

Community Forest Management and Joint Forest Management; An Ecological, Economic and Institutional Assessment in Western Ghats, India

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1. Introduction

The rural and tribal communities depend extensively on the local vegetation for their varied biomass needs viz., food, fodder, firewood, leaf manure and raw material for locally manufactured products as well as industries. The main sources of biomass are the forests, land under tree crops, groves, plantations, permanent pastures, grazing lands, farms, homestead gardens etc. There is increasing pressure on forests and village vegetation (trees, grazing land) leading to degradation of vegetation cover. The village commons are also declining rapidly due to non-sustainable use and encroachment. It is the rural and tribal communities that are affected the most due to this indiscriminate destruction of vegetation leading to land degradation.

In response to the above pressures, forest management systems have emerged in India in two stages. Firstly, the traditional community management systems in existence for long periods, of over 100 years and secondly, the community management systems that emerged recently in the past 10 to 20 years in response to severe vegetation degradation and shortages of biomass. Both these systems are in existence and practice in Karnataka. The focus of the study is to investigate the community managed systems that have evolved recently in the past few decades. The goals of the study are i) identify and record traditional forest management systems and practices in regenerating degraded forests, ii) to assess the impact of protection and management on vegetation regeneration, iii) to estimate the NTFP and fuelwood extraction, and iv) to understand the implications of current practices for managing the vegetation sustainably.

2. Study area

The study was conducted in the community managed forests of Sagara taluk of Shimoga district in the Western Ghat region of Karnataka, South India. Sagara taluk has 23 community managed forest systems, of which three were studied. The criterion for selection was the number of years of protection and management of the forests.

2.1 Features of the Village: The details of the villages - Alalli, Hunasur and Kugwe selected for our study are given in Table 1. In all the three villages Ediga community is the most dominant and the other communities are Brahmins and Harijans in Alalli and Madivalas and Bhandaris in Hunasur. The Edigas are basically agriculturists.

3. Methodology

3. 1. Vegetation study: In order to study tree species, 50 x 20 m quadrats were placed on a transect at intervals of 100 m. Four such quadrats were randomly placed in different parts of the protected forest in villages. The parameters recorded in each quadrat were the tree species name, the girth of the tree at breast height (GBH), the approximate height of the tree and the regeneration status of plants - if from coppice or seedlings. For studying regeneration, four 5 x 5 m quadrats were placed within each tree quadrat and the parameters recorded were, the tree and shrub species - their name and numbers, mode of regeneration, GBH/DBH of small trees taller than 1.5 m. To study herb species, four 1 x 1 m quadrats were laid within the shrub quadrats and the species and numbers were recorded. Identical control plots were laid in the unprotected natural forest. Vegetation studies were also carried out for social forestry plantations nearest to the protected forest using identical methods.

3. 2. Institutional study: The institutional aspects were investigated through group discussions with the chairman and members of the forest management and protection committee and elders of the village. Separate discussions were held with the womenfolk, artisans and farmers in the village. The issues addressed were; the history and motivation of protection, state of forest before protection, nature of protection organization, management practices followed, mode of protection and extraction and regulation of collection of different NTFPs and the process of sharing, cases of misuse, role of women in decision making process, relationship with forest department and the role of NGOs.

3. 3. NTFP study: A brief questionnaire survey was conducted to gather data on occupation patterns, size composition of families, cattle holding etc. The households were then categorized as large farmers, small farmers, landless and artisans based on land holdings and occupation. From each class, 25% of the households were chosen for daily monitoring. If the number of households in each of these classes were very few (lesser than 5), all the households were chosen for daily monitoring.

3. 3. 1. Daily monitoring: Two literate youth were chosen to record the daily flow of NTFPs after consultation with the chairman and the members of the committee. They observed the entry and exit points to the managed forests and recorded the details of extraction for the sampled households everyday in the registers provided. The data collected was periodically verified by the field staff. The parameters recorded were: Date, Name of the household collecting, time in and out, location of collection, quantity collected, plant part collected, implements used, if any for collection and the person collecting (man/woman/child).

4. Institutional studies and Community Management

4. 1. Period of protection: Alalli village started protecting their degraded forest patch in 1976 while in Hunasur, the protection committee came into existence in 1960. Hunasur village Kanu (Sacred grove) stands on both revenue and Government land while in Kugwe, the protected forest patch has been classified as revenue land by the government and its been protected for about 100 years.

4. 2. Mode of forest protection: In Alalli, the entire village community is involved in guarding the forest with no specific guard. In Hunasur, every house is responsible for protection on a rotational basis. In Kugwe, 2 members from 2 households are assigned the duty of watching the forest in 2 shifts and a fence has been erected around a portion of the protected forest.

4. 3. Management Committee: In all the three villages a management committee exists for protection and management of the forest. In Alalli, the committee has 13 members including a chairman and secretary elected during the general body meeting held once in a year.

In Hunasur, the committee has 9 members including the chairman, secretary and treasurer. There is representation of both young and old and all castes and sections. There are two general body meetings presided by the Tahashildar (Revenue officer) every year and attended by the village community.

In Kugwe, the committee has 22 members including a chairman, a secretary, and a treasurer. The village is divided into 5 blocks each comprising of 36-37 households and each block is represented in the committee. The term of office of the committee is one year. In all the villages eligible candidate is selected based on efficiency, leadership qualities and experience. There are no women members in the committee, except in Kugwe.

4. 4. Grazing practice: Grazing in Alalli was banned in the protected forest during the initial three years of protection. Grazing is however allowed now. During the cropping season, the 'Bari system' is practiced wherein nearly 22 households join together and send their livestock to graze together and the cattle is watched by members of a single household each day on a rotation basis. During non-cropping season, the cattle are grazed in the crop fields. Stall feeding is practiced during the rainy season. In Hunasur, grazing was prohibited inside the "Kanu" earlier and the same is practiced now. However, cattle graze the creepers, climbers and leaves found on the edge of the forest. In Kugwe, cattle are watched on a rotation basis as in Hunasur. Earlier, cattle were grazed in certain parts of Kanu but now there is no grass available, as the canopy has become very dense.

4. 5. Cases of misuse: In all the villages, penalty is decided depending on the nature of offence. Generally, first time offenders are warned and repeated offences are penalised. For eg. In Hunasur, people caught extracting green wood or leaves are penalised more and in Kugwe, carts, implements and biomass are confiscated and a penalty as high as Rs. 1000/- is imposed.

4. 6. Extraction and Sharing Mechanisms: There is no restriction with regard to the collection of leaf litter, fruits, flowers, nuts, seeds, medicinal herbs etc. from the protected patch at any time of the year in all the three villages. However, people are not allowed to cut any green twigs, branches, leaves or bamboo shoots from the patch. In Hunasur, collection of fuelwood is allowed once a year during which from each household, a man and a woman are allowed while in Kugwe, the villagers pay a nominal fee of Rs. 1/- every year for benefiting from the forest. Collection of bark of Cinnamomum is banned in Kugwe while collection of fruits of *Tamarindus indicus* and *Garcinia morella* (oil yielding fruit) for own use is permitted. Since the Kugwe forest is very old it supports a good number of timber yielding trees and villagers need of timber is met with through payment of Rs.5 to the committee. However the timber so obtained is not for sale.

4. 7. Role of the Forest Department: There is no formal relationship between the village committee and the Forest Department in all study villages. The villagers generally express fear of

losing community land to the department for raising monocultures. Hunasur and Alalli villages have been awarded by the government for promoting community forestry.

5. Vegetation Analysis

Communities have resorted to protection in response to severe degradation and shortage of biomass. Therefore it is necessary to assess the impacts of protection and management practices on vegetation so as to provide information to communities for decision making regarding management and harvest regimes.

Vegetation assessment of community managed forests has been carried out in all the three villages along with degraded forest areas, which are not under protection and management (control plot), as well as forest department promoted forest plantations. The investigation of forest department plantations and unprotected forest patches would help in comparing impact of community management on vegetation and the assessment of the other two management systems. The objectives of the vegetation study are to i) assess species diversity and distribution, density of trees and stems ii) estimate the basal area of trees, DBH and size distribution of trees, iii) assess the extent of regeneration through seedlings and coppice or root stock, and the regeneration potential of different species, iv) understand the existing and potential enduses of species v) understand the various stages of forest succession, and vi) estimate the standing biomass and productivity.

5.1. Species diversity: Hunasur has 62 tree species, which is the highest while Kugwe and Alalli have 43 and 32 tree species respectively. It can thus be seen that longer the period of protection greater is the number of tree species in the protected forests. The control plots have fewer tree species as compared to the protected forest and it is almost less than half the number found in the protected forest. The control plot of Kugwe has 30 species while Alalli has 14 species and Hunasur has 19 tree species. The plantations are basically monocultures dominated by *Acacia auriculiformis* along with few other species, represented by smaller number of individuals. The number of shrub and herb species is higher in the more recently protected forest of Alalli. This could be due to open canopy in these forests. In Hunasur and Kugwe since the forests have been protected for longer periods, there are more number of older trees, with closed canopy cover, thereby suppressing the ground vegetation regeneration.

Species Importance Value Index shows that in the older forests of Hunasur and Kugwe, *Diospyros candolleana*, *Garcinia morella*, *Olea dioica*, *Knema attenuata* etc. are the most important evergreen species, while Alalli is dominated by deciduous species like *Terminalia spp*, *Ochrocarpus spp*, *Lannea coramandelica* etc.

5.2. Size class distribution of trees: Size class distribution of trees indicates the growth rate of trees. The protected forest of Kugwe has 513 trees/ha with DBH > 10cms but only 51 trees/ha with DBH < 10cms. This shows that although Kugwe has the highest number of tree species saplings in the shrub and herb quadrat, very few of them are allowed to grow. Thus regeneration is severely affected in Kugwe, an indicator that there is a slack in protection. Alalli is showing the highest degree of regeneration with 65% of the total number of individuals in the < 10 cms DBH class. It can be seen from Table 2 that a highest basal area of 33 m²/ha has been recorded in Hunasur and the least basal area of 14 m²/ha in Alalli. Though the forest is older in Kugwe, the standing stock seems to have declined due to extraction and is only 26 m²/ha. The forest of Alalli which is under

protection since 21 years, has moderate basal area and this is because 65% of the trees of Alalli are in the DBH class < 10 cms.

5. 3. Standing Biomass and productivity: Standing biomass was calculated from the basal area values using the following equation.

Standing Biomass (t/ha) = -1.689 + 8.32 (BA)

$R^2 = 0.5$, SE of coefficient = 1.169, where BA is the basal area in m^2/ha .

Using the values of standing biomass, harvest limits were estimated. 2.84% of the standing biomass is considered as mean annual increment and 50% of the annual increment is considered as the harvestable limit. Table 2 gives the standing biomass, mean annual increment and harvestable limit for all the villages. Standing biomass is highest in the older protected and managed forest of Hunasur but lowest in Alalli. It is 273 t/ha at Hunasur and 113 t/ha in Alalli. Alalli with a recent protection history is a regenerating forest while Hunasur and Kugwe are partially degraded natural forests being protected for a longer period. The plantation of Hunasur has a biomass of 173 t/ha which is lower than that of the protected and managed forest (Table 2). The plantations have greater number of trees in the higher DBH classes than the protected forests except in Alalli. In the recently protected forest of Alalli the biomass of the plantation is 238 t/ha which is greater than the biomass of the protected forest.

5. 4. Species choice, Succession and End uses: Alalli is dominated by deciduous species and almost all the species are used as fuelwood and leaf litter as manure. The pioneers are dominated by *Terminalia sp* whose wood is used as fuelwood and flowers are used for religious purposes. There are also a few fruit yielding species among the pioneers such as *Embllica officinalis*, *Buchanania lanzan*, *Syzigium cuminii*. In Hunasur, dominated by evergreen intermediates and climax species, *Diospyros montana* is the most dominant one used as fuelwood and leaf manure. There are fewer fuelwood yielding trees in Hunasur as there are fewer deciduous species. The fruits of *Garcinia spp* are used for extraction of edible oil. Trees with multiple uses are present in large numbers in Alalli and it is clear that deciduous species provide more NTFPs than the evergreen species in these villages. The control plot is dominated by dry shrubby vegetation represented by *Eupatorium odoratum*. A few evergreens like *Artocarpus hirsutus*, *Mimusops elengi*, *Nothopegia colebrookiana*, *Diospyros candolleana*, *Ixora brachiata* and *Olea dioica* are also present.

Hunasur and Kugwe with a protection history of more than 100 years are dominated by evergreen species. Regeneration in Kugwe and Hunasur show signs of human disturbance. Alalli forest shows a very high degree of degradation with very few large trees. Hence adequate protection is very essential to prevent further degradation and adequate measures are to be adopted to revert back these forests to the original evergreen type, if the community so desire. The current species distribution in Hunasur forest is an indicator to communities of nearby villages such as Alalli on the type of vegetation likely to occur in their regenerating forests with protection for longer periods.

5. 5. Regeneration: Regeneration is an indicator of the success of protection and it is also an indicator of the sustainability of the current practice with respect to each species. The highest regeneration by seedlings of height < 1.5 cms is seen in Alalli with the least in Kugwe. In the tree quadrats of the protected forest, the number of trees with DBH <10 is seen in highest in Alalli followed by Hunasur. Alalli also has the highest number of trees in the height class of 1 - 5 m and 5 - 10 m, which indicates good regeneration. Kugwe has only 51 trees/ha with DBH <10 and it also has the least number of trees in the height classes 1-5 m and 5-10 m. This again indicates that

regeneration of seedlings is severely affected in Kugwe. This also indicates that if the current rate of seedling mortality continues for few more years, the forest regeneration would be severely affected leading to degradation or replacement by pioneers. Hunasur forest has about 661 trees/ha in the DBH class < 10 cms and also has good representation in the height classes lower height classes.

It is also seen that in the recently protected forests of Alalli, 7% of the trees regenerated through coppices, while in Hunasur, which has been protected for more than 100 years (dominated by evergreen species), only 2% of the trees regenerated through coppices and the rest through seedlings. The deciduous tree species like *Canthium diococcum*, *Diospyros spp*, *Terminalia spp* regenerate principally through coppices while the evergreen tree species regenerate through seedlings as can be seen in Hunasur. Higher percentage of trees regenerating through seeds indicates the success of protection (controlled grazing and removal).

6. Analysis of NTFP flows

The value of NTFPs as a source of employment and income and also as a source of subsistence is underrated. The forestry sector provides about 1.6 million years of employment in NTFP activities according to a conservative estimate and about 40 to 50 % of state forest revenues in India and 80 % of net export earnings from NTFPs come from NTFPs (Tewari, 1993). Economic value of forest products is expected to be a motivating factor to communities adopting protection and management practices.

The aim of the study is to assess the major NTFPs in the region, the impact of protection and management on the flow of NTFPs and their economic and ecological significance to the communities managing the forests.

6.1. NTFPs gathered in the villages: The rules and regulations on the collection of NTFPs are as discussed in section 4.6. In all the three villages under study, the major NTFPs collected are fuelwood and leaf litter. The leaf litter is used as cattle bedding and later used as manure in the crop fields. The protected forests in these villages are also good reserves of medicinal plants but the level of dependence is quite low. However, the herbalists from the neighboring villages do collect these plants. The medicinal herbs are used to treat both diseases of the cattle and humans. The other NTFPs collected in this area are mushrooms, spices like rampatre, jaikai, leaves and flowers for religious purposes, extracts and juices of plants used as stupor to trap fishes; bamboo shoots and other berries to make pickles; various flavouring agents like curry leaves, souring agents etc. The main occupation being farming and given the high rainfall, NTFP gathering among farming households is largely for self consumption and not for selling.

Table 3 gives the percentage of households collecting NTFPs in each of the land holding category. In all the villages the landless collect the highest quantity of fuelwood except in Hunasur where the small farmers collect more. Significant quantity of leaf litter is collected for use as cattle bedding and manure and it is also sold to the landed people by some households. The landless also collect flowers, fruits and seeds from the forest and also fencing material for sale within the village. The landless in Alalli collect mushrooms and are aware of its nutritive value. Like in Hunasur, several fruits, flowers and seeds are sold in the nearby Sagara and Kumta town. The seeds of *Garcinia* is used for edible oil extraction. The large farmers collect leaf manure and also buy from the landless and the small farmers. They also buy fencing material from others. They do not seem to collect

much of the other NTFPs. The large farmers in Alalli and Kugwe collect mango leaves and the inflorescence axis of *Caryota urens*. These are both used for religious purposes. They also collect the highest amount of palm leaves in Alalli to make containers for storing grains.

The human effort put in for fuelwood collection is highest in all villages. Among the landed gentry, men make higher number of trips to collect fuelwood. Among the other classes, the women and children make the highest number of trips. In all the villages except Hunasur, men make the highest number of trips in all land categories for collection of leaf manure, poles and grass. In Alalli and Hunasur, one trip for fuelwood collection takes about 8 - 10 hours and a joint effort by 4 -5 men during this time amounts to a collection of one cartload of fuelwood. Even in Kugwe, where fuelwood is relatively easily available, one trip constitutes about 5 hours. Collection of leaf manure consumes typically about 3 hours in all the villages.

6. 2. Implications of Institutional study :

6. 2. 1. Decision making Process: In all the villages a village forest management committee exists and it is the decision making body. Though there is no conscious discrimination, there is no representation of the economically poorer sections or socially backward households in the committee. Women are excluded from the committees as well as meetings although women participate in protection and are the major extractors of biomass. Therefore women's needs and aspirations are not given due prominence or priority. Thus there is a pressing need to ensure their participation to avoid conflicts that could arise at a later stage, though currently women seem to appreciate the efforts of their men folk and its positive impact on vegetation.

6. 2. 2. Sharing of costs: Currently the sharing of costs particularly the human effort for protection is equal, but the cost of human labour for a poor landless and garden owner is surely different and therefore needs thought. But the practice adopted by the village community may be the only practical option, given the socio-economic situation.

6. 2. 3. Sharing of benefits: The sharing arrangements are equal for every household has equal but limited access to fuelwood and other NTFPs. But in the actual sense, it could be argued that the present system is inequitable due to the following reasons:

* Landed, particularly garden owners have their own large biomass resources and the community forest is only a supplementary source. But for the landless and non-garden owning households with no private biomass resources, community forest is a critical source of biomass and also the cost of alternate sources is very high for the landless and marginal farmers. Secondly, Banning of extraction of bamboo will deprive raw materials to the basket weavers and such a regulation may not affect the landed households.

6. 2. 4. Gender, Equity and Sustainability: Women have no role in the decision making process although they are the main stake holders and are also involved in protection. If women were involved in the decision making process, the harvest regimens that exist now may have been very different. Though women are careful not to express their displeasure regarding the existing system, they may soon start voicing their needs for larger access to forest products. However, with the panchayat system taking root where one-third of seats as well as presidentships reserved for

women, the situation may soon change. In Kugwe, the woman member of panchayat is already a member of the village forest committee.

It is possible to take two views; firstly, it is best left of village community to sort out the issues of gender and equity, hoping that the systems are still evolving and would mature to solve issues of gender and equity. Secondly, it is possible to suggest that outside agencies such as NGOs, Forest Department and Panchayat could intervene and catalyze the promotion of gender and social equity. It is difficult to conclude which approach is more rational.

6. 2. 5. Role of the Forest Department: The Forest Department is playing no significant role in any of the study villages. It has made some minor contributions, like providing monetary help for fencing the forest in Kugwe village. The Department must encourage mixed species social forestry projects to meet diverse biomass needs. Social Forestry can directly contribute to the local income when the trees are cut, by way of usufruct (Nadkarni, M. V., Ninan, K. N. and Syed Ajmal Pasha, 1994). The National Policy guidelines issued on June 1, 1990 supports reorientation of management systems of natural forests to respond to the needs of the rural communities. The efforts of the Forest Department in areas with committed field staff and encouraging senior officials is found to be successful in establishing participatory management systems (Mark Poffenberger, 1990). But the crucial factor in this partnership is that the final decision making power must rest with the community.

6. 3. Implications of Vegetation Management: One of the goals of vegetation study should be to assist local communities in managing or manipulation of vegetation to derive higher economic benefits and to promote sustainability. The type of vegetation to be promoted depends on the choice of the village community. The type of vegetation succession can be determined by controlled grazing, controlling fire, and selective retention of species. Study of vegetation gives a clear picture about the quality and quantity of biomass available and used.

6. 3. 1. Regeneration: For a forest to survive in years to come, it is essential that there be adequate representation in all the DBH classes, particularly in the lower DBH classes. If there are more trees in the higher DBH classes and very few in the lower DBH classes, as seen in Kugwe, it indicates that succession of younger ones is severely affected. The future of the forest is not stable for there are no young seedlings to take over on death of the older individuals. Conversely, in Alalli, there is adequate representation in all the DBH classes, indicating a healthy forest.

i) It is now time for the Kugwe village community to decide whether they want the existing tree species to regenerate in which case they must minimise damage to the seedlings and promote regeneration ii) Hunasur community must stop any further disturbance, otherwise canopy openings will promote deciduous tree species iii) Alalli community will have to decide whether they want forest succession to continue and let deciduous trees such as *Terminalia spp*, *Lagerstroemia parviflora*, *Pterocarpus marsupium*, *Eugenia jambolanum etc.*, be replaced by evergreens such as *Knema attenuata*, *Hopea wightiana*, and *Acrocarpus fraxinifolius* iv) In Hunasur due to shading and presence of evergreens there is little scope for grass production. This is a point to be kept in mind by the Alalli community on deciding their course of action.

6. 3. 2 Woody biomass harvest: Woody biomass as cooking fuel is the dominant product removed from forests and often blamed for forest degradation (FSI 1988). One of the implications of the

vegetation study is that the village communities could extract, as a thumb rule, about 50% of the annual woody biomass. The quantity of fuelwood in the form of twigs and small branches that could be harvested is in the range of 1330, 1351 and 2845 kg/Household/year in Alalli, Hunasur and Kugwe villages (50% of MAI). But, fuelwood extraction is highly regulated forcing all households to go elsewhere to meet their requirement.

6. 3. 3 Plantation Vs Community Managed Forest: A comparison of plantation forestry promoted by the forest department with the community forests shows that the plant diversity is low in social forestry plantations (which are dominated largely by *Acacia auriculiformis*) compared to large number of species yielding fruits, flowers, leaf manure etc., in community managed forests.

6. 3. 4 Impact of protection of community forests on other forest biomass sources: The strict regulations enforced on extraction from protected forests has forced households to meet their firewood requirements from other sources. The households of Alalli and Hunasur travel over 20 kms to gather wood. The point to be noted here is that the lands which the communities began protecting were either totally degraded lands (Alalli) or on the verge of getting degraded (Kugwe and Hunasur). If the community had not started protecting, the land would have been completely denuded and degraded by now and also other areas would have been simultaneously put under pressure. Secondly, if the Forest Department had taken over and raised monocultures at the cost of Rs.10,000 to Rs. 15,000/ha, the villages would have lost the multiple use species. In either case village communities would not have benefited and the biodiversity would have been lost. Thus the present situation is clearly a “Win-Win” situation.

6. 3. 5 Grazing Practices and Forest Succession: Grazing is permitted in all the villages currently, although it was banned initially for a few years in Alalli. Thus to promote forest succession it may not always be necessary to ban grazing. However, some regulation of grazing during the initial years is desirable.

6. 3. 6 Period of protection, plant diversity and utility: Forest succession depends on protection practices and period of protection. In Hunasur, longer period of protection has resulted in regeneration of evergreens, canopy closure and absence of grass production. This helps the neighbouring village communities with shorter periods of protection (dominated by deciduous species) to decide the following: i) if grass production is desired, canopy has to be opened by pollarding ii) communities have to decide whether they want deciduous tree species dominated vegetation or to allow forest succession leading to evergreen tree species dominated vegetation (as in Hunasur). The latter requires intensive protection or even reduced grazing pressure to permit germination and growth of evergreen plant seedlings.

6. 3. 7 Access and Harvest Regimes: Communities have evolved their own mode of defining access and the rules as to who can collect, when and how collection can be done. Sustained harvest level should be defined in terms of how much of the resource can be harvested year after year without damaging the long-term stability of plant populations. In order to set such limits, it is very essential to conduct periodic monitoring of the vegetation and yields of species. Yield studies could indicate the quantitative and qualitative changes in NTFP yield over a period. During periodic

monitoring, if it is observed that regeneration is affected, users should immediately make alternate harvest arrangements and go for remedial measures such as,

- i) Selective weeding or selective retention of species.
- ii) Sprucing at the crown level to open up forest canopy, to promote grass production.
- iii) Setting limits to extraction of products to allow recycling of nutrients.

Controlled exploitation of NTFPs will help achieve the twin goals of augmenting the need of the tribal people and rural poor for fuelwood, fodder and other forest products and also preserving the tropical forests for posterity.

6.3.8 Sustainability aspects of fuelwood leaf manure and NTFP collection: Meeting requirements of fuelwood and leaf manure are key problems faced by people in these villages. In Alalli, extraction of fuelwood is allowed only one day in a year while upto 100 t can be harvested in a year. In Hunasur too, the villagers are allowed to gather just twice a year although more could be harvested without causing damage to the vegetation. The same is the case with Kugwe too. However the fuelwood requirement (calculated based on per capita requirement of 1.67kg/yr for North Karnataka, Ravindranath and Hall, 1995) in all the villages is greater than the harvestable biomass.

The amount of leaf litter produced is estimated to be 6.06 t/ha/yr (Bhat, D. M., 1990). Even if 50% of the litter produced is assumed as the extractable limit, the quantity harvested currently is very low because in all the villages there is a ban on the collection of green leaves.

The major changes in quantity of NTFP collected over a period is only with respect to fuelwood. Earlier in all the villages, one person could collect at least 1 cartload per day from the protected forest area itself. But now it takes 4-5 persons to collect the same quantity from the protected forest as well as far away places. Regarding other NTFP's there is shortage of fencing material. The villagers collect poles by cutting trees in the plantations and also from the wastelands. As a consequence of people cutting trees in wastelands, the creepers yielding soapnut have perished with no props to grow on. The villagers now have to buy soapnut from outside. In Hunasur some flower yielding tree species have been cut.

7. Conclusions

Till recently, forests were treated as mere sources of revenue and the abuse of forests mainly for timber has resulted in the degradation of valuable genetic resources and even localised extinction of some of the plant populations yielding non-timber products. Government controlled forest management practiced for more than 100 years contributed very little in terms of ecological conservation. The government has realized the importance of involvement of local communities in management of forests and thereby drafted the National Forest Policy of 1988 which stressed the need of active participation of local communities in management.

7.1. Evolution of Community Initiated Management Systems and Functioning: The existing community management systems were wholly initiated by local communities in response to degradation leading to biomass scarcity and fear of loss of community resource to Forest Department or encroachment. These management systems have had their ups and downs. Each village has adopted its own distinct approach for protection. But what is common to these committees is their informal organisation, not registered with any Government agency. These

committees are functioning very well on the lines envisaged by Mahatma Gandhi about the self sufficiency and empowerment of villages. Men of all classes have representation in this committee. There is no representation of women in the committee inspite of their active participation in guarding the forest and in the collection of NTFPs and they being the principal stake holders.

7. 2. Sustainability: All communities have evolved very strict rules for extraction of biomass. The communities realised that extraction rates in the pre-protection period were non-sustainable and therefore stringent measures of protection are needed. As a result of community protection in Hunasur and Kugwe, there is adequate biomass now to cater to the community needs, if extracted within sustainable limits. In Alalli too, significant quantity of biomass can be extracted. This improvement in vegetation could be duly accorded to the sustainability of the community institutions evolved in these villages.

7. 3. Role of Forest Department: _The Forest Department has not played any active role in all the three villages studied by us. But the department has been granting occasionally seedlings or cash to the villagers. The villagers fear that the Department could take away their forests and that they would lose control over their common property resources. The Department should therefore be more actively and progressively involved. The forests have a lot of NTFPs of great significance. The forest department should help promote sustainable extraction on a large scale and also its processing and marketing at the village level to help generate more employment.

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Table 1
Features of the villages selected for study1

Village	Period under Protection (Years)	Area of Forest (ha)	Area of village (ha)	Total human population	Total Livestock population	
					Cattle	Goat+Sheep
Alalli	19	73	615	683	325	80
Hunasur	> 100	49	304	814	480	143
Kugwe	> 100	162	615	1144	285	165

Table 2
Basal area, standing biomass, annual woody biomass production and potential harvestable limit for woody biomass in the selected villages

	Basal area (in m ² /ha)	Standing biomass (t/ha) ¹	Mean annual increment (t/ha/yr) ²	Harvestable limit (t/ha/yr) ³	Harvestable limit for the whole area (t/yr)	Harvestable limit/hh/yr (kgs/hh/yr)
ALALLI						
Protected Forest	14	113	3.22	1.61	117	1030
Plantation	29	238	6.76	3.38	34	300
HUNASUR						
Protected Forest	33	274	4.90	2.45	191	1352
Plantation	21	173	21.57	10.79	131	211
KUGWE						
Protected Forest	26	210	5.98	2.99	484	2645

1. Standing woody biomass = $-1.687 + 8.32 (BA)$ where BA = Basal Area
2. Annual woody biomass increment = 2.84% of the standing woody biomass
3. Harvestable limit (upto 50 % of the annual woody biomass production) = 50% of annual woody biomass increment

Table 3
Percentage of households gathering NTFPs in different land holding groups

Village		Landholding groups		
		Large Farmers	Small Farmers	Landless
Alalli	Total number of households	114		
	% of households gathering			
	Fuelwood	71	75	90
	Leaf Manure	100	50	90
	Fodder/Grass	100	63	60
	Flowers	57	50	40
	Fruits	57	38	90
	Seeds	43	38	40
	Poles (Fencing)	57	38	40
	Phoenix leaves	100		
Mangifera Leaves	100			
Hunasur	Total number of households	141		
	% of households gathering			
	Fuelwood	100	100	44
	Leaf Manure	71	71	24
	Poles (Fencing)	86	71	24
	Seeds	100	100	24
Kugwe	Total number of households	183		
	% of households gathering			
	Fuelwood	57	42	16
	Leaf manure	86	42	16
	Grass	100	58	12
	Poles	43	25	8
	Seed	57	58	16
Inflorescence Axis	100			