



GOVERNMENT ARTS & SCIENCE COLLEGE, KARWAR
(Autonomous Institution under KU Dharwad)
UTTARA KANNADA DISTRICT



Accredited by NAAC with "A" Grade with CGPA of 3.03 and RUSA funded

E mail; shivanandbhatgfc@gmail.com

Ref No: GAS CLG: KWR BOTANY: 2020-21/01

Date: 31/08/2020

To,

The Executive Engineer

KUWS& D Board Division

Karwar.

Sir

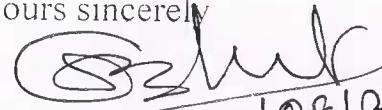
Sub: Conduct of Plant diversity studies of proposed vented
barrage across river Gangavali.

With reference to the above mentioned subject, we have conducted Plant diversity studies in the banks of River Gangavali – In view of Construction of Vented Barrage at Honnalli, Ankola, Uttara Kannada, Karnataka" as per the requirement (Your letter no.KWB/ACT/EE-KWR/ Vented barrage/2020-21/564/ dated 30/07/ 2020).

I am here with attached 04 copies of detailed report for your reference. It is requested to arrange to pay remaining amount at the earliest.

Thanking you

Yours sincerely


31/08/2020

**“Plant diversity studies in the banks of
River Gangavali – In view of Construction
of Vented Barrage at Honnalli, Ankola,
Uttara Kannada, Karnataka”**

Report Prepared and Submitted to

**Office of the Assistant Executive Engineer,
Karnataka Urban Water Supply & Drainage Board,
Sub-Division, Kajubagh, Karwar – 581301
Karnataka**

By

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August 2020



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CERTIFICATE

This is to certify that the Project entitled **"Plant diversity studies in the banks of River Gangavali – In view of Construction of Vented Barrage at Honnali, Ankola, Uttara Kannada, Karnataka"** to be executed by Karnataka Urban Water Supply & Drainage Board, under Providing water supply to Project Seabird, Karwar- Ankola towns, enroute villages and Grasim Industries Ltd., Binaga, is carried out based on the standard practice.

Shivanand S. Bhat

Assistant Professor and HOD Botany

Government Arts and Science College, Karwar

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Introduction

Gangavalli River is also called as Bedthi River. It originates from the Western Ghats the south of Dharwad Near Someshwara temple as Shalmala river. It flows in the west direction to meet the Arabian sea near Ankola . Here the River embraces the name Gangavalli from the Goddess Ganga; the village in this area carries the same name called Gangavalli. This stream joins at Kalghatgi about 30 km (19 mi) lower down to the Bedthi River that takes its birth near Hubli. As Bedthi stream reaches the core of Western Ghat region it is known to be river Gangavali and its overall catchment area spread across 3935 sq.kms (Ramachandra et.al, 2017). River then flows west and then south-west for a total distance of 69 km. This river has a catchment area of 3,574 km² (1,380 sq mi) and has a total length of 152 km. On its course towards the Arabian Sea, the river falls from a height of 180 meter at a point called Magod. Manjaguni.Ennehole, Vibhutihole, Shalmala, Sonda, Devara Kodluhole are the major tributaries of river Gangavali.

The bed fall of the river is gentle for the first 72 km. After that point the river bed falls rapidly with a clear over fall of 183 m (600 ft) at Magod and is popularly known as The Magod Falls. Afterwards river runs in deep gorges with a steep bed falls. The Sonda (the tributary of Bedthi River) joins the river after the falls. The Ganagavalli village is 11 km (7 mi) away from the Ankola town. This river flows through Dharwad and Uttar Kannada districts. The river has dense evergreen and semi-evergreen forests along its path.

Ganagavalli river basin receives a large amount of rainfall in the Evergreen and semi evergreen forest zones of Uttara Kannada. Mean annual rainfall ranges from 1,700 mm (Dharwad and Kalghatagi region) to 6,000 mm (Western Ghats of Uttara Kannada). Approximately 90% of the rainfall is received during the month of June to September. There

is some rainfall in the post monsoon season in the form of thundershowers mostly during October and some rainfall also occurs during the summer months of April and May. During heavy monsoons (July month), the river floods to nearby villages like Agasoor, Gundabala, Honnali, Santepete, Holebagilu, Hosakambi etc., and dumps dirt, wood, litter and dead animals to lands of the villages on its bank creating major problems to villagers.

Relative humidity is very high during day time exceeds 75% for most times of the year. During the months of monsoon, the relative humidity is approximately 60%. During the driest months (January to March), the relative humidity in the afternoon is usually less than 35%.

Urban Water Supply and Drainage Board, Office of the Assistant Executive Engineer sub-division Karwar intended to construct vented barrage across the Gangavali river at Honnali (approved letter number NAE/36/UWS/2015, Bangalore 10.10.2017). The proposed vented barrage having the storage capacity of 10858 ML to cater water demand for four months during the summer periods (120 days), considering the rise in the water demand up to 2068 to Project Sea Bird, Karwar, Ankola, enroute villages, and M/s. Aditya Birla Company. In this regard, study on Plant diversity in the valley of river Gangavali is being carried out by the Department of Botany, Government Arts and Science College, Karwar with the following objectives:

Objectives

1. To study the tree diversity in the proposed project area in both sides of the river banks (Honnavar and Karwar forest division) of Gangavali from Honalli to Hosakambi village and Gundbala to Hosakambi.
2. To study the Medicinal and other plant species (Herbs and Shrubs) in the proposed project area in both sides of the river banks (Honnavar and Karwar forest division) of Gangavali from Honalli to Hosakambi village and Gundbala to Hosakambi.
3. To document the list of Endemic species in the study area.

Materials and Method:

The whole study area was thoroughly visited through walking and mapped. 10 different locations were selected on both the banks of river Gangavali in the study area for plant diversity enumeration. The quadrates were laid out with a size of 100m×10m in each site for the enumeration of trees and other types of plants like herbs, shrubs and climbers. 100 meter is the length along the bank and 10-meter width from the edge of the water has been considered as a Quadrate.

All such plants in the quadrates plotted (by adopting random sampling approach) were documented. Tree species having an approximate girth at breast height (GBH) of 15cm were considered as trees and their numbers were counted. Field study was conducted from 08/08/2020 to 25/08/2020.

Results:

1. Tree diversity enumeration

The study area is covered with a dense Evergreen and Semi evergreen forest. The present study reveals that, there are 66 tree species, which are distributed under 25 families of Angiosperms. Trees of family Moraceae (07 species), Fabaceae (06 species), Anacardiaceae (06 species), Malvaceae (05 species) are dominant in the study area. (shown in Fig. 1). All tree species found in the study area are very useful with more than two or more uses. Some of them are timber yielding, medicinal, fruit and biofuel yielding. All tree species are commercially very important and having a great ecological significance. During the survey it was observed that the human population of the area are rural and depends upon agriculture and forests for their existence. It was also found that people uses the plant species for medicinal, timber, fuel wood, fodder, ornamental, agricultural tools, Aromatic etc. Information on uses of 66 tree species has been recorded during the survey. List of trees, Family name, Local name and uses have been mentioned in the **Table 1**.

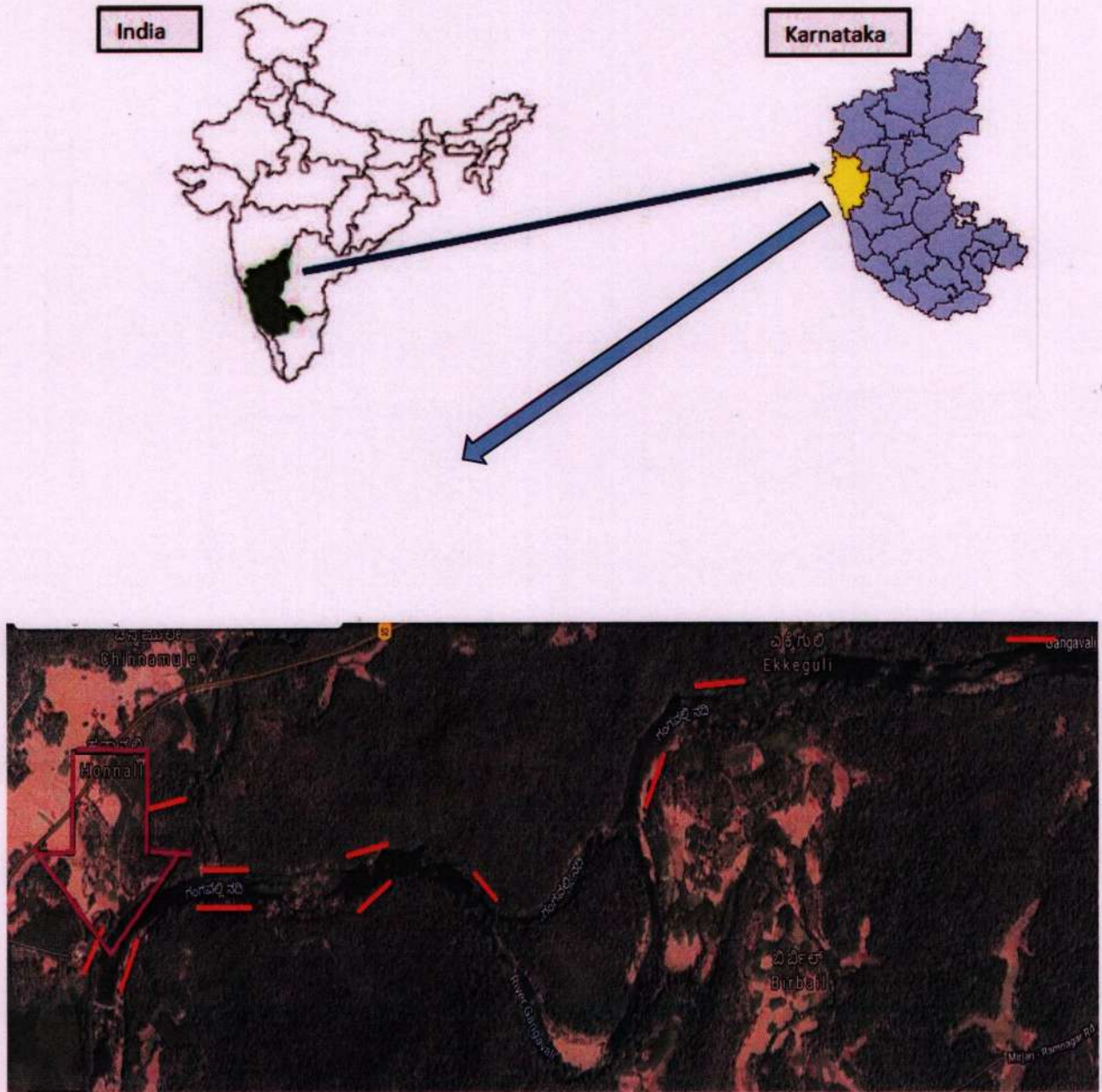
Table 1. List of tree species

SCIENTIFIC NAME	Family	LOCAL NAME	Uses
<i>Acacia ariculiformis</i>	Fabaceae	Acacia	Timber
<i>Albizia odoratissima</i>	Fabaceae	Baise	Medicinal
<i>Albizzia amara</i> (Roxb.) B. Boivin	Fabaceae	Bilkambi	Medicinal
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Haale	Medicinal
<i>Aporosa cardiosperma</i> (Gaertn.) Merr.	Phyllanthaceae	Salle hannu mara	Fruit
<i>Arenga wightii</i> Griff.	Arecaceae	Hichlu	Fruit
<i>Artocarpus gomezianus</i> Wall., ex Tree.	Moraceae	Vaate mara	Fruit/Timber

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<i>Subsp. zeylanicus</i> Jarrett			
<i>Artocarpus heterophylla</i> Lam.	Moraceae	Halasu	Fruit/ Timber
<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	Holekavalu	Medicinal
<i>Bauhinia malabarica</i> Roxb.	Fabaceae	Basavanapada	Medicinal
<i>Bombax ceiba</i> L.	Malvaceae	Kempu buruga	Medicinal
<i>Buchnanania cochinchinensis</i> (Lour.) M. R. Almeida	Anacardiaceae	Jangli	Fruit
<i>Calophyllum tomentosum</i> Wight.	Clusiaceae	Bobbi	Oil
<i>Canarium strictum</i> Roxb.	Burseraceae	Rala Dhupa	Dhupa
<i>Carellia bracheata</i> (Lour.) Merr.	Rhizophoraceae	Andamurugal	Fruit
<i>Careya arborea</i> Roxb.	Lecythidaceae	Kavale mara	Timber/ Fruit
<i>Caryota urens</i> L.	Arecaceae	Baine	Medicinal
<i>Cordia myxa</i> L.	Boraginaceae	Challe	Fruit/ Gum
<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Kanagilu	Timber/ Fruit
<i>Diospyros malabarica</i> (Desr.) Kostel.	Ebenaceae	Balagini	Medicinal
<i>Diosyrous peniculata</i> Dalzell	Ebenaceae	Gurani	Medicinal
<i>Ficus benghalensis</i> L.	Moraceae	Aalada mara	Medicinal
<i>Ficus callosa</i> Willd.	Moraceae	Geratte	Medicinal
<i>Ficus drupacea</i> Thunb	Moraceae	Goni	Medicinal
<i>Ficus racemosa</i> L.	Moraceae	Atti	Fruit/Medicinal
<i>Ficus virens</i> Aiton.	Moraceae	Basari	Medicinal
<i>Flacourtia montana</i> J. Graham.	Salicaceae	Huli sampige	Fruit
<i>Garcinia indica</i> (Thouars) Choisy	Clusiaceae	Murugalu	Fruit/Medicinal
<i>Garuga pinnata</i> Roxb.	Burseraceae	Gojjalu	Timber

Map of the Study area



Gangavali River of Ankola, Uttara Kannada

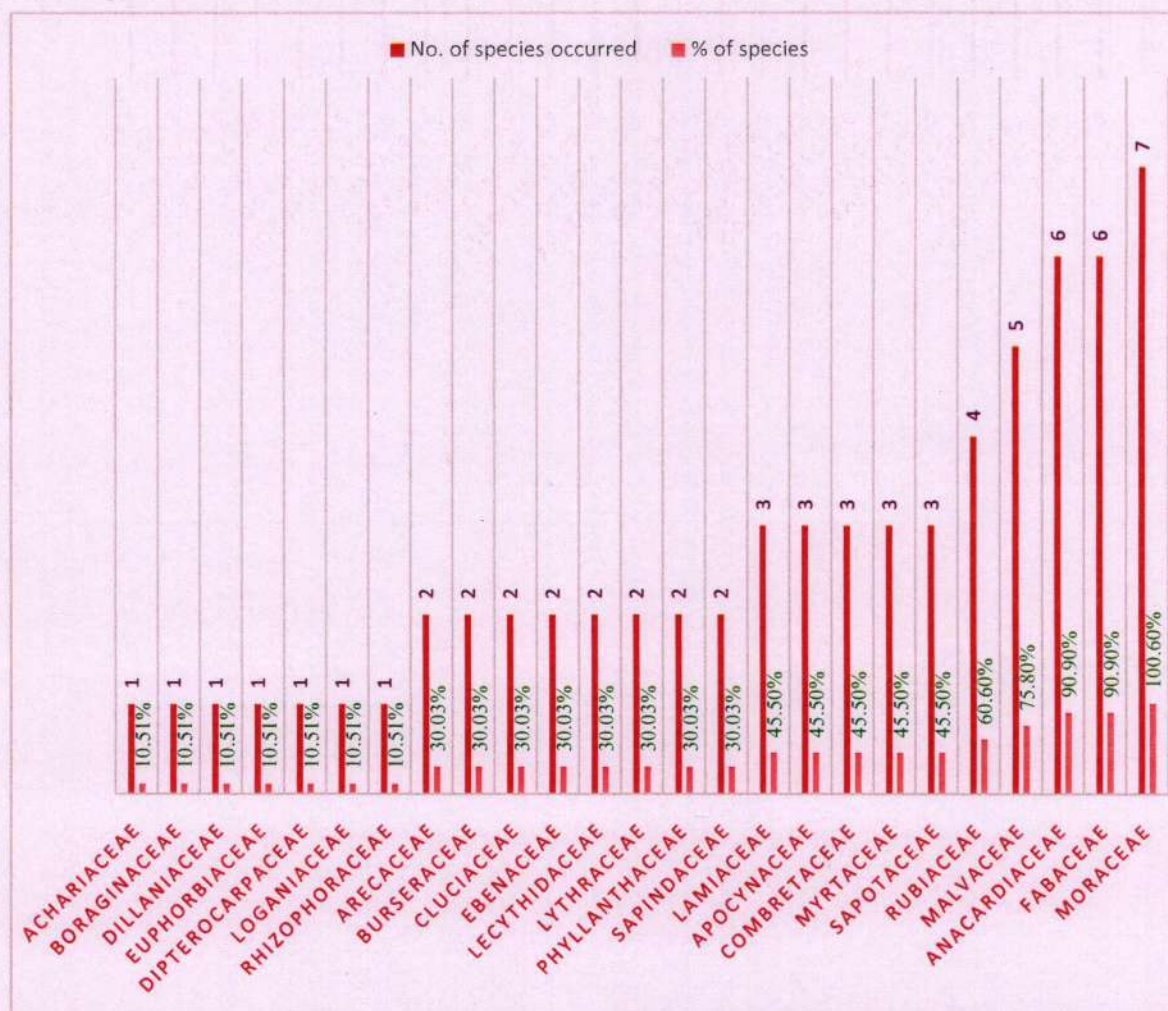
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<i>Gmelina arborea</i> Roxb.	Lamiaceae	Shivani	Medicinal
<i>Grewia tiliifolia</i> Vahl	Malvaceae	Dadasal mara	Fruit
<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Rubiaceae	Heddi	Medicinal
<i>Helicteris isora</i> L.	Malvaceae	Yeda muri	Fibre/Medicinal
<i>Holigama arnottiana</i> Hook.f.	Anacardiaceae	Holegeri	Oil
<i>Hopea ponga</i> (Dennst.) Mabb.	Dipterocarpaceae	Haiga/ Karimara	Timber
<i>Hydnocarpus pentandra</i> (Buch.-Ham.) Oken	Achariaceae	Yenne mara	Oil
<i>Ixora brachiata</i> Roxb.	Rubiaceae	Guraani mara	Medicinal
<i>Lagerstroemia microcarpa</i> Wight	Lythraceae	Nandi	Timber
<i>Lagestromia speciosa</i> (L.) Pers.	Lythraceae	Holedaasavaala	Timber
<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	God-da mara	
<i>Macarangapeltata</i> (Roxb.) Muell. Arg	Euphorbiaceae	Hangaraka	Medicinal
<i>Madhuca longifolia</i> J F.Macbr.	Sapotaceae	Hippe	Oil
<i>Mangifera indica</i> L.	Anacardiaceae	Maavu	Fruit
<i>Mimusops elengi</i> L.	Sapotaceae	Bakula	Fruit
<i>Mytragyna parviflora</i> (Roxb.) Korth	Rubiaceae	Kadaga mara	Medicinal
<i>Neolamarkia cadamba</i> (Roxb.) Bosser	Rubiaceae	Kadamba/ Apathi	Medicinal
<i>Palaquim ellipticum</i> (Dalzell) Bail.	Sapotaceae	Hansale	Fruit
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Nelli	Fruit/ Medicinal
<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Honge	Oil
<i>Sapindus trifoliatu</i> s L.	Sapindaceae	Antumara	Medicinal
<i>Schleichera olosa</i> (Lour.) Merr.	Sapindaceae	Saagade	Soft wood

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<i>Semicarpus anacardium</i> L.f	Anacardiaceae	Gudde Geru	Fruit
<i>Spondias indica</i> (Wight & Arn.) Airy Shaw & Formn	Anacardiaceae	Kaadu amate	Fruit
<i>Sterculia foetida</i> L.	Malvaceae	Peenari mara	Timber
<i>Strychnos nux-vomica</i> L.	Loganiaceae	Kasarka	Medicinal
<i>Syzygium caryophyllatum</i> (L.) Alston	Myrtaceae	Kuntu Nerale	Fruit
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Nerale	Fruit
<i>Syzygium zeylanicum</i> (L.) DC.	Myrtaceae	Jogi mara/ Kadlavanga	Timber
<i>Tabernaemontana alternifolia</i> L.	Apocynaceae	Kokke kayi	Medicinal
<i>Tectona grandis</i> L.f.	Lamiaceae	Saguvani	Timber
<i>Terminalia arjuna</i> (Roxb.ex DC.) Wight&Arn.	Combretaceae	Holematti	Medicinal
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Matti	Timber/ Fruit
<i>Terminalia peniculata</i> Roth	Combretaceae	Kindal	Timber
<i>Thespesia populnea</i> (L.) Sol.	Malvaceae	Haldi huvu	Medicinal
<i>Vitex altissima</i> L.f.	Lamiaceae	Bharanagi	Timber
<i>Wrightia tinctoria</i> (Roxb.)R. Br	Apocynaceae	Kare kodsga	Medicinal
<i>Xylia xylocarpa</i> (Roxb.) Taub.	Fabaceae	Jamba	Timber

Fig. 01. Familial distribution of Tree species



Among those 66 tree species recorded 26 species (39.40%) are medicinal. These plants are used for fever, diabetes, cancer, obesity, acidity etc., *Canarium strictum*, *Alstonia scholaris*, *Barringtonia acutangula*, *Bombax ceiba*, *Ficus callosa*, *Strychnos nux-vomica*, *Terminalia arjuna* are the some of the dominant medicinal plants in the study area.

18 tree species (27.28%) yield fruits. *Aporosa cardiosperma*, *Buchnanian cochinchinensis*, *Carellia bracheata*, *Grewia tiliifolia*, *Mangifera indica*, *Mimusops elengi*, *Syzygium cumini*, *Phyllanthus indica*, *Artocarpus heterophylla*, *Garcinia indica* are the major edible fruit species of this forest.

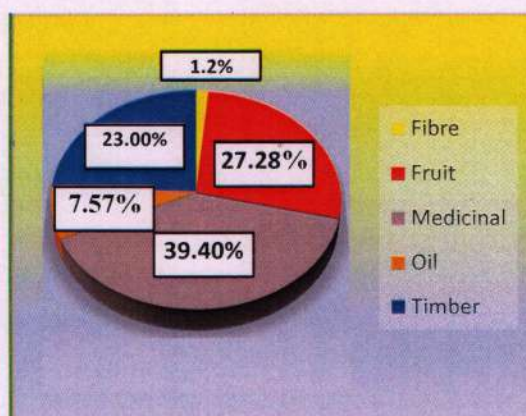
These fruit yielding plant species play an important role in maintaining and balancing the food chain in this forest ecosystem. Many species of Birds, Monkeys, Bats and other animals are depending upon these fruit yielding plants for their food. Sometimes local people will harvest these wild edible fruits and it is used for making juice (Kokum) and other local preparations.

Lagerstroemia microcarpa, *Tectonagrandis*, *Terminalia peniculata*, *Vitex altissima*, *Dilleniapentagyna* are the major timber yielding tree species of the study area.

More than 2000 such trees will be immersed in the water due to this project. But this project will not much affect the population of *Terminalia ajruna* because most of the old trees are in the river or in the river bank. Locally *Terminalia ajruna* is called Holemati (Terminalia growing near or in the river). A total of 05 species (7.57%) of oil yielding species is being recorded in the study area. *Calophyllum tomentosum* (Sura Honne), *Madhuca longifolia* (Hippe), *Pongamia pinnata* (Honge) are the important biofuel yielding plants recorded. Birds and Animals will eat the fruits of these plants.

Regeneration status of these species is also good in the study area. Usage category of tree species is shown in the fig.2.

Fig. 02. Usage category of tree species



Girth class analysis:

Individuals with girth ≥ 15 cm at breast height (GBH) were measured at 1.3 m above ground level (Dallmeier et al. 1992). The trees were grouped into seven girth classes: 15 - 30 cm, 31- 60 cm, 61 - 90 cm, 91 - 120 cm, 121 - 150 cm, 151cm and above. Tree species having an approximate girth at breast height (GBH) of 15 cm were considered as trees and their numbers were counted. Maximum number of trees (346 trees-21%) were found between the GBH 31-60cm and followed by the GBH 91-120cm (309 trees-19%), GBH 61-90cm (298 trees-18%), GBH 15-30cm (283 trees-16%), GBH 121 to 150cm (227 trees-14%), GBH 151cm and above (158 trees-10%). Botanical name of the tree species and their girth class in cm is given in the table 2.

Table 2. Girth class of the trees:

Botanical name	Girth Class in cm						
	15-30	31-60	61-90	91-120	121-150	151 and above	Total
<i>Acacia ariculiformis</i>	4	13	5	8	4	2	36
<i>Albizia odoratissima</i>	2	1	3	0	1	1	8
<i>Albizzia amara</i> (Roxb.) B. Boivin	3	1	0	0	0	3	7
<i>Alstonia scholaris</i> (L.) R. Br.	2	2	1	2	2	0	9
<i>Aporosa cardiosperma</i> (Gaertn.) Merr.	11	11	8	8	0	0	38
<i>Arenga wightii</i> Griff.	0	0	0	1	0	0	1
<i>Artocarpus gomezianus</i> Wall. ex Tree. Subsp. <i>zeylanicus</i> Jarrett	0	0	1	1	1	0	3
<i>Artocarpus heterophylla</i> Lam.	0	0	0	2	2	3	7

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<i>Barringtonia acutangula</i> (L.) Gaertn.	7	8	5	6	2	4	32
<i>Bauhinia malabarica</i> Roxb.	3	1	0	0	0	0	4
<i>Bombax ceiba</i> L.	3	4	3	7	8	0	25
<i>Buchnanania cochinchinensis</i> (Lour.) M. R. Almeida	2	6	4	9	0	0	21
<i>Calophyllum tomentosum</i> Wight.	2	3	6	3	2	0	16
<i>Canarium strictum</i> Roxb.	1	0	1	0	0	0	2
<i>Carellia bracheata</i> (Lour.) Merr.	2	2	3	1	2	1	11
<i>Careya arborea</i> Roxb.	1	4	4	2	5	1	17
<i>Caryota urens</i> L.	2	3	3	1	1	0	10
<i>Cordia myxa</i> L.	4	1	1	1	4	0	11
<i>Dillenia pentagyna</i> Roxb.	2	5	0	1	1	5	14
<i>Diospyros malabarica</i> (Desr.) Kostel.	6	6	1	1	2	0	16
<i>Diosyrous peniculata</i> Dalzell	2	1	1	3	0	0	7
<i>Ficus benghalensis</i> L.	0	2	1	1	4	5	13
<i>Ficus callosa</i> Willd.	3	9	2	4	0	0	18
<i>Ficus drupacea</i> Thunb	1	2	1	0	0	0	6
<i>Ficus racemosa</i> L.	2	5	4	8	3	2	24
<i>Ficus virens</i> Aiton.	1	0	0	5	5	2	13
<i>Garcinia indica</i> (Thouars)	2	1	9	11	8	0	31

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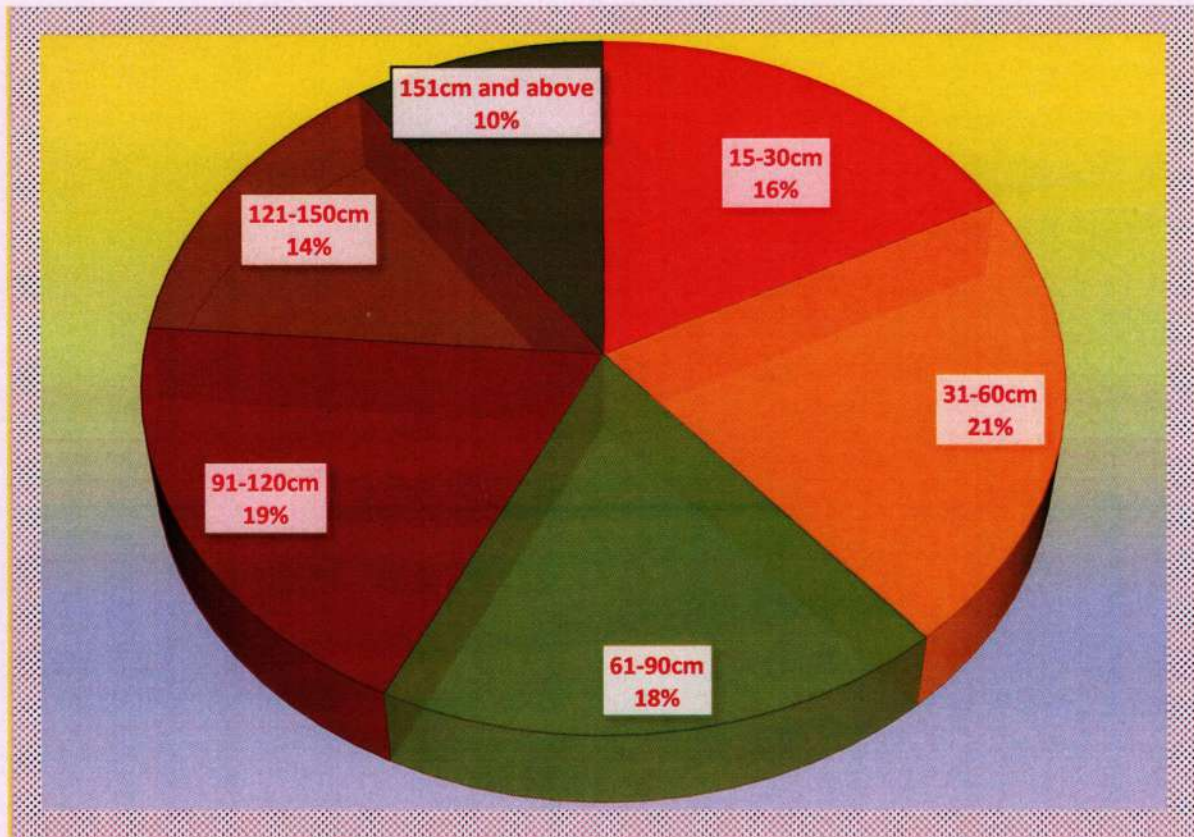
Choisy							
<i>Gmelina arborea</i>	3	04	0	0	0	0	07
<i>Garuga pinnata</i> Roxb.	1	6	1	1	0	0	9
<i>Grewia tiliifolia</i> Vahl	3	7	3	2	1	0	17
<i>Haldina cordifolia</i> (Roxb.) Ridsdale	1	8	6	5	8	1	29
<i>Helicteris isora</i> L.	5	1	1	0	0	0	7
<i>Holigama arnottiana</i> Hook.f.	7	10	6	18	12	5	59
<i>Hopea ponga</i> (Dennst.) Mabb.	2	2	4	2	1	1	12
<i>Hydnocarpus pentandra</i> (Buch.- Ham.) Oken	3	2	5	4	2	2	18
<i>Ixora brachiata</i> Roxb.	5	6	6	0	0	0	17
<i>Lagerstroemia microcarpa</i> Wight	13	20	31	21	16	18	122
<i>Lagestromia speciosa</i> (L.) Pers.	2	6	7	2	8	6	31
<i>Lannea coromandelica</i> (Houtt.) Merr.	7	8	9	3	4	0	31
<i>Macaranga peltata</i> (Roxb.) Muell. Arg	19	11	6	7	2	0	45
<i>Madhuca longifolia</i> J F.Macbr.	4	3	3	2	1	0	13
<i>Mangifera indica</i> L.	6	11	2	17	9	8	53
<i>Mimusops elengi</i> L.	2	2	9	4	5	0	23
<i>Mytragyna parviflora</i> (Roxb.) Korth	3	5	5	4	4	1	24

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<i>Neolamarckia cadamba</i> (Roxb.)Bossier	4	1	0	0	2	0	07
<i>Palaquim ellipticum</i> (Dalzell) Bail.	2	2	1	1	0	0	7
<i>Phyllanthus emblica</i> L.	5	10	0	0	0	0	18
<i>Pongamia pinnata</i> (L.) Pierre	2	7	3	6	3	2	23
<i>Sapindus trifolius</i> L.	1	2	1	2	1	2	9
<i>Schleichera oliosa</i> (Lour.) Merr.	8	8	17	9	9	6	57
<i>Semicarpus anacardium</i> L.f	5	4	5	3	6	1	24
<i>Spondias indica</i> (Wight & Arn.) Airy Shaw & Formn	1	2	0	1	0	0	4
<i>Sterculia foetida</i> L.	1	1	3	0	1	0	6
<i>Strychnos nux-vomica</i> L.	9	11	13	11	8	6	58
<i>Syzygium caryophyllatum</i> (L.) Alston	4	9	11	0	0	0	24
<i>Syzygium cumini</i> (L.) Skeels	3	7	8	8	8	9	43
<i>Syzygium zeylanicum</i> (L.) DC.	4	0	3	1	1	3	12
<i>Tabernaemontana alternifolia</i> L.	11	2	0	0	0	0	13
<i>Tectona grandis</i> L.f.	11	8	8	14	12	15	68
<i>Terminalia arjuna</i> (Roxb.ex DC.) Wight&Arn.	21	32	23	41	14	11	142

<i>Terminalia bellirica</i> (Gaertn.) Roxb.	8	9	6	11	13	7	54
<i>Terminalia peniculata</i> Roth	15	17	13	14	11	18	88
<i>Thespesia populnea</i> (L.) Sol.	6	4	1	1	0	0	12
<i>Vitex altissima</i> L.f.	2	3	3	1	3	5	17
<i>Wrightia tinctoria</i> (Roxb.)R. Br	3	2	4	1	0	0	10
<i>Xylia xylocarpa</i> (Roxb.) Taub.	3	2	4	6	4	2	21
Total no. of species	283	346	298	309	227	158	1621

Fig. 03. Girth class analysis



2. Diversity of Herbs, Shrubs and Climbers:

A total of 87 species of Herbs, shrubs and Climbers were recorded. Among these category shrubs are dominant (38 species, 44%), followed by Herbs (25 species, 29%) and climbers (23 species, 27%). Bushes are more common in the study area because of the presence of different species of climbers like *Argyreia nervosa*, *Abrus precatorius*, *Aristolochia indica*, *Gnetum ula*, *Getonia floribunda*, *Maullava spicata*. Climbers and Shrubs in clusters (“habitat circles”) that will create the dense cover. This dense clusters of stems of Shrubs and Climbers are best for many birds and other animals to nest within, but some species of birds need a more open branch structure to build their nests upon.

Among these groups of plants many are medicinal and fruit yielding. List of Herbs, Shrubs and Climbers and other details were provided in **Table. 3**

Table 3. List of Herbs, Shrubs and Climbers in the study area.

Botanical name	Family	Habit	Local name	Uses
<i>Abelmoschus menihot</i>	<i>Malvaceae</i>	<i>Shrub</i>	<i>Kadbende</i>	<i>Medicinal</i>
<i>Abrus precatorius</i>	<i>Fabaceae</i>	<i>Climber</i>	<i>Gulgunji</i>	<i>Medicinal</i>
<i>Abutilon indicum</i>	<i>Malvaceae</i>	<i>Shrub</i>	<i>Badramusti</i>	<i>Medicinal</i>
<i>Acampe praemorsa</i>	<i>Orchidaceae</i>	<i>Herb</i>	<i>Dande huvu</i>	<i>Ornamental</i>
<i>Aericaulon achiton</i>	<i>Areceae</i>	<i>Herb</i>	<i>Jondi</i>	<i>Weed</i>
<i>Agave sisalana</i>	<i>Asparagaceae</i>	<i>Shrub</i>	<i>Naaru gida</i>	<i>Medicinal</i>
<i>Amorphophallus commutatus</i>	<i>Araceae</i>	<i>Herb</i>	<i>Suvarnagadde</i>	<i>Medicinal</i>
<i>Ampelocissus indica</i>	<i>Vitaceae</i>	<i>Climber</i>	<i>Kaak maari</i>	<i>Medicinal</i>
<i>Anamirtha coccilus</i>	<i>Menispermaceae</i>	<i>Climber</i>	<i>Kaagmaari balli</i>	<i>Medicinal</i>
<i>Antidesma ghaesembilla</i>	<i>Euphorbiaceae</i>	<i>Shrub</i>	<i>Ettina kaayi</i>	<i>Fruit</i>
<i>Argyreia nervosa</i>	<i>Convolvulaceae</i>	<i>Climber</i>	<i>Girgitti balli</i>	<i>Medicinal</i>

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<i>Aristolochia indica</i>	<i>Aristolochaceae</i>	<i>Climber</i>	<i>Batkoli huvu</i>	<i>Medicinal</i>
<i>Breynia vitis-idaea</i>	<i>Phyllanthaceae</i>	<i>Shrub</i>		<i>Medicinal</i>
<i>Bridelia retusa</i>	<i>Phyllanthaceae</i>	<i>Shrub</i>		<i>Medicinal</i>
<i>Caladium bicolor</i>	<i>Areceae</i>	<i>Herb</i>	<i>Bannada kesu</i>	<i>Ornamental</i>
<i>Calamus rotung</i>	<i>Arecaceae</i>	<i>Shrub</i>	<i>Betta</i>	<i>Fibre</i>
<i>Callicarpa tomentosa</i>	<i>Lamiaceae</i>	<i>Shrub</i>	<i>Nene batti ele</i>	<i>Medicinal</i>
<i>Canscora diffusa</i>	<i>Gentianaceae</i>	<i>Herb</i>		<i>Medicinal</i>
<i>Canthium coromandelicum.</i>	<i>Rubiaceae</i>	<i>Shrub</i>	<i>Khaari</i>	<i>Fruit</i>
<i>Capparis horrida</i>	<i>Capparidaceae</i>	<i>Climber</i>	<i>Kanave Balli</i>	<i>Medicinal</i>
<i>Carissa congesta</i>	<i>Apocynaceae</i>	<i>Shrub</i>	<i>Karanja Hannu</i>	<i>Fruit</i>
<i>Catunaregam spinosa</i>	<i>Rubiaceae</i>	<i>Shrub</i>	<i>Kaadu perale</i>	<i>Medicinal</i>
<i>Chasallia curviflora</i>	<i>Rubiaceae</i>	<i>Shrub</i>	<i>Garda paatala</i>	<i>Medicinal</i>
<i>Chromalina odorata</i>	<i>Asteraceae</i>	<i>Shrub</i>	<i>Congress</i>	<i>Weed</i>
<i>Clerodendrum paniculatum</i>	<i>Lamiaceae</i>	<i>Shrub</i>	<i>Teru huvu</i>	<i>Medicinal</i>
<i>Commelina maculata</i>	<i>Commelinaceae</i>	<i>Herb</i>		<i>Weed</i>
<i>Connarus monocarpus</i>	<i>Connaraceae</i>	<i>Climber</i>	<i>Mangana gajje</i>	<i>Medicinal</i>
<i>Costus speciosus</i>	<i>Zingiberaceae</i>	<i>Shrub</i>	<i>Aarti kunda</i>	<i>Medicinal</i>
<i>Crotalaria retusa</i>	<i>Fabaceae</i>	<i>Shrub</i>	<i>Gij giji gida</i>	<i>Weed</i>
<i>Cryptolepis buchananii</i>	<i>Apocynaceae</i>	<i>Climber</i>		<i>Medicinal</i>
<i>Cyathula prostrata</i>	<i>Amaranthaceae</i>	<i>Herb</i>	<i>Kadutraani</i>	<i>Weed</i>
<i>Cyclea peltata</i>	<i>Menispermaceae</i>	<i>Herb</i>	<i>Etna balli</i>	<i>Medicinal</i>
<i>Dendrobium ovatum</i>	<i>Orchidaceae</i>	<i>Herb</i>		<i>Ornamental</i>
<i>Dendrophthoe falcata</i>	<i>Loranthaceae</i>	<i>Herb</i>	<i>Bandalike</i>	<i>Parasite</i>
<i>Desmodium gangeticum</i>	<i>Fabaceae</i>	<i>Shrub</i>		<i>Medicinal</i>

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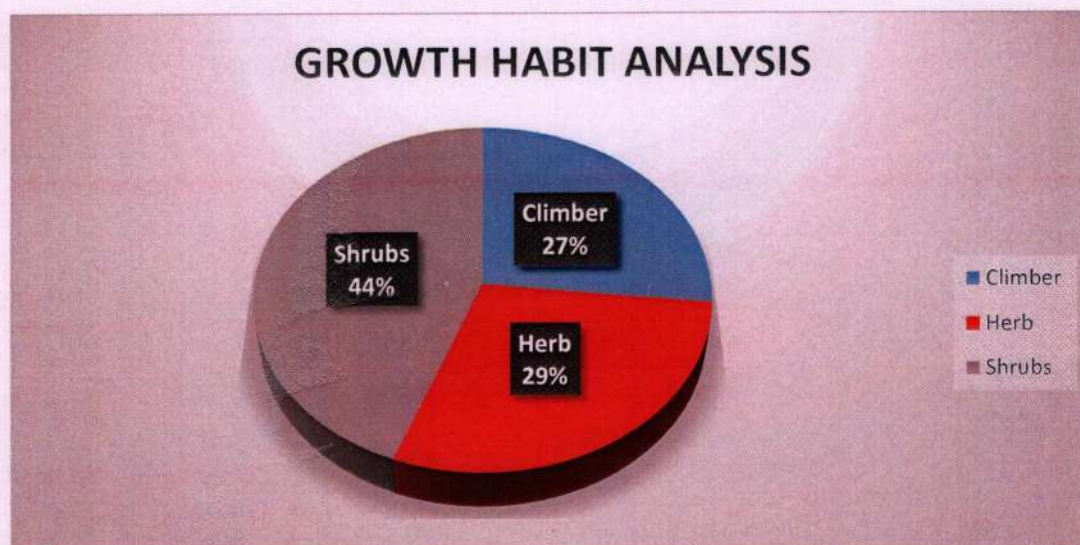
<i>Dioscorea oppositifolia</i>	<i>Dioscoriaceae</i>	<i>Climber</i>	<i>Neglagonne</i>	<i>Medicinal</i>
<i>Embelia ribes</i>	<i>Primulaceae</i>	<i>Shrub</i>	<i>Vaayu vidanga</i>	<i>Medicinal</i>
<i>Euphorbia neriifolia</i>	<i>Euphorbiaceae</i>	<i>Shrub</i>	<i>Kalli</i>	<i>Medicinal</i>
<i>Getonia floribunda</i>	<i>Combretaceae</i>	<i>Climber</i>	<i>Kul balli</i>	<i>Medicinal</i>
<i>Gloriosa supera</i>	<i>Liliaceae</i>	<i>Climber</i>	<i>Gouri huvu</i>	<i>Medicinal</i>
<i>Gnetum ula</i>	<i>Gnetaceae</i>	<i>Climber</i>	<i>Balli</i>	<i>Medicinal</i>
<i>Gnidia glauca</i>	<i>Thymelaeaceae</i>	<i>Shrub</i>	<i>Dantabhagna</i>	<i>Medicinal</i>
<i>Grangea maderaspatana</i>	<i>Asteraceae</i>	<i>Herb</i>	<i>Gadde gonde</i>	<i>Weed</i>
<i>Gymnema sylvestre</i>	<i>Apocynaceae</i>	<i>Climber</i>	<i>Madhunaashini</i>	<i>Medicinal</i>
<i>Helicanthes elastica</i>	<i>Lorabnthaceae</i>	<i>Herb</i>	<i>Bandke</i>	<i>Parasite</i>
<i>Heliotropium indicum</i>	<i>Boraginaceae</i>	<i>Herb</i>	<i>Cholugida</i>	<i>Medicinal</i>
<i>Hemidesmus indicus</i>	<i>Apocynaceae</i>	<i>Herb</i>	<i>Parmal beru</i>	<i>Medicinal</i>
<i>Ichnocarpus frutescens</i>	<i>Apocynaceae</i>	<i>Climber</i>	<i>Vanmaali</i>	<i>Medicinal</i>
<i>Impatiens acaulis</i>	<i>Balsaminaceae</i>	<i>Herb</i>	<i>Sanna paati</i>	<i>Medicinal</i>
<i>Impatiens diversifolia</i>	<i>Balsaminaceae</i>	<i>Herb</i>	<i>Paathi gida</i>	<i>Medicinal</i>
<i>Pavetta indica</i>	<i>Rubiaceae</i>	<i>Shrub</i>		<i>Medicinal</i>
<i>Ixora coccinea</i>	<i>Rubiaceae</i>	<i>Shrub</i>	<i>Bili kusummaale</i>	<i>Fruit</i>
<i>Jasminum multiflorum</i>	<i>Oleaceae</i>	<i>Shrub</i>	<i>Kadmalgi</i>	<i>Medicinal</i>
<i>Jatropha gossypifolia</i>	<i>Euphorbiaceae</i>	<i>Shrub</i>	<i>Beli gida</i>	<i>Medicinal</i>
<i>Lantana camara</i>	<i>Lamiaceae</i>	<i>Shrub</i>	<i>Vaasne gonde</i>	<i>Weed</i>
<i>Laportea interrupta</i>	<i>Urticaceae</i>	<i>Herb</i>	<i>Chonige</i>	<i>Medicinal</i>
<i>Leea indica</i>	<i>Euphorbiaceae</i>	<i>Climber</i>		<i>Fruit</i>
<i>Melastoma malabathricum</i>	<i>Melastomaceae</i>	<i>Shrub</i>	<i>Kadgida</i>	<i>Medicinal</i>
<i>Memecylon edule</i>	<i>Melastomaceae</i>	<i>Shrub</i>	<i>Nili huvu</i>	<i>Medicinal</i>

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<i>Morinda citrifolia</i>	<i>Rubiaceae</i>	<i>Shrub</i>	<i>Noni</i>	<i>Medicinal</i>
<i>Moullava spicata</i>	<i>Fabaceae</i>	<i>Climber</i>	<i>Kempuvu</i>	<i>Medicinal</i>
<i>Naravelia zeylanica</i>	<i>Ranunculaceae</i>	<i>Climber</i>	<i>Turke balli</i>	<i>Medicinal</i>
<i>Oxalis corniculata</i>	<i>Oxalidaceae</i>	<i>Herb</i>	<i>horamuchga</i>	<i>Weed</i>
<i>Passiflora foetida</i>	<i>Passifloraceae</i>	<i>Climber</i>	<i>Gadyar huvu</i>	<i>Medicinal</i>
<i>Pedaliium murex</i>	<i>Pedaliaceae</i>	<i>Herb</i>	<i>Kaadellu</i>	<i>Medicinal</i>
<i>Phyla nodiflora</i>	<i>Verbenaceae</i>	<i>Herb</i>	<i>Kadgonde</i>	<i>Weed</i>
<i>Phyllanthus amarus</i>	<i>Phyllanthaceae</i>	<i>Herb</i>	<i>Nelnelli</i>	<i>Medicinal</i>
<i>Phyllanthus reticulata</i>	<i>Phyllanthaceae</i>	<i>Herb</i>	<i>Shaayi kaayi</i>	<i>Medicinal</i>
<i>Pothos scandens</i>	<i>Araceae</i>	<i>Climber</i>	<i>Kulache</i>	<i>Medicinal</i>
<i>Rauwolfia serpentina</i>	<i>Apocynaceae</i>	<i>Shrub</i>	<i>Sarpagandha</i>	<i>Medicinal</i>
<i>Remusatia vipara</i>	<i>Areaceae</i>	<i>Herb</i>	<i>Marakesu</i>	<i>Medicinal</i>
<i>Ricinus communis</i>	<i>Euphorbiaceae</i>	<i>Shrub</i>	<i>Hallenne</i>	<i>Medicinal</i>
<i>Rincostylus retusa</i>	<i>Orchidaceae</i>	<i>Herb</i>	<i>Seetali</i>	<i>Ornamental</i>
<i>Salacia chinesis</i>	<i>Celastraceae</i>	<i>Shrub</i>	<i>Eknaika</i>	<i>Medicinal</i>
<i>Senna tora</i>	<i>Fabaceae</i>	<i>Herb</i>	<i>Tagate</i>	<i>Weed</i>
<i>Smilax zeylanica</i>	<i>Smilacaceae</i>	<i>Climber</i>		<i>Medicinal</i>
<i>Thottea siliquosa</i>	<i>Aristolochiaceae</i>	<i>Shrub</i>	<i>Chakrani</i>	<i>Medicinal</i>
<i>Tylophora indica</i>	<i>Apocynaceae</i>	<i>Climber</i>	<i>Kaphada balli</i>	<i>Medicinal</i>
<i>Urena lobata</i>	<i>Malvaceae</i>	<i>Herb</i>	<i>Bhatna jutta</i>	<i>Medicinal</i>
<i>Uvaria narum</i>	<i>Annonaceae</i>	<i>Shrub</i>	<i>Gobra balli</i>	<i>Medicinal</i>
<i>Vitex negundo</i>	<i>Lamiaceae</i>	<i>Shrub</i>	<i>Lakki soppu</i>	<i>Medicinal</i>
<i>Zingiber zerumbet</i>	<i>Zingiberaceae</i>	<i>Herb</i>	<i>Kaad shunti</i>	<i>Medicinal</i>
<i>Ziziphus glabrata</i>	<i>Rhamnaceae</i>	<i>Shrub</i>	<i>Kaad bogri</i>	<i>Medicinal</i>

<i>Ziziphus mauritiana</i>	<i>Rhamnaceae</i>	<i>Shrub</i>	<i>Bore Hannu</i>	<i>Fruit</i>
<i>Ziziphus oenoplia</i>	<i>Rhamnaceae</i>	<i>Shrub</i>	<i>kari mullannu</i>	<i>Fruit</i>
<i>Ziziphus rugosa</i>	<i>Rhamnaceae</i>	<i>Shrub</i>	<i>Bili mullannu</i>	<i>Fruit</i>

Fig. 04; Growth Habit analysis:



Endemic species:

Western Ghats, being one of the global hotspots of Biodiversity supports an enormous vegetal wealth, which over the years is undergoing great stress due anthropogenic disturbances. The narrow stretch of Western Ghats running approximately 1500km encompasses a considerable gradient of climatic conditions which have resulted in the development of diverse forest types ranging from the dry scrub types to evergreen forests. Nearly 5800 species of flowering plants occur here in which 2100 species are endemic (R. Raghavendra *et al*, 2013). A total of 13 plant species were recorded as an endemic species in the study area. Among these, 11 species are trees, 01 herb and 01 climber. List of endemic species is given in the table .4.

Table 4: List of Endemic species:

Sl. No.	Botanical Name	Family	Local name	Habit
01	<i>Amorphophallus commutatus</i> L.	Araceae	Suvarna gadde	Herb
02	<i>Diosyrous peniculata</i> Dalzell	Ebenaceae	Gurani	Tree
03	<i>Flacourtia montana</i> J. Graham.	Salicaceae	Huli sampige	Tree
04	<i>Garcinia indica</i> (Thouars) Choisy	Cluciaceae	Murugalu	Tree
05	<i>Holigama arnottiana</i> Hook.f.	Anacardiaceae	Holegeri	Tree
06	<i>Hopea ponga</i> (Dennst.) Mabb.	Dipterocarpaceae	Haiga/ Karimara	Tree
07	<i>Hydnocarpus pentandra</i> (Buch.-Ham.) Oken	Achariaceae	Yenne mara	Tree
08	<i>Impatiens diversifolia</i> Wall.ex Wight & Arn.	Balsaminaceae	Paathi gida	Herb
09	<i>Ixora brachiata</i> Roxb.	Rubiaceae	Guraani mara	Tree
10	<i>Lagerstroemia microcarpa</i> Wight	Lythraceae	Nandi	Tree
11	<i>Moullava spicata</i> (Dalzell.) Nicolson	Fabaceae	Kempuvu	Climber
12	<i>Palaquim ellipticum</i> (Dalzell) Bail.	Sapotaceae	Hansale	Tree
13	<i>Palaquim ellipticum</i> (Dalzell) Bail.	Sapotaceae	Hansale	Tree

Envisaged impact of vented barrage on Plant diversity:

Whenever rivers are turned in to reservoirs, habitat loss take place. The new lentic ecosystem resembles lake, but depending upon type of Vented barrage, surrounding biodiversity are disturbed by artificial water level fluctuations. Most of the time this will impact on the richness of the species. Studies in temperate environments affected by dams have found species changes (Jansson et al-2000; Nilson et al 2002) but have concluded that both richness and diversity are not the most sensitive indicators of effects of flow regulation (Dynesius et al 2004). In the present proposed vented barrage, water will be stored only for 3 to 4 months (February to May). So small structural change that occurs in the surrounding forest ecosystem. But it may impact on the primary and secondary consumers of the ecosystem, because some primary consumers are depending upon fruits like Mango, Kokum, Jack and other wild edible fruits. Usually fruiting season of the above mentioned plants occurs from February to May.

The proposed vented barrage will effect on Algal population in the downstream. Algal species like Spirogyra, Oedogonium, Betrachospermum, Diatoms are abundant in the river. Due to vented barrage saline water will be logged towards the barrage during high tide. This saline water will create a big negative impact on the growth of Algal species and other aquatic flora.

Flow regulation by vented barrage can affect the distribution of floating plants like Nymphyaea, Hydrilla, Azolla etc., The infestation of reservoirs by invasive aquatic weeds, for example, water hyacinth (Eichornia spp.), Pistia spp. is a major constraint on water resource management. The weeds grow rapidly, and flow regulation can cause the clogging up of river channels. Weed proliferation can alter the aquatic environment by decreasing light

penetration and depleting oxygen when they die and decompose. They also adversely affect native species.

One of the important Mangrove species in the river Gangavali is *Sonneratia caesiolaris*. It is commonly called as a mangrove apple tree. It is a medicinal plant and fruit of *S. caesiolaris* is edible. This will grow in Low salinity region near the estuary. When fresh water is blocked in a particular region, that will impact on the salinity of water and hence on the growth and regeneration of mangrove species like *Sonneratia caesiolaris*, *Rhizophora mucronata*, *Avicenia marina* etc. in the down streams of the river.

Management strategy to alleviate the negative impact:

The proposed vented barrage having the storage capacity of 10858 ML to cater water demand for four months during the summer periods (120 days) hence adapting the environmental friendly design in construction of vented barrage. Obviously vented barrage creates an artificial flood and this will damage the plant species in the banks of the river. So care should be taken to conserve the native plant species in the present study area.

Following observations were recorded during the study period:

Hence the width and depth of the river is very less, flooding is more common during monsoon in the study area. Lot of vegetation (uprooted trees and forest silts) are droned from the hilly region and it will be blocked in the proposed vented barrage. Usually flooding is more common during rainy season in the banks of Gangavli. Ankola- Hubli Highway (NH- 52) was blocked for few days in 2019 and 2020 during Monsoon because of the heavy rain in the catchment area and gave a major damage to the crop plants and life of the local people. The proposed vented barrage will enhance flooding in the adjacent villages during


monsoon by blocking the forest based debris. So care must be taken to prevent this artificial flooding.

Some of the local paddy varieties like Chitga, Chintamani, Phaluguna, Halga are being cultivated in the proposed project area extensively. It is very much essential to conserve such some valuable crop varieties.

Plant diversity is the source of food, fodder, fuel, medicine, wood, timber and non-timber forest produces for the people in the region. These species are found in abundance in the entire catchment. Some of the species recorded from the study area Endemic and Endangered. Therefore, conservation measure for such species is anticipated.

Conclusion

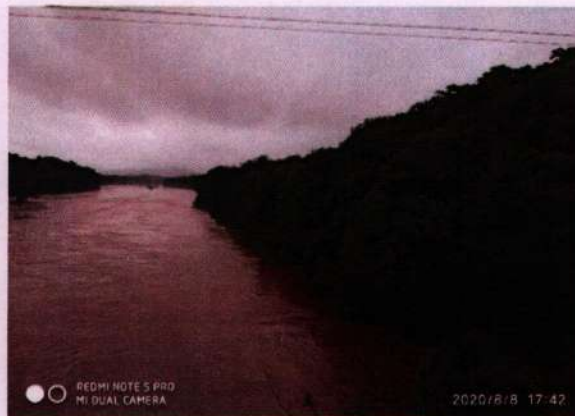
- The proposed vented barrage is surrounded by Evergreen and Semi evergreen forest. This reserve forest comprises a very rich diversity of endemic and endangered plant and animal species.
- Rain fall in the study area is very high.
- Care should be taken to conserve the plants and animals in the forest.


31/08/2020
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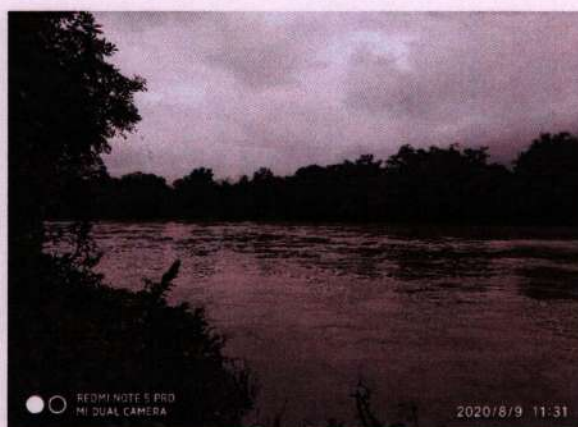
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RIVER GANGAVALI AND A PATCH OF LAGERSTROEMIA SPECIES



DURING FLOOD



RICH DIVERSITY OF TERMINALIA AND STRYCHNOUS TREES IN THE RIVER BANK



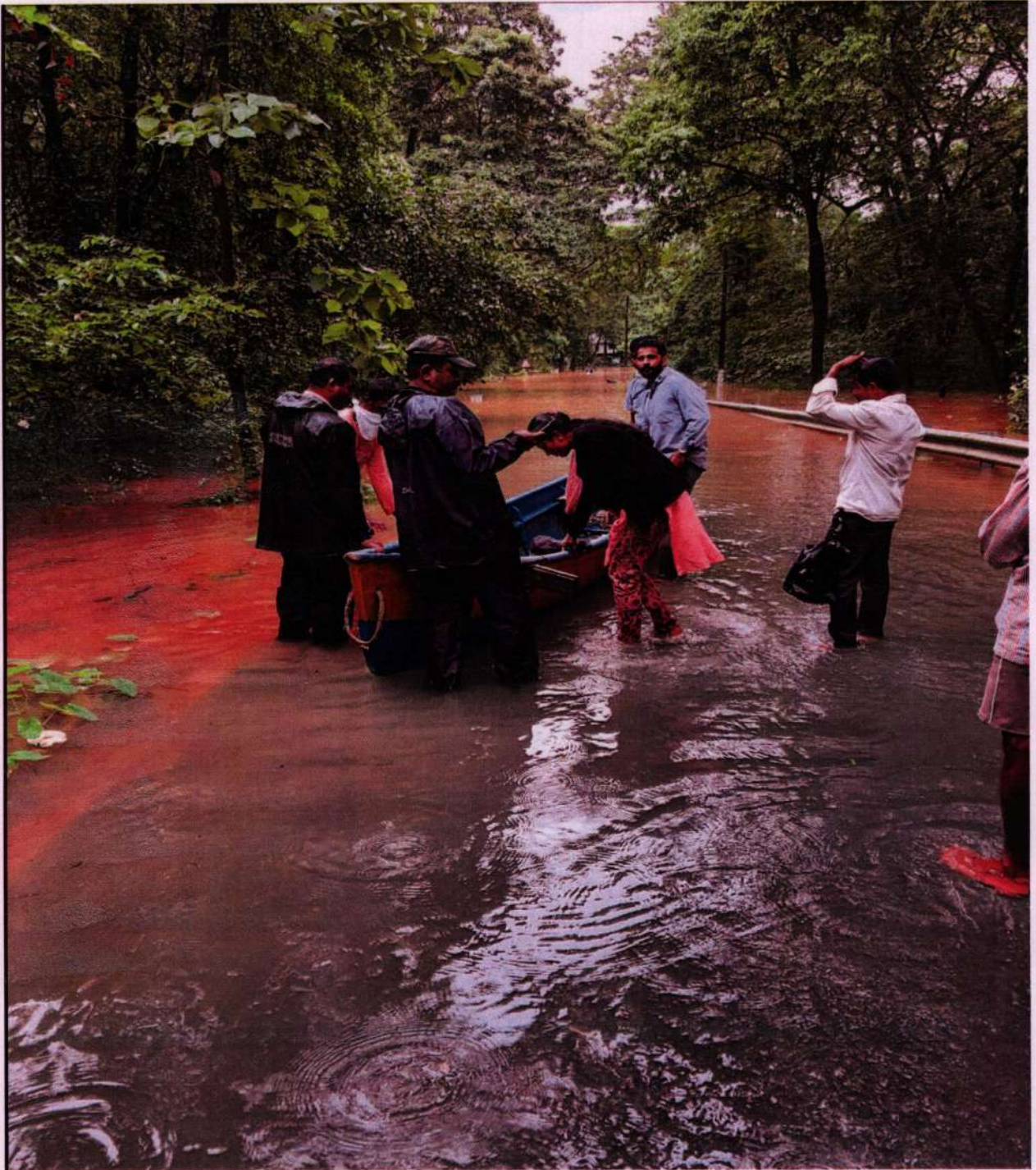
RICH DIVERSITY OF TREE SPECIES



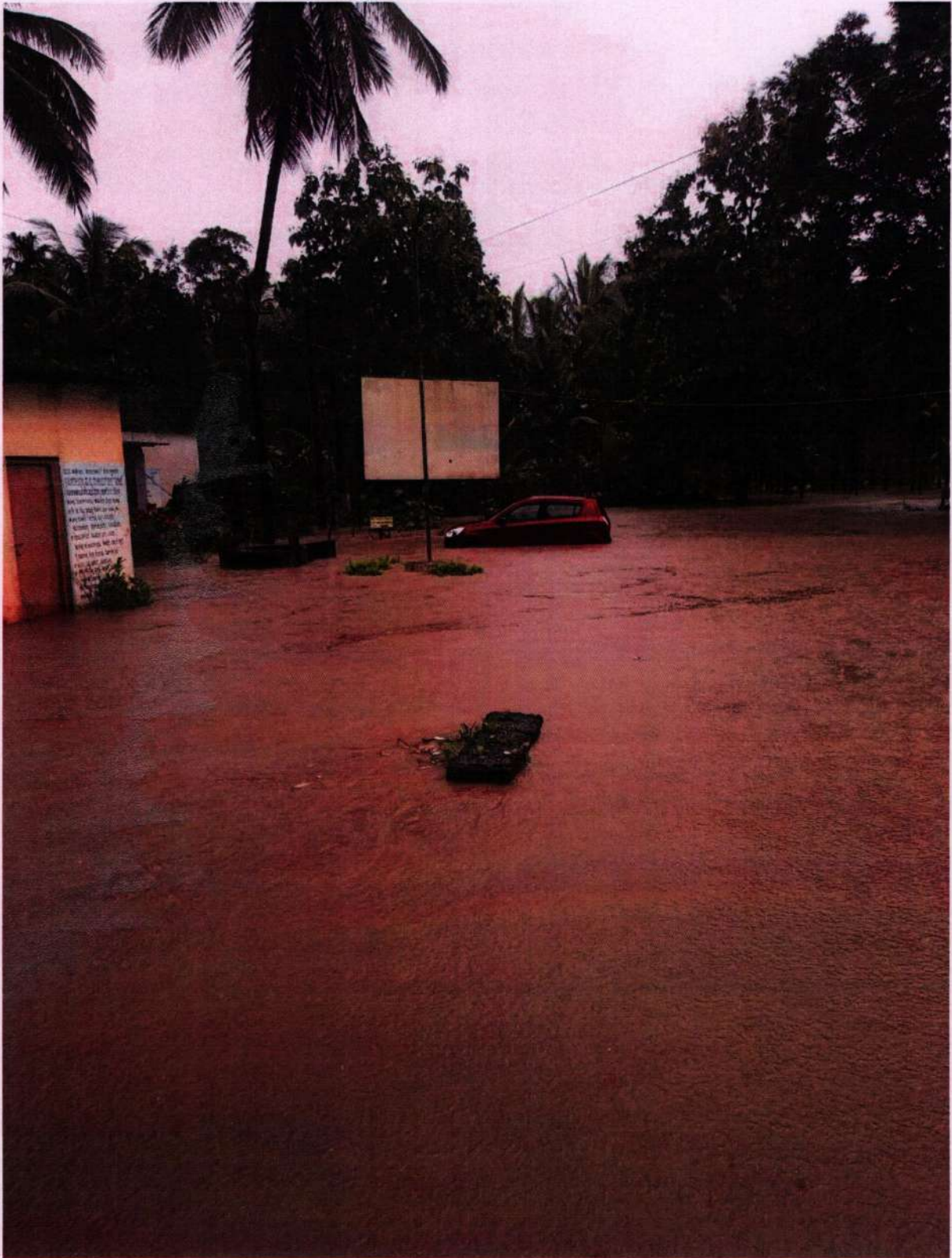
DEPOSITION OF FOREST SILTS (BAMBOO BUSH AND SAND DUNE)



CROP LANDS IN THE RIVER BANK



FLOOD ON STATE HIGHWAY NEAR HILLUR IN 2019



Flood during 2020 at Dongri



FIELD VISIT


21/08/2020
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