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# DEVELOPING SITE-SPECIFIC ECO-RESTORATION PROTOCOL BASED ON EXISTING COMMUNITY REQUIREMENTS

INDIA HIGH RANGE LANDSCAPE PROJECT, MUNNAR, KERALA

Report

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P.V.Karunakaran and Mathew K Sebastian

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Sálim Ali Centre for Ornithology and Natural  
History  
Anaikatti, Coimbatore 641 108, Tamil Nadu



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## 1.0 Introduction

Forest forms a significant and integral part of the inaccessible mountainous area and thus harbour excellent biodiversity and provides critically important ecological services. The ecosystem services provided by the forested areas in provisional services (e.g. timber extraction); regulating services (e.g. carbon sequestration, water cycle regulation); and cultural services (e.g. the role of forests in local belief systems and customs), (FAO 2011). Western Ghats region is facing forest degradation and deforestation for a long time. However, the intensity and expanse of this activity has exponentially increased over the last two decades. A study of period spread over 70 years from 1920s to 90s reported the annual rate of deforestation to be 0.57% in the Western Ghats (Menon and Bawa, 1997). Another study by Jha et. al. (2000), revealed that the annual rate of deforestation varied between -0.73 to 1.84% for the period 1973 to 1995 in the states of Karnataka, Kerala and Tamil Nadu. Forest degradation resulting in conversion of dense forest to open forest, an open forest to scrubland has been a result of land use change and exploitation of forest resources.

One of the major strategies adopted in the recent past to check the unprecedented degradation and degeneration of forests is eco-restoration that ensures not only the increase in landcover but provides ecosystem services as well. Ecosystem restoration projects will restore more than the ecosystem to benefit social and developmental aspects as well. According to Leigh (2005) reconnecting individuals with the local landscape through eco-restoration can positively influence a conservation ethic in a community. Natural and restored areas can provide a host of ecosystem services that support human wellbeing, local economic support, and quality of life. These services include ecosystem process such as carbon sequestration, pollination, food production, water purification, soil stabilization, landscape aesthetic benefits, and recreation opportunities (Fisher, Turner, & Morling, 2008). Ecosystem services have become increasingly relevant as the planet's population has increased pressures on natural areas and obstructed those services once presumed to be unlimited, making them paramount to public health (Lee, 2005). The benefits of engaging stakeholders in eco-restoration projects expand beyond the area's ecology to community and individual level benefits and impacts. The goal of ecorestoration ranges from reestablishment of native vegetation to the creation of wild faunal habitats to the restoration of ecosystem processes for sustainable and productive that benefit humans also.

There are three levels of eco-restoration. The first level is reclamation and consists of attempts to increase biodiversity in a given area, often in highly degraded sites. The second level is rehabilitation and consists of the re-introduction of certain ecosystem functions such as reduction of flood risks by creating

water retention systems. The third level, or otherwise the true restoration consists of reconstruction of ecosystems which includes not only the characteristic species, communities and structure also.

There are many potential ways a community can benefit from eco-restoration. Members of different stakeholders may have a strong attachment to the proposed restoration area and accompanying strong feelings about how it should be managed. Addressing this potential for conflict resolution can be one of the greatest challenges of eco-restoration (Ryan, 2005). Balancing the needs of the community with the goals of ecorestoration can help bring the community/stakeholders together through shared responsibility. Ecorestoration activities can also offer educational opportunities for local communities (Purcell,2007), while successful program can benefit the local communities through the development of social capital, community resilience, economic benefits and improved aesthetics (Tidball & Stedman, 2013; Schroeder, 2000; Aronson et al., 2010; Pitt et al., 2012). It is particularly important in an area where local communities (tribal) engage in the collection of non-wood forest products for their livelihood.

The hyper diverse Western Ghats is one of the 34 global biodiversity hotspots, running along the west coast of India for almost 1600 km covers 1,80,000km<sup>2</sup> with a minimum width of 48 km and maximum width of 210 km (Nair 1991; CEPF 2007; Myers *et al.* 2000). The Ghats is home of one of the richest biological and cultural diversity in the world which spread over six Indian states, viz., Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamilnadu. The average elevation is 900-1500 m, with highest peak having an altitude of 2969m. Western Ghats provide very unique landscape features along with different rainfall regimes, western slopes of the Ghats have a natural cover of evergreen forest, which changes to moist and then dry deciduous types as one comes to the eastern slopes. The western slope receive very high rainfall but the eastern receive very less precipitation due to shelter effect (Nair 1991; Myers *et al.* 2000; Mittermeier *et al.* 2008; Gadgil *et al.* 2011). The Western Ghats have also lost nearly 50% of forest cover since the early 1900s and the trend is continuing with increased fragmentation and encroachments, most of the it fragmented and degraded by agriculture, plantations, hydroelectric projects, logging, developmental activities, fire, grazing and forest produce exploitation (Nair 1991; Jha *et al.* 2000; Kumar *et al.* 2004; Molur 2011). The landscape experienced severe ecological degradation in the historical time loos immense natural resource base. Compared to the other hotspots, it has the highest human population per unit area (more than 300 humans/km<sup>2</sup> ), making it that much more challenging to conserve (Molur 2009).

The high range landscape of WesternGhats is the distinct geological biodiversity entity which located in crucial position of the southern Western Ghats. The landscape receive global significance for the long

term conservation due to high levels of endemism and biological diversity along with strong eco-cultural affinities. The landscape is undergone severe fragmentation and degradation. The forest cover of the high range landscape was disappeared over large areas by agriculture, plantations, hydroelectric projects, logging, developmental activities, fire, grazing and forest produce exploitation have participated the rampant degradation and fragmentation of the landscape. The history of the severe degradation of the landscape started Since the 19<sup>th</sup> century along with the invention of British.

The project area consist of the Protected Areas (PAs), territorial forest divisions and small patches amidst revenue and private plantations, commercial tree plantations. The High Value Biodiversity Areas (HVBAs) exist outside the existing protected area network, mostly in areas administered by the Forest Department and smaller fragments in Revenue and private lands. Extending over 84,600 ha, HVBAs cover about 27.29 percent of the project landscape. HVBAs of HRML include most of Mankulam Division, areas resumed from Kanan Devan Hills (KDH),

areas adjoining to PAs and natural forests of Munnar, Malayattoor, Marayur, and Kottayam Forest Divisions. Some of the shola patches and grasslands under the control of the Revenue Department also come under this category. The tea plantations of KDH have interspersed forests fragments, grasslands and swamps within them; all crucial HVBAs. Apart from



harbouring significant biological diversity, these HVBAs ensure linkages in the landscape and ensure the connectivity between PAs. All the HVBAs require more concerted eco-restoration efforts (both technical and financial) to bring the original habitats back.

The areas for the restoration in the whole landscape will be identified and prioritize areas based on priority base. The criteria may include both biological and sociological (livelihood) aspects such as ecological status of forests (primary or secondary), degraded status (high, moderate and low), extent of the patch, tenureial ownership of the patch (either under the control of the government, lease land, etc), topographic and edaphic features, resource dependency (minor forest products with reeds, without reeds etc). The ingenious people living in the landscape is still depending the forest for the daily lively hood and they collecting the forest produces. It is essential to consider the heterogeneity of land use models and patterns for the effective strategies for ecological restoration.

## 2.0 Objectives

The ultimate goal of the project is to restore high-diversity forests with the involvement of the local communities or stakeholders who are the beneficiary of the usufructs of such intervention. The social consciousness of the implementation of this project is very essential. The most depended native species by the local people in the different landscape elements will be consider for the restoration and it will meet the requirement of the local people as well as it ensure the success of the process in the grass root level. Keeping this in view the following objectives were formulated.

1. Identify, document and prioritize sites/habitats in the landscape for eco-restoration activities.
2. Conduct review and document the eco-restoration practices presently adopted by KFD.
3. Review the existing acts and policies related in the light of conflicting interest between development and local community.
4. Develop monitoring protocol with baseline information
5. Develop a protocol containing innovative and cost-effective eco-restoration practices for each identified site/habitat in the landscape based on the existing community requirement in the light of existing acts and policies.

### **3.0 Methods**

The approach for the study has been strategized as participatory in larger perspective with the involvement of local people along with customary scientific protocols. Nevertheless since we could not proceed with field oriented data collection, the observation made in the report are largely based on secondary information collected from various sources. The documents such as Management Plans (PAs), Working Plans (non-PAs) and many other literatures, largely web based, have been perused to collect non spatial data. Since the availability of high resolution spatial data was not available, only descriptive information could be provided. The site specific strategies are too broad since primary data could not be collected. The socio economic status of the people in the study area was collected from Department of Economics & Statistics and documents of Forests and Wildlife Department.



## 4.0 Observations

### 4.1 Extent, Type and Distribution of Degraded forests

We collected the available relevant secondary information (Spatial/non special data) on forest degradation of the study area prior to the field study. The available non spatial information's were collected from the forest administrative documents, published scientific papers and books (both qualitative and quantitative data). We also studied the success models from the different parts of Western Ghats and other tropical countries. The collected information revealed that, the landscape severely degraded by human in the past. Vast areas of intact and pristine forest was open up severely for the plantations since the beginning of 19<sup>th</sup> century. The shifting cultivation, construction of dams, raising monoculture plantations (exotic and resident) and forest fire are the major problem for the degradation of the landscape.

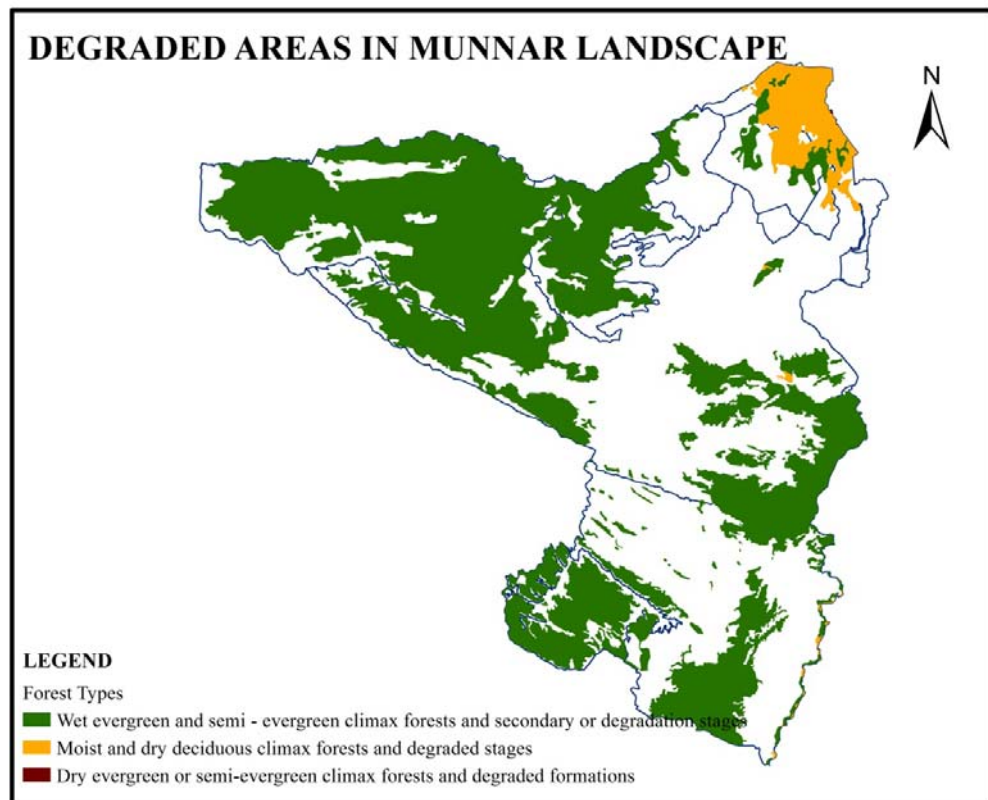


Figure 1: Munnar landscape Area – distribution of degraded forest types (source: FIP maps)

The forest fire is mentioned as one of the major havoc for the natural habitat in the landscape but quantitative data is not available. The accurate information on forest fire, shifting cultivation and degree of degradations are lacking and these information's will be collected at the field level. The present status of the area brought under shifting cultivations in the earlier periods is unclear from the available literatures. The available spatial data on forest degradation was gathered from vegetation map prepared by French institute, Pondichery and that can give insight to give area of priority for further study.

Table 1: Extent of each type of degraded forests (source; FIP vegetation map)

SN	Division Name	Forest Type	Area (km <sup>2</sup> )
<b>Non-PA</b>			
1	Malayattoor FD	Degraded forests - Wet evergreen and semi - evergreen	494.36
2	Mankulam FD	Degraded forests - Wet evergreen and semi - evergreen	65.91
3	Munnar FD	Degraded forests - Wet evergreen and semi - evergreen	469.52
		Degraded forests - Moist and dry deciduous	3.29
4	Marayur FD	Degraded forests - Wet evergreen and semi - evergreen	20.04
		Degraded forests - Moist and dry deciduous	17.18
5	Kottayam FD	Degraded forests - Wet evergreen and semi - evergreen	225.57
		Degraded forests - Moist and dry deciduous	1.59
<b>PA</b>			
6	Thattekkad Bird Sanctuary	Degraded forests - Wet evergreen and semi - evergreen	7.41
7	Mathikettan Shola NP	Degraded forests - Wet evergreen and semi - evergreen	13.89
8	Eravikulam NP	Degraded forests - Wet evergreen and semi - evergreen	17.41
9	Chinnar WLS	Degraded forests - Wet evergreen and semi - evergreen	8.21
		Degraded forests - Moist and dry deciduous	73.98
		Degraded forests- Dry evergreen	0.14
10	Anamudi Shola NP	Degraded forests - Wet evergreen and semi - evergreen	0.47
		Degraded forests - Moist and dry deciduous	4.43
11	Kurinjimala Sanctuary	Degraded forests - Wet evergreen and semi - evergreen	0.13
		Degraded forests - Moist and dry deciduous	4.82
12	Idukki WLS	Degraded forests - Wet evergreen and semi – evergreen	91.26
<b>Total</b>			<b>1519.62</b>

It was found that degraded forests are mainly found in three forests types (based on FIP maps). They account about 1520 km<sup>2</sup> characterised either partially or completely degraded (Table 1). Since majority of

the project landscape falls in the windward side of the Ghats, evergreen forests of the low and medium elevation are the major type of forests (more than 90%) accounted for degradation. It is also important to note that these are the stretches where human settlements are spread and maximum intervention is possible for livelihood opportunities in the form of resource utilization. Hence the detailed information is a prerequisite for any strategized activities for restoration. Unfortunately we could not proceed further into this due to logistic issues.

The extent of forest types in each division indicated that Munnar and Kottayam are the two Forest divisions with large extent of degraded forests though the reed patches (*Ochlandra spp.*) of Malayattoor considered as degraded but on landcover characteristics they appear more of intact vegetation. However the presence of reeds which is subjected for regular harvesting may limit the scope for restoration activities though the division is dotted with many settlements in the forested parts.

## **4.2 Specific information on different Forest Administrative unit**

### **4.2.1 Idukki Wildlife sanctuary**

The High Range forests separated from the main tract of vegetation due to development process and habitat destruction. Due to degradation and fragmentation the structure of original vegetation has changed hence presently it is difficult to differentiate the formations based on floristic composition (Veeramani and Balasubramanian, 2009). High degradation of this forest is found at **Anappallam, Muthichola, Kannamkayam, Vellakanam, Konnakuzhi, and Arakkapadam**. The dominant species found in this habitat are *Persea macrantha*, *Chionanthus mala-elangi*, *Macaranga peltata*, *Bischofia javanica*, *Artocarpus hirsuta*, *Lagerstroemia microcarpa*, *Cinnamomum zeylanicum* etc.

Weeds like lantana, *Mikania*, *Eupatorium*, *Salvinia* and *Mimosa invisa* are found in PA especially in areas surrounding the tribal hamlets. The weeds like *Mimosa invisa* is found in the open patches where the forests are degraded mainly in **Chembakassery** and **Memari** areas. The Moist Deciduous forest interspersed with savannah grassland occupy the major area of the sanctuary and the exotic weeds such as *Lantana camara* and *Eupatorium odoratum* are found abundant in this habitat. There are 12 villages inside the sanctuary and large number of inhabited areas around the PA and adjacent forest. Fire incidents were reported regularly from Idukki Wildlife Sanctuary, the **Kizhukanam** and **Idukki** sections area are more fire prone areas of the sanctuary (Forest management plan 2012). The occurrence of extensive grasslands in the Peermade and Mount plateaux in the southern part of the high range landscape were a consequence of the earlier human occupation and Eco degradation of these hills (Nair 1994).

#### 4.2.2 Chinnar Wildlife sanctuary

In many areas, the vegetation of the Sanctuary is highly disturbed mainly due to earlier felling's and planting along with other anthropogenic pressures such as cattle grazing, forest fire, shifting cultivation etc. In many areas secondary forest types replace primary types and the exact classification of forest types is difficult. The vegetation on the slopes and hilltops has been cleared earlier by the tribes for cultivation of lemon grass and food crops. The abandoned cultivated areas are devoid of shrubs and trees for a considerable area and the vegetation of that area is dominated with grasses. The lemon grass cultivation is a common practice among tribes and considerable portion of the agriculture land is utilized for this purpose. Teak and eucalyptus plantations in small patches have been raised in the past at Vanchikulam and Ollavayal. Considerable area where shifting cultivation was being practised in the past is occupied by exotics. The areas with exotics are spread at various regions of the Sanctuary. The major exotics in the sanctuary are *Lantana spp.*, *Parthenium hysterophorus*, *Argemone mexicana*, *Vicoa India*, *Euphorbia spp.*, *Chromolaena odorara* etc. Selection felling in the past in some localities and operations such as preparing the land for plantations in some other localities have resulted in opening up of canopy and weed infestation.

The degraded or the natural savannah formation was found near **Anjunattampara** area. The disturbed medium elevation forest is found in the **Viriyuttu** area. Parts of Chinnar plains were felled during the 70s to raise plantations. These plantations failed and this resulted in scrub open jungle in the Chinnar plains before the declaration of Sanctuary. There are 11 tribal settlements within the Sanctuary the residents are wholly dependent on the Sanctuary for fire wood and other minor forest produces. The periphery areas of the settlements are impacted area and considered for the habitat improvement by the department.

#### 4.2.3 Eravikulam National Park

The problem of forest degradation is less in Eravikulam NP when compared with other protected areas of the landscape. The Muthuva village **Lakkom** is situated inside the park and their pressure on forest is minor. There are no plantations within the notified boundary of the National Park. Minor fire incidents have taken place along the boundaries at Chattamunnar, Pallanad and Kadar; the boundary with Pallanad, Coffee Store and Chattamunnar are most fire prone area of the Park. A small forest patch on the eastern periphery of the Park lying close to **Talliar estate** has deciduous forests with trees like rosewood, *Pterocarpus* etc. The undergrowth is predominantly Lantana may be a degraded patch. The specific locations that require restoration activities are small patches of sholas in the border area of the park which was degraded due to fire and in and around of tribal settlements, Lakkamkudi. Since shola

forests would not provide much scope for livelihood enhancements, the major input may be given for raising firewood plantations in and around the settlement. In the recent past, tourist influx in the park has been increased many folds compare to a decade before, so even the trek paths and other grass laden small patches also need restoration. However such restoration activities will not have much relevance to the community requirements.

#### **4.2.4 Kurinjimala Wildlife Sanctuary**

Extensive areas of the Sanctuary are under the plantations of black wattle (797.8 ha) and *Acacia mearnsii* (102.6 ha). These plantations have become poor in plant diversity as wattle dominates and blocks the growth of other plants and the regeneration of wattle plants is noticed within the eucalyptus plantations along the border. The villages namely Vattavada, Kovilur and Kottakombur lie adjoining to the boundary of Sanctuary and Kadavary lies inside the Sanctuary. The annual forest fires inflicted heavy damage to the remaining patches of shola forests and other remaining natural habitats. There was no proper system to monitor the influence of forest fire on the forest. The fire affected areas and their present status of degradation will be assessed in the field level. The forest department identified an area of 900.4 ha area for the eco restoration which covers both Eucalyptus and Wattle plantations. The Kerala Forests and Wildlife Department (Munnar Wildlife Divisions) has already initiated eco-restoration in the area.

#### **4.2.5 Thattekkad Wildlife Sanctuary**

The sanctuary is experience the severe forest degradation in the past mainly for the conversion of natural forest in to monoculture plantations. Though the degraded forest exist in the sanctuary the locations are not clearly mentioned in the management plan. There are 9 teak plantations in the sanctuary comprising of an area of 216.37 and the regeneration in teak plantation towards Koottikal side is very poor. The undergrowth of the monoculture plantations and degraded forest are dominated by the weeds such as *Mimosa invisa* and *Mikania micrantha*. The sanctuary was experienced sporadic forest fire in the past especially the moist deciduous forest and teak plantations.

#### **4.2.6 Mankulam Division**

The management plan describe that the division is undergone severe degradation of the valuable natural forests by the activities such as Shifting cultivation in the past, forest fire, grazing, unscientific and unsystematic collection of NWFP and over exploitation of reed areas etc. There are eleven tribal settlements in this Division and they are directly depending the forest to meet their varied requirements. Reeds are growing profusely in the low-lying areas of this division, due to frequent forest fires and

shifting cultivation practiced by the tribals in the past, the reed belt has reduced drastically. A total of 274.97 ha area of plantations of different species were raised in the division since 1986 to 1999. Out of all plantation areas the *Eucalyptus grandis* was planted in 50 ha, *Grevillea robusta* in 67.6 ha (Kozhiyalla, Chappakulam, Kallar), *Alnus nepalensis* in 12.75 (Kallar) and rest of the plantation is Miscellaneous trees (144.62). In 1964, 50 ha of *Alnus* plantation was clear felled and planted with *Eucalyptus* in Kallar area of Mankulam Range. The plantation failed 5 ha of area having reasonable growth were retained and the balance 45 ha was replanted with miscellaneous species during 1996. An area of 24 ha of 1964 *Alnus* plantation was clear felled during 1996 from Kallar region of Mankulam Range and planted with *Alnus* and *Pinus patula*, which was a failure. Hence this area was replanted with *Grevillea robusta* during 1998.

#### **4.2.7 Malayatoor forest division**

Extensive areas of this division was prime evergreen forests earlier. Major portions of the accessible low-lying areas were either converted into plantations or were given away for the cultivation of agricultural crops. Southern Tropical Moist Deciduous Forests covers the major portion of the forests in this Division and frequent fires cause a lot of damage to this vegetation. This type of forest occurs both on the lower slopes and on the ridges. All the four ranges of the division harbour teak plantations. The first teak plantation was raised in 1865 in **Vembooram** Island near Perumthode but it failed. At present 9253.900 ha of forests are managed as plantations in the Division. Large quantity of reed was extracted from the different parts of the division by different companies but at present HNL is only functioning. Shifting cultivation was practiced both by the tribals and local people. Tribals cultivated areas in the interior forest and the local people selected land for cultivation near to their habitation.

The park management identified the degraded areas and classified in to different levels of degradation and started restoration. The degraded areas were classified in to different categories such as; Assisted Natural Regeneration (ANR), Restoration of Degraded Forests – I (RDF – I), Restoration of Degraded Forests – II (RDF – II), Restoration of Reeds, Bamboos and Canes (RRB) or under Improved productivity of pulp wood plantations. The degraded forest areas selected for the restoration under RDF-1 and RDF-2 categories are **Edamalayar, Kunjiyar, Anakayam, Pooyamkutty – Koovappara, High forest** in Kuttampuzha range, **Paneli** and **Chelathodu** areas in Kodanadu range, **Poika – Vadattupara** and **Thalumkandom** areas in Thundathil range.

The social forestry also afforested different degraded area as per the phased compensatory afforestation scheme between 1995 and 1998. The locations selected for the afforestation are **Ennakkal, Pongancaodu, Anakkayam, Vadattupara, Vatanakkara** and **Pochettimudi** in Thundathil Range and

**Anakayam, Moonja, Clachery, Vepolilatathandu** in Kuttampuzha Range and **Potta, Neeleswaram, Arrattukadavu, Kunthirumudy, Muttummudi, Kurisumudi and Padapara**. Annual fires are usual in this Division, especially in areas, namely **Illithodu, Erumthode, Evergreen, Karimpani, Paneli, Vadakkumbagam, Pothuppara, Karakkad**. A few teak plantations in the Kaladi range are recommended to be declare as failed plantations. The plantations in the upper hills shows poor performance. The information regarding the status of degradation of the newly declared National parks such as Anamudi shola NP, Pambadum shola NP and Mathiketn shola NP are not available in the Munnar wildlife division is not available.

### **4.3 Major Success Story**

The restoration ecology has to be an integral component of land management in today's world (Hobbs & Harris 2001). Deforestation is defined as the temporary or permanent deterioration in the density or structure of vegetation cover or its species composition (Grainger 1993). The tropical rain forest contain about half of all species in the world and necessarily the number of species per unit area is very high and playing very crucial role in the transfer of carbon between biomass and atmosphere and it is crucial to study the degradation of these ecosystem (Grainger 1993; Martin-Spiotta 2007). The knowledge of what should be restored is essential to achieve large-scale restoration in the tropical forests (Rodrigues et al. 2011). Tropical rain forest, once completely destroyed, could not recover naturally without deliberate restoration efforts (Hai et al. 2007). Numerous studies have shown that successful eco-restoration from degraded areas in tropical forests (Lamb et al. 1998; Holl et al. 2000; Ren Hai et al. 2007; Sankar Raman et al. 2008).

The eco-restoration was successfully implemented in different parts of Western gats as well (Sankar Raman et al. 2008). The authors carried out restoration activities in the Werstern Ghats, a biodiversity hotspot where historical fragmentation and annual deforestation rate of 1.2% have resulted in a human-dominated landscape of plantations, agriculture, and developed areas, with embedded rainforest fragments that form biodiversity refuges and animal corridors. On private lands in the Anamalai hills, Southern Western Ghats, they established restoration sites within three rainforest fragments (5, 19, and 100 ha) representing varying levels of degradation such as open meadow, highly degraded sites with dense *Lantana camara* invasion, abandoned exotic tree plantations (*Eucalyptus grandis* and *Maesopsis eminii*), and sites with mixed-native and exotic tree canopy. They reported between 2000 and 2004, planted annually during the southwest monsoon 7,538 nursery-raised seedlings of around 127 species in nine sites (0.15–1.0 ha). Seedlings monitored at 6-monthly intervals showed higher mortality over the dry season than the wet season and survival rates over a 2-year period of between 34.4 and 90.3% under

different site conditions. Seedling survival was higher in sites with complete weed removal as against partial removal along planting lines and higher in open meadow and under shade than in sites that earlier had dense weed invasion. Of 44 species examined, survival across sites after 24 months for a majority of species (27 species, 61.4%) was higher than 50%. Retaining regenerating native species during weed clearing operations was crucial for rapid reestablishment of a first layer of canopy to shade out weeds and enhances survival of shade-tolerant rainforest seedlings. The project executed on technical and scientific principles demonstrated the possibilities of restoration in an area where human and wild fauna are constantly habituated.

#### **4.4 Selection of species**

The selection of species for restoration could be decided mainly on two principles (i) the requirement of local communities if they are allowed to utilise the usufructs and (ii) ecological parameters including the level of degradation status of the sites selected for restoration. In this study since we could not do any site specific investigations, we are not able suggest appropriate species. The geomorphological and climatic conditions create an enormous variation of different natural ecosystems, each of them having well adapted community of animal and plant species. There are 13 different indigenous tribal communities living in and around the remaining forest of the landscape. They engaging in collection of different forest produce such as firewood, honey, cinnamon bark, turmeric, medicinal plants, Spices, condiments and masticators, gums and resins, dyes, tanning materials, essential oils, detergents, cosmetics and Perfumes, narcotics and beverages, fibers and flosses, edible and fodder plants, oils, Gooseberry (Amla), Eachampullu, poles for construction of houses, grass, badraksham, kattupadavalam, wild pepper etc. Though the landscape has very heterogeneous habitat types the plant species composition will be different and the availability of the forest produce in different areas vary considerably. The suitable species (depended by indigenous people) will be suggested for the restoration in different habitat elements. This will ensure the success of the forest restoration and also ensure the likelihood security of the indigenous people. However we have attempted to identify the NWFP species that are being collected from different forest divisions of the landscape area. Also provided the list of species used in Idukki districts by local people for various purposes (Annexure)

##### **4.4.1 NWFP species**

###### **Munnar Forest Division**

The under mentioned list shows the NWFP available in Munnar Forest Division area. Thelli (Calophyllum calaba), Kunthirikkam (Canarium strictum), Kattupadavalam (Tricosanthus cucumeriana)



Kattukudumpuli (*Garcinia gummi-gutta*), Peenari (*Sterculia foetida*), Cholapathri (*Myristica beddomei*), Cheevakai (*Acacia concinna*), Then (Honey), Kalpasam (stone moss), Vayambu (*Acorus Calamus*), Marottikuru (*Hydnocarpus pentandra*), Kattukurumulaku (*Pipper nigrum*), Thenmezhuku, Kadukka (*Terminalia chebula*), Nellikka (*Emblia officinalis*), Injipullu (*Cymbopogan flexuosus*), Maramanjai (*Cosciniun fenestratum*), Kakumkai (*Entada scandens*), Kasturimanjal (*Curcuma zeodaria*), Passion fruit, Pulinchikai (*Sapindus trifoliata*), Incha (*Acacia intsia*), Karimkurunji (*Nilgirianthus ciliatus*), Kurunthotti veru (*Sida rhombifolia*), Cheruthekkuru veru (*Callicarpa tomentosa*), Kumizhin veru (*Gmelina arborea*), Shathavari (*Asparagus racemosus*), Putharichunda veru (*Solanum indicum*), Adalodakkam (*Adhatoda vasica*), Elakkai (*Elettaria cardomomum*), Malayinchi (*Zingiber zerumbet*), Kannimanga (*Mangifera indica*), Chittamruthu (*Tinospora cordifolia*), Eetta (*Ochalandra trvancorica*), Nankukuru (*Mesua ferrea*), Pali (*Palaquium ellipticum*), Edanapool (*Olea dioica*), Eendhapanakai (*Cycas circinalis*), Orila (*Desmodium gangeticum*), Kazhanchi kuru (*Caesalpinia bonduc*), Cheruthen, Kattupavakka (*Momordica charantia*), Kattumanjal (*Curcuma aromatica*), Kattuthippali (*Piper longum*), Kanjiram (*Strychnos nux-vomica*), Kattupunnakai (*Dillenia pentagyna*), Keezharnelli (*Phyllanthus niruri*), Kurumthotti (*Sida rhombifolia*), Kaithonni (*Eclipta alba*), Kolerrakku, Kodithuva (*Tragia involucrata*), Panjikai (*Ceibapntandra*), Pathiripoovu (*Stereospermum colais*), Palmuthukinkizhnggu (*Ipomoea paniculata*), Padakizhaznggu (*Cyclea peltata*), Thakaraveru (*Cassia tora*), Vanthen, Thanni kai (*Terminalia bellerica*), Naruneendi (*Hemidesmus indicus*), Neelaamari (*Indigofera tinctoria*), Moovila (*Pseudarthia vasida*), Muthanga (*Cyperus rotundus*), Ramacham (*Vetiveria zizanoides*), Changanam paranda (*Cissus quadrangularis*), Vazhanapoovu (*Cinnamomum verum*), Vankurumthotti (*Sida capinifolia*), Thazhuthamaveru (*Boerhaavia diffusa*), Garudakoddy (*Aristolochia indica*), Athithippali, Plasu (*Butea monosperma*), Pulthailam (*Cymbopogan flexuosus*), Erukku (*Calotropisgigantea*), Nilapana (*Curiculigo orchides*), Menthonni (*Gloriosa superba*), Thetti (*Ixora coccinea*), Thottavadi (*Mimosa pudica*), Puliyarila (*Oxalis coniculata*), Manjady (*Adenantha pavonina*), Njaval (*Syzygium cumini*), Poovaamkurunthala (*Vernonia synoria*), Kattu chena, Elavinpasa (*Bombax ceiba*), Kodakapala (*Holarrhena pubescens*), Kunnikuru (*Abrus precatorius*), Vizhalari (*Emblia ribes*), Chiteenthu (*Phoenix sylvestris*).

### **Marayoor Forest Division**

The important NWFP are the medicinal plants, spices, condiments, tanning materials, essential oils, detergents, fibers and flosses etc. Available NWFP coming in Marayoor Sandal Division area are Kattupadavalam (*Tricosanthus cucumeriana*) Kattukudumpuli (*Garcinia cambogia*), Cheevakai (*Acacia concinna*), Then (Honey), Kalpasam (Stone moss), Vayambu (*Acorus calamus*), Marottikuru (*Hydnocarpus pentandra*), Kattukurumulaku (*Pipper nigrum*), Thenmezhuku, Kadukka (*Terminalia chebula*), Nellikka (*Emblia officinalis*), Injipullu (*Cymbopogan flexuosus*), Maramanjai (*Cosciniun fenestratum*), Kakumkai

(*Entada scandens*), Kannippala (*Wrightia tinctoria*), Kasturimanjal (*Curcuma zedoaria*), Fashion fruit (*Adenia hondala*), Cherula (*Aerva Lanata*), Vaka (*Albizia lebbbeck*), Incha (*Acacia intsia*), Ezhilampala (*Alstonia scholaris*), Karimkurunji (*Nilgiranthus ciliatus*), Kurunthotti veru (*Sida rhombifolia*), Kumizhin veru (*Gmelina arborea*), Shathavari (*Asparagus racemosus*), Putharichunda veru (*Solanum indicum*), Adalodakam (*Adhatoda vasica*), Malayinchi (*Zingiber zerumbet*), Kannimanga (*Mangifera indica*), Chittamruthu (*Tinospora cordifolia*), Edanapool (*Oleadioica*), Eendhapanakai (*Cycas circinalis*), Orila (*Desmodium gangeticum*), Kazhanchi kuru (*Caesalpinia bonduc*), Cheruthen, Kattupavakka (*Momordica charantia*), Kattumanjal (*Curcuma aromatica*), Kattuthippali (*Piper longum*), Keezharnelli (*Phyllanthus niruri*), Kaithonni (*Eclipta alba*), Kodithuva (*Tragia involucrata*), Panjika (*Ceibapentandra*), Palmuthukinkizhazngu (*Impomaea paniculata*), Padakizhazngu (*Cyclea peltata*), Thakaraveru (*Cassia tora*), Naruneendi (*Hemidesmus indicus*), Neelaamari (*Indigofera tinctoria*), Moovila (*Pseudarthia vascida*), Muthanga (*Cyperus rotundus*), Ramacham (*Vetiveria zizanoides*), Changalam paranda (*Cissus quadrangularis*), Vankurumthotti (*Sida capinifolia*), Thazhuthamaveru (*Boerhaavia diffusa*), Garudakoddy (*Aristolochia indica*), Athithippali, Plasu (*Butea monosperma*), Pulthailam (*Cymbopogon flexuosus*), Erukku (*Calotropis gigantea*), Nilapana (*Curculigo orchides*), Menthonni (*Gloriosa superba*), Thetti (*Ixora coccinea*), Thottavadi (*Mimosa pudica*), Puliyarila (*Oxalis coniculata*), Manjady (*Adenantha pavonina*), Njaval (*Syzygium cumini*), Poovaamkurunthala (*Vernonia synoria*), Kattu chena (*Amorphophalus paeonifolium*), Elavinpasa (*Bombax ceiba*), Kodakapala (*Holarrhenaantidysenterica*), Nanchu (*Anamirta cocculus*), Chemmaram (*Aphanamixis polystachya*), Samudrapacha (*Argyrea speciosa*), Nagadanti (*Baliospermum montanum*), Kanakambaram (*Barleria pratensis*), Pullani (*Calycopteris floribunda*), Mukkutti (*Biophytum*), Kunnikuru (*Abrus precatorius*), Vizhalari (*Emblia ribes*), Chiteenthu (*Phoenix sylvestris*), Cherukadaladi (*Cyathula prostrate*), Ramanamapacha (*D.gyrans*), Anachuvadi (*Elephantopus scaber*), Malampunna (*Dillenia pentagyna*) Vayana (*Cinnamomum malabattrum*), Nila amari (*Indigofera tinctoria*) Paranda (*Entada rheedii*), Vishnukranthi (*Evolvulus alsinoides*), Nannari (*Hemidesmus indicus*), Manjatti (*Rubia cordifolia*), Pachotti (*Symplocos cochinchinensis*), Chunda (*S.torvum*), Poovanam (*Schleichera oleosa*), Korandi (*Salacia oblonga*), Aaval (*Holoptelea integrifolia*), Adapathiyan (*Holostemma adakodian*), Idampiri Valampiri (*Helicteres isora*), Pongu (*Pongamia pinnata*), Chittinthal (*Phoenix lourerii*), Kolgate cheddi (*Gaultheria fragrantissima*), Athi (*Ficus racemosa*), Kaithonni (*Eclipta alba*).

### **Malayattoor Forest Division**

The important NWFP are the medicinal plants, spices, condiments, tanning materials, essential oils, detergents, fibers and flosses etc. Available NWFP coming in Malayattoor Division area are *Emblia officinalis*, *Terminalia bellerica*, *Mangifera indica*, *Artocarpus heterophyllus*, *Zingiber officianalis*, *Cycas species*, *Curcuma aromatic*, *Garcenia cambogia*, *Ellettaria cardamomum*, *Piper nigrum*, *Andropogus*

*nuricatus, Cinnamomum zeylonicum, Cinnamomum zeylanicum, Hemidesmus indicus, Bixa orellana, Myristica species, Hydnocarpus wightianum, Schleicheria oleosa, Bursia longifolia, Mesua ferrea, Samodara indica, Sacrostigma kalinii, Cassia fistula, Terminalia chebula, Terminalia bellerica, Acacia pennata, Acacia pennata, Acacia incia, Sterculia villosa, Musa spp., Quassia indica, Vateria indica, Canarium strictum, Ailanthus malabarica, Alper trisicum, Strychnos nuxvomica, Plumbago zeylanica, Myristica attenuate, Tinospora cordifolia, Curcuma spp, Hemidesmus indicus, Sida humulis, Barringtonia acutangula, Cymbopogon flexuosus, Acacia instia, Madhuca longifolia, Cinnamomum zeylanicum, Calotropis gigantea, Cinnamomum spp, Elettaria cardamomum, Cassia fistula, Murraya koenigii, Caesalpinia benduc, Jatropha curcus, Zingiber zerumbet, Dioscoria bulbifera, Phyllanthus freterous, Spilanthus clave, Gmelina arborea, Persea macrantha, Aegale marmelos, Tragia involaceata, Syzygium caryophyllatum, Beernavia diffusa, Terminalia bellerica, Ixora cocinea, Myragyna parviflora, Saraca indica, Myragyna parviflora, Emblica officinalis, Bignemia celamis, Ipemeca mauridiana, Calycoptoris floribunda, Lagerstroemia flosreginae, Pterocarpus marsupium, Hydnocarpus parviflora, Eleocarpus tinctoria, Melia dubia, Cyparus retundus, Lawsonia inermis, Dysoxylum malabaricum, Vateria indica, Asparagas recemosus, Rauwolfia serpentine, Mallotus philippensis, Cymbopogon flexuesus, Cycas circinalis, Acacia concinna, Sapindus laurifolius, Bamboosa bamboo, Ochlandra travencorica and Calamus strictus.*

#### **4.5 Site specific Strategies**

Site specific restoration strategies are envisaged in the proposal with the complete implementation of the proposed methodologies and activities. Due to the logistic constraints, the prime steps of site specific strategies such identification of sites, characterisation of sites, prioritisation of sites based on the characteristics, etc could not be worked out. The information available in the management tools such as Working/Management plans may also not verified. The only information that could be culled out from these documents are the names of degraded forest locations and the species which community are interested (NWFP) in restoration. Leaving behind a mammoth of other tasks, developing any strategy would be of any relevance.

The relevance of private or corporate degraded vegetation in the vicinity of the land owned by public exchequer also play an important role in restoration either extended habitat for wild fauna/flora or source for mother seeds in the future augmentation.

Broadly the strategies can be categorised as ecological and social. In ecological strategies it includes identification of sites (ownership, extent, accessibility, etc) , vegetation types (existing and potential), physical characteristics of the land under consideration (soil type, slope, drainage, landform, etc), nature of existing ground cover (natural vegetation or man-made plantations of any sorts), presence of

weeds/invasive species, habitat use by animals, proximity to human habitation or any other development infrastructure, weather characteristics (rainfall, light incidence, windy or not, etc). ,

In the social front the strategies includes, discussion with stakeholders, understanding their perspectives on restoration, their willingness to participate, institutionalization (if not part of EDC or VSS), agreeing on mutual responsibilities, development of strategies for benefit sharing mechanism, and ensuring their participation.

#### **4.6 Conclusion**

Ecorestoration has become an important strategy to revive the degraded nature or ecological characteristics of a given biogeographic area to sustain ecological integrity. It provides scope for all the operating elements of the given landscape to express its vigour and vitality for posterity. But however the involvement of local communities in eco restoration has become a far dream in the recent past in many countries. Realizing this, the policy makers and implementing agencies has taken serious efforts to involve the local human resources considering their expertise and aspirations in restoration activities.

In Munnar landscape, the extent of degraded forests that could be identified with the help of existing data (Vegetation map prepared by FIP) indicated that Kottayam and Munnar divisions have major area under restoration. But this may be verified on ground before drafting the plans for restoration since there is large number of human dominated landscapes in these two divisions. The three major type of vegetation undergone severe degradation in the landscape includes, tropical wet ever green/semievergreen, and moist deciduous in the windward side of the Ghats and dry evergreen in the leeward side, the Anjanad Valley.

The landscape comprises of about 130 tribal settlements in various divisions and numerous non tribal habitations and commercial conglomerations. The tribal people, among other livelihood opportunities also involved in NWFP collections and they are brought under the larger framework of Participatory Forest Management either through Ecodevelopment Committees (EDC) or Vanasamrakshana Samithis (VSS). The list of NWFP items available and collected by these people are given elsewhere in the report. Some of the fringe area non tribal settlements were also brought under such institutions especially VSS. The overall institutions such as Forest Development Agency (FDA) coordinate the activities of these micro level institutions. The presence of NGOs and active Local Self Government institutions provide a larger social framework for the implementation of the project. The list of species and other information available on the landscape which are supportive to the livelihood opportunity of the local community is indicative of the social relevance of the restoration activities. The rich array of biological endemism in the project area makes this effort a challenging task for the managers.

#### **4.7 Acknowledgements**

The authors are thankful to the United Nations Development Program (UNDP-India) for funding this study and various officials of UNDP for providing necessary support. We are highly grateful to the Kerala Forests and Wildlife Department for necessary logistic support. We are thankful to Dr. P A Azeez, Director, SACON for the encouragement and finance, administrative and library division for necessary logistic arrangement and support.

## List of Wild Edible Fruits used by Tribes of Idukki District of Kerala.

S.No	Botanic Name	Family	Common name
1	<i>Annona cherimola</i>	Annonaceae	Seethapalam/ Cherimoya
2	<i>Annona muricata</i>	Annonaceae	Mullatha/ Soursop
3	<i>Annona reticulata</i>	Annonaceae	Atha/Custard apple
4	<i>Aporosa cardiosperma</i>	Euphorbiaceae	Not known
5	<i>Artocarpus heterophyllus</i>	Moraceae	Plavu/ jack tree
6	<i>Artocarpus hirsutus</i>	Moraceae	Anjili/ wild jack tree
7	<i>Baccaurea courtallensis</i>	Euphorbiaceae	Moottipuli/ Nil
8	<i>Canthium coromandelicum</i>	Rubiaceae	Kattakara/ Wild jegguby
9	<i>Cyphomandra betacea</i>	Solanaceae	Marathakkali/ Tree tomato
10	<i>Debregeasia longifolia</i>	Urticaceae	Kattunochi/Nil
11	<i>Ficus recemosa</i>	Moraceae	Athi-al/cluster fig
12	<i>Ficus virens</i>	Moraceae	Chakkila/Nil
13	<i>Glycosmis pentaphylla</i>	Rutaceae	Kuttiapanal/Nil
14	<i>Grewia tillifolia</i>	Tiliaceae	Unnam/Nil
15	<i>Hibiscus hispidissimus</i>	Malvaceae	Mupparacham/Nil
16	<i>Ixora coccinea</i>	Rubiaceae	Chethi/Flame of the woods
17	<i>Lantana camara</i>	Verbenaceae	Kongini/Wild sage
18	<i>Madhuca longifolia</i>	Sapotaceae	Illipa/ S.Indian madhu
19	<i>Mimusops elengi</i>	Sapotaceae	Elengi/Spanish cherry
20	<i>Nicandra physalodes</i>	Solanaceae	Ommathan/ Apple of Peru
21	<i>Passiflora leschenaultia</i>	Passifloraceae	Seemavellari/nil
22	<i>Passiflora edulis</i>	Passifloraceae	Passion fruit/edible flower
23	<i>Passiflora ligularis</i>	Passifloraceae	Passion fruit/Sweet grandilla
24	<i>Passiflora foetida</i>	Passifloraceae	Passion fruit/fetid flower
25	<i>Phyllanthus acidus</i>	Euphorbiaceae	Nellipuli/Grosella
26	<i>Phyllanthus emblica</i>	Euphorbiaceae	Nelli/Goose berry
27	<i>Physalis angulata</i>	Solanaceae	Njottanjodiyam/Sun berry
28	<i>Physalis peruviana</i>	Solanaceae	Karimpotti/Cape goose berry
29	<i>Rubus ellipticus</i>	Rosaceae	Cheemullu/Yellow Himalayan raspberry
30	<i>Rubus indicus</i>	Rosaceae	Chavakari/Soap nut tree
31	<i>Sapindus trifoliatus</i>	Sapindaceae	Poovam/Ceylon oak
32	<i>Schleichera oleosa</i>	Sapindaceae	Ambhazham/Indian hog plum
33	<i>Spondias pinnata</i>	Anacardiaceae	Kurunaval/Nil
34	<i>Syzygium densiflorum</i>	Myrtaceae	Kurunaval/Nil
35	<i>Syzygium laetum</i>	Myrtaceae	Cheruthodali/ Jackal jujube
36	<i>Ziziphus oenopia</i>	Rhamnaceae	Thodali/Jujube
37	<i>Ziziphus rugosa</i>	Rhamnaceae	Kotta/Nil
38	<i>Ziziphus xylopyrus</i>	Rhamnaceae	

## Plants used for the construction of Huts by Tribes of Idukki district

S.No	Botanic Name	Common name	Family	Parts Used
1	<i>Acronychia pedunculata</i>	Muttanari	Rutaceae	Timber

2	Anogessus latifolia	Mazhu kanjiram	Combrytaceae	Timber
3	Bomboosa bambos	Kakka Choral	Poaceae	Clums
4	Calamus hookerianus	Choral	Arecaceae	Cane
5	Calamus pseudo-tenuis	Choral	Arecaceae	Cane
6	Calamus rotang	Choral	Arecaceae	Cane
7	Caryota urens	Kudapana	Arecaceae	Leaves
8	Chionanthus linocieroides	Edali	Oleaceae	Timber
9	Corypha umbraculifera	Kodappana	Areacaceae	Leaf
10	Cymbopogon caestus	Inchipul	Poaceae	Leaves
11	Drypetes venusta	Konari maram	Euphorbiaceae	Timber
12	Olea dioeca	Mulla Maram	Oleaceae	Wood
13	Poliyalthia fragrance	Perumaram	Annonaceae	Timber
14	Saccharum spontaneum	Kattkarimb	Poaceae	Leaves
15	Syzygium amottianum	Kattu Njaval	Myrtaceae	Timber
16	Syzygium cumini	Njaval	Myrtaceae	Timber
17	Syzygium gardneri	Kara Njaval	Myrtaceae	Timber
18	Themeda cymbaria	Ayikka pullu	Poaceae	Leaves
19	Themeda triandra	Nil	Poaceae	Leaves
20	Wattakaka volubilis	Vattakakkakody	Rhamnacea	Whole plant
21	Xylopia parvifolia	Chandau maram	Annonaceae	Timber

**Plants used for making Household utensils by Tribes of Idukki district**

S.No	Botanic Name	Common name	Family	Parts Used
1	<i>Bamboosabambos</i>	Illy	Poaceae	Clums, Stem
2	<i>Calamushookerianus</i>	Kakkachoral	Arecaceae	Cane
3	<i>Calamuspseudo-tenuis</i>	Choral	Arecaceae	Cane
4	<i>Calamusrotang</i>	Choral	Arecaceae	Cane
5	<i>Calycopterisfloribunda</i>	Pullanni	Combrytaceae	Stem
6	<i>Cocculusaurifolius</i>	Marpingi	Menispermaceae	BushyStem
7	<i>Coryphaumbraculifera</i>	Kodappana	Arecaceae	Leaf
8	<i>Dalbergialatifolia</i>	Eetti	Fabaceae	Timber
9	<i>Diospyrosebenum</i>	Karingali	Ebenaceae	Timber
10	<i>Ficusracemosa</i>	Athiyatholi	Moraceae	Leaf/Bark
11	<i>Gmelinaarborea</i>	Kumbil	Verbinaceae	Wood
12	<i>Macarangaindica</i>	Vattakanniela	Euphorbiaceae	Leaves
13	<i>Macarangapeltata</i>	Vattakanniela	Euphorbiaceae	Leaves
14	<i>Ochlandratravancorica</i>	Eetta/reeds	Poaceae	Clums
15	<i>Schumannianthusvirgatus</i>	Channakoova	Maranthaceae	Leaves
16	<i>Wattakakavolubilis</i>	Vattakakkakody	Rhamnacea	Wholeplant

**Plants used as food and NTFPs of Idukki District**

S.No	Botanic Name	Common name	Family	Parts Used
1	Alpinia galangal	Chittaratha	Zingiberaceae	Tuber / Rhizome
2	Anaphalis marcescens	Nil	Asteraceae	Whole plant

3	<i>Arachis hypogea</i>	Nila kadala	Fabaceae	Seed
4	<i>Bamboosa bambos</i>		Poaceae	Fruit / Seed
5	<i>Cajanus cajan</i>	Thuvara	Fabaceae	Fruit
6	<i>Canarium strictum</i>	Thelli	Burseraceae	Gum/Resin
7	<i>Canna indica</i>	Vazha chedi	Cannaceae	Rhizome
8	<i>Costus speciosus</i>	Malavayambu	Zingiberaceae	Rhizome
9	<i>Cullenta extrillata</i>	Vedi plavu	Bombacaceae	Seeds
10	<i>Curcuma aromatic</i>	Kasthuri manjal	Zingiberaceae	Rhizome
11	<i>Cymbopogon citrates</i>	Theruva	Poaceae	Leaves
12	<i>Debregeasia Ceylanica</i>	Narumaram/Vanji	Urticaceae	Bark fiber
13	<i>Dioscorea alata</i>	Kachil	Dioscoreaceae	Tuber
14	<i>Dioscorea bulbifera</i>	Vellachi/vella kizangu	Dioscoreaceae	Tuber
15	<i>Dioscorea esculenta</i>	Cherukizangu	Dioscoreaceae	Tuber
16	<i>Dioscorea pentaphylla</i>	Nooran	Dioscoreaceae	Tuber
17	<i>Dioscorea wallichii</i>	Mulli Kizhangu	Dioscoreaceae	Tuber
18	<i>Dolichos biflorus</i>	Muthira	Fabaceae	Seeds
19	<i>Drosera pelatata</i>	Kosuvettipullu	Droseraceae	Whole plant
20	<i>Elaeaguns conferta</i>	Kattumunthiri	Elaeagnaceae	Fruit
21	<i>Elaeocarpus serratus</i>	Attu kara	Elaeocarpaceae	Fruit / Seed
22	<i>Eleusine corocama</i>	Ragi	Poaceae	Fruit / Seed
23	<i>Eriocaulon cinereum</i>	Nil	Eriocaulaceae	Whole Plant
24	<i>Gaultheria fragrantissima</i>	Thailachedi	Ericaceae	Whole Plant
25	<i>Glycine max</i>	Soya	Fabaceae	Fruit
26	<i>Helichrysum perlanigerum</i>	Nil	Asteraceae	Whole Palnt
27	<i>Madhuca longifolia</i>	Ilippa	Sapotaceae	Flower and Fruit
28	<i>Medinilla beddomi</i>	Not Known	Melostomaceae	Leaves
29	<i>Myristica malabarica</i>	Ponnampoo	Myristicaceae	Aril/Seed
30	<i>Myristica beddomei</i>	Kattujathi	Myristicaceae	Aril/Seed
31	<i>Oryza sativa</i>	Nellu	Poaceae	Fruits/Seed
32	<i>Palaquim ellipticum</i>	Pali	Sapotaceae	Fruit
33	<i>Parmelia dialatata</i>	Plasma	Lichen	Plant body
34	<i>Phyllanthus amurus</i>	Keezhanelli	Euphorbiaceae	Whole plant
35	<i>Piper longum</i>	Hippali	Piperaceae	Fruit
36	<i>Piper mullesua</i>	Kattukurumulaku	Piperaceae	Fruit
37	<i>Setaria italic</i>	Thina	Poaceae	Fruits/Seed
38	<i>Sida rhombifolia</i>	Kurunthotty	Malvaceae	Root
39	<i>Stereospermum colais</i>	Poopathiry	Bignoniaceae	Flower and Fruit
40	<i>Syzygium arnottianum</i>	Kattu Njaval	Myrtaceae	Fruits
41	<i>Syzygium cumini</i>	Njaval	Myrtaceae	Fruits
42	<i>Termerindus indica</i>	Vallen puli	Fabaceae	Leaves and Seeds
43	<i>Terminalia chebula</i>	Kadukka	Combrytaceae	Fruit
44	<i>Vigna mungo</i>	Uzhunnu	Fabaceae	Seeds
45	<i>Sapindus emarginatus</i>	Pochakotta mara	Sapindaceae	Fruit
46	<i>Solanum viarum</i>	Kandakaramullu	Solanaceae	Fruit pulp

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