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LANDUSE AND MANAGEMENT PLAN FOR PRODUCTION LANDSCAPE IN MUNNAR

INDIA HIGH RANGE LANDSCAPE PROJECT, MUNNAR, KERALA

Report

Investigators

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Natural History
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*Progression of Man,
Resilient realises.*

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1.0 INTRODUCTION

Conversion of natural landcover into human desired landcover is an age old practice for the sustenance of modern mankind. Landuse changes in the Western Ghats over the last century caused by agricultural expansion, conversion to plantations and infrastructural projects have resulted in the fragmentation or degradation of natural habitats resulting in large scale human wildlife conflicts and associated issues (Kumar 1993, Jha et al 2000, Khan *et al.*, 1997). This has lead to the erosion of biological and cultural diversity, ecosystem malfunctioning, and disruption of livelihood opportunities. Large scale fragmentation and degradation of habitat has pushed many species towards different levels of conservation status starting from extinction to vulnerable. The species that are affected most is endemic since their habitat is limited in range. It is especially true when the geographic range is very narrow with highest order of the diversity in geomorphology and associated physical features. Among the multiple landuses that are resulted over centuries, many of them act as a deterrent to the survival of natural biological diversity since these landuses are aiming production or any economic development activities such as tourism, energy production, etc.

The hill chain of the Western Ghats of India is among the most diverse of tropical landscapes. This region forms one of the world's 25 biodiversity hotspots: these are defined as areas with high levels of



endemic species, which are currently under severe threat and therefore undergoing rapid change (Cincotta and Engelman, 2000). Indeed, among the 20 described hotspots, this region supports the highest population densities. The range of environmental regimes across the Western Ghats, varying in topography, soil, rainfall and temperature, make for highly heterogeneous land cover. Over time, the extent and severity of human affected landscape change has increased. As in several parts of the tropics,

the Western Ghats region is now a heterogeneous, highly variegated mosaic of both natural and managed ecosystems, in need of informed strategies for conservation and management. The landscape is now a heterogeneous and highly variegated mosaic of both natural and managed ecosystems.

By clearing tropical forests, practicing subsistence agriculture, intensifying farmland



production, or expanding urban centers, human actions are changing the world's landscapes in pervasive ways (DeFries *et al.*, 2004). Land use changes in Western Ghats over the last century caused by agriculture expansion, conversion to plantations and infrastructural projects have resulted in loss of forest and grassland

(Kumar 1993, Jha et al 2000, Khan *et al.*, 1997). Considerable areas of forest have been converted to plantations in the Western Ghats, particularly of tea, coffee, and *Eucalyptus* and different species of *Acacia*. The area under plantations is large and growing. Tea plantations in the south Indian states increased by 17.7% in the period 1987-1998 from 74,765 ha to 87,993 ha (Tea Board 2002). Large areas of *Eucalyptus* and *Acacia* plantations also occur with tea as it is used as fuelwood for tea-curing in the factories. Extensive eucalyptus plantations have also been established by large tea companies and private farmers. The *Eucalyptus* plantations raised and managed by corporate tea companies are used exclusively for the fuel requirements of tea factories and labour lanes. The private *Eucalyptus* plantations in the high-altitude but low-rainfall areas of Vattavada and Kanthalloor are reportedly causing acute water shortage in the valley bottoms. There is also a recent tendency to convert the vegetable farms to eucalyptus plantations which leads to disruption of local livelihoods, cultural drift,



impoverishment of communities as well as ecosystem malfunctioning. Hindustan News Print Ltd (HNL)

and Kerala Forest Development Corporation (KFDC) have also established short rotation eucalyptus plantations for industrial raw material requirements on land taken on concessions from the Forest Department.

Although tea gardens (14,000 ha) occupy one of the major cash crops in the project landscape it retain several interspersed forest fragments (largely *shola*) in varying size that act as corridor or sheltered habitat for many floral as well as faunal components of the biological diversity especially the lower groups of the landscape. The management input in the tea garden also make negative impact to the biological richness of the area. Cardamom (around 42,000 ha) being the biggest employer of the Munnar Landscape also has pivotal position in conservation and management of biological diversity in the area. Being cultivated in the medium elevation tropical evergreen forests as a shade loving crop, it provides habitat for both terrestrial and arboreal fauna and a wide range of critical plant species found in the region. The management of cardamom estates has been highly evolved towards high yielding in the recent decades due to its economic gains that made considerable impact on naturally growing trees and the physical environment. As a result large scale input in the form of pesticides and chemicals and fast growing tree species as shade for the growing crop has been employed that impoverished the biological diversity of the area.



Hence it is mandatory to look into the alternate strategies and action plans for the sustenance of biological diversity along with the production activities.

2.0 Objectives

The main aim of the project is to develop management plan for the production landscapes addressing the management issues. The specific objectives include:

1. Identification and mapping of different commercial and forestry production landuses
2. Characterizing the production landscapes
3. Assessing the ecological and conservational importance of production landscapes
4. Identification of management threats/issues that impede biodiversity conservation and environmental health in the production landscape
5. Conduct review of the management inputs into different production landscapes
6. Develop a tool kit (spatial data base) on production landscapes of the project area
7. Develop landuse management plan with specific strategies for mainstreaming biodiversity conservation for different production landscapes

3.0 Methods

The methods initially proposed to utilise for this study includes both ecological and social tools that would help us in collecting relevant information in the shortest span of time. However due to unexpected logistic constraints only literature based, largely management plan and working plan based information could be collected and collated. The data regarding one of the major landuse, agriculture in the eastern Anjanad Valley could not be thus collected in extensive manner.

4.0 Observations

4.1. PRODUCTION LANDSCAPE:

The three major sectors of production landscapes in the Munnar landscape are, Agriculture, forestry and commercial plantations apart from the home gardens. In the past the landuse changes were mainly due to conversion of forest lands to extensive plantations especially in the high ranges, then the implementation of Grow More Food programme during the 1940s due great famine, colonization in the 1960s and creation of settlements and post independent infrastructure projects and allied activities.

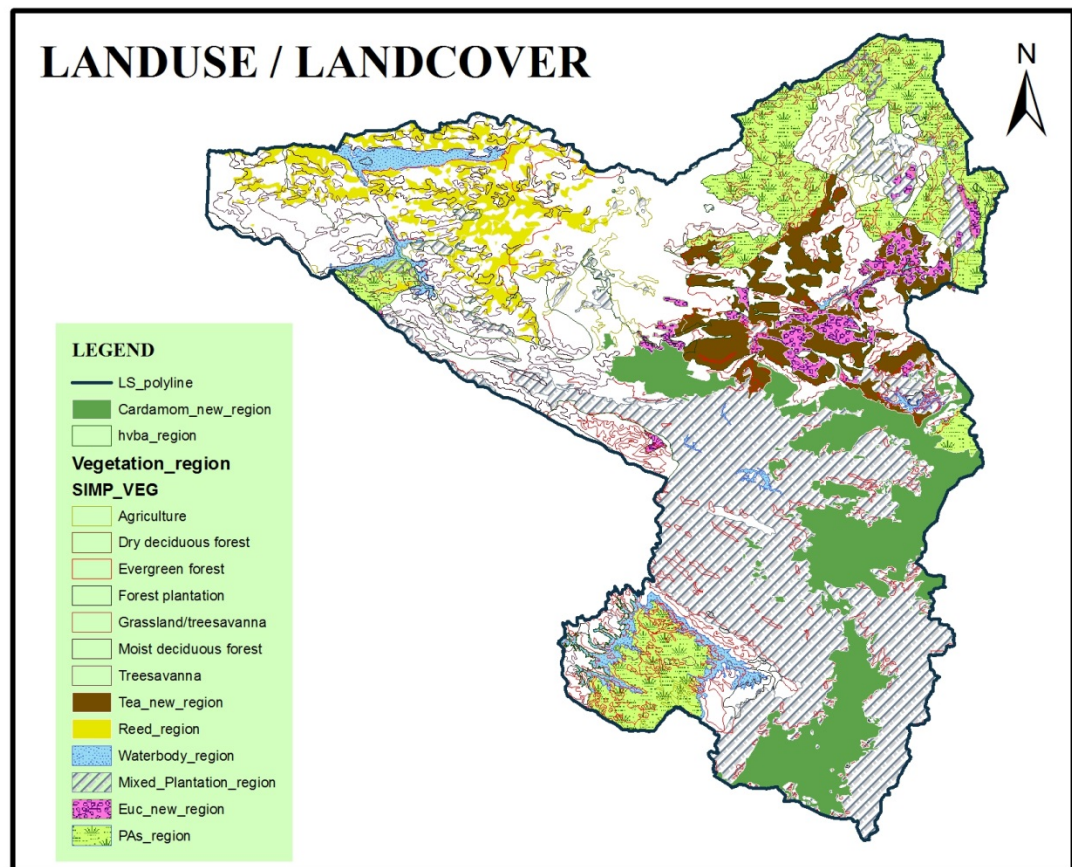
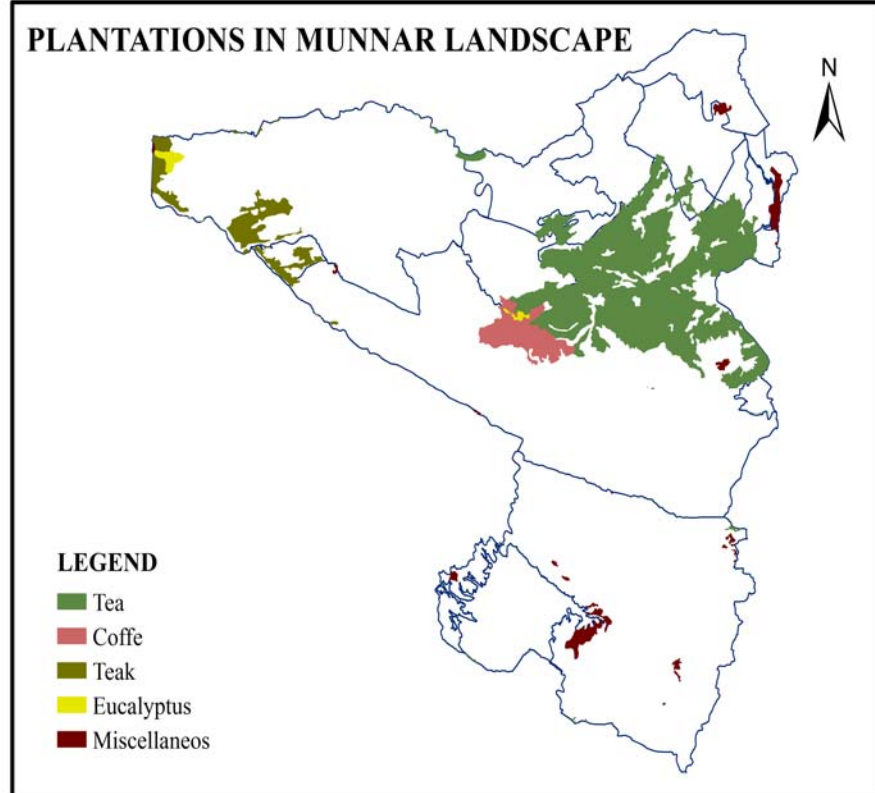


Figure 1 : Major landuses in Munnar Landspae

4.1.1 Forestry Plantations

Among the three types of production sectors, plantations of forestry and commercial dominate the area and agriculture practices account only in the restricted eastern valley. Plantations such as those of teak, *Eucalyptus*, wattle and other miscellaneous species account for a large area in the project landscape (31,580 ha). Reed (*Ochlandra travancorica*) collection and associated craft is an important economic activity in the lower reaches of the landscape (e.g. Kuttampuzha, Neriamangalam, Adimali, Edamalayar and Mankulam). In many areas, reeds grow profusely and extraction at sustainable levels is not a worry. Reed extraction occurs through concessions given by the government for a) purely commercial purpose (Hindustan plantations Newsprint Ltd. (HNL) for pulp industry), b) supporting commercial as well as artisanal use (Kerala State Bamboo Corporation (KSBC)), and c) for own use by communities. The area of

reed collection extends over 70,000 ha in HRML and in terms of local communities it supports 3,700 families most of them belonging to Scheduled Castes (SCs) along the forest fringes and the Scheduled



Tribes (STs) in Kuttampuzha and Edamalayar as the most important source of their livelihood.

Table 1: List of species planted in different forest administrative units

SN	Species	Division
1	Teak	Malayattoor, Thattekkad WLS, MUnnar
2	Eucalyptus	MUnnar, Kurinjimala WLS, Malayattoor, Mankulam
3	Wattle	Munnar, Kurinjimala WLS, Chinnar WLS
4	Pine	Munnar
5	Mahagony	Munnar, Thatekkad WLS, Malayattoor
6	Grevilia	Munnar, Malayattoor
7	Miscellaneous	Marayoor, Malayattoor, Thattekkad WLS, Munnar, Mankulam,

Tree are mostly under the control of Forest Department (teak plantations in Malayattoor and wattle in the high altitude grasslands). HNL and KFDC have established short rotation Eucalyptus plantations for industrial raw material requirements.

Table 2 : Details of plantation in each forest administrative unit

S.No	Divisions	Plantations	Area (Sq Km)
1	Malayattoor FD	Miscellaneous	0.390229
		Tea	1.31646
		Eucalyptus	4.672898
		Teak	34.352389
2	Munnar FD	Miscellaneous	3.143978
		Tea	313.880714
		Eucalyptus	0.25967
		Teak	0.473667
3	Marayur FD	Miscellaneous	1.30094
4	Chinnar WLS	Miscellaneous	0.75096
5	Kurinjimala Sanctuary	Eucalyptus	5.321905
6	Kottayam FD	Miscellaneous	13.972351
7		Tea	0.749856
8	Thattekkad Bird Sanctuary	Teak	10.40111
10	Mankulam FD	Tea	16.919932
11		Coffee	3.363116
12		Eucalyptus	1.366006

Extensive Eucalyptus plantations have also been established by large tea companies (for fuel wood for curing tea) and private farmers in Vattavada and Kanthalloor.

4.1.2 Division wise details of forestry plantations

Munnar Forest Division: Munnar division has four ranges and each range has both softwood and heartwood plantations with single species and mixed species. Nearly 70 km² area is under forestry plantations in this division, where large number of wild animals both carnivores and herbivores such as elephant, gaur, sambhar deer, tiger, leopard, Nilgiri tahr, etc range. Frequent reporting of human wildlife conflicts involving elephant, wild boar, leopard, tiger, wild dog are reported from the divisions.

Table : Range wise and species wise details of forestry plantations in Munnar Division

SI. No	Range	Teak	Pulpwood	Softwood	Miscellaneous	Total(ha)
1.	Adimaly	335.38	687.97	182.82	431.74	1637.91
2.	Neriamangalam	435.84	265.34	75.35	500.88	1277.41
3.	Munnar	0	1734.74	61.6	126.14	1922.48
4.	Devikulam	0	1946.15	15.00	0	1961.15
	Total	771.22	4634.2	334.77	1058.76	6798.95

SI. No	Species	R. F	CHR	KDH	Revenue Land	Total(ha)
1	Teak	453.843	317.380	-	-	771.223
2	Eucalyptus	526.89	153.97	1593.58	-	2274.44
3	Wattle	-	-	1215.79	105.00	1320.79
4	Pine	-	-	62.00	423.00 Assigned	62.00
5	Alnus	-	-	61.60	-	61.60
6	Matti	116.84	40.00	-	-	156.84
7	Mixed Plantation (pulpwood)	66.02	-	643.50	-	709.52
8	Miscellaneous plantation	1058.76	-	-	-	1058.76
9	Elavu	20.99	-	-	-	20.99
10	Bamboo	267.45	-	-	-	267.45
11	Grevilia	80.32	-	15.00	-	95.32
	Total	2591.113	511.35	3591.47	105.00	6798.933

Malayattor Division: The total forest area under the Division is 617.76 km² which include 85.53 km² plantation area, 10.81 km² area given to HNL for raising captive plantations, 2.66 km² handed over to Nature Study Centre, Kalady and an area of 46.09 km² of lease.

Species	Range wise area in has				Total
	Kuttampuzha	Kalady	Kodanad	Thundathil	In ha
Teak	1163.27	1796.35	2501.35	127.62	5588.59
Teak and Mix	174.97	115.98	1491.77	549.99	2332.71
Mahagony	21.00				21
Eucalyptus and Acacia		270.03			270.33
Ailanthus			5.00		5.00
Rose wood				10.00	10.00
Grewelia			36.41		36.41
Other Softwood		244.68	33.69		278.31
	1359.24	2427.04	4068.22	687.61	8542.11

Kothamanagalam division: The division which has an area of 317 km² does not have much plantations except teak and teak plus mixed in its ranges

Species	Range wise area in Ha					Total
	Thodupuzha	Kothamangalam	Neriyamangalam	Kaliyar	Mullaringad	
Teak	2221.90	1215.13	1120.43	707.46	936.54	6201.46
Teak + mixed	40	18		110.96	270.54	439.5
Miscl.		458.54			30.60	489.14
	2261.90	1691.67	1120.43	818.42	1237.68	7130.10

Among the other non PAs, Mankulam Forest Division does not have any forest plantations but only reed working circle of about 2.7 km². Coming to the PAs, most of the PAs does not have forest plantations except Thattekkad Bird Sanctuary and Kurinjimala Wildlife Sanctuary. Thattekkad possess both teak, rosewood plantations and softwood plantations whereas later PA has black wattle and Eucalyptus plantations. Teak Plantations have been raised in this area from 1927 onwards with a total area of 216.37ha and rosewood only in 5ha. Mahagony has been planted in an area of 6.67ha during 1974. In Kurinjimala sanctuary black wattle (*Acacia mearnsii*) was planted in 798.40 ha and Eucalyptus in 102.00 ha.

4.2 Commercial Plantations:

Tea: The KDH and surrounding areas of HRML comprise the largest tea producing area in southern India (14,000 ha). The tea industry is a major employer providing jobs to more than 19,000 persons Tea processing is an energy intensive operation. In the past tea processing was responsible for deforestation of large areas but at present rely heavily on biomass (197,836 m³ annually) from captive fuel wood plantations (*Eucalyptus*). Kannan Devan Hills (KDH), also known as the 'High Ranges proper', extend over 55,000 ha in the upper reaches of HRML. Planters from Europe and labour from eastern Tamil plains moved to KDH in the late 19th century and extensively converted forests and grasslands, initially for Cinchona and coffee, both giving way finally to tea. Around this time, the Kannan Devan Hills Produce Company was formed bringing together a number of small proprietary tea plantations. The tea gardens of HRML have retained several interspersed forest fragments (varying in extent from 0.1 ha to 1,000 ha), at currently are valuable as they act as stepping-stone corridors and store-houses of biodiversity. The tea gardens are one of the most used habitats by wild animals. The presence of *shola* patches interspersed with large expanse of tea bushes provide excellent cover for many animals. Hence both large and small animals ranging from elephant to mouse deer are very common in many of these estates. They move very frequently through the estates and sometime the chemically intensive tea industry pose problem for the proper habitat utilization of these species. They also engaged into direct conflict with the people who are involved in the estate management.

Cardamom farms: Cardamom farming is the biggest employer (74,000 persons including 49,000 women in 35,000 families and at least 12,000 commuting workers from Tamil Nadu) in the High ranges. The extent of area under cardamom (yielding area) in the state is about 307 km² in which major part is the

project landscape. The HRML produces around 13,000 metric tonnes of cardamom annually. Cardamom Hills is predominantly moist evergreen forests and endured small-scale extraction of wild cardamom from long time ago. However, following the state monopolization of the cardamom trade in the early 19th century, major cardamom growing areas were notified as Cardamom Hill Reserve (CHR). Cardamom cultivation expanded considerably and the region witnessed massive changes in land-use with complex landholding patterns. In 2003, a portion of CHR was also gazetted as a National Park (Mathikettan). In recent times, there has been a perceptible shift towards more light-loving and drought-resistant varieties (e.g. *njallani*) that require intensive farming practices, greater tree canopy opening and heavy application of chemical fertilizers and pesticides. Like tea, cardamom also a lot of fuelwood for curing (around 6 kg of firewood for making one kg dry cardamom). Traditionally the cardamom was grown under natural trees, but over the period the seedling and saplings are removed and there could not be any more shade trees in the recent years. In order to meet this circumstances the growers started planted exotic species like *Erythrina* sp, *Grewelia* in the cardamom estate and also light tolerant species are researched up on. Another characteristic feature in the recent past is the extensive use of pesticides and chemicals in the estates and it drains to the natural streams. Moreover cardamom estates are one of the excellent habitats for birds and arboreal animals such as squirrels, martens, civets and langurs (lion tailed macaque has been almost vanished). Moreover, these estates are bounded with natural forests of the Non-PAs or PAs with good number of animal population also visits the cardamom estates frequently. Hence any such practices in the estate will be detrimental to the survival of such animals.

Agriculture is essentially modifying natural ecosystems for a select few species of plants. Agriculture manipulations influence the overall ecological equilibrium of the area and the overall ecological conditions directly influence the agricultural potential. Currently approximately 30% of the total land area is being cultivated. Another 10% remains cultivable waste. Almost half the agricultural area is under plantation crops such as cardamom, tea, pepper, coffee and rubber.

Agricultural Plantations:

The colder and higher areas of the landscape lying towards the east (Vattavada and Kanthalloor) have vegetable farming (1,600 ha) and intensive *Eucalyptus grandis* plantations (owned mostly by absentee land owners) as dominant land uses. In recent times, tourism is picking up. A few farmers cultivate fruits such as apple, peach while many farmers maintain small home gardens of multi-purpose tree species. Anchanad Valley is the drier east facing tracts of HRML. It remained largely insular to

developments until recently when settlers from the plains started migrating to Kanthalloor and Marayur. Following this, lemon grass cultivation became extensive with a proportionate increase in fuel wood collection from the forests. During this period large areas of the unique sandal bearing forests of Marayur were degraded by illegal felling while large areas of rice growing areas were converted to sugarcane plantations. Smallholder farming (e.g. pepper and cardamom), collection of NTFPs (e.g. wild cardamom, honey, dammar, wild nutmeg, medicinal plants, *Garcinia* etc.) and small artisanal enterprises (e.g. lemon grass distillation, broom stick making, reed mat weaving etc.) are their major sources of their livelihoods. They also depend on the forests for NTFPs, fuel wood and other subsistence needs.

4.3 IMPACTS OF THE PRODUCTION SECTOR:

Forestry Plantations:

Invasive alien species such as wattle, eucalypts and sporadic distribution of pine stands and is causing shrinkage of natural grassland - shola ecosystem. Plantations result in Habitat loss, High degree of fragmentation, invasive species introduction, transfer of diseases from monoculture crops to the adjoining areas, demolish forest types and change context in the biodiversity. In grasslands adjacent to sholas, to cater to the pulpwood industries, the forest department established plantations of exotic species like Eucalyptus, Wattle and Pine. This induced a change in species composition of the sholas resulting in drastic degradation of climate. This degradation induced the introduction of new weeds, insects and diseases. Due to the presence of single species plantation in the area which is normally present in inside or adjacent to the Reserve forest and protected areas may act as a vector for several forest pest and diseases. Most of the plantation are of Teak, Eucalyptus, wattle are easily affected by their own specific diseases and suppress the growth of their natural competitors. The existence of large stretches of Eucalyptus plantations in the Kurunjimala Wildlife sanctuary, departmental as well as private, is said to have depleted the water availability. Legal issues which suppress the conservation program by the presence of plantation in the adjoining states near to the natural forest.

4.4 Commercial plantations:

Tea and Coffee:

Estates of beverage crops: tea, coffee and cacao, and of industrial crops: rubber and oil palm, now occupy large tracts of land which have been cleared from the forest. Whilst only a relatively small

proportion of current forest clearing (ca. 15 per cent) involves the creation of agricultural plantations, the management of existing estates, and indeed the replanting of old stands, have important environmental implications.

Cardamom:

Cardamom is normally cultivated as an understory plant in medium elevation climax evergreen forests located in between 600-1500m elevation. All the existing cardamom plantations are originally the best high canopy evergreen forests leased for cardamom cultivation. Cardamom cultivation requires both clearance of the understory growth and opening up of the canopy to enhance light penetration but such manipulation of the evergreen plant community invariably results in the disintegration of the evergreen forest in a relatively short time. Presently Planting of these high yield varieties signaled abandoning the conservative farming practices and adapting new technologies which are highly detrimental to natural forest and results in degradation of the area. The Reserves of soil nutrients accumulated over the past many centuries get depleted fast, in the modern cardamom plantations. Present cultivation practices will eventually result in creating a deserted and barren landscape.

Agricultural Plantations:

Land use changes in Western Ghats over the last century caused by agriculture expansion, conversion to plantations and infrastructural projects have resulted in loss of forest and grassland (Kumar 1993, Jha et al 2000, Menon and Bawa 1997). The forests are highly fragmented due to agriculture and settlements leading to man - wildlife conflict in many places. Crop damage by wild animals is a severe problem in some parts of Kerala. Forty seven species of crops were vulnerable to animal damage especially highly nutritious crops like paddy, plantains and coconut. Crop damage is found to be linked to the cropping pattern and location of the agriculture fields. These agricultural chemicals have deleterious effects which extend beyond the ecosystem. They not only undermine the natural agricultural resource base but also will destroy the natural resources over a wide area down in the plains. Continued and injudicious use of agrochemicals have increased the pest disease complex, degraded the soil and land has become increasingly unproductive.

4.5 Threats due to the alteration of natural landcover into man-made types

- Loss of Biological diversity

- Fragmentation of habitat
- Degradation and degeneration of habitats
- Habitat loss for wild species both plants and animals
- Extensive environmental contamination
- Loss of biological corridors
- Degradation of environment
- Crop raiding and human-animal conflicts
- In breeding and vulnerability of wild population to local extinction
- Displacement of species from one place to another
- Invasion of undesirable species
- Transfer of diseases

4.6 Broad Strategies proposed for overcome the threats by the Plantation:

- Phased removal of monoculture exotic plantations and thinning of teak plantation and augmentation with native species. The immediate opening up of canopy in the case of closed canopy monocultures will invite many invasive hardy species. In order to avoid that interspersed phased removal is the appropriate method. During the process of felling and removal care may be taken to minimise the environmental/collateral damage including the fire prone materials. Bonafide use in association with FDA may be thought for this purpose
- Planting of species that attract birds and butterflies in the plantation once the initial thinning has taken place may be thought off.
- The degradation of physical elements such as in the plantations need to be tackled with the help of materials such as wood or other local materials
- In case of wattle repeated cutting /uprooting of the species may be conducted since wattle has the ability to recoup even from the burnt stumps
- Take up planting of fodder species as understory in the plantations that facilitate the habitat use of ungulates
- Monitor the survival of planted seedlings.
- Use organic pesticides and fertilizers near the natural forests and stream sides
- Removing the barricades (barbed wires and any other obstacles) around the estates to facilitate the free movement of larger fauna

- Create awareness among the estate workers and other people who are in the vicinity of the animal habitat regarding the potential straying of animals
- Removal of exotic species shall be carried out regularly
- The possibility of utilising the removed material for carrying out Soil and Moisture conservation activities shall be explored.
- Based on the observation for two to three years, assisted regeneration of indigenous species may be tried if natural seedlings are not sufficiently coming up.
- Monitor regeneration status and soil erosion in the managed areas of plantations
- Establish a permanent plot for monitoring succession and eco restoration.
- The agricultural crops in the eastern valley may be using organic or indigenous method of animal repellants
- Minimum use of pesticides and chemicals may be ensured in the agricultural areas adjacent to the natural forests

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.

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