

CONSERVATION OF FRAGMENTED FORESTS IN BANAVASI
RANGE, SIRSI FOREST DIVISION, KANARA CIRCLE

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Degraded Kalangi forest with a water body



Santolli forest



Cultivation expanding into the forest



A well inside forest showing high water table in January

Karnataka Forest Department, Sirsi Division, Kanara Circle
Western Ghats Task Force, Government of Karnataka
Karnataka Biodiversity Board, Government of Karnataka

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CONSERVATION OF FRAGMENTED FORESTS IN BANAVASI RANGE, SIRSI FOREST DIVISION, KANARA CIRCLE

Summary:

In the pre-colonial times, when the forests were under the virtual control of village communities, especially along the eastern fringes of Western Ghats, in eastern Sirsi and Siddapur, in the taluks of Sorab, Sagar, Tirthahalli etc. in Shimoga district, there were well developed, self-sustaining agro-forestry systems under the practical control of village communities. By the end of the 19th century the British claimed almost all forests of Uttara Kannada, including kans, kaadu, old shifting cultivation areas etc. As secondary forests had most of the marketable hardwood timbers more importance was given to these forests than to the *kans*. But the *kans* were protected under the British rule as very important watershed areas. With the increase in population need for agricultural lands, human settlements, cattle grazing, timber, firewood, fencing materials etc. increased many-fold. The dependence of people on the *kans* and other forest fragments increased substantially leading to their fast degradation. Encroachments of *kans* and other forests started taking place all over eastern Sirsi and Siddapur, and elsewhere in the district mainly for cultivation and housing. In Uttara Kannada, unlike in Shimoga, most of the time, *kans* were not demarcated separately from other reserved forests. So forest cutting for industrial demands, for timber and fuel wood affected all forests. A description of these forests, along with maps, and illustrative photographs with suggested action plan are presented in this report based on the field investigations in the select fragmented forests.

Keywords: *kans*, Western Ghats, sustainable management, forest fragmentation

1. Introduction

Uttara Kannada is one of the most well forested districts of entire Indian peninsula. Forest conservation and sustainable use was part of the tradition of local population. In the pre-colonial times, when the forests were under the virtual control of village communities, especially along the eastern fringes of Western Ghats, in eastern Sirsi and Siddapur, in the taluks of Sorab, Sagar, Tirthahalli etc. in Shimoga district, there were well developed, self sustaining agro-forestry systems under the practical control of village communities. These systems consisted of following elements of landscapes:

- a. ***Kans*:** These were sacred forests, which almost in every malnadu village covered several hectares, many times several hundred hectares. The large *kans* were surrounded, sometimes on all sides, as in undulating landscapes, by more than one village. The *kans* were the main seats of the deities of the villages. These evergreen forests protected from fire also

functioned as prime watershed areas and local centres of biodiversity conservation. The perennial streams coming out of these evergreen forests were dammed to create lakes and tanks, the main sources of irrigation and water for domestic uses. These lakes and tanks with their hydrophytic plants, nearby gardens and fields attracted several kinds of birds, as they are even to this day. Traditionally tree cutting was a taboo in the village *kans*. But there was no taboo on collecting non-timber forest produce like wild pepper, toddy from banyan palm (*Caryota urens*), wild fruits like mango and jack, medicinal plants, dalchini (cinnamon) etc. The village communities would meet annually to maintain the boundaries of *kans* and performed periodically fairs in honour of the deities.

- b. Kaadu:** ‘Kaadu’ was a traditional word used for ordinary forests. These ordinary forests were often the result of kumri or hakkal cultivation. Often fire was used to clear patches of these forests for purposes of cultivation. Firewood and timber were collected for household purposes. The secondary forests being fire affected areas were characterized by leaf shedding trees, mostly hardwoods, with high timber value, such as teak, beete (rosewood), nandi, matti, kindal etc. Even sandal trees grew in the secondary forests. Dry leaves were collected and fresh twigs from trees and bushes extracted for leaf manure. These secondary forests had many fruit trees like mangoes and neerilu (in fire protected areas), Ficus spp., karvanda or kavale (*Carissa carandas*) etc. Numerous birds and animals would use the kaadu and kan as their habitats.
- c. Bena and tree savanna:** These were grasslands, with or without trees, maintained by village communities for the purpose of cattle grazing. When they were overgrown with vegetation fire was used in dry months to clear such vegetation and promote grasses.
- d. Water bodies:** The lakes and tanks were many and were created by bunding streams flowing from the *kan* forests. Through sluice gates water was let into the canals to irrigate gardens and rice fields.
- e. Cultivation:** In traditional land use arecanut gardens with undergrowth of pepper, betel leaves, nutmegs, cardamom, banana etc were raised in lands benefitted by irrigation. Rice was raised either as rainy season crop or twice in irrigated lands

1.1 Changes in the traditional land use

By the end of the 19th century the British claimed almost all forests of Uttara Kannada, including *kans*, kaadu, old shifting cultivation areas etc. As secondary forests had most of the marketable hardwood timbers more importance was given to these forests than to the *kans*. But the *kans* were protected under the British rule as very important watershed areas. To meet the demand for leaf manure for the gardens land was allotted to garden owners in some of the *kans* as ‘betta’. Owing to rising pressures from the local agriculturists for firewood and leaf manure, especially in eastern Sirsi and Siddapur taluks, some concessions were given to the locals to collect dry wood and leaf manure. By 1920’s, because of overuse of *kans*, many openings had already happened in them and these openings were infested with weeds like *Lantana*, replaced

by *Eupatorium* in later years. As market demand for timber and firewood increased in later times even the *kans* were not spared from timber extraction for meeting demands of plywood, match and packing case industries. After Indian independence many *kans* were disforested and lands released for human settlements.

1.2 Rising pressures on forest fragments in eastern Sirsi and Siddapur

With increase in population need for agricultural lands, human settlements, cattle grazing, timber, firewood, fencing materials etc. increased many-fold. The dependence of people on the *kans* and other forest fragments increased substantially leading to their fast degradation. Encroachments of *kans* and other forests started taking place all over eastern Sirsi and Siddapur, and elsewhere in the district mainly for cultivation and housing. In Uttara Kannada, unlike in Shimoga, most of the time, *kans* were not demarcated separately from other reserved forests. So forest cutting for industrial demands, for timber and fuelwood affected all forests. It is today difficult to distinguish many *kans* from other forests unless the local people testify or by the presence of deities and worship places in those forests in question.

1.3 Field visits to encroached and degraded forests in Banavasi forest range of Sirsi Forest Division

Accompanied by the Assistant Conservator of Forests, Sirsi, Range Forest Officer, Banavasi Range, and other forest ground staff, with required maps a team of ecologists and botanists and local environmentalists (Messers M D Subash Chandran, G R Rao, Sumesh Dudani, Vishnu D M, Shrikanth Naik – all from Indian Institute of Science, Bangalore- and Narasimha Hegde, Raghunandan Bhat and Ganapati Hegde from Sirsi), visited in January 2013 some of the forest patches in Banavasi Range that are badly degraded and often encroached for human settlement or cultivation or both. A description of these forests, along with maps, illustrative photographs and recommended action are presented in this report.

I. BADANGOD FOREST, BADANGOD PANCHAYAT

Survey no : 217;
 Area : 27.83 ha;
 Type of forest : Proper Forest
 Protection required : CPT for 3 km length

Village Forest Committee: Yes

Description of forest: The forest is in thoroughly degraded condition. The basal area of trees/hectare is in the range of 5-10 sq.m only. The forest is densely infested with weeds, prominently *Eupatorium*. The forest was formerly a kan forest dedicated to the deity 'Guthamma'. A large pond/tank downside of the hill was more or less in dried state. When the forest was in good condition, perhaps the watershed value was much greater than today. The tank no more serves the purpose of irrigation in the command area as the water level was far below the sluice gate.

The forest is today a dense scrub with distantly distributed small trees. Most are coppice growths of older larger trees. Several stumps and mutilated remains of trees are found. Among the trees noted are *Aegle marmelos* (near the temple on the hill top only), *Alstonia scholaris*, *Anogeissus latifolia*, *Bauhinia racemosa*, *Careya arborea*, *Diospyros melanoxylon*, *Lagerstroemia microcarpa*, *Mallotus phillippensis*, *Mitragyna parviflora*, *Terminalia paniculata*, *T. tomentosa*, *Xantolis tomentosa*, *Xylia xylocarpa*. Among the climbers noted were *Calycopteris floribunda*, *Hemidesmus indicus*, *Ichnocarpus frutescens*, *Ipomoea* spp. etc. Saplings of sandal (*Santalum album*) were noticeable. *Carissa carandas* was frequent in the undergrowth and clumps of bamboo were dispersed in the forest.

Threats: Deforestation of serious kind; forests being encroached and also trees hacked heavily. Forest is densely infested with weeds

Future management suggested

- 1. Requirement of cattle-proof trench (CPT):** CPT required for 3 km (see figure). CPT will be the immediate solution for preventing further encroachments
- 2. Minimum basal area to be targeted:** Considering the good condition of soil, under proper protection and management the basal area of trees should be raised to a minimum of 35 sq.m/ha. through replanting, natural regeneration and protection through the involvement of VFC
- 3. Species recommended for planting/natural regeneration:** To be chosen from the indicative list

4. **Revival of VFC:** Rangapur has VFC, but seems to be in dormant state. The VFC to be revived for forest restoration and co-management
5. **Awareness programmes:** To be conducted periodically in the village
6. **NTFP rights:** To be given to the VFC
7. **Meeting fuelwood crisis:** 10 out of 27.83 ha to be used for fuelwood species. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Assistance required for installing gobargas plants in households with adequate number of cattle. Astra stoves and solar devices (particularly for hot water) recommended to save use of fuelwood from forest.
8. **Water body maintenance:** Water scarcity seems to be severe. The water bodies downside of the forested hill to be maintained through appropriate government programmes

II. KALANGI FOREST; BADANGOD PANCHAYAT

Survey no	: 91	Area: 62.08 ha (Proper Forest)
	109 B1	3.44 ha (Betta- unassigned)
	109 B2	9.31 ha (Betta- unassigned)

Protection required : CPT for 8 km length

Village Forest Committee: No

Description of forest: Tree growth is somewhat better than in Rangapura Forest, Badangod village. A visual estimate shows about 50% of unassigned bettas are encroached and cultivated mainly by cotton. The basal area/ha is around 12-15 sq.m/ha. This needs to be enhanced to 30-35 sq.m through consistent programmes. The forest could have been of semi-evergreen nature once; but today there is hardly any evidence that this forest was of such kind as most trees are deciduous, obviously because of desiccation due to large gaps and periodical ground fires in summer. The ponds downside of the forest had very little water in January itself the level of which was below the sluice gate level. The arecanut farmers in the command area seem to be relying on bore wells for irrigation.

Of the tree growth noted were: *Anogeissus latifolia* (mostly stumps), *Bridelia retusa*, *Butea monosperma*, *Careya arborea*, *Cordia wallichii*, *Dalbergia latifolia*, *Ficus* spp., *Madhuca latifolia*, *Phyllanthus emblica*, *Pterocarpus marsupium*, *Streblus asper*, *Syzygium cumini*, *Tectona grandis* (mostly reduced to stumps), *Terminalia bellirica*, *Terminalia tomentosa*, *Vitex altissima*, *Xantolis tomentosa* etc. *Bambusa arundinacea* is frequent and the forest is densely infested with weeds, prominently *Eupatorium*. Among the shrubs and climbers noticed

were *Aristolochia indica*, *Allophyllus serratus*, *Embelia pteriam-cottam*, *Carissa carandas*, *Ichnocarpus frutescenc*, *Moullava spicata*, *Naravelia zeylanica*, *Smilax macrophylla*, *Tarenna asiatica* etc. The presence of isolated large trees indicate that once it was a high stature forest.

Threats: Deforestation for cultivation (mainly cotton) has taken a good toll of the betta forests. The other forest patch is also degraded and densely infested with weeds.

Future management suggested

1. **Requirement of cattle-proof trench (CPT):** CPT required for 8 km is recommended (see figure). CPT will be the immediate solution for preventing further encroachments
2. **Minimum basal area to be targeted:** Under proper protection and management the basal area of trees could easily be increased to the least 35 sq.m/ha through replanting, natural regeneration and proper protection.
3. **Species recommended for planting/natural regeneration:** To be chosen from the indicative list
4. **VFC formation:** Co-management is the better solution for isolated patches of forests amidst human habitation. Therefore constitution of VFC is very important.
5. **Awareness programmes:** To be conducted periodically in the village
6. **Meeting fuelwood crisis:** 25 out of the almost 75 ha to be used for fuelwood species. Native species, as indicated in Table-1 to be preferred for planting purpose. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Households with adequate number of cattle should be assisted to install gohar gas (biogas) plants in. Astra stoves and solar devices (particularly for hot water) are recommended to save use of fuel wood from forest.
7. **Redeclaration as sacred grove:** The hilltop has newly built temple of mother deity Gutavva. The forest be named as ‘Gutavvakanu’ as it was known in the olden days, in the presence of VFC and village community
8. **NTFP rights:** To be given to the VFCs to be formed

III. SANTOLLI FOREST; BADANGOD PANCHAYAT

Survey no	: 27	Area: 32.01 ha (Proper Forest)
	30	35.05 ha (Minor Forest)
	31	2.07 ha (Minor Forst)
	51	74.79 ha (Minor Forest)
Protection required	: CPT for 8 km length	
Village Forest Committee:	No	

Description of forest: The forest is of degraded moist deciduous type, denser due to abundance of regeneration, weeds and bamboo. Large trees are sparse and many are in mutilated state.

Basal area does not exceed 15 sq.m/ha. anywhere, whereas it needs to be more than doubled to regain healthier composition.

Vegetation is characterized deciduous tree species like *Acacia auriculifolia*, *Adina cordifolia*, *Alseodaphne semecarpifolia*, *Anogeissus latifolia*, *Bridelia retusa*, *Butea monosperma*, *Careya arborea*, *Chickrasia tabularis*, *Dalbergia latifolia*, *Ficus religiosa*, *Ficus spp.*, *Grewia tilifolia*, *Kydia calycina*, *Mallotus phillippensis*, *Madhuca latifolia*, *Randia dumetorum*, *Stereospermum personatum*, *Syzygium cumini*, *Tectona grandis* (reduced to stumps and coppice growth), *Terminalia paniculata*, *Terminalia tomentosa*, *Xylia xylocarpa*, etc. *Bambusa arundinacea* is frequent and the forest is densely infested with weeds, prominently *Eupatorium*. Among the shrubs and climbers were noticed *Abrus precatorius*, *Acacia sinuata*, *Allophyllus serratus*, *Colebrookea oppositifolia*, *Carissa carandas*, *Ichnocarpus frutescenc*, *Mucuna pruriens*, *Smilax macrophylla*, *Zizyphus rugosa* etc.

Threats: Timber and fuelwood extraction, encroachments

Future management suggested

1. **Requirement of cattle-proof trench (CPT):** CPT required for 8 km is recommended (see figure). CPT will be the immediate solution for preventing further encroachments
2. **Minimum basal area to be targeted:** Under proper protection and management the basal area of trees could easily be increased to the least 35 sq.m/ha through replanting, natural regeneration and proper protection.
3. **Species recommended for planting/natural regeneration:** To be chosen from the indicative list
4. **VFC formation:** Constitution of VFC is very critical.
5. **Awareness programmes:** To be conducted periodically in the village
6. **Meeting fuelwood crisis:** 45 ha out of the almost 145 ha to be used for fuelwood species. Native species, as indicated in Table 1 are to be preferred for planting purpose. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Households with adequate number of cattle should be assisted to install gobargas plants in. Astra stoves and solar devices (particularly for hot water) recommended to save use of fuelwood from forest.

NTFP rights: To be given to the VFCs to be formed

IV. HEBBATI-RANGAPUR FOREST; ANDAGI PANCHAYAT

Survey no	: 126	Area: 38.33 ha (Proper Forest)
	6 B1	3.90 ha (Betta)
	6 B2	1.33 ha (Betta)
	221 A	4.05 ha (Betta)
	222 B1	2.95 ha (Betta)
	222 B2	1.53 ha (Betta)
	223	1.39 ha (Betta)
	224 B2	4.10 ha (Betta)
	225	13.10 ha (Betta)
Protection required	: CPT for 6 km length (as indicated in Figure)	
Village Forest Committee:	No	

Description of forest: The forest, distributed in various survey nos. is in fragmented state. Encroachment, mostly by landless poor, has happened in a big way. Amidst the cultivated encroached area are large isolated trees, especially *Terminalia bellirica*, *Terminalia tomentosa*, *Salmalia malabarica*, *Lagerstroemia microcarpa* etc. Such remaining large trees in the middle of fields, on bunds, are slowly being eliminated through girdling and burning of base. Immediate task to form a VFC, number those trees and ensure their protection. Probably the forest was earlier of semi-evergreen kind, which due to human impact in the form of tree felling, fire incidence etc. turned into moist deciduous type.

Vegetation is characterized deciduous tree species like *Bombax ceiba*, *Bridelia retusa*, *Butea monosperma*, *Buchanania lanzan*, *Careya arborea*, *Dalbergia latifolia*, *Dillenia pentagyna*, *Ficus benghalensis*, , *Ficus* spp., *Grewia tilifolia*, *Lagerstromia microcarpa*, *Madhuca latifolia*, *Syzygium cumini*, *Tectona grandis* (mostly reduced to stumps and coppice growth), *Terminalia bellirica*, *T. paniculata* *T. tomentosa*, *Xylia xylocarpa*, etc. *Bambusa arundinacea* is frequent and the forest is densely infested with weeds, prominently *Eupatorium due to large openings* . Among the shrubs and climbers were noticed *Abrus precatorius*, *Acacia sinuata*, *Allophylus serratus*, *Calycopteris floribunda*, *Canthium parviflorum*, *Carissa carandas*, *Ichnocarpus frutescens*, *Zizyphus rugosa* etc.

Threats: Continued degradation by human impacts and encroachments.

Future management suggested

- 1. Requirement of cattle-proof trench (CPT):** CPT for 6 km is recommended (see figure). CPT will be the immediate solution for preventing further encroachments
- 2. Minimum basal area to be targeted:** Under proper protection and management the basal area of trees could easily be increased to the least 35 sq.m/ha through replanting,

- natural regeneration and proper protection. Forest has good potential for regeneration under protection of natural growth.
3. **Species recommended for planting/natural regeneration:** To be chosen from the indicative list
 4. **VFC formation:** Constitution of VFC is very critical.
 5. **Awareness programmes:** To be conducted periodically in the village
 6. **Meeting fuel wood crisis:** 45 ha out of the almost 145 ha to be used for fuelwood species. Native species, as indicated in Table 1. to be preferred for planting purpose. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Households with adequate number of cattle should be assisted to install gobargas plants in. Astra stoves and solar devices (particularly for hot water) recommended to save use of fuelwood from forest.
 7. **NTFP rights:** To be given to the VFCs to be formed

V. ANDAGI, KALAKARDI; ANDAGI PANCHAYAT

Survey no : 89.73 Area: 89.73 ha (Proper Forest)
 Protection required : CPT for 5 km length
 Village Forest Committee: No

Except 20 ha of degraded deciduous forests the rest is covered by a teak plantation. Mainly the teak plantation is in need of protection, for which 5 km long CPT is proposed. This is very critical to prevent the valuable forest areas amidst villages getting encroached. Steps should be adopted to desilt water bodies, introduce energy saving devices to reduce dependence on firewood and introduce suitable cottage industries in the village.

VI. NARUR KAN FOREST, BASI PANCHAYAT

Survey no : 289 Area: 9.33 ha (Minor Forest)
 290 4.98 ha (Minor Forest)
 Protection required : CPT for 3 km length
 Village Forest Committee: No

Description of forest: The forest was formerly a *kan* forest, a village sacred forest of pre-colonial times. Kans were evergreen forests in earlier times. May be because of local communities losing their traditional control over the *kan* and conversion of the same into Minor Forest for meeting

biomass requirements reduced it into a moist deciduous forest. Acacia plantation has also been raised in part of it. Of the evergreen trees what remain today are few: *Carallia brachiata*, *Syzygium cumini*, *Hydnocarpus wightiana*, *Caryota urens* etc. are few relics of the *kan* nature.

The notable trees in the forest were *Adina cordifolia*, *Alangium salvifolium*, *Albizia lebbek*, *Buchanania lanzan*, *Careya arborea*, *Carallia brachiata*, *Cordia wallichii*, *Dalbergia latifolia*, *Diospyros melanoxylon*, *D. montana*, *Ficus benghalensis*, *Ficus callosa*, *Ficus drupacea*, *Ficus* spp., *Lagerstromia microcarpa*, *Lannea coromandelica*, *Madhuca latifolia*, *Mitragyna parviflora*, *Odina wodier*, *Olea dioica*, *Pterocarpus marsupium*, *Schleischera oleosa*, *Semecarpus anacardium*, *Spondias acuminata*, *Syzygium cumini*, *Terminalia bellirica*, *T. paniculata*, *T. tomentosa*, *Xylia xylocarpa*, etc. *Bambusa arundinacea* is frequent in the forest; weed infestation is high in the openings. Among the shrubs and climbers noticed were *Calycopteris floribunda*, *Carissa carandas*, *Hemidesmus indicus*, *Holarrhena antidysenterica*, *Ichnocarpus frutescens*, *Jasminim malabaricum*, *Zizyphus rugosa* etc.

Threats: Extraction pressures and encroachments

Future management suggested

1. **Requirement of cattle-proof trench (CPT):** CPT for 3 km is recommended (see figure). CPT will be the immediate solution for preventing further encroachments
2. **Minimum basal area to be targeted:** Under proper protection and management the basal area of trees could easily be increased to the least 35 sq.m/ha through replanting, natural regeneration and proper protection. Forest has good potential for regeneration under protection of natural growth.
3. **Species recommended for planting/natural regeneration:** To be chosen from the indicative list
4. **VFC formation:** Constitution of VFC is very critical.
5. **Awareness programmes:** To be conducted periodically in the village
6. **Meeting fuelwood crisis:** Of the 14 ha forest, 7 ha may be used for fuelwood species. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Households with adequate number of cattle should be assisted to install gobargas plants in. Astra stoves and solar devices (particularly for hot water) recommended to save use of fuelwood from forest.
7. **Kan protection committee:** Bringing awareness on the importance of *kan* protection it is recommended to constitute a committee of villagers for the same purpose.

VII. CHIKKADUGLI FOREST; BASI PANCHAYAT

Survey no	: 22	Area: 46.84 ha (Minor Forest)
	30	38.36 ha (Proper Forest)
Protection required	: CPT for 2.50 km length	
Village Forest Committee:	No	

Description of forest: The forest is today of moist deciduous nature, whereas the rainfall of 1800 mm could have been good enough for semi-evergreen forest. The forest is subjected to desiccation due to canopy gaps, increased levels of human interference and probably sporadic fires. Today deciduous tree species dominate the vegetation.

Of the notable trees are *Adina cordifolia*, *Alseodaphne semecarpifolia*, *Aporosa lindleyana*, *Buchanania lanzan*, *Butea monospema*, *Careya arborea*, *Cordia myxa*, *Dalbergia latifolia*, *Diospyros melanoxylon*, *Ficus* spp., *Helictres isora*, *Holarrhena pubescens*, *Lannea coromandelica*, *Mangifera indica*, *Phyllanthus emblica*, *Pterocarpus marsupium*, *Syzygium cumini*, *Tabernamontana heyneana*, *Terminalia bellirica*, *T. paniculata* *T. tomentosa*, *Xantolis tomentosa*, *Xylia xylocarpa*, etc. *Bambusa arundinacea* is frequent in the forest; weed infestation is high in the openings. Among the shrubs and climbers noticed were *Calycopteris floribunda*, *Carissa carandas*, *Embelia tsjeriam-cottam*, *Hemidesmus indicus*, *Ichnocarpus frutescens*, *Jasminim malabaricum*, *Smilax zeylanica*, *Zizyphus rugosa* etc.

Threats: Extraction pressures and encroachments

Future management suggested

1. **Requirement of cattle-proof trench (CPT):** CPT for 2.5 km is recommended (see figure). CPT will be the immediate solution for preventing further encroachments
2. **Minimum basal area to be targeted:** Under proper protection and management the basal area of trees could easily be increased to the least 35 sq.m/ha through replanting, natural regeneration and proper protection. Forest has good potential for regeneration under protection of natural growth.
3. **Species recommended for planting/natural regeneration:** To be chosen from the indicative list
4. **VFC formation:** Constitution of VFC is very critical.
5. **Awareness programmes:** To be conducted periodically in the village
6. **Meeting fuelwood crisis:** Of the 85 ha forest, about 25 ha may be used for fuelwood species. The remaining to be earmarked as conservation area and no biomass/NTFP to be harvested till forest recovery. Fast growing species and wood gasifier recommended. Households with adequate number of cattle should be assisted to install gobargas plants in. Astra stoves and solar devices (particularly for hot water) recommended to save use

of fuelwood from forest. All these steps are dissuade people from depending heavily on forests for routine biomass needs.

- Village Forest Committee:** VFC has to be constituted for better management of this fragmented and highly impacted forest.

Table 1: Species recommended for planting in the forest fragments of Banavasi Forest Range

No	Scientific name	Local name	Importance
Fuel wood block			
1	<i>Albizzia chinensis</i>	Hottebage	Fuel wood; leaves as fodder for goats; slope stabilization
2	<i>Anogeissus latifolia</i>	Dindiga	One of the toughest and useful woods; gum for tanning and calico printing; leaves as fodder; good for rocky and dry areas; leaves for silkworm to produce tassar silk
3	<i>Bridelia retusa</i>	Kandakasana	Timber and firewood, leaves for manure. Bark and leaves important in ayurveda
4	<i>Cordia wallichii</i>	Challehannu	Fruits eaten by bears; cattle feed on leaves; fruits edible. Fruits medicinal; for pickling
5	<i>Dillenia pentagyna</i>	Kanigale	Malabar giant squirrel feed on fruits; monkeys and birds feed on fruits. Plant parts used in ayurvedic medicine
6	<i>Diospyros melanoxylon</i>	Tumri	Drought resistant tree. Good fuel and timber; wood valued for carving; leaves as NTFP. Fruit bats, birds, particularly hornbills feed on fruits. Fruits edible to humans; leaves make fodder;
7	<i>Grewia tilifolia</i>	Tadasalu	Malabar giant squirrel feed on bark and leaves
8	<i>Melia dubia</i>	Hebbevu	Fast growing large tree; produces useful timber and firewood. High biomass improves soil fertility, where it grows densely good watershed protection can be expected. Bioinsecticide from leaves for chicken pests; dry leaves when burns repels mosquitos; seed oil insect repellent like neem oil. It can yield upto 40 tons biomass/year for 10 years and is a good solution for firewood crisis in Banavasi region; good for biomass gasification plant
9	<i>Xylia xylocarpa</i>	Jambe	Fuelwood and leaf manure, bark medicinal, N-fixer; favours regrowth of evergreens. Malabar giant squirrel feed on seeds
Conservation block			
1	<i>Aegle marmelos</i>	Bilpatri	Sacred tree; Leaves, fruit pulp medicinal; leaves have sale value; medicated oil from leaves; gum from fruit added to watercolors; oil distilled from rind for

			flavouring hair oil; fruit shell for handicrafts; yellow dye from fruit
2	<i>Alangium salvifolium</i>	Ankolemara	Edible fruits; roots very medicinal, leaves and fruits also medicinal; plant is rich in alkaloids; fruits eaten by Roseringed parakeet, Indian myna, Common babbler
3	<i>Alseodaphne semecarpifolia</i>	Mashe	Re-establishment of evergreen forest
4	<i>Artocarpus gomezianus</i>	Waate-huli	Yellow dye from wood and fruits, sour fruits dried and sold like tamarind
5	<i>Artocarpus heterophyllus</i>	Halasu	Edible fruit and seeds, chips prepared from fruits, tender fruits as vegetable. Leaves and fruit waste as fodder; plant parts, including latex, medicinal; orange-red dye from wood; useful for re-establishment of evergreen nature; strong wind-break tree; many herbivores feed on the fruits
6	<i>Buchanania lanzan</i>	Nurkalu	Nuts edible, for making sweet-meats. Good for afforesting bare hill slopes; roots, leaves and fruits medicinal; char oil extracted from fruit medicinal; nuts have export value
7	<i>Butea monosperma</i>	Muttaga, Palasa	Roots, leaves, flowers, seeds, gum and bark reputed in medicines. Tree ornamental; dry leaves sold as eating plates. Fabric dye from flowers. Tree considered sacred.
8	<i>Carallia brachiata</i>	Andamurgila	Large tree for re-establishment of evergreen forests. Stem bark wound healing; fruits and seeds edible
9	<i>Caryota urens</i>	Bainymara	Palm of great ecological significance. Palm civets disperse seeds; juice from flowers (palm toddy) made into palm jiggery. Flowers produce nectar and favours apiculture; leaf fibre for brushes; old stem for timber; starch from stem pith as food of medicinal value
10	<i>Cassia fistula</i>	Kakkemara	Tree with beautiful flowers; flowers provide pollen to honey bees and leaf nectaries provide nectar. Fruit pulp/seeds reputed in ayurvedic medicines. Flowers and bark medicinal
11	<i>Ficus benghalensis</i>	Aala	Large tree useful for forest restoration. Used in ayurvedic medicines; many birds and mammals feed on fruits; keystone species; leaves for fodder
12	<i>Ficus callosa</i>	Neeruvatee	Fore evergreen forest restoration; ecosystem value-birds and bats feed on the fruits.
13	<i>Flacourtia montana</i>	Hannu-sampige	Good for evergreen forest restoration; fruit edible, has market value
14	<i>Hydnocarpus pentandra</i>	Toratte	Good for evergreen forest restoration. Seeds and seed oil reputed in ayurveda for skin diseases

15	<i>Madhuca indica</i>	Ippimara	Petals used as food; seed oil for cosmetics and soap; as biofuel; fat used in chocolates and sweets; oil cake as fertilizer; plant medicinal; leaves have fodder value; seed as NTFP. Fruits eaten by many wild animals and birds
16	<i>Mangifera indica</i>	Maavu	Good for evergreen forest restoration; wild mangoes like appemidi used for pickling can promote cottage industry
17	<i>Phyllanthus emblica</i>	Nellikai	Highly valued forest produce; fruit as food, for pickling; reputed as highly medicinal
18	<i>Pongamia pinnata</i>	Honge	Fast growing evergreen tree; can grow on poor soils; good for nitrogen enrichment; leaves make good green manure and has pesticide property; seed oil for blending with diesel; one tree can produce up to 40 kg seeds/year
19	<i>Pterocarpus marsupium</i>	Honnemara	Timber, adds soil fertility, leaves for fodder, latex medicinal.
20	<i>Santalum album</i>	Sreegandha	Many saplings and treelets in Rangapura forest, Badangod; needs protection through VFC participation
21	<i>Sapindus laurifolius</i>	Antuvaala	Soapnut fruit is NTFP; flowers source of highly priced honey
22	<i>Syzygium cumini</i>	Neerale	Good for evergreen forest re-establishment; edible fruits; plant parts, fruits and seeds have medicinal values. Large fruited varieties recommended or planting
23	<i>Tamarindus indicus</i>	Hunsemara	Tamarind fruit could be a good source of income for locals. Tree recommended for planting alongside CPT
24	<i>Terminalia bellirica</i>	Tari	Fruits rich in tannin, dye from fruits for fabrics; fruit very medicinal; seed oil for soap
25	<i>Zanthoxylum rhetsa</i>	Jumminkaimara	Fruit an NTFP; used for flavouring curries.

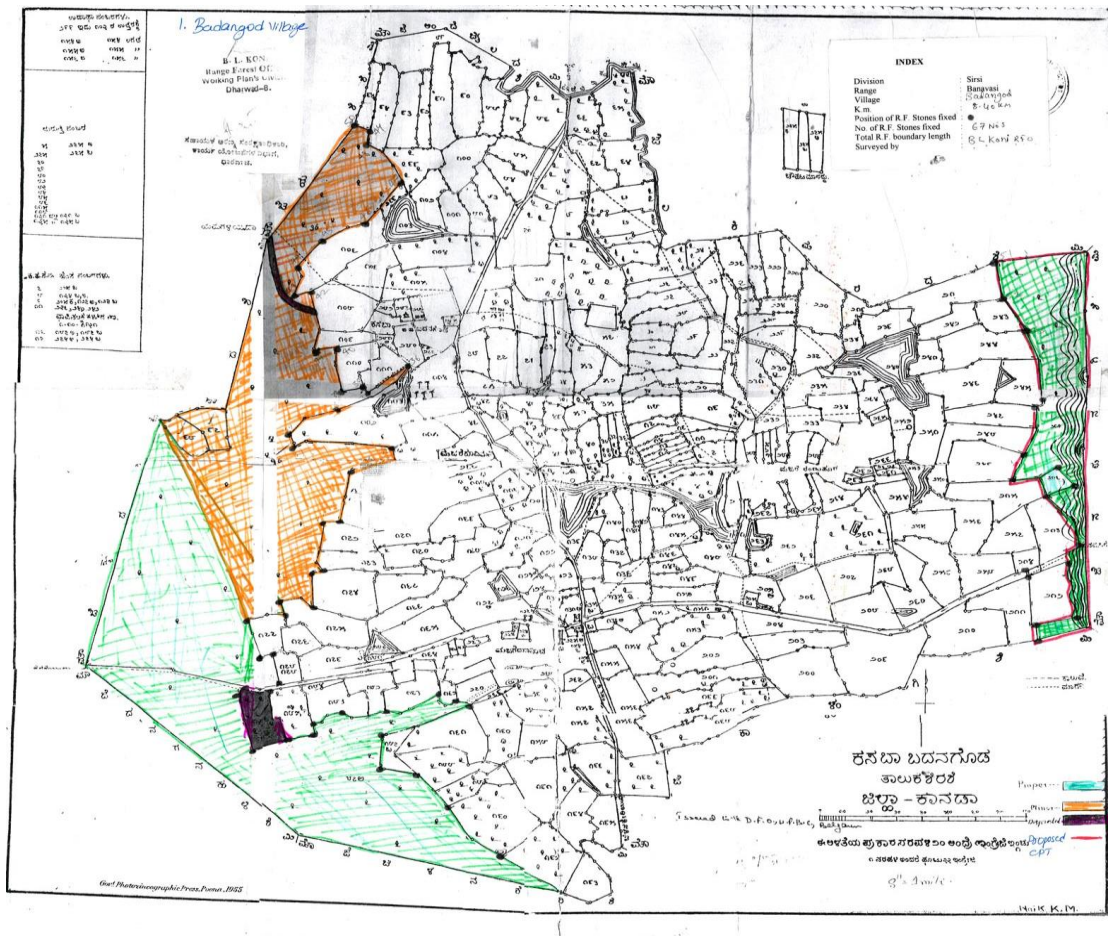


Figure 1. Badangod village forest (towards right border), CPT marked



Figure 2 & 3: Degraded state of the Badangod forest

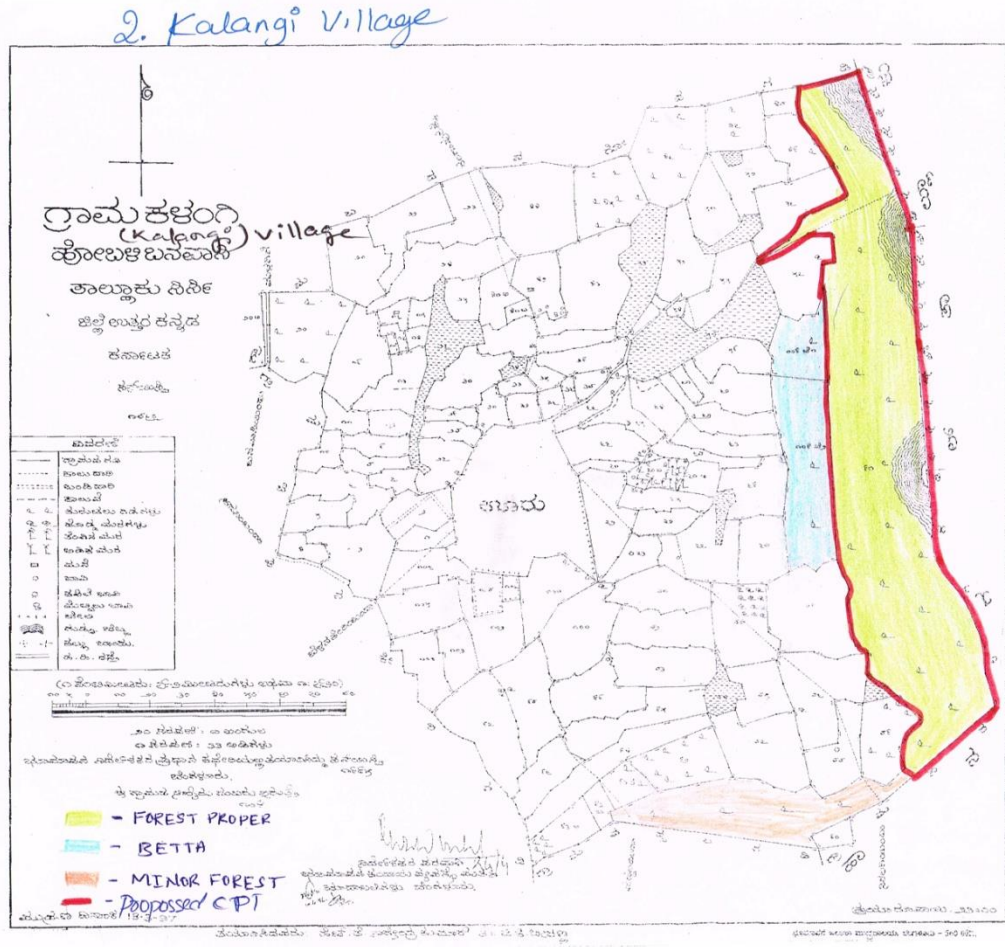


Figure 3: Kalangi village showing forest area to be protected by CPT



Figure 4: Degraded Kalangi forest with water body below. Figure 5: Gutavva temple on the hill top.

3. Santolli Village

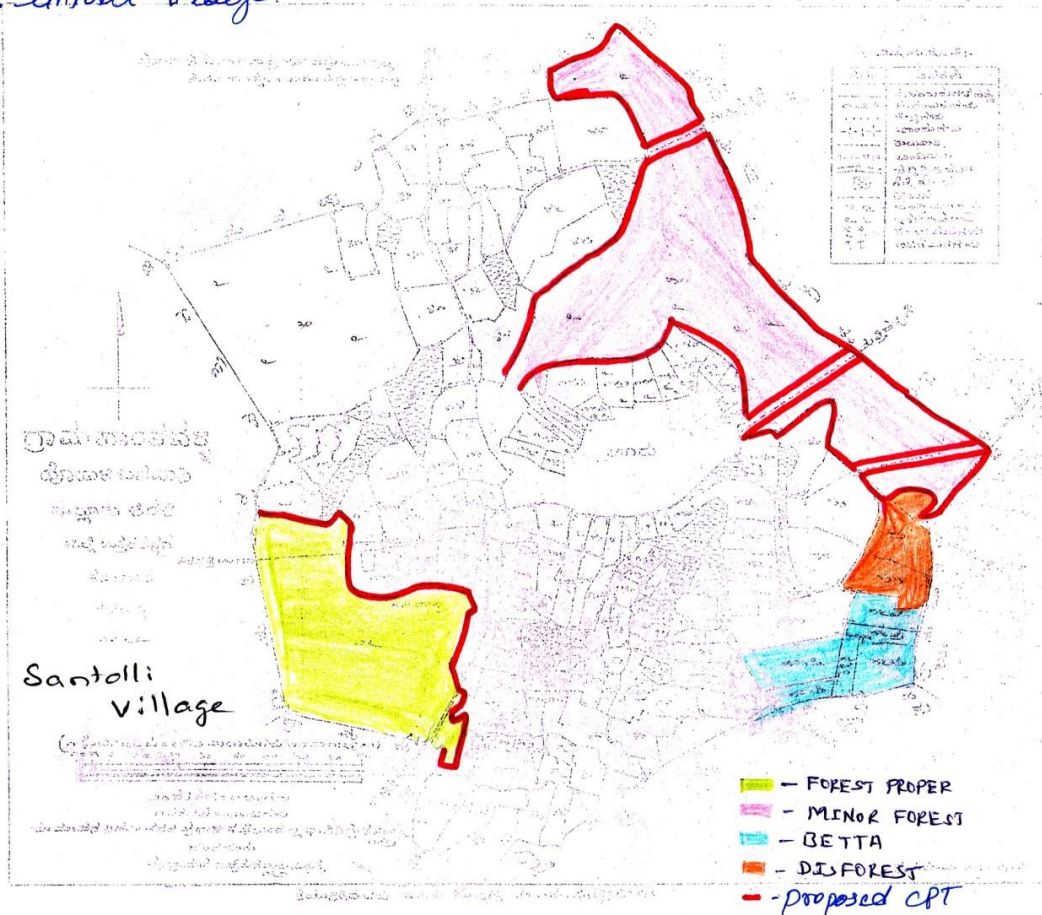


Figure 6: Santolli village showing forest patches and proposed CPT



Figure 7: Cultivation expanding into the forest



Figure 8: Santolli forest

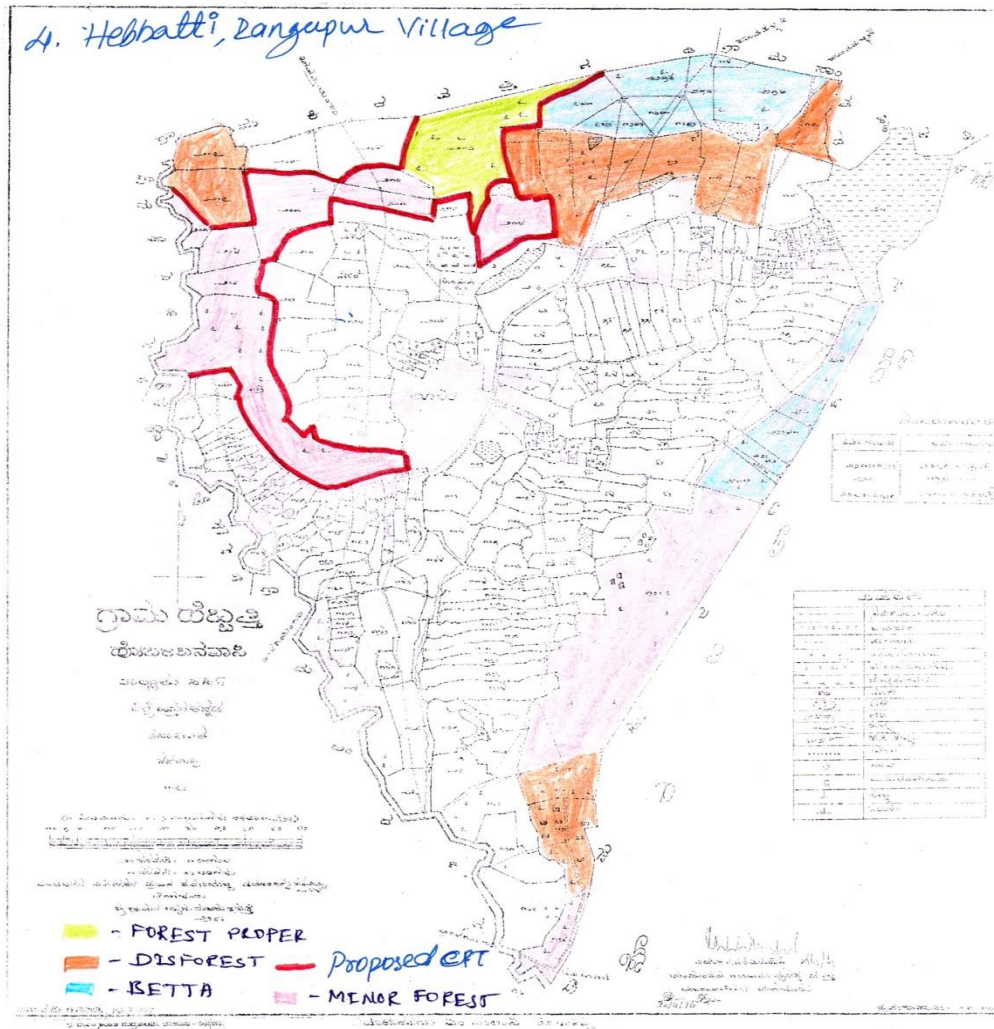


Figure 9: Hebbatti-Rangapur forest showing forest area proposed to be protected by CPT



**Figure 10: A base burned tree in encroached area; Figure 11: A sacred place within forest
Figure 12: Ring barked tree in encroached area**

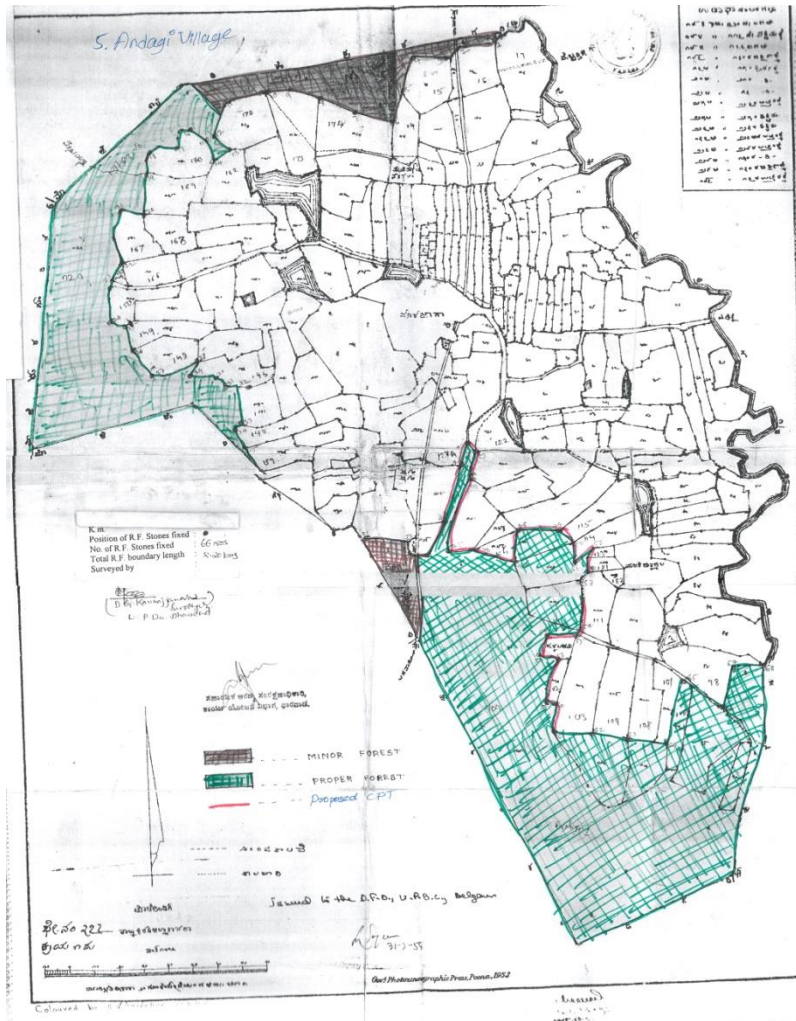


Figure 13: Andagi village map teak plantation (south side) requiring CPT.



Figure 14: Teak plantation requiring CPT protection

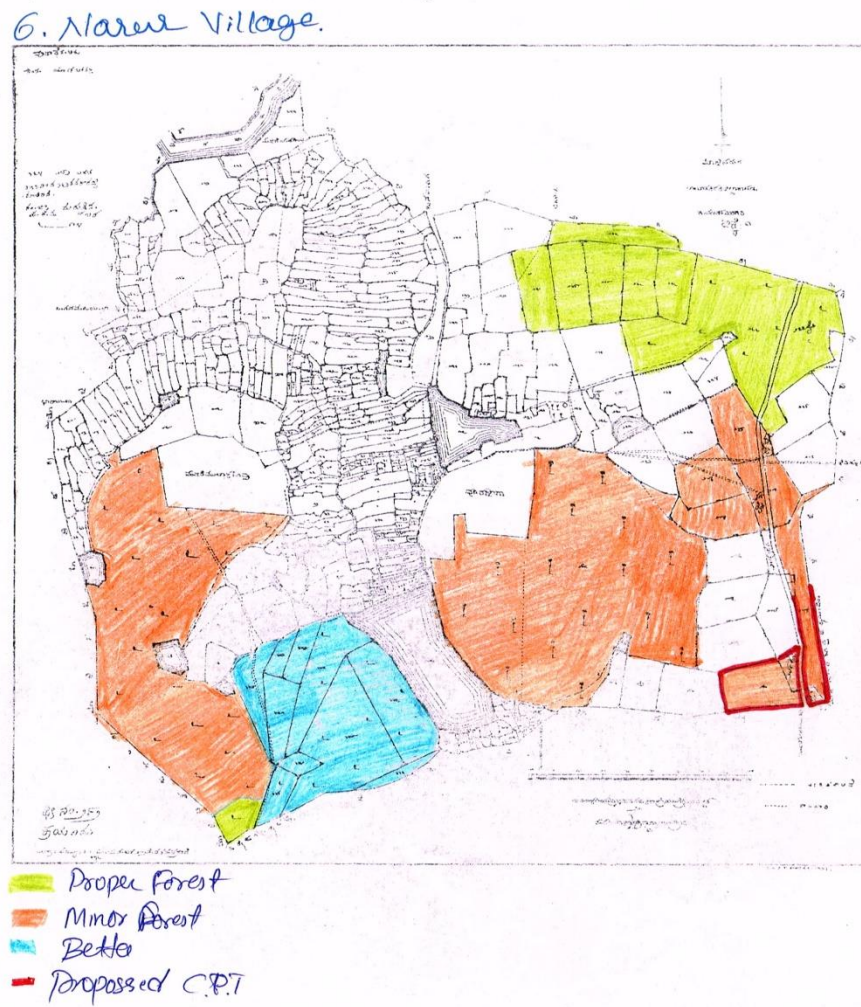


Figure 15: Narur village showing forest area requiring CPT (bottom-south corner)



Figures 16 & 17: Views of Narur forest

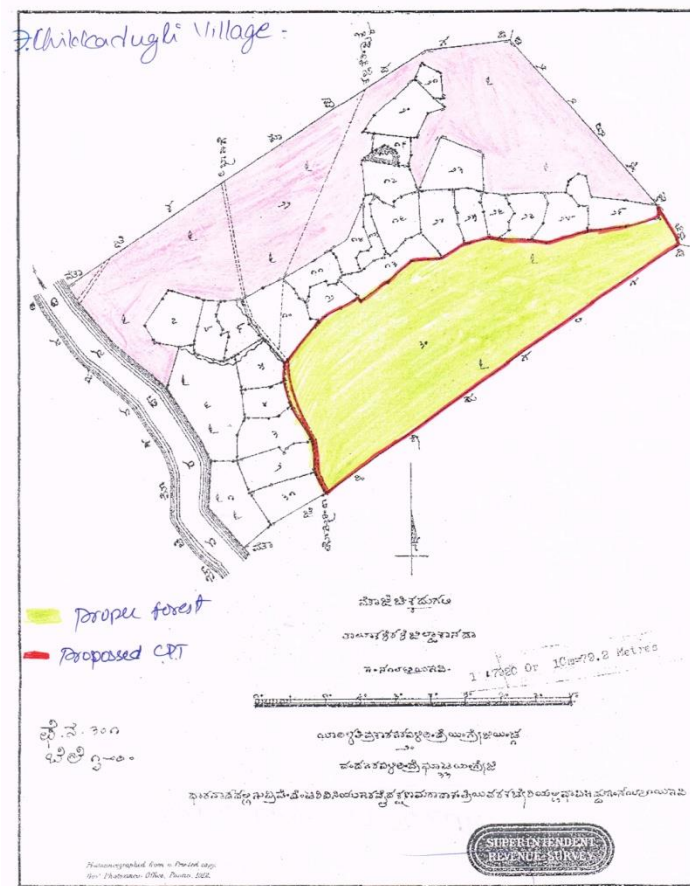


Figure 18: Chikkadugli village showing forest area requiring CPT



Figure 19: Studying the forest;
January



Figure 20: A well inside forest showing high water table in

**CONSERVATION OF FRAGMENTED FORESTS IN
BANAVASI RANGE, SIRSI FOREST DIVISION**

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