gangeticum, Hemidesmus indicus, Sida rhombifolia, Solanum torvum, Strobilanthus ciliates, Pseudarthria viscida* and honey. The Muduga and Kurumba were involved in the collection of resin of *Canarium strictum,* fruits of *Mangifera indica, Phyllanthus emblica* and roots of *Callicarpa tomentosa.* The Kurumba community was involved in the collection of whole plant of *Balanophora fungosa,* stem of *Piper nigrum,* fruit of *Garcinia gummigatta, Piper longum,* aril of *Myristica dactyloides* and wax. The Muduga was the only community involved in the collection of the twigs of *Phoenix loureiroi.*

The levels of dependence of various tribal communities on the NTFP's marketed are presented in Table 16. For Irulas and Mudugas, NTFP collection was a subsidiary source of income. Ten per cent of the Irula houses were involved in the collection of fruits of *Acacia concinna,* tubers of *Cyclea peltata* and roots of *Desmodium gangeticum, Hemidesmus indicus, Pseudarthria viscida, Sida rhombifolia, Solanum torvum* and *Strobilanthus ciliates.* Among Irulas, 18 per cent of the houses were involved in the honey collection, where as in Muduga and Kurumba 48 and 44 per cent respectively were involved. In Muduga highest percentage of the houses were involved in the collection of honey (48 %), followed by *Phyllanthus emblica* (46 %) and *Mangifera indica* (36 %). The Mudugas were least involved in the collection of *Callicarpa tomentosa* and *Phoenix loureiroi* with 14 per cent. The Kurumba households collected *Acacia concinna* and *Piper nigrum* (78 %) the most, followed by *Pseudarthria viscida* (76 %) and *Strobilanthus ciliates, Desmodium gangeticum* and *Canarium strictum* with 74 per cent. The lowest number of Kurumba houses were involved in wax collection (4 %).

Table 15.The frequently marketed NTFP's by the tribal communities in Western Attappady

Sl.No.	Item	Local name	Part used	Community involved
1	*Acacia concinna*	Cheenikka	Fruit	Irula, Muduga, Kurumba
2	*Balanophora fungosa*	Nilabombu	Whole plant	Kurumba
3	*Callicarpa tomentosa*	Mulathekku	Root	Muduga and Kurumba
4	*Canarium strictum*	Tumma	Resin	Muduga and Kurumba
5	*Cyclea peltata*	Padaberu	Tuber	Irula, Muduga and Kurumba
6	*Desmodium gangeticum*	Ottaila	Root	Irula, Muduga, Kurumba
7	*Garcinia gummigatta*	Kudampuli	Fruit	Kurumba
8	*Hemidesmus indicus*	Nannari	Root	Irula, Muduga,and Kurumba
9	Honey (*Apis dorsata*)	Then	Honey	Irula, Muduga and Kurumba
10	*Mangifera indica*	Mave	Fruit	Muduga and Kurumba
11	*Phoenix loureiroi*	Choolpullu	Twig	Muduga
12	*Phyllanthus emblica*	Nellikka	Fruit	Muduga and Kurumba
13	*Piper nigrum*	Kurumulakuvalli	Stem	Kurumba
14	*Piper longum*	Thippalli	Fruit	Kurumba
15	*Pseudarthria viscida*	Moovila	Root	Irula,Muduga and Kurumba
16	*Sida rhombifolia*	Kalamaru	Root	Irula, Muduga and Kurumba
17	*Solanum torvum*	Chunda	Root	Irula, Muduga and Kurumba
18	*Myristica dactyloides*	Pathiripoovu	Aril	Kurumba
19	*Strobilanthus ciliates*	Karinkurinji	Root	Irula, Muduga and Kurumba
20	Wax	Mekku	Honey comb	Kurumba

Table 16.The percentage of households depending on marketed NTFP in Western Attappady

Sl.No.	NTFP	No. of houses involved in collection (%) *		
		Irula	Muduga	Kurumba
1	*Acacia concinna*	10	34	78
2	*Balanophora fungosa*	-	-	38
3	*Callicarpa tomentosa*	-	14	68
4	*Canarium strictum*	-	28	74
5	*Cyclea peltata*	10	18	62
6	*Desmodium gangeticum*	10	18	74
7	*Garcinia gummigatta*	-	-	24
8	*Hemidesmus indicus*	10	20	62
9	Honey (*Apis dorsata*)	18	48	44
10	*Mangifera indica*	-	36	28
11	*Myristica dactyloides*	-	-	28
12	*Phoenix loureiroi*	-	14	-
13	*Phyllanthus emblica*	-	46	28
14	*Piper nigrum*	-	-	78
15	*Piper longum*	-	-	-
16	*Pseudarthria viscida*	10	18	76
17	*Sida rhombifolia*	10	20	58
18	*Solanum torvum*	10	20	62
19	*Strobilanthus ciliates*	10	20	74
20	Wax	-	-	4

- denotes Not Applicable, * The percentages are calculated based on the number of houses involved in each community in the collection of each NTFP species

The contributions of different marketed NTFP's to the income of the tribes are furnished in Table 17. For Irulas, the honey contributed 50 per cent of their income, followed by *Acacia concinna* (10 %). The species such as *Strobilanthus ciliates, Solanum torvum, Desmodium gangeticum* and *Pseudarthria viscida* contributed 5 per cent each to their income. The Mudugas obtained highest income from *Canarium strictum* (18 %), followed by *Mangifera indica* (17 %) and honey (12 %). The least contribution of two per cent was from the roots of *Desmodium gangeticum, Strobilanthus ciliates, Hemidesmus indicus, Pseudarthria viscida* and fruits of *Garcinia gummi-gatta*. The Kurumbas obtained highest income of Rs. 5880/annum from *Solanum torvum,* which contributed 13 per cent of their income from NTFP

collection, followed by honey and *Strobilanthus ciliates* which contributed 12 and 11 per cent respectively. The least contribution to the Kurumba income was from *Myristica dactyloides* (0.2 %) and *Hemidesmus indicus* (0.8 %).

Table 17. Income from NTFP collection for the tribal communities in Western Attappady

Sl.No.	Item	Average annual income/household from NTFP collection (Rs)		
		Irula	Muduga	Kurumba
1	Honey	2880 (50)	3360 (12)	5760 (12)
2	*Canarium strictum*	-	4800 (18)	4560 (10)
3	*Acacia concinna*	600 (10)	1800 (7)	3000 (6)
4	*Myristica dactyloides*	-	-	100 (0.2)
5	*Piper nigrum*	-	-	4000 (9)
6	*Sida rhombifolia*	375 (7)	860 (3)	1060 (2)
7	*Strobilanthus ciliates*	300 (5)	450 (2)	4750 (11)
8	*Solanum torvum*	300 (5)	2250 (8)	5880 (13)
9	*Cyclea peltata*	500 (9)	1300 (5)	2300 (5)
10	*Desmodium gangeticum*	300 (5)	600 (2)	2580 (6)
11	*Callicarpa tomentosa*	-	450 (2)	2000 (4)
12	*Hemidesmus indicus*	200 (4)	550 (2)	400 (0.8)
13	*Pseudarthria viscida*	300 (5)	600 (2)	2880 (6)
14	*Balanophora fungosa*	-	-	4000 (9)
15	*Mangifera indica*	-	4500 (17)	1125 (2)
16	*Phyllanthus emblica*	-	3200 (11)	1200 (3)
17	*Garcinia gummigatta*	-	-	660 (1)
18	*Phoenix loureiroi*	-	2500 (9)	-
	Total	5755	27220	46255

- denotes Not Applicable, Figures in parenthesis show percentage contribution of each NTFP to the overall income.

The species such as *Solanum torvum, Strobilanthus ciliates, Canarium strictum* and honey together contributed 46 per cent of the overall income of Kurumbas from NTFP collection. The major species that were contributing significantly to the income of Muduga were *Canarium strictum, Mangifera indica, Phyllanthus emblica* and honey which together contributed 56 per cent of their income from NTFP collection. The Irula household obtained an average annual income of Rs. 5755/annum from NTFP collection, whereas Mudugas and Kurumbas got an average annual income of Rs. 27220 and Rs. 46255/annum respectively.

4.3. GENDER DIMENSION IN NTFP COLLECTION

The gender dimensions in the collection of NTFP's for domestic purpose are presented in the Table 18. The both genders of Irula, Muduga and Kurumba were involved in the collection of fruits of *Syzygium cumini*, *Mangifera indica* and *Cycas circinalis*. The men from all the 3 groups were involved in the collection of fruits of *Artocarpus heterophyllus*. The Irula, Muduga and Kurumba women collected the fruit of *Capsicum frutescens* and leaves of *Murraya koenigii*. The leaves of *Amaranthus gangeticus* and tubers of *Dioscorea oppositifolia* were exclusively collected by the Kurumba women, where as fruit of *Garcinia gummigatta* and tubers of *Colocasia antiquorum, Dioscorea pentaphylla* were exclusively collected only by Kurumba men.

Table 18. Gender dimension in NTFP collection for domestic purpose among tribes in Western Attappady

Sl.No.	Item	Gender involved in collection					
		Irula		Muduga		Kurumba	
		M	F	M	F	M	F
1	*Amaranthus gangeticus*	-	-	-	-	-	✓
2	*Artocarpus heterophyllus*	✓	-	✓	-	✓	-
3	*Colocasia antiquorum*	-	-	-	-	✓	-
4	*Capsicum frutescens*	-	✓	-	✓	-	✓
5	*Cycas circinalis*	✓	✓	✓	✓	✓	✓
6	*Dioscorea oppositifolia*	-	-	-	-	-	✓
7	*Dioscorea pentaphylla*	-	-	-	-	✓	-
8	*Garcinia gummigatta*	-	-	-	-	✓	-
9	*Mangifera indica*	✓	✓	✓	✓	✓	✓
10	*Murraya koenigii*	-	✓	-	✓	-	✓
11	*Syzygium cumini*	✓	✓	✓	✓	✓	✓

√:Collected, - : Not collected

The gender distinction in NTFP collection was followed in the case of certain commercial products (Table 19) also. The men alone were involved in the honey collection in all the three communities. The women were exclusively involved in the collection of roots of medicinal plants such as *Sida rhombifolia*, *Cyclea peltata*,

Hemidesmus indicus, Desmodium gangeticum, Pseudarthria viscida, Solanum torvum, Strobilanthus ciliates, Callicarpa tomentosa and *Piper nigrum.* The Irula community got an amount of Rs. 5755 from NTFP collection, out of that Rs. 2880 (50 %) was the contribution of men through honey collection. The women contributed the remaining part of their income from NTFP collection by collecting roots. In Muduga community the men and women contributed 65 and 35 per cent of their income from NTFP collection. The Kurumba women who were involved in the collection of roots contributed Rs. 25850 (56 %), whereas men contributed Rs. 20405 (44 %) of their income from NTFP collection.

Table 19. Contribution of men and women to the income from NTFP collection among the tribes of Western Attappady

Sl. No.	Tribe	NTFP's collected by men	Income (Rs)	NTFP's collected by women	Income (Rs)
1	Irula	Honey	2880 (50 %)	*Acacia concinna* *Cyclea peltata* *Desmodium gangeticum* *Hemidesmus indicus* *Sida rhombifolia* *Solanum torvum* *Pseudarthria viscida* *Strobilanthus ciliates*	2880 (50 %)
2	Muduga	*Acacia concinna* *Canarium strictum* Honey *Mangifera indica* *Phyllanthus emblica*	17660 (65 %)	*Callicarpa tomentosa* *Cyclea peltata* *Desmodium gangeticum* *Hemidesmus indicus* *Sida rhombifolia* *Phoenix loureiroi* *Solanum torvum* *Pseudarthria viscida* *Strobilanthus ciliates*	9560 (35 %)
3	Kurumba	*Acacia concinna* *Balanophora fungosa* *Canarium strictum* *Garcinia gummigatta* Honey *Mangifera indica* *Myristica dactyloides* *Phyllanthus emblica*	20405 (44 %)	*Callicarpa tomentosa* *Cyclea peltata* *Desmodium gangeticum* *Hemidesmus indicus* *Sida rhombifolia* *Piper nigrum* *Solanum torvum* *Pseudarthria viscida* *Strobilanthus ciliates*	25850 (56 %)

Figure in parenthesis show percentage contribution to the total income from NTFP collection

4.4. HARVESTING OF NTFP

The distance travelled for harvesting NTFP (Table 20), number of visits in a season and quantity collected / trip among the three tribal communities are furnished in Table 21. The maximum range a tribal group went for collecting a specific NTFP was taken as the distance travelled. The Irula, Muduga and Kurumba were involved in the collection of honey. The Irulas travelled 10-20 km for collecting honey, whereas the Kurumbas and Mudugas travelled 10-30 km. The Irulas went 3-4 times in a year, whereas Mudugas went 5-6 times in a year. The Kurumbas went for collecting honey 5-6 times in a season. In each trip, all the community got 20-40 kg of honey. All the three communities travelled less than 2 km for collecting *Cyclea peltata*, *Hemidesmus indicus*, *Sida rhombifolia* and *Solanum torvum*. The Irula community had travelled 2-5 km for collecting the species such as *Acacia concinna, Desmodium gangeticum* and *Pseudarthria viscida*, whereas Muduga and Kurumba collected fruits of *Mangifera indica* and *Phyllanthus emblica* from the same distance. The Muduga and Kurumba collected 7 commercial NTFP's travelling 6-10 km. The Kurumbas travelled 2-5 km for collecting fruits of *Mangifera indica* and *Phyllanthus emblica*. They travelled 6-10 km for collecting fruit of *Acacia concinna*, *Garcinia gummigatta*, *Callicarpa tomentosa*, resin of *Canarium strictum*, roots of *Desmodium gangeticum, Pseudarthria viscida* and *Strobilanthus ciliates*. For collecting *Balanophora fungosa* and *Piper nigrum*, kurumbas travelled 10-15 km. The Kurumbas travelled 10-20 km for collecting *Myristica dactyloides*.

The Irulas collected 3-5 kg/trip of *Acacia concinna* fruits, roots of *Desmodium gangeticum* and *Strobilanthus ciliates*. They collected the highest quantity of honey/trip. All the communities collected less than 1 kg of *Cyclea peltata* in a trip. One to two kilograms of *Hemidesmus indicus* and *Garcinia gummigatta* were collected by all the communities in a single trip. The Muduga collected maximum quantity of*Mangifera indica* (40-50 kg/trip), followed by *Phyllanthus emblica* (20-30 kg/trip).

Table 20. Distance travelled by the communities for the collection of marketed NTFP's

Sl.No.	Distance travelled (km)	No. of NTFP's collected			NTFP's		
		I	M	K	Irula	Muduga	Kurumba
1	<2	4	4	4	*Cyclea peltata Hemidesmus indicus, Sida rhombifolia Solanum torvum*	*Cyclea peltata Hemidesmus indicus,Sida rhombifolia Solanum torvum*	*Cyclea peltata Hemidesmus indicus, Sida rhombifolia Solanum torvum*
2	2-5	3	2	2	*Acacia concinna, Desmodium gangeticum, Pseudarthria viscida*	*Mangifera indica Phyllanthus emblica*	*Mangifera indica Phyllanthus emblica*
3	6-10	1	7	7	*Strobilanthus ciliates*	*Acacia concinna Callicarpa tomentosa, Canarium strictum, Desmodium gangeticum, Pseudarthria viscida, Strobilanthus ciliates, Phoenix loureiroi,*	*Acacia concinna Callicarpa tomentosa, Canarium strictum, Desmodium gangeticum, Pseudarthria viscida, Strobilanthus ciliates, Garcinia gummigatta*
4	11-15	-	-	2	-	-	*Piper nigrum, Balanophora fungosa*
5	16-20	1	-	1	Honey	-	*Myristica dactyloides*
6	>20	-	1	1	-	Honey	Honey

I: Irula, M:Muduga, K:Kurumba, - denotes Not Applicable

The Mudugas collected 10 kg/trip of the roots of *Callicarpa tomentosa*, *Desmodium gangeticum*, *Pseudarthria viscida*, *Solanum torvum* and *Strobilanthus ciliates*. The Kurumbas collected the most quantity of *Strobilanthus ciliates* (50-100 kg/trip), followed by *Solanum torvum* (35-50 kg/trip). The Kurumbas collected less than 1 kg/trip of *Myristica dactyloides*. The Kurumba and Muduga collected 5 kg of *Canarium strictum*/ trip.

The Irula went the most times to collect *Cyclea peltata* (10/year), followed by *Hemidesmus indicus* (5 trips/year) and least times to collect *Strobilanthus ciliates*, *Solanum torvum* and *Desmodium gangeticum* (2/year). For the other products, the Irula had made upto 3 visits in a year for collection. The Mudugas went maximum times to collect *Cyclea peltata* (10-15/year), followed by *Canarium strictum* (12/year), *Phyllanthus emblica* (8-9/ year) and *Mangifera indica* (8-9/ year). The least times the Mudugas went for collecting *Callicarpa tomentosa* (3/ year).The collection of other products were done through 3-6 times visit in a season. The Kurumbas went the most times to collect *Cyclea peltata* (20/year), followed by *Canarium strictum*, honey (12/year) and *Acacia concinna* (12/ year). The Kurumba went least times for collecting *Sida rhombifolia* (2/year). For most of the products Kurumba had undertaken 3-6 times visits in a year. The Irulas went 30 trips/year, whereas Mudugas and Kurumbas went 78 and 123 trips/year respectively.

The collection season and harvesting methods of the NTFP's are presented in Table 22. The roots of *Sida rhombifolia*, *Solanum torvum*, *Desmodium gangeticum*, *Pseudarthria viscida*, *Strobilanthus ciliates* and *Callicarpa tomentosa* were collected during the months of November- February (Fig. 8). The resin of *Canarium strictum* was collected during April- June, whereas honey was collected twice in a year, April-June and October-November. All the communities were involved in honey collection during October-November, whereas only Kurumbas was involved in honey collection during April-June.

Table 21.Quantity collected and number of trips made for NTFP collection by the tribes of Western Attappady

Sl. No.	NTFP	Tribes	Quantity collected / trip (kg)	No of trips/year
1	*Acacia concinna*	Irula	3-5	4
		Muduga	20	6
		Kurumba	10-50	12
2	*Balanophora fungosa*	Kurumba	20-25	5
3	*Callicarpa tomentosa*	Muduga	10	3
		Kurumba	10-20	5-6
4	*Canarium strictum*	Muduga	5	16
		Kurumba	5	16
5	*Cyclea peltata*	Irula	0.1-0.2	10
		Muduga	0.5-1	10-15
		Kurumba	0.5-1	20
6	*Desmodium gangeticum*	Irula	5	2
		Muduga	10	3-4
		Kurumba	10-30	5-6
7	*Hemidesmus indicus*	Irula	0.5	5
		Muduga	1-2	5
		Kurumba	1-2	3-4
8	Honey (*Apis dorsata*)	Irula	20-40	3-4
		Muduga	20-40	5-6
		Kurumba	20-40	12
9	*Mangifera indica*	Muduga	40-50	6-8
		Kurumba	20	3
10	*Phyllanthus emblica*	Muduga	20-30	8-9
		Kurumba	20-30	3
11	*Pseudarthria viscida*	Irula	5	2
		Muduga	10	2-4
		Kurumba	10-25	5-6
12	*Sida rhombifolia*	Irula	1-2	3
		Muduga	5	4
		Kurumba	10	2
13	*Solanum torvum*	Irula	3-5	2
		Muduga	10	4-5
		Kurumba	35-50	4-5
14	*Myristica dactyloides*	Kurumba	<1	4
15	*Strobilanthus ciliates*	Irula	3-5	2
		Muduga	10	3-4
		Kurumba	50-100	5
16	*Phoenix loureiroi*	Muduga	10	3
17	*Piper nigrum*	Kurumba	10	10
18	*Piper longum*	Kurumba	10-15	5
19	*Garcinia gummigatta*	Kurumba	1-2	3
20	Wax	Kurumba	<1	5-6
Total trips/Year		Irula		**30**
		Muduga		**78**
		Kurumba		**123**

Table 22. Harvesting of NTFP's

Sl. No.	NTFP	Season of collection	Harvesting method	Total quantity collected/ household (kg)		
				Irula	Muduga	Kurumba
1	*Canarium strictum*	Sept- May	Tapping	-	60	60
2	Honey (*Apis dorsata*)	April- June and Oct-Nov	Using fire	10	12	20
3	Wax	April- Dec	Melting of bee comb	-	-	0.250
4	*Hemidesmus indicus*	Nov- Feb	Digging	2(dried)	5 (dried)	4 (dried)
5	*Acacia concinna*	April- May	Climbing and using long handle	15	120	120
6	*Cyclea peltata*	May- Dec	Digging	1	7.5	10
7	*Sida rhombifolia*	Nov-Feb	Whole plant	3	20	20
8	*Solanum torvum*	Nov- Feb	Whole plant	8	50	140
9	*Desmodium gangeticum*	Nov- Feb	Whole plant	10	40	60
10	*Piper longum*	Jan- Feb	Hand plucking	-	-	-
11	*Piper nigrum*	Nov- Feb	Whole plant	-	-	100
12	*Pseudarthria viscida*	Nov- Feb	Whole plant	10	40	60
13	*Strobilanthus ciliates*	Nov-Feb	Whole plant uprooted	10	40	250
14	*Callicarpa tomentosa*	Nov- Feb	Cut the roots after digging	-	30	50
15	*Myristica dactyloides*	June	climbing	-	-	0.5
16	*Phyllanthus emblica*	Oct- Dec	Cut the small branches	-	160	60
17	*Balanophora fungosa*	Dec- Jan	Whole plant	-	-	80
18	*Mangifera indica*	Jan-Feb	Cut small branches	-	60	30
19	*Phoenix loureiroi*	Nov-May	Twigs	-	10	-
20	*Garcinia gummigatta*	June- Aug	Climb the tree	-	3	3

- Denotes Not Applicable

NTFP	January	February	March	April	May	June	July	August	September	October	November	December
Acacia concinna				*	*							
Balanophora fungosa	*											*
Callicarpa tomentosa	*	*									*	*
Canarium strictum	*	*	*	*	*				*	*	*	*
Cyclea peltata					*	*	*	*	*	*	*	*
Desmodium gangeticum	*	*									*	*
Garcinia gummigatta						*	*	*				
Hemidesmus indicus	*	*									*	*
Honey (*Apis dorsata*)				*	*	*				*	*	
Mangifera indica	*	*										
Myristica dactyloides						*						
Phoenix loureiroi	*	*	*	*	*						*	*
Phyllanthus emblica										*	*	*
Piper nigrum	*	*									*	*
Pseudarthria viscida	*	*									*	*
Sida rhombifolia	*	*									*	*
Solanum torvum	*	*									*	*
Strobilanthus ciliates	*	*									*	*

Fig.8 The seasonal calendar of marketed NTFPs in Western Attappady (*): Collection Season

Acacia concinna was collected during April-June, whereas fruits of *Piper longum* and *Mangifera indica* were collected during Jan-Feb. The stem of *Piper nigrum* was collected during Nov-Feb, whereas the twig of *Phoenix loureiroi* was collected during Nov- June. The climbing method was used for harvesting the fruits of *Acacia concinna, Myristica dactyloides* and *Garcinia gummigatta.* The digging method was used for harvesting roots of *Hemidesmus indicus* and *Cyclea peltata.* The branches were cut for harvesting the fruits of *Mangifera indica* and *Phyllanthus emblica.*

Table 23. Pre processing and price distribution of commercially important NTFP in Western Attappady

Sl.No.	NTFP	Part used	Primary processing technique	Price before Processing (Rs/kg)	Price after processing (Rs/kg)
1	*Canarium strictum*	Resin	Grading	45	Grade 1: 90
					Grade 2: 75
					Grade 3: 50
2	*Hemidesmus indicus*	Root	Drying	110	120
3	*Phoenix loureiroi*	Twigs	Making broom	10	25/Broom
4	*Sida rhombifolia*	Root	Chopping	53	56
5	*Piper nigrum*	Stem	Drying	20-25	35-40
			Chopping	35-40	37-42
6	*Strobilanthus ciliates*	Whole plant	Chopping	19	21
7	*Solanum torvam*	Root		42	44
8	*Callicarpa tomentosa*	Root		40	42
9	*Pseudarthria viscida*	Whole plant		46	48
10	*Desmodium gangeticum*	Whole plant		43	45
11	*Balanophora fungosa*	Whole plant	Drying and chopping	9	14

The pre processing such as cleaning, grading, drying and chopping are done at the primary collectors level and price distribution before and after pre processing are furnished in Table 23. It was observed that the pre processing had increased the value

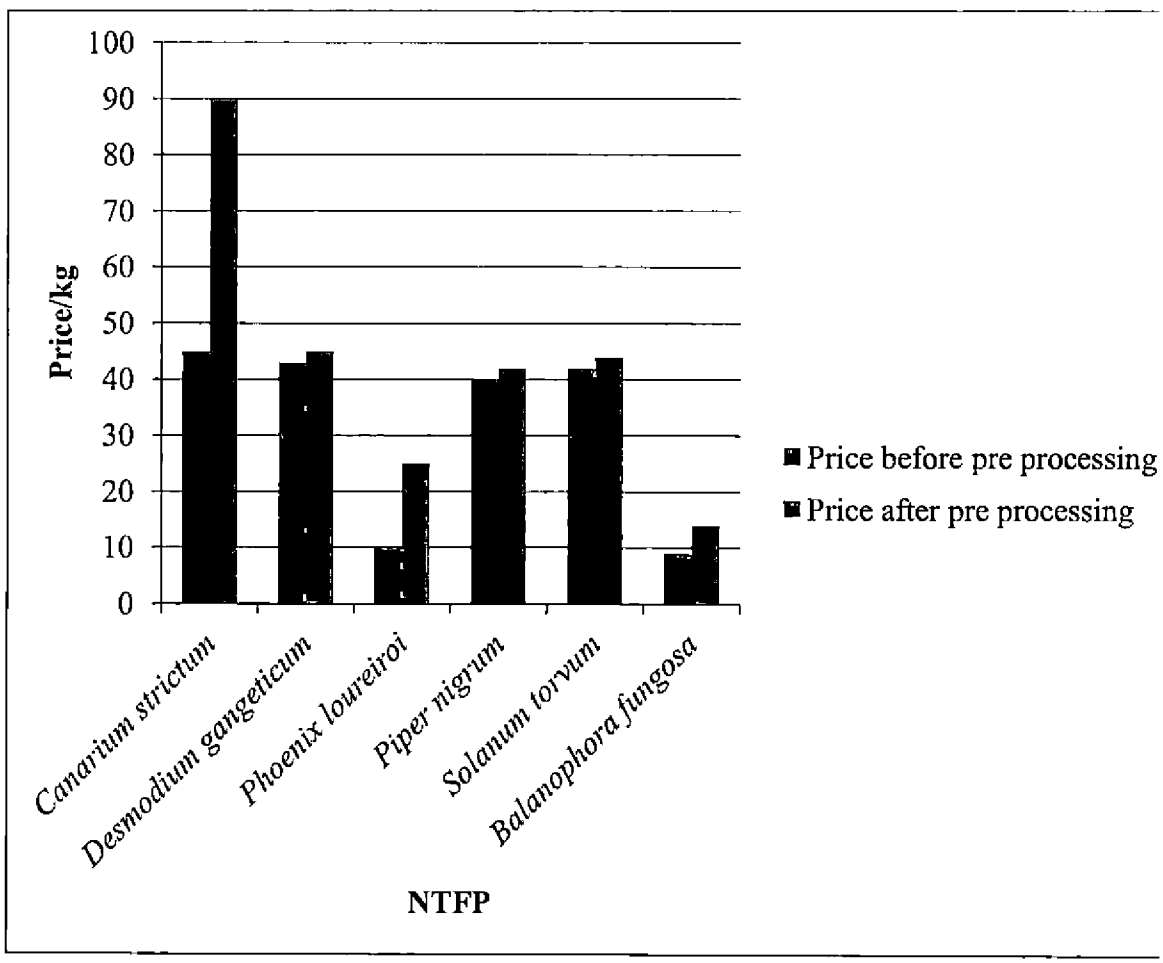


Fig. 9 Comparison of prices of NTFPs before and after pre processing

of the product (Fig. 9). The grading of *Canarium strictum* increased the price from a base price of Rs. 45 to Rs. 90 based on the different grades. When the roots of *Hemidesmus indicus* was dried the price increased by Rs 10. The chopping of the products had increased the price by Rs. 2/kg for chopped products. The tuber of *Balanophora fungosa* showed highest increase in price after drying and chopping, an increase from Rs. 9 to 14/kg was seen.

4.5. MARKETING OF NTFP

The institutions prevalent in Western Attappady for marketing of NTFP are shown in Table 24. The non timber forest products at Western Attappady were marketed mainly through three channels. The marketing agencies identified were Kurumba Cooperative society at Chindakki, Eco Development Committee (EDC) Vanasree Eco shop at Mukkali and Private traders. The Kurumbas were marketing most of their NTFP's collected through the Kurumba cooperative society at Chindakki. The society marketed 21 commercialized NTFP's. Out of these; the Kurumba contributed 15 commercially important NTFP's. The remaining six products viz. *Rauvolfia serpentina, Holostemma adakodien, Piper longum, Parmelia dilatata, Entada rheedi* and *Phoenix loureiroi* were collected from elsewhere. EDC procured four NTFP's such as resin of *Canarium strictum,* fruits of *Phyllanthus emblica, Garcinia gummigatta* and honey. The medicinal plants marketed through society were sold to the pharmaceutical companies such as Kottakkal Arya Vydhasala, Oushadhi and Nagarjuna. The industrial products were marketed to the industries at Coimbatore.

Among the NTFP's marketed, majority were medicinal plants. The 15 medicinal products were sold to the pharmaceutical companies. The 5 NTFP's used for industrial purpose were sold to the industries mainly at Tamil Nadu. The products such as tuber of *Balanophora fungosa,* fruits of *Entada rheedi, Holostemma adakodien, Myristica dactyloides, Piper longum, Piper nigrum, Parmelia dilatata, Rauvolfia serpentina* and wax were marketed exclusively by Kurumba society. Ten NTFP's were marketed through the society and private shops. All the marketing channels were involved in the marketing of honey and resin of *Canarium strictum.*

The fruit of *Phyllanthus emblica* was marketed through private shops and EDC, whereas fruit of *Mangifera indica* was marketed exclusively through private shops. The marketing channels of NTFP's used for edible, industrial and medicinal purpose are shown below.

Edible products

Channel 1: Primary collector→ Kurumba society → Consumer

Channel 2: Primary collector→ Private shops →Consumer

Channel 3: Primary collector→ EDC → Consumer

Industrial products

Channel 1: Primary collector→ Kurumba society→ Federation→ Industries

Channel 2: Primary collector→ Private shops → Industries/ Shops

Channel 3: Primary collector→ EDC →Consumer

Medicinal plants

Channel 1: Primary collector→ Kurumba society→ Pharmaceutical companies

Channel 2: Primary collector→ Private Traders → Medicinal shops

The edible NTFP's such as honey, mango and *Phyllanthus emblica* were marketed through Kurumba society, EDC eco shop and private shops. The Irula marketed their products mainly through the channel 2, whereas Mudugas made use of channel 2 and 3. The Kurumba community used channel 1 as their major marketing channel, even though the other two channels (channel 2 and channel 3) were also involved. The EDC sold their products to the tourists who came to visit Silent Valley National Park. The NTFP's used for industrial purpose were *Acacia concinna*, *Canarium strictum*,

Table 24. The marketing agencies for various NTFP's in Western Attappady

Sl. No.	NTFP	Purpose	Marketing agency	Consumer
1	*Acacia concinna*	Industrial	Society and Private	Industries at Coimbatore
2	*Canarium strictum*	Industrial	Society, private and EDC	Industries at Coimbatore and local use
3	*Parmelia dilatata*	Industrial	Society	Paint industries
4	*Phoenix loureiroi*	Industrial	Society and Private	Industries at Coimbatore
5	Wax	Industrial	Society	Industries
6	Honey	Edible	Society, private and EDC	Local people/and Tourist
7	*Phyllanthus emblica*	Edible	Private and EDC	Local
8	*Mangifera indica*	Edible	Private	Local
9	*Balanophora fungosa*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
10	*Callicarpa tomentosa*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
11	*Cyclea peltata*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
12	*Desmodium gangeticum*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
13	*Entada rheedi*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
14	*Hemidesmus indicus*	Medicinal	Society and Private	Local market
15	*Holostemma adakodien*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
16	*Myristica dactyloides*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
17	*Piper longum*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
18	*Piper nigrum*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
19	*Pseudarthria viscida*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
20	*Rauvolfia serpentina*	Medicinal	Society	Kottakkal, Oushadhi, Nagarjuna
21	*Sida rhombifolia*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
22	*Solanum torvum*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna
23	*Strobilanthus ciliates*	Medicinal	Society and Private	Kottakkal, Oushadhi, Nagarjuna

Phoenix loureiroi and wax. Among these products the Irulas marketed *Acacia concinna* through the private shops.

The Mudugas marketed *Acacia concinna* and *Phoenix loureiroi* through the channel 2, whereas *Canarium strictum* was marketed through channel 2 and 3. The Kurumbas marketed *Acacia concinna* and wax through the channel 1, whereas *Canarium strictum* was marketed through the channel 1, 2 and 3. The Irula and Muduga marketed the medicinal plants through channel 2, whereas Kurumbas marketed medicinal plants through channel 1.

4.5.1. Production and procurement of NTFP

The six years (2008- 2014) data of Kurumba society was analyzed inorder to understand the production sustainability of NTFP. The quantities of NTFP procured through the society during 2008-14 are shown in Table 25. Among the NTFP's collected for industrial purpose (Plate 6), *Canarium strictum* and *Phoenix loureiroi* showed a gradual increase over the years. *Phoenix loureiroi* showed a tremendous increase in the quantity collected over the years (Fig. 10), in total a quantity of 402500 kg was collected. Wax was the least collected industrial commodity during the period (246 kg).*Acacia concinna* had shown a highly varying trend in the quantity procured in the simultaneous years, the maximum quantity of 22739 kg (29 %) was collected in 2009-10 and least quantity of 2772 kg (4 %) was collected during 2012-13. *Balanophora fungosa* has shown a gradual increase from 38 kg during the period 2008-2009 to 10042 kg during 2011-2012 and in the succeeding years the trend shown a drastic decline. *Desmodium gangeticum* showed a decline in the quantity collected over the years. Honey constituted a total of 6088 kg, with a maximum quantity recorded in 2011-2012 (2106 kg). Among the 21 commercially collected NTFP's, 15 were medicinal plants (Plate 7). Eventhough, *Rauvolfia serpentina* was the least collected medicinal plant (9 kg), it showed a consistency over the years.

a. *Balanophora fungosa* b. *Callicarpa tomentosa* c. *Cyclea peltata*

d. *Desmodium gangeticum* e. *Hemidesmus indicus*. f. *Solanum torvum*

Plate 7. The NTFPs marketed for medicinal purpose from Western Attappady

Table 25.Quantity of NTFP regularly procured through the society from 2008- 2014

Sl. No.	NTFP	Purpose	Quantity of NTFP collected over the years (kg)						Total* (kg)
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	
1	*Acacia concinna*	Industrial	18110 (23)	22739 (29)	8195 (10)	12362 (16)	2772 (4)	14719 (18)	78897 (100)
2	*Canarium strictum*	Industrial	1267 (12)	1497 (14)	1646 (16)	1582 (16)	2088 (20)	2330 (22)	10411 (100)
3	*Parmelia dilatata*	Industrial	184.9 (21)	-	-	12.4 (2)	675 (77)	-	872 (100)
4	*Phoenix loureiroi*	Industrial	9000 (2)	17450 (4)	51700 (13)	90000 (22)	102100 (26)	132250 (33)	402500 (100)
5	Wax	Industrial	56.3 (23)	54.4 (22)	65 (27)	30 (12)	10.85 (4)	29.85 (12)	246 (100)
6	Honey	Edible	121 (2)	350 (6)	1716 (28)	2106 (35)	878 (14)	917 (15)	6088 (100)
7	*Balanophora fungosa*	Medicinal	38 (0.2)	381 (2)	6728 (39)	10042 (58)	106 (0.80	-	17295 (100)
8	*Callicarpa tomentosa*	Medicinal	5080 (15)	1400 (4)	7137 (20)	4922 (14)	13673 (39)	2681 (8)	34893 (100)
9	*Cyclea peltata*	Medicinal	2393 (18)	1406 (10)	2412 (18)	1977 (15)	3630 (27)	1704 (12)	13522 (100)
10	*Desmodium gangeticum*	Medicinal	16859 (30)	4146 (8)	11672 (21)	11238 (21)	5269 (10)	5349 (10)	54533 (100)
11	*Entada rheedi*	Medicinal	115 (100)	-	-	-	-	-	115 (100)
12	*Hemidesmus indicus*	Medicinal	176 (2)	21.5 (0.2)	85.5 (0.8)	5152 (60)	2950.7 (34)	233 (3)	8618 (100)
13	*Holostemma adakodien*	Medicinal	-	1.4 (4)	1.5 (5)	10 (32)	13.5 (42)	5.5 (17)	32 (100)
14	*Myristica dactyloides*	Medicinal	6.2 (16)	8.9 (24)	6.2 (16)	8.9 (24)	5.4 (14)	2.250 (6)	38 (100)
15	*Piper longum*	Medicinal	-	28 (3)	644 (76)	62 (7)	116 (14)	-	850 (100)
16	*Piper nigrum*	Medicinal	8361 (16)	1347 (2)	4797 (9)	12042 (23)	26036 (49)	105 (1)	52688 (100)
17	*Pseudarthria viscida*	Medicinal	3157.6 (3)	1611 (1)	27239 (25)	37042 (34)	25745 (23)	15122 (14)	109917 (100)
18	*Rauvolfia serpentina*	Medicinal	1.65 (18)	1.65 (18)	1.65 (18)	1.65 (18)	0.350 (4)	2.16 (24)	9 (100)
19	*Sida rhombifolia*	Medicinal	4793 (16)	3629 (12)	5594 (19)	4181 (14)	6541 (22)	4906.5 (17)	29645 (100)
20	*Solanum torvum*	Medicinal	25158 (24)	1240 (1)	8839 (8)	26532 (26)	29279 (29)	12191 (12)	103239 (100)
21	*Strobilanthus ciliates*	Medicinal	35000 (16)	3635 (2)	16846 (8)	25111 (11)	72421 (33)	66731 (30)	219744 (100)
		Total**	129878	60947	155325	244414	294310	259278	1144152

Source: Kurumba society Chindakki, *: Row total, **: Column total, Figures in parenthesis is percentage of total production in six years.(– denotes Nil)

Table 26: Procurement rate given by the society for various NTFP during 2008-14

Sl. No.	NTFP	Purpose	Procurement rate of NTFP's over the years (Rs/kg)					
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	*Acacia concinna*	Industrial	11	13.5	14	14	15.5	22
2	*Canarium strictum*	Industrial	42	50	48	63	73	77
3	*Parmelia dilatata*	Industrial	60	-	-	130	150	-
4	*Phoenix loureiroi*	Industrial	3	4.25	5	7	8	9.5
5	Wax	Industrial	65	65	65	80	100	100
6	Honey (*Apis dorsata*)	Edible	80	90	105	160	180	240
7	*Balanophora fungosa*	Medicinal	10	17.5	47.5	47.5	50	-
8	*Callicarpa tomentosa*	Medicinal	16	16	16	32	24	40
9	*Cyclea peltata*	Medicinal	125	125	125	175	216	230
10	*Desmodium gangeticum*	Medicinal	17.55	19	17.50	30	43	43
11	*Entada rheedi*	Medicinal	5	-	-	-	-	-
12	*Hemidesmus indicus*	Medicinal	73	81.5	120	120	110	200
13	*Holostemma adakodien*	Medicinal	-	300	300	330	465	450
14	*Myristica dactyloides*	Medicinal	100	100	100	100	200	175
15	*Piper longum*	Medicinal	-	32	48	45	68	-
16	*Piper nigrum*	Medicinal	12.25	12.25	30	14.5	19.5	37.5
17	*Pseudarthria viscida*	Medicinal	21.5	23.75	23	33	48	48
18	*Rauvolfia serpentina*	Medicinal	80	80	80	80	80	80
19	*Sida rhombifolia*	Medicinal	22	24	22	35	53	53
20	*Solanum torvum*	Medicinal	15	18	18	16.5	26	42
21	*Strobilanthus ciliates*	Medicinal	9	9	9	13	20	19

Source: Kurumba society, Chindakki, (– denotes Nil)

Strobilanthus ciliates was the most collected medicinal plant (219744 kg), followed by *Solanum torvum* (103239 kg) and *Pseudarthria viscida* (109917 kg).

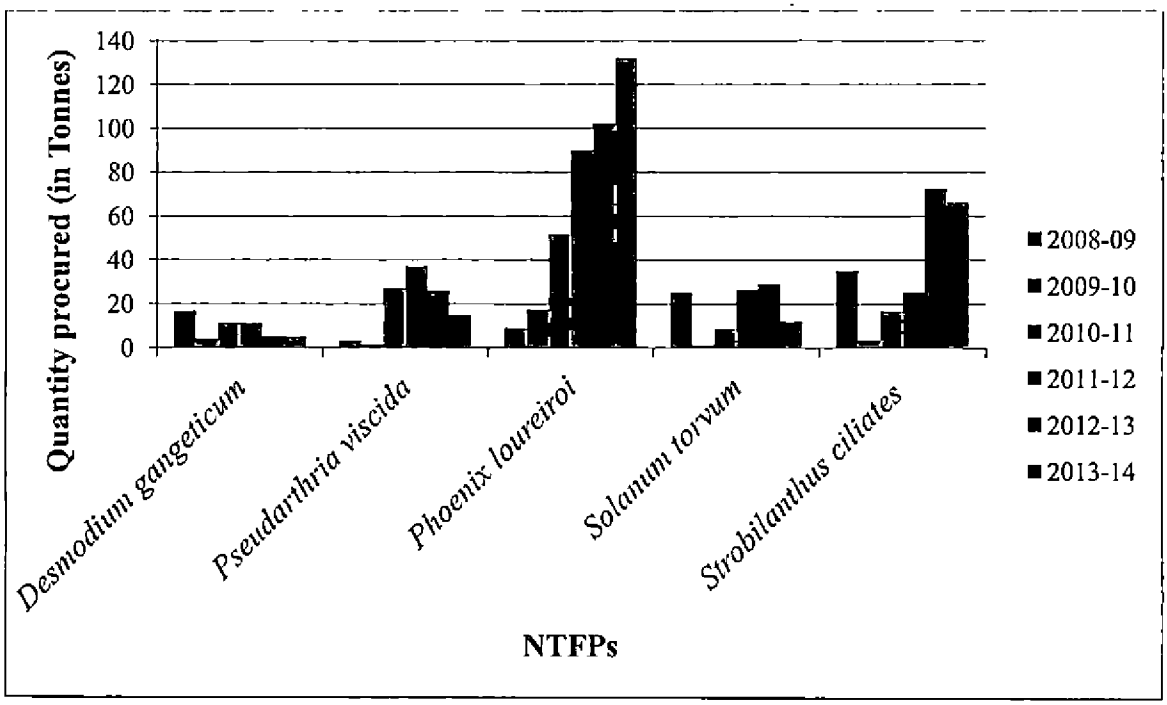


Fig. 10 The quantity of major NTFPs procured by the society during 2008-14

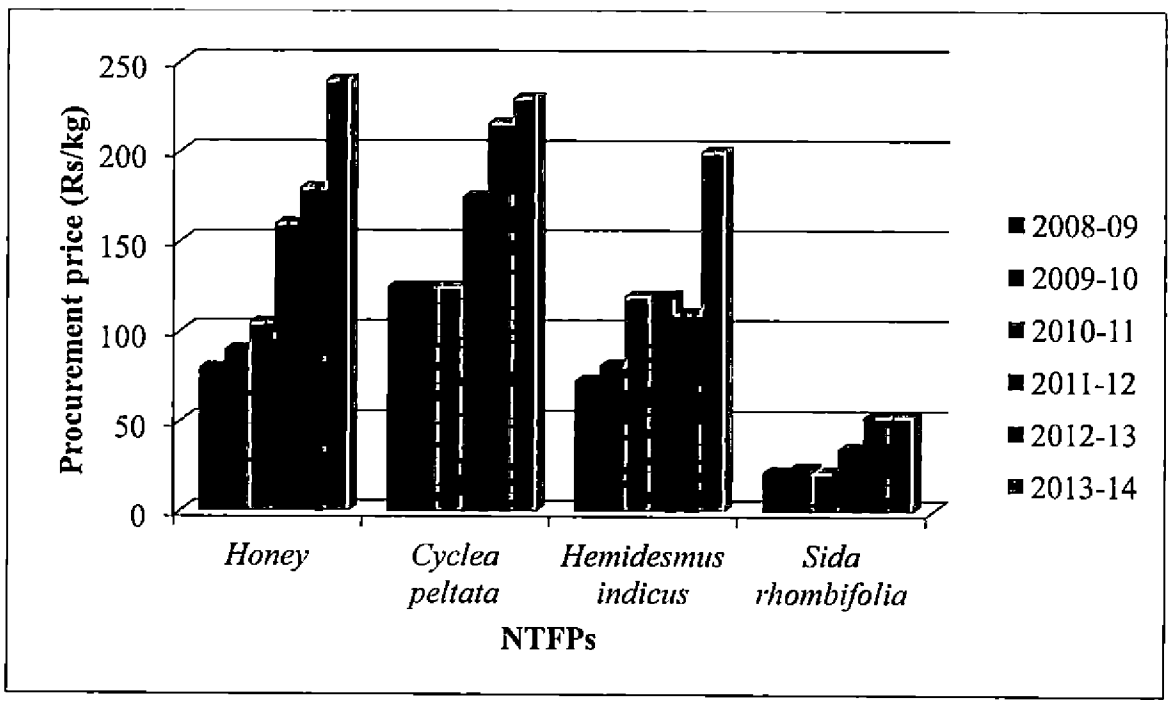


Fig. 11 The procurement price of major NTFPs of Western Attappady

The procurement rates given by the society for the marketed NTFP's are furnished in Table 26. Except for *Piper nigrum* and *Rauvolfia serpentina*, all other NTFP's had a gradual increase in the procurement rate. Most of the medicinal plants were having an average collection rate of Rs.15- 50/kg. Highest procurement price was for *Holostemma adakodien*, which had an increase from Rs. 300 to Rs. 450 followed by *Cyclea peltata* (Rs. 125/kg- Rs. 230/kg) (Fig. 11). The least procurement price was for *Phoenix loureiroi* (Rs. 3/kg- Rs. 9.5/kg). Collection price of honey increased three times and for *Balanophora fungosa* it increased five times from the initial (2008-09) to the final period (2013-2014). The procurement price of *Acacia concinna* increased 2 times, whereas for *Piper nigrum* the increase was 3 times. A steady procurement rate of Rs. 80 was observed in the case of *Rauvolfia serpentina* throughout the period. The highest variation in procurement rate was shown by *Piper nigrum.*

4.5.2. Quantity sold and sales price of NTFP

Quantities of NTFP sold through the society during 2008-2014 are depicted in Table 27. A total quantity of 10, 91,594 kg of NTFP's were sold through the Kurumba cooperative society for the last 6 years. *Phoenix loureiroi* had an exponential increase from 6000 kg to 132250 kg during the period 2008-14. The same trend was observed for *Balanophora fungosa* also. The lowest quantity sold out was for *Holostemma adakodien* (32kg). *Strobilanthus ciliates* and *Pseudarthria viscida* were the most sold NTFP's among the medicinal plants with 2, 19,541 kg and 1, 12,754 kg respectively.

Strobilanthus ciliates was the second most sold NTFP, which attained 72415 kg in 2012-13 and 66264 kg in 2013-14 (Fig. 12). The most quantity of NTFP was sold in the year 2012-13 (2, 98,915 kg), followed by 2013-14 (2, 61,593 kg) and 2011-12 (2, 21,634 kg). The least quantity was sold in 2009-10 (45501 kg).Honey had shown an exponential increase in the quantity collected (80 kg to 2679 kg) from 2008 to 2012, but a drastic decline occurred in the succeeding years. Highly varying trend was observed for most of the NTFP's sold during 2008-14. None of the NTFP's except *Phoenix loureiroi* and *Balanophora fungosa* had an increasing trend in the quantity

sold over the years. Most of the NTFP's were having an inconsistent trend in the quantity sold. *Acacia concinna* had shown an increase and decrease in the simultaneous years in the quantity sold during 2008-14.

The percentage of quantity sold ranged from 10 to 24 per cent. *Phoenix loureiroi* showed an increase from 2 per cent to 33 per cent in the quantity sold during 2008-14. Sales price of various NTFP marketed through society is tabulated in Table 28. The sales price was lowest for *Phoenix loureiroi*, *Acacia concinna*, *Strobilanthus ciliates* and *Piper nigrum* whereas the highest sales price was observed for *Holostemma adakodien*. The products such as *Parmelia dilatata*, *Phoenix loureiroi*, honey, *Balanophora fungosa* had shown a steady increase in the sales price. A notable increase in sales price was observed for honey (Rs. 112-280) and *Cyclea peltata* (Rs. 190-345) during the period 2008-14 (Fig.13). NTFP's like *Rauvolfia serpentina*, *Myristica dactyloides* and *Entada rheedi* were not sold during 2008-14. The sales price of honey and *Desmodium gangeticum* increased 2.5 times, but for *Acacia concinna* the price increased in the initial years, there was a huge reduction of sales price in the late years. *Parmelia dilatata* and *Strobilanthus ciliates* had 2.6 times increase in its sales price. Few products such as *Acacia concinna*, *Canarium strictum*, *Holostemma adakodien* and *Hemidesmus indicus* had shown a decline in sales price during the period 2008-14. All the other products had an increase in their sales price over the years.

Table 27. Quantity of NTFP sold through society during 2008-14

Sl.No.	NTFP	Purpose	Quantity of NTFP sold (kg)						Total (kg)
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	
1	*Acacia concinna*	Industrial	15136 (18)	8000 (10)	16300 (20)	8677 (11)	19756 (24)	14223 (17)	65784 (100)
2	*Canarium strictum*	Industrial	-	575 (6)	2322 (26)	1537 (17)	2199 (25)	2311 (26)	8944 (100)
3	*Parmelia dilatata*	Industrial	184 (21)	-	-	-	688 (79)	-	872 (100)
4	*Phoenix loureiroi*	Industrial	6000 (2)	17450 (4)	51700 (12)	90000 (23)	102100 (26)	132250 (33)	399500 (100)
5	Wax	Industrial	54 (55)	-	-	44 (45)	-	-	98 (100)
6	Honey	Edible	83 (1)	180 (3)	1716 (27)	2679 (42)	865.4 (13)	917 (14)	6440 (100)
7	*Balanophora fungosa*	Medicinal	38 (1)	381 (7)	1814 (33)	-	3190 (59)	-	5423 (100)
8	*Callicarpa tomentosa*	Medicinal	1516 (5)	1400 (5)	7137 (23)	4655 (15)	9311 (30)	6890 (22)	30909 (100)
9	*Cyclea peltata*	Medicinal	-	1500 (14)	2694 (24)	1972 (18)	3615 (33)	1164 (11)	10945 (100)
10	*Desmodium gangeticum*	Medicinal	3703 (9)	4146 (10)	13283 (31)	11238 (26)	5269 (12)	5349 (12)	42988 (100)
11	*Hemidesmus indicus*	Medicinal	178 (2)	-	80 (1)	5151 (63)	2772 (34)	-	8181 (100)
12	*Holostemma adakodien*	Medicinal	-	1.4 (5)	1.4 (5)	10 (31)	13.5 (42)	5.5 (17)	32 (100)
13	*Piper longum*	Medicinal	-	28(3)	644 (76)	62 (7)	116 (14)	-	850 (100)
14	*Piper nigrum*	Medicinal	7078 (17)	1356 (3)	2537 (7)	15244 (37)	14845 (360)	-	41060 (100)
15	*Pseudarthria viscida*	Medicinal	3139 (3)	1611 (1)	30095 (27)	37048 (33)	25739 (23)	15122 (13)	112754 (100)
16	*Sida rhombifolia*	Medicinal	4301 (14)	3998 (13)	6106 (20)	4189 (14)	6734 (23)	4906.5 (16)	30235 (100)
17	*Solanum torvum*	Medicinal	23606 (26)	1240 (2)	10390 (12)	14017 (15)	29287 (32)	12191 (13)	90730 (100)
18	*Strobilanthus ciliates*	Medicinal	20812 (10)	3635 (2)	31304 (14)	25111 (11)	72415 (33)	66264 (30)	219541 (100)
Total**			85828	45501	178123	221634	298915	261593	1091594

Source:Kurumba society, *: Row total, **: Column total, Figures in parenthesis is the percentage to the total, (– denotes Nil)

Table 28.Sales price of various NTFP's sold through society over the years 2008-14

Sl. No.	NTFP	Purpose	Sales price of NTFP's (Rs)					
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	*Acacia concinna*	Industrial	17	20	25	10	26	17
2	*Canarium strictum*	Industrial	-	115	115	85	102	135
3	*Parmelia dilatata*	Industrial	90	-	-	-	234	-
4	*Phoenix loureiroi*	Industrial	5	5.75	6.5	9	11.75	13.5
5	Wax	Industrial	130	130	-	140	-	-
6	Honey	Edible	112	125	160	200	220	280
7	*Balanophora fungosa*	Medicinal	22	30	80	-	70	-
8	*Callicarpa tomentosa*	Medicinal	26	26	55	57.5	60	77
9	*Cyclea peltata*	Medicinal	190	190	190	260	260	345
10	*Desmodium gangeticum*	Medicinal	30	32	34	46	59	75
11	*Hemidesmus indicus*	Medicinal	125	-	175	140	145	-
12	*Holostemma adakodien*	Medicinal	500	500	425	330	650	620
13	*Piper longum*	Medicinal	-	35	50	52	80	-
14	*Piper nigrum*	Medicinal	25	25	25	69	56	-
15	*Pseudarthria viscida*	Medicinal	35	35	44	48	62	75
16	*Sida rhombifolia*	Medicinal	31	33.5	34	50	76	90
17	*Solanum torvum*	Medicinal	23	25	25	38.5	53	65
18	*Strobilanthus ciliates*	Medicinal	15.25	19.25	18.5	26.5	26.5	40

Source: Kurumba society, Chindakki, (– denotes Nil)

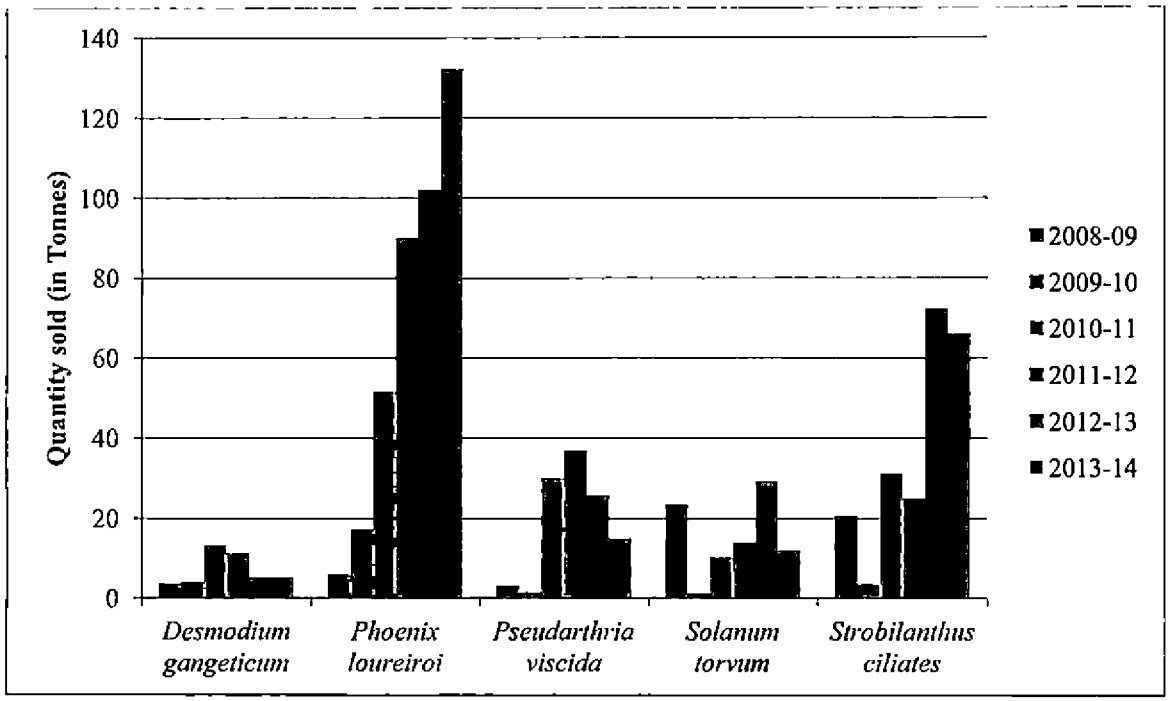


Fig.12 The quantity of major NTFPs sold through society during 2008-14.

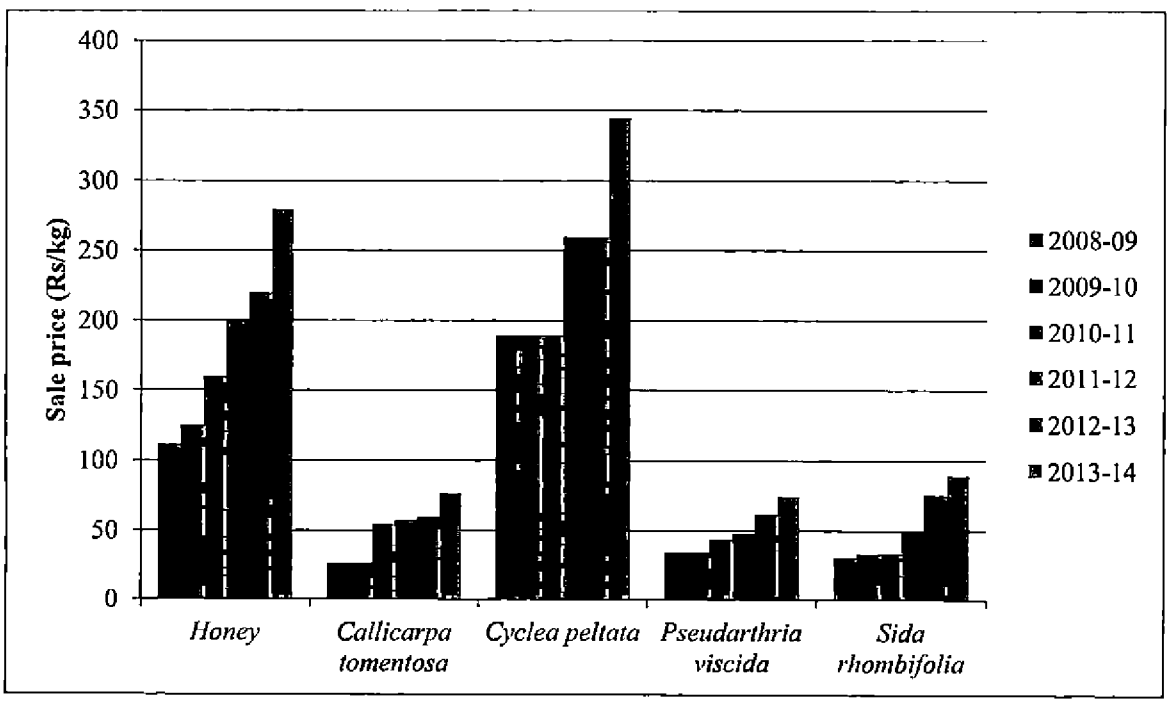


Fig. 13 The sales price of major NTFPs marketed through the society

4.5.3. Price spread

The price spreads of products marketed through society are given in Table 29. The price spread is the difference between the price paid by the consumer and the price received by the primary collector. The highest price spread was received for *Holostemman adakodien* whereas the lowest for *Phoenix loureiroi*. *Acacia concinna* had shown a negative price spread in 2011-12 and 2013-14 (-4 and -5 respectively), however in other years it had a positive price spread. Wax had shown most consistency in the price spread over the years. The NTFP's like *Myristica dactyloides, Rauvolfia serpentina* and *Entada rheedi* were not having price spread since there was no sales during the years. Honey had a constant price spread of 40 during 2011-14. Only *Sida rhombifolia* had a steady increase in the price spread (9 to 37) during 2008 to 2014. *Piper nigrum* showed a negative price spread of -5 in 2010-11, whereas in other years it had a positive price spread. *Parmelia dilatata* shown an increase from 30 to 84 in their price spread in between 2008-09 to 2012-13.All the other products were having an inconsistent variation in their price spread over the years.

4.5.4. Collector's share

The collector's share on sales price of different NTFP's during the period 2008-14 is presented in Table 30. In 2008-09, the overall collector's share (105 %) was higher than the total sales price of the society. The honey has contributed more than 80 per cent of sales price to collectors from 2011-12 onwards. All other products were having distinct variability in collector's share. Most of the products contributed less than 80 per cent of the sales price to the collectors. In 2010-11, the highest price spread was for *Piper nigrum* (120) and least for *Callicarpa tomentosa* (29).*Acacia concinna* during 2010-11 contributed 140 per cent of their sales price to the collectors. That means the collection charge of *Acacia concinna* was higher than the sales rate. In 2011-12, the contribution of *Holostemma adakodien* was 100 per cent to the collectors.

Table 29. The price spread of marketed products through the society from 2008-14 (Rs/kg).

Sl.No.	NTFP	Purpose	Price spread = Price paid by consumer - Price received by primary collector					
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	*Acacia concinna*	Industrial	6	6.5	11	-4	10.5	-5
2	*Canarium strictum*	Industrial	-	65	67	22	29	58
3	*Parmelia dilatata*	Industrial	30	-	-	-	84	-
4	*Phoenix loureiroi*	Industrial	2	1.5	1.5	2	3.75	4
5	Wax	Industrial	65	65	-	60	-	-
6	Honey	Edible	32	35	55	40	40	40
7	*Balanophora fungosa*	Medicinal	12	12.5	32.5	-	20	-
8	*Callicarpa tomentosa*	Medicinal	10	10	39	25.5	36	37
9	*Cyclea peltata*	Medicinal	65	65	65	85	44	115
10	*Desmodium gangeticum*	Medicinal	12.45	13	16.5	16	16	32
11	*Hemidesmus indicus*	Medicinal	52	-	55	20	35	-
12	*Holostemma adakodien*	Medicinal	-	200	125	-	185	170
13	*Piper longum*	Medicinal	-	3	2	7	12	-
14	*Piper nigrum*	Medicinal	12.75	12.75	-5	54.5	36.5	-
15	*Pseudarthria viscida*	Medicinal	13.5	11.25	21	15	14	27
16	*Sida rhombifolia*	Medicinal	9	9.5	12	15	23	37
17	*Solanum torvam*	Medicinal	8	7	7	22	27	23
18	*Strobilanthus ciliates*	Medicinal	6.25	10.25	9.5	13.5	6.5	21

(– denotes Not Applicable)

Table 30. The collectors share of the sales price of the society

Sl.No.	NTFP	Purpose	Collectors share (%) = Collectors price/sales price of NTFP * 100					
			2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	*Acacia concinna*	Industrial	65	68	56	140	60	65
2	*Canarium strictum*	Industrial	-	43	42	74	72	57
3	*Parmelia dilatata*	Industrial	67	-	-	-	64	-
4	*Phoenix loureiroi*	Industrial	60	74	77	78	68	70
5	Wax	Industrial	50	50	-	57	-	-
6	Honey (*Apis dorsata*)	Edible	71	72	66	80	82	86
7	*Balanophora fungosa*	Medicinal	45	58	59	-	71	-
8	*Callicarpa tomentosa*	Medicinal	62	62	29	56	40	52
9	*Cyclea peltata*	Medicinal	66	66	66	67	83	67
10	*Desmodium gangeticum*	Medicinal	59	59	51	65	73	57
11	*Hemidesmus indicus*	Medicinal	58	-	69	86	76	-
12	*Holostemman adakodien*	Medicinal	-	60	71	100	72	73
13	*Piper longum*	Medicinal	-	92	96	87	85	-
14	*Piper nigrum*	Medicinal	49	49	120	21	34	-
15	*Pseudarthria viscida*	Medicinal	61	68	52	69	77	64
16	*Sida rhombifolia*	Medicinal	71	72	65	70	70	59
17	*Solanum torvam*	Medicinal	65	72	72	43	49	65
18	*Strobilanthus ciliates*	Medicinal	59	47	49	49	75	48
Total sales			105	97	52	65	60	60

(– denotes Not Applicable)

Balanophora fungosa and wax were having steady increase in the collectors share during 2008-14.The species such as *Acacia concinna*, *Parmelia dilatata*, *Phoenix loureiroi*, *Cyclea peltata*, *Desmodium gangeticum*, *Hemidesmus indicus*, *Holostemma adakodien*, *Piper longum*, *Pseudarthria viscida* and *Sida rhombifolia* had always contributed more than 50 per cent of their sales price to the primary collectors.

4.5.5. Marketing cost

The marketing cost includes all the expenses incurred in organizing and carrying out the marketing process. The marketing cost incurred by the society for undertaking various activities such as processing and transportation are mentioned in Table 31. Highest processing price was given for *Sida rhombifolia* (Rs. 3/kg), whereas Rs. 2/kg was spent for the processing of *Solanum torvum*, *Desmodium gangeticum*, *Callicarpa tomentosa* and *Hemidesmus indicus*.

Table 31.The marketing cost of various NTFP's, marketed through the society

Sl.No.	NTFP	Processing (Rs/kg)	Transportation (Rs/kg)	Total Marketing cost (Rs/kg)
1	*Sida rhombifolia*	3	2	5
2	*Desmodium gangeticum*	2	2	4
3	*Solanum torvum*	2	2	4
4	*Callicarpa tomentosa*	2	2	4
5	*Cyclea peltata*	1.5	2	3.5
6	*Balanophora fungosa*	1.5	2	3.5
7	*Pseudarthria viscida*	1.5	2	3.5
8	*Piper nigrum*	1.5	2	3.5
9	*Strobilanthus ciliates*	1.5	2	3.5
10	*Acacia concinna*	-	2	2

(– denotes Nil)

All other products were processed at the rate of Rs. 1.5/kg. *Acacia concinna* did not incur the cost of processing whereas it had the transportation cost. The transportation cost of all the products remained the same at Rs. 2/kg. The highest marketing cost/kg was for *Sida rhombifolia* (Rs. 5/kg), followed by *Desmodium gangeticum*, *Solanum*

torvum and *Callicarpa tomentosa* with Rs. 4/kg. The least marketing cost was for *Acacia concinna* (Rs. 2/kg).

4.5.6. NTFP marketing through EDC

The NTFP's marketed through EDC (Eco Development Committee), their quantity, price and price spread are given in Table 32. The NTFP's such as *Canarium strictum*, *Garcinia gummigatta*, *Phyllanthus emblica* and honey were the products procured and sold through EDC shop. Other than NTFP, ragi and Thuvara were also procured by EDC from the tribes. The highest procurement price and sales price was for honey, with Rs. 260/kg and 340/kg respectively and followed by *Garcinia gummigatta* with Rs. 220/kg and 280/kg respectively.

Table 32. NTFP marketing done through EDC during 2013-14

Sl.No.	**Item**	**Quantity procured (kg)**	**Unit price (Rs)**	**Quantity sold (kg)**	**Selling Price/kg**	**Price spread**	**% collectors price**
1	Honey	2123	260	2111	340	80	76
2	*Canarium strictum*	391.5	100 (No grading)	337	200	100	50
3	*Garcinia gummigatta* (dried)	192.5	220	268	280	60	79
4	*Phyllanthus emblica*	155.5	20	155.5	30	10	50

The least procurement price and sales price was for *Phyllanthus emblica* with Rs. 20/kg and 30/kg respectively. *Canarium strictum* was procured at the rate of Rs. 100/kg without any grading and sold at Rs. 200/kg. Honey was the most procured (2123 kg) and sold (2111 kg) NTFP by EDC during 2013-14. *Phyllanthus emblica* was the least quantity collected (155.5 kg) and sold (155.5 kg) NTFP in 2013-14. *Canarium strictum* had the highest price spread of 100 and least was for *Phyllanthus emblica* (10). *Garcinia gummigatta* had the highest percentage of collectors share (79

%), followed by honey with 76 per cent. The least contribution to collectors share was made from *Canarium strictum* and *Phyllanthus emblica* with 50 per cent each.

The price given to the various NTFP's among the different marketing agencies are given in Table 33. Honey was procured at a rate of Rs. 240/kg by society, whereas EDC and Private shops procured it for Rs. 260 and 270 respectively. The society collected *Canarium strictum* based on the different grades. The rates for various grades were as follows, grade I Rs. 110/kg, grade II Rs. 65/kg and grade III for Rs. 55/kg. The private shops and EDC who were not having grading procured *Canarium strictum* at Rs. 80/kg and Rs. 100/kg respectively. *Phyllanthus emblica* was procured by EDC and private shops at Rs. 20/kg. The medicinal plants such as *Solanum torvum* and *Desmodium gangeticum* were collected at the rate of Rs. 42 and 43/kg. whereas private shops collected it for Rs. 12-15/kg. *Callicarpa tomentosa* was procured for Rs. 40/kg whereas private shops collected for Rs. 20/kg.

Table 33. Comparison of price between various marketing channels in 2013-14

Sl.No.	Item		Procurement Price/kg		
			Society	Private	EDC
1	Honey		240	270	260
2	*Canarium strictum*	Grade 1	110	80 (No grading)	100 (No grading)
		Grade 2	65		
		Grade 3	55		
3	*Phyllanthus emblica*		-	20	20
5	*Solanum torvum*		42	12-15	-
6	*Desmodium gangeticum*		43	12-15	-
7	*Strobilanthus ciliates*		19	15	-
8	*Callicarpa tomentosa*		40	20	-

4.5.7. Percentage contribution of NTFP through Kurumba society to the SC/ST Federation

The percentage contributions of the Kurumba cooperative society to the total quantity procurement of SC/ST Federation are given in Table 34 and Fig. 14. The 100 per cent contribution was made from Attappady for the species such as *Callicarpa tomentosa*, *Hemidesmus indicus* and *Holostemman adakodien* in 2011-12. The least contribution

was from the species *Myristica dactyloides* and *Piper nigrum*. The production of honey (1.44 – 12.23 %) and *Canarium strictum* (13.05- 20.11 %) were on the lower side when compared to the state production. Attappady had a significant contribution to the production of NTFP's such as *Phoenix loureiroi*, *Balanophora fungosa*, *Cyclea peltata*, *Hemidesmus indicus*, *Holostemma adakodien*, *Piper nigrum* and *Pseudarthria viscida*. During 2010-11 the quantity of *Phoenix loureiroi* collected by society was higher than that of the overall collection of the SC/ST Federation.

Table 34. Percentage contribution of NTFP through society at Western Attappady to the overall production of the SC/ST Federation

Sl.No.	NTFP item	Purpose	Contribution of Attappady (%)		
			2009-10	2010-11	2011-12
1	*Acacia concinna*	Industrial	30	19.32	22
2	*Canarium strictum*	Industrial	20.11	15.68	13.05
3	*Parmelia dilatata*	Industrial	-	-	12.96
4	*Phoenix loureiroi*	Industrial	33.75	79	76.33
5	Wax	Industrial	5.80	22.72	26.75
6	Honey (*Apis dorsata*)	Edible	1.44	6.44	12.23
7	*Balanophora fungosa*	Medicinal	23.10	77.02	55.27
8	*Callicarpa tomentosa*	Medicinal	16.59	77.60	100
9	*Cyclea peltata*	Medicinal	38.92	45.01	84.51
10	*Desmodium gangeticum*	Medicinal	19.81	34.20	60.37
11	*Hemidesmus indicus*	Medicinal	-	94.39	100
12	*Holostemma adakodien*	Medicinal	100	4.68	100
13	*Myristica dactyloides*	Medicinal	0.55	0.11	0.54
14	*Piper longum*	Medicinal	1	5.9	0.91
15	*Piper nigrum*	Medicinal	87.46	14.30	72
16	*Pseudarthria viscida*	Medicinal	3.97	34	48.94
17	*Rauvolfia serpentina*	Medicinal	33	-	-
18	*Sida rhombifolia*	Medicinal	1.6	1.31	1.49
19	*Solanum torvum*	Medicinal	0.8	3.6	12.10
20	*Strobilanthus ciliates*	Medicinal	12.99	12.30	28.87

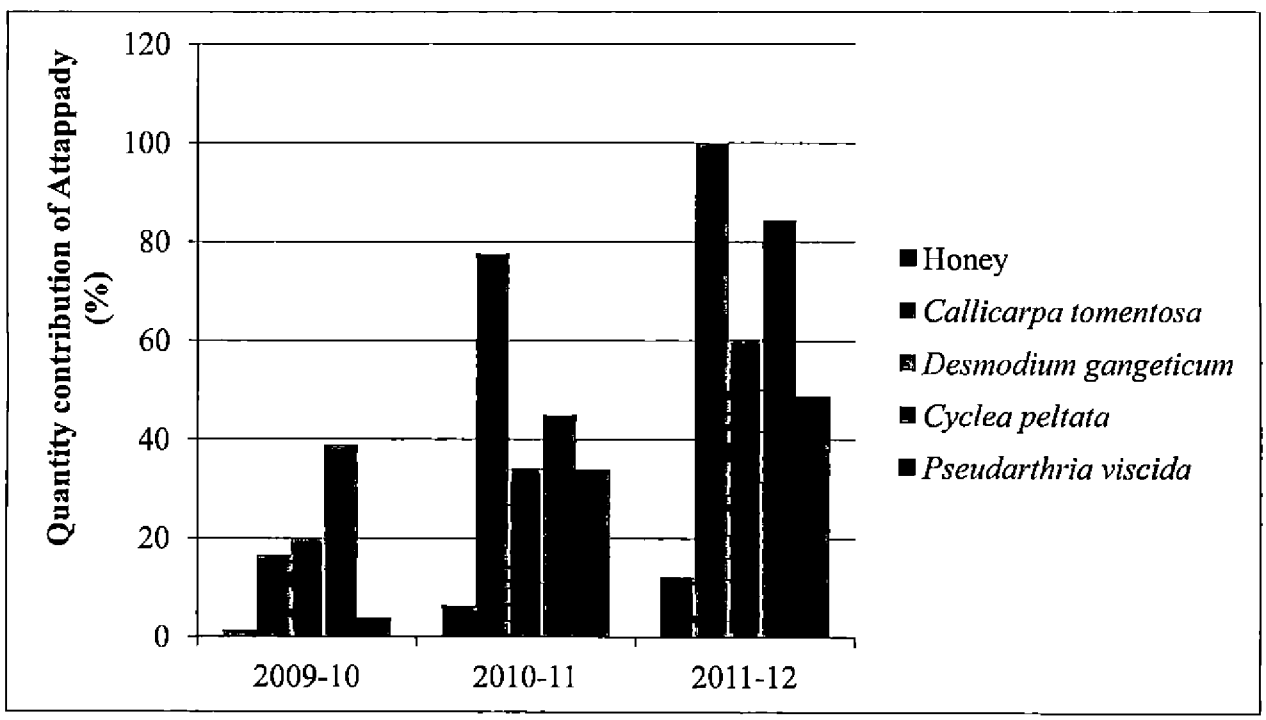


Fig. 14 The percentage contribution of major NTFPs of the society to the overall procurement of SC/ST Federation during 2009-12

Discussion

DISCUSSION

Attappady is one among the three tribal centres of the state. The three tribal groups viz. Irula, Kurumba and Muduga constitute the tribal population of Western Attappady. The Kurumbas are one among the particular vulnerable tribal groups in Kerala. Their settlements are located in the interior areas of the forest. The Mudugas and Irulas are settled in the lower plains of the valley, whereas the Kurumbas in the upper tracts. The Kurumbas are the dominant population and the Mudugas the least populated tribal community in the western part of Attappady. The Irulas are basically wage labourers, whereas Mudugas and Kurumbas are more involved in agriculture (Muraleedharan *et al.*, 1991). The Kurumbas followed the practice of shifting cultivation (Tharakan, 2003). The level of dependence of the above three tribal communities on the NTFP are discussed below.

5.1. SOCIO-ECONOMIC STATUS OF THE TRIBES

The Irulas had the highest literacy rate with 73 per cent, followed by Kurumbas (72 %) and Mudugas (58 %). The women literacy rate among Irulas, Mudugas and Kurumbas were 66, 55 and 66 per cent respectively (Table 2), which followed the similar trend as that of overall educational status among the tribes of Kerala. The overall educational status of tribes in Kerala according to 2011 census was 64.35 per cent and female literacy rate was 58.11 per cent. In Irula and Kurumba communities, the literacy rate was higher than the state average. The female literacy rate among Irulas and Kurumbas were also higher than that reported in 2011 census.

The Irulas and Mudugas were depending more on daily wages for their subsistence. The Kurumbas were mainly involved in agriculture and NTFP collection. Sathyapalan and Reddy (2010) reported that the Irulas were basically agriculture labourers and Mudugas were more involved in agriculture, whereas Kurumbas were involved in NTFP collection. The Kurumbas had the common property resource known as Panchakkadu (4 acres/ family) for doing agriculture. Since their settlements were in the interior areas of the forests, Kurumbas grown the food crops such as ragi,

maize, mustard and vegetables. The Kurumbas did agriculture for their subsistence. Tharakan (2007) also found that the Kurumbas method of cultivation was by clearing and burning fresh fields and they grown crops such as finger millet, little millet, red gram and mustard in their agricultural lands.

5.1.1. Income of the tribes

The daily wages work was the major source of income for Irulas (Table 6). The Irulas were working as agricultural labourers in settler's agriculture land or in the farms of Attappady Cooperative Farming Society (AFC). Since Irulas was residing on the lower plains, they got more job opportunities through MGNREGP (Mahatma Gandhi National Rural Employment Guarantee Program) than Mudugas and Kurumbas. The Irulas got more than 80 days of work through MGNREGP, whereas Mudugas and Kutumbas got upto 60 days of work. The Mudugas were having only part time jobs at the AFC farm, so they were depending on agriculture, daily wages work and NTFP collection (Table 7). The Mudugas were excellent climbers of trees, so they were given part time jobs in AFC farm for lopping of the trees. The Kurumbas major source of income was NTFP collection (Table 8). They had less opportunity for other jobs. Some of youngsters were going outside for daily wages work. In Irulas and Krumbas the contribution of agriculture sector was less than 30 per cent of their income, whereas Mudugas got 30 to 60 per cent of their income from agriculture. The Mudugas were cultivating pepper, plantain and areacanut. The Kurumbas agriculture was mainly for subsistence, whereas for Mudugas agriculture was a source of income. The Kurumbas dependency on NTFP for income (44 %) was more compared to other groups, since their opportunities for other jobs were less. Sathyapalan and Reddy (2010) found that the Kattunaikkan tribes who settled in the interior areas of the forest got 80 per cent of their income from NTFP collection and 17 per cent from wage labour, whereas Kurichyan tribes who were residing on the fringe areas of the forest got 80 per cent of their income from daily wages and 11 per cent from NTFP collection. So the income from other sources has an important role in determining the dependency on NTFP. A similar situation was also found in Western Attappady, the

Irulas who settled in the fringe areas of the forests depended more on daily wages work for subsistence, whereas the Kurumbas who were residing in the interior areas of the forest depended mainly on NTFP collection.

5.1.2. Expenditure of the tribes

The average annual expenditure of Irulas, Mudugas and Kurumbas were found to be Rs. 76950, 75300 and 57300 respectively (Table 9 & 10). All the groups spent most of their income for food. The Kurumbas were spending the least amount (Rs. 18000) for food compared to other groups. Because the Kurumbas depended more on their agriculture land, forest resources and public distribution system for meeting their food requirements. The Mudugas and Irulas were depending on public distribution system and private shops for their food needs. The public distribution system gave 35 kg of rice to a family in a month at Rs. 1/kg. All the groups were spending an amount for their miscellaneous uses (alcohol, cigarettes, soap, paste etc.). The Kurumbas were spending 24 per cent of their income for miscellaneous uses. This might not be because of higher consumption rate, the alcohol which were brought from outside to the settlements for sale, fetched higher price than that of the government outlet. Shivarathri is the most celebrated festival among the tribal groups in Western Attappady. For Shivaratri festival, everyone brought new dresses and was grandly celebrated among all. Their children are studying in various districts of Kerala for a better education. Since they are staying in hostels, atleast once in a month, the parents went to see them and gave some amount of pocket money to their children. This had increased their transportation cost as well as educational cost.

Nair *et al.* (2007) found the average monthly expenditure per person of the forest depended tribe Kattunaikans was Rs. 482. In Western Attappady the annual expenditure of /household among Irula, Muduga and Kurumba were Rs. 76950, 75300 and 57300 respectively (Table 9). When monthly expenditure was worked out per person of Irula, Muduga and Kurumba, the annual expenditure values obtained were Rs. 1991, 1530 and 1033 respectively. According to the socio-economic survey of the Government of Kerala (2008), the average monthly per capita expenditure

among ST's in Kerala was Rs. 614. The increased expenditure among the tribes in Western Attappady might only be because of the normal increase in their wages or collection rate of NTFP that took place over the years. The Irula had the highest monthly expenditure than other two groups because they had better opportunities for jobs, so they got better income. Thus they had more expenditure. The Kurumbas had the least monthly per capita expenditure since they resided in the interior areas of the forests and their income was less, so their expenditure per month was low when compared to the other communities.

5.2. DEPENDENCE ON NTFP

5.2.1. NTFP as food

The tribes of Western Attappady used 17 edible NTFP's for meeting their dietary requirements (Table 10). Out of these, 10 NTFP's were used by all the 3 tribal groups. The seven species were exclusively used by the Kurumbas. The tubers such as *Dioscorea oppositifolia*, *Dioscorea pentaphylla* and *Colocasia antiquorum* were used only by the Kurumbas. Ramachandran and Udhayavani (2013) reported that the Kurumbas of Nilgiri have subsisted as food gatherers whose staple foods are wild tubers, wild fruits and other minor forest products. The Kurumbas of Attappady depended on these items to ensure the food security was attained during the shortage period, especially during monsoons. The Non-timber forest products have an important role to play in alleviating poverty, dietary shortfalls of the forest dependent people during particular lean seasons in the year. NTFP's constitute an integral component of food for the communities dependent on forests (Bhattacharya *et al.*, 1999). The Muduga and Irula had various other options such as shops near to their settlements which resulted its availability near to their settlements. Thomas *et al.* (2012) found that the Cholanaickkens of Nilambur consumed 40 species of wild plants as food including leaves, fruits, tubers, roots, rhizomes, seeds etc for maintaining their dietary requirements. The forest foods contribute to the food security as a way of ensuring safety nets during the periods of shortage in rural households (Nkem *et al.*, 2007). The tribes of Attappady also made use of different

NTFP's including leaves, fruits and tubers to ensure that their food requirements are met.

5.2.2. NTFP as medicine

The tribes are having a vast knowledge about their surrounding flora and fauna. They identified the use of different plants for treating various diseases, which are transferred to the next generations orally. The tribes of Western Attappady made use of 19 medicinal plants for treating various ailments (Table 12). Among those 12 medicinal plants were used exclusively by Kurumbas and two by Mudugas. Other five species were used by all the three communities. The Kurumba had depended more on the medicinal plants than other groups because no immediate hospital or transportation facilities were available for the interior settlements. So for the immediate relief they depended on the surrounding medicinal plants available. For Irula and Muduga settlements transportation facilities are available, enabling them to take patients immediately to the hospitals. So their dependence had decreased. Thomas *et al.* (2013) found the Arnatan tribes of Nilambur region utilized various parts like leaves, bark, roots and rhizome of 30 species of medicinal plants for both internal and external applications in the treatment of various ailments in their daily life. Even though the dependence on medicinal plants got considerably reduced among the younger generations in Attappady, the older people were depending on the medicinal plants in their locality. Sasidharan and Muraleedharan (2009) found that *Sida rhombifolia* and *Phyllanthus emblica* are most abundantly consumed medicinal plants in Kerala. The tribes of Attappady also utilized both these species abundantly as medicinal plants.

5.2.3. NTFP for firewood and household activities

The firewood was the only source of energy for the tribes in Western Attappady. All the groups preferred using *Grewia tillifolia* as firewood (Table 13). Anitha and Muraleedharan (2002) found the similar preference of the tribes to use *Grewia tillifolia* as fire wood in Peechi-Vazhani Wildlife Sanctuary. The Irulas and Mudugas

who had job in the AFC farm collected the firewood from the farm itself. The twigs of *Phoenix loureiroi* were used by Kurumbas for making brooms for their household use, whereas Mudugas made brooms and sold it in the private shops for Rs. 25/broom. The solid bamboo *Dendrocalamus strictus* was used by all the tribal groups for making cattle sheds. The bamboos were also used by the men for climbing trees while honey collection. The stem of *Ochlandra travancorica* was used as the long handle (thotti) for harvesting the fruits of *Acacia concinna* and *Myristica dactyloides*.

5.2.4. NTFP for religious purpose

The various plants had played an important role in the beliefs and customs of tribes. Even in their myths, beliefs and religious ceremonies, plants have played an important role. The tribes of Western Attappady made use of six species for the various religious purposes (Table 14). The twigs of four species such as *Achyranthes aspera, Amaranthus spinosus*, *Aerva lanata* and *Calotropis gigantea* were used by all the communities for Vishu Kani during the month of April. Even though the dependence on food and medicine varied between the tribes, there was not much change in the traditional use of plants for the religious purpose for any of the communities. Razia (2013) found the tribes in Attappady had a custom called *kappa kettal*, for that they used a bunch from the leaves of *Mangifera indica*, *Calotropis gigantea* and *Aerva lanata*. Tribes are of the belief that diseases are caused by evil spirits and toward them off different rituals were performed by using specific plant twigs, leaves, roots etc. Several plants are associated with superstitious beliefs. The tribes of Western Attappady used the roots of *Catunaregam spinosa* to make a drink for the religious ceremonies. According to their beliefs the ceremonies and drink would remove the evil spirits and thus diseases got cured.

5.2.5. NTFP as a source of income

There are 671 tribal settlements inside the forests of Kerala, who depend mainly on NTFP collection as a major source of income. The tribes of Western Attappady

collected 20 commercially important NTFP'S for sustaining their livelihood. The number of commercially important NTFP's collected by Irula, Muduga and Kurumba were 9, 14 and 18 respectively. The average contributions of NTFP collection to the annual income of the Irulas, Mudugas and Kurumbas were 1, 9 and 44 per cent respectively (Table 5). Singh *et al.* (2010) reported that the contribution of NTFP's to the forest dwellers of Sundarban is quite high, as it contributes almost 79 per cent on an average to the annual income of the collector's family. The Kurumbas were residing in the interior areas of the forests, so they had less opportunity for other jobs. This led them to more active involvement in NTFP collection for a better income. Davidar *et al.* (2008) found that the likelihood of harvesting forest products decreased significantly with increasing distance from the forest boundaries. Ravi *et al.* (2006) found for the Jenukurumba tribes of South India, the collection of NTFP's provided the maximum income to the extent of 50.98 per cent of the total income of the households followed by wage employment (33.95%), agriculture (11.65 %) and allied sector (3.42 %). Sekhar *et al.* (1996) found the average income derived from various NTFP's in Sathy Forest Range of Western Tamil Nadu was found to be Rs. 9000 per household. In the present study, the Irula and Muduga had various opportunities such as daily wages or agriculture for income generation. So their involvement in NTFP collection was reduced and they consider NTFP as a subsidiary source of income. Thomas (1996) found the collection of NTFP is a supplementary source of income to a majority of the tribal population in Kerala. Senerate *et al.* (2003) also found the alternative income earning opportunities substantially reduced the dependency on NTFP. In Irulas, the old women were involved in NTFP collection, so the contribution of NTFP to the income was low. The younger generations of Irulas are involved in daily wages jobs or government jobs (Table 5).

The Kurumbas got maximum income from *Solanum torvum* (13 %), followed by honey (12 %). *Canarium strictum* contributed 17 per cent of the income of Mudugas, followed by *Mangifera indica* (16 %). The Kurumba and Muduga collected the same quantity of *Canarium strictum* (60 kg/ yr) but Muduga got better income for *Canarium strictum* since they sold it in the private shops. The private shops procured

Canarium strictum for Rs. 80/kg without any grading, whereas society gave different price for *Canarium strictum* based on their grades. Eventhough the price of *Solanum torvum* (Rs 42/kg in 2013-14) is not high, the volume collected every year ensures they got a substantial contribution to their income from NTFP collection. Sinha and Bawa (2002) found that the Soliga households in Karnataka derived 50 per cent of their cash income from the extraction of NTFP's. The most heavily harvested NTFP's are fruits from *Phyllanthus emblica* and *Phyllanthus indofischeri* which have a high potential for boosting the household economy by generating a good source of cash income. Kumar (2010) reported that when the cash income per household from NTFP was considered, *Acacia concinna* contributed the most with Rs. 998.16 (14.5%) towards total cash income from NTFP's and followed by honey with Rs. 913.26 (13.33%) in the interior forest areas in Karnataka. *Mangifera indica* contributed a major part of income of Mudugas from NTFP collection. The Mudugas had an inherent ability to climb trees than other groups. Sajeev and Sasidharan (1997) have reported Gooseberry (*Phyllanthus emblica*), Mango (*Mangifera indica*) and honey are the major NTFP's collected and marketed by the hill pulayas and the muthuvans of Chinnar Wildlife Sanctuary. In the present study, since the Muduga settlements are close to Mukkali, they sold mangoes freshly immediately after harvest to the nearby shops. Since the Kurumba settlements are in the interior areas, by the time they brought it to the shops the freshness of the mangos were lost. So Kurumba are not much involved in the collection of mango. Siddhik (2008) found in Vazhachal Forest Division, the Kadar community settled in the interior areas of the forests obtained 80 per cent of their income from NTFP collection, whereas the other communities Mannan, Muthuvar and Malayar communities settled on the fringe areas of forests got 11, 8 and 1 per cent of their income from NTFP collection. In Attappady also a similar trend was observed, the Kurumbas who resided on the interior areas obtained 60-90 per cent of their income from NTFP. When they get close to the fringe areas, the level of dependence got considerably decreased among Mudugas and Irulas.

Honey had contributed an annual amount of Rs. 5760 to Kurumbas, Rs. 3360 to Mudugas and Rs. 2550 to Irulas. The Kurumbas went to collect honey in 2 seasons in

a year (Table 20). Honey was collected in the month of April - June and October-November (Table 21). The honey collected during the months of October-November were sweet honey which is having a high demand among the people, where as honey collected in the months of April- June were bitter in taste. It was because of the flowering of *Syzygium cumini* and *Strychnos nux-vomica*. The bitter honey was used in medicine preparation which was high in demand among the pharmaceutical industries. The bitter honey is procured only by the Kurumba cooperative society. The Mudugas got better price (Rs 270/ kg) for honey than Kurumbas since they are selling it in the private shops. Since Kurumba went two seasons for collection (5-6/season), they collect more quantity than Mudugas and got an overall better income from honey. The Irula men were involved only in honey collection and they just went 3-4 times in a season. So they got less income from honey compared to other groups. The quantity of honey collected in a season was higher for Mudugas than Irulas and Kurumbas. Gubbi and Macmillan (2008) found that in Periyar Tiger Reserve honey was the most valuable NTFP collected and returns from NTFP depended on the distance travelled, quantity collected and price obtained. Tharakan (2007) found that the collection of honey were done only by men usually in groups who are highly skilled in activities such as climbing big trees, driving away the bees, and also tracing the bees and locating the honey comb in the thick forest.

The collection of resin from *Canarium strictum* was done throughout the year. The least collection was done during the monsoon season. Tapping method by making wounds using knife on the bole was used for harvesting the resin. After tapping it took almost one week for the soldification of the resin. A week gap was given after each harvest. Mostly the collection was done together by the husband and wife. In a month, a family would go 2-3 times to the forest area for collection of resin. A family would collect almost 5 kg per trip. Varghese and Ticktin (2008) found that the Cholanaikan tribe in Kerala was harvesting *Canarium strictum* using fire and incision method and waited for two weeks. They went for collection three times in a week. The tribes of Western Attappady were not having intensive collection practice as compared to the Cholanaikens. *Acacia concinna* was collected from Western

Attappady by all the three communities. If men go for collection, they would climb up the nearby tree and harvest the fruits of *Acacia concinna* using long handle (thotti) or they will shake the branches of the tree so the dried fruits falls down. The women would collect it using long handle standing on the ground. This was against Anitha and Muraleedharan (2002) report that *Acacia concinna* was harvested by cutting down the base of the climber to avoid the effort of climbing and for collecting the maximum quantity. The collection practice followed in Attappady was more sustainable which ensures sustained production every year which ensures a regular income for the tribes.

Harvesting of *Phyllanthus emblica* was done by climbing up the tree and plucking using hands where ever possible. In the inaccessible areas, the small branches of the tree were cut down for the collection of fruits. Those trees whose branches were cut may or may not give yield next year. The Mudugas are involved very actively in the collection of wild mango. They are excellent climbers. Kurumbas are less involved in the collection of mango as compared to Mudugas. The collection is done during February- April. One kilo of mango would fetch around Rs. 80. The harvesting of the fruits was done by climbing up the tree and cutting off the small branches. Only the private markets are involved in the collection. Anitha and Muraleedharan (2002) have reported the branches of fruit trees like *Phyllanthus emblica* and *Mangifera indica* were lopped for harvesting. The similar harvesting technique was followed in Attappady, which would cause great threat to the species. Ultimately which affect the productivity and future income of the tribes.

The tribes of Attappady ensured the availability of the medicinal plants for the future years through sustainable harvesting practices. While harvesting medicinal plants, they collected only those plants that attained full growth and maturity, the immature plants where left without harvesting. The maturity of the plant was decided based on the colour and size of the leaves. Through this sustainable harvesting practice, the tribes ensures the future availability and gives them clear idea about the distance they have to travel next year for collection. Yesodharan (2010) also found that while

collecting *Sida rhombifolia, Pseudarthria viscida* and *Desmodium gangeticum*, small and weaker plants are left out and only the robust plants are collected. These plants could grow and become the seed source for the next growing generation.

5.3. GENDER DIMENSION IN NTFP COLLECTION

The gender played an important role in the collection of certain NTFP's. There are variations in the knowledge base between gender even in the collection of domestic as well as commercial NTFP's. Through their years experience, they are aware about the edible and non-edible species in their locality. The Kurumbas were depending more on the domestic use of NTFP and for them the contribution of both gender remains the same for the domestic use of various NTFP's. *Dioscorea pentaphylla* tuber was collected exclusively by Kurumba men because inorder to extract the tubers they have to dig deep, which was done by men. Even though Muduga and Irula were not depending much on the NTFP's for domestic use, the contribution of both genders were seen in both the groups. Narayanan and Anilkumar (2007) found the women of most tribal communities were actively involved in the collection of NTFP's to meet their livelihood needs.

Among Kurumbas, the women were involved in the collection of roots of commercially important NTFP's and their men involved in the agriculture activities. They have grown ragi, maize, mustard and other vegetables in their agriculture land which required frequent attention and care. So the men mostly involved in agriculture works and women went for collecting roots from the forests. Biswal (2009) reported that in Sathyamangalam forest division, the females were contributing more towards cash income than men. In the present study this was true for Kurumbas, in most of the NTFP's, the exploitable part was root which was collected by women. *Solanum torvum* collected by women brought highest percentage of income to the Kurumbas.

In Mudugas, both gender together went for collecting most of the NTFP items as compared to the Kurumbas, because the Mudugas had grown agricultural crops like pepper, plantain and areca nut which required less care or seasonal care. In Irula

community, only the aged women were involved in the NTFP collection. Husband and wife together went for tapping the resin of *Canarium strictum* in Muduga and Kurumba communities. The men of all the communities were involved in honey collection. The gender has dominance in the collection of certain NTFP species. Kumar (2010) found that in Karnataka, the men spent more time in the collection of NTFP's than women except in the collection of firewood and green leaves. Whereas in Attappady active involvements of both genders in the collection of fuel wood, NTFP for domestic and commercial purpose were seen among Mudugas and Kurumbas. The women collected fruits of *Acacia concinna* using long handle standing on the ground whereas the men collected the fruits of *Phyllanthus emblica* and *Mangifera indica* by cutting down the branches. So the women were adopting more conservative strategies in the collection of NTFP than men, which ensure a sustained future income.

The women actively participated in the agricultural works also. They are involved mainly in the digging works and harvesting. In Kurumbas and Mudugas the women helped their husbands in sowing, weeding and harvesting of the crops. Tharakan (2007) reported that the women were involved in soil preparation works, sowing, weeding and harvesting of their agricultural crops. The women made use of the every job opportunities available to them such as MGNREGP and other daily wages jobs in all the tribal communities in Western Attappady. The involvement of women in various activities ensures a daily source of income to the households.

5.4. MARKETING OF NTFP

The marketing of NTFP is the only source of income for some of the Kurumba settlements in the interior areas of forest. The three NTFP marketing institutions in Western Attappady are Kurumba cooperative society at Chindakki, Eco Development Committee (EDC) Vansree outlet at Mukkali and private shops. Shylajan and Mythili (2007) have identified there are mainly three marketing channels for the trade of NTFP's in Kerala. In the first channel, the products are marketed through the Federation. In the second channel, the products are marketed through private traders.

In some part of the State, Forest Department also practices marketing of some products. The Federation adopted direct negotiation practiced in case of a few products like *Sida rhombifolia, Desmodium gangeticum, Pseudarthria viscida, Phyllanthus emblica* and *Strobilanthus ciliates* mainly because these plants are needed in the raw form and cannot be stored for long periods (Muraleedharan and Sreelakshmi, 2006). In Attappady also the Kurumba cooperative society sold the medicinal plants directly without auction to the pharmaceutical companies such as Kottakkal Arya Vaydhyashala, Oushadhi and Nagarjuna based on their orders (Table 23). The Kurumbas sold most of the products collected to the Kurumba Cooperative Society. The society has done negotiation for the sales of medicinal plants with the pharmaceutical companies. The pharmaceutical companies fixed the procurement price of various medicinal plants. It may be higher or lower than the price fixed by the Minor Forest Products Committee (MFPC) constituted under the Kerala Forest Department.

The society would provide an advance to the collection agent in each settlement before the start of collection season. They also announced the quantity of NTFP to be collected from each settlement along with the price. Based on the marketing cost involved, the society procured NTFP's at different prices from the various settlements. Shanker and Muraleedharan (1996) reported that the societies are given interest free advance which is distributed to the commission agents to pay the collection charges to the tribals. At the end of each day, the collected NTFP was quantified in the settlement itself and agent will pay the amount based on the quantity collected. The agent entered the quantity collected by each member of the society in the register and based on that the society provides its bonus to the members. The society distributed 25 per cent of their profit to the members as bonus.

The Mudugas and Irulas sold their medicinal items to the private shops at Mukkali. Anitha and Muraleedharan (2002) reported that the marketing scenario in Peechi-Vazhani showed a dominant role of private traders that led to large-scale commercial exploitation of the resources. In Attappady also the private sector has a profound

influence on the marketed NTFP's. Most of the sales through Muduga and Irula had gone through the private sector. During the off seasons also the Kurumbas sold atleast 10 kg/household of products such as black dammar (*Canarium strictum*), Cheevakkai (*Acacia concinna*) and honey to the private shops. During the lean season (monsoon season), the Kurumbas were not having any job and income would be very scarce. During the end of May, just before start of monsoon, the Kurumbas brought everything in bulk required for their consumption. The tribes won't be able to make the full payment of the products purchased. So in return, the tribes would give the NTFP items collected to the private shops. Thus they settle the balance amount of the commodities purchased. This always keeps the private channel opened for the marketing of major products such as black dammar, cheevakkai and honey. Shanker and Muraleedharan (1996) reported a similar situation in Kerala, where the private traders provide necessary provisions, clothes and financial assistance to the tribes. In return the tribes sold the collected NTFP to repay the loan. The Mudugas and Irulas sold the collected products to the private shops. They won't sell it in the society, because the procurement price of society was less than that of private shops. Since the Kurumba society was established for the upliftment of the Kurumba community, only the Kurumbas got membership in the society. The bonus (25% of profit) was given to the members of the society during onam festival. So Irulas and Mudugas prefer selling their products to the private shops. Eco Development Commitee has under taken a lot of welfare activities for the tribes especially in the Karuvara settlements (Muduga). So few of them who are members in EDC sold black dammar, kokkam and honey to EDC. Chathukulam *et al.* (2013) reported that the scheme governance has transformed the EDC as centers of local development and has helped in the improvement of employment opportunities and food security to several tribal families.

There was difference in the procurement price of various NTFP's. The procurement price of honey was highest for the private shops (Rs. 270/kg), followed by EDC (Rs. 260/kg) and society (Rs.240/kg) (Table 33). The private shops and EDC are not doing grading for black dammar, they collected it for Rs. 80/kg and 100/kg

respectively. This high price encourages the collectors to sell these products to private shops and EDC. The society had higher procurement price for medicinal plants than private shops. *Acacia concinna* was procured by the society at (Rs. 19-25/kg) whereas private shop procured it for Rs. 15/kg. So for those products which are having high demand among the local people, private shops procured it at a higher rate than that of society and for medicinal products the procurement price was less. Abraham (2003) reported that in Wayanad the private traders provided more price/kg for various NTFP's marketed. Basavarajappa (2008) found that in Kodagu district of Karnataka the tribes fetched an amount of Rs. 52/kg in the co-operative society, whereas the same honey fetched higher price (Rs. 60-100) when it was sold locally. In the present study society's procurement price was ranging from 73-100 per cent of the private shops procurement price. The society's procurement price of honey was 89 per cent of the private shops procurement price. The procurement price of the major NTFP's had shown an increasing trend over the years, but not a steady one. Honey and roots of *Cyclea peltata* had made a significant contribution to the tribal income through its higher price.

There was high variation in the quantity of NTFP's collected and sold throughout the years by the society (Table 24). *Phoenix loureiroi* had shown a steady increase in quantity collected over the years. All other products were having highly varying trend in the quantity collected. Rise and fall in the quantity collected was seen in the subsequent years especially in cheevakkai. Because in some years, the quantity of NTFP's collected by the society will be much more than the demand or order. So society stocks it in the settlements itself for the next year. In the coming year they reduce the quantity of NTFP collected in order to make sure, the quantity that was left over was sold in the next year. Murthy *et al.* (2005) found that in Uttara Kannada the quantity of *Acacia concinna* realized over the years shows an irregular trend. Muraleedharan (2003) reported that there was high variation in the quantity of NTFP collected in certain years. In the present study *Strobilanthus ciliates* had shown a steady increase from 2009-10 onwards. *Strobilanthus ciliates* will flower once in 7 years, if a plant flowers it would die immediately. So the quantity collected would be

higher when it comes close to the flowering period. This had an impact on the tribal livelihood. In some years the contribution of the certain NTFP's will be very low, which would ultimately affect the income of the tribes.

The quantity sold and sale prices of the NTFP's also had an impact on the tribal livelihood. If the quantity of sales was a low in a particular year, the society would reduce the quantity to be collected for the next year and if trade does not occur the society won't be able to give the tribes the bonus which was 25 per cent of the sales price of the society. In *Canarium strictum* the variation in sales price was based on the grade of dammar sold. The first grade of *Canarium strictum* fetches good amount, which usually obtained in limited quantity. So the quantity procured and sold, procurement price and sales price of the society do have great impact on the income and the livelihood options of the tribes, especially the Kurumbas. Anitha and Muraleedharan (2002) found in Palappilly tribal cooperative society that over a period of time (1983-2000) all the variables such as quantity collected, procurement price, quantity sold and sale price, showed an increase with annual variation, which are more prominent in the case of quantity collected. A common tendency of high fluctuations in the quantity collected in the alternate years was observed. They found the reasons may be due to the high intensity of harvest in previous years, restricted collection in alternate years proposed by the forest department and product not in demand due to previous year's excess stock. In Western Attappady excess stock of the NTFP's in the previous years was the major reason for variation in the quantity collected in the alternative years.

According to the rules of the SC/ST Federation they would give 80 per cent of their sales price to the collectors. The Federation gives 95 per cent of the sale price to the member societies. The societies are passing 80 per cent of the same to the tribals towards collection charges (Bhaskaran, 2006). But in the present study, analysis showed (Table 30) that in most of the NTFP's this target was not achieved. Considering the year wise contribution of the society to the collectors, in some years the collection price was higher than the sales price. It was also having a negative

impact on the income of the tribes. Because when the sales price is low, the value of 80 per cent of the sales price also will be less which goes ultimately to the collectors. Thus the low price of the commodity also had a negative impact on the tribes income. Thomas (1996) reported that the tribal cooperative societies in Kerala payed on an average 66 per cent of their sales value as collection charge to the tribes. The Kurumba society in Attappady paid an average of 52-105 per cent of their sale price to the collectors during 2008-14.

The dependence on NTFP among the tribes in Western Attappady had high level of variation. The Kurumbas who settled in the interior areas of the forest depended on NTFP (44 %) for their income (Table 5). The Mudugas who had income from daily wages and agriculture, the dependency on NTFP was considerably less. For Irulas better education and job opportunities have limited them from NTFP collection, which they feel had higher risks compared to other jobs. So the income for other sectors determines the level of dependence on NTFP among the tribes. It is observed that in all the communities when other income options are available, the dependence on NTFP has come down at a faster rate. The expenditure patterns of tribes also have an influence on the dependence on NTFP. The expenditure for alcohol, smoking was higher among the tribes. Such activities had a negative impact on the tribal health, when the health condition was poor they could not go long distance for collecting NTFP which ultimately affected the dependence on NTFP. The tribes who got higher educational status moved out of the settlements, in search of government jobs or other jobs that led to the decreased dependence on NTFP. The proximity to the shops and hospitals determined the level of dependence on NTFP for food and medicinal purpose. Since the Kurumba settlements were in the interior areas of the forests, they depended more on tubers, leaves and fruits for food and different medicinal plants seen in their locality for immediate requirements.

The marketing of NTFP in Attappady are done through Kurumba cooperative society, Vanasree shop of EDC and private shops. The Kurumbas who had membership in the Kurumba cooperative society marketed their products mainly through society. Even

Kurumbas had a good marketing relation with the private shops inorder to repay the price of commodities they brought from the shops during lean season. The Mudugas and Irulas marketed their products through the private channels. There was price difference for various NTFP's marketed among the different marketing institutions. The products such as *Canarium strictum* and honey which had higher demand among the local people fetched highest price in private shops than society. The quantity of NTFP procured and sold through the society showed high variation over the years (Table 25 and 27), which ultimately affected the income of the tribes. To avoid the over stocking the society collected and sold based on the demand from pharmaceutical companies. This cause a variation in the income of Kurumbas from NTFP collection. Since Irula and Muduga sold their products to private shops they are not affected by such problems. The sale prices of society do have a influence on Kurumba income. The society provides 80 per cent of their income from sales to the collectors. This practice was not seen in other marketing channels. For Kurumbas NTFP collection was the major source of income, whereas Mudugas and Irulas depended on it as a subsidiary source of income. The NTFP had played a significant part to sustain the livelihood of the Kurumbas, whereas for Mudugas and Irulas eventhough the dependence was less, NTFP had contribution to their incomes.

The whole NTFP marketing systems in Kerala are facing the similar constraints that are seen in Attappady. All throughout Kerala the SC/ST Federation is facing severe competition from the private sector in the marketing of NTFP's. Due to the unscientific harvesting methods followed by the tribes in different regions, the Federation could not sustain the quantity of NTFP produced in each year. Since the Federation could not supply the required quantity to the industries, they looked for new sources for getting the raw materials. This brings in the situation wherein the Federation was forced to sell the NTFP products to the industries at a low price through the auction. Shanker and Muraleedharan (1996) reported till 1991-92 the societies were marketing NTFP's, the society gave less collection charge than prescribed by MFP committee. So the federation took over the marketing which resulted in higher turnover and fetched higher prices at the public auction conducted

by the federation. In some of the areas in Kerala there are no tribal cooperative societies for marketing NTFP's. This has eased the establishment of the private sector as a major marketing channel of NTPs in Kerala. In Attappady since Irula and Muduga did not have membership in Kurumba cooperative society they sold their NTFP's to the private markets. This resulted in smooth functioning of the private marketing channel. Even though the federation has listed 144 items of commercially important NTFP's, only 40 NTFP's are regularly collected. The societies are not taking any value addition processing of NTFP's in Kerala. Such activities can enhance the livelihood and income opportunities for the indigenous people. Prasad *et al.* (1999) reported that a significant increase in the level of returns may be achieved by drying *Phyllanthus emblica* collected in February fetched Rs. 800-900/kg and immature fruits collected and dried fetched Rs. 600-700/kg. Even though EDC was doing some kind of value addition such as making pickles of mango, gooseberry etc, the tribes were not involved in such activities. The policy such as 80 per cent of the sale price of the NTFP's should be given to the collectors has to be implemented properly throughout the state.

To improve the marketing system of NTFP's in Kerala, the federation should take some necessary actions. Give proper training to the tribes for sustainable harvesting of NTFP's. This can ensure a sustained production of various NTFP's throughout the years. If sustained production is attained the federation can inform the quantity available for sale and sale price well before the auction. So they can ensure the NTFP's are sold at a better rate. Tewari (2006) reported that the Gujarat State Forest Development Corporation enters into sale contract with the potential buyers before the seasonal collection of non-timber forest products begins. This saves on the storage and demurrage costs and results in a better price. Since societies provide 80 per cent of their sales price, this would enhance the livelihood and income of the tribes. A detailed survey has to be done to document the current status of major NTFP yielding plants in our natural ecosystems. The federation should ensure all the commercially important NTFP's mentioned in their list are regularly collected and marketed. The federation should take initiative to develop new marketing channels

for those NTFP's that are having lesser demand. The Federation has to establish new societies in NTFP pockets where there are currently no societies. The society should give membership to all the tribal groups in a locality. The society should get involved in the welfare activities other than providing bonus for the tribes, inorder to gain their confidence. The society and the forest department should start some processing units for value adding the NTFP's. The free time of women can be utilized for the value addition activities of different NTFP's. Such actions provides a sustained income as well as open up a market for the lesser utilized NTFP's. The NGO's like Uravu and Key Stone Foundation in Wayanad took up value addition of NTFP's based on the tribal knowledge. Uravu (2009) started making value added products such as bamboo shoot pickle and candy, tamarind toffee, squashes and jam involving the tribes. Thus the indigenous knowledge and techniques acquired traditionally by the tribes can be conserved and used for the welfare of the whole human society.

Summary

SUMMARY

The study was conducted in Western Attappady during the period 2013-14. The objective of the study was to document the utilization, marketing mechanism and role played by NTFP in the livelihood enhancement of the tribals of Attappady. The major findings of the study are given in this chapter.

1. The Irulas had the highest literacy rate (73 %), followed by Kurumbas (72%) and Mudugas (58 %). The women literacy rate among Irula, Muduga and Kurumba were 66, 55 and 66 per cent respectively.

2. The Irula community who settled on the lower plains of the valley involved mostly in daily wages works. Fifty per cent of the houses were involved in daily wages work as their major occupation. Among Mudugas 38 per cent of the houses involved in a combination of daily wages work and NTFP collection. The Kurumbas settled in the interior areas of the forest depended on NTFP collection and agriculture (42 %).

3. Sixty six per cent of the Irula households were landless, 30 per cent of the households were having less than one acre of land. Among Mudugas, 42 per cent of the households were landless and eight per cent of the households had more than 3 acres of land. All the Kurumba families had an area of 4 acres of community property resource, which they called as panchakadu.

4. The Irulas got 69 per cent of their income from daily wages and one per cent from NTFP collection. The Muduga community got 64 per cent of the income from daily wages and 9 per cent from NTFP collection. The Kurumba community settled in the interior areas of the forest obtained 44 per cent of their income from NTFP collection.

5. Seventy six per cent households of Irula got more than 90 per cent of their income from daily wages work. Though 26 per cent houses got income from the forest resources, but their contribution to the income was less than 10 per cent. In Mudugas, 46 per cent houses obtained 60-90 per cent of their income from daily wages work. The NTFP collection contributed upto 20 per cent of the income for 30 per cent houses and 20-30 per cent income for 18 per cent houses. In Kurumbas, 84 per cent families had an income from NTFP collection. Twelve per cent got less than 30 per cent of their income from NTFP collection and 40 per cent families got 60-90 per cent of their income from NTFP collection.

6. The average annual expenditure of Irulas, Mudugas and Kurumbas were found to be Rs. 76950, 75300 and 57300 respectively. The highest per cent of the expenditure was incurred for food followed by miscellaneous in all the communities.

7. The tribes of Western Attappady made use of 17 NTFP's as food. Out of this 10 species were used by all the three tribal groups, whereas seven species, like *Dioscorea oppositifolia* and *Dioscorea pentaphylla* were exclusively consumed by the Kurumbas.

8. The tribes made use of 19 medicinal plants for treating various ailments. Twelve species were exclusively used by the Kurumbas, two species by Irulas and five species were used by all communities as medicinal plants. The tribes made use of five species for the construction purpose and 3 species as firewood. Six species were used for the religious purpose among the tribal groups.

9. Twenty commercially important NTFP's were collected by the tribes of Western Attappady. The Irula collected 9 species, whereas Mudugas and Kurumbas collected 14 and 18 species respectively.

10. In Muduga, highest percentages of the households were involved in the collection of honey (48 %), followed by *Phyllanthus emblica* (46 %) and *Mangifera indica* (36 %). The Kurumba households collected *Acacia concinna* and *Piper nigrum* (78 %) the most, followed by *Pseudarthria viscida* (76 %), *Strobilanthus ciliates* (74%), *Desmodium gangeticum* (74 %) and *Canarium strictum* (74 %).

11. For Irula, the honey contributed 50 per cent of their income from NTFP, followed by *Acacia concinna.* The Mudugas obtained highest income from *Canarium strictum* (17 %), followed by *Mangifera indica* (16 %) and honey (12 %). The Kurumbas received highest income of Rs. 5880/annum from *Solanum torvum* (13 %), followed by honey (12 %) and *Strobilanthus ciliates* (11 %).

12. Honey was exclusively collected by men. In Irula community the men and women contributed 50 per cent of their income from NTFP collection, whereas in Muduga community the men and women contributed 65 and 35 per cent respectively. The Kurumba women contributed 65 per cent, whereas Kurumba men contributed 44 per cent of the income from NTFP collection.

13. The tribes followed conservative methods in the harvesting of NTFP's except in case of *Phyllanthus emblica*, *Piper nigrum* and *Mangifera indica.* The Irulas made 30 trips/ year for NTFP collection, whereas Mudugas and Kurumbas went 78 and 123 trips/year respectively.The maximum distance was travelled by the communities for collecting honey. The Irula took most number of visits to collect *Cyclea peltata* (10/year), followed by *Hemidesmus indicus* (6 trips/year). The Mudugas went maximum times to collect *Cyclea peltata* (10-15/year), followed by *Canarium strictum* (12/year), *Phyllanthus emblica* (8-9/ year) and *Mangifera indica* (8-9/ year). The Kurumbas travelled

the most times to collect *Cyclea peltata* (20/year), followed by *Canarium strictum*, honey (12/year) and *Acacia concinna* (12/ year).

14. Most of the commercially important NTFP's, especially medicinal plants were collected during the period November- February.

15. The primary processing activities like cleaning, drying, chopping and grading were done for some NTFP's which provided a better price for the tribes. The primary processing had increased the price by Rs. 2-10/kg for various NTFP's

16. The marketing institutions identified at Western Attappady were Kurumba Cooperative society at Chindakki, Vanasree Eco shop of EDC at Mukkali and Private traders.

17. The society marketed 21 commercialized NTFP's, whereas private and EDC marketed only fourteen and four respectively.

18. The Muduga and Irula were marketing the NTFP's through the private shops and EDC at Mukkali. The Kurumbas was marketing most of their NTFP collected through the Kurumba cooperative society at Chindakki.

19. The medicinal plants marketed through society were sold to the pharmaceutical companies such as Kottakkal Arya Vydhasala, Oushadhi and Nagarjuna. The industrial products were marketed to the industries at Coimbatore.

20. Among the commercially important NTFP's, eight were exclusively marketed by Kurumba society and 10 NTFP's were marketed through the society and private shops. The fruit of *Mangifera indica* was exclusively marketed through the private shops.

21. *Phoenix loureiroi* was the most procured NTFP and *Rauvolfia serpentina* was the least procured NTFP during 2008-14 by the society. Highly varying trend was observed in the quantity of NTFP procured over the years. This fluctuating trend had an impact on the tribal livelihood.

22. The procurement price of NTFP's showed a gradual increase over the years. The procurement price of honey increased three times during the study period. The highest procurement price was for *Holostemma adakodien* and least for *Phoenix loureiroi.*

23. The quantity of NTFP sold had shown a varying trend over the years. The rise and fall in the simultaneous years had a negative impact on the tribes. If sales do not occur in a year, the quantity of NTFP procured in the next year was reduced by the society. This ultimately affected the tribal income and livelihood. *Phoenix loureiroi* was the most sold NTFP and *Holostemma adakodien* was the least sold NTFP during 2008-14.

24. A gradual increase in sale price of NTFP was observed for most of the NTFP's. Sale price also had a direct influence on the tribal livelihood. Twenty five per cent of the profit of the society obtained through sales of NTFP was given to the tribes as bonus. If sale do not occur, the bonus was affected.

25. The price spread of society was less for the products like honey and *Canarium strictum* as compared to EDC.

26. For most of the NTFP's traded, the society was not able to give back the 80 per cent of their sale price to the collector's. The private shops and EDC did not have this provision.

27. The marketing cost includes the cost incurred for processing, transportation and collection of NTFP. The marketing cost was highest for honey and least for *Strobilanthus ciliates.*

28. The private traders had given better price than society to the collector's for NTFP's that have maximum demand among the local people. The private traders always maintained a link with the tribes to ensure that the private marketing channel was always active.

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DEPENDENCE ON NON TIMBER FOREST PRODUCTS (NTFP) FOR THE SUSTAINABLE LIVELIHOOD ENHANCEMENT OF TRIBALS OF WESTERN ATTAPPADY

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ABSTRACT OF THE THESIS

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ABSTRACT

Non-Timber Forest Products (NTFP) play a crucial role in the daily life and welfare of people all over the world. The livelihoods of the people living close to the forest and within the forests are inextricably linked to the forest ecosystem. In Kerala, out of 4000 tribal settlements, 671 settlements are forest settlements, which depended on NTFPs for meeting their various requirements. The present study was conducted in the Western part of Attappady among the three tribal groups namely; Irula, Muduga and Kurumba. The main objective of the study was to document the NTFPs collected and utilized by the tribes for their sustainable livelihood and explore the various marketing mechanisms followed in Western Attappady. A pre-tested questionnaire survey and semi structured interviews were conducted in fifty houses from each community. Secondary data were collected from the cooperative societies, SC/ST Federation and Silent Valley National Park Wildlife Warden's Office etc.

The Irula community who are basically daily wage workers settled on the lower plains of the valley had the highest literacy rate and obtained one per cent of their income from NTFP collection. The Mudugas settled on the midlands had the least literacy rate and derived 9 per cent of their income from NTFP collection. The particular vulnerable tribal group Kurumba settled in the interior areas of the forests obtained 44 per cent of their income from NTFP collection. The tribes of Western Attappady depended on 17 plant species for food, 19 for medicine, 8 for construction and firewood and 6 for religious purpose. The Irulas collected 9 commercial NTFPs, whereas Mudugas and Kurumbas collected 14 and 18 NTFPs respectively. The Irula and Muduga were mostly involved in the collection of honey, whereas Kurumbas involved in the collection of *Acacia concinna*.

The NTFPs have contributed an annual income of Rs. 5755, Rs. 27220 and Rs. 46255 to the Irulas, Mudugas and Kurumbas households respectively. The Irulas got maximum income (Rs. 2880/annum) from honey, whereas Mudugas and Kurumbas got the highest income from *Canarium strictum* (Rs. 4800/annum) and *Solanum torvum* (Rs 5880/annum) respectively. Honey was collected only by men and roots were collected by women. In Irula, both the genders made equal contribution to their income from NTFP, whereas in Mudugas the men and women contributed 65 and 35 per cent respectively. The Kurumba women contributed 56 per cent of their income from NTFP collection. The most of the medicinal plants whose roots were the exploitable part were harvested during November to February. The Irulas made 30 trips/ year for NTFP collection, whereas Mudugas and Irulas undertook 78 and 123 trips/year respectively. The three institutions involved in the marketing of NTFPs were Kurumba Cooperative society, Eco shop of EDC and private traders. The Kurumba was marketing most of the NTFPs through the Kurumba society, whereas Irula and Muduga marketed NTFPs through the private shops. The private traders gave better price to the collectors than the society. For Irulas and Mudugas NTFP collection was a subsidiary source of income, whereas for Kurumbas, it was the major source of income. The private traders maintained a constant link with the tribes and ensured the private marketing channels are always active.

Appendices

APPENDIX I

Dependence on Non-Timber Forest Products (NTFP) for the sustainable livelihood enhancement of tribals of Western Attappady

Number of the respondent:

Date of data collection:

- Tribal group : Settlement/Panchayath:
- Name of head of the family: (M/F)
- Educational status of head of the family: Illiterate/Lower primary/Upper primary/ High school/ college/Any other
- Family size:
- Family status

Slno	Name	Sex	Age	Education	Occupation					Income/ month or day	
					Main occupation				Sub occupation	Main	Sub
					Govt	Farmer	Forest based	Others			

- Main occupation of household(contributing more than(50%) of annual income: Agriculture/Forest/Job
- Agricultural land area:
- No.of members involved in NTFP collection from the family:

Total no.of individuals involved in collection	Male Adult	Female Adult	Children	
			Girls	Boys

- Source of NTFP

NTFP item	Part used	Purpose	Whole plant collected/specific part

- NTFP collection

Slno	NTFP item	Use		Season	Harvesting method	Marketing channel	Price/kg	Quantity collected
		Own use	sale					

- Storage of NTFP

Slno	NTFP item	Storage		Raw material storage		Techique	Period
		Yes	No	Processed	Unprocessed		

- Own use classification

NTFP item	Food	Medicine	Construction	Fuelwood	Religious use

- NTFP sale:

NTFP item	Directly sold	Sold after processing	Price /kg		Received training for processin g (Y/N)
			Raw	Processed	

- Gender dimensions in NTFP collection

Slno	NTFP	Collectors sex		Age	Procedure involved in the collection phase	Process involved in post collection phase	Location/Distance travelled for collection	Challenges /problems faced	No.of days work in a month
		M	F						

- Problems/challenges in collection and processing of NTFP

NTFP	Problem/ challenge	Techniques for collection	Techniques for processing	Practices followed	Awareness Y/N	Adoption Y/N

- Main source of annual income

Source of income	Particulars	Quantity	Price (Rs/unit)
Forests	Timber Fuelwood Fodder Poles Bamboo Canes NTFP		
Agriculture	Cereals vegetables		
Livestock	Milk products Sale of animals Cowdung cake		
Labour	Agricultural Forests Others		
Salary/income			
Business/Trade			
Contribution of NTFP to social functions	Marriage WorshipCeremonies		

- Main items of annual expenditure

Source of expenditure	particulars	Amount
Food		
Clothing		
NTFP collection	Travelling Food Staying	
Housing repair		
Livestock	fodder	
Agriculture	Seed Fertilizer Irrigation Labour charges Machinaries	
Health		
Education		
Social activities	Marriage Death	
Cost of collection in terms of man days spent	Fuelwood Fodder Timber Bamboo NTFP	
Social cost	Damage to livestock,humans	

Appendix II

Major NTFPs used by the tribes in Western Attappady

Sl.No.	NTFP item	Common name	Part used	Use
1	*Acacia caesia*	Erraksinka	Bark	Medicine for stomach ache
2	*Acacia concinna*	Cheevakkai	Fruit	Marketing
3	*Achyranthes aspera*	Irrumulli	Twigs	Worship
4	*Amaranthus spinosus*	Cheera	Twig	Edible and worship
5	*Artocarpus heterophyllus*	Jack Tree	Fruit, Timber	Edible, firewood
6	*Balanophora fungosa*	Athithippali	Whole plant	Medicine and marketing
7	*Bauhinia malabarica*	Ashamaram	Twig	Medicine for eye disease
			Bark	Making ropes
8	*Cajanus albicans*	Parivasappa	Root	To treat wounds, infection
9	*Callicarpa tomentosa*	Cheruthekk	Root	Marketing
10	*Calophyllum polyanthum*	Kattupunna	Bark	To treat wound in animals
11	*Calotropis gigantea*	Erukku	Twig	Worship
12	*Canarium strictum*	Kungiliyum	Resin	Marketing and insect repellent
13	*Canavalia africana*	Kilara	Root	Wound, piles, swelling
14	*Capsicum frutescens*	Jeenimula	Fruit	Edible
15	*Catunaregam spinosa*	Kara	Root	Worship and medicine
16	*Colocasia antiquorum*	Indian kales	Tuber	Edible
17	*Cycas circinalis*	Eenthu	Fruit, seed	Edible
18	*Cyclea peltata*	Padakizhangu	Tuber	Marketing
			Leaves	Against Leech
19	*Dalbergia latifolia*	Veeti	Bark juice	Medicine for stomach pain
20	*Desmodium gangeticum*	Oorila	Root	Sold
21	*Desmodium repandum*	Kaduppukodi	Leaves	Medicine for Loose motion
22	*Dioscorea oppositifolia*	Erraikodi	Tuber	Edible
23	*Dioscorea pentaphylla*	Noorakilangu	Tuber	Edible
24	*Garcinia gummigatta*	Kudampuli	Fruit	Edible
25	*Gloriosa superba*	Kodakizhangu	Tuber	Poison, Medicine for snake

				bite
26	*Grewia tillifolia*	Chadachi	Fruit	Edible
			Timber	Firewood
27	*Helicteres isora*	Kavari	Stem	Making rope and medicine
28	*Hemidesmus indicus*	Nannari	Root	Marketing
29	*Holostemma adakodien*	Adapathian		Marketing
30	Honey	Then		Own use and sold
31	*Jatropa curcas*	Jatropa	Seed Oil	Oil
32	*Mallotus philippensis*	Kathivettu	Bark	Knife wounds
33	*Mangifera indica*	Mango	Fruit	Edible and sales
34	*Murraya koenigii*	Curry leaf	Fruit	Edible
35	*Nervilia aragoana*	Kalpasam		Marketing
36	*Ochlandra travancorica*	Oda	Woody stem	Construction
37	*Palaquium ellipticum*	Paalipoovu	Flower	Kidney disease
38	*Piper longum*	Kattu Thippali	Fruit	Marketing
39	*Piper nigrum*	Kurumulaku	Stem, Fruit	marketing
40	*Pseudarthria viscida*	Moovila	Root	Marketing
41	*Racinus communisa*	Avannak		Marketing
42	*Rauvolfia serpentina*	Amalpori	Root, fruit	Marketing
43	*Phoenix loureiroi*	Chool pullu		Sweeping
44	*Senna hirsuta*	Thakara	Leaves	Headache
45	*Sida rhombifolia*	Kurumthotti	Root and twigs	Marketing and medicinal
46	*Solanum torvum*	Chunda	leaves	Edible
			Root	Marketing
47	*Myristica dactyloides*	Pathiripoo	Fruit	Marketing
48	*Strobilanthus ciliates*	Karimkurinji	Root, fruit	Marketing
49	*Syzygium cumini*	Njaval	Fruit	Edible
50	*Tamarindus indica*	Tamarind	Fruit	Edible
51	*Terminalia bellerica*	Thanni	Bark	Medicine for stomach problem
52	*Ziziphus rugosa*	Juli	Fruit	Edible