Sahyadri Conservation Series 61

My Village Biodiversity: Documentation of Western Ghats Biodiversity through Network of Students and Teachers

T V Ramachandra
Deepthi Hebbale
Sudarshan P. Bhat
Durga Madhab Mahapatra
Vishnu D. Mukri
M D Subash Chandran
Prakash Mesta
Asulabha K S
Harish R. Bhat
Gouri Kulkarni
Bharath Settur
Rajasri Ray
Sincy Varghese
Vinay S.
Bharath H. Aithal

Alva's College Moodbidri & Alva's Institute of Engineering and Technology, Mijar, Moodbidri, Dakshina Kannada – 574227

The Ministry of Science and Technology, Government of India
The Ministry of Environment, Forests & Climate Change, Government of India
Indian Institute of Science, Bangalore 560012

ENVIS Technical Report: 113
August 2016

Environment Information System [ENVIS]
Centre for Ecological Sciences
Indian Institute of Science
Bangalore-560012, INDIA
Web: http://ces.iisc.ernet.in/energy/
http://ces.iisc.ernet.in/biodiversity
Email: cestvr@ ces.iisc.ernet.in
energy@ ces.iisc.ernet.in

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Energy & Wetlands Research Group,

Centre for Ecological Sciences, TE 15

New Bioscience Building, Third Floor, E Wing

Indian Institute of Science

Bangalore 560012, India

http://ces.iisc.ernet.in/energy, http://ces.iisc.ernet.in/biodiversity

Email: cestvr@ces.iisc.ernet.in, energy@ces.iisc.ernet.in

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My Village Biodiversity: Documentation of Western Ghats Biodiversity through Network of Students and Teachers

Executive Summary

The Biological Diversity Act 2002 was enacted in 2002 and notified Biological Diversity Rules in 2004, to give effect to the provisions of this Convention (http://www.moef.nic.in/division/ biodiversity). Successful implementation of the biodiversity act would help in realizing the objectives enshrined in the United Nations Convention on Biological Diversity (CBD) 1992, through the sovereign rights to use their own Biological Resources by the federal states. The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process. In response to the Biodiversity Act, 2002 and Biodiversity rules, 2004, many State Biodiversity Boards were constituted which in turn is involved in formation of Biodiversity Management Committees (BMC) for "promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge relating to biological diversity." The BMCs should prepare People's Biodiversity Register (PBR) containing local knowledge on biological resources and their usages. Nationwide preparation of PBRs, is expected to be a mammoth exercise for India, a megadiversity country. A decade is past since the Biodiversity Act, but only tardy progress made in relation to PBRs. Major hurdles hampering the process appeared to be concepts and formats unfriendly for grassroots level people, paucity of taxonomic expertise, low funding and lack of motivation and guidance. Model PBRs developed were not replicable and required enormous expenditure, also failed in capturing local biological resources.

The deployment of student community from high schools and colleges to document biodiversity under the banner 'My Village Biodiversity' with simplified user friendly documentation would help in copiling the information most effectively. Simplified formats, as understood easily by high school students and village communities, were prepared in consultation with experts (through series of brain storming session involving small group of local experts). The teachers and select students were given orientation through series of workshops highlighting the importance of biodiversity, Biodiversity Act, and the details to be compiled. Competitions for students and nominal rewards for the best reports and good presentations in the presence of experts would help in validation of the data. The objectives included:

a. ***Sensitisation of students:*** The very use of data formats were also aimed at sensitizing students to biodiversity related issues. Notable among data to be gathered included forest types, landscape and waterscape elements, plant and animal diversity as the village community understand, crop diversity, preparations and uses of bio-pesticides, organic farming, traditional storage methods, NTFP, management of village environment, community health, wildlife, human-wildlife conflicts, domestic of animal diversity, production of honey and apiculture, energy sources, skilled and knowledgeable people in the villages, sacred groves etc.
b. ***Recording observations:*** Study and understand data formats necessary in the contemporary contexts of conservation and sustainable use.
c. ***Vital information on crop diversity:*** Stress laid on documentation of local varieties of crops.
d. ***Low cost methods to assist PBR preparation:*** No money was paid to partner institutions and students except for meeting the travel expenses for attending workshops.
e. ***Creating ambassadors of goodwill:*** Students, with their unbiased minds were expected to merit greater acceptability in the households, as the villagers otherwise tend to be more reserved with outside agencies like NGOs engaged in such work.
f. ***Expertise in communication:*** Students were expected to gain good communication skills.

Results and discussion

About 580 students from 116 high schools and 6 colleges representing the 11 taluks of Uttara Kannada took part in the two year exercise (2010-12). Biodiversity documentation covered about 190 villages of the total of about 1200 villages in the district. This exercise was attempted during 2013-14 in select villages of Shimoga and Dakshina Kannada districts. Considering the sluggish scenario of PBR progress, with only 212 panchayats of Karnataka covered by 2008, comments on their merits pending, the cost was high for the Biodiversity Board in its infancy to bear, but at the same time funding considered small by the agencies catalyzing the PBRs at panchayat levels. The information compiled by Karnataka Biodiversity Board through select university faculty contained only secondary information without much details from the field. The poor quality performance is mainly on account of (i) lack of interest among university faculty, and (ii) bureaucratic style of functioning of the board (interested in reaching the targets than the quality and reliability of information).

The education departments should make suitable changes in the syllabi to incorporate biodiversity documentation, with due credits to the performers, the outcome would be more fascinating. The students in general found greater acceptability in the villages, got first hand learning opportunities and often turned out to be good communicators of local knowledge.

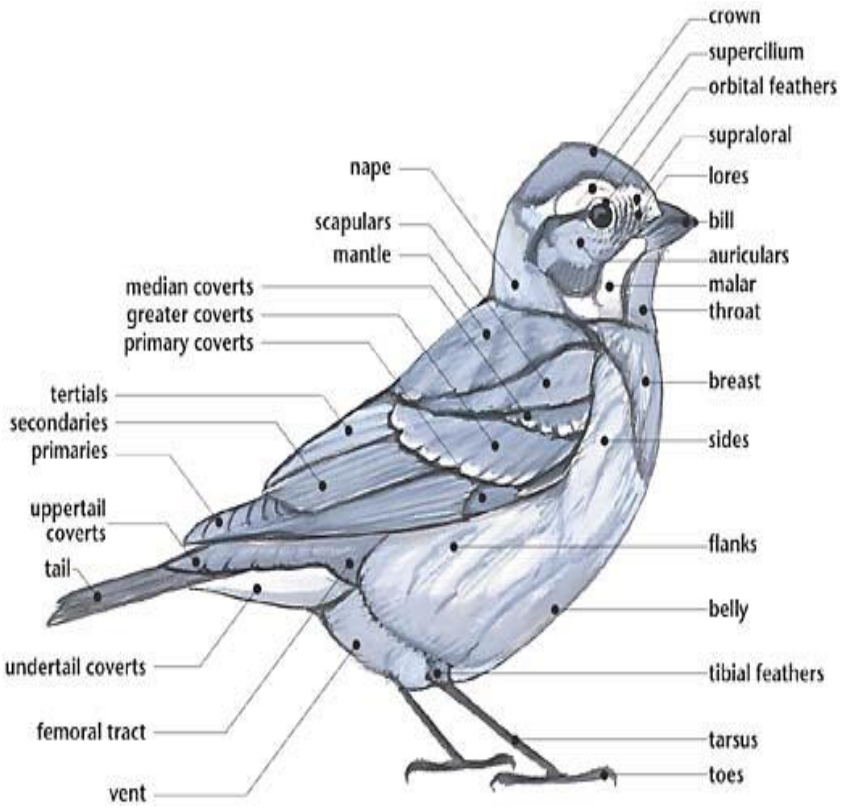
To highlight some results, notably, of 232 villages where rice cultivation was reveiwed, 181 varieties were recorded; out of them 101 were native varieties. Sample survey with regression analysis gives expectation of finding around 492 native varieties in the district. Countrywide adoption of the method will benefit rapid documentation of traditional varieties, feared to have dwindled from around one lakh down to 8-10 thousand, mainly due to unregulated introduction of new varieties. Documentation also covered local varieties of banana, pepper, mango, jack, sugarcane, arecanut, coconut etc.

The villages have rich wealth of traditional knowledgeable knowledge holders like herbal healers specialized in treating ailments like rheumatism, paralysis, migraine, kidney stones, bone fractures, eye and skin problems, jaundice, herpes, paralysis, infertility, epilepsy etc. and cattle diseases. Medicinal plants were exhibited during workshops and their uses documented. Information on persons with knowhow on biopesticides, earthworm manure, water divining, organic farming etc. also is available.

Villagers gave good account of local wildlife, on occasional visiting animals like tiger, leopard, bear etc. Local names of fishes available in the fresh water bodies were recorded. The students provided indications on the presence of hundreds of sacred groves in the villages. They would be interesting places from biodiversity and cultural angles. On the whole pastoralism is on the decline due to fodder scarcity and cattle manure, inevitable for high rainfall agricultural soils, is getting scarce. This can undermine the very farming system of the district.

This experiment highlights the need for optimal harnessing of student and teachers power for documentation of the immense biodiversity of the country. Biodiversity awareness creation among the younger generation is a paramount necessity for the successful documentation and conservation of the immense biodiversity of India, a megadiversity country with two biodiversity hotspots. The educational system has to be restructured to institutionalize biodiversity documentation, especially using student power from high school and undergraduate levels with due academic credits given to the participants.

This report provides the biodiversity documentation formats along with details for capturing aquatic and terrestrial biodiversity.



YOUNG SAHYADRI ECOLOGIST-2016 COMPETITION

DETAILS: As you are aware India is one of the 12 mega-biodiversity countries of the world. Bulk of the Indian population is directly dependent on biodiversity and ecosystems for almost their entire basic needs: water, food, medicine, clothing housing etc. In India the Western Ghats, along with Sri Lanka, constitute one of the 34 biodiversity hot spots of the world. The Western Ghats are exceptionally rich in plant and animal species and supply nearly 40% of the water needs of the country. Unfortunately due to heavy human pressures this tremendous biodiversity is getting destroyed fast. Water resources are drying up and getting less in quantity for the growing population.

India is rich not only for wild biodiversity but also for the crop species and varieties. We had till fifty years ago over 100,000 local varieties of rice itself, each with its own special characteristics. Over 80% of these ancient rice varieties are today not traceable due to overuse of hybrids and other new varieties. Same is the case with wheat, jowar, ragi, cotton, brinjal, mango, jack, pepper, bananas, tuber crops etc. of which we had very high diversity. Our rich diversity of cattle, buffaloes, goat, sheep etc. are also on the decline.

We have a very rich treasure of medicinal plants and local vaidyas knew how to use them. Most of this traditional knowledge related to medicinal plants and their uses are vanishing due to more dependence on modern medicines. Moreover the traditional medicinal knowledge of the country and the products from our medicinal plants like neem. Sarpagandha, kokam, nelanelli, turmeric etc. are getting patented in foreign countries without any profit to the knowledge holders in this country, who are mostly villagers and forest tribals.

Our forest wealth is getting degraded due to high developmental pressures, encroachments for agriculture, cutting for raising tree plantations, mining, dams etc. As forest wealth declines our water sources become poorer and soils erode. Floods and landslides have increased due to improper use of forests and hills. Most sensitive, endemic plants and animals decline faster than others with forest degradation. As forests are fragmented and plant biodiversity declines animal species like tigers, elephants, deers, lion tailed macaque, birds, amphibians, honey bees etc are also on the decline. Forest decline may be linked to poor quality life in villages and large scale migration to urban areas.

On one side the planet is threatened with climatic change because of air pollution. As sea level is rising slowly low lying coastal areas are becoming increasingly prone to sea erosion. To protect from erosion the government is spending huge money for making expensive stone walls which spoils the beauty of our scenic beaches and seriously affect the functioning of beach as an ecosystem.

From time immemorial our forefathers worshipped gods in specially protected sacred forests like kans and devarakadus, almost in every village of the Western Ghats. Today most of these sacred forests have been cut, reduced to one or few trees in the villages, or became part of reserve forests and lost their special forests. Some became Acacia plantations like Menasi aand Akkunji kan in Siddapur. If we study some of these old and well protected devarakans like Karikanamman forest in Honavar or Kathalekan in Siddapur it could be seen that they are full of very rare species of plants and animals.

Realizing this grave situation facing India's biodiversity and the hardships to village and forest people who have maximum dependence on biodiversity the Government of India passed the Biodiversity Act -2002. This Act aims at:

- Conservation of the rich biodiversity of India
- Highlights importance of sustainable use of biodiversity
- Fair and equitable share of benefits from use of bioresources and for using valuable knowledge about biodiversity that our people at grass root level possess.

According to the Biodiversity Act-2002 the Government of India set up National Biodiversity Authority at Chennai. Every State is also required to establish Biodiversity Board to advise the State Government on matters relating to conservation and sustainable use of biodiversity and equitable sharing of the benefits from use of bioresources with the rightful knowledge holders, who may be villagers or even forest tribes.

According to the Act every local body shall constitute a Biodiversity Management Committee for the purpose of promoting conservation, sustainable use and documentation of biodiversity in People's Biodiversity Registers. These local committees should take initiatives in preserving habitats, conserve traditional agricultural and livestock varieties and document all the special knowledge that the local people have about biodiversity.

Karnataka State is the first in the country to set up State Biodiversity Board, which won the award for the best performance for the year 2009-10. The State is also the first to establish Western Ghat Task Force to safeguard the Western Ghats.

The Centre for Ecological Sciences of the Indian Institute of Science has been engaged in various types of ecological and biodiversity related studies in Uttara Kannada for over 25 years, and has made many contributions and guidance related to documentation, sustainable use, conservation of biodiversity etc. Considering this background the State Biodiversity Board and the Western Ghats Task Force have entrusted us with a project to estimate Ecological Carrying Capacity of Uttara Kannada.

Similarly, identifying ecologically sensitive regions in Western Ghats is a very ambitious project and it is our desire that the project should be carried out with the close co-operation and participation of the people. In this regard, recently, we prepared a simple plan for ecological studies at village level with the help of high school students. The plan was carried out experimentally with the participation of students and teachers from about 60 high schools. Students studied individually or in small groups about 120 villages and created a wonderful database under a scheme **Namma Grama Biodiveristy.** Their valuable contribution covers many aspects of village biodiversity, such as

- Traditional crop varieties and their special qualities; names of farmers who are conserving traditional varieties of specially rice, banana, mango, jack, pepper, tuber crops etc.
- Traditional livestock races
- Plant and animal diversity of land and water
- Wild plants used as food in villages
- Medicinal plants and their uses

- Village-wise list of nati-vaidyas specialized in treating diseases of humans and domestic animals
- Local methods of crop disease and pest control
- Information on sacred groves of the villages
- Village-wise database on perennial water bodies
- Village artisans and other knowledge individuals

Students were given opportunities to make presentations of their findings in conferences held at Kumta and Sirsi. About 18 selected students, along with their teacher guides, were selected for presentation of their work before scholars during the Lake-2010 Conference at the Indian Institute of Science, Bangalore during December 2010. All the winners were suitably rewarded. This programme of involving students and teachers in ecological studies have created widespread interest among the academic community and several high schools, junior and degree colleges have expressed interest in taking part in such programmes in the future. Therefore, once again, we are re-introducing this programme to the student community, not only of high schools but also of junior and degree colleges.

The benefits to the student and teaching community are as follows:

- Students and teachers gaining first hand knowledge of biodiversity
- Students become efficient communicators
- Student get exposed to environmental problems faced by villagers
- Environmental education has become part of high school teachers' training programme
- Environmental education is compulsory for the colleges
- Science students of colleges are required to submit student research projects for their examination. The students of biological sciences can utilise their work on village level biodiversity for preparing these reports
- The teachers will be able to familiarise with much of biodiversity and environment in their surroundings and can use such experiences for better teaching
- Teachers (of colleges and high schools) can identify and choose research programmes of their choice related to biodiversity/ecology and get guidance from the scientists of the Centre for Ecological Sciences
- Collaboration with the research team of Indian Institute of Science will earn better ranking for the colleges during NAAC accreditation prorgrammes
- The work under this programme can be considered as extension education and help in spread of environmental literacy in the society.
- The students will be molded into better, eco-conscious citizens in the future.

Highlights of the competition

The competition will be conducted first at taluk levels and selected students will take part and present their work in Lake 2016 (28^{th} to 31^{st} Dec 2016). The students who successfully document all aspects of biodiversity (as per format Student's Biodiversity Register) and excel in the presentations, will be honoured with "**Young Ecologist, 2016**" – award.

The proposed programme will involve:

1. Interested institutions are required to send the consent letter to take part in the documentation of biodiversity (on or before 15 August 2016)
2. A copy of the biodiversity register format be downloaded frpm http://ces.iisc.ernet.in/energy at Lake 2016 portal.
3. Orientation programme to train guiding teachers will be conducted in each taluk
4. Students will take part in the documentation of biodiversity of their own villages or any of their choice villages. Only one or two students will study one village.
5. The study may be undertaken preferably during the vacation (October 2016)
6. The institutions will arrange to send the study reports to Indian Institute of Science field station at Kumta (on or before30 sept 2016) to the address:

   Dr. Prakash Mesta,
   Centre for Ecological Sciences,
   Indian Institute of Science
   Field Station, 679/II, Vivek Nagar,
   Kumta 581343 (Phone 08386-223426)
7. Student competition at taluk level will be conducted during Oct 2016
8. Announcement of the short listed candidates for Lake 2016 during November 2016
9. Finalists will be selected during the **Conference Lake 2016**.
10. All finalists will be given the certificate and memento at the Conference
11. Three students in each category (VIII, IX, X, XI, XII and Degree students), and one teacher (from each taluk) from school and college level will be given special prizes
12. Steps will be taken to publish good quality reports through Karnataka Biodiversity board with the due credit to student, teacher and institution.

We look forward to your active participation in documenting the biodiversity of Uttara Kannada. This would provide an excellent opportunity for students and teachers taking science to the villages of Western Ghats villages.

The Organising Committee, **Conference – Lake 2016**
Energy & Wetlands Research Group
Centre for Ecological Sciences, Indian Institute of Science
Bangalore 560 012, India
Tel: 91-080-22933099/23600985
Fax: 91-080-23601428

Address at Kumta, Uttara Kannada District

The Organising Secretary, **Conference Lake 2016**
Centre for Ecological Sciences,
Indian Institute of Science Field Station,
Siddanabavi Road, Gandhinagar
Kumta 581343 (Phone 08386-223426)
Mobile: 9342470560 (Dr. Prakash Mesta)
e-mail: prakashhonavar@gmail.com, prakash_honavar@ces.iisc.ernet.in

CENTRE FOR ECOLOGICAL SCIENCES
INDIAN INSTITUTE OF SCIENCE
BANGALORE 560 012, INDIA
Telephone: 91-080-23600985 / 2293 3099/ 2293 2506
Telefax: 91-080-23601428 / 23600085 / 23601683 (attn: CES/TVR)
E Mail: cestvr@ces.iisc.ernet.in
Web URL http://ces.iisc.ernet.in/energy

Dr. T.V. Ramachandra
Energy & Wetlands Research Group

CES /TVR/UK-YSE2016/10505/2016
24 July 2016

Dear Sir/Madam,

Subject: Young Sahyadri Ecologist-2016 (for high school/college students)

We have the pleasure to inform you that considering the urgent need for quality environmental education for students and teachers, and for documentation of biodiversity and conservation of rare natural resources we are planning to conduct **Young Ecologist -2016** competition for high school, junior college and degree college students of Uttara Kannada. Uttara Kannada has been selected for this programme because our institution, the Indian Institute of Science, has been actively engaged in ecological studies in this biodiversity rich region for the past 25 years. The fruits of this long period of concentrated ecological work have been passed on to the society and the governments of state and centre. To fulfill the expectations of Biodiversity Act-2002, we have decided to introduce ecological research and awareness programmes to the grassroots level. For the success of this programme and for creating the much needed knowledge on declining biodiversity and to solve environmental problems facing the society, we believe that the student community has a lead role to play.

The results of this study would be helpful in identifying ecologically sensitive regions and helps to prepare ecologically sound developmental plans for the region. The best performing students in this competition, open to all levels of high school, pre-university and degree colleges, will be presented with Young Sahyadri Ecologist-2016 award. The details of the programme accompany this letter. I hope your reputed institution will co-operate in conducting "**My Village Biodiversity"** studies and prepare your students for the **Young Sahyadri Ecologist -2016** award. Please fill up the entry form and send it back to the address given on the form by 15 August 2016.

With regards,

yours sincerely

Dr T V Ramachandra
Convener
Conference on Lake 2016

PS: This competition is for all students in Western Ghats region. Each student (or group of two) can take up the assignment of documenting their village biodiversity.

ENTRY FORMAT

1. **Name and address of the Institution**
2. **Name of the Head of Institution**
3. **Phone nos & email**
4. **Details of villages proposed for the study**

Taluk	**-**	**Panchayat**	**-**	**Village**
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10				

Note: An institution can select any number of villages for study depending on the number of students who show interest

Please send the entry forms to the following address on or before 5 September 2016

Dr. Prakash Mesta,
Centre for Ecological Sciences,
Indian Institute of Science
Field Station, Siddana bavi road, Gandhi Nagar
Kumta 581343 (Phone 08386-223426)

CENTRE FOR ECOLOGICAL SCIENCES
INDIAN INSTITUTE OF SCIENCE
FIELD STATION, VIVEKNAGAR, KUMTA 581 343, INDIA
Telephone: 91-08386-223426, 09342470560(Dr.Prakash Mesta)
E Mail: cestvr@ces.iisc.ernet.in, mdschandra@yahoo.com, prakashhonavar@gmail.com
Web URL : http:// ces.iisc.ernet.in/energy/

DR. T. V. RAMACHANDRA/DR. M. D. SUBASH CHANDRAN CES/TVR/CCP/100504/2016

"MY VILLAGE BIODIVERSITY DOCUMENTATION"

Instruction to Participants

1. The students are advised to take guidance from teachers.
2. The student and teachers may contact our office for clearing doubts.
3. Only one student or two should work on the selected village.
4. An institution may select as many villages which their students can handle.
5. The students are advised to use their vacation and holidays for the study.
6. **Submission of the entry form** with the letter indicating name of the students and villages chosen 5 September 2016
7. Study reports should be sent to our office by end of 31 August-2016.
8. All students who submit good reports will be invited for taluk level presentation of reports in September /15th October 2016.
9. Students selected in the taluk level can rework and improve their reports and submit final reports before October 2016.
10. Final presentations will be held during Lake 2016 and classwise **Young Ecologists Award** will be given at the conference
11. All reports should be sent to **Kumta address:**

Completed study reports to be sent to:

Dr. M.D. Subash Chandran
CES, Field Station (Indian Institute of Science)
Siddana Bavi Raod, Gandhi Nagar, Kumta-581 343

For more information contact:

Dr. Prakash Mesta, Phone: 08386 223426, Mobile: 9342470560
e-mail: prakashhonavar@gmail.com, prakash_honavar@ces.iisc.ernet.in

Organised by

Energy and Wetland Reserch Group
Centre For Ecological Sciences
Indian Institute of Science, Banglore-12
E-Mail: cestvr@ces.iisc.ernet.in
Phone: 080-22933099; 23600985

MY VILLAGE BIODIVERSITY DOCUMENTATION FORMAT

(Note: Village means revenue village)

Village name :		**Student's names**	**Class**
Panchayat name :		**1.**	
Taluk :		**2.**	
Name of school Address of school with phone no. & email :		**Name of guide teacher**	
		Phone no :	

*** Note:** 1. Only one or two students to study one village
2. Use extra sheets for writing if necessary

1) FOREST TYPES OF VILLAGE

	Forest types	**Yes**	**No**
a)	Evergreen forest		
b)	Semievergreen forest		
c)	Deciduous forest		
d)	Scrub		
e)	Mangrove vegetation (only for coastal taluks)		
f)	Savanna (grassland with trees)		

2) LANDSCAPE ELEMENTS OF THE VILLAGE

	Landscape elements		Yes	No
a)	Bena (grassland) :			
b)	**Rocky places (Name & localities)**	**Rock types (write local names)**		
i				
ii				
iii				
iv				
c)	No. of stone quarries : Type of stone in the quarry :_____			
d)	No. of soil quarries : Types of soil : _____			
e)	No. of sand quarries_____ Describe where_____ Sand extraction from sea shore if any. Why sand is removed from sea shore?			
f)	Mining details (record if any metal ore is removed from the village):			

*** Use extra sheets for writing if necessary**

3) WATERSCAPE ELEMENTS OF THE VILLAGE

	Waterscape elements	Water availability (√)											
a)	Name of the river, if any:	J	F	M	A	M	J	J	A	S	A	N	D
b)	Stream names: _____ Name of perennial streams if any: i) _____ ii) _____iii) _____												
c)	Name of perennial springs if any: _____												
d)	Waterfalls: Name(Height): i) _____ ii) _____												
e)	Name of any dam in the village:												
f)	Names or numbers of check dams:												
g)	Backwater areas:												
h)	Swampy places if any with local name:												
i)	**Ponds and Lakes**												

Name	Area in acres	No. of months with water (√)											
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D
		J	F	M	A	M	J	J	A	S	A	N	D

***Use extra sheets for writing if necessary**

4) PLANT DIVERSITY OF THE VILLAGE

A) Medicinal plants

i) Medicinal plants of the village and utilisation of plants by village people

Plant name	Availability			Parts used for medicine	Uses
	High	Med	Less		

***Use extra sheets for writing if necessary**

ii) Medicinal plants collection and trade

List medicinal plants that are grown by villagers in their own gardens/farms for sale

Name of farmer	Medicinal plants grown for sale	Agency/name of purchasers	Demand		
			good	moderate	poor

***Use extra sheets for writing if necessary**

iii) List of medicinal plants collected from the village/forest for sale

Name of collector	Medicinal plants collected for sale	Agency/name of purchasers	Demand		
			good	moderate	poor

***Use extra sheets for writing if necessary**

B) Uses of non-cultivated plants for food

Plant name	Availability			Part used for food	Uses
	High	Med	Less		

***Use extra sheets for writing if necessary**

C) Non-cultivated plants that are used for other purposes than food

Plant name	Availability			Part used	Uses
	High	Med	Less		

***Use extra sheets for writing if necessary**

D) Rare types of forest trees present in the village

Forest tree local name	Location name

***Use extra sheets for writing if necessary**

E) Road side trees

List planted roadsid trees by surveying one km of village main road

Trees Species	Nos

***Use extra sheets for writing if necessary**

F) Forest products

i) Collection of forest produce

(Interview persons who collect forest produce; list the products that are regularly collected from the forests)

Names of forest produce collectors	List of products collected	Uses of products for own use/sale

***Use extra sheets for writing if necessary**

ii) Do contractors collect forest produce (name products collected)

Names of forest produce collectors	List of products collected	Uses of products for own use/sale

***Use extra sheets for writing if necessary**

iii) Do local societies collect forest produce

(name society, products collected etc. – Attach details from Societies' annual report)

Name of society	Products collected	Annual Income

***Use extra sheets for writing if necessary**

G) Agriculture

i) Names of crop plants and their varieties

(Note: Please note down varieties of rice, sugarcane, ragi, jowar, other millets, black gram (uddu), pacha hesaru (green gram), cow pea (alsandi); ground nut (senga), etc.)

Name of crop	Names of varieties	Farmer's name & address	Area (Acres-Gunta)

***Use extra sheets for writing if necessary**

ii) Special characters of crop varieties (please give importance to traditional varieties)

Note: Special characters: Please note down special characters as explained by the farmer. For eg: Crop name :Rice; Variety name: Bantwala: Special characters: 3.5 months duration, tall (5 ft); red rice, yield approx. 8quintals/acre; tasty; soft straw liked by cattle – Please ask farmer to describe the varieties.

Crop name	Variety	Farmer interviewed	Special characters

***Use extra sheets for writing if necessary**

iii) Traditional storage methods of agricultural products

(Explain what are the important methods of storage of foodgrains and pulses etc. without damage or insect attack.)

Agricultural product	Traditional storage/preservation methods

***Use extra sheets for writing if necessary**

iv) Model agriculturists in the village

Names	Why he/she is considered model?

***Use extra sheets for writing if necessary**

v) Seed treatment

Name of farmer	Name of crops	Seed storage method	Seed treatment before planting	Name of substances/chemicals used for seed storage/treatment

***Use extra sheets for writing if necessary**

H) Horticulture

i) Horticultural crop and their varieties

(Note: Please note down varieties of coconut, arecanut, pepper, betel leaf, mango, jack fruit, banana, citrus, vegetables, leafy vegetables, chillies, local flowers, kokam, onions, tubers, ginger, cardamom)

Name of crop	Names of varieties	Farmer's name & address	Area (Acres-Gunta)

*** Please use extra sheets**

ii) Special characters of horticultural crop varieties

Note: Please note down special characters as explained by the farmer

Crop name	Variety	Farmer interviewed	Special characters

***Use extra sheets for writing if necessary**

iii) Traditional methods of processing and storage of horticultural products

(Explain what are the important methods of processing and storage of horticultural products without damage or insect attack.).

Horticultural products	Traditional storage/preservation methods

***Use extra sheets for writing if necessary**

iv) Information about home gardens for growing vegetables

(collect information form a cluster of ten families – poor and rich and representing different communities)

Person interviewed	Home garden Present/absent	Vegetables grown	Write reasons why home garden is not there for the family

v) Model horticulturists in the village

Names	Why he/she is considered model?

***Use extra sheets for writing if necessary**

vi) Fruit trees grown in the school campus

Name	No.

***Use extra sheets for writing if necessary**

vii) Methods for ripening of fruits

Name of farmers	Crops	Fruit ripening methods you apply

***Use extra sheets for writing if necessary**

viii) Fruits storage/preservation/ processing methods (making pickles, jams, drying, salting etc)

Name of farmers/other persons	Crops	Fruits storage/preservation/processing methods	Purpose (for own use/sale)

***Use extra sheets for writing if necessary**

I) Model Farms

i. Write names of the farmers who have model farms. Model farms combine many of the following features described under a/b/c/d etc. (√ whatever is applicable).

Names of the farmers	Features															
	a	b	c	d	e	f	g	h	i	j	K	l	m	n	o	p

a. Water conservation methods adopted
b. Soil conservation methods adopted
c. Animal husbandry is part of the system
d. Bee keeping is part of system
e. Gobar gas is used
f. Vermi-compost is made
g. Preparation of bio-pesticides; pesticides are not used for rice crops and vegetables
h. Solar lamps; solar drier; improved stoves like Astra Ole
i. Bettaland has more than 100 trees per acre; trees belong to at least 15 species/acre; at least 40 trees per acre are not lopped for leaves or branches cut for fuel.
j. No fuelwood is purchased from outside
k. No fulewood is collected from forest
l. Crop rotation is practiced in rice fields (mention what crops are grown after rice is harvested)
m. List fodder crops grown in the farm (including grasses, shrubs and trees)
n. At least one traditional rice variety is grown (mention name:……..)
o. Poultry is part of farming system
p. Fish farming is part of the system (name fishes in the pond……..)

J) Village environment management

i) People's participation in environment management

	Environment management	Yes	No
a)	**Village Forest Committee (VFC)** is present in the village		
	VFC is active/inactive/ moderately active (tick right choice)		
b)	**Biodiversity Management Committee (BMC)** is formed in the Panchayat :		
	BMC is active / inactive (tick right choice)		
c)	**Peoples' Biodiversity Register (PBR)** is prepared for the Panchayat		
d)	Meetings conducted on environmental awareness in the village/panchayat during last two years (give details if any):		
e)	The village has a Farmers' Union		
f)	The Farmers Union meets regularly to discuss about farming systems/ problems etc.		

ii) List names of farmers who do fully organic farming
(without use of chemical pesticides and fertilizers) for any crops

Name of farmer	Crops grown without use of chemicals	For own use/sale

***Use extra sheets for writing if necessary**

iii) List farmers who use biopesticides

Name of farmer	Crop	Disease/insect	Describe bioipesticide used

***Use extra sheets for writing if necessary**

iv) What biopesticides are used by you?

Name of farmers	Crops	When you apply bio-pesticides?	How bio-pesticides are prepared by you	Expenses if any/gunta/ acre

***Use extra sheets for writing if necessary**

v) Manuring/application of fertilizers

Name of farmer	Name of crops	Name manures used	Expenses per gunta/acre	Name fertilizers used	Expenses per gunta/acre

vi) Name chemical pesticides/fungicides used

Name of farmers	Crops	Names of pesticide/fungicides used	Purpose	Expenses/ gunta/acre

5) COOPERATIVE

i) Cooperative Societies

Notes on tribal co-operatives in the village/panchayat (eg. Siddi co-operative society for forest produce collection) , Notes on other co-operative societies in the village

Co-operative societies	Main activities

***Use extra sheets for writing if necessary**

ii) Name Self Help Groups/Sthree-Shakti groups in the village and list their activities

Name self help group	Type

***Use extra sheets for writing if necessary**

6) COMMUNITY HEALTH

Visit a cluster of ten families representing different communities and list the health problems

Name of person interviewed	Health problems	Any remarks on treatment

***Use extra sheets for writing if necessary**

7) ANIMAL DIVERSITY

A) Wild Life

Name	NUMBERS			Changes in numbers		
	Common	Moderate	Rare	Increasing	Decreasing	No change
Mammals (including bats)						
Birds						
Reptiles (including snakes & turtles)						
Fishes						
Insects (including butterflies & honeybees)						
Other animals						

***Use extra sheets for writing if necessary**

B) Knowledge on wild animals

Name of person interviewed	Species	Seasons present	Where present?	Numbers		
				low	moderate	high

Note:

- Seasons present : Rainy season, cold season, summer season or throughout the year
- Where present: Habitat to be mentioned such as forest, scrub, field, garden, river bank, river, pond etc

C) Crop damage from wild life

Interview farmers on what damages are done to crops by wild animals in the village (write names of farmers interviewed and details of animals which create problem and the extent of damages they suffer)

***Use extra sheets for writing if necessary**

D) Attack on humans by wild animals

Any details on attack on humans by wild animals (including snake bites, attack on domestic animals) may be mentioned – number of cases during the last two years

***Use extra sheets for writing if necessary**

E) Write the names of plants that wild animals/birds feed upon

Name of persons interviewed	Name of wild animal/bird	Plant/plant parts used as food

F) Name wild animals that seasonally visit the village

Persons interviewed	Animals which visit the village	Seasons of visit (months)	Any reasons why they come?

G) Hunting

i. Do people hunt in the village or outside? : yes/no

ii. Which communities customarily hunt?

_____

iii. What are the animals/birds normally hunted within village?

_____

iv. What are the names of animals/birds hunted from outside the village?

_____

v. How far do the hunters go for hunting? Name places and distances from the village you are surveying

_____

vi. Do outsiders enter the village for hunting?

vii. From where do outsiders come for hunting?

_____

viii. Why do people hunt?

_____

ix. For food (mention names of animals/birds)

_____

x. For medicine (mention animals/birds)

_____

xi. For sale of meat/other products (mention animals/birds)

_____

xii. As part of their hunting tradition – hunting is compulsory for the community (mention names of communities which perform traditional hunting)

_____

xiii. What are the restrictions on hunting followed by local people themselves?

_____

H) Livestock

i. INFORMATION ON CATTLE, GOATS AND SHEEP OF THE VILLAGE

1. Cattle census : Attach livestock statistics of the village as available from the Panchayat veterinary officer or other sources (mention the sources) and year of statistics (include cattle, buffloe,oat, sheep nos.)
2. Interview some families on cattle nos and fill the following tables

Name of cattle keepers	Cows breed	Total
	1.	
	2	
	3.	
	Bulls/bullocks breed	
	1	
	2	
	3	

***Use extra sheets for writing if necessary**

ii. Interview some families on buffalo nos and fill the following table

Name of buffalo keepers	Buffalo breed (female)	Total
	1.	
	2	
	3.	
	Buffalo breed (male)	
	1	
	2	
	3	

***Use extra sheets for writing if necessary**

iii. Interview some families and fill the table on Goats diversity

Name of persons	Goat breeds	Numbers

iv. Interview some families and fill the table on sheep diversity

Name of persons	Sheep breeds	Numbers

v. Details regarding Poultry farmers

Name of farmers	Chicken varieties	Numbers

vi. Fodder availability

Names of cattle keepers interviewed	Grass & leaves produced in own farm/fields qty/day/month/yr	Grass purchased from outside qty	Straw available from own fields	Straw purchased from outside

vii. Do you sell grass and straw- if so answer the following

Names of farmer interviewed	Grass sold annually (qty)	Straw sold annually (qty)

viii. The places from where straw/grass is purchased from outside (include in the study also small farmers and landless having cattle)

Names of cattle keeper interviewed	Places from where grass is purchased (villages & taluks)	Places from where straw is purchased (villages & taluks)

ix. Milk production (include in the study small farmers and landless also; conduct as many interviews)

Names of milk producers interviewed	Average milk production/day (ltrs) (tick right figure)
	< 1 lit/ 1-2 / 2-4 / 4-8/ 8-16/ >16/
	< 1 lit/ 1-2 / 2-4 / 4-8/ 8-16/ >16/
	< 1 lit/ 1-2 / 2-4 / 4-8/ 8-16/ >16/
	< 1 lit/ 1-2 / 2-4 / 4-8/ 8-16/ >16/
	< 1 lit/ 1-2 / 2-4 / 4-8/ 8-16/ >16/

x. Milk processing/marketing (tick whatever is applicable)

Name of milk producers interviewed	uses			
	Name of milk producers interviewed	Milk used for home	Milk sold to dairy	Milk sold to villagers

xi. Production of cattle dung

Name of cattle keeper	No. of cattle	Total no of baskets of dung/day

xii. Uses of cattle dung (how much dung used daily for gobar gas)

Names of cattle keepers	Total dung used for own lands (in baskets/carts)	Total dung sold to others in baskets/carts	Do you have gobar gas plant (mention capacity)	Gobar gas for cooking (Y/N)	Gobar gas for lighting (Y/N)

xiii. Problems faced by cattle keepers

(Write the names of persons interviewed and list their problems)

_____

_____

xiv. What are the needs/recommendations of cattle keepers regarding fodder, milk marketing, gobar gas etc. (Write names of persons interviewed and state their recommendations)

_____

_____

I)Honey production

i. Honey production from the forest

Name of persons interviewed	Names of honey bee types in the village	How much honey is collected in a year	Quantity of honey sold	Months of honey collection

***Use extra sheets for writing if necessary**

ii. Honey production by apiculture

Names of persons	No. of boxes	Annual production of honey	Qty sold

iii. List types of honey available in the village (soapnut honey, mango honey etc.) (List names of persons who provides the information)

_____

_____

_____

iv. What are the plants which are very useful for increasing honey production? (List names of persons who provides the information)

_____

_____

_____

v. What are your recommendations for increasing honey production in the village? (List names of persons who provides the recommendations)

_____

_____

_____

vi. List people who received training in honey production and processing? (add note on who gave training)

_____

_____

_____

vii. What are the medicinal uses of honey?

_____

_____

_____

8) ENERGY SOURCES

A) Availability and uses of plant fuel

Names of persons interviewed	No. of members in the family	Plant fuel used in kgs/day	Sources of fuel		
			Agricultural waste used (specify type and qty)	Firewood/leaves from own land (specify type and qty)	Firewood/leaves from forest (specify type and qty)

B) Recommendations by plant fuel users

(Name some users and write their recommendations)

C) List names of Astra-ole/improved cook stoves (not gas stoves) users in the village

Names	Type of stove used	Advantages	Problems faced

D) List names of people using solar lighting (try to get complete information on all users)

Names	Year of installation	Are you satisfied with the product	Problems faced

E) List names and addresses of people using solar water heaters

(try to get complete information on all users)

Names	Year of installation	Are you satisfied with the product	Problems faced

F) No. of families having cooking gas in the village (LPG)

_____

G) Names and addresses of people using power from micro-hydel

_____

_____

_____

9) KNOWLEDGEABLE INDIVIDUALS (people with traditional knowledge)

Note: Village may have several people having knowledge in herbal medicines (*naativaidyaru*), special knowledge in agriculture, in preparation of bio-pesticides, grafting plants like mangoes, identification of plants and animals etc.

Name & address	Subject	Knowledge
Subbaray Bhat, Muroor	Agriculture	Treating of plant diseases
Devu Mukri	Naativaidya	Skin diseases of cattle
Dinga karvi	Fishing	Fish breeding areas

***Use extra sheets for writing if necessary**

10) Details on artisans of the village

(give details of people in carpentry, blacksmiths, ornaments making, wood carving, stone carving, pot making, shoe making, making of idols such as Ganapati using soil etc.)

Name	Sector (carpentry, wood carving etc.)	Remarks

***Use extra sheets for writing if necessary**

11) Details on fishing communities

Note: Interview five fishermen in the village

Name		**Mention the villages adjacent to his fishing grounds**	**Mode of Fishing**											
Fishing area (√)			**Hook**		**Net**		**Trawler net**		Purseiner net		**Multi day trawler**			
Sea			**No of days of fishing (√)**											
Estuary		**Month**	J	F	M	A	M	J	J	A	S	A	N	D
river		No. of fishing days												
Backwater		Average Income/day												
Pond														
others		No. of family members depending on you												

***Use extra sheets for writing if necessary**

12) DETAILS ON SACRED FORESTS OF THE VILLAGE

(provide details on natural areas of worship such as jatakabana, hulidevarakanu, chowdibana, kapribana etc. or others)

Name of the bana	**Name of the deity**	**Area (acres-gunta)**	**Ownership Private/community/ govt**	**Water sources in or near devarabana*(√)**											
				J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**A**	**N**	**D**

Note: A sacred forest should have minimum five trees

***Water sources:** If water sources such as springs, streams, ponds, wells etc if any in or near the sacred groves

***Use extra sheets for writing if necessary**

13) MAKE A LIST SOME WILD PLANTS IN THE DEVARAKADU

	Name of the bana	plants
a)		
b)		
c)		`
d)		

***Use extra sheets for writing if necessary**

14) MAKE A LIST OF ANIMAL DIVERSITY OF DEVARAKADU

	Name of the bana	animals
a)		
b)		
c)		`
d)		

***Use extra sheets for writing if necessary**

15) VILLAGE STATISTICS (collect details from village accountant's office from *Adarshatakta*) – attach separate sheet

16) Village Map (**collect details from village accountant's office from *Adarshatakta***) – attach sheet

****

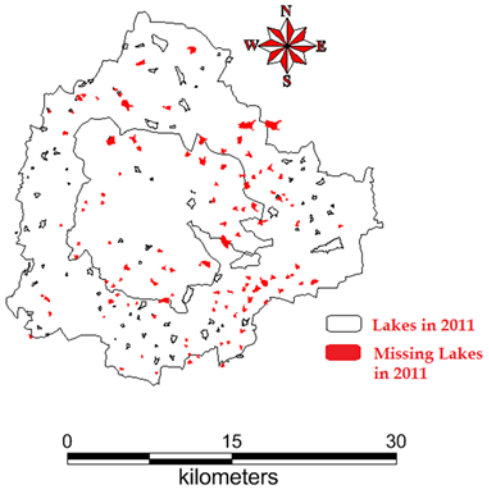
ENVIRONMENT MONITORING IN THE NEIGHBOURHOOD

Environment monitoring is essential for evaluating environmental planning and policy. Long term monitoring helps in evaluating the success of policy as well as helps in identifying areas for improvement. Environmental monitoring provides a vital scientific insights of long-term trends apart from new knowledge and understanding. For Example, monitoring of Bangalore wetlands during the last two decades, provided evidence of poor environmental status of wetlands in Bangalore affecting the land and groundwater sources in the vicinity. Due to its distinctive contributions to science and practice, monitoring is an integral aspect of ecological research, management, and policy.

Environment monitoring in the neighbourhood would help in the preservation of natural resources (lakes, parks, street trees). During 2011-12, we attempted the deployment of student community from high schools and colleges to document biodiversity under the banner 'My Village Biodiversity' in the Uttara Kannada district of Karnataka State. This helped in the compilation of biodiversity information of 300 villages within a year. Competitions were conducted for students and nominal rewards announced for the best reports and good presentations. No financing of the educational institutions has been done to carry out this model of work. The objectives of environment monitoring is to generate "Environment Sensitive Citizens" required for the sustainable management of natural resources. This approach includes:

g. ***Sensitisation of students:*** Pre tested data formats is aimed at sensitizing students to environment, biodiversity and ecology related issues.
h. ***Recording observations:*** Study and understand data formats necessary in the contemporary contexts of conservation and sustainable use. Regular monitoring would help in updating the environment information.
i. ***Vital information on goods and service:*** documentation of goods and services and their significance in meeting the people's livelihood.
j. ***Low cost methods:*** long term monitoring would provide information and technique would be cost effective
k. ***Creating ambassadors of goodwill:*** Students, with their unbiased minds were expected to merit greater acceptability in the neighbourhood, as the local people otherwise tend to be more reserved with outside agencies like NGOs engaged in such work.
l. ***Expertise in communication:*** Students were expected to gain good communication skills.
m. ***Capacity building:*** Students and teachers will have an opportunity to interact with the researchers from Indian Institute of Science, apart from taking active part in LAKE 2014 at Parisara Sabhangan, Sirsi, Uttara Kannada, Central Western Ghats during 13-15 November 2014 (details at the end of this report).

1.0 MAPPING AND MONITORING WATER BODIES



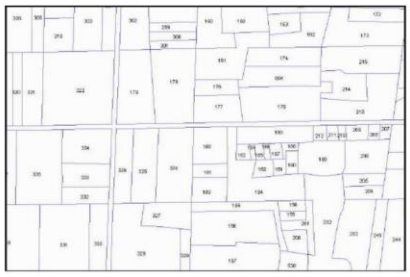
	Bangalore city	Greater Bangalore
1973	58	207
2010	10	93

Objective: Mapping water bodies (Spatial extent and location)

Knowledge required: We need to know (i) Map (ii) Mapping tools (iii)Details about a Map

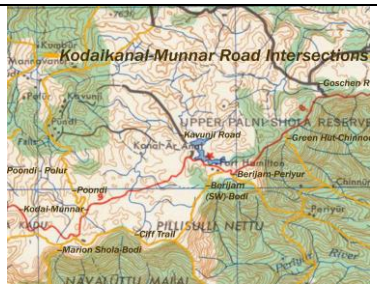
MAP: Is a diagrammatic representation usually on a flat surface of the whole or a part of the Earth surface showing various features like road, water bodies etc.

Types of Maps: Maps are classified based on (a) scale- On the basis of scale (ex. *Cadastral Maps* or *Revenue Maps, Topographical Maps, Geographical Maps, Atlas Maps etc.,)* (b) Contents and purpose (ex: Road map, Railway map, cultural map)



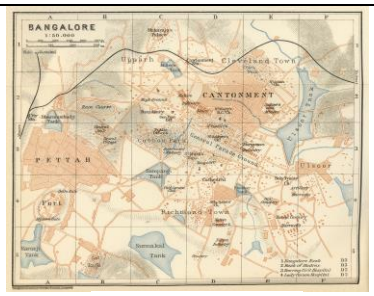
Cadastral Map

These maps are drawn on large scale ex: administration and collection of revenue



Topographical Maps

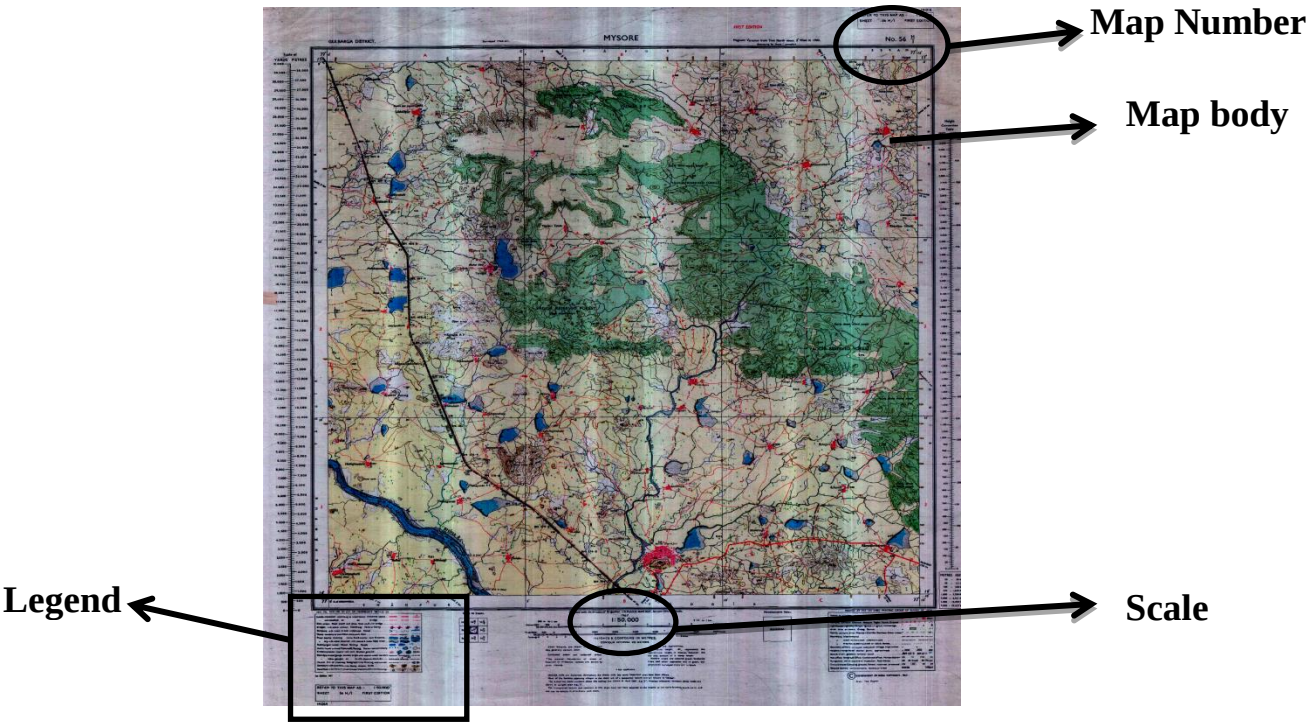
These maps show natural as well as man-made features of an area.



Geographical maps

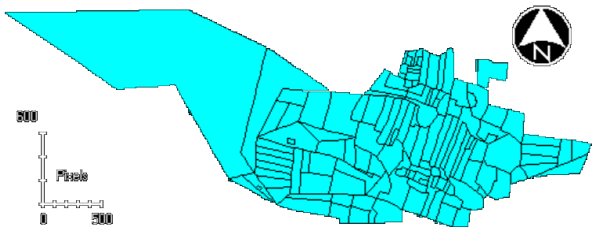
They are on small scales in which strict representation of the individual features.

How to read a MAP?



- **North arrow** represents North direction
- **Scale** is the ratio between distances on a map and the corresponding distances on the earth's surface.
- **Legend** provides details of the content of the map.

Scale represents map unit on the ground. For example, scale of 1:250,000 means that 1 unit on the map corresponds to 250,000 units on ground.



Large scale means maps shows a larger details smaller area coverage (1:10,000). Gives details of each parcels of land

Small scale maps means maps shows lesser details but large area covered

Examples of Scales: 57/H/9/NE – 1:25000 map of North east area of Bangalore, 57/H/9 – 1:50000 Map of Bangalore,

Map: 57 indicate 1:1 million, 57/H -1:250,000 shows the district, 57– 1:100000 covers Indian subcontinent.

Map Numbering

A	E	I	M
B	F	J	N
C	G	K	O
D	H	L	P

1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

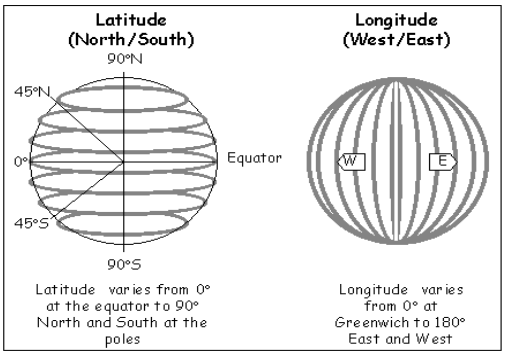
NW	NE
SW	SE

57 - 4^0 x 4^0 on 1:1M scale Shaded cell shows 57 J of scale 1: 250000	57 - 1^0 x 1^0 on 1: 250000 scale Shaded cell shows 57 J/12 of scale 1:50000 scale	57 - 15' x 15' on 1: 50000 scale Shaded cell shows 57 J/12/NE of scale 1:25000 scale

MAP Coordinate system: A coordinate system is a standardized method for assigning codes to locations so that locations can be found easily. Good example is Latitude (LAT) Longitude (long) system.

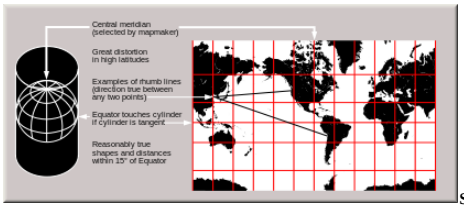
- **Latitude:** specifies the north-south position of a point on surface of Earth. Latitude is an angle which ranges from 0° at the Equator to 90° (North or South) at the poles. Reference being equator.

- **Longitude:** specifies the east-west position of a point on surface of Earth, measured as the angle east or west from the Greenwich Prime Meridian, ranging from 0° at the Prime Meridian to +180° eastward and −180° westward.



- **Datum:** A datum is a set of reference points on the earth's surface against which position measurements are made and an associated model of the shape of the earth to define a geographic coordinate system.

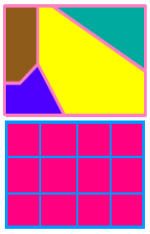
- **Projection:** A transformation of the spherical or ellipsoidal earth onto a flat map is called a map projection.ex: Projection: Cylindrical UTM projection as shown below, Datum:WGS84



Source: WIKI

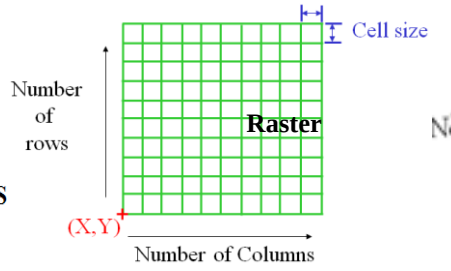
Spatial data: Data that represents the space is referred as spatial data. Two kinds of spatial data are (i) raster and (ii) vector. Both these are used in GIS (Geographic Information System) to store and retrieve geographical data.

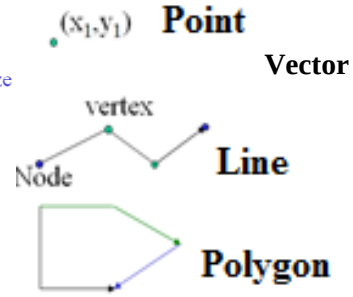
- **Raster data**: is a collection of **cells** which have a single value and are organized in arrays in number of rows and columns. Ex: Your own photograph is a raster data, when zoomed you can see pixels
- **Vector data:** are associated with **points, lines, or polygons**, Points are located by coordinates, Lines are described by a series of connecting line segments and polygons are described by a series of vectors enclosing the area.



Discrete Space: Vector GIS

Continuous Space: Raster GIS





Global Positioning System (GPS): GPS help in locating the co-ordnates of a location, which helps in the navigation. This works on the constellation of 24 communication satellites. Minimum of three satellite signals are necessary for correct measurements.

- Switch on the GPS (Soft switch normally at top or front)
- Navigate to the page showing lat-long and satellite signal strength
- Stand in the location to be marked and press mark
- Note the waypoint number and lat-long and proceed
- GPS can also be connected to pc using USB and software

Conversion from Degree Decimals to Degree, Minutes, Seconds

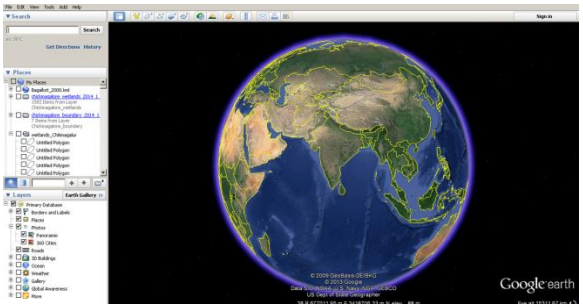
Consider the example 96.31°, the whole units of degrees will remain the same (i.e. in 96.31°, longitude, start with 96°).
Multiply the decimal by 60 (i.e. .31 * 60 = 18.6).
The whole number becomes the minutes (18').
Take the remaining decimal and multiply by 60. (i.e. .6 * 60 = 36).
The resulting number becomes the seconds (36''). Seconds can remain as a decimal.

GPS NAME: …… Area surveyed……..
Date: ……., Time: ……., Name: ……..

Location (inlet of lake, near place etc.)	Waypoint number	Latitude	Longitude

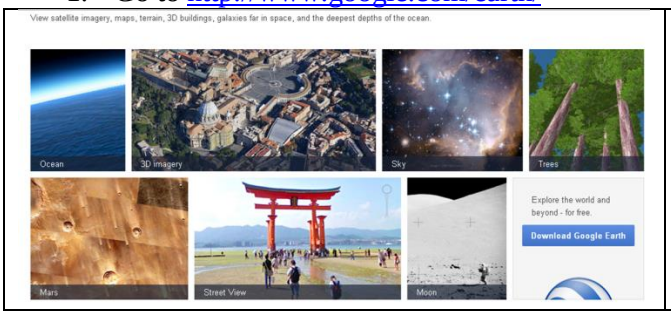
2.0 DIGITSING MAP FROM ONLINE DIGITAL DATABASE

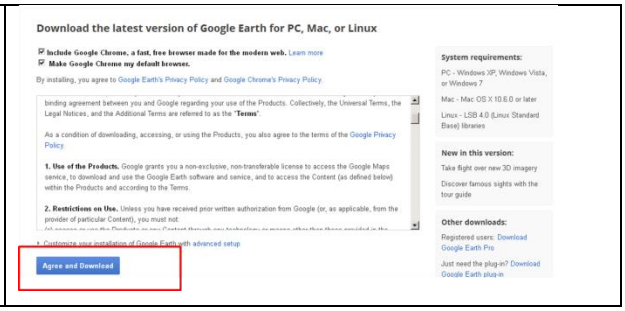
Google earth (http://*earth.google*.com) /Bhuvan (http://bhuvan.nrsc.gov.in)



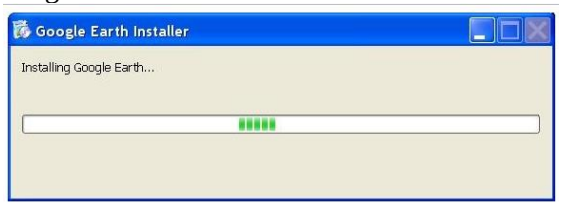
Downloading Google earth

1. Go to http://www.google.com/earth/

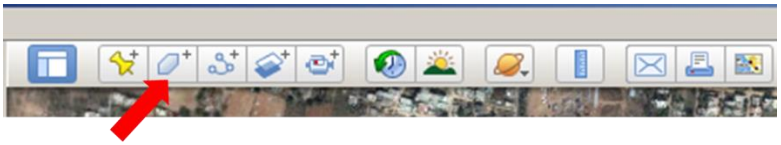




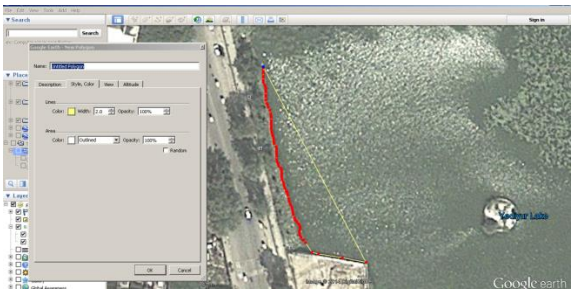
2. Installing google earth : Click on downloaded googleearthupdatesetup.exe file to install, you will be greeted with below message



3. Creating a vector Layer (Polygon, Point, Line)
   a. Adding a polygon – describes a area (ex boundary of a lake)

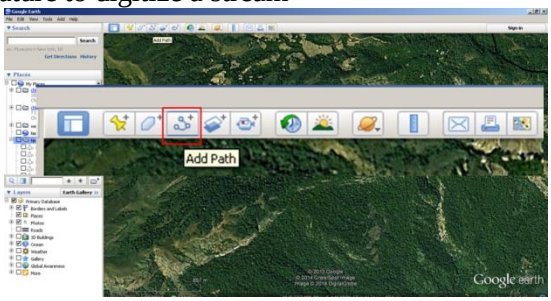


Use left mouse button to place points on boundary as shown below

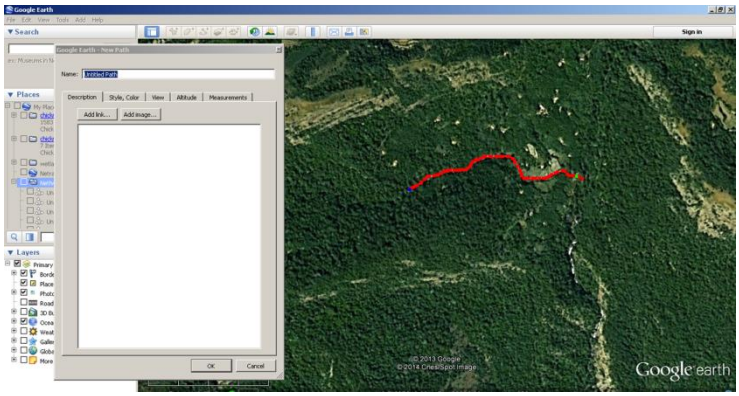


Once completed the entire waterbody click ok (example shown below)

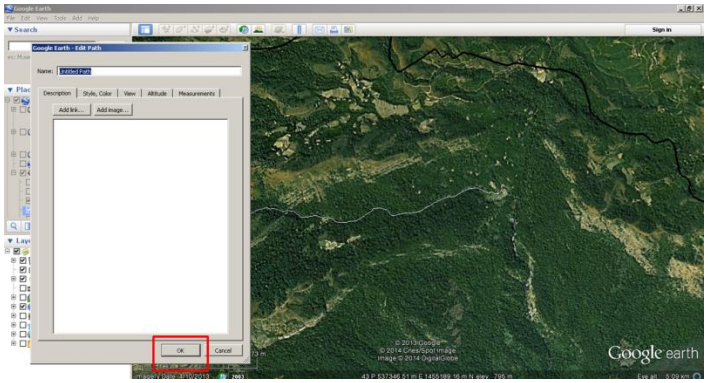
b. Creating a line feature to digitize a stream



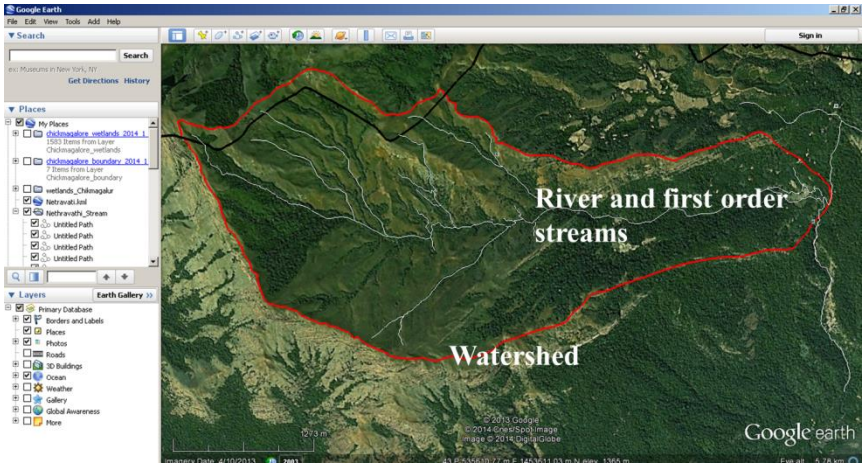
Digitise river using mouse by left clicking at each point



After entire stream is delineated click on ok



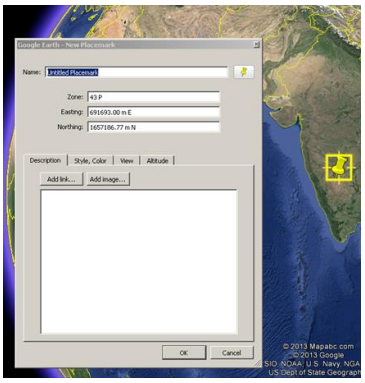
Example of first order streams and catchment delineated from Google earth



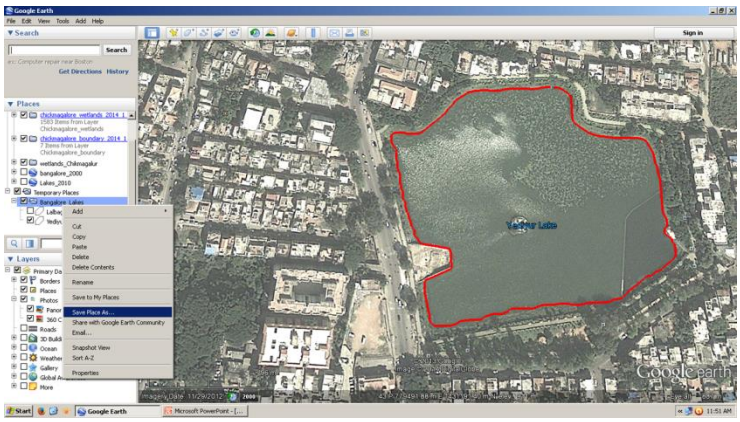
c. Creating a point feature to show a place of interest (Point may represent your school location)

Click on placemark as shown below

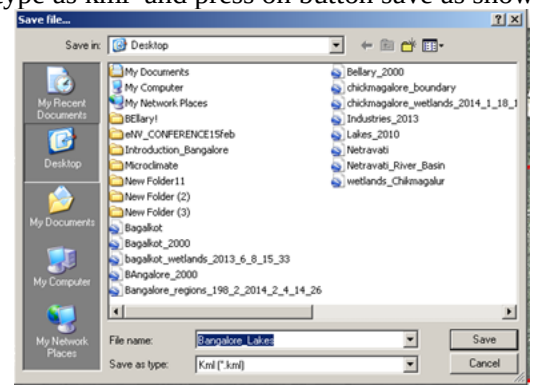
Click on ok, once you could locate your school



d. **Save digitized KML layers :** Right mouse click on the layer to be saved and select save place as



e. Select type as kml and press on button save as shown below

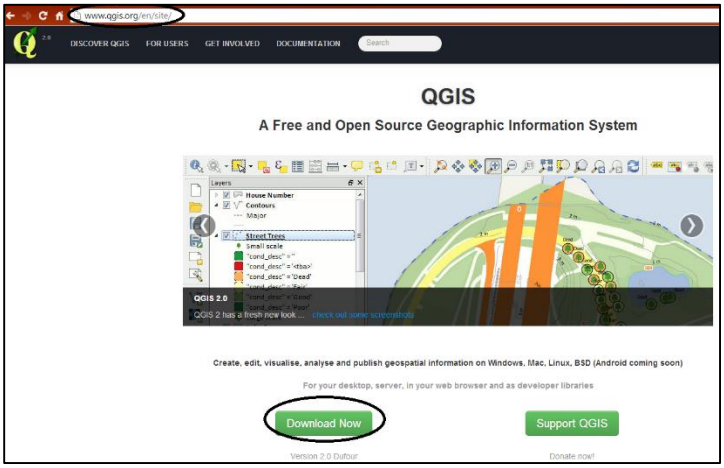


3.0 QUANTUM GIS (QGIS) – SPATIAL MAPPING TOOL

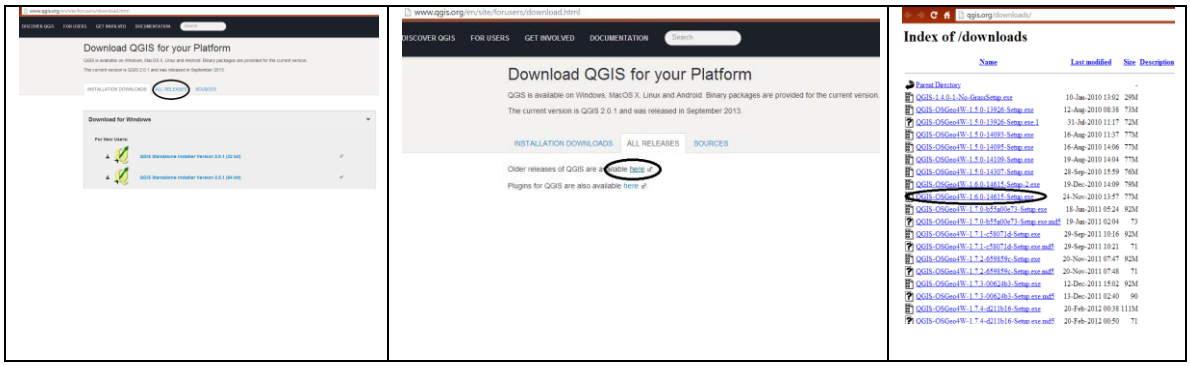
QGIS is a Free and Open Source GIS for manipulating geographical data (vector, raster), statistical analysis.

INSTALLATION:

- Download QGIS from http://www.qgis.org/en/site/
- QGIS main page will be opened as shown below.



- Click on download now you will find the list of versions available.
- Download the latest stable version.

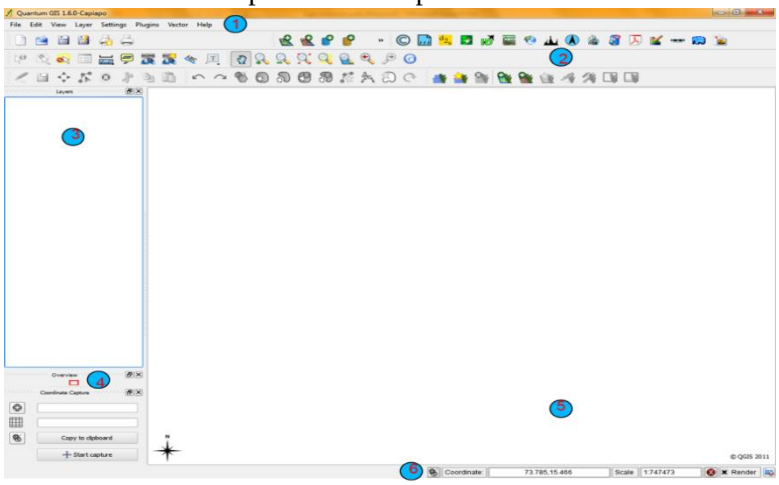


- Installation of Software: Double click on QGIS-OSGeo4W-1.6.0-3-Setup-x86_32.exe. After the installation click on QGIS icon on the desktop.

Use of QGIS:

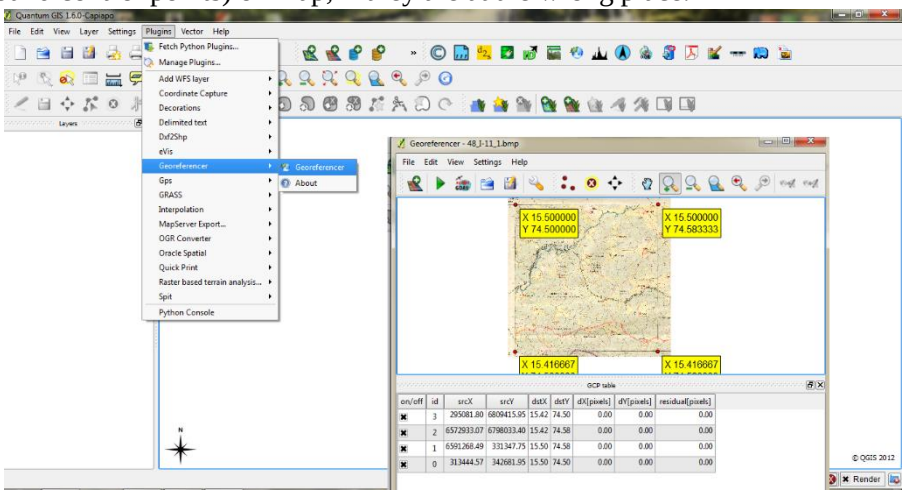
- **QGIS main** window will be opened and looks as shown
  1. The menu bar provides access to numerous QGIS features.
  2. The toolbars offers additional tools for interacting with the map. Hold the mouse over the particular icon, a short description of the tool's purpose will be displayed.
  3. The map legend area sets the visibility
  4. QGIS - maps are displayed in map canvas area

5. The map overview panel provides a full extent view of layers added
6. The status bar shows the current position in map coordinates

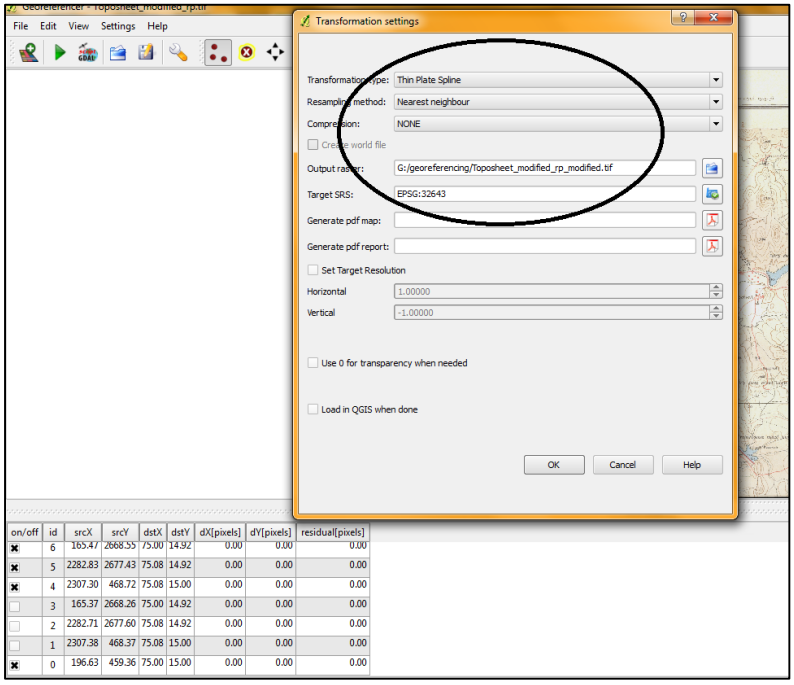


Geo referencing:

- Geo-referencing is the process of assigning real earth coordinates to the digitised maps, so it can be viewed, queried, and analysed with other geographic data.
- To start geo referencing an unreferenced raster, we must load it by clicking Plugins menu option in the menu bar and click on **Georeferencer** plugin. The Georeferencer window will be opened click on **File** menu and click Add raster layer. The raster will show up in the main working area of the dialog. Once the raster layer is loaded, we can start to enter reference points.
- Using the Add Point button (Edit→ Add points), you can add points to the main working area and enter their coordinates. Click on a point in the raster image which you want to assign co-ordinates and enter the X and Y coordinates manually. With the move button option you can move the GCPs (Ground control points) on map, if they are at the wrong place.



- Continue entering points. You should have at least 4 points and the more coordinates you can provide, the better the result will be. There are additional tools on the plugin dialog to zoom and pan the working area in order to locate a relevant set of GCP points.
- After entering GCP's click on Settings option in Georeferencing menu bar select Transformation Settings option. A drop box will be displayed and select options as shown in the below image. Specify output file name and transformation parameters and projection system then click OK.

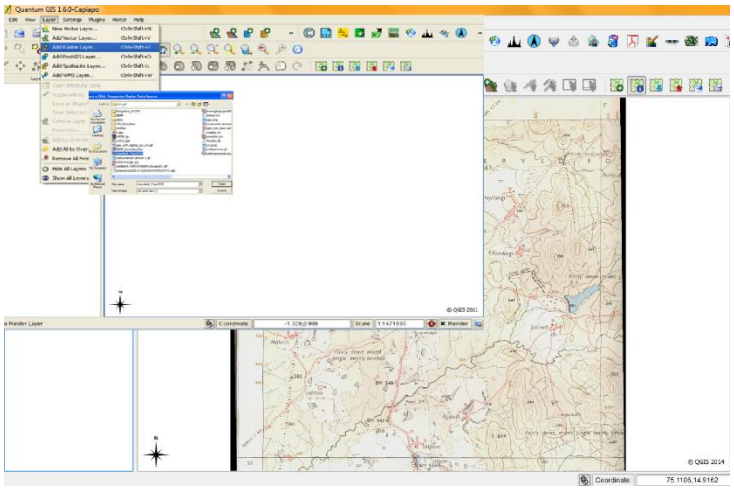


- Click on File menu and Select Start Georeferncing option. The Georefrencing will be started.

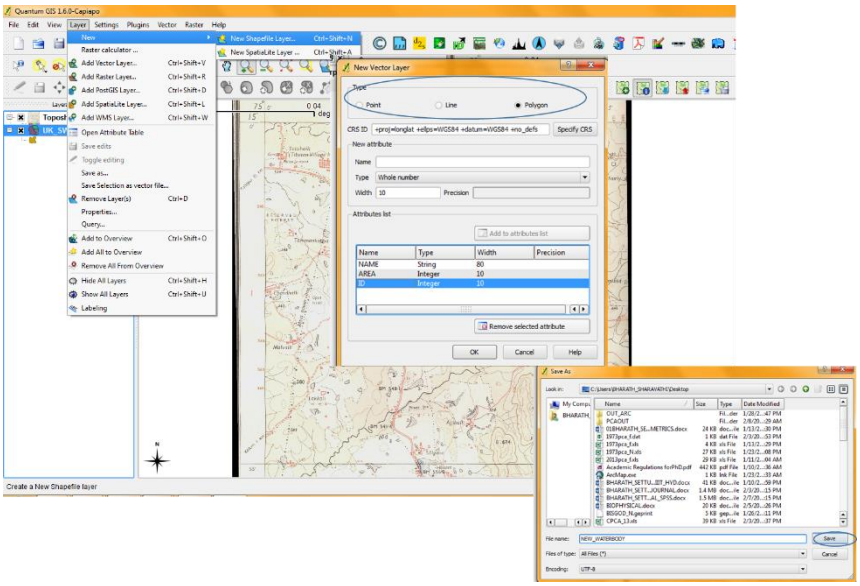
Digitising vector data

Digitising features (water bodies) of Topo map:

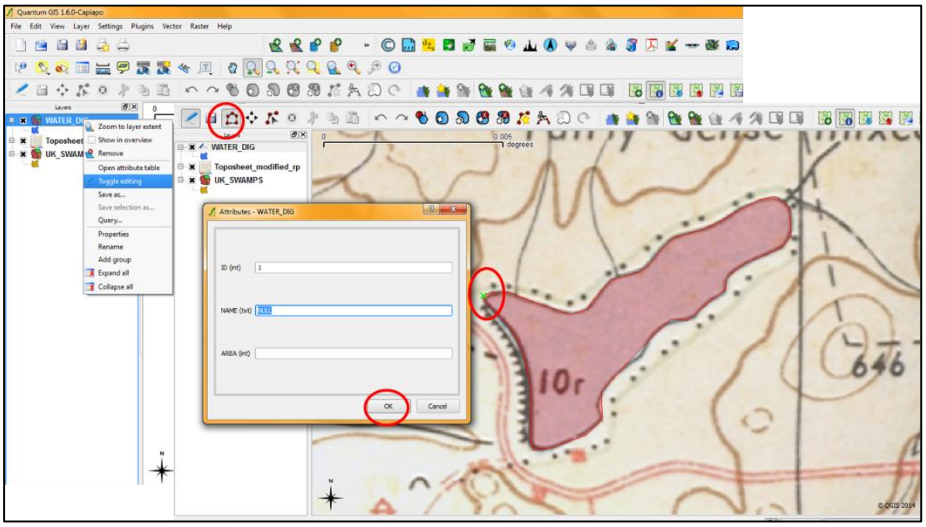
- Open the raster file you have geo referenced by clicking Layer→ Add raster layer option.
- The raster layer window will be open and load the saved layer. It will be displayed on Map canvas.



- To digitise the water bodies select Layer menu and click New→create new shape file layer option. Then new shape file layer drop box will open with options.
- Select polygon option and provide the attributes for it and save the file with a name. The saved new shape file will be loaded for creation of features.



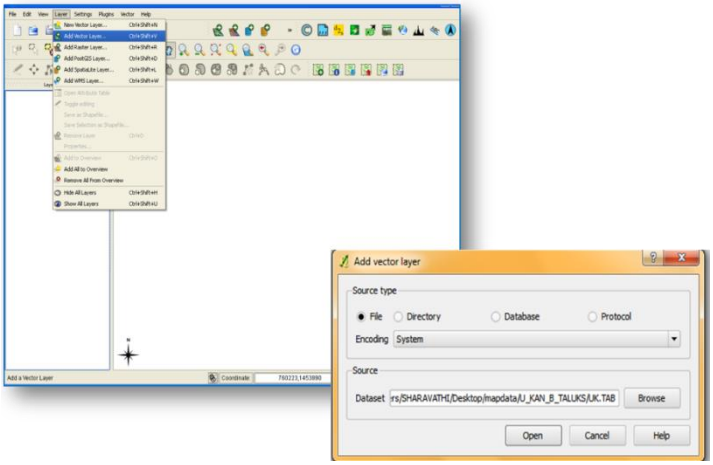
- **Attributes** are entered as features to be created.
- Zoom to the feature you want to digitize by using zoom options. Right click on the vector layer you have created and select **Toggle editing** (pencil like symbol) option. Then tool bar will be highlighted. Click on **capture polygon icon** and start digitizing the water body.



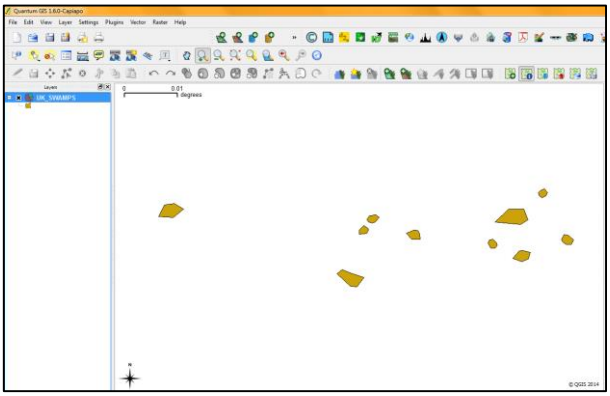
- Enter the attributes and press ok. After digitisation click save layer option to save the modifications you made.
- To compute area of the polygon right click on the layer you digitised and click open attribute table and select field calculator select area option to compute area.
- The area will be shown in degrees. Convert it to Hectares by adding new column and provide the name for new column. Then select field calculator select the new column to be updated.
- Type the formula as AREA*110*110*100 for getting in terms of Ha.

Importing Google earth data:

- To load a vector file click on **Layer menu** in menu bar select add vector layer, a dialogue box will be displayed, which allows to traverse through the file system and load a kml file which you have created using Google earth or other formats of vector data.



- The layer will be displayed in the map canvas area.



- Right click on the layer and select properties to check the attributes, colors etc.
- QGIS supports a number of Symbology renderers to control how vector features are displayed
- Labels tab allows to enable labelling features and control a number of options related to fonts, placement, style, alignment and buffering.
- Attributes tab allows to manipulate the attributes of the selected dataset
- General tab permits to change the display name, view/change the projection of vector
- Metadata tab contains general information about the layer which is not yet editable.
- Diagram tab used to overlay a graphics to a vector layer. It allows overlying pie charts, bar charts.
- Right click on the layer click save as option to create a ***shape file***. Import the shape file and continue to work with it. So you can edit the features and compute the area etc.

Help from QGIS:
http://www.qgis.org/en/site/forusers/index.html#

http://www.qgis.org/en/docs/index.html

4.0 WATER YIELD IN THE CATCHMENT

Objective: To estimate the water yield in a catchment (of a lake, pond, stream or river).

Catchment (Drainage area, Drainage Basin or Watershed): The area of land draining water into a water body (fig1). Two neighboring catchments are separated by a ridge (highest land that separates two watersheds). The areal extent of a catchment is obtained by tracing the ridge on a Topographical Map (fig2). Based on the spatial extent, catchments are classified given in table 1.

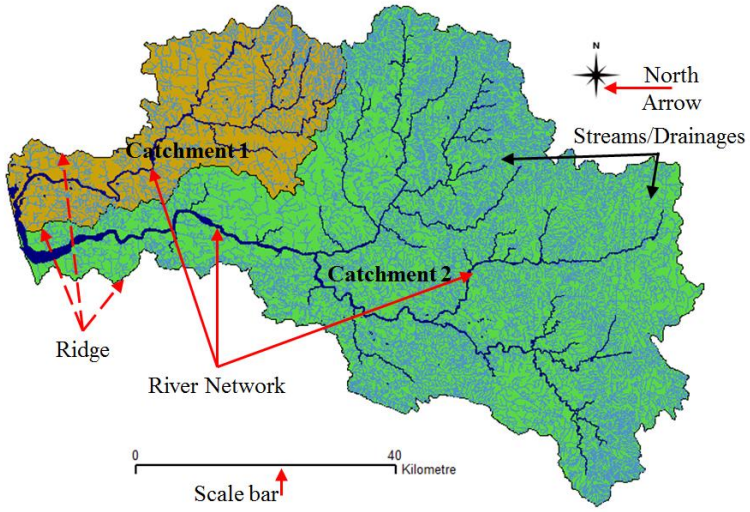


Fig1: Catchment Map

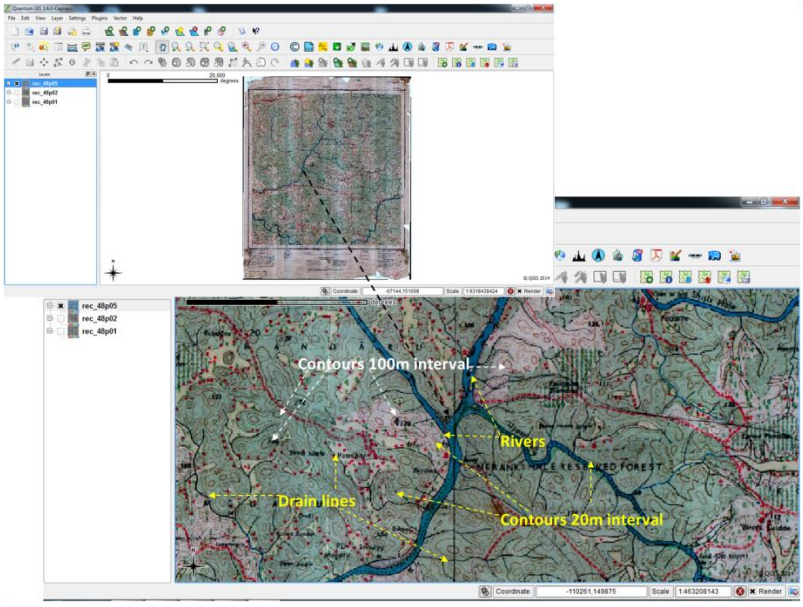


Fig2 : Topographic map indicating different features

Table1: Classification of Catchments in India

Sl.no	Type of Catchment	Area in 1000 Hectares
1	Micro-watershed	Less than1
2	Milli-Watershed	1 – 10
3	Sub-Watershed	10 – 50
4	Watersheds	50 – 200
5	Sub-Catchments	200 – 1000
6	Catchments	1000 – 3000
7	Basin	3000 – 25000
8	Region	Greater than 25000

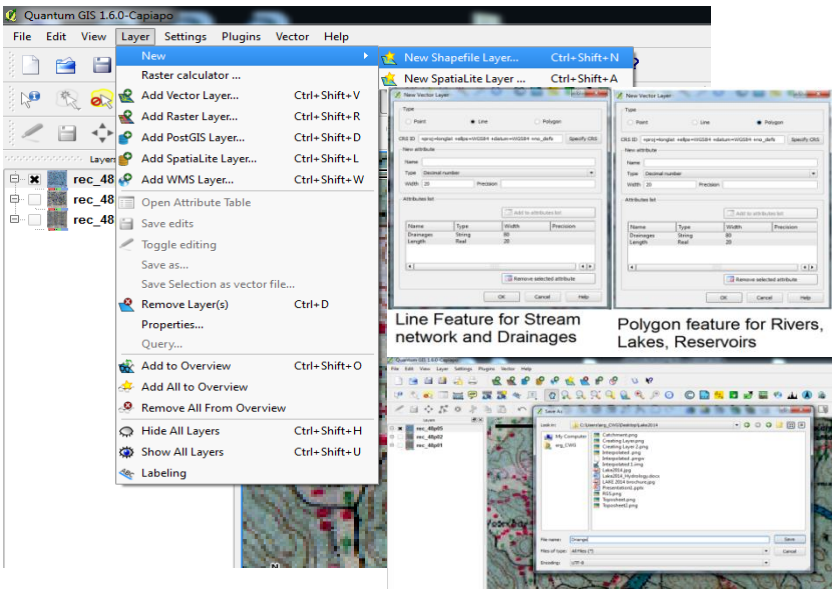
Source: http://fes.org.in/source-book/SWC%20Source%20Book_final.pdf

Contours: Contours are the imaginary lines on the earth surface with equal elevation. In a topographic map of 1:50000 scale, contours are at every 20 metre interval. Contours with decreasing altitudes with respect to an higher altitude contour indicates hillock, on the contrary increasing contours along a low altitude contour indicates Valley.

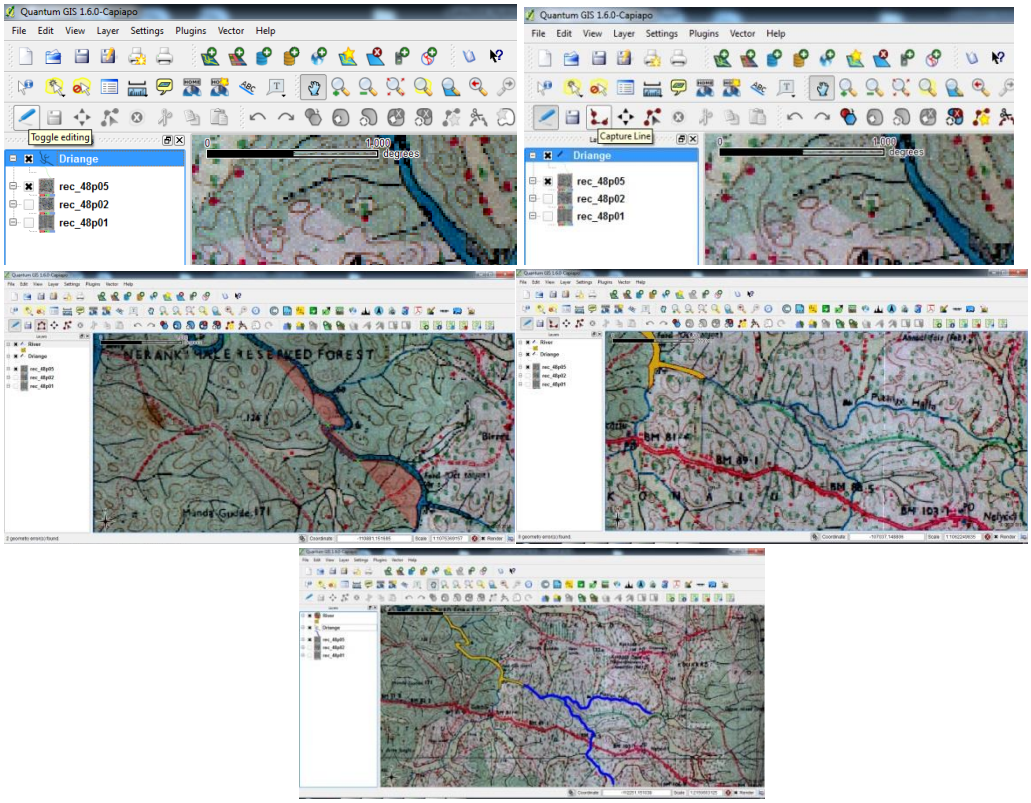
Steps involved in Delineating a Catchment:

Step 1. Scan the respective topographic map
Step 2. Use QGIS, Geo-reference or assign the co-ordinates
Step 3. Digitise waterbody as polygons and Stream network as line features.

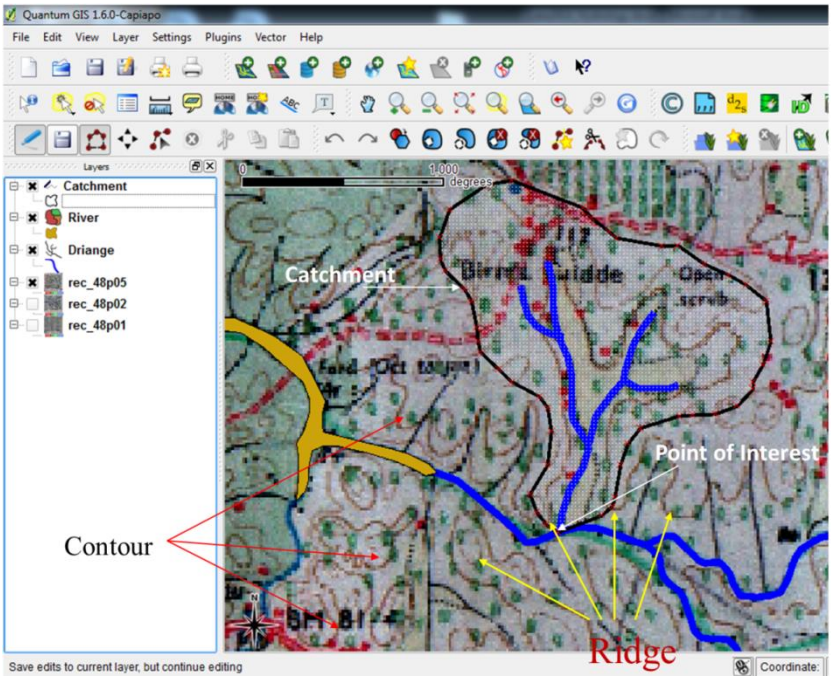
a. Create New features as line or polygon
Go to Layers, New Shape file Select Line or Polygon feature based on the feature to be delineated, add attributes and save.



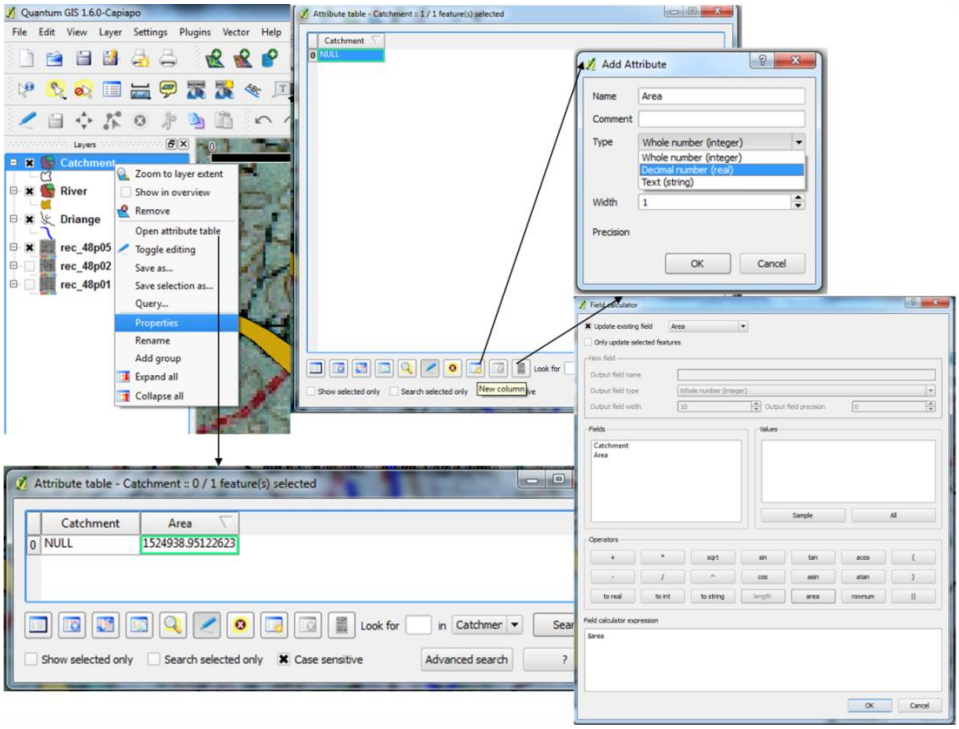
b. Load the new shape files created, click on toggle editing, click on add feature and start delineating the feature, save the edits. And stop toggle editing.



With respect to the water body, digitize its catchment as polygon feature.



Step 4. Compute the spatial extent of the catchment. To measure the Area, right click on the catchment layer, click on properties, toggle editing, add column (the same procedure could be adopted to define the attribute), provide the details of the attribute such as attribute name, type such as text, integer or float and then ok. Click on the Field Calculator, click on update field and select the field to be updated (Area). Add the Area Operator to the field calculator expression to estimate the area of the polygon (Catchment). Save Edits and Stop Toggling.

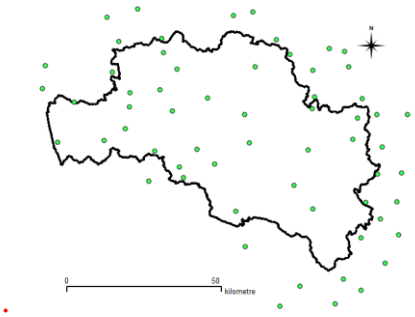


Step 5. Click on the Open Attribute to obtain the information about the area estimated. [**very important: if you have the coordinate system in latitude longitude degree decimal coordinate system, are would be in square degrees, if the coordinate system is UTM then the area would be as square metres. To convert square degrees to hectares multiply the area measured with 1100*1100, and to convert square metres to hectare divide area measured by 10000**]. In the above example demonstrated, area is 152.5 Hectares.

Similarly, other measurements such as distance, coordinates, centroids etc. along with other vector operations could be made using Calculator TOOL.

Rainfall: Daily Rainfall data at different locations are observed using rain gauges as millimeter and maintained by India Meteorological Department (IMD), Public Works Department (PWD), Water resources Development Organisation (WRDO), Agriculture Department, Revenue Department, Forest Department, etc, and is as depicted in fig.3. ***Each rain gauge represents rainfall over an area assuming rainfall is uniform in its vicinity***

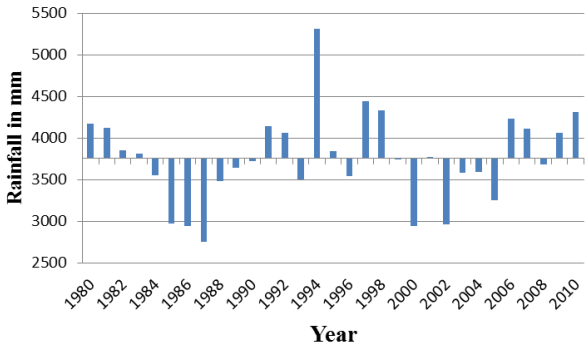
Fig 3: Rain Gauge stations



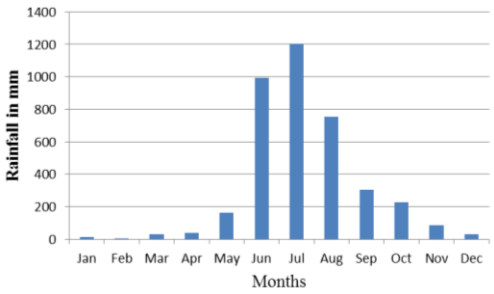
To analyze the rainfall trend and dynamics over a region, seasonal and annual rainfall data for atleast 10 to 20 year.

Steps involved in analyzing rainfall trend in the basin:

Step 1. Rainfall data for 15 to 20 years shall be acquired from the agencies such as IMD (Indian Meteorological Department), WRDO, Statistical department etc.
Step 2. Rain gauge stations inside and near to the basin are identified based on the location of the rain gauge stations.
Step 3. Annual data is plotted as a graph to understand the dynamics of rainfall over time.



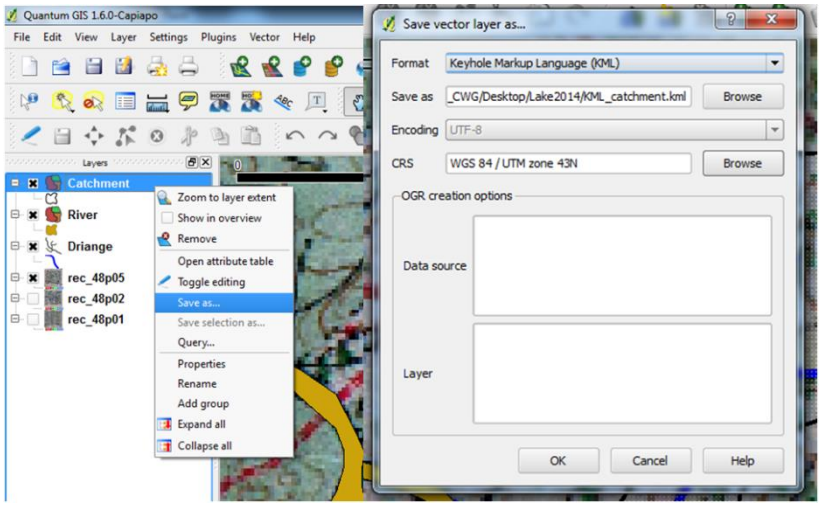
Step 4. Based on the annual rainfall trend, seasonal variation in the watershed is estimated



Extraction of Land use details from Google Earth: Google earth provides satellite images with high resolution, this could be used to identify different types of land uses in the basin.

Steps involved in extraction of landuse features from Google earth:

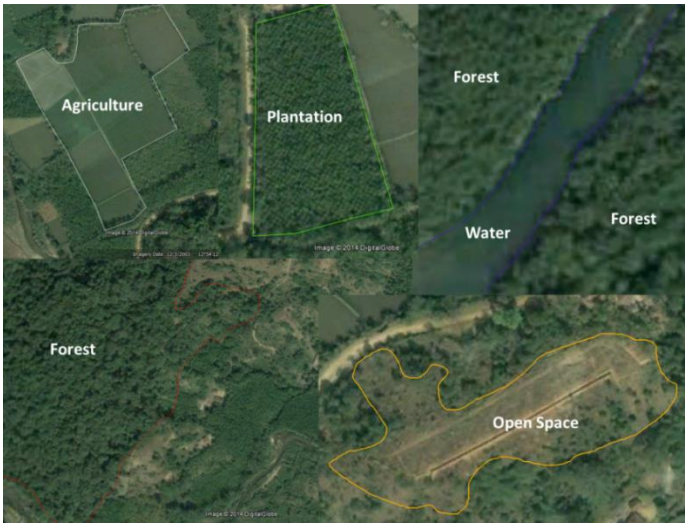
Step 1. The delineated catchment would be in the form of **xxx**(filename)***.shp*** format i.e., as a shape file, first convert the same to kml. Right click on the shape file, click on save as, click on format and select KEYHOLE MARKUP LANGUAGE (KML) to convert the convert the file to kml, save the file



Step 2. Double click on the saved 'kml' to open the same in Google earth

Step 3. Within the watershed, start digitising layers as polygons and save as 'kml'.

Example: Agriculture as a layer, Forest as a layer, water body as a layer etc



Step 4. 'kml' files are imported in QGIS, and converted as shape file (same procedure as step1)
Step 5. Calculate the are under each landuse using Map calculator tool

Assessment of water yield: Water yield or Surface Runoff is the precipitated water that drains to a water body in a catchment. Surface runoff occurs during monsoon. Factors affecting Runoff are the Slope, Drainage, Land use, Soil Characteristics, Rainfall. The total quantity of water that can be expected in a stream in a given period of time such as monthly, annual etc… is referred to as Runoff Yield.

Runoff Yield (Q) as kilo.cubic metre (Million Litres) is estimated empirically (eq.1) as a function of Rainfall (P) in mm and Area under different land uses (A) in Hectares.

$$Q = (C*P*A)/100 \qquad 1$$

Where Q = Runoff Yield in Million litres
C = Runoff Coefficient of a particular land use
A = Area under land use in Ha
P = Mean Monthly rainfall in mm (average of 10 – 15 years)

Runoff Coefficient under different land use is as specified in table 2.

Land Use	**Runoff Coefficient**
Forests	0.1 – 0.2
Plantations	0.2 – 0.6
Agriculture	0.4 – 0.7
Open Spaces, Grasslands	0.5 – 0.8
Built-up	0.7 – 0.9
Rocky Areas	0.8 - 1.0

Water Yield Estimation

Location Description						
Catchment Extent	Latitude		Longitude			
	min		min			
	max		max			
Catchment Area in Ha						
Annual Rainfall in mm						
Land Use	Area in Ha **A**		Runoff Coefficient **C**			
Forests						
Plantations						
Agriculture						
Open Spaces, Grasslands						
Built-up						
Rocky Areas						

Monthly rainfall ***P*** in mm	January	February	March	April	May	June
	July	August	September	October	November	December

Seasonal Catchment Yield in Million Litres **Q = (C*A*P)/100**						
Land Use	January	February	March	April	May	June
Forests						
Plantations						
Agriculture						
Open Spaces, Grasslands						
Built-up						
Rocky Areas						
Gross Yield **Q**						
Land Use	July	August	September	October	November	December
Forests						
Plantations						
Agriculture						
Open Spaces, Grasslands						
Built-up						
Rocky Areas						
Gross Yield **Q**						
Annual Catchment Yield = (Σ Q)					Million Liters	

5.0 FLYING FRIENDS….

Introduction: Birds (class Aves or clade Avialae) are feathered, winged, two-legged warm-blooded, egg-laying vertebrates. Aves ranks as the tetrapod class with the most living species, approximately ten thousand. Extant birds belong to the subclass Neornithes, living worldwide and ranging in size from the 2 in Bee Hummingbird to the 9 ft Ostrich. The fossil record indicates that birds emerged within the theropod dinosaurs during the Jurassic period, around 150 million years ago. *Archaeopteryx* was the first fossil to display both clearly traditional reptilian characteristics: teeth, clawed fingers, and a long, lizard-like tail, as well as wings with flight feathers identical to those of modern birds. It is not considered a direct ancestor of modern birds, though it is possibly closely related to the real ancestor. Depending on the taxonomic viewpoint, the number of known living bird species varies anywhere from 9,800 to 10,050. In India, around 1314 species of birds are documented, of which 42 are endemic to India. In Karnataka state, 535 species of birds has been reported.

Evolution: Modern birds are characterized by feathers, a beak with no teeth, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a lightweight but strong skeleton. Wings are evolved forelimbs, and most bird species can fly. Flightless birds include penguins, and diverse endemic island species. Some species of birds, particularly penguins and members of the Anatidae family, are adapted to swim. Birds also have digestive and respiratory systems that are uniquely adapted for flight. Some birds, especially corvids and parrots, are among the most intelligent animal species; several bird species make and use tools, and many social species culturally transmit knowledge across generations.

Behaviour: Many species annually migrate great distances, and many more perform shorter irregular movements. Birds are social, communicating with visual signals, calls, and songs, and participating in such social behaviours as cooperative breeding and hunting, flocking, and mobbing of predators.

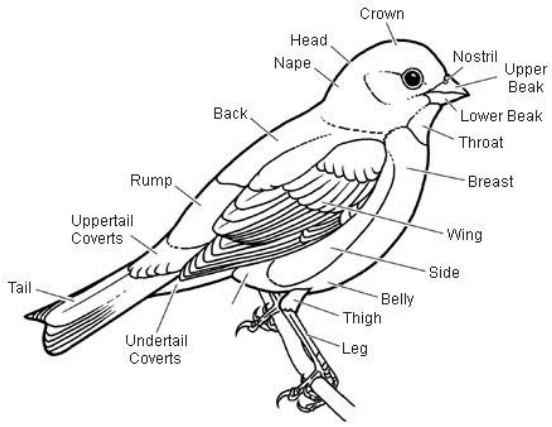
Usefulness: They eat a lot of harmful insects that may destroy crops. they are part of the food chain. They help disperse the seeds of many plants. The raptors keep rodent populations in check. The vultures help clean the land of animal carcasses, preventing the spread of infectious diseases. Another use of birds is harvesting guano (droppings) for use as a fertilizer. Birds prominently figure throughout human culture. About 120–130 species have become extinct due to human activity since the 17th century, and hundreds more before then.

Need to study: Birds are among the most fascinating creatures on Earth. Many are beautifully colored. Others are accomplished singers. Many of the most important discoveries about birds and how they live have been made by amateur birders. Ornithology is the scientific study of birds. The information ornithologists gather is used to better understand how birds function, inside and out, and to learn how birds relate to their natural environment.

- Birds provide a terrific doorway into nature and scientific study.
- They are easy to see and study.
- They engage in fascinating behaviors and play important roles in the ecosystems that sustain life
- Birds are excellent indicators of environmental health.
- Their changing populations often provide clues to the overall health of their habitat.

Requirements: A pair of binoculars, good pictorial field guide and note book to pen down observation.

Parts of a bird



- **Head**: The bird's head is one of the best places to look for field marks such as eye colour, malar stripes, eyebrows, eye rings, eye lines and auricular patches. The crown (top) and nape (back) are also key parts of the head that can help identify a bird.
- **Bill**: The size, shape and colour of a bird's bill is critical for identification. Also check for any curvature in the bill or unique markings such as differently coloured tips or bands.
- **Chin**: The chin, directly below the bill, is often hard to see on many birds, but when it is a different colour it can be an exceptional body part to check for identification.
- **Throat**: A bird's throat may be a different colour from its surrounding plumage, or it may be marked with spots, streaks or lines. Malar stripes may frame the throat as well, helping set it off from the rest of a bird's body. For many birds, the chin and throat have similar colours and markings.
- **Neck**: The neck of a bird is hard to see on many species, since it can be relatively short and insignificant. On wading birds, however, the neck is much more prominent and can be a good place to look for field marks. The length of the neck can also help distinguish different bird species.
- **Back**: A bird's back is often broad and easy to see in the right posture. Different colours and markings along the back that distinguish it from the neck, rump and wings.
- **Chest**: The chest (also called the breast) is the upright part of the bird's body between the throat and the abdomen. A bird's chest may be differently coloured or marked with stripes, streaks or spots that can help with identification.
- **Abdomen**: The abdomen or belly of a bird extends from the bottom of the chest to the under-tail coverts. The colours and markings on the abdomen may vary from the chest and flanks, making it a good feature to check for identification.
- **Flanks**: The flanks (sides) of a bird are located between the underside of the wings and the abdomen. In many bird species, the flanks have unique colours or markings, though depending on how the birds carry their wings, the flanks may be difficult to see.
- **Wings**: Birds' wings are their upper limbs used for flight. Wing bars or patches are useful field marks, as are the lengths of the wings compared to the length of the tail when the bird is perched. In flight, wing shape is also a great field mark.
- **Rump**: A bird's rump is the patch above the tail and low on the back. For many birds, the rump

does not stand out, but some species show unique rump colour patches that are useful for identification.

- **Tail**: The length, shape and colours of a bird's tail are important for proper identification. The tail can be held in different positions when the bird is perched or flying. Also, watching for different markings can help distinguish different birds.
- **Under-tail Coverts**: The short feathers beneath the tail are the under-tail coverts, and these feathers often show unique colours or markings that can distinguish bird species.
- **Legs**: Birds' legs vary in length and colour, both of which can be useful field marks for proper identification. The thickness of the leg, while difficult to see on many species, can also be a clue, as can any feathering. Some raptors, for example, have heavily feathered legs that can be used to identify the birds.
- **Feet**: Many birds' feet are the same colour as their legs, but not always. The orientation of the toes, the size of the talons and how a bird uses its feet are also useful identification characteristics.

Field Analysis:-

Method - Random Sampling

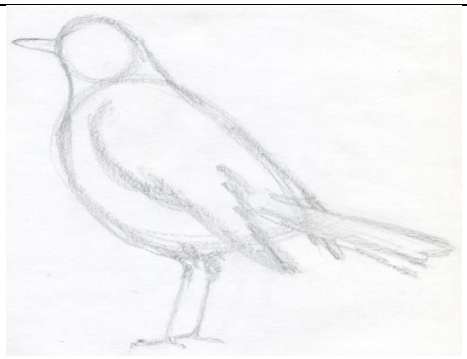
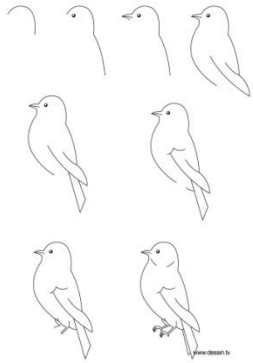
Equipment used - Binoculars, Digital SLR Camera

Duration – every month last Sunday

Weather Conditions: **Day light: Sunny/cloudy**

Temperature:

Date	Location	Habitat	Birds	comment

<table>
<tr><th colspan="2">How to sketch a bird in field?</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Common Friends in Bangalore</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>House Sparrow (Passer domesticus)</td><td>Spotted Munia (Lonchura punctulata)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>House Crow (Corvus splendens)</td><td>Jungle Crow (Corvus macrorhynchos)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Common Myna (Acridotheres tristis)</td><td>Jungle Myna (Acridotheres fuscus)</td></tr>
</table>

	
Red-whiskered Bulbul (*Pycnonotus jocosus*)	*Red-vented Bulbul* (*Pycnonotus cafer*)
	
Black Kite (Milvus migrans)	*Brahminy Kite* (*Haliastur indus*)
	
Cattle Egret (*Bubulcus ibis*)	*Rose-ringed Parakeet* (Psittacula krameri)
	
Green Bee-eater (Merops orientalis)	*White-cheeked Barbet* (*Megalaima viridis*)

6.0 GEOTAGGING AND FIELD DATA COLLECTION

Geotagging: Geotagging (is the process of adding geographical identification metadata to various media such as a geotagged photograph or video, websites, SMS messages. This data usually consists of latitude and longitude coordinates, altitude, distance, accuracy data, and place names.

Geotagging photographs is the process of recording location information (the latitude and longitude) where and when a photograph was captured by the camera. The data is recorded within the digital image file that the camera records and this data can be read by any suitable software.

STEPS INVOLVED IN GEOTAGING AND FIELD DATA COLLECTION:

Go to play store in your Android mobiles

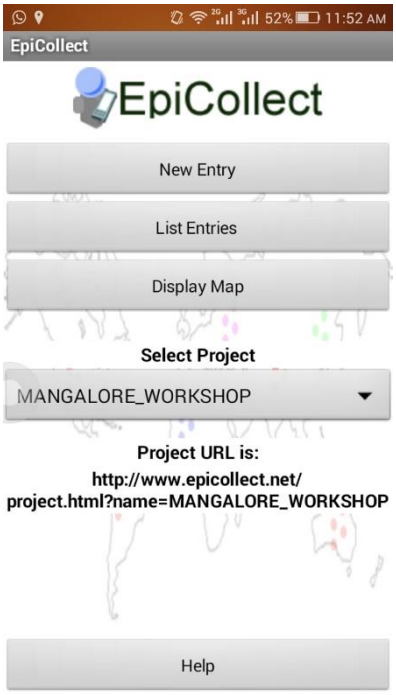
Search for **EpiCollect** software, download and install it.

Open EpiCollect application and the welcome screen is

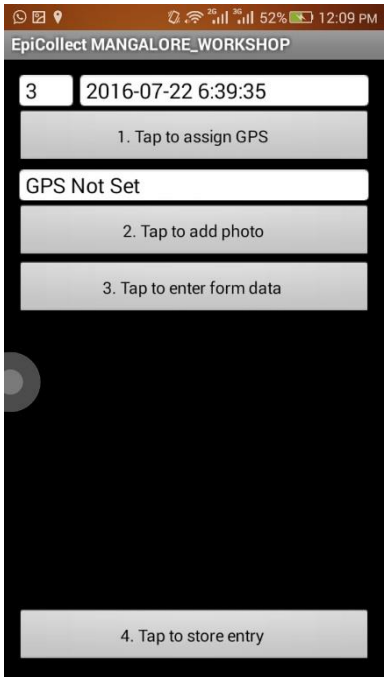
By default, demo project will be loaded.

To load a new project, select **Menu option and load project**

Load "MANGLAORE_WORKSHOP" Project, which is created to geo-tag plants:



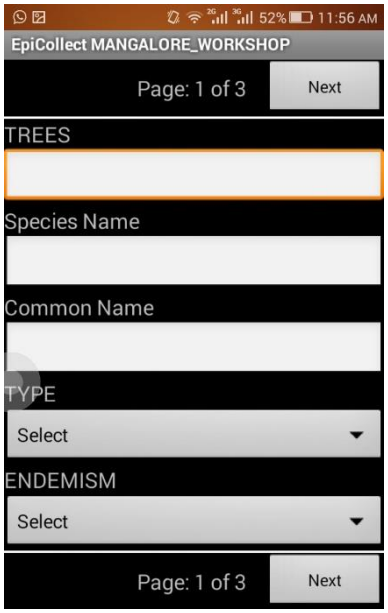
Click on New entry,



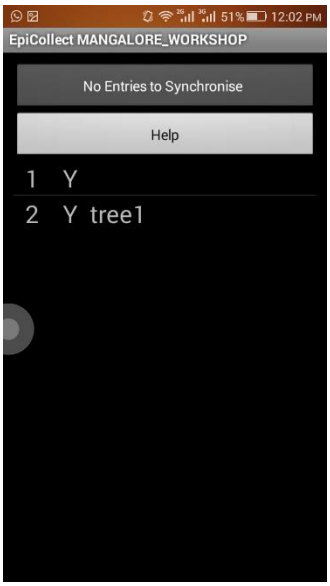
Click on assign GPS to get location (x, y: longitude, latitude) details. It takes some time for assigning GPS. You need to wait for few seconds for good accuracy.

Tap to take a photograph for capturing new photo of a sapling. If you have already saved the photograph, you can upload the same). Take a photograph and click save.

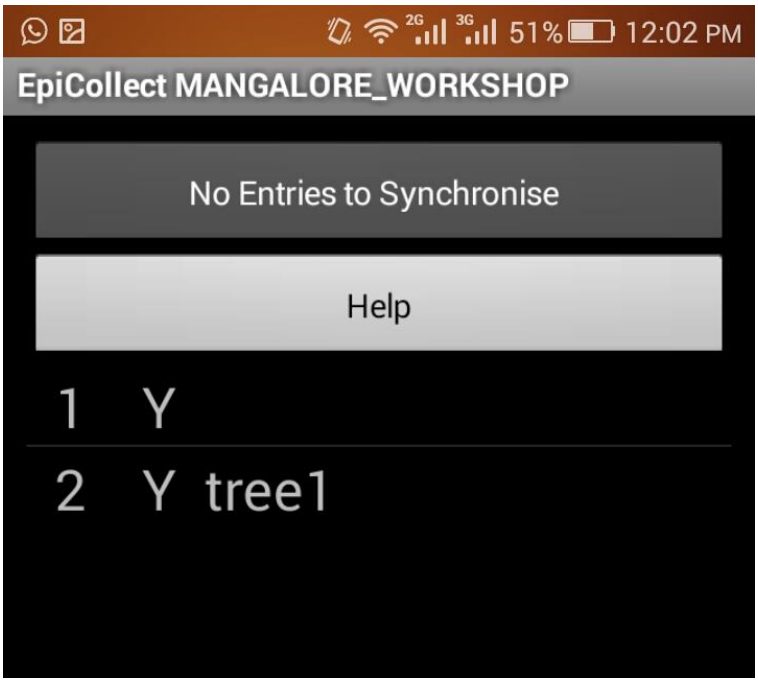
Tap to enter form data



After entering press confirm button and press Tap to synchronize to server.

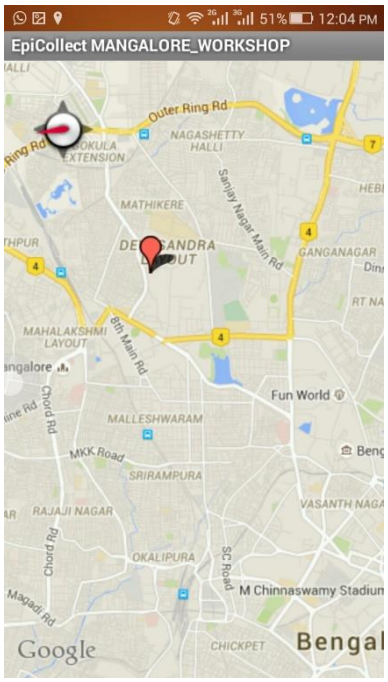


You can also list the earlier data you have entered in List entries section

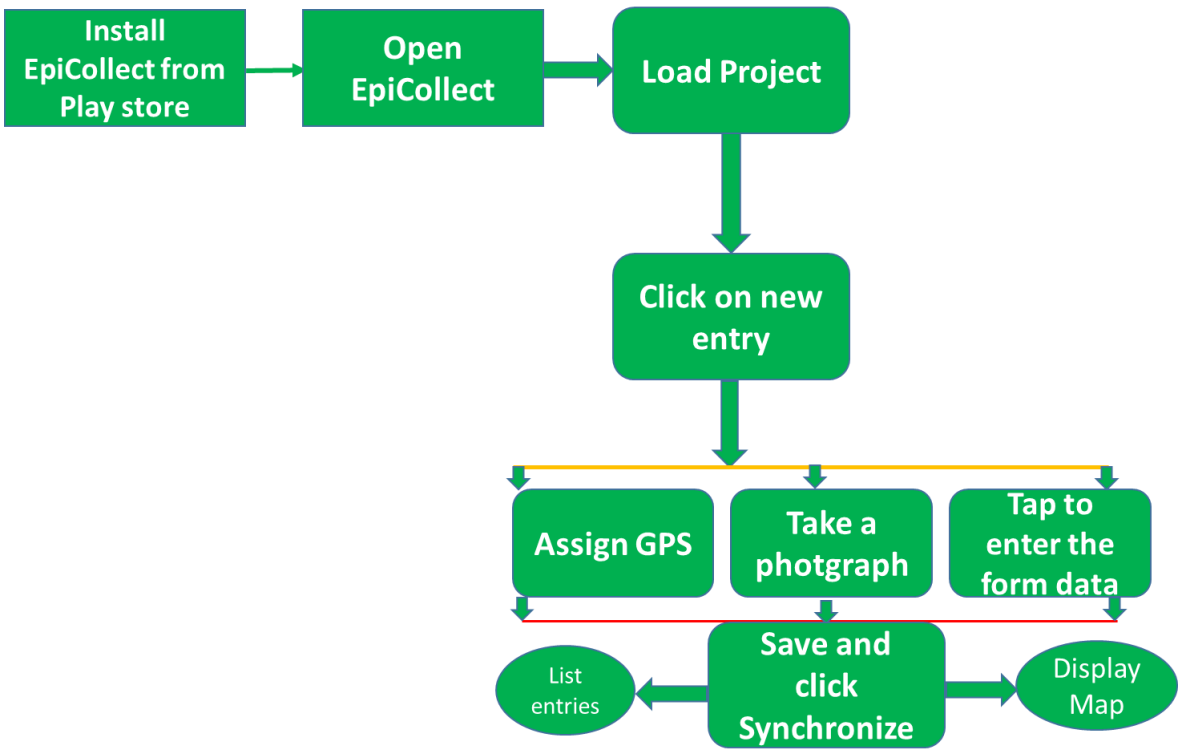


Click on one entry and preview the entry.

Click on View on Map to visualize on Google maps backdrop.

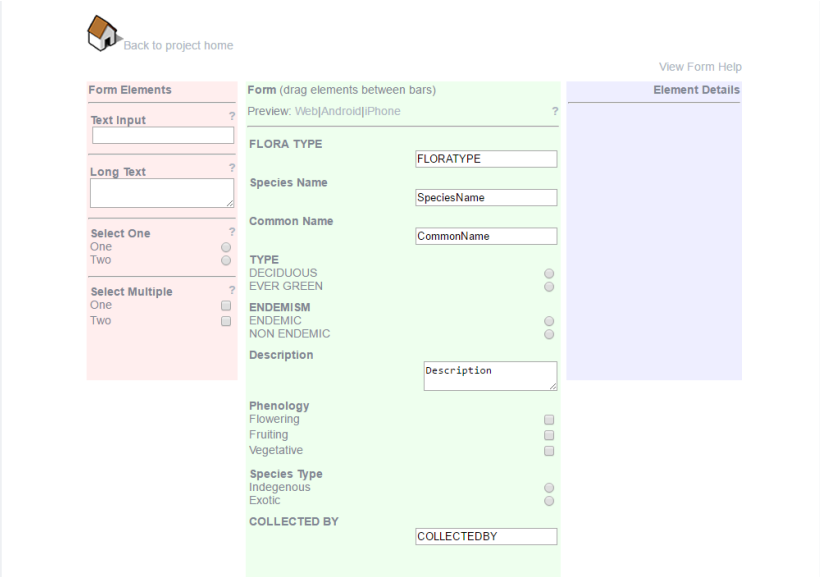


A simple flow chart of working with EpiCollect



You can create your own project at http://www.epicollect.net/create1.html by providing a new name for your project.

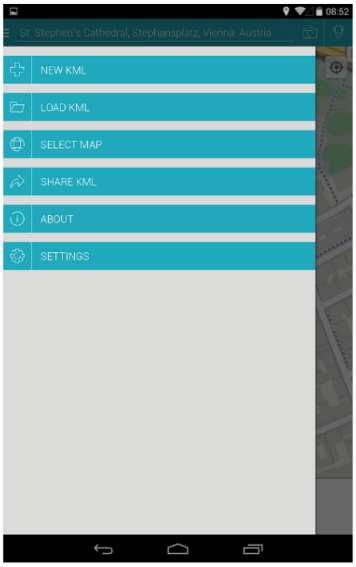
Add the fields which you required for the collection of data input it and save the form.



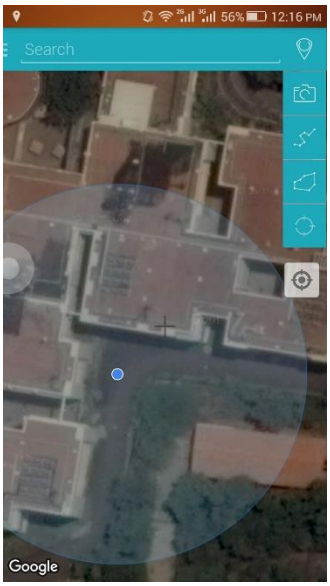
ANOTHER SIMPLE SOFTWARE FOR FIELD DATA COLLECTION

- ✓ Install "MAPinr-KML/KMZ/WMS/GPX/OFFLINE" from Google Play Store -For Android users. MAPinr is a simple and free Android app that allows you to manage your kml/kmz/gpx files and view them on different maps.
- ✓ In your phone switch on GPS shortcut button.
- ✓ Open Mapinr app and you will get welcome screen.

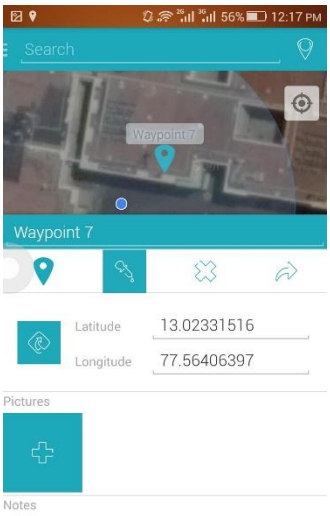
- ✓ Click on menu option select new file and provide file name.



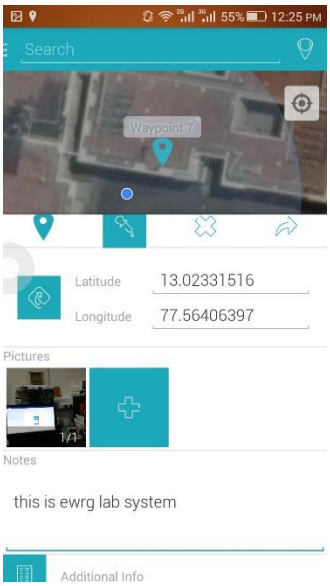
- ✓ Click on back drop map to be displayed. Select the option of OSM to Google maps, which ever required.



- ✓ Go to settings select auto save option to save the session for without losing the information.
- ✓ Clock on map Waypoint option to record GPS location. Then the Latitude and Longitude will be displayed as



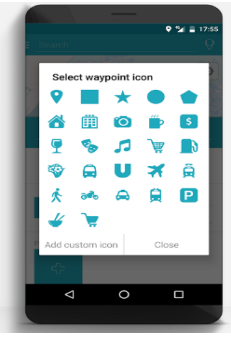
✓ Then if you want to take picture click + symbol to add pictures and save it.



✓ You can enter Attribute data corresponding to the waypoint location in the note section.

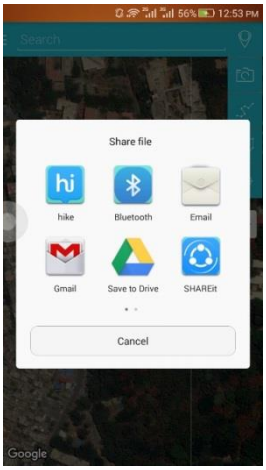
✓ Time stamp will be stored your time of location point recorded.

✓ If you want, you can change the pin color, symbol etc.



- ✓ If you want to measure length and area you can do it with options selecting poly line and polygon symbol available in home screen as shown.
- ✓ If you want to change the measuring units go to Setting and change it.

- ✓ If you have already created some data in the form of KML file you can import and visualize here.
- ✓ You can share the file with your friend by clicking Share option in the Menu bar. You have options suc
- ✓ h as Shareit; Bluetooth; Mail; Gmail and you can send it to Google drive.

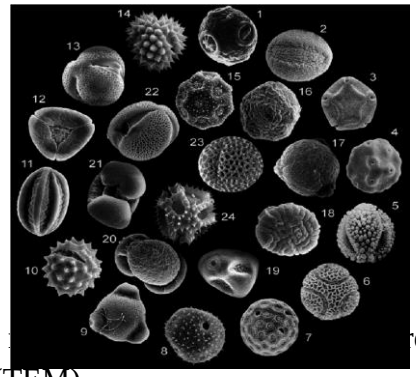
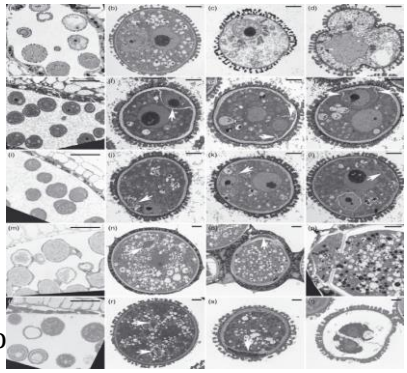


8.0 Pollen study and its application – a brief overview

Pollination, the life supporting function of plant world, is considered as one of the most valuable ecosystem services as per human assessment (Mburu et al. 2006). Pollination is defined as " the process of moving pollen from the anthers of one flower to the stigma of another or the same flower"(www.fao.org). This simple transfer of pollen grains to ovule and subsequent chain of events have led to quests on evolution, biodiversity, species-species interaction and economic prospects. Considering only the economic importance of pollination, an estimation of £153 billion per annum has been calculated at global level (Breeze et al. 2011). Apart from bee the major pollinator, pollination is usually mediated through beetles, bugs, butterflies, moth, flies, birds even through large animals like humans too. The focal point of pollination is successful transfer of pollen grains to flower's receptive surface i.e. stigma. Depending on destination pollination can be classified as self (within same flower) and cross (to other flower). Similarly, based on mode of pollen transfer it can be anemophily (wind mediated), zoophily (animal mediated) or hydrophily (water mediated).

Pollen: Morphology, development and function

Pollen, the pivotal component of pollination mechanism deserves attention in this regard. Apart from its role in pollination it has many use in other disciplines, both academic and commercial aspects. Pollen, at a glance can be characterized as haploid, small in size, resistant to decay and enormous in production. Morphologically, pollen can be of many shapes, round, pyramidal, elliptical, square and intermediate variations. The cell has two layers, outer layer, exine and inner layer intine. It is the exine which helps most in pollen identification and survival. Exine has sporopolenin, the protein which is responsible for pollen's extraordinary survival power against desiccation. Exine is also decorated with pores and slits, accordingly pollen can be classified as porate (with pores) and colpate (with slits). In addition to that, many a times exine has additional ornamentations (spine, network etc.) which also helps in classification.

t … ro transmission electron microscope (TEM)

Pollens are present inside the anthers. They are generated from pollen mother cell (P.M.C) through meiosis. Initially, the resultant cells from meiosis form a tetrad which later on dissociates into single pollen grain. During fertilization, pollen cell gives rise to two sperm cells,

among which one fixes with ovule forming diploid zygote and another one joins with central cell to form tri-nucleate endosperm.

Pollen study methods– Pollen study is a part of Palynology, where plant pollen along with spores and microscopic planktonic organisms are studied in both living and fossil form.

A typical study plan includes following steps –

a) **selection of study area (based on objectives):** Forest, open land, lakes, mines, ancient sites / objects, air (practically any space can be selected)

b) **collection of pollen:** Pollen collection should be done under sterile condition (as much as possible). There is always chance of contamination through wind, surrounding material, animals, human interaction and even sampling items. Therefore, collection process should be fast, preferably clean and collected material must have proper labelling. For surface collection of sample, a spoonful of sediment (with replica) is enough for serving the purpose (the amount can vary also. For stratigraphic column, collecting samples at 2 cm vertical intervals ($1cm^3 – 20cm^3$) is mostly recommended (Cummings 2007). For air borne pollens, pollen samplers are used for collection.

c) **processing of sample:** Collected samples can be stored under refrigeration until laboratory work begins. Pollen processing is mostly chemical based with an aim to remove all debris attached with the particle. Standard procedure is as follows –

Incubation with 10% hydrochloric acid (HCl) for overnight (for calcium carbonate removal)

↓

Addition of sodium polytungstate for density separation

↓

Separation of organic layer through centrifugation

↓

Addition of acetolysis mixture (9:1, acetic anhydride : sulphuric acid) to remove non-pollen organogenic material

↓

Centrifugation and sequential wash with glacial acetic acid and distilled water

↓

Ethanol addition for precipitation

↓

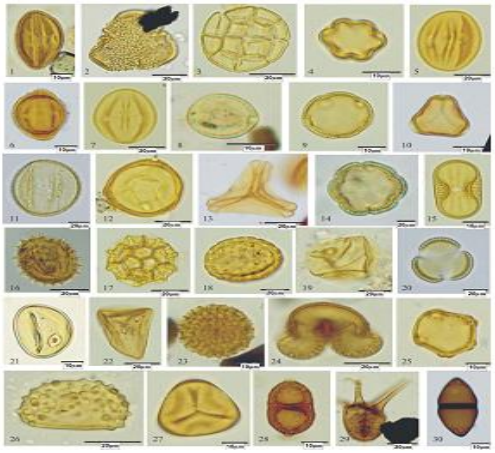
Removal of ethanol and addition of glycerol for mounting

↓

Preparation of slide and counting

d) **pollen counting:** Pollen count can be done under light microscope and observed grains should be compared with reference collection from the related area. In ideal circumstances, at least 300

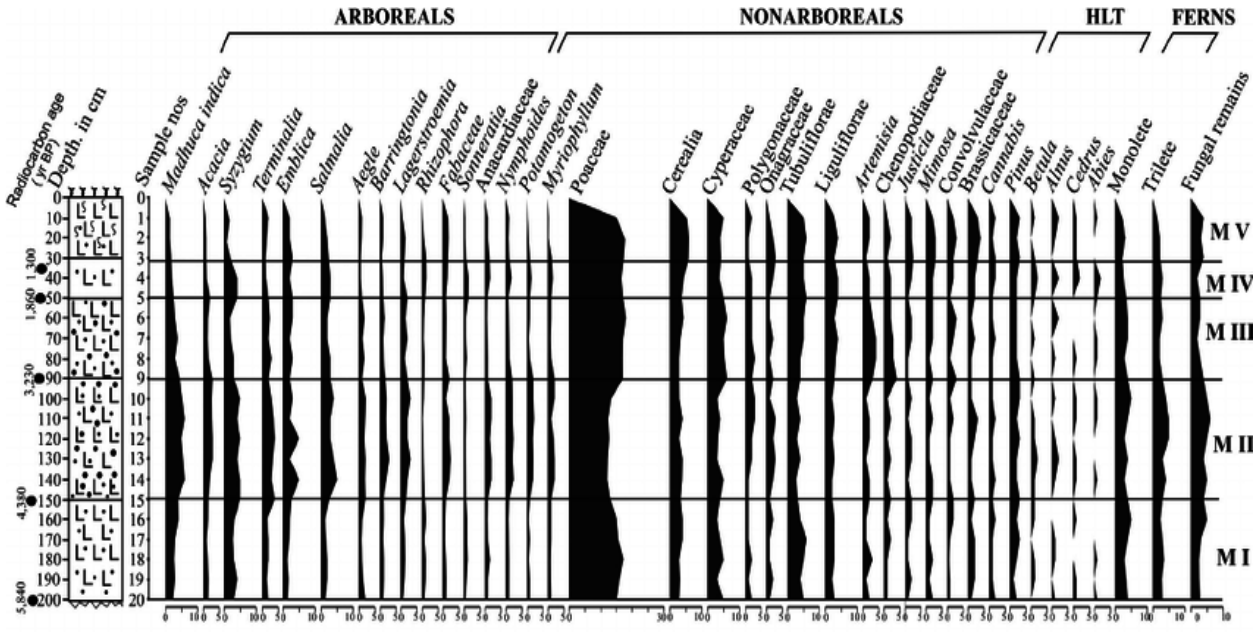
pollen grains would have been counted, however it depends on concentration of grain recovered after processing.



Palynoassemblage recovered from the surface samples (source: Tripathi et al., 2016, DOI:10.1080/01916122.2015.1045049)

e) **observation and deduction:** At first glance, pollen slides provide information on pollen morphology, and their variation in a given study area. For surface sample studies combination of slides from different sample sites provide an overall view of the pollen profile from the study area. This pollen profile/diagram can be compared with the vegetation information available from the region.

For stratigraphic studies, pollen profiles from different depths depict the changing vegetation patterns taken place in temporal scale. By radiocarbon dating, it is possible to detect the age of the different strata which then can correlate with available pollen variation. The pollen profile/diagram developed from this study has major contribution in paleovegetation/paleoclimate reconstruction.



Past vegetation structure-Pollen diagram from sedimentary sequence of Bargarh District, Odisha
Tripathi et al. 2014, DOI: 10.1016/j.quaint.2013.12.005

Application of pollen study – Pollen study has multiple applications, which can be broadly categorized into two groups, though many times they are interrelated.

Academic work / integration in other discipline – Paleobiology – the most notable use is in paleobotany to understand past vegetation composition and distribution. Identification of fossil pollen and its affinity with present members would be helpful for evolutionary biology, phylogenetics and addressing issues related to land plant evolution, paleoclimate reconstruction and archeobotany.

Pollen study shed light on human-nature interaction in various ways, like ancient diet construction, crop domestication, crop introduction and social and cultural activities etc.
Geology – pollen composition and form at different sedimentary strata provides detail input related to sedimentation process, prevailing temperature and fossilization output.

Industrial / practical use –
Oil and gas exploration – As oil and gas ("fossil fuel") originating from vegetation, pollen presence in stratigraphic layers is used as indicator of fossil fuel presence. It is the pollen abundance / density, diversity and coluring pattern which are determinants of fossil fuels presence and quality.
Melissopalynology – One of the interesting use of palynology is in product authentication eg. Honey. Honey has an estimated world production of 3.6 billion pounds in 2011 and the product can be broadly categorized into general and custom made (Phipps 2014). General honey which has more wide circulation network often falls prey to manufacturers false claim of genuineness. The thorough screening of unprocessed honey which most often has trace amount of pollen provides information on source of honey/parent tree, area/country of origin, detection of adulterant, antibiotics etc. On the other hand, custom made honey eg. organic/certified honey, particular tree based honey as per customers' choice of preference which has niche market but high demand, is very much dependent on authentication which determines their market share.
Museology – Pollen study provides support to authenticate genuineness of the antique pictures/artefacts to some extent. Paintings especially which have been done in outdoor setup, often have captured pollens in the canvas which could provide information on location and season of the painting, source of the material etc. By corroborating pollen study result with associated information the genuineness or artist/agents' claim can be validated.
Custom / Excise application – detection of narcotics, their country of origin, possible route of travel even media of transport can be identified and spotted through pollen analysis.
Forensic science – The successful application of pollen study in crime solving scenario is perhaps most widely referred examples of palynology application. Pollen prints' detection over victim's/suspect's body or any other crime scene objects is an indicator of crime area identification, tracing identity and motive of the crime.
Healthcare – seasonal release of pollen grains, their identity and abundance are useful for making pollen calendar. These calendars are prerequisite for any clinical technicians and medical professionals for treating air borne allergy cases.

8.0 MANGROVES

Most mangroves are woody plants, shrubs and trees. There are also few herbs, mainly some grasses and sedges. Among the woody plants one is a lower plant- a fern namely *Acrostichum aureum* this fern grows in colonies in swampy and marshy places where the tidal force is low and salinity is not that high.

I. TRUE MANGROVES

Family: Rhizophoraceae - This is the most important family of mangroves. The members are woody plants, usually trees. The family has spectacular development of aerial stilt roots. These roots spring from the main stem and also the branches; they branch repeatedly and grow downwards and give additional support to the tree in the soft mud. The aerial roots, studded with tiny air passing windows known as lenticels, visible to the naked eye, also help in aeration.

The trees have opposite, simple, dark green leathery leaves. The terminal bud is protected by a long cover made up of stipules. These stipules fall off when new leaves emerge. The members of the family produce from the fruits long, green, cylindrical propagules. These on maturity detach from the fruit and fall vertically into the mud, where they strike roots and become daughter plants. If the propagules happen to fall when the substratum is flooded during high tides they may be carried away by water currents; On reaching suitable swampy places they develop into new plants. This interesting phenomenon of reproduction is called 'vivipary'. Here apparently the mother plant is giving birth to daughter plants.

Members of Rhizophoraceae can be identified using the following key:

Calyx 8-16 lobed; petals 2 lobed : 1. ***Bruguiera***

Calyx 4-6 lobed; petals not lobed:

Calyx 4 lobed; petals without apical outgrowths : 2. ***Rhizophora***

Calyx 5-lobed; petals with apical outgrowths;
Stamens more than 12 : 3. ***Kandelia***

1. **Bruguiera:** It is a tree with rough corky bark; stem base may be flattened into buttresses. Leaves elliptic to oblong elliptic with a narrow tip; but not ending in a narrow long point as in *Rhizophora.* Leaf size 7-14 cm by 4 to 6 cm. Leaf stalks and midrib red coloured. Flowers in singles, reddish coloured; calyx 10-16 lobed, red to pinkish; petals bilobed, outer margin with silky hairs. The fruit produces a propagule of 10-15 cm. which is slightly angled. Small trees were found at Hegle in Venktapur river of Bhatkal. In Andamans it grows to 36 m, and is buttressed.

2. ***Rhizophora:***
R. mucronata*:* Trees reaching maximum height of 10 m in the Division. Numerous branched stilt roots arise from the base of the stem. Some arise from the branches also.

Leaves 10-18 cm X 4-10 cm, broad and elliptic; the leaf tip is produced into a narrow outgrowth called mucro; leaf base blunt to obtuse. Flowers are produced in long clusters, each cluster having 4-8 flowers. Petals are hairy and stamens 8. The propagule, a long green, smooth cylindrical structure, reaches a maximum length of 65 cm .

Note: Both *Rhizophora mucronata* and *R. apiculata* are found in Honnavar Division. The former is the commoner and widely used for afforestation.

R. apiculata*:* A smaller tree, reaching 4-5 m in the Division. Stilt roots arising from main stem as well as from branches form impenetrable barrier beneath the canopy. Leaves elliptic lanceolate with a smaller narrow bristle like point towards the narrow tip. Size 10-20 cm X 5-8 cm. Leaf base conical; leaf middle vein reddish. Flowers in pairs in upper leaf axils, without stalks; petals not hairy; stamens 12. Propagules 30-50 cm long .

3. Kandelia candel: Small trees reaching 5-6 m high. Leaves narrower than *Rhizophora*, oblong shaped. Flowers white, in dichotomously branched inflorescence axis. Calyx 5 lobed, reflexed; petals 5, divided into numerous fine branches. Stamens numerous. Propagule cylindrical, green, narrowed towards the tip, 30-40 cm long. The trees have flesh coloured base flattened into buttresses; stilt roots closely adpressed to the stem base. Bark reddish brown, peeling off into flakes

Note: Found commonly in all estuaries

Family: Sonneratiaceae - Buttresses absent; pneumatophores (breathing roots) corky and soft, rising vertically into the air from the mud. Leaves opposite, simple; flowers large with numerous free stamens.

Sonneratia alba: Small trees reaching maximum of 5 m. Many corky pneumatophores stick out of the mud from all around the tree. Leaves opposite, elliptic, oblong, blunt at apex, narrowed at base; Flowers 2-3 together; calyx has a cup shaped part and 6-8 lobes which are distinct in fruit. Petals white, small; stamens numerous, free, white; ovary depressed globose. Fruit somewhat spherical, many seeded with calyx remaining in the fruit. Natural regeneration is plentiful especially in shallow places with low tidal effects .

Note: Found in all rivers except Sharavathi

Sonneratia caseolaris: Trees up to 12 m height; soft corky pneumatophores longer than *S. alba*, reaching up to 1 m. Young stem 4-angled. Leaves almost without stalk, much narrowed at base, opposite. Leaf tip has a pore known as hydathode through which excess salt is secreted. Flowers reddish purple, in singles at the tip of branches; stamens numerous, reddish. Fruits depressed globose

Note: Most common mangrove tree in Sharavathi; Rare in other rivers; not found in Gnagavali, although Rao & Suresh (2001) present it as a cpmmon species there. It prefers places with low salinity; the Sharavathi river, where fresh water from the dams is constantly released appears to be ideal for it.

Family: Avicenniaceae - Shrubs or trees without buttresses. Breathing roots (pneumatophores) numerous and protruding from the mud all around the tree. Leaves opposite, without stipules; flowers yellow. Fruit one seeded, dry when mature.

Avicennia marina: Shrubs or small trees upto 4 m high. Bark smooth yellowish brown. Leaves 3-6 X 2.2.5 cm, elliptic oblong or ovate, narrowing to an acute tip; leaf base rounded or narrowing. Flowers small, stalkless, yellowish clustered towards tips of floral axis; stamens not projecting out from the corolla. Fruit at maturity ovoid with a pointed tip, slightly flattened .

Note: Very common in Gangavali, rare in Aghanashini, common in Alvekodi creek, absent in Sharavathi and Badgani, moderate in Venktapur.

Avicennia officinalis: Larger trees, reaches 8-10 meters in Honavar Forest Division; exceptional individuals of 12 m are found in the sacred grove of Masurkurve in Aghanashini. Smooth whitish gray bark; pneuatophores seen all around the tree. In addition masses of branching stilt roots hang from the upper part of the trunk and base of large branches. Leaves 5-7.5 cm X 2.5- 3.25 cm, ovate, oblong with more or less rounded leaf tip. Small, yellow stalkless flowers seen in clusters towards the tip of floral axis. Flowers distinguished from *A. marina* by stamens seen projecting outside the corolla

Note: Found in all the rivers of the Division.

Family: Myrsinaceae - Plants without pneumatophores; flowers with 4 sepals and 4 petals; and superior ovary.

Aegiceras corniculatum: Shrubs or small trees with slender stilt roots. Leaves 4-8 cm X 2-4 cm, alternate, ovate-oblong or obovate, may have a small notch at the blunt tip; leaf base cone like. Flowers small, white, fragrant in umbellate bunches. Propagules which come out of the fruits are 3-4 cm long and curved with pointed tips .

Notes: Found in all estuaries along edges and banks away from strong tides; notable for fragrant white flowers

Euphorbiaceae - Plants with latex. Male and female flowers in separate clusters

Excoecaria agallocha: Large shrubs or small trees occurring along the edges of the swamp, on bunds and on wet soils. Acrid, blister causing latex present. Numerous serpentine roots produced from base of stem. Leaves alternate, margins entire or mostly minutely toothed; leaves turn red before shedding .

Acanthaceae - Family of herbs and shrubs. Flowers not regular in shape.

Acanthus ilicifolius: A shrubby plant growing in colonies in shallow parts of the swamp. Leaves opposite, stiff, wavy and with sharp spines along the margin. Flowers large, blue

Poaceae - The members are grasses. In the estuaries these grasses are found often forming meadows submerged during high tides and exposed during low tides.

Porteresia coarctata: A stiff erect grass growing in meadows in open shallow parts of the estuaries

II. MANGROVE ASSOCIATES

Numerous species of plants occur in association with the mangroves. These are not obligate mangroves and higher salinity is not often a prerequisite for their growth. They may also be often associated with inland habitats. These plants have certain degree of salinity tolerance. They often grow along the margins of swamps, or on estuarine bunds. Details of notable mangrove associates are found in **Table 2.1.**

Table 2.1. Details of notable mangrove associate species in Honavar Forest Division

Sn	Name	Family	Remarks
1	**Cerbera manghas** (Kan: Cande)	Apocynaceae	Shrub or small tree with white latex and white flowers and mango sized green fruits; old fruits fibrous
2	**Barringtonia racemosa** (Kan: Samudraphala)	Barringtoniaceae	Small to medium tree with 15-30 cm long leaves, and pink flowers in long hanging inflorescences.
3	*Dolichandron spathacea*	Biganoniaceae	Tree close to coastal swamps with white fragrant flowers, and long bean like compressed cylindrical pods
4	**Capparis spp.**	Capparidaceae	Spiny climber on bunds
5	*Crateva magna*	Capparidaceae	Small trees on the bank of Aghanashini near NH bridge; leaves 3 foliate; yellowish flowers with hard fruit.
6	**Calophyllum inophyllum** (Kan: Honne)	Clusiaceae	Large evergreen tree; white fragrant flowers and greenish yellow ripe fruits with a single seed.
7	*Cyperus malaccensis*	Cyperaceae	Grass; abundant in Sharavathi backwaters.
8	*Diospyros embryopteris*	Ebenaceae	Small evergreen tree with guava sized gummy fruits.

9	*Bridelia scandens*	Euphorbiaceae	Climbing shrub with greenish yellow flowers small bluish-black fruits.
10	*Acacia farnesiana* (Kan: Kasturijali)	Fabaceae	Thorny bush or small tree; leaves with minute leaflets; flowers yellow, fragrant.; pod dull brown & inflated.
11	*Acacia nilotica*	Fabaceae	Small trees, rare on the coast; leaflets small; flowers golden yellow in globose heads.
12	**Caesalpinia bonducella** (Kan: Gajagakai)	Fabaceae	Climber with curved sharp prickles; compound leaves; yellow fragrant flowers; dark brown dry pod 1-2 seeded.
13	*Caesalpinia crista*	Fabaceae	Large woody climber; stem and leaves with sharp curved prickles; flowers fragrant, yellow; pod one seeded.
14	*Derris scandens* (Kan: Handiballi)	Fabaceae	Woody climber with rosy flowers
15	*Derris trifoliate*	Fabaceae	Woody climber common on the coast
16	*Erythrina variegata* (Indian coral tree; Kan: Varjipe)	Fabaceae	Soft & light wooded tree, branches covered with small black prickles; leaves with 3 foliage; coral coloured flowers.
17	*Pongamia pinnata* (Kan: Honge)	Fabaceae	Medium sized tree with compressed pods, growing often near water courses, sea beaches and rarely on estuarine banks.
18	*Prosopis juliflora*	Fabaceae	Shrub or small trees with drought resistance.
19	*Hibiscus tiliaceous*	Malvaceae	Shrub or small tree with yellow flowers changing to pink in the evening.
20	*Thespesia populnea* (Kan: Hoovarase)	Malvaceae	A medium sized coastal tree with heart shaped leaves on long stalks and yellow flowers resembling cotton flowers.
21	*Ficus racemosa* (Kan: Atti)	Moraceae	Tree with milky latex and hollow, edible, fleshy false fruits.
22	*Morinda citrifolia* (Kan: Ainshe, Tagase)	Rubiaceae	Small tree with large leaves, dense heads of white flowers and glossy green fruit, white when ripe.

23	*Pandanus fascicularis* (Kan: Ketaki)	Pandanaceae	A palm-like, but branched shrub with narrow very long spinous leaves with small flowers on dense axis covered with white or light yellow, very fragrant bracts
24	*Cynodon dactylon*	Poaceae	Karki grass forming meadows in open shallow part of estuaries
25	*Sporobolus virginicus*	Poaceae	Grass; perennial grass with good sand-binding properties.
26	*Salvadora persica* (Tooth-brush tree; Kan: Gonimara)	Salvadoraceae	Much branched shrub or small tree; rare along the bunds of Aghanashini; small round fruits dark red when ripe.
27	*Clerodendrum inerme*	Verbenaceae	Shrub with white flowers
28	*Odina wodier* (Kan: Gojal)	Verbenaceae	Medium sized deciduous tree with minute flowers in panicles and small, reddish, compressed fruits with one seed.
29	*Premna corymbosa*	Verbenaceae	Shrub
30	*Vitex negundo* (Kan: Lakkigida; Nokki)	Verbenaceae	Shrubs, young stem 4-angled; aromatic; leaves 3-5 foliate; terminal leaflet longer
32	*Vitex trifolia*	Verbenaceae	Shrubs, young stem 4-angled; leaves 3-foliate; leaflest without stalks

MANGROVES OF ESTUARY


Mangroves of Karnataka
Kandelia kandel
Bruguiera gymnorrhiza

9.0 Monitoring CRABS

Crabs belonging to the infra order Brachyura are considered to be highly successful group of Decapoda, adapted to diverse kinds of estuarine habitats. The brachyurans form very conspicuous and bio-ecologically very important faunal constituents in estuarine ecosystem and belong to different families. The brachyuran crabs play a significant role in the coastal and marine food chains and ecology as their larvae are consumed by many predators and omnivorous fishes; they have certain check on mangrove saplings.

Morphological characteristics of Crab: The Brachyuran crabs have a depressed carapace or cephalothorax and a much reduced, straight, and symmetrical abdomen which is closely bent under the cephalothorax; this abdomen is never used for swimming and lacks biramous uropods; in the female, during the spawning season, the eggs are attached to the abdominal appendages (berried crabs).The cephalothorax has 5 pairs of walking legs, the first of which is chelate (ending in pincers) and nearly always much stronger than the other legs.

Antero-lateral teeth: The teeth of the anterolateral margins of the carapace (also called as apibranchial teeth). In some crabs anterolateral margin is smooth absence of teeth. The first anterolateral tooth is commonly called the "external orbital tooth'' and sometime it is counted separately from the following anterolateral teeth.

Frontal margin (or **front):** Front is sometimes elongate, spiny form and serrated. In some crabs front is modified in to a rostrum(eg, spider crab).

The mouthparts: There are 6 pairs of feeding appendages present in mouthpart as explained below.

Third maxillipeds: Outer appendage of mouth part. Look at the crab *en face*, the third maxillipeds cover the mouth field (Fig 4). They are the appendages together they resemble a pair of doors protecting the mouth field and hiding the other mouthparts. It is attached to the body by its protopod. The endopod has distal three articles form a small palp. The endopod is composed of the large proximal ischium followed by the merus, carpus, propodus, and dactyl. The exopod consists of a long, narrow basal article and a multiarticulate flagellum. At the lateral corner of the protopod has a long setose flabellum extending through the inhalant aperture into the branchial chamber.The flabellum is used to clean the gills.

Second maxillipeds: Present underneath the third maxillipeds(Figs 5). Like the third, they bear endopods, exopods, and lateral flabellae.

First maxillipeds: Are located, normally covered by the third maxillipeds(Fig 6).

Two smaller feeding appendages are situated below the 3 pairs of maxillipeds:

Second maxilla (or maxillules): The posterior most head appendage is the second maxilla (Fig 7) lying immediately anterior to the first maxilliped. It is small, complex, and more delicate than the maxillipeds.

First maxilla (or maxilla): The **first maxilla** (Fig 8)is smaller and more delicate than the second. It has two endites and an end pod but no exopod.

Mandibles: Last pair of mouthpart pair of well-calcified, jaw-like, and highly modified appendage. Anterior to the first maxillae are the large, hard **mandibles** (Fig 9). Each mandible consists of a heavily calcified. protopod from which arises a small palp. Only the smooth, white cutting surfaces can be seen externally.They rotate on two movable articulations, or condyles, with the head skeleton and are adapted for cutting, rather than grinding food

Antennae: Two pairs of antennae are small and may go unnoticed if they are folded out of sight under the anterior edge of the carapace (Fig 1).

Eyestalks: The two short, thick **eyestalks,** which are not segmental appendages, are located on the anterior edge of the head in the **orbits** (Fig 1). A large **compound eye**, located at the end of each eyestalk is composed of hundreds of independent photoreceptive units.

Locomotory appendages: The 5 pairs of locomotory appendages of a crab also called as the ‘‘pereiopods’’. Pereiopods includes a pair of powerful chelipeds (legs carrying a chela or pincer) and 4 pairs of walkinglegs. Pereiopode have different types of parts i.e. coxa, basis, ischium, merus, carpus, propodus and dactylus. In cheliped basis and ischium is fused. The chela itself consists of a palm (or manus) and 2 fingers, outer one of which is movable (the dactylus or movable finger), whereas the other one immovable is pollex. The tips or edges of the both fingers may be pectinated (teeth like structures).

Male and female crabs are easily distinguished by the shape of their abdomen. In males, the abdomen is triangular to broadly T-shaped, whereas in females it is broad, usually semicircular, often covering most part of the ventral surface (Fig 12). Many crab species show a sexual dimorphism, with the males usually being larger or possessing special or excessively developed structures. In some species, however, it is the female which grows larger. Males possess 2 pairs of gonopods (Fig 10 & 11), that is, modified pleopods (abdominal appendages) specifically adapted for copulation most crabs practice internal fertilization. The pleopods of females are branched, setose and serve to carry the eggs fertilized eggs are exuded, attached to the setose pleopods of females, and kept there for several weeks until the planktonic larvae hatch out. Many species of crabs possess pubescence to varying degrees on their body and appendages. The

hair (or more appropriately called setae) may be soft or stiff, simple or plumose (plume-like), or so short that it becomes pile-like, sometimes even short and dense, giving a velvet-like appearance. The setae may sometimes be hard and spine-like, especially on the propodus and dactylus of legs. Unlike real spines, however, those stiff setae are never calcareous. Most of the softer setae on the legs and chelae have a sensory function.

Classification of brachyuran crabs

Phylum: Arthropoda (Jointed legs)
Subphylum: Mandibulata (Having mandibles)
Class: Crustacea (Hard exoskeliton)
Subclas: Malacostraca (Biramous or branched appendages)
Series: Eumalacostraca (True soft shell)
Super Order: Eucarida (Carapace large, fused to and covering entire thorax**)**
Order: Decapoda (Ten legs)
Infra order: Brachyura (having a reduced abdomenfolded against the ventral surface)
(source: http://www.niobioinformatics.in/crab/crabs/tex1.html)

General morphology of brachyuran crab

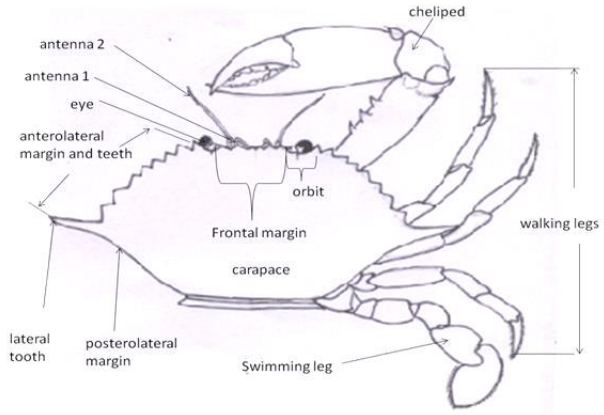


Fig 1: Dorsal view of the brachyuran crab

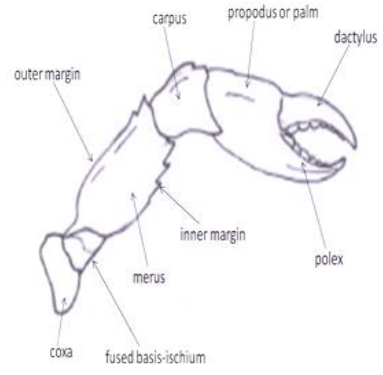


Fig 2: Cheliped

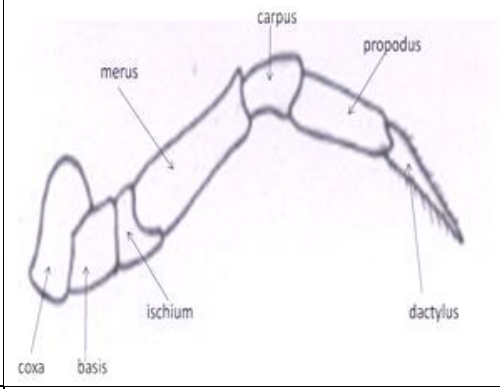


Fig 3: Walking leg

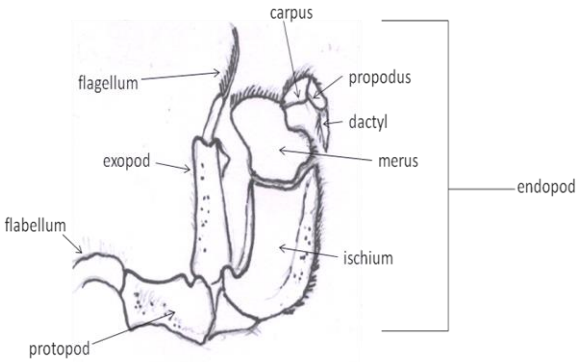


Fig 4: Third maxilliped

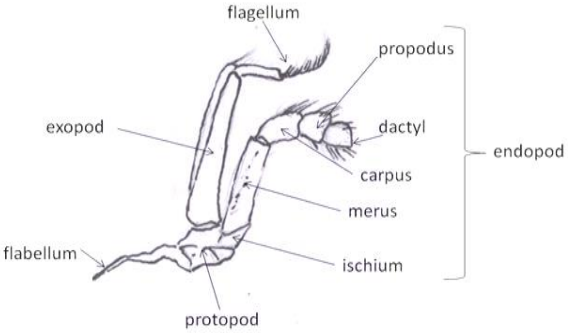


Fig 5: Second maxilliped

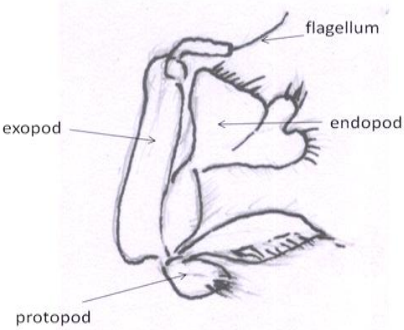


Fig 6: First maxilliped

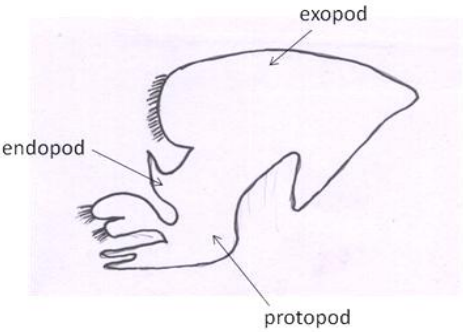


Fig 7: Second maxilla

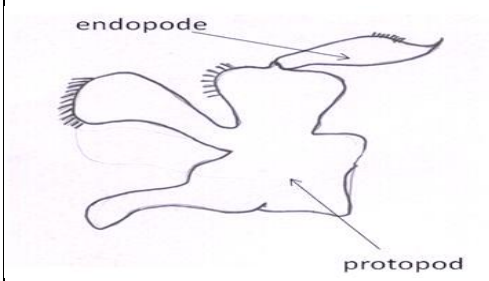


Fig 8: First maxilla

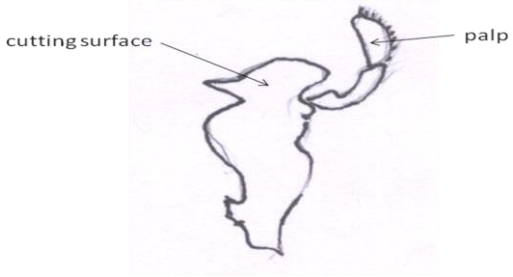


Fig 9: Mandible

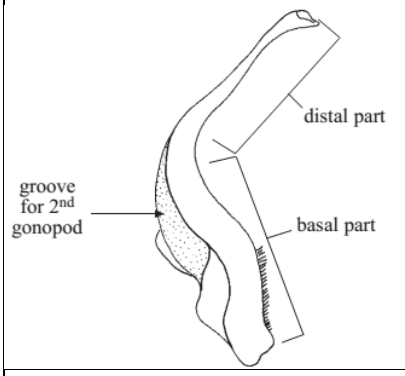


Fig 10: first gonopod

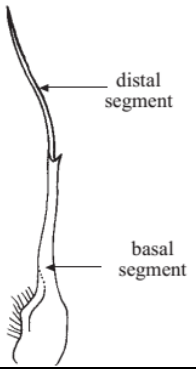


Fig 11: second gonopod

(Source: Kent E. Carpenter and Volker H. Niem 1998; *FAO Species identification guide for fishery purposes, the living marine resources of the western central pacific*; volume 2; ISSN1020-6868)

CRABS OF ESTUARY

FAMILY: PORTUNIDAE

Thalamita crenata

Portunus sanguinolentus

Portunus pelagicus

Scylla serrata

Scylla olivacea

FAMILY: OCYPODIDAE

Uca lactel annulipes

Uca vocans

Uca acuta acuta

Ocypode cordimanus

Dotilla malabarica

Dotilla sp.

FAMILY: XANTHIDAE

Heteropenope indica

Ozius tuberculoses

FAMILY: GRAPSIDAE

Grapsus albolineatus

Metapograpus maculates

Neosarmatium malabaricum

Metopograpsus messor.

Sesarma bidens

Paraypyxidognathus deianira

10.0 Inventorying and mapping of Macroalgae

Macroscopic, multicellular marine algae or commonly referred as Seaweeds. They are of different types based on the presence of photosynthetic pigments and are categorized their colour as red, green and brown algae. Like the land plants, seaweeds contain photosynthetic pigments and with the help of sunlight and nutrient present in the seawater, they photosynthesize and produce food. Seaweeds are found in the coastal region between high tide to low tide and in the sub-tidal region up to a depth where photosynthetic light is available. Seaweeds are similar in form with the higher vascular plants but the structure and function of the parts significantly differ from the higher plants. Seaweeds do not have true roots, stem or leaves and whole body of the plant is called thallus that consists of the holdfast, stipe and blade.

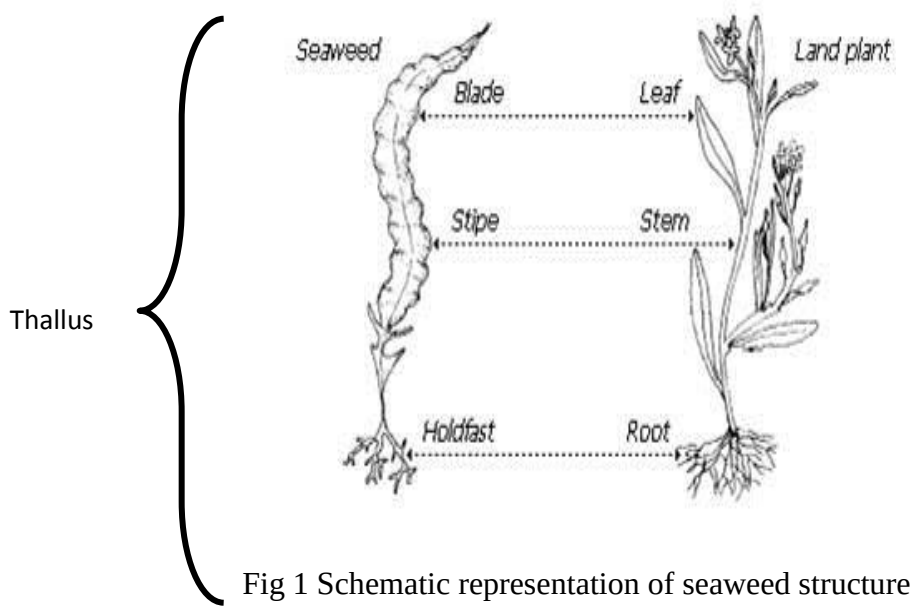


Fig 1 Schematic representation of seaweed structure

- **Blades:** Leaf like structure which occurs in different shapes such as flattened, tubular, round, smooth, perforated, segmented, dented, etc.
- **Stipe:** Stipe is the elongated stalk of seaweed which supports the blade and keep them erect
- **Holdfast or Haptera:** These are structures used to attach seaweeds to hard substratum. They can be discoidal, rhizoidal, bulbous or branched depending on the substratum it attaches.
- **Float:** These are structures observed in brown algae, a balloon like structure that keeps the algae afloat in the water.

Materials required for seaweed collection:

- Tide chart (http://www.tides4fishing.com/as/india/mangalore)
- Polyethylene bags
- Knife or scalpel
- Labeling materials (pen/pencil, labels, marker pens etc.)
- Rubber bands
- Field note book

Procedure:

- Reading the tide chart and marking the low tide timings and date, preferably below 1m tide should be chosen
- Samples can be selected at random as per requirement by selecting sampling points in the area
- Using the identification key below, identify the seaweed species.
- If the identification cannot be carried out in the field, sample can be carried in a zip lock cover to the lab and identified at lab using the identification keys.
- Wet preservation of seaweed samples can be done using 5-10% formaldehyde in seawater.
- Photograph of seaweeds in natural habitat can be documented as well.
- Once the seaweeds are cleaned of all the epiphytes, dry the seaweed using a tissue and in a tray spread out the seaweed (along with a scale) and photograph.

Data compilation - Macroalgae

Name of the collector :				***Date:*** ***Time:*** ***Low tide (m):***		
Sl.no.	**Latitude**	**Longitude**	**Seaweed species**	**Division** (Red, Green, Brown)	**Habitat** (Intertidal, Supratidal, Subtidal)	**Growth Type** (Sparse, Patchy Tuft, Foliose, abundant)

Fig 2. Different structures represented in all Red ,Green and Brown seaweed

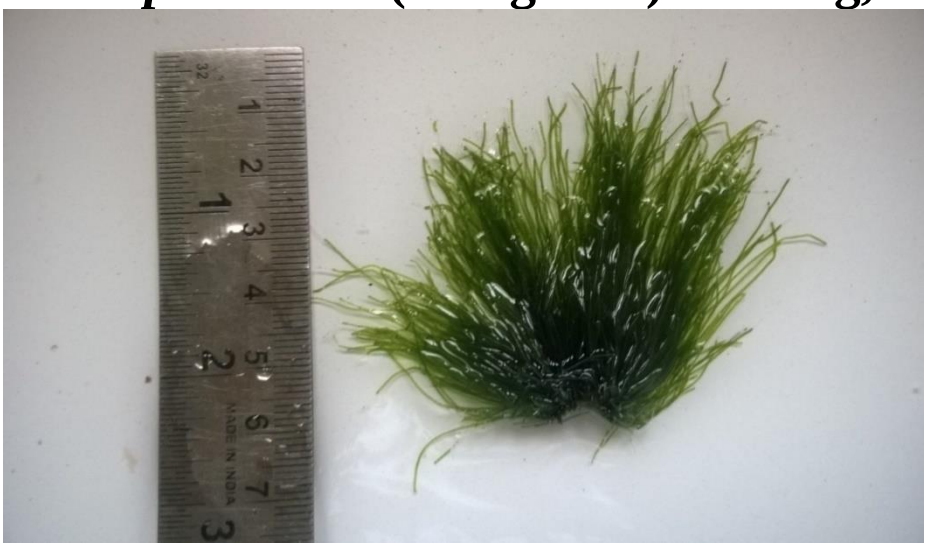
Ulva lactuca Linnaeus,1753

Kingdom	Plantae
Phylum	Chlorophyta
Class	Ulvophyceae
Order	Ulvales
Family	Ulvaceae
Description:	Plant grows up to 20 cm tall, light green to dark green in colour, blades are folded and are like waxed paper to touch, reproduces both asexually and sexually. Edible seaweed in most of the South east Asian countries.
Vernacular name:	Sea lettuce (England), Zeesla (Dutch), Ulve (French)
Worldwide distribution	Australia , North pacific ocean , Belgium , Federal Republic of Somalia , France , Gulf of Mexico , Indian Ocean , Ireland , Kenya , Madagascar , Mediterranean sea, North Atlantic ocean , Seychelles , South Africa
Distribution along Indian coast:	Gujarat, Maharashtra, Goa, Karnataka, Kerala, Lakshadweep.
Distribution in Uttara Kannada:	Majali- Karwar; Belekan, Kirubele, Om beach- Kumta; Dhareshwar, Mugli- Honnavar
Habitat:	*Ulva* is tolerant to environmental parameters such as desiccation, full sunlight and variations in salinity and temperature. This enables it to occupy a broad range of habitats from the upper intertidal (mainly rock pools) to the subtidal. Occurs throughout the year
Growth season	Occurs throughout all the season
Economic uses	Food, animal feed, medicine, Potential biomass feedstock for bioethanol production

Ulva fasciata Delile,1813

Kingdom	Plantae
Phylum	Chlorophyta
Class	Ulvophyceae
Order	Ulvales
Family	Ulvaceae
Description:	Thalli thin, sheet like consisting of wide blades, grows upto 1 m long. Holdfast is small without dark rhizoids. Bright grass green to dark green, gold at margins when reproductive. White in colour when stressed.
Vernacular name:	*Limu palhalala (*Hawai'i)
Worldwide distribution:	Eastern Atlantic, Caribbean, Indian and Pacific Ocean. Aegean Sea , Australia , North pacific ocean , Belgium , Federal Republic of Somalia , France , Gulf of Mexico , Indian Ocean , Ireland , Kenya , Madagascar , Mediterranean sea , North Atlantic ocean , North Sea , Republic of Mauritius , Seychelles , South Africa
Distribution along Indian coast:	Gujarat, Maharashtra, Goa, Kerala, Lakshadweep
Distribution along Uttara Kannada coast:	Majali- Karwar; Belekan, Kirubele, Om beach-Kumta; Dhareshwar, Mugli-Honnavar
Habitat:	Found on intertidal rocks, in tide pools and on reef flats. Abundant in areas of fresh water runoff high nutrients such as near the mouth of stream and run off pipes
Growth season	Occurs throughout all the seasons
Economic use:	Used as food in Hawai'i along with salads
Ecology:	Potentially invasive, increased bloom observed in nutrient rich waters

Chaetomorpha media (C. Agardh) Kutzing, 1849



Kingdom	Plantae
Phylum	Chlorophyta
Class	Ulvophyceae
Order	Cladophorales
Family	Cladophoraceae
Description:	Plant grows upto 8-10 cm tall, blades are long and thin attached by a small disc represents hair like structures, green in colour,
Worldwide distribution:	Gulf of Mexico, Caribbean Sea, Puerto rico, Australia
Distribution along Indian coast:	Gujarat, Malvan, Ratnagiri (Maharashtra), Goa, Karnataka.
Distribution along Uttara Kannada Coast:	Kumta beach, Majali- Karwar; Belekan, Kirubele, Om beach-Kumta; Dhareshwar, Mugli-Honnavar, Murudeshwar, Apsarkonda
Habitat:	Mostly confined to supra littoral and intertidal zone, sensitive to temperature easily dried, occurs during monsoon and starting of post monsoon.
Growth season	Occurs through all the seasons, dries up during prolonged emersion periods.
Economic Uses :	Food, cattle feed and agriculture.

Caulerpa taxifolia (M. Vahl) C. Agardh, 1817

Kingdom	Plantae
Phylum	Chlorophyta
Class	Ulvophyceae
Order	Bryopsidales
Family	Caulerpaceae

Description: Plant with erect branches often close together, blades simple or sparingly branched, rhizoid bearing branches, Dark green to light green

Worldwide distribution: Adriatic Sea , Australia, California, Mediterranean, Eastern Atlantic (Africa canaries), Western Atlantic, Indo-Pacific, North pacific ocean , Caribbean, Gulf of Mexico, Federal Republic of Somalia , Gulf of Mexico , Indian Ocean , Kenya , Madagascar , North Atlantic ocean , Republic of Mauritius , Seychelles , Tanzania , Venezuela.

Distribution along Indian coast: Malvan (Maharashtra), Karnataka.

Distribution along Uttara Kannada coast: Majali- Karwar, Honnavar – Bhatkal

Habitat: Grow in tidal pools, covers available substrate, including rock, sand and mud.

Growth season occurs after Monsoon seasons

Economic use: Used as food source and animal feed.

Ecology: Called "killer algae" in Mediterranean Sea. *C. taxifolia* has a number of characteristics that make it a successful invader. An extensive rhizoid system aids in nutrient acquisition from sediments in nutrient-poor waters

Enteromorpha intestinalis (Linnaeus) Nees, 1820

Kingdom	Plantae
Phylum	Chlorophyta
Class	Ulvophyceae
Order	Ulvales
Family	Ulvaceae

Description:	Plant grows up to 30 to 50 cm long, blades elongated and inflated tube like, green in colour.
Vernacular name:	Gut weed, grass kelp (English), Enteromorphe (French), Darmatang (German)
Worldwide distribution:	Baltic sea, Belgium, France, Gulf of Finland, Mediterranean sea, Netherlands, North Atlantic Ocean, North sea, Seychelles, South Africa, Wadden sea.
Distribution along Indian coast:	Goa; Malvan, Ratnagiri, (Maharashtra), Lakshadweep, Karnataka
Distribution along Uttara Kannada Coast:	Kirubile-Kumta, Dhareshwar-Honnavar, Gokarna-kumta, Honey beach-Ankola.
Habitat:	open coast and in estuaries, attached to any substrata; littoral and shallow sublittoral
Growth season	Occurs throughout all the seasons.
Economic Uses	Edible-raw, toasted and steamed Food, animal feed and medicine

Grateloupia lithophila Borgesen, 1938

Kingdom	Plantae
Phylum	Rhodophyta
Class	Florideophyceae
Order	Halymeniales
Family	Halymeniaceae

Description:	Blades are long and irregular tapering at the end, grows 10-15 cm long, slimy to touch, forms tuft on hard substratum.
Worldwide distribution:	Yemen, Sri Lanka, Indonesia
Distribution along Indian coats:	Goa, Maharashtra, Karnataka.
Distribution along Uttara Kannada coast:	Mugli-Honnavar; Kirubele, Belekan- Kumta; Honey beach-Ankola
Habitat:	Found in intertidal area, and tidal pools
Growth seasons	Occurs in mid Monsoon, easily dried up during prolonged emersion periods.
Economical Uses:	Potential feedstock for Bioethanol production

Gelidiopsis varaiabilis (Greville ex J. Agardh) F. Schmitz ,1895

Kingdom	Plantae
Phylum	Rhodophyta
class	Florideophyceae
Order	Rhodymeniales
Family	Lomentariaceae

Description:	Thalli erect, about 4 cm high, composed of a few, irregularly branched cylindrical branches.
Worldwide distribution:	Diego Garcia atoll, Indonesia, Madagascar ,Seycelles, South Africa Sri Lanka
Distribution along Indian coats:	Lakshadweep, Kerala , Tamil Nadu (Tuticorin , Kaniyakumari , Mandapam) , Maharashtra (Bombay) , Andra Pradesh , Jalleshwar , Okha (Gujarat) Madagascar ,
Distribution along Uttara Kannada coast:	Majali (Karwar), Mugli (Honnavar),Vannali (Kumta)
Growth seasons	Post monsoon
Habitat:	Found in intertidal zone in Rocky shores
Economical Uses:	Agar production

Gelidium pusillum (Stackhouse) Le Jolis, 1863

Kingdom	Plantae
Phylum	Rhodopyta
Class	Florideophyceae
Order	Gelidiales
Family	Gelidium
Description:	Small plant grows upto 2-5 cm, forms tuft on substrata, blade is slightly long and flattened at the tip, sparsely pinnately proliferating. Blackish-red colour when dry, extensive rhizoids and flattened reproductive fronds
Vernacular name:	Small agar algae (Norwegian Bokmal)
Worldwide distribution:	France, Gulf of Mexico, Indian Ocean, Ireland, Kenya, Mediterranean Sea, North Atlantic Ocean, North Sea, Republic of Mauritius, Tanzania
Distribution along Indian coast:	Dwarka, Porbandar, Veraval (Gujarat), Mumbai (Maharashtra), Lakshadweep , Karnataka
Distribution along Uttara Kannada coast:	Majali- Karwar**;** Mugli – Honnavar
Habitat:	Found on exposed hard substratum in intertidal area.
Growth season	Occurs throughout all the seasons, peak growth in Pre monsoon
Economic uses:	Potential feedstock for bioethanol production also potential species as source of agar

Hypnea valentiae (Turner) Montagne, 1841

Kingdom	Plantae
Phylum	Rhdophyta
Class	Florideophyceae
Order	Gigartinales
Family	Cystocloniaceae

Description: Plant is erect and firmly branched. Branches are simple and thread like but occasionally forked and are distinctly oriented at right angle to the axis; inflated branches are seen as swollen bands at the middle, near the base or rarely near the tips of the ultimate branchlets

Worldwide distribution: Aegean Sea, Gulf of Mexico, Indian Ocean, Kenya, Madagascar, Mediterranean Sea, North Atlantic Ocean, Republic of Mauritius, Seychelles, Tanzania

Distribution along Indian coast: Bombay, Malvan, Ratnagiri, (Maharashtra) Goa, Karnataka, Lakshadweep.

Distribution along Uttara Kannada coast: Majali- Karwar; Om beach – Kumta.

Habitat: Mangrove swamps and Intertidal zone

Growth season Monsoon and Post monsoon

Economic Uses: It is a carrageenan yielding plant. This seaweed is also edible and the freshly gathered seaweed is commonly prepared as salad. Potential feedstock for biofuel production

Chondria armata (Kutzing) Okamura, 1907

Kingdom	Archaeplastida
Phylum	Rhodophyta
Class	Florideophyceae
Order	Ceramiales
Family	Rhodomelaceae

Description:	Thallus simple or branched, attached to rocky substratum by conical hold fast and clumps of rhizoids, branches with pinnately sub divided fronds which are arranged alternately in two opposite vertical rows. Tip of the branches bears hair-like structure when young, prominent but rarely persistent when old
Worldwide distribution:	Indian ocean, Kenya, Mozambique, South Africa, Tanzania
Distribution along Indian Coast:	Maharashtra (Bombay), Tamil Nadu (Tuticorin, Krusadai Island), Gujarat (Okha, Dwarka, Gulf of Kutch, Saurashtra), Goa, Lakshadweep Island, Andra Pradesh, Karnataka, Kerala.
Distribution along Uttara Kannada Coast:	Om beach-Kumta; Mugli- Honnavar
Habitat:	Intertidal zone in the lower parts of rocky shore
Growth season:	Throughout all the seasons
Economical uses:	Pharmaceuticals for glycoglycerolipid extraction

Gracilaria corticata (J. Agardh) J. Agardh, 1852

Kingdom	Archaeplastida
Phylum	Rhodopyta
Class	Florideophyceae
Order	Gracilariales
Family	Gracilariaceae

Description: Plants 10-12cm long, the thallus consists of bundles of flat and much divided blades with 2-3 mm broad segments; branching is dichotomous in young blades; in older plants numerous marginal projections line the edges of the segments in a pinnate fashion; they are ½-2 cm long; the colour of the plants vary from deep purple to grass green.

Worldwide distribution: Indian ocean, Kenya, Madagascar, Republic of Mauritius, Tanzania.

Distribution along Indian Coast: Dwarka, Okha (Gujarat), Bombay, Malvan, Ratnagiri, (Maharashtra) Goa, Karnataka**.**

Distribution along Uttara Kannada Coast: Majali- Karwar; Dhareshwar, Mugli-Honnavar, Murudeshwar, Apsarkonda – Honnavar

Habitat: Intertidal and subtidal zone

Growth season Observed during all the seasons with peak growth in Post monsoon and Pre Monsoon.

Economical Uses : It can be used for agar production, food, animal feed

Padina tetrastromatica Hauck, 1887

Kingdom	Chromista
Phylum	Ochrophyta
Class	Phaeophyceae
Order	Dictyotales
Family	Dictyotaceae

Description:	Thalli divided into several small lobes, regularly and distinctly concentrically zonate; easily recognized due to dark double lines of sporangia; enclosing a line of colourless hairs in between; blades composed of two layers of cells.
Worldwide distribution:	Mediterranean Sea (Eastern basin), Federal Republic of Somalia, Kenya, Seychelles, South Africa, Tanzania.
Distribution along Indian Coast:	Gujrat, Malvan, Ratnagiri, (Maharashtra), Goa, Karnataka, Lakshadweep,
Distribution along Uttara Kannada Coast:	Karwar , Honnavar , Bhatkal
Habitat:	Mangrove swamps (attached to mud)/Intertidal and on sandy shores
Growth seasons	Growth period Mid Monsoon, peak growth in Post Monsoon
Economical Uses:	Extraction of alginate, fertilizer

Sargassum ilicifolium (Turner) C.Agardh, 1820

Kingdom	Chromista
Phylum	Ochrophyta
Class	Phaeophyceae
Order	Fucales
Family	Sargassaceae

Description: Plants 30-40 cm high with elliptical leaves in the upper part of the plant, 1-3 cm long and 8-15 mm broad; the margin is toothed, with minute and larger teeth mixed; midrib is visible for 2/3 of the length of the leaf, vanishing near the tip; branches are provided with spiny outgrowths; vesicles are nearly globular, 3-5mm in diameter with a stalk of the same length.

Worldwide distribution: Kenya, Madagascar, Republic of Mauritius, Seychelles, South Africa, Tanzania.

Distribution along Indian Coast: Gujarat, Malvan, (Maharashtra), Goa, Karnataka, Lakshadweep,

Distribution along Uttara Kannada Coast: Majali- Karwar; Honnavar , Bhatkal .

Habitat: Mangrove swamp, Intertidal in open coast.

Growth season: Growth period Mid Monsoon, peak growth in Post Monsoon

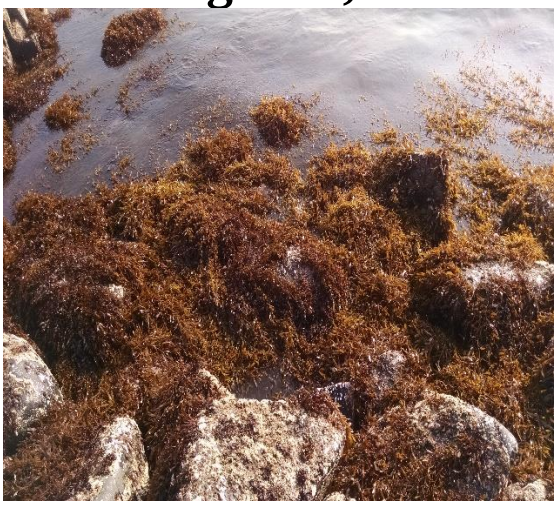
Economic uses: Used as a source of alginate, fertilizer, medicine and animal feed

Sargassum cinereum J.Agardh, 1848

Kingdom	Chromista
Phylum	Ochrophyta
Class	Phaeophyceae
Order	Fucales
Family	Sargassaceae

Description:	Plants with short, stout main axis, bearing terate, smooth, primary branches at their upper part, beset with secondary branches and branchlets; basal leaves membranaceous, oblong, about 2.5 - 3 cm long, 7 - 8 mm broad, rounded at the apices and dentate at the margins; leaves of the branchlets lanceolate, 2 - 2.5 cm long, 3 - mm broad, cuneate at the base. Vesicles spherical, about 4 mm diameter, obovate, rounded, usually mucronate at the apices, sub cylindrical below.
Worldwide distribution:	Laccadive island, Sri Lanka, Indonesia, Mauritius
Distribution along Indian Coast:	Malvan, Ratnagiri, (Maharashtra). Goa, Karnataka, Kerala.
Distribution along Uttara Kannada Coast:	Vannalli rocky shore-Kumta , Honnavar , Bhatkal , Majali rocky shore-Karwar
Habitat:	Intertidal zone
Growth season:	Growth period Mid Monsoon, peak growth in Post Monsoon
Economical Uses :	Used as a source of alginate, fertilizer, medicine

Sargassum wightii Greville ex J. Agardh, 1848



Kingdom	Chromista
Phylum	Ochrophyta
Class	Phaesophyceae
Order	Fucales
Family	Sargassaceae
Description:	Plant dark-brown, 20-30 cm in height with a well-marked holdfast, upper portion richly branched, axes cylindrical, glabrous, leaves 5-8 cm long and 2-9mm broad, leaves tapering at the base and apex, midrib inconspicuous vesicles large, spherical or ellipsoidal being 5-8mm long and 3-4 mm broad, stipe of the vesicle 5-7 mm long seldom ending into a long tip, receptacles in clusters and repeatedly branched.
Worldwide distribution:	Indian Ocean.
Distribution along Indian Coast:	Bombay(Maharashtra) , Goa, Karnataka , Kerala.
Distribution along Uttara Kannada Coast:	Majali- Karwar
Habitat:	Intertidal and subtidal
Growth season:	Growth period Mid Monsoon, peak growth in Post Monsoon
Economical Uses:	It is used as raw material for the production of sodium alginate. It also contains 8-10 % of mannitol which can be used as substitute for sugar, fertilizer and medicine

Dictyota bartayresiana J.V. Lamouroux, 1809

Kingdom	Chromista
Phylum	Ochrophyta
Class	Phaeophyceae
Order	Dictyotales
Family	Dictyotacea

Description:	Plants 9-14 cm high, erect, not entangled, a little harsh to the touch, attached to the substratum by irregularly shaped holdfast with rhizoids, thallus branched dichotomously; segments without midrib, 1 to 1.5 cm long, 2 - 4 mm broad above a fork, broadening to 6 - 10 mm below the next fork; margin entire, tips are pointed except in young branches. Sporangia 125 - 140 µ in diameter.
Worldwide distribution:	Gulf of Mexico , Indian ocean , Kenya ,Madagascar, Mozambique , New Zealand , North Atlantic ocean , Republic of Mauritius , Seychelles , Tanzania .
Distribution along Indian Coast:	Okha (Gujrat), Malvan, Ratnagiri, (Maharashtra), Goa, Karnataka, Lakshadweep
Distribution along Uttara Kannada Coast:	Karwar , Honnavar , Bhatkal
Habitat:	Intertidal zone
Growth season:	Growth period Mid Monsoon, peak growth in Post Monsoon
Economical Uses:	Food, animal feed and alginate production

3. Seaweed genera identification Key

Key to common Genera of Chlorophyta

1. Plant hollow and tubular, one celled thick.....Enteromorpha.
Plant membranous .....2.
2. Plant membranous, 2 celled thick .....Ulva.
Plant filamentous, unbranched thick cell wall .....3.
3. Plant filamentous, thick cell wall, basal cell long
compared with the width, unbranched.....Chaetomorpha.
Plant filamentous branched .....4.
4. Plant filamentous tufted branched,
lower branches dichotomous .....Cladophora
Plant coenocytious. .....5.
5. Plant coenocytious organized to form
stolon and erect branches .....Caulerpa

Key to common Genera of Phaeophyta

6. Plant erect, dichotomously branched with rounded
apex, unilocular sporangia .....Dictyota
Plant broad, sparsely branched without mid-rib.....7.
7. Plant broad, erect, margin entire, branches
irregularly dichotomus .....Spatoglossum
Plant entire, lobbed .....8.
8.Plant entire, lobbed,2-8 celled thick marked with
concentric row of hairs ..... Padina
Plant erect, axis cylindrical bearing leaves and vesicles 9
9. Plant with erect axis, branched, leaves membranous,
prominent mid rib, receptacles axially ..... Sargassum.

Key to common Genera of Rhodophyta

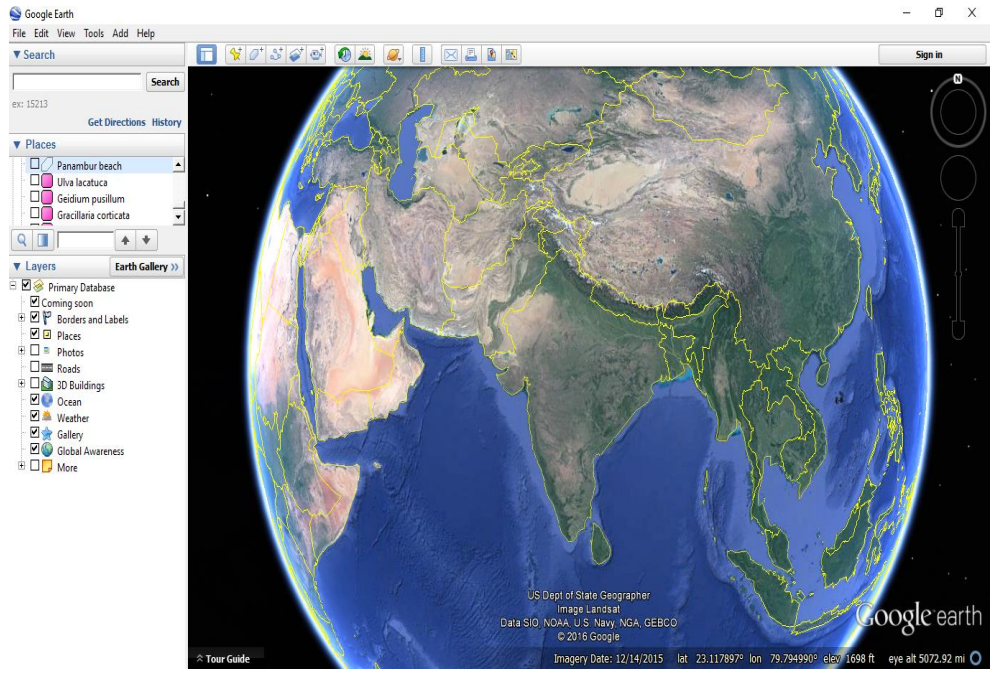
10. Plant erect, foliaceous, margin entire, majenta colour,
stallate chloroplast with central pyrenoid .....Porphyra
Plant tufted, dichotomously branched .....11.
11. Plant cartilaginous, terate to compress, saxicolous .....Gelidium
Plant slender, cylindrical stolon .....12.
12. Plant cartilaginous, erect, stolon give rise to erect and
decumbent branches above and coarse short rhizoidal
branches below, axial branches are cylindrical or compressed,
stichidia are borne on the swollen tips .....Gelidiella
Plant bushy, wiry clumps .....13.
13. Plant bushy, wiry clumps, lower branches some what
creeping, upper erect tapering towards the apex .....Gelidiopsis
Plant branched, axis cylindrical or flattened.....14.
14. Plant branched, flattened, structurally composed of
central medulla surrounded by cortex .....Gracilaria

Plant cylindrical, profusely branched bearing
short acute alternate branches .....15.
15. Plant erect radially branched, cylindrical, commonly
beset with numerous thorn like branchelets. Tetraspores
and cystocarps in swollen alternate branches.....Hypnea
Plant erect, cartilaginous, wart like determinate branchlets.....16
16.Plant erect, cartilaginous, determinate branches
beset with wart like branchlets .....Laurentia
Plant erect, cylindrical, determinate branches acute.....17
17. Plant erect, cylindrical, delicate in texture, determinate
branches acute, stalked antheridia, oval cystocrap .....Chondria
Plant erect, flattened to foiliaceous .....18.
18. Plant erect, flattened with slippery blade, branches
pinnate to irregular, texture firm, dark purple colour .....Grateloupia

10.1 SPATIAL MAPPING -SEAWEEDS DISTRIBUTION

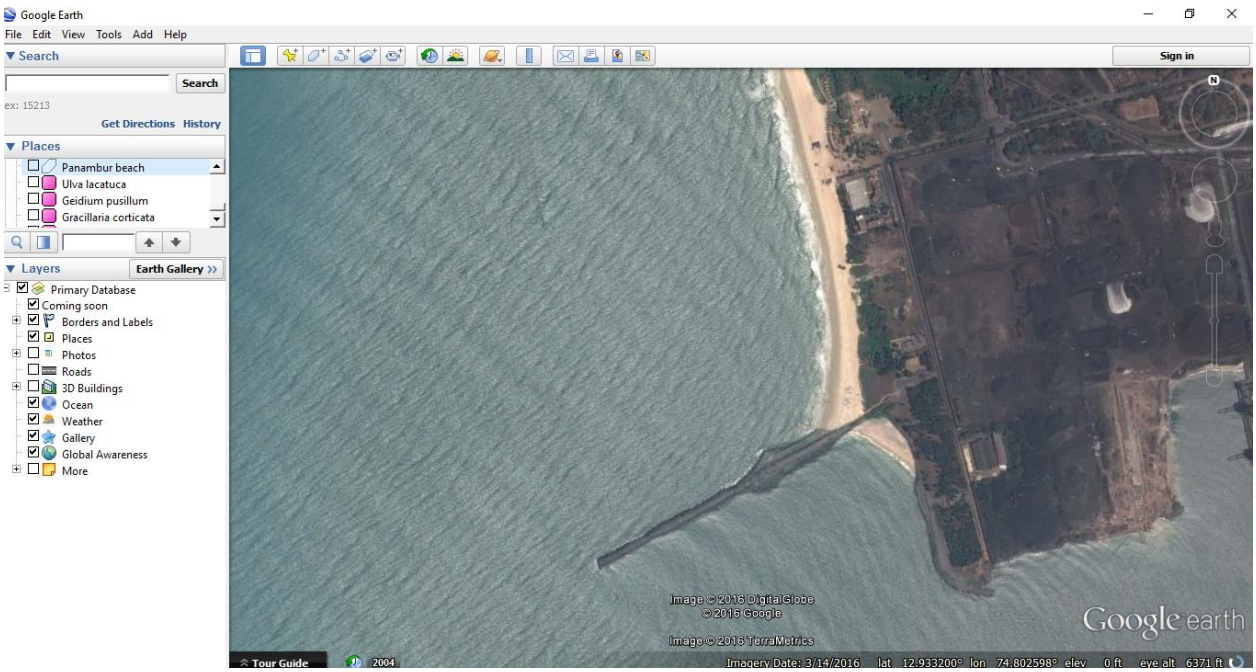
10.1.1 Digitizing the Rocky shores

1. Downloading google earth (http://www.google.com/earth/)

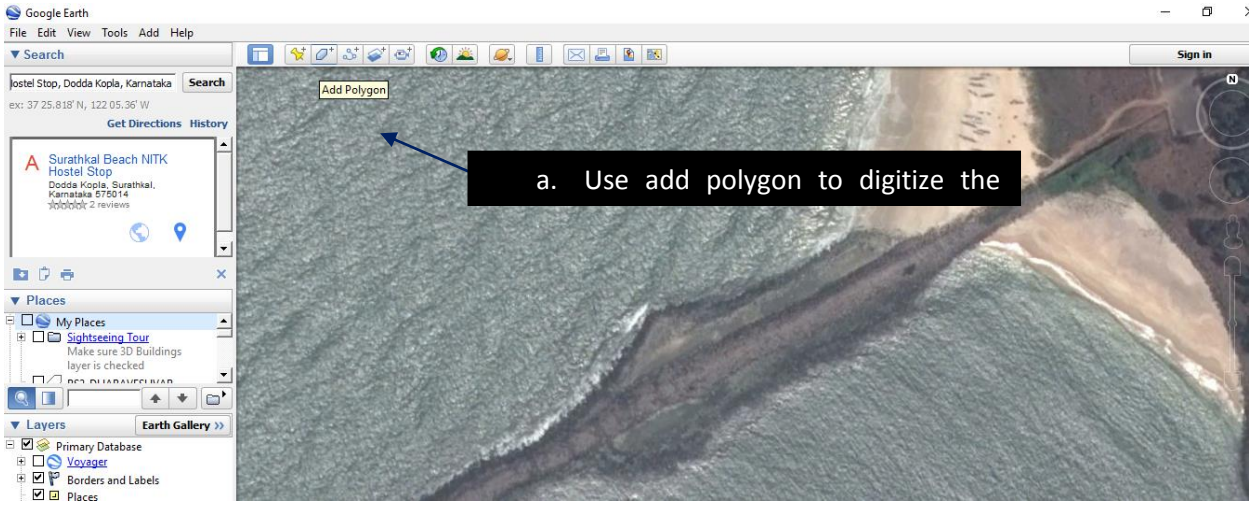


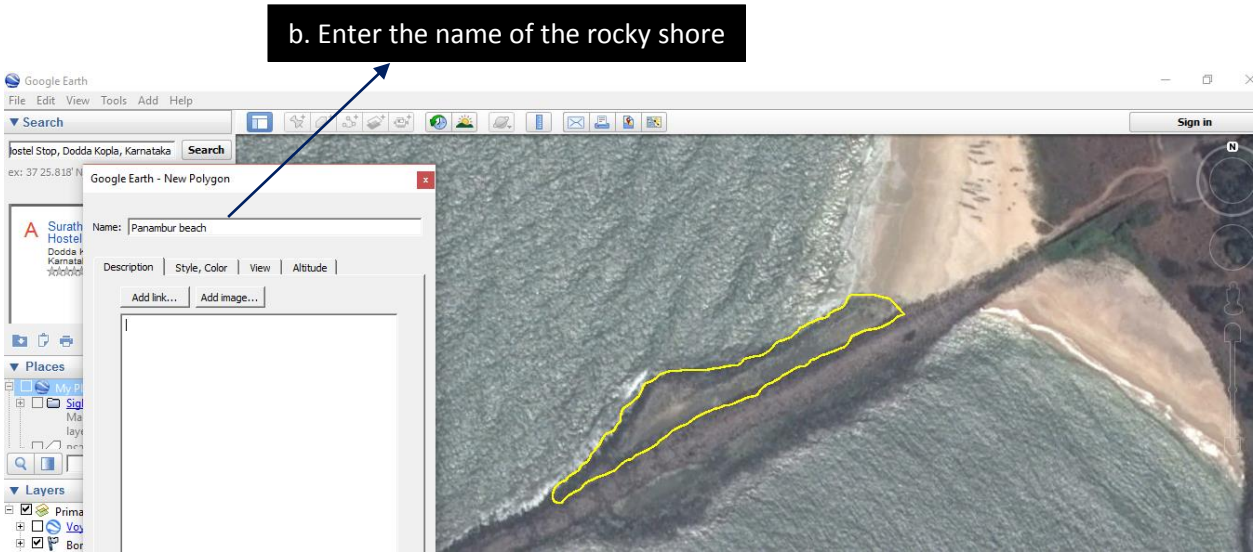
10.1.2 Installing Google earth

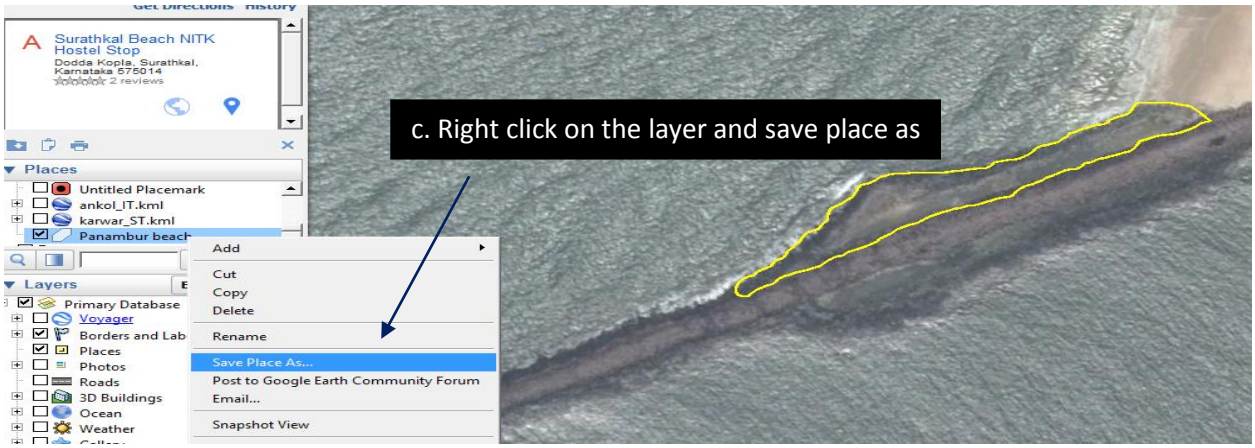
Zoom to the desired location /rocky shore

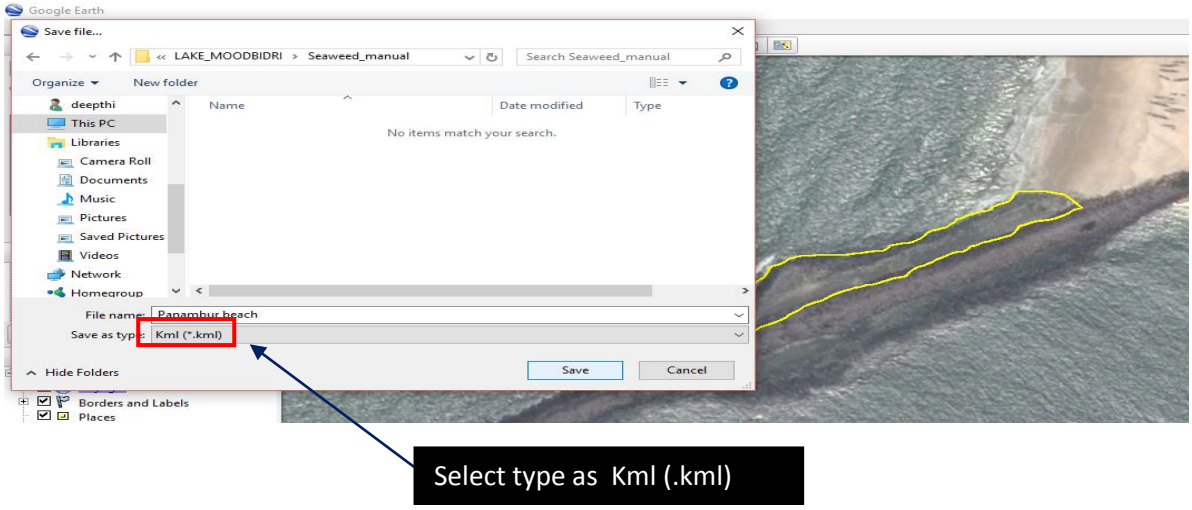


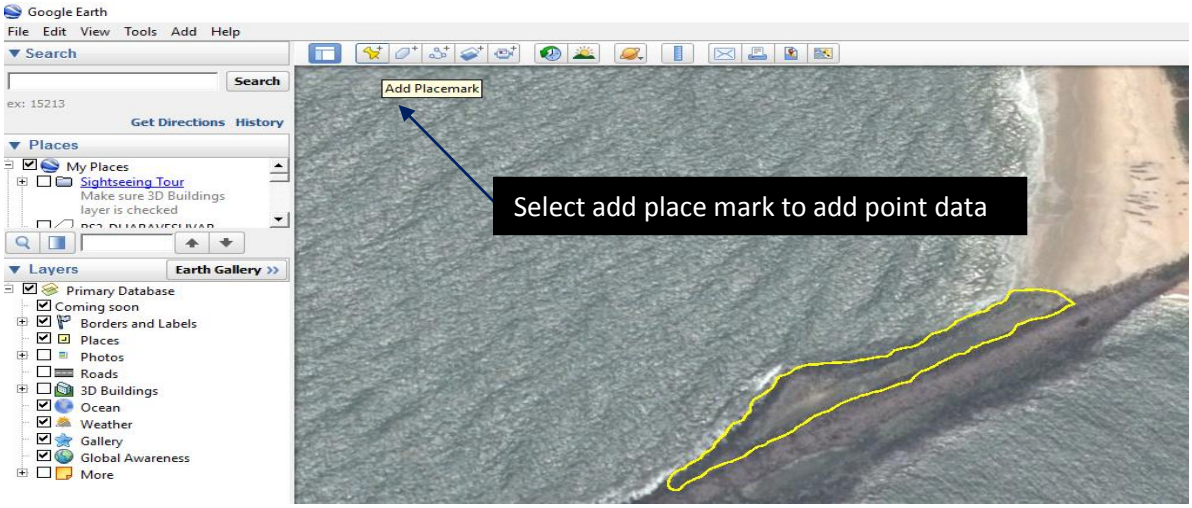
10.1.3 Using the polygon tool digitized the rocky shore



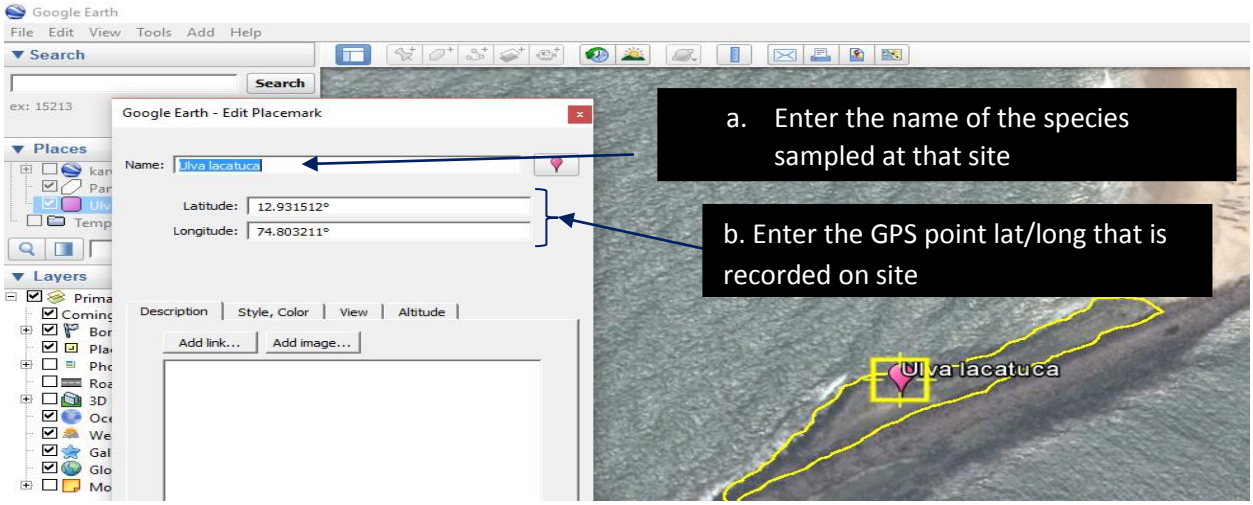


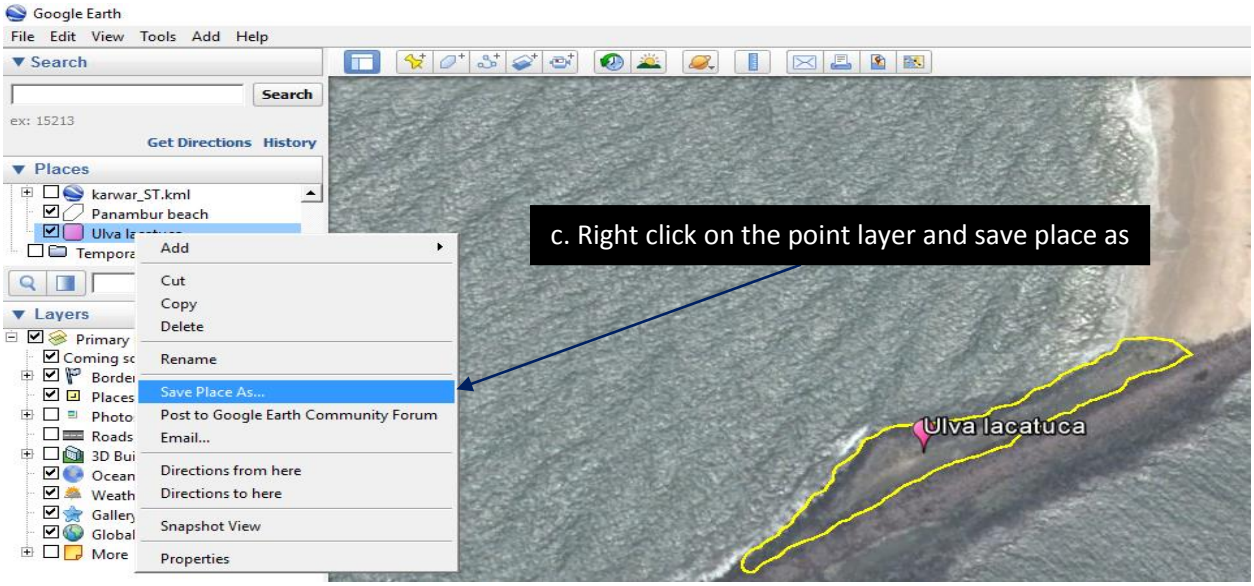






Entering point data




Google Earth
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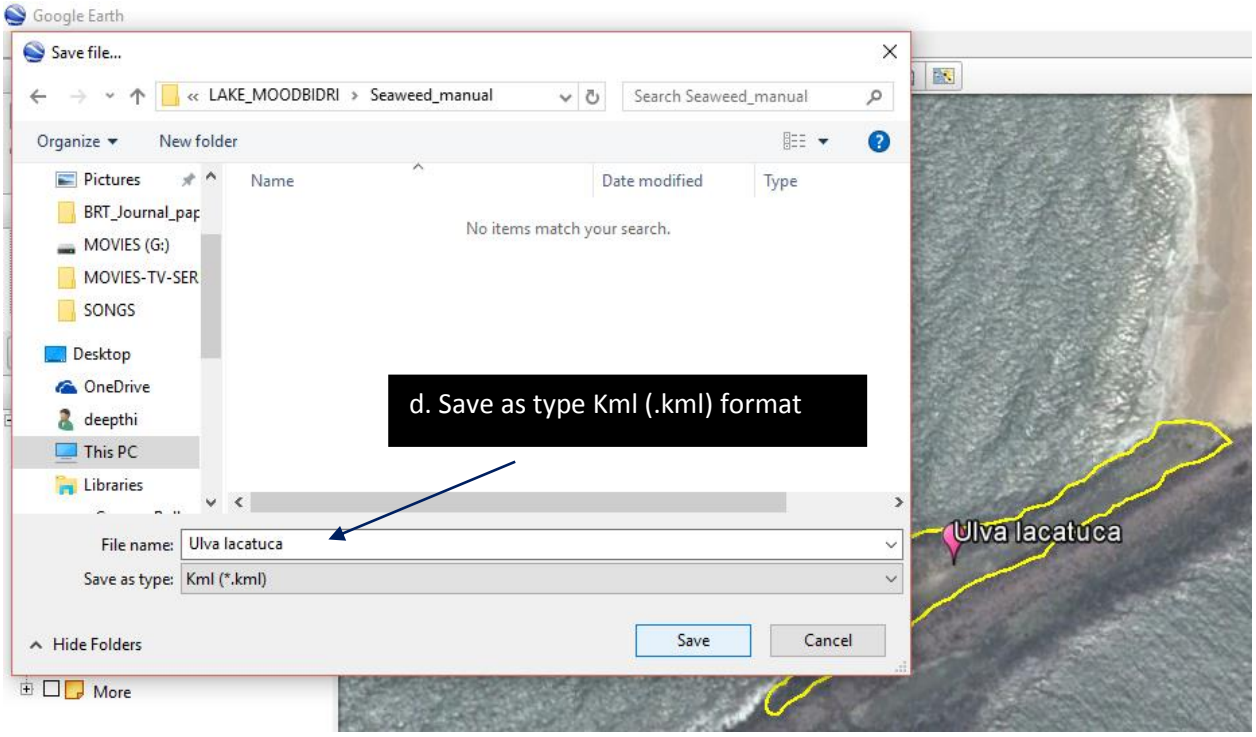
Delete
Rename
Save Place As...
Post to Google Earth Community Forum
Email...
Directions from here
Directions to here
Snapshot View
Properties
Layers
Primary
More
c. Right click on the point layer and save place as
Ulva lacatuca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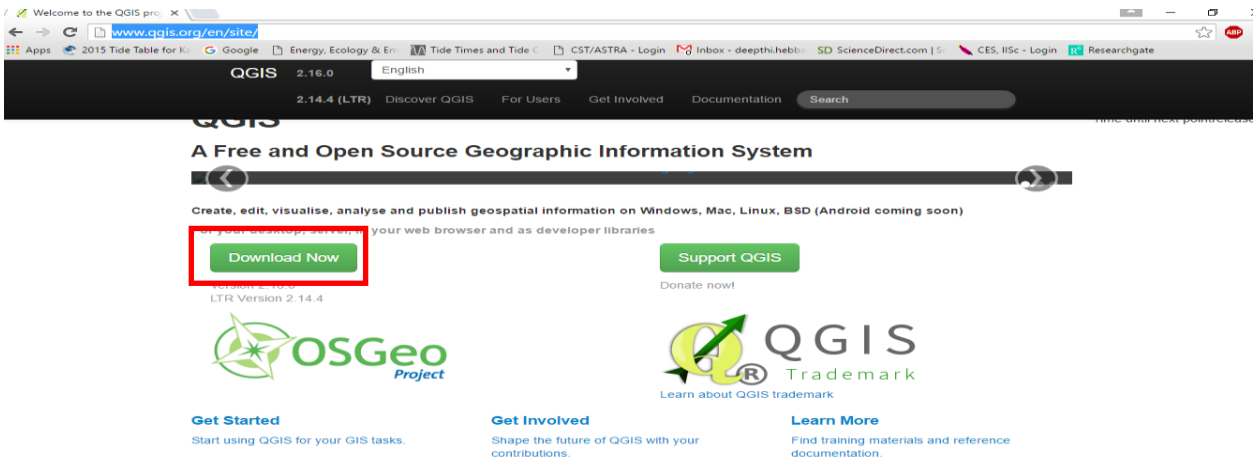
Search Seaweed_manual
Organize
New folder
Pictures
BRT_Journal_pap
MOVIES (G:)
MOVIES-TV-SER
SONGS
Desktop
OneDrive
deepthi
This PC
Libraries
Name
Date modified
Type
No items match your search.
d. Save as type Kml (.kml) format
File name: Ulva lacatuca
Save as type: Kml (*.kml)
Hide Folders
Save
Cancel
More
Ulva lacatuca

QUANTUM GIS (QGIS) – SPATIAL MAPPING TOOL

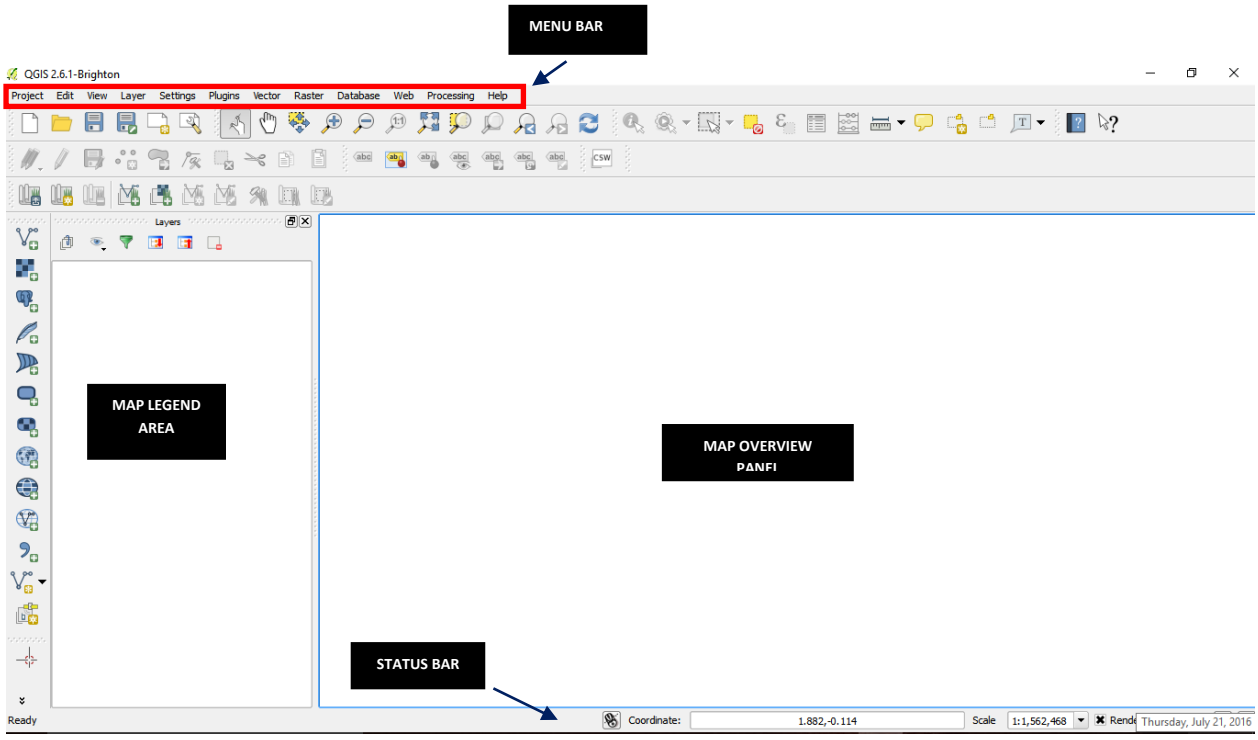
QGIS is a Free and Open Source GIS for manipulating geographical data (vector, raster), statistical analysis.

Downloading and Installing QGIS

- Download QGIS from http://www.qgis.org/en/site/
- Click on download now you will find the list of versions available.
- Download the latest stable version.



- QGIS main page will be opened as shown below.

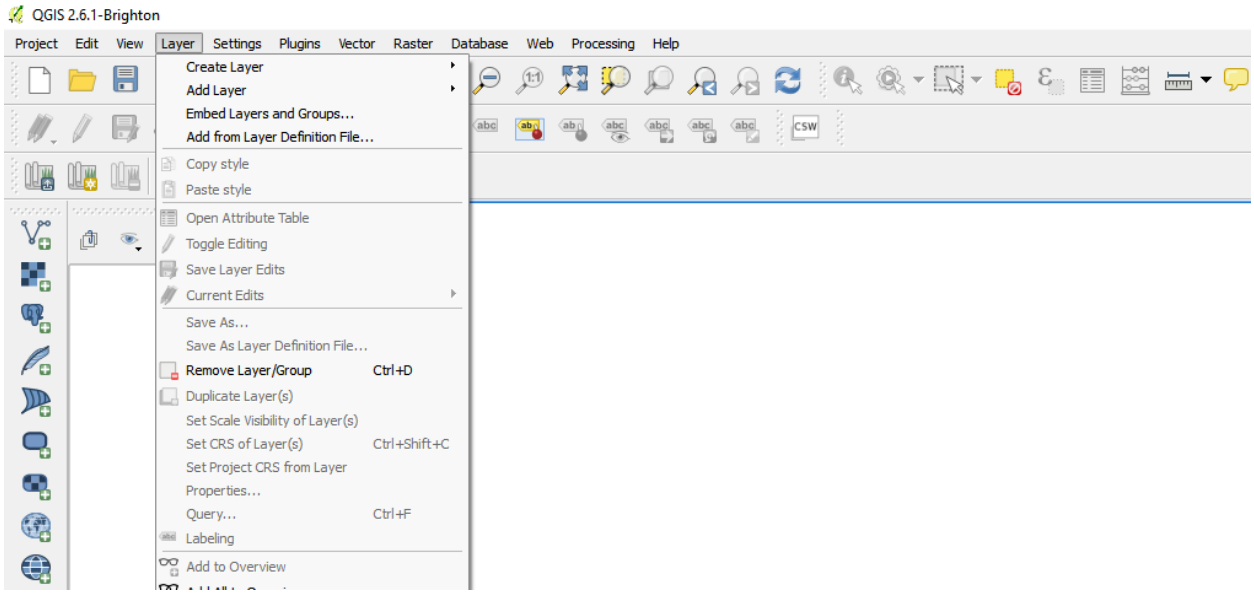


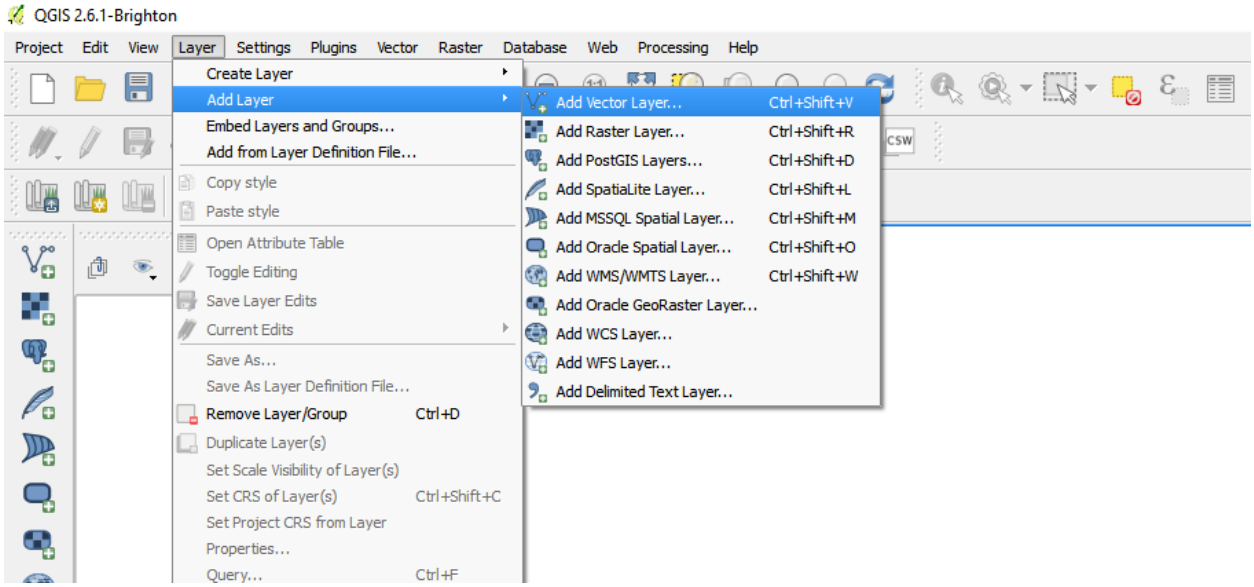
- The menu bar provides access to numerous QGIS features.

- The toolbars offer additional tools for interacting with the map. Hold the mouse over the particular icon, a short description of the tool's purpose will be displayed.
- The map legend area sets the visibility
- The map overview panel provides a full extent view of layers added
- The status bar shows the current position in map coordinates

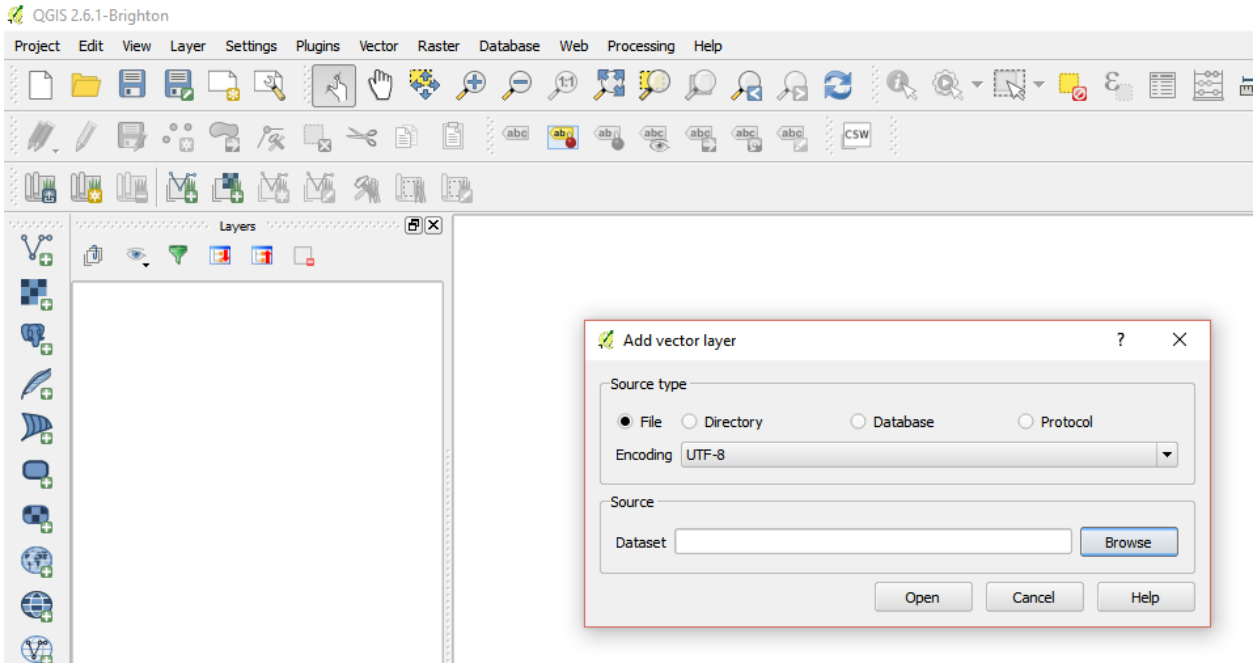
Importing vector layer (.kml file)

- Click on add layer go to add vector layer

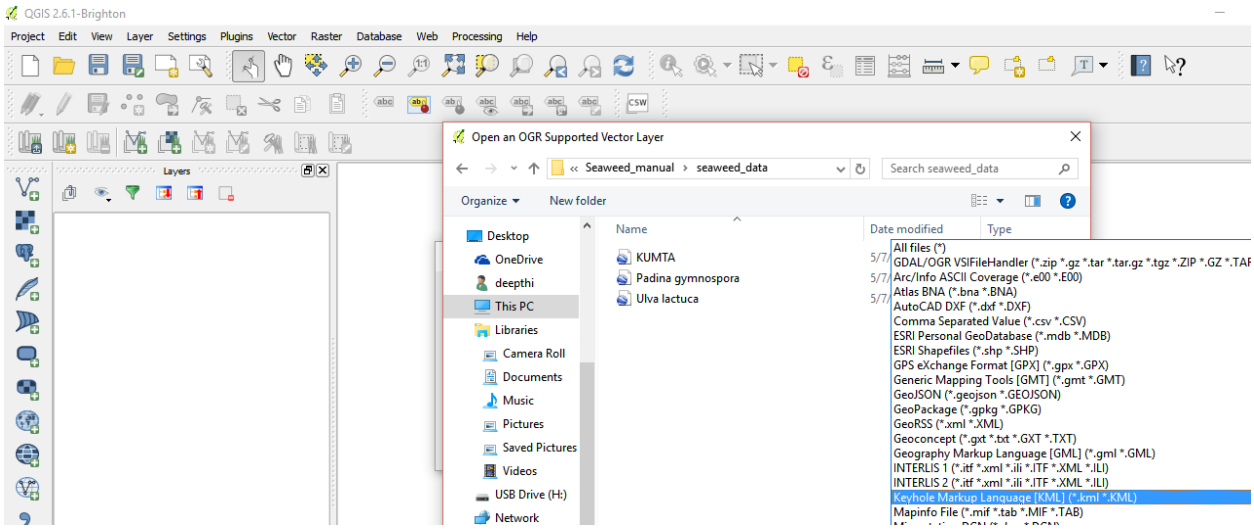




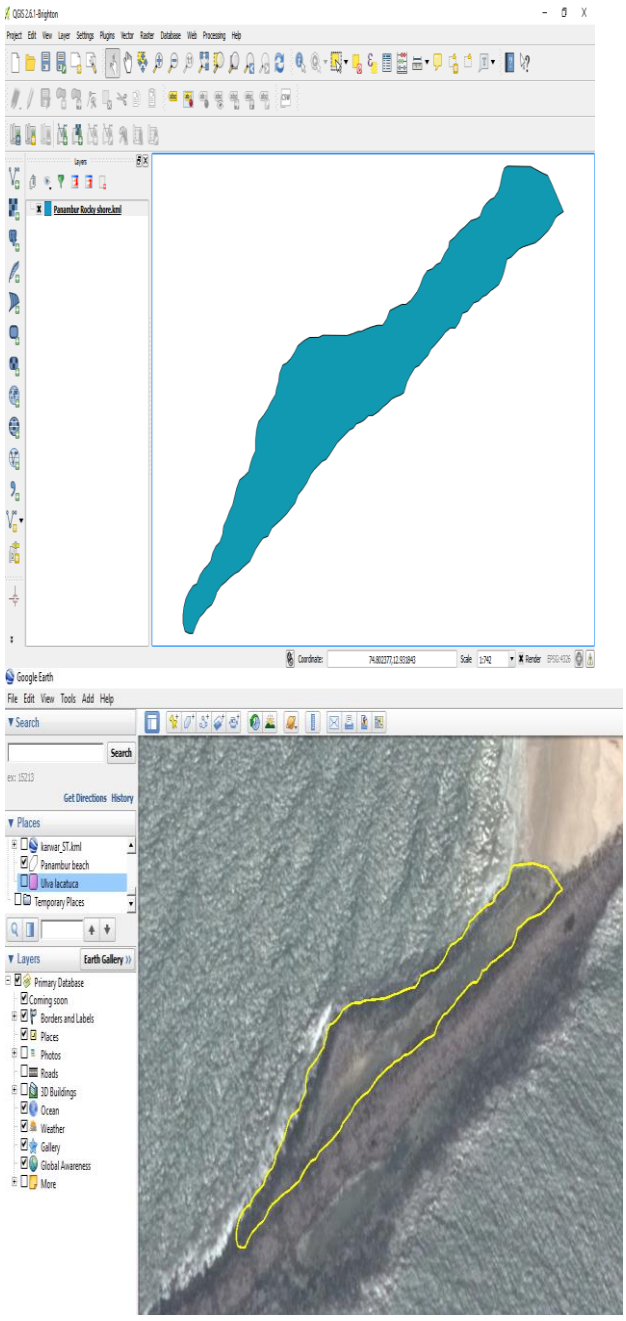
Import the .kml file by browsing



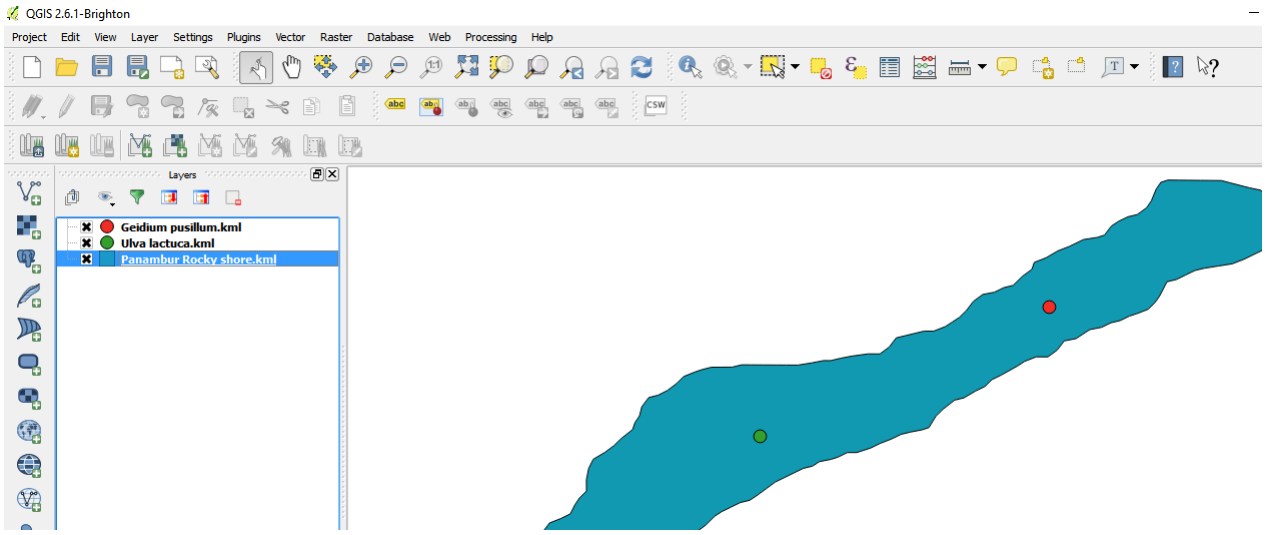
If the file is not visible click on keyhole markup language [KML] (*.kml *KML)



Vector layer displayed in the map overview

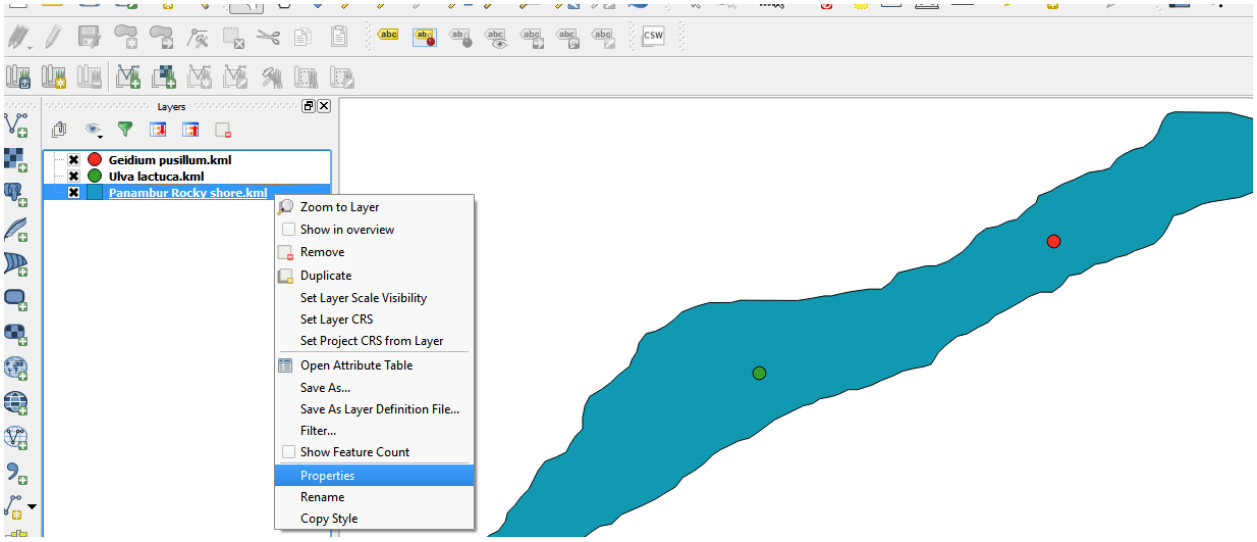


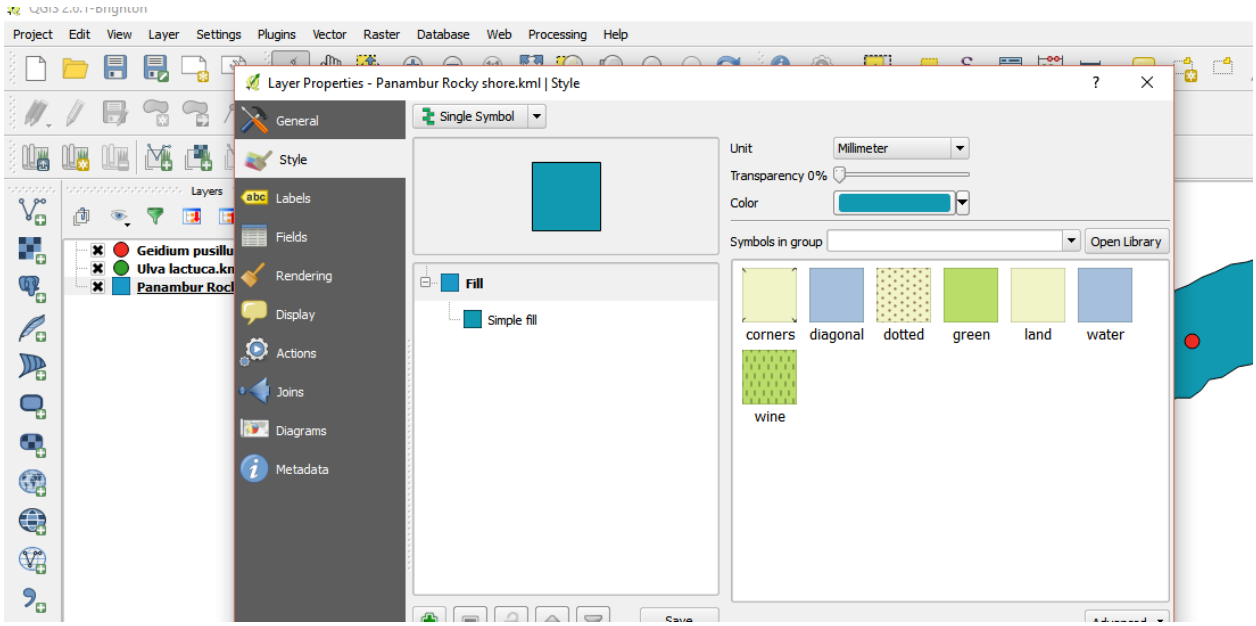
In a similar way import the point data in this case the seaweed species data

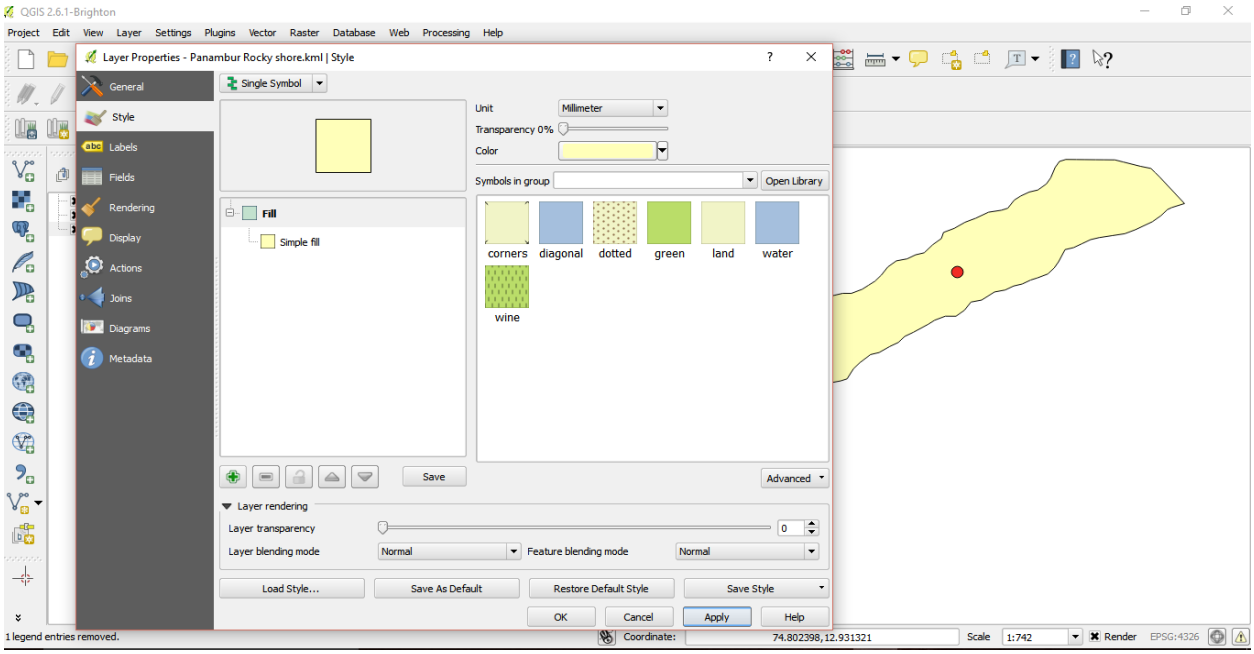


Layer properties such as size, colour, label, font can be edited

- **right click on the layer go to properties**

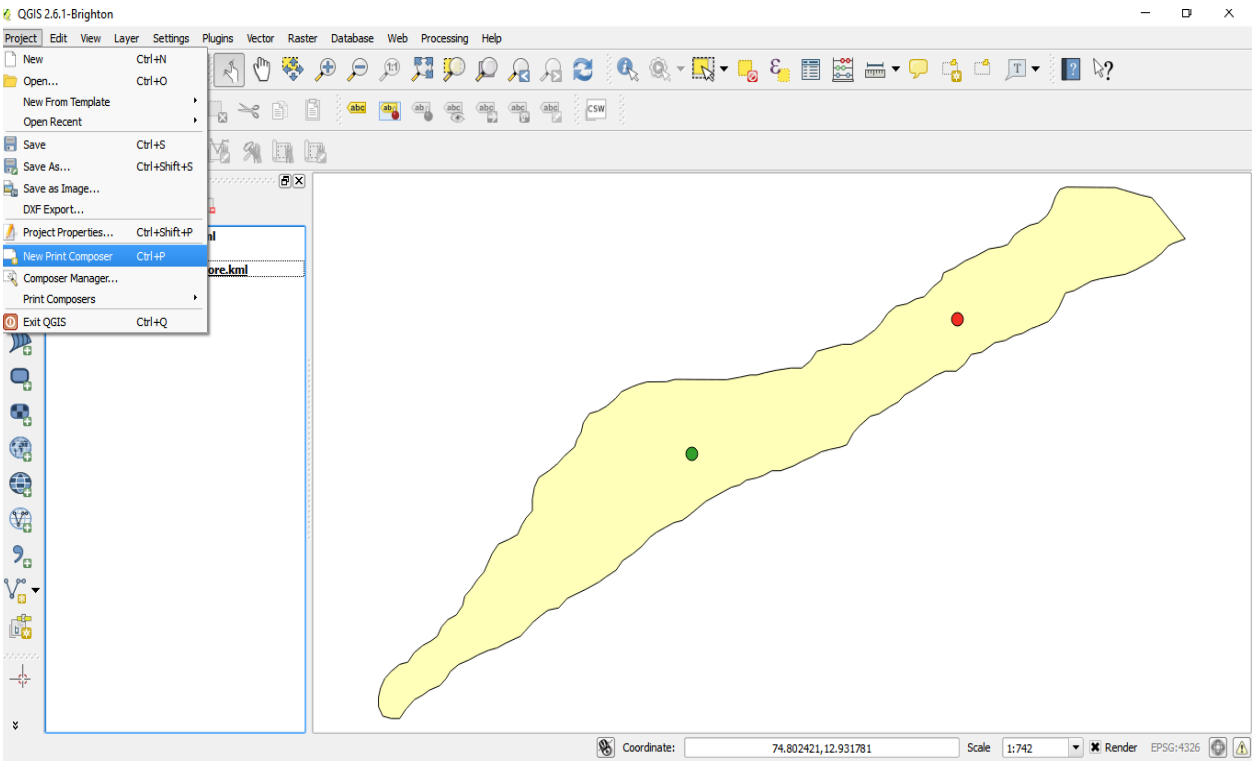






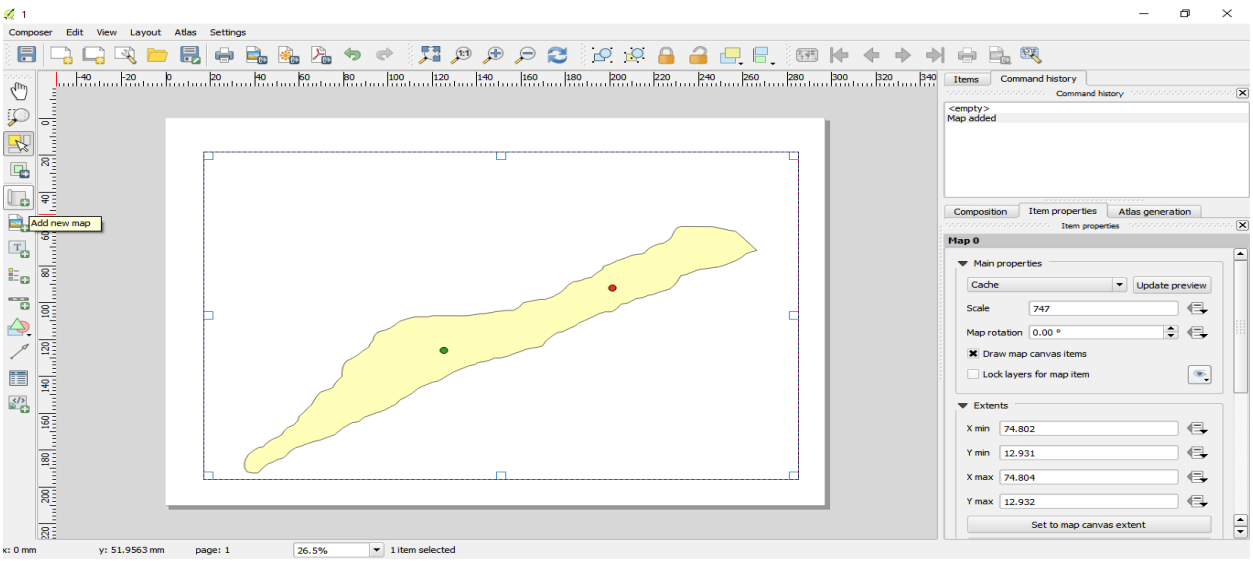
For final map representation

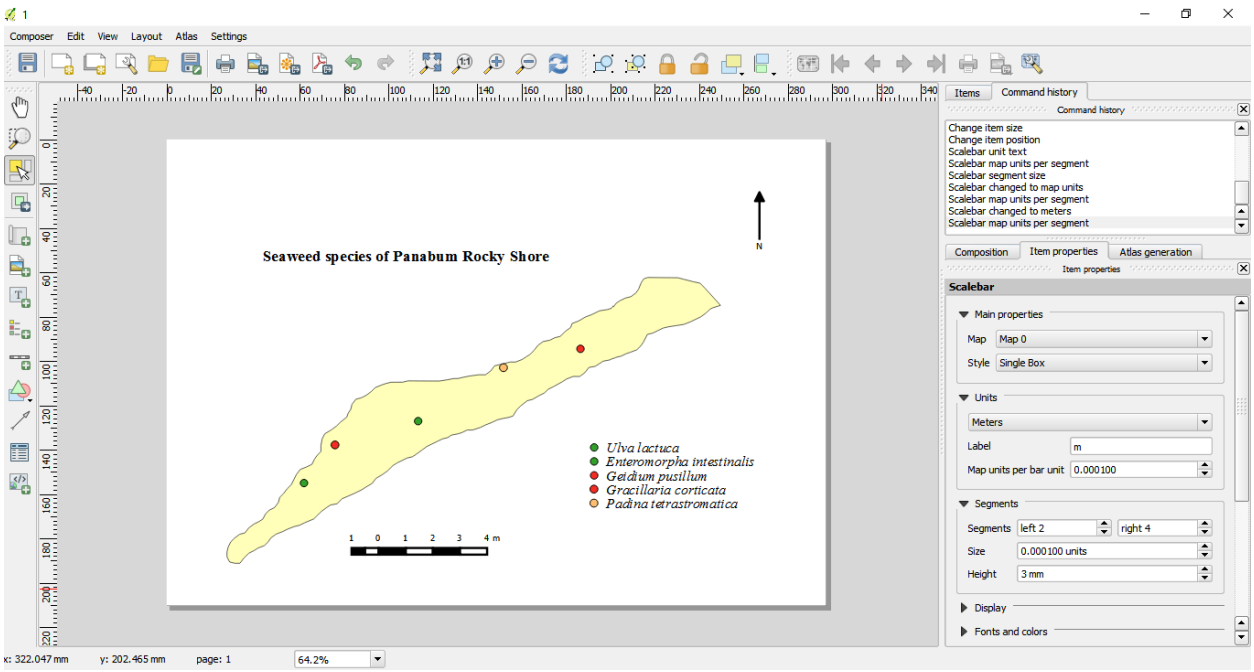
- **Go to project click on new map composer**
- **Give id as 1 a new map window opens**



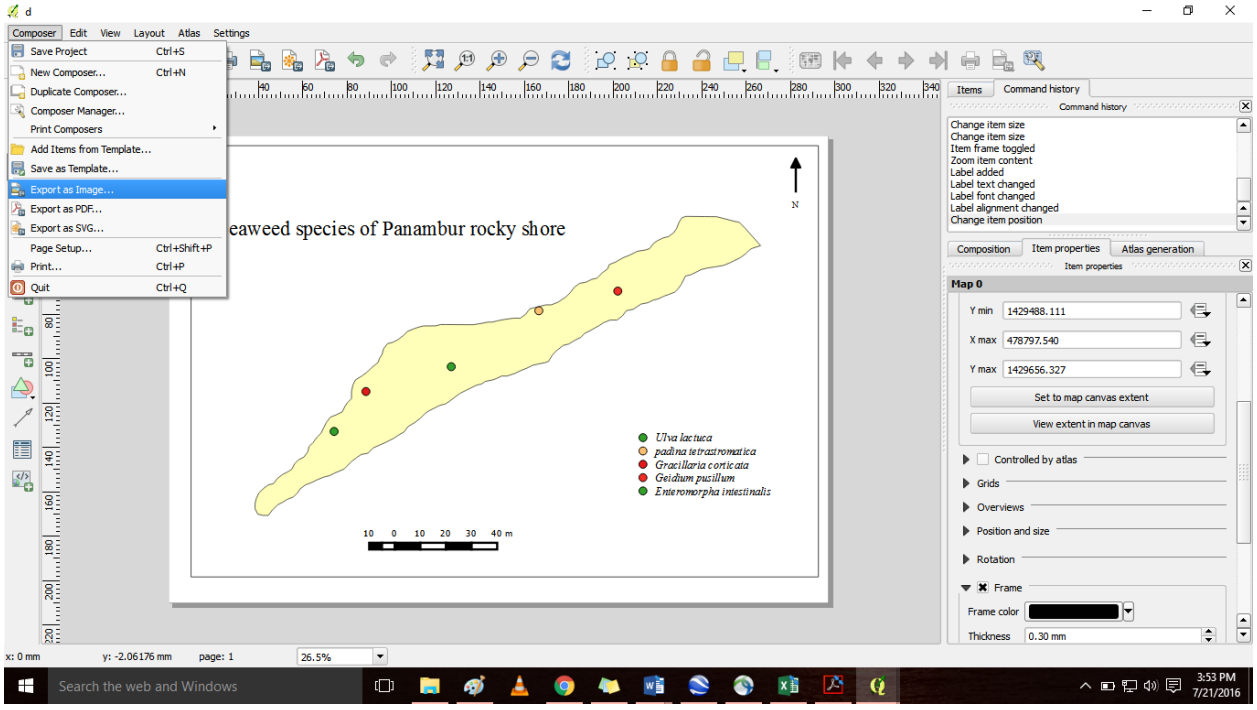
Add new map by dragging the cursor inside the window

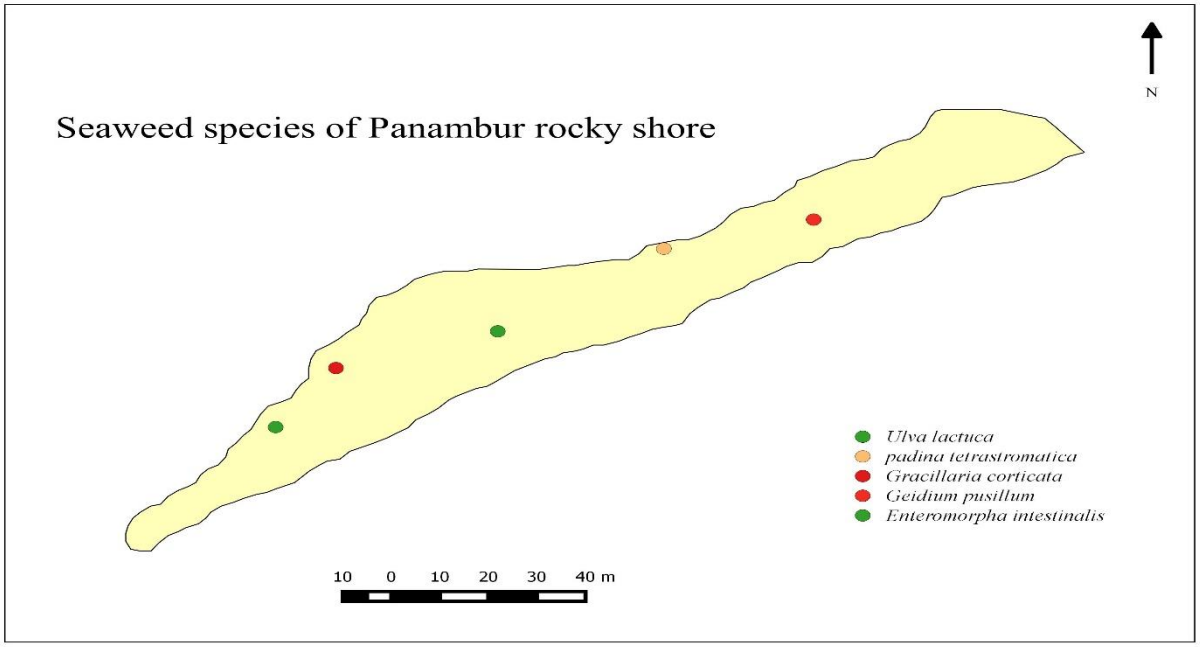
- **On the left hand side different icons are present which helps in adding legend, label and direction**
- **On right hand side these icons are edited in item properties**





Final map can be saved as jpg image





Help from QGIS:
http://www.qgis.org/en/site/forusers/index.html#
http://www.qgis.org/en/docs/index.html

References:

1. Algae Base , www.algaebase.org
2. Economically important seaweeds of India, special publication number 62, CMFRI,1995
3. WoRMS- http://www.marinespecies.org/
4. NIO bioinformatics-http://www.niobioinformatics.in/seaweed/introduction.html

11.0 PROTOCOL FOR WATER QUALITY MONITORING (PHYSICAL, CHEMICAL AND BIOLOGICAL PARAMETERS)

WATER SAMPLING

Sampling:

The sample collected should be small in volume, enough to accurately represent the whole water body. The water sample tends to modify itself to the new environment. It is necessary to ensure that no significant changes occur in the sample and preserve its integrity till analysed (by retaining the same concentration of all the components as in the water body). The essential objectives of water quality assessment are to:

- Define the status and trends in water quality of a given water body.
- Analyse the causes for the observed conditions and trends.
- Identify the area specific problems of water quality and provide assessments in the form of management to evaluate alternatives that help in decision-making.

Site selection in a waterbody: Sampling sites for the water body/lake are selected to represent the water quality at different points and depths. Generally three sampling sites are selected for monitoring.

- ***Inlet*:** the point where the principal feeder opens into the lake.
- ***Center*:** the point that gives the general water quality of the lake.
- ***Outlet*:** the place where the overflow occurs.

Types of sampling: Generally three types of sampling are adopted for collecting water samples.

- ***Grab or Catch sampling:*** the sample is collected at a particular time and place that represents the composition of the source at that particular point and time.
- ***Composite sampling:*** a mixture of grab samples is collected at the same sampling point at different time intervals.
- ***Integrated sampling:*** a mixture of grab samples collected at different points simultaneously.

Sampling frequency

The quality of water varies with time in a water body due to various natural and human induced factors. The monitoring has to be done in a way that records all the changes in the quality. The sampling frequencies generally adopted in monitoring are:

- Monthly sampling covering all seasons (preferably for 24 months).
- Weekly sampling for one year.
- Consecutive day sampling during the study period.
- Hourly sampling for 24 hours (example: parameters such as dissolved oxygen, pH, etc.).

Variations in water quality are mainly due to changes in the concentrations of the components of the water flowing into the water body. These variations can be man-made or natural and can either be cyclic or random.

- *Random variations*: due to spasmodic, often unpredictable events such as accidental oil spills, sewage leaks, overflows, etc.
- *Cyclic variations:* may be a result of regular seasonal changes triggering certain natural processes such as rainfall, snowmelts and seasonal temperature changes, altering the ecosystem. Seasonal growth and decay of vegetation will also rise due to cyclic changes in the composition of water.

In lakes, the mass of water and good lateral mixing provide inertia against any rapid modifications due to inputs and outputs.

Sampling container: The sampling container should not react with the sample, be of adequate capacity to store the sample and be free from contamination.

Sampling method: Grab sampling can be performed at the inlet, center and outlet in most of the water bodies studied to assess their physical and chemical qualities. The samples can be collected in thoroughly cleaned 2.5-litre inert plastic containers, which is rinsed with distilled and lake/tank water before collection.

Note: Water samples were collected in a sampling bottle avoiding floating materials. The stoppers of the sample containers were closed properly to prevent outside contamination. The container was labelled describing the name of the water body, date, time, sampling-point, and conditions under which it was sampled.

Analyses of Physical, Chemical and Biological Parameters
The parameters analysed to assess the water quality are broadly divided into: • **Physical parameters:** Colour, Temperature, Transparency, Turbidity and Odour. • **Chemical parameters:** pH, Electrical Conductivity (E.C), Total Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrates, Phosphates, Chlorides, Dissolved Oxygen (D.O), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Fluorides, Free Carbon-dioxide, Potassium and Sodium. • **Biological parameters:** The biological parameters involved the qualitative analyses of planktons
Field measurement: The field (on-spot) parameters measured include pH, conductivity, dissolved oxygen, temperature and transparency.
Sample Preservation: Between the time a sample is collected and analysed in the laboratory, physical, chemical and biochemical reactions may take place in the sample container leading to changes in the intrinsic quality of the sample, making it necessary to prevent or minimize these changes with suitable preservatives such as alcohol and mercuric chloride. Highly unstable parameters such as pH, temperature, transparency, free carbon-dioxide, dissolved oxygen, etc. is measured at the sampling site. The preservation procedure includes keeping the samples in the dark, adding chemical preservative, lowering the temperature to retard reactions, or combinations of these.

Experiment	Preservative	Max. holding time
BOD	Cool, 4^{o} C	4 hours
Calcium	Cool, 4^{o} C	7 days
Chloride	Cool, 4^{o} C	7 days
COD	Cool, 4^{o} C	24 hours
Dissolved Oxygen*	Fix on site	6 hours
Magnesium	Cool, 4^{o} C	7 days
Nitrate + Nitrite	Cool, 4^{o} C	24 hours
pH	None	6 hours
Phosphorus*		
Dissolved	Filter on site using 0.45µm filter	24 hours
Inorganic	Cool, 4^{o} C	24 hours
Ortho	Cool, 4^{o} C	24 hours
Total	Cool, 4^{o} C	1 month
Potassium	Cool, 4^{o} C	7 days
Specific Conductance	Cool, 4^{o} C	24 hours
Sodium	Cool, 4^{o} C	7 days

(Source: Analytical Methods Manual, Water quality branch, Environment Canada, 1981)

WATER TEMPERATURE	**1**

WATER TEMPERATURE: The water temperature is important for its effects on the chemistry, and biological reactions in the organisms in water. A rise in temperature of the water leads to the speeding up of the chemical reactions in water, reduces the solubility of gases, affects carbon dioxide-carbonate-bicarbonate equilibrium and amplifies the tastes and odours. Temperature influences water chemistry, e.g. DO, solubility, density, pH, alkalinity, salinity, conductivity etc. At elevated temperatures, metabolic activity of organism's increases, requiring more oxygen but at the same time the solubility of oxygen decreases. Water temperature is important in relation to fish life. The disease resistance in the fishes also decreases with rise in temperature. The aquatic organisms show varied sensitivities to temperature. The temperature of drinking water has an influence on its taste.

Procedure

Clean the pH-TDS-EC probe/thermometer (Hg bulb region) with distilled water and fill the container with water sample. Then check the water temperature of the sample by dipping the pH-TDS-EC probe into sample and record it in degrees Celsius (^{o}C).

Apparatus: pH-TDS-EC probe/ Laboratory thermometer, Beaker

Do's and Dont's:

- Clean the electrode (sensor parts) of the meter with distilled water and wipe properly using tissue paper, before and after usage.
- Calibrate the meters prior to each field trip. (Follow internal calibration solutions as per the Company instructions)
- Ensure: Company instructions for field use, maintenance and storage of the pH-TDS-EC probe have been followed properly.
- Note down the temperature readings of each sample.
- Don't expose the meter/laboratory thermometer directly to sunlight.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

pH	2

pH: pH is the measure of the acid-base balance of a solution and is defined as the negative logarithm to the base 10 of the hydrogen ion (H^+) concentration. The pH scale runs from 0 to 14 (i.e., very acidic to very alkaline) with pH 7 representing a neutral solution. When the pH is less than 7, it is said to be acidic; a pH greater than 7 is basic.

pH tends to increase during day largely due to the photosynthetic activity (consumption of carbondioxide) and decreases during night due to respiratory activity. pH is also governed by the equilibrium between carbon dioxide/bicarbonate/carbonate ions. The change in the intensity of acidity or alkalinity of an aquatic ecosystem can be due to inflow of industrial effluents, domestic sewage and atmospheric deposition of acid-forming substances. Diurnal variations in pH can take place due to photosynthesis and respiration cycles of algae in eutrophic waters. Acidity of water is controlled by strong mineral acids, weak acids (such as carbonic, humic and fulvic acids) and hydrolysing salts of metals such as iron and aluminium. Waste water and polluted natural waters have pH values lower or higher than 7 based on the nature of the pollutant. Changes in pH endanger the lives of the organisms in the water.

A lower pH value, below 4 will produce sour taste whereas pH above 8.5 produces an alkaline taste. If the pH is below 6.5, corrosion of pipes occur, thus toxic metals like Zinc, Lead, Cadmium and Copper etc. are released. Higher pH values induce scale formation in water heating apparatus, production of toxic trihalomethanes and also reduce the germicidal potential of chlorine.

Procedure

- **Colorimetric method:** About 10ml of the sample is taken in a wide mouth test tube, 0.2 ml of BDH indicator is added, and shaken gently. The colour developed is matched with the chart and the pH noted.
- **Electrometric method:** The pH is determined by measuring the Electro Motive Force (E.M.F) of a cell comprising an indicator electrode (an electrode responsive to hydrogen ions such as a glass electrode) immersed in the test solution and the reference electrode (usually a mercury/calomel electrode). Contact between the test solution and the reference electrode is usually got by means of a liquid junction, which forms a part of reference electrode. E.M.F of this cell is measured with pH meter that is a high impedance voltmeter calibrated in terms of pH. The electrode is allowed to stand for 2 minutes to stabilize before taking reading for reproducible results (at least ±0.1 pH units).

Apparatus:

- **pH indicator (BDH) method:** BDH Indicator (Universal Indicator) and test tubes.
- **Electrometric method:** Glass electrode, reference electrode (mercury/calomel or silver/silver chloride) and pH meter.

Do's and Dont's:

- Clean the meters with distilled water and wipe properly using tissue paper, before and after usage.
- Calibrate the meters prior to each field trip.
- Ensure that all the instructions on use, maintenance and storage of the pH-TDS-EC probe have been followed.
- Note down the pH readings of each sample.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 7-8.5 Excessive Not less than 6.5 or greater than 9.2
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

ELECTRICAL CONDUCTIVITY (EC)	3

ELECTRICAL CONDUCTIVITY: Conductivity denotes the ability of an aqueous solution to conduct an electrical current. It depends on the presence of ions, their total concentration, mobility, valence, relative concentration and on the temperature of measurement. Electrolytes in a solution dissociate into positive (cations) and negative (anions) ions and impart conductivity. Solution of most inorganic acids, bases and salts (chloride, nitrate, sulfate, phosphate anions, sodium, magnesium, calcium, iron, and aluminium cations) are relatively good conductors unlike organic compounds (oil, phenol, alcohol, and sugar). Conductivity increases with temperature.

Conductance is defined as the reciprocal of the resistance involved and expressed as mho or Siemen (s).

$G=1/R$ [where, G – Conductance (mho or Siemens) and R – Resistance]

The amount of current that can flow through a solution is proportional to the concentration of dissolved ionic species in the solution. Thus, higher the concentration of electrolytes in water, the more is its electrical conductivity. i.e. lesser the resistance.

Procedure

The electrode of the conductivity meter is dipped into the sample, and the readings are noted for stable value shown as mS/cm.

Apparatus: Conductivity meter, 100ml Beaker

Do's and Dont's:

- Clean the meters with distilled water and wipe properly using tissue paper, before and after usage.
- Calibrate the meters prior to each field trip.
- Ensure that all the instructions on use, maintenance and storage of the pH-TDS-EC probe has been followed.
- Note down the EC readings of each sample.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 750-2000 Excessive >2000
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

TOTAL DISSOLVED SOLIDS (TDS)	4

TDS : The substances that would pass through the filter paper but will remain as residue when the water evaporates which includes dissolved minerals and salts, humic, tannin and pyrogens. A constant level of minerals in the water is necessary for aquatic life. Changes in the amounts of dissolved solids can be harmful because the density of total dissolved solids determines the flow of water in and out of an organism's cells. Many of these dissolved solids contain chemicals, such as nitrogen, phosphorous, and sulfur, which are the building blocks of molecules for life. Concentration of total dissolved solids that are too high or too low may limit the growth and may lead to the death of many aquatic organisms. High concentrations of total dissolved solids may reduce water clarity, which contributes to a decrease in photosynthesis and lead to an increase in water temperature. Many aquatic organisms cannot survive in high temperatures. The conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. These particles contribute the dissolved solids of the water. Waters with high dissolved solids generally are of inferior palatability and may induce an unfavourable physiological reaction.

Procedure

Clean the pH-TDS-EC probe with distilled water and fill the container with water sample. Then the total dissolved solids is determined by dipping the pH-TDS-EC probe into sample and express in parts per million (ppm).

Apparatus: pH-TDS-EC probe, 100ml Beaker

Do's and Dont's:

- Clean the meters with distilled water and wipe properly using tissue paper, before and after usage.
- Calibrate the meters prior to each field trip.
- Ensure that all the instructions on use, maintenance and storage of the pH-TDS-EC probe has been followed.
- Note down the TDS readings of each sample.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 500 Excessive 1500
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

TRANSPARENCY (LIGHT PENETRATION)	**5**

TRANSPARENCY: Solar radiation is the major source of light energy in an aquatic system, governing the primary productivity. Transparency is a characteristic of water that varies with the combined effect of colour and turbidity. It measures the light penetrating through the water body and is determined using Secchi disc.

Procedure

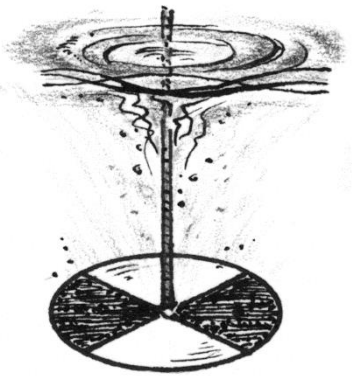
Transparency is measured by gradually lowering the Secchi disc at respective sampling points. The depth at which it disappears in the water (X_1) and reappears (X_2) is noted.

The transparency of the water body is computed as follows:

Transparency (Secchi Disc Transparency) = $(X_1 + X_2)/2$

Where, X_1 = Depth at which Secchi disc disappears

X_2 = Depth at which Secchi disc reappears



secchi disk

Apparatus: Secchi disc, a metallic disc of 20cm diameter with four quadrats of alternate black and white on the upper surface. The disc with centrally placed weight at the lower surface, is suspended with a graduated cord at the center.

Do's and Dont's:

- Clean the secchi disc before and after usage.
- Handle the secchi disc with care.
- Note down the readings of each sample.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible Excessive
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

TURBIDITY	**6**

TURBIDITY: Turbidity is an expression of optical property; wherein light is scattered by suspended particles present in water (Tyndall effect) and is measured using a nephelometer. Any substance having a particle size more than 10^{-9} will produce turbidity in water. Suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter; plankton and other microscopic organisms cause turbidity in water. Turbidity affects light scattering, absorption properties and appearance in a water body. Increase in the intensity of scattered light results in higher values of turbidity. Turbidity makes the water unfit for domestic purposes, food and beverage industries, and many other industrial purposes. In natural waters, turbidity restricts light penetration for photosynthesis.

Nephelometric measurement is based on comparison of the intensity of scattered light of the sample with the intensity of light scattered by a standard reference suspension (Formazin polymer) under similar conditions.

Procedure: The nephelometer is calibrated using distilled water (Zero NTU) and a standard turbidity suspension of 40 NTU. The thoroughly shaken sample is taken in the nephelometric tube and the value is recorded.

Turbidity (NTU) = (Nephelometer readings) (Dilution factor*)

* If the turbidity of the sample is more than 40 NTU, then the sample is diluted and the dilution factor is accounted in final calculations.

Apparatus: Nephelometer (It detects scattered light at 90^{o} to the incident beam of light. It consists of a light source for illuminating the sample. One or more photoelectric detectors with a display unit indicate the intensity of light scattered at 90^{o} to the path of incident light.), sample cells, lab-glass wares.

Do's and Dont's:

- Collect the sample directly into the sampling cuvet (cell).
- Do not leave the sample cell in the meter so as to avoid scratches.
- Empty the sample at each site and rinse properly.
- Note down the Turbidity readings of each sample.
- Wipe the cell properly with tissue paper and ensure that the outside of the cell is clean and dry before placing the cell in to the meter.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 5 NTU Excessive 25 NTU
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

DISSOLVED OXYGEN (DO)	**7**

DISSOLVED OXYGEN: Oxygen is essential to all forms of aquatic life. DO depend upon the physical, chemical and biochemical activities in the water body. The analysis of DO is a key test in water pollution and waste treatment control. The two main sources of dissolved oxygen are diffusion of oxygen from the air and photosynthetic activity. Low levels of DO frequently indicate a high concentration of decaying organic matter in the water. As bacteria digest organic matter, they use up oxygen, leaving little for the other aquatic creatures. The factors affecting the DO are (1) temperature: as temperature increases, the amount of oxygen (or any gas) dissolved in water decreases. (2) Partial pressure of O_2 in contact with water: at high altitudes, less oxygen is dissolved in water because the partial pressure of oxygen in the atmospheric is low (3) Salinity: the solubility of gases O_2 and CO_2 decreases with increasing salinity.

D.O (mg/L)	Water quality
Above 8.0	Good
6.5-8.0	Slightly polluted
4.5-6.5	Moderately polluted
4.0-4.5	Heavily polluted
Below 4.0	Severely polluted

Winkler's method

Principle: Oxygen present in the sample oxidizes the dispersed divalent manganous hydroxide to the higher valency to precipitate as a brown hydrated oxide after addition of potassium iodide and sodium hydroxide. Upon acidification, manganese reverts to its divalent state and liberates iodine from potassium iodide, equivalent to the original dissolved oxygen content of the sample. The liberated iodine is titrated against N/80 sodium thiosulphate using fresh iodine as an indicator.

Calculation: $N_I V_I = N_2 V_2$ (Molar equivalence formula)

$$\text{Dissolved oxygen, mg/L} = \frac{\text{(ml*N) of sodium thiosulphate} * 8 * 1000}{V_2 [(V_1 - V)/V_1]}$$

Where, V_1 = Volume of sample bottle

V_2 = Volume of contents titrated

V = Volume of $MnSO_4$ and KI added (2ml)

Procedure

The samples are collected in BOD bottles, to which 1ml of manganous sulphate and 1ml of potassium iodide are added and sealed. This is mixed well and the precipitate is allowed to settle down. Then, 1ml of concentrated sulphuric acid is added, and mixed well until all the precipitate dissolves. 25 ml of the sample is measured into the conical flask and titrated against 0.025N sodium thiosulphate using starch as an indicator. The end point is the change of colour from blue to colourless.

Apparatus: BOD bottle-125ml, measuring cylinder, conical flask, 1ml glass pipette etc.

Reagents:

- **Manganous sulphate solution:** Dissolved 100 g of manganous sulphate in 200ml of distilled water and heated to dissolve salt and filtered after cooling.
- **Alkaline potassium iodide solution:** Dissolved 100 g of KOH and 50 g of KI in 200ml of pre-boiled distilled water.
- **Starch indicator:** 1g of starch is dissolved in 100 ml of warm distilled water and added few drops of formaldehyde solution.
- **Stock sodium thiosulphate (0.1 N):** 24.82g of sodium thiosulphate pentahydrate ($Na_2S_20_2. 5H_2O$) is dissolved in distilled water and made up to 1000ml.
- **Standard sodium thiosulphate (0.025N):** 250ml of the stock sodium thiosulphate pentahydrate is made up to 1000ml with distilled water to give 0.025N.

Do's and Dont's

- Label the BOD bottle with waterproof pen before collecting sample.
- Ensure that no air bubble enters the BOD bottle while filling it with water sample.
- Clean and different microtips should be used for each reagent.
- Handle the reagents and acids with extreme care. Wear disposable gloves if possible.
- Don't keep the BOD under direct sunlight while doing experiment as it will interfere with the results.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 3 Excessive 6
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

BIOLOGICAL OXYGEN DEMAND (BOD)	8

BIOLOGICAL OXYGEN DEMAND: BOD is the amount of oxygen required by microorganisms for stabilizing biologically decomposable organic matter (carbonaceous) in water under aerobic conditions. The test is used to determine the pollution load of wastewater, the degree of pollution and the efficiency of wastewater treatment methods. 5-Day BOD test being a bioassay procedure (involving measurement of oxygen consumed by bacteria for degrading the organic matter under aerobic conditions) requires the addition of nutrients and maintaining the standard conditions of pH and temperature and absence of microbial growth inhibiting substances.

The method consists of filling the samples in airtight bottles of specified size and incubating them at specified temperature (20 ^{o}C) for 5 days. The difference in the dissolved oxygen measured initially and after incubation gives the BOD of the sample.

Calculation:

$$BOD, mg/L = (D_0 - D_5) \times \text{Dilution factor}$$

Where,

D_0 = Initial DO in the sample

D_5 = DO of the sample after 5 days

Procedure

The sample having a pH of 7 is determined for first day DO. Various dilutions (at least 3) are prepared to obtain about 50% depletion of D.O. using sample and dilution water. The samples are incubated at 20 ^{o}C for 5 days and the 5th day D.O is noted using the Winkler's method. A reagent blank is also prepared in a similar manner.

Apparatus: BOD bottles - 125ml capacity, air incubator - to be controlled at 20 ^{o}C ± 1 ^{o}C, magnetic stirrer.

Reagents:

- **Manganous sulphate solution:** Dissolved 100 g of manganous sulphate in 200ml of distilled water and heated to dissolve salt and filtered after cooling.
- **Alkaline potassium iodide solution:** Dissolved 100 g of KOH and 50 g of KI in 200ml of pre-boiled distilled water.
- **Starch indicator:** 1g of starch is dissolved in 100 ml of warm distilled water.
- **Stock sodium thiosulphate (0.1 N)*:*** 24.82g of sodium thiosulphate pentahydrate ($N_{a2}S_2O_2$. $5H_2O$) is dissolved in distilled water and made up to 1000ml.
- **Standard sodium thiosulphate (0.025N):** 250ml of the stock sodium thiosulphate pentahydrate is made up to 1000ml with distilled water to give 0.025N.
- **Formaldehyde:** preservative for freshly prepared starch solution

Do's and Dont's

- Rinse the BOD bottles properly with distilled water before initiating the experiment.
- Label the BOD bottle with waterproof labels/pen before collecting sample.
- Ensure that no air bubble enters the BOD bottle while filling it with water sample.
- Handle the reagents and acids with extreme care. Wear disposable gloves if possible.
- Don't keep the BOD bottles under direct sunlight while doing experiment as it will interfere with the results.

*Alkaline KI – potential skin irritant

*Conc. H_2SO_4 – corrosive acid

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 10 Excessive 30
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

CHEMICAL OXYGEN DEMAND (COD)	**9**

CHEMICAL OXYGEN DEMAND: COD is the measure of oxygen equivalent to the organic content of the sample that is susceptible to oxidation by a strong chemical oxidant. The intrinsic limitation of the test lies in its ability to differentiate between the biologically oxidisable and inert material. It is measured by the open reflux method.

The organic matter in the sample gets oxidized completely by strong oxidizing agents such as potassium dichromate in the presence of conc. sulphuric acid to produce carbon-dioxide and water. The excess potassium dichromate remaining after the reaction is titrated with Ferrous Ammonium Sulphate (FAS) using ferroin indicator to determine the COD. The dichromate consumed gives the oxygen required for the oxidation of the organic matter.

Procedure

15ml of conc. sulphuric acid with 0.3g of mercuric sulphate and a pinch of silver sulphate along with 5ml of 0.025M potassium dichromate is taken into a Nessler's tube. 10ml of sample (thoroughly shaken) is pipetted out into this mixture and kept for about 90 minutes on the hot plate for digestion. 40ml of distilled water is added to the cooled mixture (to make up to 50ml) and titrated against 0.25M FAS using ferroin indicator, till the colour turns from blue green to wine red indicating the end point. A reagent blank is also carried out using 10ml of distilled water.

Calculation:

$$\text{COD, mg/L} = \frac{\text{(b-a) x N of FAS x 1000 x 8}}{\text{ml of sample}}$$

Where,

a = ml of titrant with sample.

b = ml of titrant with blank.

Apparatus: Reflux apparatus, Nessler's tube, Erlenmeyer flasks, hot plate and lab glassware.

Reagents:

- **Standard potassium dichromate solution (0.250M):** 12.25g of potassium dichromate dried at 103 ^{o}C for about 2 hours is dissolved in distilled water and made up to 1000ml.
- **Standard ferrous ammonium sulphate (FAS) 0.25N:** 98g of FAS is dissolved in minimum distilled water to which 20ml of conc. sulphuric acid is added and made up to 1000ml using distilled water to give 0.25N of ferrous ammonium sulphate.
- **Ferroin indicator:** 1.485g of 1,10-Phenanthroline monohydrate and 695mg of ferrous sulphate is dissolved in 100ml of distilled water.
- **Conc. sulphuric acid**
- **Silver sulphate crystal**
- **Mercuric sulphate crystals**

Do's and Dont's

- Label the cleaned Erlenmeyer flasks properly.
  .
- Handle the reagents and acids with extreme care.
- It is safe to wear gloves.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 30 Excessive 100
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

FREE CARBON-DIOXIDE	**10**

FREE CARBON-DIOXIDE: The important source of free carbon-dioxide in surface water bodies is mainly respiration and decomposition by aquatic organisms. It reacts with water partly to form calcium bicarbonate and in the absence of bicarbonates gets converted to carbonates releasing carbon-dioxide.

Procedure

A known volume (25ml) of the sample was measured into a conical flask. 2-3 drops of phenolphthalein indicator was added and titrated against 0.22N sodium hydroxide till the pink colour persisted indicating the end point.

If the pink colour appears on adding phenolphthalein it indicates the absence of free carbon-dioxide.

Apparatus: Lab glassware - measuring cylinder, pipette, conical flask, etc.

Reagents:

- **Sodium hydroxide solution (0.22N):** 1g of sodium hydroxide was dissolved in 100ml of distilled water and made up to 1000ml to give 0.22N.
- **Phenolpthalein indicator:** Dissolve 0.5 g of phenolphthalein in 50 ml of 95% ethanol and add 50 ml of distilled water. Add 0.05 N CO_2 free NaOH solution dropwise, until the solution turns faintly pink.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Handle the reagents and acids with extreme care.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible Excessive
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

ALKALINITY	**11**

ALKALINITY: In natural water, that are not highly polluted alkalinity is more commonly found than acidity. Alkalinity is the good indicator of presence of dissolved inorganic carbon (bicarbonates and carbonate anions). Some of the minor contributions to alkalinity come from ammonia, phosphates, borates, silicates and other basic substances.

Alkalinity is beneficial to aquatic animals and plants, because it buffers both the natural and human induced pH changes. Water with high alkalinity generally have a high concentration of dissolved inorganic carbon (in the form of HCO_3^- and CO_3^{2-}), which can be converted to biomass by photosynthesis.

Titrating a basic water sample with acid to pH 8.3 measures phenolphthalein alkalinity. Phenolphthalein alkalinity primarily measures the amount of carbonate ion (CO_3^{2-}) present in the sample. Titrating with acid to pH 3.7 measures methyl orange alkalinity or total alkalinity. Total alkalinity measures the neutralizing effects of all the bases present.

Calculate total phenolphthalein and methyl orange alkalinity as follows and express in mg/L as $CaCO_3$,

$$\text{P Alkalinity m mg/L as } CaCO_3 = \frac{A*1000}{\text{ml sample}}$$

$$\text{T Alkalinity m mg/L as } CaCO_3 = \frac{B*1000}{\text{ml sample}}$$

Where,

A= ml of H_2SO_4 required to raise pH up to 8.3

B= ml of H_2SO_4 required to raise pH up to 4.5

Procedure

Measure a suitable volume of sample in 250 ml conical flask. Add 2-3 drops of phenolphthalein indicator. If the pink colour develops titrate against 0.02 N H_2SO_4, till the colour disappears, which is the characteristic of pH 8.3.Note down the volume of H_2SO_4 consumed. Add 2-3 drops of methyl orange and continue titration with H_2SO_4 till

the yellow colour changes to orange, which is the characteristic of pH 4.5. Note down the additional amount of H_2SO_4 required. In case pink colour does not appear after addition of phenolphthalein, continue with addition of methyl orange.

Apparatus: Lab glassware - measuring cylinder, pipette, conical flask, etc.

Reagents

1. **Standard sulphuric acid (0.02N):** Dilute 200 ml of 0.1N H_2SO_4 with distilled water to 1000ml to obtain standard 0.02N H_2SO_4.
2. **Phenolphthalein indicator:** Dissolve 0.5g phenolphthalein in 1:1 of 95 % ethanol and distilled water. Add 0.05 N CO_2 free NaOH solution drop wise until faint pink colour appears.
3. **Methyl orange indicator:** Dissolve 0.5 g of methyl orange in 1000ml CO_2 free distilled water.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Handle the reagents and acids with extreme care.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible Excessive 500
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

TOTAL HARDNESS	12

TOTAL HARDNESS: Water hardness is the traditional measure of the capacity of water to react with soap, hard water requiring a considerable amount of soap to lather.Hardness is predominantly caused by divalent cations such as calcium, magnesium and alkaline earth metals such as iron, manganese, strontium, etc. The total hardness is defined as the sum of calcium and magnesium concentrations, both expressed as $CaCO_3$ in mg/L. Carbonates and bicarbonates of calcium and magnesium cause temporary hardness. Sulphates and chlorides cause permanent hardness.

In alkaline conditions EDTA (Ethylene-diamine tetra acetic acid) and its sodium salts react with cations forming a soluble chelated complex when added to a solution. If a small amount of dye such as Eriochrome black-T is added to aqueous solution containing calcium and magnesium ions at alkaline pH of 10.0 ± 0.1, it forms wine red colour. When EDTA is added as a titrant, all the calcium and magnesium ions in the solution get complexed resulting in a sharp colour change from wine red to blue, marking the end point of the titration. Hardness of water prevents lather formation with soap rendering the water unsuitable for bathing and washing. It forms scales in boilers, making it unsuitable for industrial usage. At higher pH >12, Mg^{++} ion precipitates with only Ca^{++} in solution. At this pH, murexide indicator forms a pink color with Ca^{++} ion. When EDTA is added Ca^{++} gets complexed resulting in a change from pink to purple indicating end point of the reaction.

METAL + INDICATOR ⟶ METAL-INDICATOR COMPLEX (WINE RED COLOUR)

METAL-INDICATOR COMPLEX + EDTA ⟶ METAL-EDTA COMPLEX + INDICATOR (BLUE COLOUR)

Calculation:

$$\text{Total hardness (mg/L)} = (T)\,(1000) / V$$

Where, T = Volume of titrant

V = Volume of sample

Hardness Chart *(for drinking water)*:

Soft	0 – 60 mg/L
Medium	60 –120 mg/L
Hard	120 - 180 mg/L
Very Hard	> 180 mg/L

Procedure

The complete titration should be completed within 5 minutes after addition of the buffer. Take 25 ml of the sample (dilute it with distilled water if required) and add 1-2 ml of the buffer solution and 1-2 g of EBT indicator. Then titrate against the EDTA, with continuous stirring; until the last reddish tinge disappears. At the end point the solution gives blue colour.

Apparatus: Lab glassware-burette, pipette, conical flask, beakers etc.

Reagents:

1. **Buffer solution**: (a) 16.9 g of ammonium chloride was dissolved in 143ml of concentrated ammonium hydroxide. (b) Dissolve 1.179 g of disodium EDTA and 0.780 g of $MgSO_4$. $7H_2O$ in 50 ml distilled water. Mix both (a) and (b) and dilute to 250ml with distilled water
2. **Standard EDTA indicator:** (0. 01 M) Weigh 3.723 g of EDTA and dissolve in 1000 ml of distilled water and standardize against standard calcium solution.
3. **EBT Indicator:** Mix 0.40 g of Eriochrome Black T with 100 g NaCl (AR) and grind.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 150 Excessive 500
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

CALCIUM HARDNESS	13

CALCIUM HARDNESS: The presence of calcium (fifth most abundant) in water results from passage through or over deposits of limestone, dolomite, gypsum and such other calcium bearing rocks. Calcium is present in all waters as Ca^{2+} and is readily dissolved from rocks rich in calcium minerals, particularly as carbonates and sulphates. Calcium carbonate solubility is controlled by pH and dissolved CO_2. The salts of calcium, together with those of magnesium are responsible for hardness of water. Calcium is an important element for all organisms and is incorporated in to the shells of many aquatic invertebrates, as well as the bones of vertebrates. Calcium concentrations in natural waters are typically <15 mg/l. For water associated with carbonate rich rocks, concentrations may reach 30-100 mg/l. Salt waters have concentrations of several hundred milligrams per litre or more.

When EDTA (Ethylene-diamine tetra acetic acid) is added to the water containing calcium and magnesium, it combines first with calcium. Calcium can be determined directly with EDTA when pH is made sufficiently high such that the magnesium is largely precipitated as hydroxyl compound (by adding NaOH and iso-propyl alcohol). When murexide indicator is added to the solution containing calcium, all the calcium gets complexed by the EDTA at pH 12-13. The end point is indicated from a colour change from pink to purple.

Calculation

$$\text{Calcium hardness as } CaCO_3 = \frac{A*B*1000}{\text{ml of sample taken}} * \text{Dilution factor (If diluted)}$$

Where, A = ml titrant for sample and B = mg Caco3 equivalent to 1.0 ml EDTA titrant.

Procedure

A known volume (25ml) of the sample is pipetted into a clean conical flask, to which 1ml of sodium hydroxide is added. A pinch of murexide indicator is added to this mixture and titrated against EDTA until the pink color turns purple.

Apparatus: Burettes, pipette, conical flask, beakers and droppers

Reagents:

1. **Sodium hydroxide (8%):** 8g of sodium hydroxide is dissolved in 100ml of distilled water.
2. **Murexide indicator (ammonium purpurate):** 0.2 g of murexide is ground well with 100g of sodium chloride.
3. **Standard EDTA titrant, 0.01M:** 3.723 g of EDTA (disodium salt) is dissolved in distilled water and made up to 100ml with the same.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results

Date	S1	S2	S3		Limits (Inland)
					Permissible 75 Excessive 200 *Calcium (as Ca) mg/l
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

MAGNESIUM HARDNESS	**14**

MAGNESIUM HARDNESS: Magnesium is a relatively abundant element in the earth's crust, ranking eighth in abundance among the elements. It is found in all natural waters and its source lies in rocks, generally present in lower concentration than calcium. It is also an important element contributing to hardness and a necessary constituent of chlorophyll. Its concentration greater than 125 mg/L can influence cathartic and diuretic actions.

Magnesium hardness can be calculated from the determined total hardness and calcium hardness.

Magnesium = (T - C) x 0.243 (as mg/L)

where, T = Total hardness mg\L (as $CaCO_3$)

C = Calcium hardness mg\L (as $CaCO_3$)

High concentration of magnesium proves to be diuretic and laxative, and reduces the utility of water for domestic use while a concentration above 500 mg/L imparts an unpleasant taste to water and renders it unfit for drinking. Chemical softening, reverse osmosis and electro dialysis or ion exchange reduces the magnesium hardness to acceptable levels.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 50 Excessive 150 *Magnesium (as Mg) mg/l
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra				

	T. V. and Ahalya N. (2001)

CHLORIDES	**15**

CHLORIDES: Chloride (Cl^-) enters surface waters by the atmospheric deposition of oceanic aerosols with the weathering of some sedimentary rocks (mostly rock salt deposits), industrial effluents and agricultural run-off. High concentrations of chloride can make waters unpalatable and therefore unfit for drinking or livestock watering. Chloride is an abundant anion found in the wastewaters and is a good indicator of pollution sources. Chloride gives water a salty taste detectable at a level of 250 ppm with sodium as cation, but with Ca and Mg cations, the salty taste is not detectable until the chloride concentration reaches up to 1000 ppm. High chloride content has a deleterious effect on metallic pipes and structures, as well as agricultural plants. They are calculated by Argentometric method.

In alkaline or neutral solution, potassium chromate indicates the endpoint of the silver nitrate titration of chlorides. Silver chloride is quantitatively precipitated before the red silver chromate is formed.

$$Ag^+ + Cl^- \longrightarrow AgCl \text{ (White precipitate)}$$

$$2Ag^+ + CrO^{-4} \longrightarrow Ag_2CrO_4 \text{ (Red precipitate)}$$

Calculation

$$\text{Chlorides mg/L} = \frac{(A-B)*N*35.45*1000}{\text{ml sample}}$$

Where, A = ml $AgNO_3$ required for sample.

B = ml $AgNO_3$ required for blank.

Procedure

A known volume of filtered sample (50ml) is taken in a conical flask, to which about 0.5ml of potassium chromate indicator is added and titrated against standard silver nitrate till silver chromate (Ag_2CrO_4) starts precipitating.

Apparatus: Lab glassware, pipette.

Reagents:

1. **Potassium chromate indicator solution:** 50g of potassium chromate is dissolved in minimum amount of distilled water and silver nitrate is added drop wise till a red precipitate is formed. The mixture is allowed to stand for about 12 hours and diluted to 1000ml with distilled water.
2. **Silver nitrate solution (0.014N):** 2.395g of silver nitrate is dissolved in distilled water and made up to 1000ml.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 250 Excessive 600
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

POTASSIUM	**16**

POTASSIUM: Potassium ranks seventh among the elements in order of abundance, behaves similar to sodium and remains low. Though found in small quantities (<20mg/L), it plays a vital role in the metabolism of fresh water environment.

Trace amounts of potassium can be determined by direct reading of flame photometer at a specific wavelength of 766.5nm by spraying the sample into the flame. The desired spectral lines are then isolated by the use of interference filters or suitable slit arrangements. The intensity of light is measured by the phototube.

Working principle of Flame photometer: The emission of characteristic radiations by alkali and alkaline earth metals and the correlation of the emission intensity with the concentration of the element form the basis of flame photometry. The principle of the flame photometer depends on the "Emission Spectroscopy" in which the electrons of the metals after absorbing energy get excited from ground state to higher energy level and return back to the ground state with emission of light. The sample under test is introduced into flame in solution by means of atomizer. The radiation from the flame enters a dispersing device and isolates it (radiation) from the flame to the desired region of the spectrum. The photo tube measures the intensity of isolated radiation, which is proportional to the concentration of the element present in the sample.

Calculation:

Potassium (K) or Sodium (Na), mg/L

= (mg/L of K/Na in diluted aliquot) x dilution factor

Procedure

The filter of the flame photometer is set at 766.5nm (marked for Potassium, K) and the flame is adjusted for blue colour. The scale is set to zero and maximum using the highest standard value. A standard curve of different concentration is prepared by feeding the standard solutions. The sample is filtered through the filter paper and fed into the flame photometer. The concentration is found from the standard curve or as direct reading.

Apparatus: Flame photometer, lab glassware and Whattman filter paper.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible Excessive
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

SODIUM	**17**

SODIUM: Sodium is one of the most abundant elements and is a common constituent of natural waters. The sodium concentration of water is of concern primarily when considering their solubility for agricultural uses or boiler feed water. The concentration ranges from very low in the surface waters and relatively high in deep ground waters and highest in the marine waters. It is calculated by flame photometric method.

Procedure

The filter of the flame photometer is set to 589nm (marked for Sodium, Na). By feeding distilled water the scale is set to zero and maximum using the standard of highest value. A standard curve between concentration and emission is prepared by feeding the standard solutions. The sample is filtered through filter paper and fed into the flame photometer and the concentration is found from graph or by direct readings.

Apparatus: Flame photometer, lab glassware and Whattman filter paper.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids and gas of flame photometer with extreme care.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible Excessive
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

NITRATES	18

NITRATES: Nitrate ion (NO_3^-) is the common form of combined nitrogen found in natural waters. It may be bio chemically reduced to nitrite (NO_2^-) by denitrification processes, usually under anaerobic conditions. The nitrite ion is rapidly oxidized to nitrate. Natural sources of nitrate to surface water include igneous rocks, domestic sewage, land drainage and plant growth and decay. The natural concentration of nitrate is 0.1mg/L; it may be enhanced by sewage, industrial effluents and nitrate fertilizers.

Ammonia and other nitrogenous material in natural waters tend to be oxidized by aerobic bacteria first to nitrite and then nitrates. So all organic compounds containing nitrogen are potential source of nitrates. It is first oxygenated to nitrite (NO_2^-) and is rapidly oxidized to nitrate (NO_3^-) so normally the amount of nitrite is very low. High concentrations (>1-2 mg/L) of nitrate or nitrite in surface or ground water generally indicate agricultural contamination from fertilizers and manure.

NITRIFICATION

$$\text{Ammonia} \xleftrightarrow[\text{ADB}]{(O)} \text{Nitrite} \xleftrightarrow[\text{FAB}]{(R)} \text{Nitrates}$$

ADB = Aerobic Denitrifying Bacteria. Ex: Nitrosomes

FAB = Facultative Anaerobic Denitrifying Bacteria. Eg: Pseudomonas

Estimation of nitrates by electrode screening method

The NO_3^- ions electrode is a selective sensor that develops a potential across a thin, porous, inert membrane that holds in a place a water-immiscible liquid ion exchanger. The electrode responds only to NO_3^- ion activity between about 10^{-5} and 10^{-1} M (0.14 to 1400 mg NO_3^- -N/L). The lower limit of detection is determined by the small but finite solubility of the liquid ion exchanger.

Procedure

A known volume (50ml) of the sample is pipetted into a porcelain dish and evaporated to dryness on a hot water bath. 2ml of phenol disulphonic acid is added to dissolve the residue by constant stirring with a glass rod. Concentrated solution of sodium hydroxide or conc. ammonium hydroxide and distilled water is added with stirring to make it alkaline. This is filtered into a Nessler's tube and made up to 50ml with distilled water. The absorbance is read at 410nm using a spectrophotometer after the development of colour. The standard graph is plotted by taking concentration along X-axis and the spectrophotometric readings (absorbance) along Y-axis. The value of nitrate is found by comparing absorbance of sample with the standard curve and expressed in mg/L.

Apparatus: Porcelain dishes, pipettes, standard flasks, beakers, spectrophotometer, cuvettes, measuring jar and hot water bath.

Reagents:

 Phenol disulphonic acid: 25 g of phenol is dissolved in 150 ml of concentrated sulphuric acid, to which 85ml of sulphuric acid is further added and heated for about 90 min on a water bath and stored in dark bottles upon cooling.

 Sodium hydroxide: About 50g of sodium hydroxide is dissolved in 150-200 ml of water and cooled.

 Conc. Ammonium hydroxide (Liquid ammonia)

Nitrate solution:

- **Stock nitrate solution:** 721.8 mg (0.722g) of AR potassium nitrate is dissolved in distilled water and made up to 100ml for stock solution.
- **Standard nitrate solution:** Standard nitrate solution is prepared by evaporating 50ml of the stock solution to dryness in the water bath. The obtained residue is dissolved in 2ml of phenol disulfonic acid and diluted to 500ml, to give 1ml = 10

μg. The solution of various strengths ranging from 0.0 (blank) to 1.0 mg/L at the intervals of 0.2 mg/L is prepared by diluting stock solution with distilled water.

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results

Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 45 Excessive
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

PHOSPHATES

PHOSPHATES: Phosphates are an essential nutrient for living organisms and exist in water bodies on both for wastewater phosphorous occurs as orthophosphates, polyphosphates and organically bound phosphates.

Orthophosphates applied to agricultural land as a fertilizer, finds its way to the surface water by runoff. phosphates, such as weathering of rock and decomposition of organic matter.

Estimation of phosphorous by stannous chloride Method

In the acidic condition, orthophosphates reacts with ammonium molybdate to form molybdophosphoric a the concentration of phosphates present in the sample.

$$PO_4+12(NH_4)_2MoO_4+24H^+ \longrightarrow (NH_4)PO_4.12MoO_3+21NH_4^++12H_2O$$

$$(NH_4)_3PO_4.12\ MoO_3+Sn^{2+} \longrightarrow \text{Molybdenum blue} +Sn^{4+}$$

Calculation

Mg/L of phosphates = Test absorbance * Slope * Dilution factor

$$\text{Where, Slope} = \frac{\text{Sum of concentration of Standards}}{\text{Sum of absorbance of Standards}}$$

$$\text{Dilution ratio (D)} = \frac{\text{ml sample + ml distilled water}}{\text{ml sample}}$$

Procedure

Take the appropriate aliquot of sample (as per the expected concentration of phosphates) in the Nessler tube. A

light path at 690 nm.

Apparatus: Spectrophotometer, lab glassware, hot plate and Nessler's tube.

Reagents

1) Standard phosphate solution: Dissolve 219.5 mg of anhydrous KH_2PO_4 in 1000ml of water (1 ml = 0.5 m
2) Ammonium molybdate solution:
    a) Dissolve 25 g ammonium molybdate in 175 ml distilled water.
    b) Add cautiously 280 ml concentrated sulphuric acid to 400ml water and cool.

    Mix two solutions (a) and (b) and make up to 1000ml.
3) Stannous Chloride: Dissolve 2.5 g $SnCl_2$. 2 H_2O in the 100ml glycerol. Heat in water bath to ensure comp

Do's and Dont's

- Ensure that the Erlenmeyer flasks to be used are washed properly and labeled.
- Don't keep the reagent bottle open.
- Handle the reagents and acids with extreme care.

Results					
Date	**S1**	**S2**	**S3**		**Limits (Inland)**
					Permissible 2 Excessive 5
Inference					
References	APHA (1998); Trivedi R. K. and Goel P. K. (1986); Ramachandra T. V. and Ahalya N. (2001)				

Table: Surface Water Quality Standards (as per IS: 2296).

Class A – Drinking water without conventional treatment but after disinfection. Class B –Water for outdoor bathing. Class C – Drinking water with conventional treatment followed by disinfection. Class D – Water for fish culture and wild life propagation. Class E – Water for irrigation, industrial cooling and controlled waste disposal. (Unobj = Unobjectionable).

Sl	Parameter and Unit	A	B	C	D	E
1	Taste	None	--	--	--	--
2	Odour	Unobj	--	--	--	--
3	Colour (True) (Hazen unit)	10	300	300	--	--
4	pH (max) (min : 6.5)	8.5	8.5	8.5	8.5	8.5
5	Conductivity (25oC) uS/cm	--	--	--	1000	2250
6	DO (mg/L) (minimum)	6	5	4	4	--
7	BOD (3d, 27oC) (mg/L)	2	3	3	--	--
8	Total Coliforms (MPN/100 mL)	50	500	5000	--	--
9	TDS (mg/L)	500	--	1500	--	2100
10	Oil and Grease (mg/L)	--	--	0.1	0.1	--
11	Mineral oil (mg/L)	0.01	--	--	--	--
12	Total Hardness (mg/L as CaCO3)	300	--	--	--	--
13	Chlorides (mg/L as Cl)	250	--	600	--	600
14	Sulfates (mg/L as SO4)	400	--	400	--	1000
15	Nitrates (mg/L as NO3)	20	--	50	--	--
16	Free CO2 (mg/L)	--	--	--	6	--
17	Free NH3 (mg/L as N)	--	--	--	1.2	--
18	Fluorides (mg/L as F)	1.5	1.5	1.5	--	--
19	Calcium (mg/L)	80.10	--	--	--	--
20	Magnesium (mg/L)	24.28	--	--	--	--
21	Copper (mg/L)	1.5	--	1.5	--	--
22	Iron (mg/L)	0.3	--	50	--	--
23	Manganese (mg/L)	0.5	--	--	--	--

24	Zinc (mg/L)	15	--	15	--	--
25	Boron (mg/L as B)	--	--	--	--	2
26	Barium (mg/L)	1	--	--	--	--
27	Silver (mg/L)	0.05	--	--	--	--
28	Arsenic Total (mg/L)	0.05	0.2	0.2	--	--
29	Mercury (mg/L)	0.001	--	--	--	--
30	Lead (mg/L)	0.1	--	0.1	--	--
31	Cadmium (mg/L)	0.01	--	0.01	--	--
32	Chromium (VI) (mg/L)	0.05	0.05	0.05	--	--
33	Selenium (mg/L)	0.01	--	0.05	--	--
34	Cyanide (mg/L as CN)	0.05	0.05	0.05	--	--
35	Phenols (mg/L)	0.002	0.005	0.005	--	--
36	Anionic detergents (mg/L as MBAS)	0.2	1	1	--	--
37	PAH (mg/L)	0.2	--	--	--	--
38	Pesticides (ug/L)	0	--	--	--	--
39	Insecticides (ug/L)	--	--	0	--	--
40	Alpha emitters (10^{-6}uC/mL)	0.001	0.001	0.001	0.001	0.001
41	Beta emitters (10^{-6}uC/mL)	0.01	0.01	0.01	0.01	0.01
42	Percent Sodium (%)	--	--	--	--	60
43	Sodium Absorption Ratio	--	--	--	--	26

BIOLOGICAL PARAMETERS

PLANKTON ANALYSIS: The physical and chemical characteristics of water affect the abundance, species composition, stability and productivity of the indigenous populations of aquatic organisms. The biological methods used for assessing water quality includes collection, counting and identification of aquatic organisms; biomass measurements; measurements of metabolic activity rates; toxicity tests; bioaccumulation; biomagnifications of pollutants; and processing and interpretation of biological data. The work involving plankton analysis would help in:

1. Explaining the cause of colour and turbidity and the presence of objectionable odour, tastes and visible particles in waters.
2. The interpretation of chemical analyses.
3. Identifying the nature, extent and biological effects of pollution.
4. Providing data on the status of an aquatic system on a regular basis.

Plankton: A microscopic community of plants (phytoplankton) and animals (zooplankton), found usually free floating, swimming with little or no resistance to water currents, suspended in water, non-motile or insufficiently motile to overcome transport by currents, are called "Plankton".

Phytoplankton (microscopic algae) usually occurs as unicellular, colonial or filamentous forms and is mostly photosynthetic and is grazed upon by the zooplankton (microscopic protozoans, rotifers, cladocerans and copepods) and other organisms occurring in the same environment.

The structure of photosynthetic populations in the aquatic ecosystems is dynamic and constantly changing in species composition and biomass distribution. An understanding of the community structure is dependent on the ability to understand the temporal distribution of the different species. Changes in species composition and biomass may affect photosynthetic rates, assimilation efficiencies, rates of nutrient utilization, grazing, etc.

Plankton, particularly phytoplankton, has long been used as indicators of water quality. Because of their short life spans, planktons respond quickly to environmental changes. They flourish

both in highly eutrophic waters while a few others are very sensitive to organic and/or chemical wastes. Some species have also been associated with noxious blooms causing toxic conditions apart from the tastes and odour problems.

Plankton net: The plankton net is a field-equipment used to trap plankton. It has a polyethylene filter of a defined mesh size and a graduated measuring jar attached to the other end. A handle holds the net. The mesh size of the net determines the size range of the plankton trapped. The mesh number 30 of size 60 mm was used for collecting samples.

Sampling Procedure: The manner in which sampling is done should conform to the objectives of the study. The "surface samples" (samples collected from the surface) are collected as close to the water surface as possible, mostly towards the center of the lake at regular monthly intervals. A known volume of the sample, 5L to 50 L is filtered and planktons are filtered and preserved for further analysis.

Labels: The sample label has the date, time of sampling, study area-lake name and the volume measured and pasted on the containers of 50 ml capacity.

Preservation: The samples are collected into 100 ml polyethylene vials and are preserved by adding suitable amounts of 1ml chloroform to act as the narcotizing agent and 2 ml of 2% formalin for preservation and analyses.

Concentration technique: The plankton nets are used to collect samples for the qualitative and quantitative estimation of the plankton, by filtering a known volume of water (5-50 liters) through the net depending on the plankton density of the tanks.

Qualitative and quantitative evaluation of plankton: Detailed analyses of phytoplankton populations are done by estimating the numbers in each species. The phytoplankton consisting of individual cells, filaments and colonies are counted as individual cells. When colonies of species are counted, the average number of cells per colony is counted, and in filamentous algae, the average length of the filament has to be determined.

Sedimentation and enumeration by microscope: Preserved samples in bottles are mixed uniformly by gentle inversion and then exactly 1ml of the sample is pipetted out into the S-C cell for analysis.

Microscope

Compound microscope: A monocular compound microscope is used in the counting of plankton with different eyepieces such as 4X, 10X and 40X. The microscope is calibrated using plankton-counting squares.

Counting

Counting cell- Sedgwick-Rafter (S-R) cell: The Sedgwick-Rafter cell is a devise used for plankton counting and is about 50mm long by 20mm wide and 1mm deep. The cell is covered by a relatively thick cover slip and is calibrated to contain exactly 1.0 ml.

Method

Filling the cell: The cover slip is placed diagonally across the S-R cell and filled with the sample carefully without air bubbles with a large bore pipette. The sample is allowed to settle for about 5 minutes before the actual counting begins.

Note: Since the configuration of the S-R cell does not allow the use of high power microscope objectives, the identification of organisms smaller than 10 – 15 mm is difficult or impossible, limiting the usage to only larger forms of relatively dense populations.

Strip counting: A "strip" is the length of the cell that constitutes a volume approximately 50 mm long, 1-mm deep accounting to the volume of $25mm^3$ or 1/40 (2.5%) of the total cell volume. By moving the mechanical stage from left to right, the organisms can be examined in a systematic manner. By knowing the surface area of the portion counted in relation to that of the total, a factor is determined to expand the average counts of the plankton to the total area of the counting surface. This total area represents the number of organisms present per given volume of the sample. This volume expanded to an appropriate factor yields the organisms per litre of water for the lake.

The total number of planktons in the S-R cell is obtained by multiplying actual count in the strip by the number (enumeration factor) representing the portion of the S-R cell counted. The number of the strips counted is a function of the precision desired and the number of units (cells, colonies) for the strips measured. In this study, 500 cells were counted for estimation.

The plankton count in the S-R cell is got from the following,

$$\text{Number/ml} = \frac{C \text{ X } 1000 \text{ mm}}{L \text{ X } D \text{ X } W \text{ X } S}$$

Where

C = Number of organisms counted
L = Length of each strip (S-R cell length) mm
D = Depth of a strip (S-R cell depth) mm
W = Width of a strip in mm
S = Number of strips counted

$V_1 = (50)(1)(W)$

$= \quad mm^3$

The plankton counts per strip are then determined by multiplying the actual count by the factor representing the counted portion of the whole S-R cell volume.

$$\text{Number/ml} = (C)\ (1000\ mm^3) / (L)\ (D)\ (W)\ (S)$$

Where

C = Number of organisms counted.
L = Length of each strip in mm (of S-R cell)
D = Depth of the strip in mm (S-R cell)
W = Width of the strip in mm (Whipple grid image width)
S = Number of strips counted.

Phytoplankton Counting Units: Some plankton are unicellular while others are multicellular (colonial), posing a problem for enumeration. For analysis, a colony of plankton is accounted as a single count. The large forms that cross two or more boundaries of the grid are counted separately at lower magnification and their number included in the total count.

COMMONLY FOUND ALGAL GROUPS IN LAKES

Bacillariophytes: They occur in fresh water, salt water, and terrestrial ecosystems. They are single-celled algae with shells constructed of two overlapping valves composed of pectin and impregnated with silica. Amorphous silica is the form of silicon in diatom cell walls. The diatoms are single-celled or unicellular organisms, but some can form colonies and filaments. They may occur as plankton or periphyton, with most brownish-green films on substrates such as rocks or aquatic plants being composed of attached diatoms. The Bacillariophytes comprises two main types: centric and pennate. Centric diatoms are radially symmetrical and pennate diatoms that are bilaterally symmetrical. Many diatoms have conspicuous oil droplets within the cell, which is the photosynthetic food reserve, chrysolaminarin. The diatoms contain the pigments chlorophyll *a* and *b*, alpha and beta carotene, and several xanthophylls.

Example: *Nitzschia* sp., *Cymbella* sp., *Melosira* sp., *Navicula* sp., *Gomphonema* sp., *Cyclotella* sp., *Pinnularia* sp., *Gyrosigma* sp., etc.

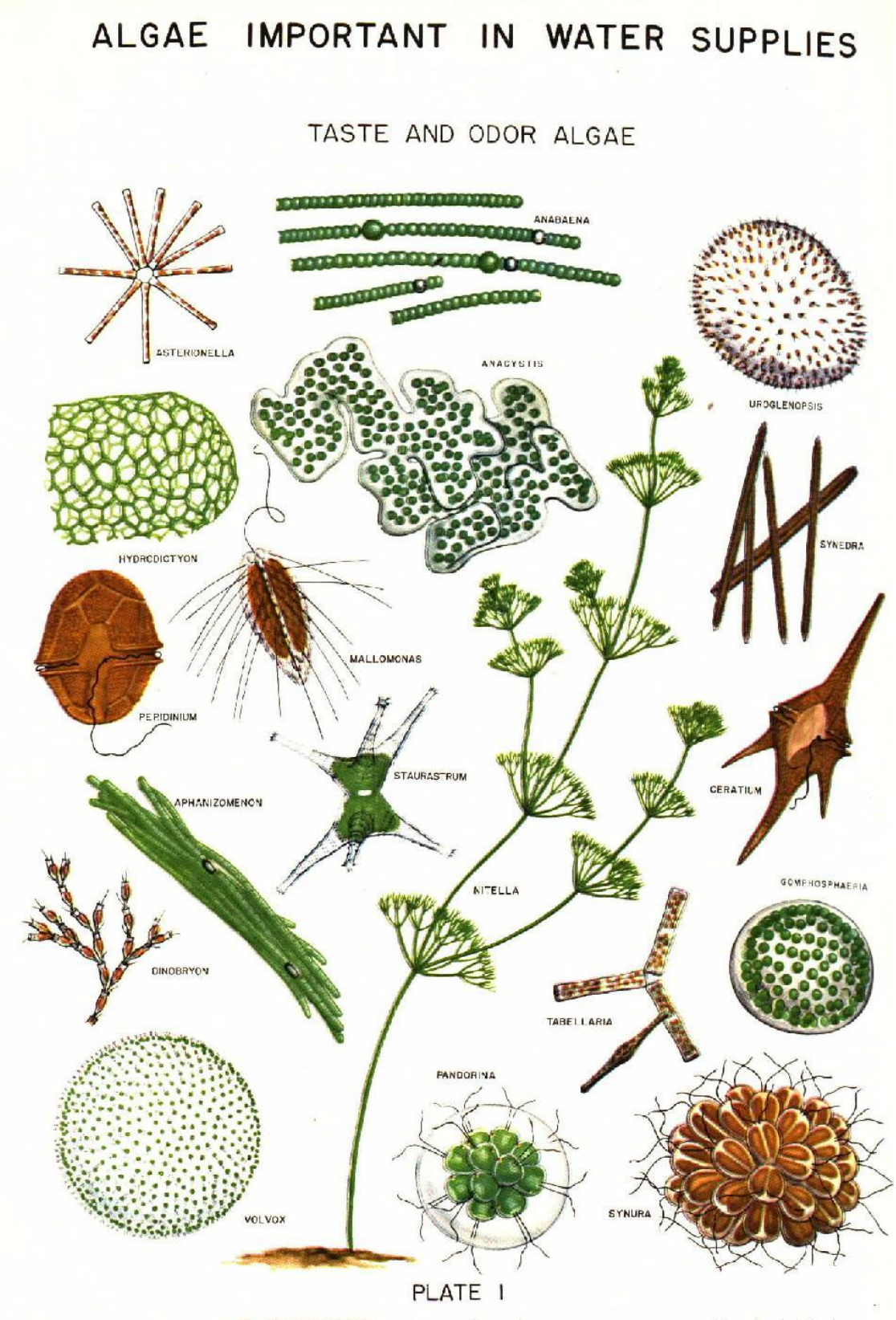
Euglenoids: Typically green and unicellular, euglenoid flagellates occur in most freshwater habitats: puddles, ditches, ponds, streams, lakes, and rivers, particularly waters contaminated by animal pollution or decaying organic matter. Most are photosynthetic, but many, lacking chloroplasts are heterotrophs. Most do not reproduce sexually. Euglenoids lack a cellulose cell wall; instead, they have a proteinaceous pellicle just inside the plasmalemma. Euglenoids are characterized by chlorophylls *a*, *b*, beta carotene, and xanthophylls, one membrane of chloroplast endoplasmic reticulum, a mesokaryotic nucleus, two emergent flagella with fibrillar hairs in one row and paramylon or chrysolaminarin as the storage product in the cytoplasm. They have eyespot (stigma) which is a collection of orange-red lipid droplets. If placed in the dark over the course of several divisions, the chloroplasts of *Euglena gracilis* will become colorless. When returned to the light, the plastid structure is reformed and the green color returns. All euglenoid species with an eyespot and flagellar swelling exhibit phototaxis, usually swimming away from bright light (negative phototaxis) and away from darkness toward subdued light (positive photoaxis) to accumulate in a region of low light intensity.

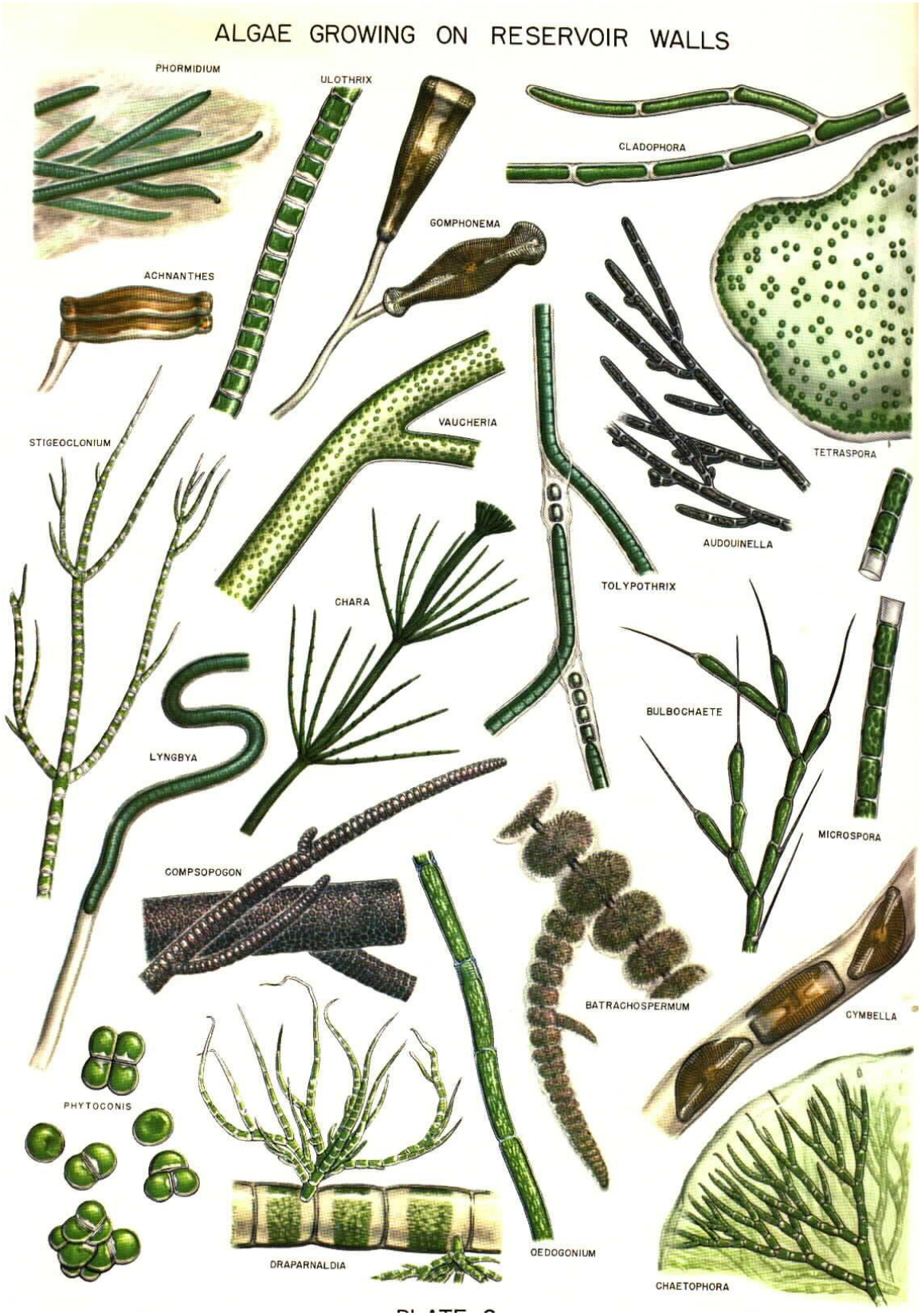
Example: *Euglena* sp., *Phacus* sp., *Trachelomonas* sp., etc.

Blue-Green Algae (Cyanobacteria): The cyanophytes are the only prokaryotic algae and lack membrane bound organelles. Cyanobacteria are aerobic phototrophic organisms that can perform photosynthesis as they possess chlorophyll a and photosystem II. They are ubiquitous in nature and are found in every type of environment including terrestrial, freshwater, and marine habitats. Blue green algae are very common in waters of a great range of salinity and temperature, and they occur in and on the soil and also on rocks and in their fissures. However, the external structure can range from unicellular or colonial to branched or unbranched and filamentous. The cyanobacterial cells possess a number of cell inclusion bodies like include phycobilisomes, carboxysomes, glycogen granules, polyphosphate granules, poly-β –hydroxybutyrate granules, cyanophycin granules and gas vesicles. The cyanophytes possess no flagellated or cilliated cells at any stage of their lifecycle, although, simple movements such as bending and swaying are made possible by internal pressure changes exerted on the cell wall. They are heavily pigmented with chlorophyll *a*, beta carotene, and several xanthophylls. The presence of several phycobiliproteins gives the cyanophyta their unique blue-green coloration. Food is stored in the form of glycogen. Example: *Microcystis* sp., *Merismopedia* sp., *Phormidium* sp., *Anabaena* sp., etc.

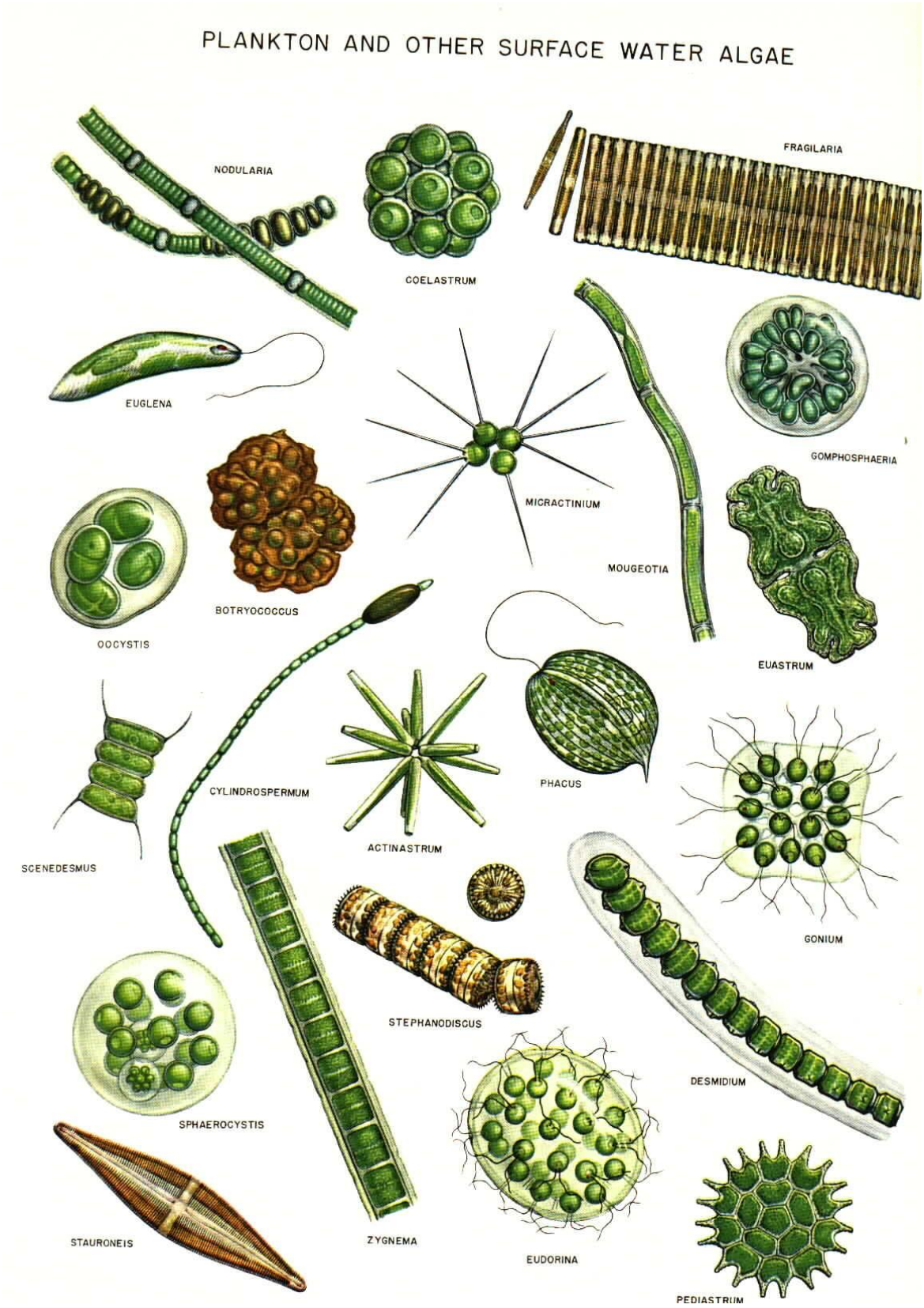
Green Algae (Chlorophytes): Chlorophytes are a diverse group and are common in fresh water, salt water, and soil. The chlorophyta are primarily freshwater; only about 10% of the algae are marine, whereas 90% are freshwater. Green algae have unicellular or multicellular thalli. Some are flagellates, and others produce reproductive cells, the majority of which are biflagellate. Chlorophyte reproduction varies greatly, from asexual division to isogamy and heterogamy to oogamy. Cell walls are constructed of cellulose and pectin. The food storage product is true starch, the same as plants. Green algae possess true chloroplasts, which contain the same pigments found in higher plants: chlorophyll *a* and *b*, alpha and beta carotene, and many xanthophylls.

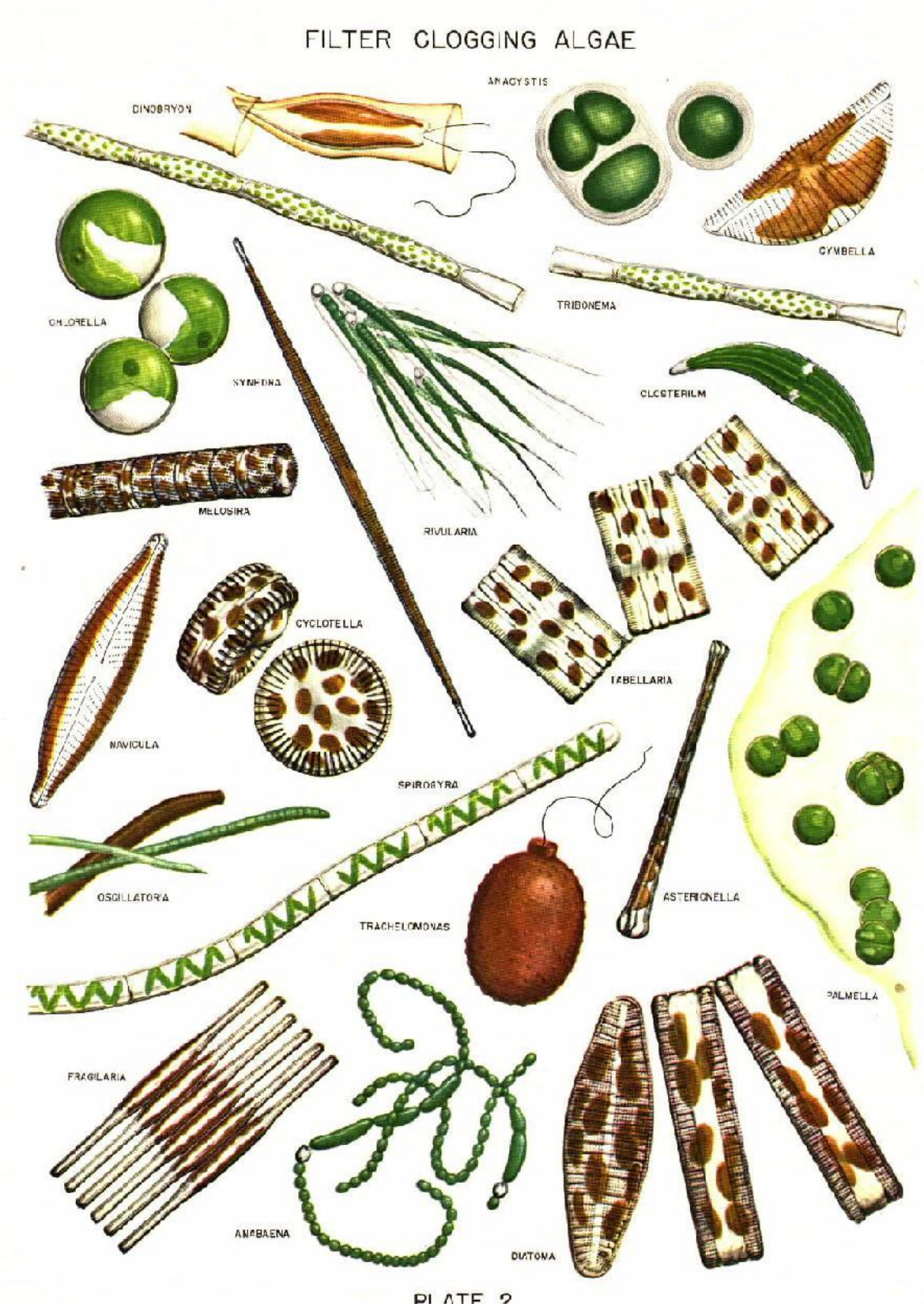
Example: *Chlorella* sp., *Ankistrodesmus* sp., *Chlamydomonas* sp., *Pandorina* sp., *Eudorina* sp., *Chlorogonium* sp., *Actinastrum* sp., *Pediastrum* sp., *Scenedesmus* sp., etc.


ALGAE IMPORTANT IN WATER SUPPLIES
TASTE AND ODOR ALGAE
ASTERIONELLA
ANABAENA
ANACYSTIS
UROGLENOPSIS
HYDRODICTYON
SYNEDRA
MALLOMONAS
PERIDINIUM
STAURASTRUM
APHANIZOMENON
CERATIUM
NITELLA
GOMPHOSPHAERIA
DINOBRYON
TABELLARIA
PANDORINA
VOLVOX
SYNURA
PLATE I


ALGAE GROWING ON RESERVOIR WALLS
PHORMIDIUM
ULOTHRIX
CLADOPHORA
GOMPHONEMA
ACHNANTHES
VAUCHERIA
STIGEOCLONIUM
TETRASPORA
AUDOUINELLA
TOLYPOTHRIX
CHARA
BULBOCHAETE
LYNGBYA
MICROSPORA
COMPSOPOGON
BATRACHOSPERMUM
CYMBELLA
PHYTOCONIS
DRAPARNALDIA
OEDOGONIUM
CHAETOPHORA


POLLUTED WATER ALGAE
PHORMIDIUM
AGMENELLUM
CARTERIA
LEPOCINCLIS
NITZSCHIA
PYROBOTRYS
ANABAENA
EUGLENA
TETRAEDRON
SPIROGYRA
CHLOROCOCCUM
OSCILLATORIA
PHACUS
CHLOROGONIUM
CHLORELLA
GOMPHONEMA
STIGEOCLONIUM
ANACYSTIS
ARTHROSPIRA
CHLAMYDOMONAS
LYNGBYA


PLANKTON AND OTHER SURFACE WATER ALGAE
NODULARIA
COELASTRUM
FRAGILARIA
EUGLENA
GOMPHOSPHAERIA
MICRACTINIUM
MOUGEOTIA
BOTRYOCOCCUS
OOCYSTIS
EUASTRUM
CYLINDROSPERMUM
PHACUS
ACTINASTRUM
SCENEDESMUS
GONIUM
STEPHANODISCUS
DESMIDIUM
SPHAEROCYSTIS
STAURONEIS
ZYGNEMA
EUDORINA
PEDIASTRUM


FILTER CLOGGING ALGAE
ANACYSTIS
DINOBRYON
CYMBELLA
TRIBONEMA
CHLORELLA
SYNEDRA
CLOSTERIUM
MELOSIRA
RIVULARIA
CYCLOTELLA
TABELLARIA
NAVICULA
SPIROGYRA
OSCILLATORIA
TRACHELOMONAS
ASTERIONELLA
PALMELLA
FRAGILARIA
ANABAENA
DIATOMA
PLATE 2

12.0 ECOLOGICAL STUDIES ON MACROPHYTES

Aquatic macrophytes refers to aquatic vascular plants and these plant species normally found growing in wetlands, either in or on the water, or where soils are flooded or saturated long enough for anaerobic conditions to develop in the root zone are called as macrophytes (Cowardin et.al 1979). The aquatic macrophytes occur mainly in the shallow region of lakes ponds, pools, marshes streams and rivers etc. These are grouped into three categories based on their habit as:

1. Submerged macrophytes: Largely or completely submerged plants, the roots may or may not be present (*Ceratophyllum, Hydrilla, vallisneria* etc)
2. Emergent macrophytes: Plants not submerged in water, further subdivided into two (a) erect leaved emergent plants: rooted plants with principle photosynthetic surfaces projecting above the water (*Typha, Scirpus* etc) (b) floating leaved emergent plants: rooted plants with floating leaves (*Nymphaea, Nelumbos* etc)
3. Floating macrophytes: plant floating on the water surface (*Eichhornia, Lemna, Pista* etc)

Macrophytes are of considerable ecological and economic importance. They contribute significantly to the productivity of water bodies; mobilize mineral elements from the bottom sediments and provide shelter to aquatic macroinvertibrates and fishes. They also respond to changes in water quality and have been used as indicators of pollution. When there is enough room for colonization and abundant availability of nutrients, macrophytes show a high growth rate. They assimilate nutrients directly into their tissues. Due to these they were used to solve eutrophic problems of freshwater bodies and to remove pollutants.

- **Sampling:** The sampling of macrophyte depends on type of habit, type of vegetation, variation and distribution of the vegetation and aim of the study. It is essential to first survey the area and decide about the suitable sampling methods. Quadrat method of sampling is followed (50 cmX50cm or 1mX1m for emergent).
- **Vegetation mapping:** This is done 1)to calculate total macrophytic biomass of different species in a water body 2) to understand the distribution pattern of vegetation 3) to monitor the changes caused by a pollutant on these patterns at various times.
- **Treatment of samples:** Immediately after collection wash the plants to remove adhered soil, epiphytes etc. Drain out the excess water after washing. Take the fresh weight of sample. Transport the samples to the lab in polythene bags.
- **Biomass estimation:** After determining fresh weight of the samples, keep the samples in hot air oven at 105°C for 24 hrs for the determination of dry weight. Biomass is usually estimated as dry matter per unit area.

12.0 ECOLOGICAL MONITORING - MACROPHYTES

Aquatic macrophytes is a term given to a vast category of aquatic vascular plants. Plant species normally found growing in wetlands, either in or on the water, or where soils are flooded or saturated long enough for anaerobic conditions to develop in the root zone are called as macrophytes (Cowardin et.al 1979). The aquatic macrophytes occur mainly in the shallow region of lakes ponds, pools, marshes streams and rivers etc. They belong to following 3 categories on the basis of their habit:

i. Submerged macrophytes: Largely or completely submerged plants, the roots may or may not be present (*Ceratophyllum, Hydrilla, vallisneria* etc)
ii. Emergent macrophytes: Plants not submerged in water, further subdivided into two (a) erect leaved emergent plants: rooted plants with principle photosynthetic surfaces projecting above the water (*Typha, Scirpus* etc) (b) floating leaved emergent plants: rooted plants with floating leaves (*Nymphaea, Nelumbos* etc)
iii. Floating macrophytes: Entire plant will be floating on the water surface (*Eichhornia, Lemna, Pista* etc)

Macrophytes are of considerable ecological and economic importance. They contribute significantly to the productivity of water bodies; mobilize mineral elements from the bottom sediments and provide shelter to aquatic macroinvertibrates and fishes. They also respond to changes in water quality and have been used as indicators of pollution. When there is enough room for colonization and abundant availability of nutrients, macrophytes show a high growth rate. They assimilate nutrients directly into their tissues. Due to these they were used to solve eutrophic problems of freshwater bodies and to remove pollutants.

Sampling: The sampling of macrophyte depends on type of habit, type of vegetation, variation and distribution of the vegetation and aim of the study. It is essential to first survey the area and decide about the suitable sampling methods. Quadrat method of sampling is followed (50 cmX50cm or 1mX1m for emergent).

Vegetation mapping: This is done 1)to calculate total macrophytic biomass of different species in a water body 2) to understand the distribution pattern of vegetation 3) to monitor the changes caused by a pollutant on these patterns at various times.

Treatment of samples: Immediately after collection wash the plants to remove adhered soil, epiphytes etc. Drain out the excess water after washing. Take the fresh weight of sample. Transport the samples to the lab in polythene bags.

Biomass estimation: After determining fresh weight of the samples, keep the samples in hot air oven at 105°C for 24 hrs for the determination of dry weight. Biomass is usually estimated as dry matter per unit area.

COMMON MACROPHYTES IN WETLANDS OF INDIA

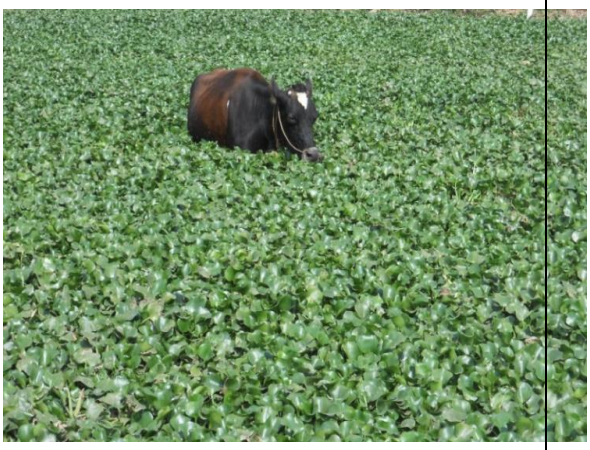
Name: *Eichhornia crassipes*

Common Name: Water hyacinth

Description: Water hyacinth is a free-floating perennial aquatic plant, With broad, thick, glossy, ovate leaves; leaves are 30-40 cm long with spongy petiole. Roots are fibrous and featherlike.

Flowering: March-July

Habitat: Water hyacinth grows in still or slow-flowing fresh water in tropical and temperate climates. Optimum growth occurs at temperatures of between 28°C and 30°C, and requires abundant nitrogen, phosphorus and potassium.



Impact: Its wide spread occurrence in the fresh water lakes and riverbeds is harmful to fishing (depleting DO), rowing, and depleting water content from the water bodies and interfering in water utilization and other activities. Water hyacinth by its abundance of leaves, dense vegetation and innumerable rootlets in tertiary manner obstruct water flow in irrigation channels and displaces many aquatic grasses, which were useful as fodder for cattle, and suppresses the phytoplankton growth. Water hyacinth provides suitable breeding places for mosquitoes and other disease-carrying insects by stagnating the water in ditches and shallow areas.

Uses: Phytoremediation, waste water treatment

Name*: Alternanthera philoxeroides*
Common name: Alligator weed
Habitat: grow in a variety of habitats, including dry land but usually found in water.
Stems are pinkish, long, branched, and hollow. Fleshy, succulent stems can grow horizontally and float on the surface of the water, forming rafts, or form matted clumps which grow onto banks
Leaves are simple, elliptic, and have smooth margins. They are opposite in pairs or whorls, with a distinctive midrib, and range in size from 5-10 cm.
Flowers: whitish, papery ball-shaped flowers that grow on stalks.
Fibrous roots arising at the stem nodes may hang free in water or penetrate into the sediment/soil.
Flowering: December-April
Impact: Alligator weed disrupts the aquatic environment by blanketing the surface and impeding the penetration of light. Such blanketing can also prevent gaseous exchange (sometimes leading to anaerobic conditions) which adversely affects aquatic flora and fauna. It also competes with and displaces native flora along river and in wetlands.

Name: *Typha*
Common name: Cattail
Description: It is a common perennial marsh, Aquatic or wetland plant in temperate, tropical, and subtropical climates. Plants are rhizomatous monoecious herb, grow upto 1.5-3m high, **Leaves** radical, sheath white. Flowering stem length is typically equal to or somewhat longer than leaf length. Numerous tiny, dense, flowers occur in a terminal spike that is 0.7 to 2 inches, Male flowers make up the upper, narrower half of the spike and female flowers the lower, slightly wider half
Flowering: June- August
Habitat: It grows in shallow water of lakes, rivers, ponds, marshes, and ditches.
Significance: Phytoremediation, wastewater treatment, Used as medicine, fodder

Name: *Lemna*

Common name*:* Common duckweed

Lemna minor: free-floating aquatic plants, with one, two or three leaves each with a single root hanging in the water; as more leaves grow, the plants divide and become separate individuals. The root is 1-2 cm long. The leaves are oval, 1-8 mm long and 0.6-5 mm broad, light green, with three (rarely five) veins, and small air spaces to assist flotation. It propagates mainly by division, and flowers rarely produced.

Habitat: Grows in water with high nutrient levels and a pH of between 5 and 9, optimally between 6.5 and 7.5, and temperatures between 6 and 33 °C.

Significance: Important food resource for fish and birds(ducks)

Lemna minor

Lemna gibba

Name: *Pistia stratiotes*

Common name: water cabbage, water lettuce

Description: Aquatic free-floating, odorous monoecious herb with thick, soft leaves that form a rosette. Roots hanging submersed beneath floating leaves. Leaves can be up to 14 cm long and have no stem. They are light green, with parallel veins, wavy margins and are covered in short hairs which form basket-like structures which trap air bubbles, increasing the plant's buoyancy.

Habitat: waters with high nutrient content, particularly those that have been contaminated with human loading of sewage or fertilizers

Impact: major weed of lakes, dams, ponds, irrigation channels and slow-moving waterways in tropical, subtropical and warmer temperate regions. It can completely cover water bodies, disrupting (lowering DO) all life on the water.

Name: *Polygonum glabrum*

Common name: Common Marsh Buckwheat

Morphology: Stems erect, shrubby, upto 2.5 m tall, leaf blades shortly petiolate, blades narrowly lanceolate, glabrous except for midrib and some lateral nerves, flowers in terminal and axillary, 7-10 cm long spike-like racemes

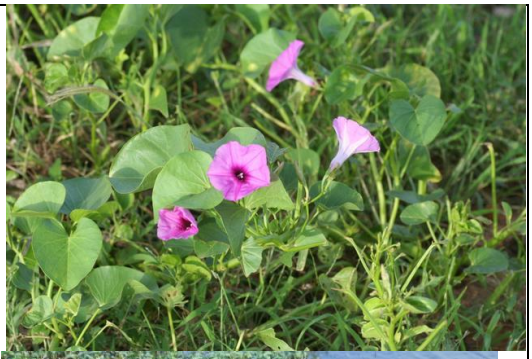
Habitat: Perennial or annual, found along water courses and tanks but is also found in marshes. It is often dominant along large rivers

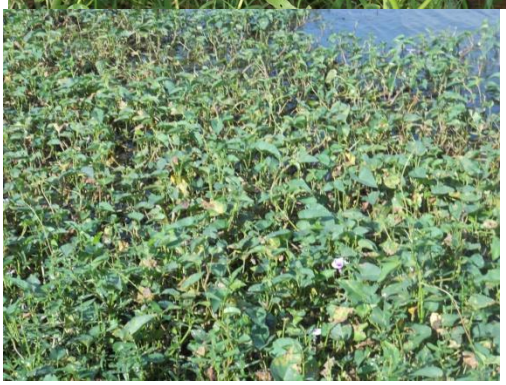
Significance: Tender branches used as vegetable, also used for dispelling fever and colic.

Name: *Ipomea aquatica*

Common name: Water spinach, river spinach

Morphology: Plants aquatic, annual, twining herbs, stem hollow, leaves alternate and entire, flowers solitary or in cymes, corolla pinkish, darker in throat,fruit 4-6 valved capsule.





Habitat: usually floating on stagnant water sometimes found on banks of pools, canals and rivers

Significance: It is often cultivated for its edible shoots and as a medicine. It can be serious weed if left to grow unchecked.

Name: *Ludwigia*

Common name: Water Primrose, Water Dragon, marshy jasmine

Habitat: Still or slow flowing freshwater habitats, occurring in marshes, swamps, ditches, ponds, and around lake margins, where they form dense floating mat. Shallow, nutrient-rich ponds, lakes, and drainage ditches provide ideal conditions for abundant growth of this weed.
Aquatic floating herb, floats crowded at nodes, white
Leaves alternate simple, ovate, obtuse entire

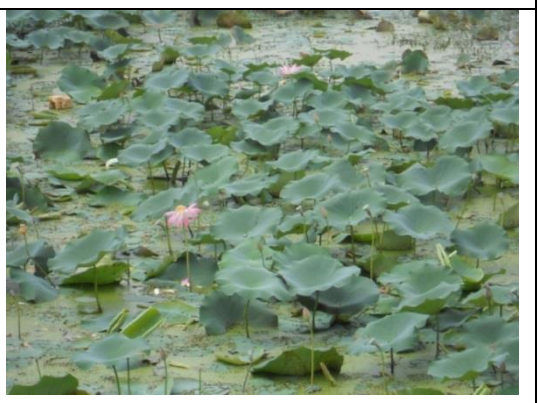
Flowers: Axillary, solitary, peduncle 2.5 cm long, corolla 5, yellow, inserted on the rim of the disc, base narrow.
Flowering: February-July
Harvesting period: August
Impacts: Once established, however, it forms dense, monotypic stands along shorelines and banks

Name: *Nymphaea*

Leaves with a deep sinus, veins mostly radiating from the summit of the petiole and repeatedly forked; flowers born above the water surface. Sepals 4, green or streaked with red. Petals numerous, showy, stamens numerous, with or without appendaged connectivities. Pistil-1, carpels many, syncarpous, ovary superior.

Nymphaea nouchali*:*
Habitat: Perennial or annual, found in still or flowing water up to 2 m deep, in a wide variety of habitats
Significance: The rhizomes, flower buds and seeds of some species eaten for food, medicine or to cause hallucinations. The rhizomes are used as mordant in dyeing and tanning. Many species and hybrids are cultivated for ornament.

Nelumbo: Leaves without sinus, centrally peltate, unarmed, carpels many, free, ovary superior.



Nelumbo nucifera:

Common name: Lotus
Morphology: Large perennial, with milky latex. Stems dimorphic, slender horizontal, vegetative stolons or rhizomes or thickened storage rhizomes. Leaves alternate, petioles upto 3 m or long, bearing numerous spines, leaf blades when immature floating, when mature raised above the water surface, Flowers large (8-20 cm diameter), pink to red or white; petioles and peduncles rough, perianth segments 14-30, stamens upto 200 or more, filaments upto 1 cm anthers upto 1.2 cm long, Carpels 12-30.

Significance: Widely cultivated as a crop for its edible rhizomes, edible nuts and for honey, also grown for ornament, leaves are used for serving food, Sacred for Hindus; buds are collected for worship in temples. It is used in medicine; seeds for skin diseases and diarrhea, rhizomes for piles and ringworm.

Name: *Potamogeton*

Common Name: Pond weed

Morphology: Stems usually elongate, flexible, submerged or floating or stoloniferous and creeping, leaves submerged or floating, stipulate, sessile or petiolate, distichous, alternate or opposite, flowers small emerged or submerged, tetramerous, in terminal spikes, Perianth of 4, bract like, Stamens 4, united with perianth at base, anthers sessile, Ovary superior, carpels several free, sessile, fruit drupelet

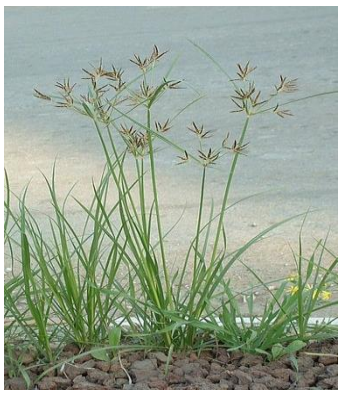
Habitat: Perennial or sometimes annual. Found in a wide variety of aquatic habitats, totally submerged or with floating leaves. Occasionally it grows in brackish water.

Name: *Cyperus*

It is a perennial plant, which may reach a height of up to 40 cm.

Common name: nut grass, nut sedge

Habitat: *Cyperus* is found in cultivated fields, farmlands, neglected areas, wastelands, grasslands, at the edges of forests, and on roadsides, sandy or gravelly shores, riverbanks and irrigation canal banks. Grow profusely in nutrient rich environment.



Leaves: Leaves sprout in ranks of three from the base of the plant. The flower stems have a triangular cross-section. The flower is bisexual and has 3 stamina and a three-stigma carpel. The fruit is a three-angled achene.

Rhizome: The root system of a young plant initially forms white, fleshy rhizomes. Some rhizomes grow upward in the soil, then form a bulb-like structure from which new shoots and roots grow, and from the new roots, new rhizomes grow. Other rhizomes grow horizontally or downward, and form dark reddish-

brown tubers or chains of tubers.

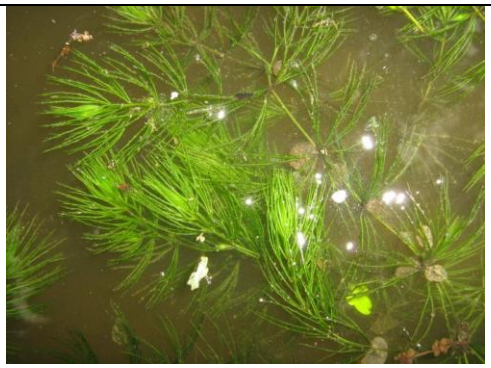
Impacts/significance: It is a weed and the world's worst invasive weed based on its distribution and effect on crops. It contains several chemical compounds and used in medicines.

Azolla

- Habitat: Annual sometimes perennial in permanent water. Free floating on permanent or temporary water, in rice fields, canals and ponds.
- Used as fertilizer-contains nitrogen fixing cyanobacteria
- Roots simple bearing numerous root hairs, stems alternately branched, branches arranged pinnately or bipinnately, leaves alternate, ovate divided into 2 lobes-upper lobe thick green and usually somewhat reddish, above the water lower lobe 1 cell thick, colorless short in contact with water with cyanobacterium.
- Growth phase : Nov-Feb

Salvinia

- Habitat: Perennial or annual. Free floating mat-building plants. Heterosporous;
- Morphology: Stems floating, irregularly forked, without roots.
- Leaves in whorls of 3, 2 of them floating and 1 submerged, floating leaves photosynthetic, entire with complex unwettable hairs on adaxial (upper) surface and wettable hairs on the abaxial surface; submerged leaves not photosynthetic, finely divided into filamentous segments which bear a striking resemblance to roots.
- Sporocarps born on modified segments of

submerged leaves; megasporangial sporocarps developed first, microsporangial sporocarps developed later, producing numerous microsporangia, each containing usually 64 microspores. • It can be a very serious pest, spreading by vegetative fragments.	
Marsilea • Perennial or annual, found in shallow pools, edge of rivers, canals, lakes and rice fields. Most abundant in temporarily flooded places where it forms dense colonies • Plants mat forming, rhizomes slender, wiry, repeatedly branched, creeping or floating • Leaves spirally rolled when young, compound, Leaflets very variable 2-25 mm long, terrestrial leaflets with outer margins entire, bilobed to many lobed, floating leaflets with margins entire. • Sporangia in closed sporocarps, born on short stalks arising from petioles or in their axils • Reproductive phase-Nov-Jan • Used in medicine	 
Ceratophyllum • Morphology • Shoot tips often with shortened internodes giving it bottle brush appearance. • Leaves usually bright or olive green, rigid • Perennial or sometimes annual, totally submerged, rootless, free-swimming. • Sept-Nov • *Ceratophyllum* can be used as a measure of lake pollution, as it can contain trace metals such as cadmium and lead in plant tissue (Stankovic et al. 2000)	

Hydrilla • Habitat: Mostly perennial but sometimes annual • Totally submerged. • Growing in still or slowly flowing water • Oct-March • Stems elongate, branched regularly but at distant intervals, horizontal and stoloniferous below, erect and spreading above, bulb-like structures develop either underground terminally on stolons or or terminally or axillary on erect stems or their branches. • The leaves are strap-shaped with pointed tips and saw-tooth edges, Leaf colour can vary from green, translucent, yellowish, to brown • found in freshwater but can tolerate salinities of up to 7% salinity	


Eichhornia crassipes
Salvinia molesta
Pistia stratiotes
Wolffia papulifera
Spirodela polyrhiza
Lemna minor
Azolla pinnata
Nymphae rubra
Nymphae nouchali
Nelumbo nucifera
Nymphoides indica
Monochoria vaginalis
Ludwigia sp.
Trapa bispinosa
Potamogeton crispus
Chara sp.
Najas indica
Ottelia alismoides
Hydrilla verticillata
Myriophyllum heterophyllum
Potamogeton pectinatus
Scirpus sp.
Alternanthera sessilis
Ipomea aquatica
Marsilea sp.
Colocasia esculenta
Cyperus sp.
Cyperus sp.
Aeschynomene indica
Eleocharis palustris
Hygrophila spinosa
Hygrorhiza sp.
Phragmites karka
Typha sp.
Sagittaria sagittifolia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K.H.E.P.HIGH SCHOOL, AMBIKANAGAR
Thaluk:Haliyal, Sirsi Educational District-581363

MY VILLAGE BIODIVERSITY DOCUMENTATION FORMAT
(Village means revenue village)

Village Name:	Kegdal, Bommanahalli.		Student's name	Class
Panchayat name:	Bhagavathi		Kum.Kruthika M.Gunaga	VIII
Taluk:	Haliyal(N.K.)			VIII
Name of school Address of school with phone no. & email:			Name of guide teacher Sri.Ganapati S.Shet, Senior Asst. Teacher. e-mail: ganapatishet19@gmail.com	
K.H.E.P.HIGH SCHOOL, K.P.C.COLONY,AMBIKANAGAR Tq:Haliyal, N.K. 581363 08284 - 258234			Phone no: 9480509177	

1) FOREST TYPES OF VILLAGE

	Forest types		
a)	Evergreen forest		No
b)	Semi-evergreen forest		No
c)	Deciduous forest	Yes	
d)	Scrub		No
e)	Mangrove vegetation (only for coastal taluks)		No
f)	Savanna (grassland with trees)		No

2)LANDSCAPE ELEMENTS OF THE VILLAGE

Landscape elements			Yes	No
a)	Bena (grassland):			No
b)	Rocky places (Name & localities)	Rock types (write local names)		
i	Thattihalla	Granite		
ii	Bommanahalli	Granite		
iii	Vincholli	Black Granite		
iV				
c)	No.of stone quarries: 2			
	Type of stone in the quarry: Granite			
d)	No. of soil quarries: Nil			
	Type of soil: Nil			
e)	No. of sand quarries Nil Describe where			

	Sand extraction from sea shore if any. Why sand is removed from sea shore? NA
f)	Mining details (record if any metal ore is removed from the village): No

*Use extra sheets for writing if necessary.

WATERSCAPE ELEMENTS OF THE VILLAGE

	Waterscape elements	Water availability (√)											
a)	Name of the river if any:	J	F	M	A	M	J	J	A	S	O	N	D
	Kali river	√	√	√	√	√	√	√	√	√	√	√	√
b)	Stream names: Nil Name of perennial streams if any: Nil i) ii) iii)												
c)	Name of the perennial springs if any: Nil												
d)	Waterfalls: Name(Height): i) **Vincholli Appr 30ft** ii)												
e)	Name of any dam in the village: Bommanahalli dam												
f)	Names or numbers of check dams: 15 nos.												
g)	Backwater area: Kallabhavi, Thattihalla, Bommanahalli												
h)	Swampy places if any with local name:												
i)	Ponds and Lakes												

Name	Area in acres	No. of months with water(√)											
		J	F	M	A	M	J	J	A	S	O	N	D
Kalbavi pond		√	√	√	√	√	√	√	√	√	√	√	√
Vincholi pond		√	√	√	√	√	√	√	√	√	√	√	√

Note: Apart from above ponds there are seven more ponds developed by forest department. Only in the month of March, April and May water not available.

*Use extra sheets for writing if necessary

PLANT DIVERSITY OF THE VILLAGE

A) Medicinal plants

Medicinal plants of the village and utilization of plants by village people

Plant name	Availabilioty			Parts used for medicine	uses
	High	Med	Less		
Shatavari+Kasaraka+Nachike mullu				Root+seed+leaf	Mulavyadhi
Ekke gida				leaf	Migraine
Gulamaavu				bark	Kai-muritha
Akaligida				leaf	Ajeerna

Pattegida (bows sting)				leaf	Snake bite
Karigonde				flower	Hottege bhatti
Lolasaara				leaf	Kudalu uduruvudu
Baale				Dindina rasa	Kudalu uduruvudu
Nelli				Powder	Kudalu uduruvudu
Matti				leaf	Taleya jiddu
Sabpun balli				root	Malabaddate, atisara
Bale+jenituppa				flower	Raktabedhi
Sabpun balli				leaf	Snake bite(poisonus)
Gojjalu				bark	Kodali gaya
Kavalu				Stem apex	Hottenovu-rakta bedi
Kuda				Stem apex	Hottenovu-rakta bedi
Castor				bark	Jwara
Daba hullu+limberasa				tube	Gaya
Bilidasavala				Flower	Biliseragu
Kempudasavala				flower	Kempusergu
Gulagunji				leaf	Kemmu
Vilyadele				leaf	Kemmu
Kadunale				seed	Mutrakallu
Saptaparni+bevu+sasapun				Bark+leaf+root	Roga nirodhakate
Karajola				leaf	Charmarogakke
Manchapatre				leaf	Charmarogakke
Sasapuna balli				root	Maleriya
Peralu+irulli				Leaf+tuber	Nashe ilisalu
Sanna tomato				leaf	Vishaprashana

ii) Medicinal plants collection and trade

List medicinal plants that are grown by villagers in their own gardens/farms for sale

Name of farmer	Medicinal plants grown for sale	Agency/name of purchasers	Demand		
			Good	Moderate	Poor

	NOT APPLICABLE				

***Use extra sheets for writing if necessary**

iii) List of medicinal plants collected from the village/forest for sale

Name of collector	**Medicinal plants collected for sale**	**Agency/name of purchasers**	**Demand**		
			Good	**Moderate**	**Poor**
	NOT APPLICABLE				

***Use extra sheets for writing if necessary**

B) Uses of non-cultivated plants for food

Plant name	Availabilioty			Parts used for Food	Uses
	High	Med	Less		
Murugalu			√	Fruit	Cooking, Juice
Challehannu	√			Fruit	As Food
Atti hannu	√			Fruit	As Food
Bili mullu hannu		√		Fruit	As Food
Paragi			√	Fruit	As Food
Anabe			√	Bud	As Food
Appemidi			√	Fruit	Pickle
Kad haagalkai			√	Fruit	As Food
Jambe	√			Seed	As Food

***Use extra sheets for writing if necessary**

C) Non-cultivated plants that are used for other purposes than food

Plant name	Availabilioty			Parts used for Food	Uses
	High	Med	Less		
Gelani	√			Bark, seed, leaves	Axe handle, fish poison
Kasaraka	√			Leaves	Fertilizer
Shige balli		√		Seed	Local shampoo
Soap nut			√	Seed	Local shampoo
Buralu hathi		√		Cotton	Pillows
Ippe		√		Flowers	Local alcohol
Channangi		√			
Kari matti	√			Tender leaves	Herbal shampoo
Bidiru	√			Stemstem	Butti, articles, fencing
Kaadu bende		√		Seeds,stem	Fibres

Thare mara		√		Stem	Furniture
Beete		√		Stem	Furniture
Thega	√			Stem	Furniture
Shivani		√		stem	Butti, articles, fencing

***Use extra sheets for writing if necessary**

D) Rare types of forest trees present in the village

Forest tree local name	Location name
Kadamba	**Vincolli**
Ippe	Vincholli
Buthale	Vincholli
Karimthalu	**Bommanhalli**
Hole mathi	**Kegdal**
Honge	**kegdala**

***Use extra sheets for writing if necessary**

E) Road side trees

List planted roadside trees by surveying one km of village main road

Tree Species	Nos
Kakke jambe	**4**
Aala	**5**
Gobbara gida	**100**
Muthuga	**15**
Sagavani	**50**
Hunase	**12**
Thengu	**15**
Jathropa	**25**
Hole mati	**8**
Honge	**7**
Seeme thangadi	**5**
Kindaal	**12**
Gojjalu	**8**
Kumbha	**5**
Heddi	**4**
Maavu	**10**

***Use extra sheets for writing if necessary**

F) Forest products

i) Collection of forest produce

(Interview persons who collect forest produce; list the products that are regularly collected from the forests)

Names of forest produce collectors	List of products collected	Uses of products for own use/sale
Local people do not collect any forest produce		

Yellapur contractor and their Siddi workers used to collect forest produce occassionally at Bommanahalli		

***Use extra sheets for writing if necessary**

ii) Do contractors collect forest produce (name products collected)

Yes

***Use extra sheets for writing if necessary**

iii) Do local societies collect forest produce NO

(name society, products collected etc. – Attach details from Societies' annual report)

Name of society	**Products collected**	**Annual income**
	NA	

***Use extra sheets for writing if necessary**

G) Agriculture

i) Names of crop plants and their varieties

(Note: Please note down varieties of rice, sugarcane, ragi, jowar, other millets, black gram (uddu), pacha hesaru (green gram), cow pea (alsandi); ground nut (senga), etc.)

Name of crop	**Names of varieties**	**Farmer's name & address**	**Area (Acres-Gunta)**
Paddy	Jaya, Sali, Dodga,	Panduranga Seemanna Kasalkar, Kegdal	10
	Savara, Akkalasaale,	Bairappa Kasalkar, Kegdal	8
	Antharasaale	Juvab Benith Siddi, Kegdal	12
		Gangubai Basalinga Naik, Kegdal	6
		Mingel Jujo Siddi, Kegdal	6
		Emanuel Juvav Jujo, Kegdal	2
		Sayyad Darvez Mehanudiin, Sayyd farm, Bommanalli	10

Sugarcane	Sakre kabbu	Panduranga seemanna Kasalkar, Kegdal	
	Konana Katti	Bairappa Kasalkar, Kegdal	
	Dasa kabbu		
Cottoan	Jadhara, BT	GangubaiBasalinga Naik, Kegdal	2
		Mingel Jujo Siddi, Kegdal	3

ii) Special characters of crop varieties (please give importance to traditional varieties)
Note: Special characters: Please note down special characters as explained by the farmer. For eg: Crop name : Rice; Variety name: Bantwala: Special characters: 3.5 months duration, tall (5 ft); red rice, yield approx. 8quintals/acre; tasty; soft straw liked by cattle – Please ask farmer to describe the varieties.

Crop name	**Variety**	**Farmer interviewed**	**Special characters**
Paddy-Saale	Saale- Tall, tasty, white	Panduranga Seemanna.Kasalkar	Disease resistant drought resistant, no need to chemical fertilizer
Paddy- Dodaga	Dodaga- round, thick reddish, tasty	Mingel Jujo Siddi, Kegdal	Disease resistance drought resistance 100days
Sugar cane	Sakkare kabbu	Panduranga Seemanna Kasalkar	Used for sugar. Commercial profitable.

***Use extra sheets for writing if necessary**

iii) Traditional storage methods of agricultural products
(Explain what are the important methods of storage of food grains and pulses etc. without damage or insect attack.)

Agricultural product	**Traditional storage/preservation methods**
Paddy	Kanaja Using bamboos, mud, cowdung they construct round model to store paddy. Neem leaves mixed with paddy to control insect infestation.

***Use extra sheets for writing if necessary**

iv) Model agriculturists in the village

Names	**Why he/she is considered model?**
Kasalkar	Organic farmer

	Crop rotation Uses native varieties of paddy
Sayyad darvez Mainuddin Sayyad farm, Bommanahalli	Cultivating crops, horticulture, floriculture, cereals & grains Organic farming is adopted mixed cropping, multiple cropping well equipped water supply technique. Environmental friendly farming (without IBX)

***Use extra sheets for writing if necessary**

v) Seed treatment

Name of farmer	Name of crops	Seeds storage method	Seed treatment before planting	Name of substances/chemicals used for seed storage/treatment
		NO		

***Use extra sheets for writing if necessary**

H) Horticulture

i) Horticultural crop and their varieties

(Note: Please note down varieties of coconut, arecanut, pepper, betel leaf, mango, jack fruit, banana, citrus, vegetables, leafy vegetables, chillies, local flowers, kokam, onions, tubers, ginger, cardamom)

Name of crop	Names of varieties	Farmer's name & address	Area (Acres-Gunta)
Arecanut, Banana		Sayyad darvez Mainuddin Sayyad farm, Bommanahalli	30 acres
Dalchini			
Pepper			
Yalakki			
Betloin			
Mango			
Papaya			
Jack fruit			
Bera halasu			
Lavanga			
Peru			
Nelli			

***Please Use extra sheets**

ii) Special characters of horticultural crop varieties

Note: Please note down special characters as explained by the farmer

Crop Name	Variety	Farmer's name interviewed	Special characters

Mango	**Chitra payera Apus Kalmi**	**Gangubai Venkappa Mirashi**	**Sweet, good flavor, Disease resistant**

***Use extra sheets for writing if necessary**

iii) Traditional methods of processing and storage of horticultural products

(Explain what are the important methods of processing and storage of horticultural products without damage or insect attack.).

Horticultural products	Traditional storage/preservation methods

***Use extra sheets for writing if necessary**

iv) Information about home gardens for growing vegetables

(collect information form a cluster of ten families – poor and rich and representing different communities)

Person interviewed	**Home garden Present/absent**	**Vegetables grown**	**Write reasons why home garden is not there for the family**
Home garden is not there			Domestic and wild animals conflicts.

v) Model horticulturists in the village

Names	**Why he/she is considered model?**
Sayyad Darvez Mainuddin Sayyad farm, Bommanahalli	Cultivating crops, horticulture, floriculture, cereals & grains. Organic farming adopted mixed cropping multiple cropping. Well equipped water supply technique. Environmental friendly farming(without IBX)

***Use extra sheets for writing if necessary**

vi) Fruit trees grown in the school campus

Name	**No.**
Mango	3

Papaya	2
Hunse	1
Peru	1
Neralu	1
Balle	4
Nugge	2

***Use extra sheets for writing if necessary**

vii) Methods for ripening of fruits

Name of farmers	**Crops**	**Fruit ripening methods you apply**
Bairappa Sheemanna Kasalkar	Mango	Straw of paddy

***Use extra sheets for writing if necessary**

viii) Fruits storage/preservation/ processing methods (making pickles, jams, drying, salting etc)

Name of farmers/other persons	**Crops**	**Fruits storage/preservation/processing methods**	**Purpose (for own use/sale)**
	NOT APPLICABLE		

***Use extra sheets for writing if necessary**

I) Model Farms

i. Write names of the farmers who have model farms. Model farms combine many of the following features described under a/b/c/d etc. (whatever is applicable).

Names of the farmers	**Features**															
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**
Sayyad	√	√				√	√		√	√		√	√	√		

b. Soil conservation methods adopted
c. Animal husbandry is part of the system
d. Bee keeping is part of system
e. Gobar gas is used
f. Vermi-compost is made
g. Preparation of bio-pesticides; pesticides are not used for rice crops and vegetables
h. Solar lamps; solar drier; improved stoves like Astra Ole
i. Bettaland has more than 100 trees per acre; trees belong to at least 15 species/acre; at least 40 trees per acre are not lopped for leaves or branches cut for fuel.

j. No fuelwood is purchased from outside
k. No fulewood is collected from forest
l. Crop rotation is practiced in rice fields (mention what crops are grown after rice is harvested)
m. List fodder crops grown in the farm (including grasses, shrubs and trees)
n. At least one traditional rice variety is grown (mention name:……..)
o. Poultry is part of farming system
p. Fish farming is part of the system (name fishes in the pond……..)

J) Village environment management

i) People's participation in environment management

	Environment management	**Yes**	**No**
A	**Village Forest Committee (VFC)** is present in the village	**Yes**	
	VFC is active/inactive/ moderately active (tick right choice)	**Active**	
B	**Biodiversity Management Committee (BMC)** is formed in the Panchayat :		**No**
	BMC is active / inactive (tick right choice)		
C	**Peoples' Biodiversity Register (PBR)** is prepared for the Panchayat		**No**
D	Meetings conducted on environmental awareness in the village/panchayat during last two years (give details if any):	**Yes**	
E	The village has a Farmers' Union	**Yes**	
F	The Farmers Union meets regularly to discuss about farming systems/ problems etc	**Yes**	

V.F.C, BMC, PBR, Farmers Union are not present. But all the activities that could be conducted under these organization are carried on very actively by the people. People are maintaining the forest of the village.

ii) List names of farmers who do fully organic farming
(without use of chemical pesticides and fertilizers) for any crops

Name of farmer	**Cropes grown without use of chemicals**	**For own use/sale**
Sayyad Darvez Mainuddin, Bommanalli	**Paddy**	**Both**
Panduranga Sheemanna Kasalkar, Kegdal	**Sugarcane**	
Narayan Thukkappa Chennaikar	**Coconut**	
Mingel Benith Siddi, Kegdal	**Mango**	
Subhash Yashwant Keragao		
Gangubai Venkappa Mirashi		

***Use extra sheets for writing if necessary**

iii) List farmers who use biopesticides

Name of farmer	Crop	Disease/insect	Describe bio-pesticide used

***Use extra sheets for writing if necessary**

iv) What biopesticides are used by you?

Name of farmers	Crops	When you apply biopesticides?	How bio-pesticides are prepared by you	Expenses if any/gunta /acre

***Use extra sheets for writing if necessary**

v) Manuring/application of fertilizers

Name of farmer	Name of crops	Name manures used	Expenses per gunta/acre	Name fertilizers used	Expenses per gunta/acre
Sayyad Darvez	**Paddy**	**Compost** **Cowdung**	**Rs.4000/-**		
Panduranga	Sugarcane				
Narayan Thukkappa	Banana				
Mingel Benith	Coconut				
Ramu Meenappa					
Subhash Yashwanth					
Gangubai Venkappa					

vi) Name chemical pesticides/fungicides used

Name of farmers	Crops	Names of pesticide/fungicides used	Purpose	Expenses/ gunta/acre

5) COOPERATIVE

i) Cooperative Societies

Notes on tribal co-operatives in the village/panchayat (eg. Siddi co-operative society for forest produce collection)

Notes on other co-operative societies in the village

Cooperative Societies	Main activities

***Use extra sheets for writing if necessary**

ii) Name Self Help Groups/Sthree-Shakti groups in the village and list their activities

Name of self help group	Type
Mahila Swasahaaya Sangha run by NGO	All 28 Siddi family members are active participants
Lepracy mission of India	
Dharmasthala Swasahaya Sangha	Financial assistance

***Use extra sheets for writing if necessary**

6) COMMUNITY HEALTH

Visit a cluster of ten families representing different communities and list the health problems

Name of person interviewed	Health problems	Any remarks on treatment
Sachin Balakrishna Duble	As per the opinion these Persons no much major health problems were reported. Common fever, cough, cold and amoebiasis are often seen	They get treatment either by local naativydyas Shri Ponnappa Krishna Vadekar, Shri.Gangaram Vittu Yedage, Shri Chandrakant Madav Chiratkar. In case of serious problems they go to nearest PHC or taluk health centre, Haliyal. During power failure they don't get water from borewells supplied by panchayat and forced no consume water from nearby well and used to get water related disorders.
Pavaneshvar Dongru, Chiratkar		
Vitttal Jaanu Mishale		
Gangaram Vagu Patakare		
Malu Kokare		
Baba sab Akbarsab Sayyad		

***Use extra sheets for writing if necessary**

7) ANIMAL DIVERSITY

A) Wild Life

Name	NUMBERS			Changes in numbers		
	Common	Moderate	Rare	Increasing	Decreasing	No change
Mammals (including bats)						
Tiger	√			√		
Elephant	√			√		
Black panther		√		√		
Gaur		√		√		
Sloth bear	√			√		
Spotted deer	√			√		
Sambar	√			√		
Barking deer		√		√		
Common langur	√			√		
Malbar gaint squirrel	√			√		
Mouse deer		√				√
Porcupine		√				√
Wild pig	√			√		
Mongoose	√			√		
Stripe nacked Mongoose		√				√
Common monitor lizard	√			√		
Three striped squirrel	√			√		
Flying squirrel	√			√		
Flying lizard	√					√
Flying snake						
Slender loris			√			√
Jackal	√			√		
Dhole (Wild dog)		√		√		
Common palm civet	√			√		
Small Indian civet		√				√
Leopard cat			√			√
Brown palm civet			√			√
Hare	√			√		
Bonnet macaque	√			√		
Chippu handi (Pangolin)		√		√		
BATS						
Lesser false vampire		√		√		
Lesses wolly horse shoe bat		√				√
Birds						
Indian pea fowl	√			√		
Indian roller	√			√		
Malabar pied	√					√

Hornbill						
Great pied Hornbill	√			√		
Indian grey hornbill		√		√		√
Malabar grey hornbill	√					
Cattle egret	√			√		√
Jungle crow	√					√
House crow	√					
Black ibis		√		√		
White ibis		√		√		
Red wattled lapwing	√			√		√
Pompdour green pigeon	√					√
Blue rock pigeon	√					√
Emarald dove	√					√
Rose ringed parakeet		√				√
Little egret	√					√
Barhminy Kite	√			√		
Shikra	√					√
Crested serpent eagle	√					√
Grey jungle fowl	√			√		
White necked stork		√				√
Lesser adjutant stork		√				√
Pond heron	√			√		
Snake bird	√					√
Little cormorant	√					√
White braested water hen	√			√		
Night heron		√				√
Golden plover						
Hill myna	√					√
Jungle myna	√					√
Rufus tree pie	√					√
Scarlet minivet	√					√
Red vented bulbul	√			√		
Paradise flycatcher		√		√		
Tailor bird	√			√		
Asian koel	√			√		
Common hoopoe		√				√
Common wood strike	√			√		
Grey tit		√				√
Green bee eater	√			√		
White breast kingfisher	√			√		
Indian pitta		√		√		
Magpie robin	√			√		
Black drango	√			√		

Golden oriole		√		√		
Black hooded oriole	√					√
Common myna	√			√		
Tickle blue flycatcher	√					√
Purple sunbird	√					√
White eye	√					√
Baya weaver bird			√			√
White throated muniya	√					√
Black headed munia	√					√
White rumped munia	√					√
House sparrow		√			√	
Common golden backed woodpecker	√			√		√
Great black woodpecker		√				√
Brown headed barbet	√					√
Coppersmith barbet	√					√
Heart spotted woodpecker		√				√
Stork billed kingfisher	√			√		
Pied kingfisher		√				√
Small blue kingfisher	√			√		
Chest nut headed bee eater		√		√		
Common kestrel		√				
Gold fronted chlropsis	√			√		√
Jungle babler	√			√		
Spotted munia						
Barn owl		√				√
Common lora	√			√		
Small green billed mulkoba		√				√
Indian blue robin		√				√
Black lored yellowtit	√					√
Wire tailed swallow			√			√
Red pumped swallow	√			√		
Plum headed parakeet	√			√		
Common sand piper						√
Spotted owlet	√					√
Brown fish owl	√			√		
River tern		√				√
Grey heron		√				√
Ashy wood swallow spotted dove	√					√
Purple heron		√				√

Velvet fronted nuthatch	√					√
Grey wag tail	√					√
Malabar starling		√				√
Black crested bulbul			√			√
Red wagtil		√				√
Forest wagtail		√				√
Fairy blue bird		√				√
Pied flycatcher shrike		√				√
Small minivet	√					√
Rufous backed shrike	√					√
Spotted Dove	√			√		
Reptiles (including snakes & turtles)						
Common cobra	√			√		
Russel viper	√			√		
Saw scaled viper			√			√
Common crait			√			√
King cobra		√				√
Ceylon cat snake	√					√
Dumeriles black headed snake			√			√
Hump nosed pit viper		√		√		
Common wolf snake	√			√		
Rat snake	√			√		
Checkered keelblack	√			√		
Flying ornatesnake		√		√		
Common green vine snake	√			√		
Fosten cat snake	√			√		
Russel kukri snake			√			√
Striped keel black	√					√
Beddomes keel black	√					√
Green keel black			√			√
Bamboo pit viper		√				√
Painted bronze black			√			√
Shield tail snake	√			√		
Indian rock phython		√		√		
Red sand boa		√				√
Montane trinket snake		√				√
Common bronze black tree snake	√			√		

Fishes						
Kattla	√			√		
Rhoo	√			√		
Gojali(Baalemeenu)	√			√		
Panel	√			√		
Malaga	√			√		
Girlaa(Miseminu)	√			√		
Avalu	√			√		
Chillipilli(Perl spot)	√			√		
Ayar minu		√				√
Belachi	√			√		
Giral	√					√
Chenna oriantales		√				√
Doke(Matta)	√					√
Yellow paplet	√					√
Kannadi minu	√					√
Insects (including butterflies & honeybees)						
Butterfly						
Southern bird wing	√			√		
Danaid eggfly	√			√		
Blue Mormon	√					√
Small orangetip	√					√
Common emigrant	√			√		
Blue oak leaf			√			√
Painted lady		√				√
Malbar tree nymph	√			√		
Yellow pancy	√					√
Cabbage white	√			√		
Common mormon	√			√		
Chocolate pancy	√			√		
Common rose	√			√		
Tailed jay	√					√
Crimson rose	√			√		
Blue tiger	√			√		
Lime butterfly	√			√		
Common ezbel	√					√
Pioneer	√					√
Common sailor	√			√		
Lemon pancy	√			√		
Striped tiger	√			√		
Malbar raven		√				√
Common silver line		√				√

Other animals						
Spiders						
Gaint wood spider	√			√		
Ball spider	√			√		
Signature spider	√			√		
Wolf spider	√			√		
Ornamental spider		√				√
AMPHIBIANS						
Common toad	√			√		
Datta preynous	√			√		
Nictibhatrius	√			√		
Polyphidatus maculates	√			√		
Eplictis cynoplictis	√			√		
Skipper frog		√				√
Ramnella Montana		√				√
Indian bull frog	√			√		
Philatus leucorinus	√			√		
Bi coloured frog	√			√		
Indian painted frog			√			√
Ornate narrow mouth frog		√				√
White nosed bush frog	√					√
Common tree frog	√			√		

***Use extra sheets for writing if necessary**

B) Knowledge on wild animals

Name of person	**Species**	**Seasons present**	**Where present?**	**Numbers**		
				low	**moderate**	**high**
P.S.Kasalkar	Elephant	Throught the year	**Forest**			√
	Pig	Harvest season	**Forest**			√
	Deer	Summer to rainy transition period	**Forest**			√
Salu Benith Siddi	Sloth bear	Throughout the year	**Forest**		√	
	Tiger	Throughout the year	**Forest**	√		
Duming Juvav Siddi	Peacock	Through the year	**Forest**			√
	Junglefowl	Throughout the	**Forest**			√

		year				
Laxman V.Gajakosh	Crocodile	Summer and rainy season	**River**		√	
	Jackel	Rainy season	**Forest**			√
	Sambar	Throughot the year	**Forest**		√	

Note:

- Seasons present : Rainy season, cold season, summer season or throughout the year
- Where present: Habitat to be mentioned such as forest, scrub, field, garden, river bank, river, pond etc

C) Crop damage from wild life

Interview farmers on what damages are done to crops by wild animals in the village (write names of farmers interviewed and details of animals which create problem and the extent of damages they suffer)

Name of the farmer interviewed: Panduranga Sheemanna Kasalkar, Between May-January after sowing until harvest, 5-6 times it was reported as Elephants have damaged the crops Every year a loss of Rs.5000-6000 incurred due to the elephant attack. But Karnataka forest dept. compensated them feebly. But by the construction of EPT (Elephant proof trench) by the dept. has controlled such incidents. Still only one elephant managed to cross over EPT. Out of 35 years cultivation this year only his crops have been protected due to EPT construction.

D) Attack on humans by wild animals

Any details on attack on humans by wild animals (including snake bites, attack on domestic animals) may be mentioned – number of cases during the last two years

i) **Dulbu Changlu Pattakare (Gowli tribe): died by Elephant attach**
ii) **Maruthi Naik: Forest watchman: Was attacked by sloth bear, injured severely but survived.**
iii) **Malabari lady: Died by elephant attack**

E) Write the names of plants that wild animals/birds feed upon

Name of persons interviewed	**Name of wild animal/bird**	**Plant/plant parts used as food**
Maruthi Kammar, Carpenter	**Elephant**	**Bamboo, banana, sugarcane**
	Deer	**Grass, bamboo leaves**
	Bear	**Mushroom, tubers**
	Monkey	**Banana, mango, tender coconut**

F) Name wild animals that seasonally visit the village

Persons interviewed	**Animals which visit the village**	**Seasons of visit (months)**	**Any reasons why they come?**
Salu Benith Siddi	**Elephant**	**May-Jan**	

	Pig	**May-Jan**	
	Deer	**May-Jan**	
	Sloth bear	**May-Jan**	
	Tiger	**May-Jan**	**For food**
	Peacock	**May-Jan**	
	Junglefowl	**May-Jan**	
	Jackal	**May-Jan**	
	Sambar	**May-Jan**	

G) Hunting

i. Do people hunt in the village or outside? : No

ii. Which communities customarily hunt? : Nil

iii. What are the animals/birds normally hunted within village? : No

iv. What are the names of animals/birds hunted from outside the village? No

v. How far do the hunters go for hunting? Name places and distances from the village you are surveying. NA

vi. Do outsiders enter the village for hunting? No

vii. From where do outsiders come for hunting? NA

viii. Why do people hunt? NA

ix. For food (mention names of animals/birds) NA

x. For medicine (mention animals/birds) NA

xi. For sale of meat/other products (mention animals/birds) NA

xii. As part of their hunting tradition – hunting is compulsory for the community (mention names of communities which perform traditional hunting) **No**

xiii. What are the restrictions on hunting followed by local people themselves?

Awareness created by DATR (Dandeli Anashi Tiger Reserve) officials.
Awareness created by NGO's like Green India, Taluka Leprosy Mission of India etc. Inspirational speeches, streetdramas etc by the leaders like Kiran Kamal from Bangalore, Mr. Bosco from Uganda.

H) Livestock

i. INFORMATION ON CATTLE, GOATS AND SHEEP OF THE VILLAGE

1. Cattle census : Attach livestock statistics of the village as available from the Panchayat veterinary officer or other sources (mention the sources) and year of statistics (include cattle, buffaloe, goat, sheep nos.)
2.Interview some families on cattle nos and fill the following tables

Name of cattle keepers	Cows breed	Bulls/bullocks breed	
Subash Yashwant, Kergao	5	2	
Rama Meenappa Atwekar	4	2	
Mingel Benith Siddi	2	5	
Narayan Chennegar	**10**	2	
Panduranga Kasalkar	**20**	6	

***Use extra sheets for writing if necessary**

ii. Interview some families on buffalo nos and fill the following table

Name of cattle keepers	Buffalo breed (female)	Total
Gangubai Venkappa Mirashi	1	1
Mingel Benith Siddi	1	1
	Buffalo breed (male)	
	Nil	

***Use extra sheets for writing if necessary**

iii. Interview some families and fill the table on Goats diversity

Names of persons	Goat breeds	Numbers
	Nil	

iii. Interview some families and fill the table on Sheep diversity

Name of persons	Sheep breeds	Numbers
	NA	

v. Details regarding Poultry farmers

Name of farmers	Chicken varieties	Numbers
	NA	

vi. Fodder availability

Names of cattle keepers interviewed	Grass & leaves produced in own farm/fields qty/day/month/yr	Grass purchased from outside qty	Straw available from own fields	Straw purchased from outside
Panduranga Shimanna	No	Nil	20 tractors/Yr	Nil
Angubai Venkappa	No	Nil	50 Tractor/Yr	Nil

vii. Do you sell grass and straw- if so answer the following

Names of farmer interviewed	Grass sold annually (qty)	Straw sold annually (qty)
Gangubai Venkappa	Nil	**30 tractors**

viii. The places from where straw/grass is purchased from outside (include in the study also small farmers and landless having cattle)

Names of cattle keeper interviewed	Places from where grass is purchased (villages & taluks)	Places from where straw is purchased (villages & taluks)
	NA	

ix. Milk production (include in the study small farmers and landless also; conduct as many interviews)

Names of milk producers interviewed	Average milk production/day (ltrs) (tick right figure)
Dondu Vaghu Patakcare	< 1 lit/ 1-2 / 2-4 / 4-8/ **8-16** √/ >16/
Lakku Vaghu Patalkare	< 1 lit/ 1-2 / 2-4 / 4-8/ **8-16** √/ >16/
Gangaram Vaghu Patalkare	< 1 lit/ 1-2 / 2-4 / **4-8** √/ 8-16 / >16/
Gangaram Jaanu Mishale	< 1 lit/ 1-2 / 2-4 / **4-8** √/ 8-16/ >16/
Malu Kakare	< 1 lit/ 1-2 / 2-4 / 4-8/ **8-16** √/ >16/

x. Milk processing/marketing (tick whatever is applicable)

Name of milk producers interviewed	Uses			
	Name of milk producers interviewed	Milk used for home	Milk sold to dairy	
	NO			

xi. Production of cattle dung

Name of cattle keeper	No. of cattle	Total no of baskets of dung/day
Narayan Thukkappa Chenengar	**12**	**6 baskets**
Panduranga	**26**	**12 baskets**
Mingel	**7**	**3 baskets**

xii. Uses of cattle dung (how much dung used daily for gobar gas)

Names of cattle keepers	Total dung used for own lands (in baskets/carts)	Total dung sold to others in baskets/carts	Do you have gobar gas plant (mention capacity)	Gobar gas for cooking (Y/N)	Gobar gas for lighting (Y/N)
Note: 2-3 nos Gobar gas palnt seen in Bommanahalli, but not in service as electricity and firewood availablility in the village is continuous.					

xiii. Problems faced by cattle keepers
(Write the names of persons interviewed and list their problems)

Panduranga Kasalkar: 5-8 cattle kills are noted in the village every year due to the Tiger attack.
Sayyed Darvez Minuddin: 8-10 buffaloes and cattle are being killed per year by the attack of tiger, also by Crocodile.

xiv. What are the needs/recommendations of cattle keepers regarding fodder, milk marketing, gobar gas etc. (Write names of persons interviewed and state their recommendations)

Bairappa Thimmanna Kasalkar:

- Fodder scarcity because of grazing competition in the forest also non-availability of sufficient grass.
- Stoppage of Kumri cultivation in the forest, no grass lands.

I)Honey production

i. Honey production from the forest

Name of persons interviewed	Names of honey bee types in the village	How much honey is collected in a year	Quantity of honey sold	Months of honey collection
		NIL		

***Use extra sheets for writing if necessary**

ii. Honey production by apiculture

Names of persons	No. of boxes	Annual production of honey	Qty sold
	NIL		

iii. List types of honey available in the village (soapnut honey, mango honey etc.) (List names of persons who provides the information)

NA

iv. What are the plants which are very useful for increasing honey production? (List names of persons who provides the information)

NA

v. What are your recommendations for increasing honey production in the village? (List names of persons who provides the recommendations)

NA

vi. List people who received training in honey production and processing? (add note on who gave training)

NA

vii. What are the medicinal uses of honey?

Cough, & cold, skin diseases
Blood purification
Throat infection
Wound healing etc.

8) ENERGY SOURCES

A) Availability and uses of plant fuel

Names of persons interviewed	No. of members in the family	Plant fuel used in kgs/day			
			Sources of fuel Agricultural waste used (specify type and qty)	Firewood/leaves from own land (specify type and qty)	Firewood/leaves from forest (specify type and qty)

B) Recommendations by plant fuel users
(Name some users and write their recommendations)

C) List names of Astra-ole/improved cook stoves (not gas stoves) users in the village

Names	Type of stove used	Advantages	Problems faced
	NI		

D) List names of people using solar lighting (try to get complete information on all users)

Names	Year of installation	Are you satisfied with the product	Problems faced
	NIL		

E) List names and addresses of people using solar water heaters
(try to get complete information on all users)

Names	Year of installation	Are you satisfied with the product	Problems faced
	NIL		

F) No. of families having cooking gas in the village (LPG)

G) Names and addresses of people using power from micro-hydel

NIL

9) KNOWLEDGEABLE INDIVIDUALS (people with traditional knowledge)
Note: Village may have several people having knowledge in herbal medicines (*naativaidyaru*), special
knowledge in agriculture, in preparation of bio-pesticides, grafting plants like mangoes, identification of plants and animals etc.

Name & address	Subject	Knowledge

Bairappa Thimmanna Kasalkar	**Nativaidya**	**Snake bite, Migrane, Fractures, Skin diseases**
Jivav Juje Souz	**Nativaidya**	**Piles, fractures, dog bite, snake bite, constipation, fever, jaundice, cough, kidney stone, diabetes, BP, skin diseases etc.**
Sayyad Darvez Mainuddin	**Farming**	**Organic farming, horticulturist**

***Use extra sheets for writing if necessary**

10) Details on artisans of the village

(give details of people in carpentry, blacksmiths, ornaments making, wood carving, stone carving, pot making, shoe making, making of idols such as Ganapati using soil etc.)

Name	**Sector (carpentry, wood carving etc.)**	**Remarks**
Maruthi Kammar	**Carpenters**	
Naguli Kammra	**Carpenters**	

***Use extra sheets for writing if necessary**

11) Details on fishing communities

Note: Interview five fishermen in the village

<table>
<tr><td colspan="2">Name</td><td>Mention the villages adjacent to his fishing grounds</td><td colspan="12">Mode of Fishing</td></tr>
<tr><td colspan="2" rowspan="2">Fishing area (√)</td><td rowspan="2"></td><td>Hook</td><td>Net</td><td colspan="2" rowspan="2">Trawler net</td><td colspan="2" rowspan="2">Purseiner net</td><td colspan="2" rowspan="2">Multi day trawler</td></tr>
<tr><td>√</td><td>√</td></tr>
<tr><td>Sea</td><td></td><td></td><td colspan="12">No of days of fishing (√)</td></tr>
<tr><td>Estuary</td><td></td><td>Month</td><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr>
<tr><td>River</td><td>√</td><td>No. of fishing days</td><td colspan="12" rowspan="2">Throughout the year, 180-200 days, Rs.2,000/-</td></tr>
<tr><td>Backwater</td><td>√</td><td>Avarage income/day</td></tr>
<tr><td>Pond</td><td></td><td></td><td colspan="12"></td></tr>
<tr><td>Others</td><td></td><td colspan="13">No. of family members depending on you</td></tr>
</table>

***Use extra sheets for writing if necessary**

12) DETAILS ON SACRED FORESTS OF THE VILLAGE

(provide details on natural areas of worship such as jatakabana, hulidevarakanu, chowdibana, kapribana etc. or others)

Name of the bana	**Name of the deity**	**Area (acres-gunta)**	**Ownership**	**Water sources in or near devarabana*(√)**

			Private/community/govt												
				J	F	M	A	M	J	J	A	S	O	N	D

Note: A sacred forest should have minimum five trees
***Water sources:** If water sources such as springs, streams, ponds, wells etc if any in or near the sacred groves

***Use extra sheets for writing if necessary**

13) MAKE A LIST SOME WILD PLANTS IN THE DEVARAKADU

	Name of the bana	plants
a)		
b)	NA	
c)		
d)		

***Use extra sheets for writing if necessary**

14) MAKE A LIST OF ANIMAL DIVERSITY OF DEVARAKADU

	Name of the bana	animals
a)		
b)	NA	
c)		
d)		

***Use extra sheets for writing if necessary**

15) VILLAGE STATISTICS (collect details from village accountant's office from *Adarshatakta*)– attach separate sheet

16) Village Map (**collect details from village accountant's office from *Adarshatakta***) – attach sheet

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MY VILLAGE SPECIALITY-SIDDI TRIBES

In the village Kegdal and Bommanahalli there are approximately 25 Siddi families.

A typical siddi at KEGDAL Village

I had visited Siddi famility in Kegdal & interviewed Mr.Emenual Jivav Souz and collected some information about their life style. As per him Siddi families migrated to India about 300 years back from Africa and were utilized as slaves by Portuguese and then by British. After undergoing repeated humiliation by English and Portuguese rulers, they found their way to Malenad area to live peacefully and privately. So, they settled in Yellapur, Joida, Haliyal taluks and villages like Bhagavathi, Ambikanagar, Kegdal, Bommanhalli and surrounding forest area. Those are hilly area and thick forest. During West coast Paper Mill, Dandeli construction period about 50 year back they were engaged in some hard manual work. They are mostly farmers cultivating in forest. They used to live with the help of forest product. Totally they depend on forest for their lively hood.

In their community literacy % is very less. He expressed his unhappiness regarding the co-operation, steps taken by the government for the improvement of their community. But, recently they are included in reservation (ST) group by the Government to extend possible help which is being appreciated by their community. But government has to take lot of measures to bring them to the main stream.

They have their own self help groups. Twice or thrice different NGO's visit them in the village to create awareness in the community by giving lot of information and suggestions regarding the education, life style improvement and different government schemes etc in a year. Here they give all the required information. Most important is that they follow up to see the improvement. Whereas government agencies give information but do not follow up. And the required facilities from government do not reach their community.

Mr. Juvav benith Siddi, Kegdal is well known Naativaidya and he treats verities of diseases with simple medicinal plant parts. It was amazing to hear from him that lot of serious diseases like diabetes, B.P. Ladies problem, wounds, Stomach ache, skin diseases,

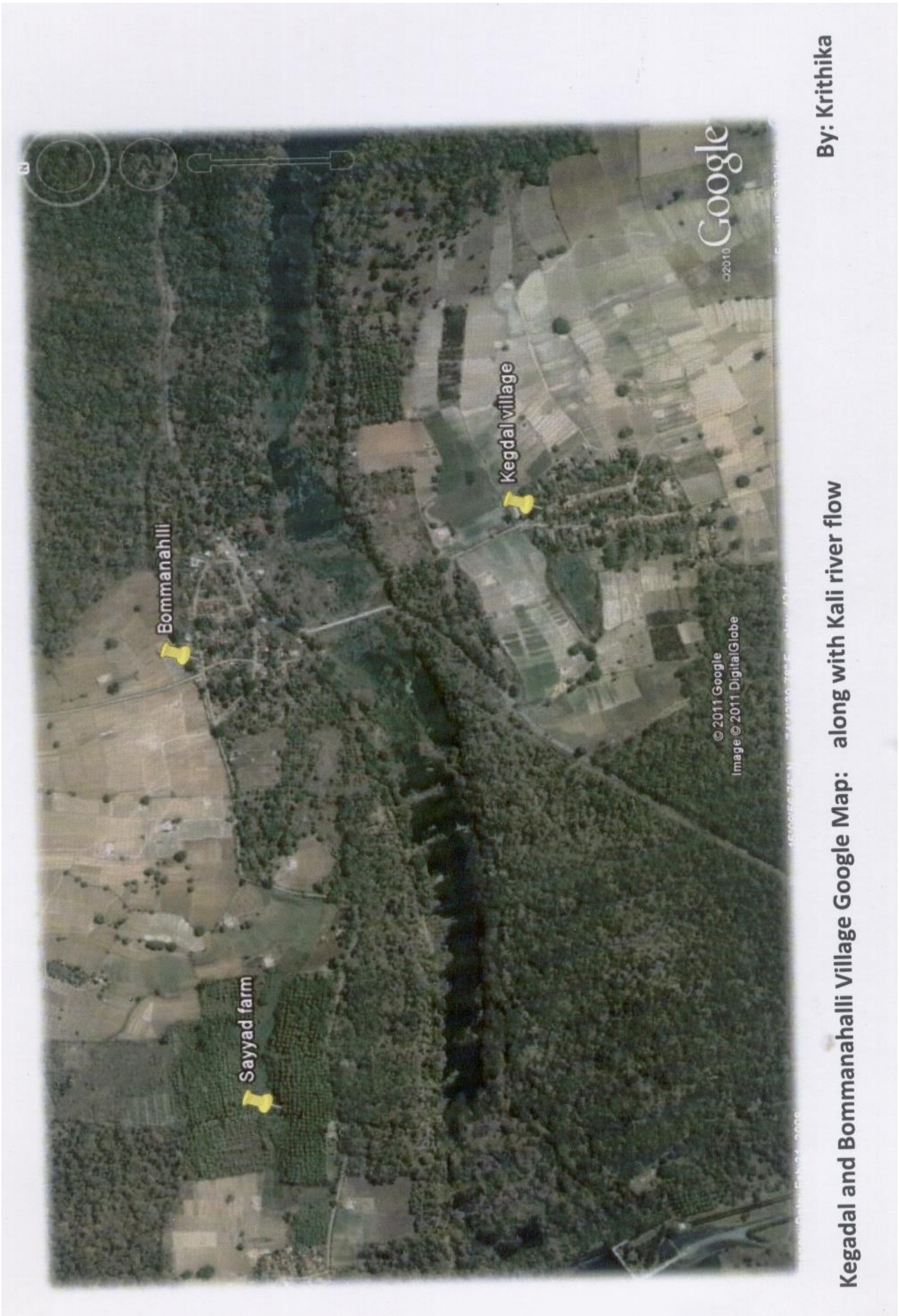
piles, jaundice, migraine, constipation and fever could be cured using simple herbs and shrubs. We have noted already some of the diseases and their treatment with plants and plant parts and treatment methods from him.

As they are physically strong, innocent and educationally backward, their strength is being misused for the illegal works in their vicinity. But they should be indulged in positive activities such as sports, body building and forest development activities also their knowledge of medicine can be utilized for the treatment.

Measures are to taken by the government as well as the public, who live with them, to bring them to the main stream and to make and feel as they are all one among us.

ADHRSHA THAKTE

Sl.No		KEGDAL	BOMMANAHALLI
1	Geographical area	727.49 hectares	1337.40 hectares
	Forest land	512.52 hectares	1217.66 hectares
	Beelu bhumi	105.62 hectares	28.82 hectares
	Agricultural land	101.32 hectares	84.87 hectares
	Non agricultural land	8 hectares	6 hectares
	Total families	182	186
	Total population	292	582
	Schedule caste		
	Male	Nil	12
	Female	Nil	6
	Schedule Tribe		
	Male	38	21
	Female	26	8
	Backward classes		
	Male	2	28
	Female	3	8
	General		
	Male	114	249
	Female	109	250



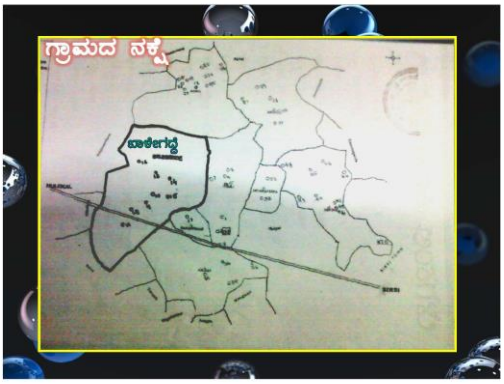
Kegadal and Bommanahalli Village Google Map: along with Kali river flow

By: Krithika

Kegdal -- Bommanahalli


ಭಾರತೀಯ ವಿಜ್ಞಾನ ಸಂಸ್ಥೆ, ಬೆಂಗಳೂರು
"ನಮ್ಮ ಗ್ರಾಮದ ಜೀವವೈವಿಧ್ಯತೆ"
ಗ್ರಾಮ : ಬಾಳೆಗದ್ದೆ
ಪಂಚಾಯತ್ : ಅಬಗಳಿ


LIONS ENGLISH HIGH SCHOOL
ಮುಖ್ಯಾಧ್ಯಾಪಕರು
ಶ್ರೀಮತಿ ಗೀತಾ ಹೆಗಡೆ
ಮಾರ್ಗದರ್ಶಿ ಶಿಕ್ಷಕರು
ಕು. ರಾಧಿಕಾ ದೀಕ್ಷಿತ್
ಯೋಜನಾ ವಿದ್ಯಾರ್ಥಿ
ಕು. ಮಧುಶ್ರೀ ಹೆಗಡೆ


ಗ್ರಾಮದ ನಕ್ಷೆ
ಬಾಳೆಗದ್ದೆ


ಜಲಧ್ಯಶ್ಯದ ಘಟಕ
ನದಿ:- ಕೆಂಗ್ರಹೊಳೆ
ಕೆರೆ :-
ಹೊಸ್ಮಗದ್ದೆ ಕೆರೆ – (ವಿ)00–08–00
ಕಡಕೊಡು ಕೆರೆ – (ವಿ)00–21–00

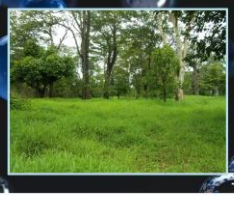
ಅರಣ್ಯ ವೈವಿಧ್ಯ

ಅರೆನಿತ್ಯ ಹರಿದ್ವರ್ಣ ಕಾಡುಗಳು

ಎಲೆ ಉದುರಿಸುವ ಕಾಡುಗಳು

ಹುಲ್ಲುಗಾವಲು / ಬೇಣ

ನೆಡುತೋಪುಗಳು



ಸಸ್ಯ ವೈವಿಧ್ಯಗಳು (ಔಷಧ ಸಸ್ಯಗಳು)

ಆಹಾರಕ್ಕೆ ಬಳಸುವ ಖಾದ್ಯ ಸಸ್ಯಗಳು

ಪಾತಿಹುಳ, ಮುರಗಲು, ಒಂದೆಲಗ, ಅಣಬೆ, ಹುಣಸೆಬಟ್ಟು ಇತ್ಯಾದಿ

ಕಾಡಿನ ಉತ್ಪನ್ನಗಳು

ಕಟ್ಟಿಗೆ, ಒಣ ಎಲೆ, ಅಣಲೆ ಕಾಯಿ, ಸೀಗೆ, ಲವಂಗದ ಎಲೆ ಹಾಗೂ ಅಟ್ಲಕಾಯಿ, ಉಪ್ಪಾಗೆ ಬೀಜ, ಜೇನುತುಪ್ಪ

ವಿರಳವಾಗಿರುವ ಮರಗಳು

ಸಾಲುಧೂಪ – ಕೆಂಗ್ರೆಕಾನು

ಸಂಪಿಗೆ – ಕೆಂಗ್ರೆಕಾನು

ಜೇನುಮರ – ಕೆಂಗ್ರೆಕಾನು ಮತ್ತು ಇಡ್ಲಳ್ಳಕಾನು

ಗುಳುಮಾವು – ಇಡ್ಲಳ್ಳಕಾನು

ದೇವದಾರು (ಕೆಂಪು ಹಾಗೂ ಬಿಳಿ) – ಇಡ್ಲಳ್ಳಕಾನು

ಹೊನ್ನೆಮರ – ಹೊನ್ನೆಗದ್ದೆ ಮತ್ತು ಇತರ ಸ್ಥಳಗಳಲ್ಲಿ

ಅಶೋಕಮರ – ಜೌಡಿಬನ (ಬಾಳೆಗದ್ದೆ) ಹಾಗೂ ಕೆಲವಡೆ ಅಪರೂಪ.

ಶ್ರೀಗಂದ – ಅಪರೂಪ

ಕೃಷಿ

ತೋಟದ ಬೆಳೆಗಳು

ಅಡಿಕೆ – ಸ್ಥಳಯ ತಳ – ಒಳ್ಳೆಯ ಇಳುವರಿ, ಬಹುವಾರ್ಷಿಕ ಬೆಳೆ.

ತೆಂಗು – ಸ್ಥಳಯ ತಳ – ತಿರುಳು ದಪ್ಪ, ದೊಡ್ಡಕಾಯಿ

ಬಾಳೆ – ಮಿಟ್ಲ – ಗಟ್ಟಿ ಹಾಗೂ ಸಿಹಿಯಾದ ಹಣ್ಣು.

ಬರಗಿ – ವಿಶಿಷ್ಟ ರುಚಿ – ದೊಡ್ಡ ಗಾತ್ರದ ಕಾಯಿ

ಬೂದು – ದೊಡ್ಡ ಗಾತ್ರದ ಕೊನೆ

ಕಾಳುಮೆಣಸು – ಫಣಿಯುರು – ಉದ್ದಕರೆ – ಕಾಳುತುಂಬಿರುತ್ತದೆ.

ಮಲ್ಲಸರ – ಧಪ್ಪನೆಯ ಕಾಳು.

ಯಾಲಕ್ಕಿ – ಸ್ಥಳಯ – ಹವಮಾನಕ್ಕೆ ಹೊಂದಿದೆ.

ಕೊಕೊ – ಎಫ್-1 – ಉತ್ತಮ ಇಳುವರಿ.

ಕಾಫಿ – ಕಾವೇರಿ ತಳ – ಕುಬ್ಜ ತಳ, ಉತ್ತಮ ಇಳುವರಿ.

ಗದ್ದೆ

ಭತ್ತ – ಸ್ಥಳೀಯ – ಭತ್ತ ಹಾಗೂ ಹುಲ್ಲು ಹೆಚ್ಚಿನ ಪ್ರಮಾಣದಲ್ಲಿ ದೊರಕುವಿಕೆ, ಸ್ಥಾನಿಕ ಪರಿಸರಕ್ಕೆ ಹೊಂದಿದೆ.

ಕೃಷಿ ಪದ್ಧತಿ

ಬಹುತೇಕವಾಗಿ ಎಲ್ಲರೂ ಸಾವಯವ ಕೃಷಿಯನ್ನೆ ಅವಲಂಬಿಸಿದ್ದಾರೆ.

ಅಡಿಕೆ – ಮೈಲುತುತ್ತ ಹಾಗೂ ಚಿಪ್ಪುಸುಣ್ಣ.

ಬೆಳೆಗಳ ಸಂರಕ್ಷಣಾ ವಿಧಾನ

ಭತ್ತ – 1) ಋಣಜ
2) ಕಣಜ

ಸಂರಕ್ಷಣಾ ವಿಧಾನ

ಬೇಳೆಕಾಳು – ಲಕ್ಷ್ಮಿಸೊಪ್ಪು, ಗೇರುಬೀಜ, ಅರಿಶಿಣ ಹಾಕಿಡುವುದು.

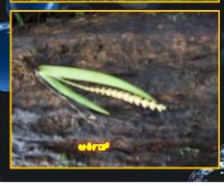
ಮಾವಿನಮಿಡಿ – ಉಪ್ಪು ಹಾಕಿಡುವುದು.

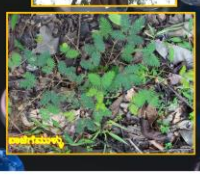
ಹಲಸಿನ ಸೊಳೆ – ಸೊಳೆಯ ಹಾಗೂ ಉಪ್ಪಿನ ಪದರ ಮಾಡಿಡುವುದು.

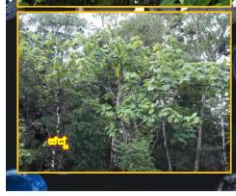
ಮಾವು – ಹುಲ್ಲನ್ನು ಮುಚ್ಚಿಡುವುದು.

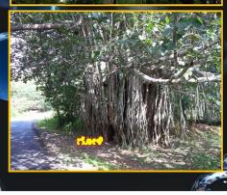
ಮನೆ ತೋಟದಲ್ಲಿ ಬೆಳೆಯುವ ತರಕಾರಿಗಳು

ಬೀನ್ಸ್, ಮೂಗೆಕಾಯಿ, ಸೌತೆ, ಬದನೆ, ಬೆಂಡೆ, ಕೂಂಡೆ, ಮೆಣಸು, ಬೇರುಹಲಸು, ಟೊಮೆಟೊ, ಮತ್ತಿ ಅವರೆ, ಹಾಲಗುಂಬಳಕಾಯಿ, ಗಜ್ಜರಿ, ಪಾಲಕ್‌ಸೊಪ್ಪು ಇತ್ಯಾದಿ.

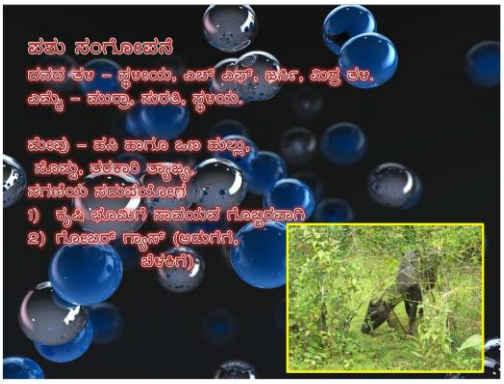







ಅಡಿಕೆ ಪರಂಗಿ
ಗೇರು
ಮಾವು
ಕಣಗಿಲು
ಮತ್ತಿ
ಮುರಗಲು
ಹಾರಿ
ಹಿಪ್ಪೆ
ಹುರಳಲು


ಮರಗಳ ಪಾಲಿ

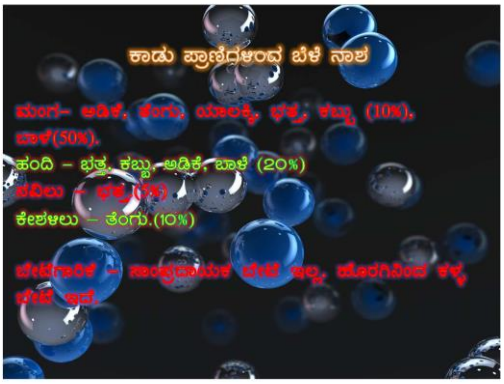

ಪಶು ಸಂಗೋಪನೆ
ದವದ ತಳಿ – ಸ್ಥಳೀಯ, ಎಚ್ ಎಫ್, ಜರ್ಸಿ, ಮಿಶ್ರ ತಳಿ.
ಎಮ್ಮೆ – ಮುರ್ರಾ, ಸುರತಿ, ಸ್ಥಳೀಯ.
ಹೊಲವು – ಹಸಿ ಹಾಗೂ ಒಣ ಹುಲ್ಲು,
ಹೊಟ್ಟು, ಕಳಪಾರಿ ಇತ್ಯಾದಿ.
ಜಗಚಿಯ ಸಮಪ್ರಯೋಗ
1) ಕೃಷಿ ಭೂಮಿಗೆ ಸಾವಯವ ಗೊಬ್ಬರವಾಗಿ
2) ಗೋಬರ್ ಗ್ಯಾಸ್ (ಅಡುಗೆಗೆ,
ಬೆಳಕಿಗೆ)


ಸಮಸ್ಯೆಗಳು
1) ಪಶು ಆಹಾರದ ಬೆಲೆ ಏರಿಕೆ
2) ಪಾರ್ಥೇನಿಯಮ್ ಕಳೆ
3) ಏಕಜಾತೀಯ ನೆಡುತೋಪು
4) ದನ ಮೇಯಿಸಲು ಜಾಗದ ಸಮಸ್ಯೆ
5) ವಿದೇಶಿ ತಳಿಗಳಿಗೆ ರೋಗ ಹಳ್ಳು
6) ಮೂಲ ಮಲನಾಡು ಗಿಡ್ಡ ತಳಿ ಇಲ್ಲವಾಗಿದೆ.
ಸಲಹೆಗಳು
1) ತಮ್ಮ ಸಾಮರ್ಥ್ಯಕ್ಕನುಗುಣವಾಗಿ ಸಾಕಬೇಕು.
2) ಉತ್ತಮವಾಗಿ ನೋಡಿಕೊಳ್ಳಬೇಕು.


ಜೇನು ಸಾಕಾಣಿಕೆ
ಹೆಸರು : ರಾಮಚಂದ್ರ ನಾರಾಯಣ ಹೆಗಡೆ, ಹೊಸ್ಮನೆ
ಜೇನು : ಹುಡುವಿ (3 ಪೆಟ್ಟಿಗೆ)
ಕಾರಣ : ಕೃಷಿ ಅನುಕೂಲತೆಗಾಗಿ ಪರಾಗ ಸ್ಪರ್ಶಕ್ಕೆ ಮಾತ್ರ.
ಆಹಾರ : ಹಾರಿ ಹೂವು, ಗುರ್ಗೆ, ಮತ್ತಿ, ಕೆಂಗು.
ಸಮಸ್ಯೆ : ಅಳಿಗಾಲದಲ್ಲಿ ಕಡಿ ಜೇನು ದಾಳಿಯಿಂದ ಹುಡುವಿ
ಜೇನಿನ ಸಂತತಿಗೆ ಹಾನಿ.


ಪ್ರಾಣಿ ವೈವಿಧ್ಯತೆ
ಸಸ್ತನಿ : ಚಿಗರೆ, ಮಂಗ, ಬೆಕ್ಕು, ಕೇಶಳಿಲು, ಕಡ.
ಮೀನು : ಗೊಜಳೆ, ಗಿಂಡ್ಲೆ, ಮುರಗೊಡು, ಕರ್ಪೆ.
ಸರಿಸೃಪ : ಗೋಸುಂಬೆ, ಉಡ, ದೊಳುಬುಕ್ರಿ, ಕೆರೆಹಾವು,
ನಾಗರಹಾವು ಇತ್ಯಾದಿ.
ಪಕ್ಷಿಗಳು – ಕಾಗೆ, ಗುಬ್ಬಿ, ಮುರಕುಟಿಕ, ಕೆಪ್ಪಕ್ಕಿ,
ಹಾರ್ನ್‌ಬಿಲ್, ಜುಟ್ಟಿದ ಹಕ್ಕಿ
Magpierobin
ಮಡಿವಾಳ ಹಕ್ಕಿ


ಕೆಡಬು / ಪೆಪ್ಪೆ – ತಿಗಣೆ, ಸೊಳ್ಳೆ, ನೊಣ, ಜಿಗಿಜಿರಲೆ,
ಮಿಂಚುಹುಳು, ದುಂಬಿ, ವರಟೆ, ಹುಲ್ಲುಸಾರಂಗ, ಪಾತರಗಿತ್ತಿ.
ದುಂಬಿ
Swallotail butterfly


ಕಾಡು ಪ್ರಾಣಿಗಳಿಂದ ಬೆಳೆ ನಾಶ
ಮಂಗ– ಅಡಿಕೆ, ತೆಂಗು, ಯಾಲಕ್ಕಿ, ಭತ್ತ, ಕಬ್ಬು (10%), ಬಾಳೆ(50%).
ಹಂದಿ – ಭತ್ತ, ಕಬ್ಬು, ಅಡಿಕೆ, ಬಾಳೆ (20%)
ಆನೆ – ಭತ್ತ (10%)
ಕೇಶಳಲು – ತೆಂಗು.(10%)
ಬೇಡ್ತಗಾರಿಕೆ – ಸಾಂಪ್ರದಾಯಿಕ ಬೇಟೆ ಇಲ್ಲ, ಹೊರಗಿನಿಂದ ಕಳ್ಳ ಬೇಟೆ ಇದೆ.


ದೇವರಬನ ಹಾಗೂ ಸ್ಥಾಂಪ್ರದಾಯಿಕ ಆಚರಣೆ
ಹುಲಿದೇವರ ಮಠ, ಹುಣಸೆಪಳ್ಳ
ನಾಗರ ಕಲ್ಲ ಹೊಸ್ಸ


ಜ್ಞಾನ ವೈವಿಧ್ಯ
ಶ್ರೀ ರಾಘವೇಂದ್ರ ಹೆಗಡೆ ಬಾಳೆಗದ್ದೆ,
ಕೃಷಿ ಸಂಬಂಧಿ ಸಂಶೋಧಕರು


ಶ್ರೀ ಮಾದೇವ ಶಿವು ಗೌಡ ಹುಣಸೆಪಳ್ಳ,
ನಾಟಿವೈದ್ಯ
ಶ್ರೀ ಗಣಪತಿ ರಾಮಕೃಷ್ಣ ಹೆಗಡೆ ಹೂನ್ಸೆಗದ್ದೆ,
ನಾಟಿವೈದ್ಯರು (ಸುಟ್ಟ ಗಾಯಕ್ಕೆ ಔಷಧ)


ಶ್ರೀ ಕಾಸಿಮ್ ಅದಂ ಸಾಬ ಹೊನ್ನಳ್ಳಿ,
ಕಲಾಯಿ, ಹಾಕುವುದು
ಶ್ರೀ ಶ್ರೀನಿವಾಸ ಪಟಗಾರ ಬಾಳೇಗದ್ದೆ,
ಕರಕುಶಲ ಕಲಾವಿದ


ಗ್ರಾಮದ ಶಾಲೆಗಳು


ಮಾಹಿತಿ ಸಂಗ್ರಹಣೆ


ಧನ್ಯವಾದಗಳು
ಭಾರತೀಯ ವಿಜ್ಞಾನ ಮಂದಿರ
ಇಟಗುಳಿ ಪಂಚಾಯತ್
ಬಾಳೆಗದ್ದೆ ಗ್ರಾಮದ ನಾಗರಿಕರು
ಕಂದಾಯ ಇಲಾಖೆ

ನಮ್ಮ ಗ್ರಾಮ ಜೀವ ವೈವಿಧ್ಯತೆ

ಗ್ರಾಮದ ಹೆಸರು	ಕಕ್ಕಳ್ಳಿ
ಪಂಚಾಯತ	ವಾನಳ್ಳಿ
ತಾಲೂಕ	ಸಿಸಿ
ಪಿನ್ ಕೋಡ್	೫೮೫೩೩೩೬
ಶಾಲೆಯ ವಿಳಾಸ	ಗ.ಮಾ.ಶಾಲೆ, ವಾನಳ್ಳಿ ತಾ:ಸಿರಸಿ, ಪೋ–ವಾನಳ್ಳಿ
ಹೆಸರು, ದಾರವಾಣಿ	ದಾರವಾಣಿ:೨೪೬೯೦೭
ವಿದ್ಯಾರ್ಥಿನಿಯ ಹೆಸರು	ಭಾಗ್ಯ.ನ.ಭಟ್, ಕಗ್ಗುಂಡಿ
ಉಸ್ತುವಾರಿ ಶಿಕ್ಷಕರು	ಕೆ.ವಿ.ಭಟ್(ಮುಖ್ಯೋಪಾಧ್ಯಾಯರು) ರಾಘವ್.ಅ.ಹೆಗಡೆ

ನಾನು ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡ ಗ್ರಾಮ:– ಕಕ್ಕಳ್ಳಿ(ಕಂದಾಯ ಗ್ರಾಮ)

ಗ್ರಾಮದ ಮಜರೆಗಳು:–

- **ಕಕ್ಕಳ್ಳಿ**
- **ಕಾನಬಾಗಿಲು(ಸಿದ್ಧೀಜನಾಂಗದ ಸ್ಥಳ)**
- **ಕಾನಮುಸ್ಕಿ**
- **ತೋಟಿಮನೆ**
- **ಮೇಲಿನಕೇರಿ**
- **ಅಜ್ಜೀಮನೆ**
- **ವೈದ್ಯರ ಮನೆ(ಹೊಸ್ಮನೆ)**
- **ಶಿರಸಗಾಂವ್**
- **ಕಕ್ಕಳ್ಳಿ ಮಠ**

ಒಟ್ಟೂ ೯ ಮಜರೆಗಳು

೧. ಅರಣ್ಯದ ವಿಧಗಳು:–

ಅರಣ್ಯದ ವಿಧಗಳು	ಇದೆ	ಇಲ್ಲ
ನಿತ್ಯ ಹರಿದ್ವರ್ಣ ಕಾಡು	√	
ಅರೆ ನಿತ್ಯ ಹರಿದ್ವರ್ಣ ಕಾಡು		√
ಎಲೆ ಉದುರುವ ಕಾಡು	√	
ಕುರುಚಲು ಸಸ್ಯಗಳು	√	
ಕಾಂಡ್ಲಾ ವನಗಳು		√
ಮರಗಳಿರುವ ಹುಲ್ಲು ಪ್ರದೇಶ	√	

೨. ಗ್ರಾಮದಲ್ಲಿನ ಭೂದೃಶ್ಯದ ಘಟಕಗಳು:–

ಭೂದೃಶ್ಯದ ಘಟಕಗಳು	ಇದೆ	ಇಲ್ಲ
ಹುಲ್ಲುಗಾವಲು/ಬೇಣಾ	√	

ಶಿಲಾವೃತ ಪ್ರದೇಶಗಳು	ಸ್ವರೂಪ
ಅ.ಮುಸ್ಕಿ	ಶಿಲೆಕಲ್ಲು
ಬ.ಶಿರಸಗಾಂವ್	ಶಿಲೆಕಲ್ಲು
ಕ.ಅಸ್ತಾಳ್	ಶಿಲೆಕಲ್ಲು

ಕಲ್ಲು ಕ್ವಾರಿಗಳ ಸಂಖ್ಯೆ:–೦೪ ತೆಗೆಯುವ ಕಲ್ಲಿನ ಸ್ಥಳೀಯ ಹೆಸರು:_ಚೀಪ್‌ಗಲ್ಲು(ಶಿಲೆಕಲ್ಲು)
ಮಣ್ಣಿನ ಕ್ವಾರಿಗಳ ಪ್ರದೇಶದ ಸಂಖ್ಯೆ:–ಇಲ್ಲ
ಮರಳಿನ ಕ್ವಾರಿಗಳು ಇವೆ.(ಬಿಳಿಹೊಳೆ,ಶೇಡಿಹೊಳೆ,ಪಟ್ಟಣದ ಹೊಳೆ) ಉಪಯೋಗ:–ಗೃಹ ನಿರ್ಮಾಣ, ಸಾರ್ವಜನಿಕ ಕಟ್ಟಡ, ಮೋರಿ ಇತ್ಯಾದಿ .
ಗಣಿಗಾರಿಕ ಪ್ರದೇಶಗಳು:– ಇಲ್ಲ.

೩. ಗ್ರಾಮದಲ್ಲಿನ ಜಲದೃಶ್ಯದ ಘಟಕಗಳು

ಜಲದೃಶ್ಯದ ಘಟಕಗಳು	ಜ	ಫೆ	ಮಾ	ಏ	ಮೇ	ಜೂ	ಜು	ಅ	ಸೆ	ಅ	ನ	ಖಿ
ನದಿಗಳು ಹೆಸರು:–ಬಿಳಿಹೊಳೆ	√	√	√	√	√	√	√	√	√	√	√	√
ಹಳ್ಳಗಳ ಹೆಸರುಗಳು :–ವರ್ಷವಿಡೀ ನೀರಿರುವ ಹಳ್ಳಗಳು) ೧.ಬಿಳಿಹಳ್ಳ ೨.ಮಠದ ಹಳ್ಳ ೩. ಮುಂಡಗೆ ಹಳ್ಳ												
ಶಾಶ್ವತ ಜರಿಗಳ ಹೆಸರುಗಳು:– ೧.ಜಟಕನ ಕೊಡ್ಲು ೨. ತೋಟಿಮನೆ ಕೋಡ್ಲು ೩. ಅಸ್ತಾಳ್ ಕೋಡ್ಲು												
ಜಲಪಾತಗಳ ಹೆಸರು:– ೧.ಮುಷ್ಕಿ ಫಾಲ್ಸ್ ೨. ಕಲ್ಲಾರೆ ಜಲಪಾತ ೩.ಸೂಸಬ್ಬಿ ಜಲಪಾತ												
ಆಣೆಕಟ್ಟುಗಳು:–ಇಲ್ಲ ಚೆಕ್ ಡ್ಯಾಂಗಳು:– ಇವೆ ೧. ಬಿಳಿ ಹೊಳೆಗ ೨. ಶೇಡಿಹೊಳೆಗೆ ಕಟ್ಟಲಾಗಿದೆ												
ಹಿನ್ನೀರಿನ ಪ್ರದೇಶಗಳ ಹೆಸರು:– ಇಲ್ಲ												
ಜೌಗು ಪ್ರದೇಶಗಳು: ತೋಟಿಮನೆ, ಗದ್ದೇಮನೆ,ಮೂಗಿನಮನೆ,ಹಣಗಾರ್,ಅಜ್ಜೀಮನೆ.												

ಹೆಸರು	ವಿಸ್ತೀರ್ಣ (ಎಕರೆ)	ಜ	ಫೆ	ಮಾ	ಏ	ಮೇ	ಜೂ	ಜು	ಅ	ಸೆ	ಅ	ನ	ಖಿ
ಭೀಮನ ಹೊಂಡ	೨೦ಗುಂಟೆ	√	√	√	√	√	√	√	√	√	√	√	√
ಸರ್ಕಾರೀಕೆರೆ	೧ಎಕರೆ	√	√	√	√	√	√	√	√	√	√	√	√
ಅಸ್ತಾಳ್ ಕೊಡ್ಲು	೩೦ಗುಂಟೆ	√	√	√	√	√	√	√	√	√	√	√	√
ಜಟಕನ ಕೊಡ್ಲು	೩೫ಗುಂಟೆ	√	√	√	√	√	√	√	√	√	√	√	√

೪. ಗ್ರಾಮದ ಸಸ್ಯ ವೈವಿಧ್ಯತೆ

ಅ. ೧. ಔಷಧಿ ಸಸ್ಯಗಳು – ಉಪಯೋಗಗಳು

ಸಸ್ಯದ ಹೆಸರು	ಲಭ್ಯತೆ			ಬಳಕೆಯ ಭಾಗ	ಉಪಯೋಗಗಳು
	ಹೆಚ್ಚು	ಮಧ್ಯಮ	ಕಡಿಮೆ		
ಎಲವರಿಗೆ	√			ಎಲೆ, ಬೇರು	• ಅರಿಶಿಣ ಕಾಂಮಾಲೆಗೆ • ರಜಸ್ವಲಾ ದೋಷಕ್ಕೆ
ಅರಿಶಿಣ	√			ಬೇರು	• ಕ್ರಿಮಿನಾಶಕ • ಸೌಂದರ್ಯವರ್ಧಕ
ಮದರಂಗಿ		√		ಎಲೆ	• ಕಾಮಾಲೆ ರೋಗಕ್ಕೆ
ಬಾಣಂತಿ ಹಸ್ತ			√	ಬೇರು	• ರಜಸ್ವಲಾ ದೋಷಕ್ಕೆ
ಕತ್ತಿದಾರೆ ಬಳ್ಳಿ			√	ಬೇರು	• ಹಸುಗಳ ಮೈಕೈ ನೋವಿಗೆ
ಶುಂಠಿ	√			ಬೇರು	• ಅಜೀರ್ಣಕ್ಕೆ
ಬಿಳಿ ದಾಸವಾಳ		√		ಹೂವು	• ಧಾತುನಷ್ಟಕ್ಕೆ
ಸದಾಪು			√	ಎಲೆ	• ಬಾಲಗ್ರಹ ನಿವಾರಣೆಗೆ
ದಾಸಪತ್ರೆ		√		ಎಲೆ	• ಬಿಳಿಕಲೆ ನಿವಾರಣೆಗೆ
ರೇಷ್ಮೆಗಿಡ			√	ಬೇರು	• ಧಾತು ನಷ್ಟಕ್ಕೆ
ಶತಾವರಿ	√			ಬೇರು	• ಮೂತ್ರಕೋಶದಲ್ಲಿನ ಕಲ್ಲು
ಸಂಭಾರ ಸೊಪ್ಪು	√			ಎಲೆ	• ಥಂಡಿ–ಕೆಮ್ಮಿಗೆ
ಅಂಬೆಕೊಂಬು	√			ಬೇರು	• ಹಾವಿನ ವಿಷನೀಗಲು
ಸರ್ಪಗಂಧಿ		√		ಬೇರು	• ಹಾವಿನ ವಿಷನೀಗಲು
ಲೋಳೆಸರ			√	ದಂಟು	• ಮೊಡವೆಗಳ ನಿವಾರಣೆಗೆ
ವಾಲ್ಸಸ್ಪೈಸಸ್			√	ಎಲೆ, ಬೇರು	• ಸಕ್ಕರೆ ಕಾಯಿಲೆಗೆ

೨. ಔಷಧಿ ಸಸ್ಯಗಳ ಮಾರಾಟ–ಸಂಗ್ರಹಣೆ

ನಮ್ಮೂರಿನಲ್ಲಿ ಔಷಧೀಯ ಸಸ್ಯಗಳನ್ನು ಮಾರಾಟ ಮಾಡಿ, ಹಣಗಳಿಸುವುದಿಲ್ಲ, ಬದಲಾಗಿ ಅನುವಂಶಿಕ ಪದ್ಧತಿಯ ಮೂಲಕ ಔಷಧೀಯ ಸಸ್ಯಗಳನ್ನು ಸೇವೆಯ ರೂಪದಲ್ಲಿ ನೀಡಲಾಗುತ್ತದೆ.

೩. ಕಾಡಿನಿಂದ ಜನರು ಪಡೆವ ಔಷಧೀಯ ಸಸ್ಯಸಗಳು

ಔಷಧಿ ಸಸ್ಯಗಳು	ಬೇಡಿಕೆ		
	ಹೆಚ್ಚು	ಮಧ್ಯಮ	ಕಡಿಮೆ
ಬಿಳಿಮತ್ತಿ		√	
ಆರಾರೂಟ್(ಕೋವೆಗಡ್ಡೆ)	√		
ಅತ್ತಿ		√	
ಕೊಡಸ	√		
ಶಿವಣೆ	√		
ಜಂತಾಳೆ	√		
ಕೆಂಪಿ ಬೇರು		√	
ನೆಲ್ಲಿಕಾಯಿ	√		
ಅಣಲೆ	√		
ತಾರೀಮರ	√		
ಅಶೋಕ			√
ಕೈರಾ			√
ಕಹಿಬೇವು			√
ಮುರುಗಲು	√		
ಕತ್ತಿದಾರೆ ಬಳ್ಳಿ			√
ಶತಾವರಿ	√		
ಬಾಣಂತಿ ಹಸ್ತ			√
ಕರಿಮುಳ್ಳೆ ಹಣ್ಣು	√		
ಕುಮುಸಲ		√	
ಬಲಗಣೆ		√	
ಸೋಮವಾರದ ಗಿಡ			√

೪. ಆಹಾರಕ್ಕಾಗಿ ಬಳಸುವ ವನ್ಯ ಸಸ್ಯಗಳು

ಸಸ್ಯಗಳು				ಬಳಕೆಯ ಭಾಗ	ಉಪಯೋಗಗಳು
	ಹೆಚ್ಚು	ಮಧ್ಯವು	ಕಡಿವೆು		
ಮರಕೆಸು		√		ಎಲೆ	• ಪಲ್ಯ,ಚಟ್ನಿ,ಪತ್ರವಡೆಗಳ ತಯಾರಿಕೆಗೆ
ಕಳಲೆ(ಬಿದಿರಿನ ಮೊಳಕೆ)	√			ಮೊಳಕೆ	• ಸಾಂಬಾರು,ಪಲ್ಯ,ಕರಿದ ತಿಂಡಿ ತಯಾರಿಕೆ
ಮುರುಗಲು ಹಣ್ಣು	√			ಹಣ್ಣು	• ಕೋಕಂ, ತಂಬಳಿ,ಸಾರು ತಯಾರಿಕೆಗೆ
ಉಪ್ಪಾಗೆ ಬೀಜ	√			ಬೀಜ	• ತುಪ್ಪ ತಯಾರಿಕೆಗೆ
ಅಂಡಿಗೆ		√		ಬೀಜ	• ತುಪ್ಪ ತಯಾರಿಕೆಗೆ
ದಾಲ್ಚಿನ್ನಿ		√		ಎಲೆ,ಮೊಗ್ಗೆ	• ಸಂಭಾರ ಪದಾರ್ಥಗಳ ತಯಾರಿಕೆಗೆ
ರಾಂಪತ್ರೆ	√			ಕಾಯಿಯ ಒಳಭಾಗ	• ಸಂಭಾರ ಪದಾರ್ಥಗಳ ತಯಾರಿಕೆಗೆ
ನೆಲ್ಲಿಕಾಯಿ	√			ಕಾಯಿ	• ತಂಬುಳಿ,ಚಟ್ನಿ,ಹಿಂಡಿ ತಯಾರಿಕೆಗೆ
ಹಲಸು	√			ಕಾಯಿ,ಹಣ್ಣು	• ಹಪ್ಪಳ,ಚಿಪ್ಸ್, ಪದಾರ್ಥಗಳ ತಯಾರಿಕೆಗೆ
ಅಪ್ಪೆಮರ	√			ಮಿಡಿ	• ಉಪ್ಪಿನಕಾಯಿ ತಯಾರಿಕೆಗೆ
ಮರಗೆಣಸು	√			ಕಾಯಿ	• ಅಡಿಗೆ ಪದಾರ್ಥಗಳಲ್ಲಿ ಬಳಸುತ್ತಾರೆ.

೩. ವನ್ಯ ಸಸ್ಯಗಳ ಆಹಾರೇತರ ಉಪಯೋಗಗಳು

ಸಸ್ಯಗಳು	ಲಭ್ಯತೆ			ಬಳಕೆಯ ಭಾಗ	ಉಪಯೋಗಗಳು
	ಹೆಚ್ಚು	ಮಧ್ಯಮ	ಕಡಿಮೆ		
ಮತ್ತಿ	√			ಕಾಂಡ,ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಹೊನ್ನೆ		√		ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಭರಣಗಿ	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಜಂಬಾ	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ನೇರಳೆ	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಸಾಗುವಾನಿ		√		ಕಾಂಡ	• ಕಟ್ಟಡ ನಿರ್ಮಾಣಕ್ಕೆ
ಹೊನಗಲು	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಬಿಲ್ಲಕಂಬಿ			√	ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಬೀಟೆ			√	ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಕೌಲು		√			• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು,

					ಗೊಬ್ಬರ
ಕಣಗಿಲು			√		• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಬಬ್ಬಿ	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ನಂದಿ	√			ಕಾಂಡ, ಸೊಪ್ಪು	• ಕಟ್ಟಡ ಸಾಮಗ್ರಿ, ಉರುವಲು, ಗೊಬ್ಬರ
ಹಾಯಿಗ		√		ಸೊಪ್ಪು	• ಉರುವಲು, ಗೊಬ್ಬರ
ಶಿವಣಿ		√		ಕಾಂಡ, ಸೊಪ್ಪು	• ಉರುವಲು, ಗೊಬ್ಬರ, ಕಟ್ಟಡ ನಿರ್ಮಾಣಕ್ಕೆ
ಮಸೆ		√		ಕಾಂಡ, ಸೊಪ್ಪು	• ಉರುವಲು, ಗೊಬ್ಬರ, ಕಟ್ಟಡ ನಿರ್ಮಾಣಕ್ಕೆ
ಕಾಸರಕಲು		√		ಕಾಂಡ, ಸೊಪ್ಪು	• ಉರುವಲು, ಗೊಬ್ಬರ

ಈ. ಗ್ರಾಮದಲ್ಲಿ ವಿರಳವಾಗಿರುವ ಮರಗಳು:–

ಸಸ್ಯಗಳು	ವಿರಳವಾಗಿರುವ ಸ್ಥಳಗಳು
ಬೀಟೆ	ಹುಲ್ಲುಗಾವಲು
ಹೊನ್ನೆ	ಬೇಣಾ, ಹುಲ್ಲುಗಾವಲು
ಆಲ	ದಟ್ಟ ಅರಣ್ಯ
ಅಶ್ವತ್ಥ	ದಟ್ಟ ಅರಣ್ಯ
ಕೈರಾ	ದಟ್ಟ ಅರಣ್ಯ
ಶಮೀಪತ್ರೆ	ದಟ್ಟ ಅರಣ್ಯ
ಬಿಲ್ವಪತ್ರೆ	ದಟ್ಟ ಅರಣ್ಯ
ಶ್ರೀಗಂಧ	ಹುಲ್ಲುಗಾವಲು
ಸಾಗುವಾನಿ	ಹುಲ್ಲುಗಾವಲು
ಹೆಬ್ಬಲಸು	ಹುಲ್ಲುಗಾವಲು
ವಾಟೆಮರ	ಬೇಣಾ, ಹುಲ್ಲುಗಾವಲು
ಬಿಳಿಮತ್ತಿ	ಗಾಂವ್‌ಟಾಣಾ, ಬೇಣಾ
ಶಿವನಿ	ಸೊಪ್ಪಿನ ಬೆಟ್ಟ

ಉ.ಗ್ರಾಮದ ರಸ್ತೆ ಬದಿಯಲ್ಲಿನ ಮರಗಳು

ಮರದ ಜಾತಿಗಳು	ಸಂಖ್ಯೆ
ಮಾವು	೮
ಹಲಸು	೬
ಚಳ್ಳೆ	೧೮
ಉಪ್ಪಾಗೆ	೫
ಮತ್ತಿ	೧೫
ಕೌಲು	೧೦
ಹೊನ್ನೆ	೦೪
ನೆಲ್ಲಿ	೩
ನೇರಳೆ	೫
ಆಲ	೧
ನಂದಿ	೬

ಊ. ಕಾಡಿನ ಉತ್ಪನ್ನಗಳು

೧.ಕಾಡಿನ ಉತ್ಪನ್ನಗಳನ್ನು ಸಂಗ್ರಹಿಸುವವರು:–

ಉತ್ಪನ್ನ ಸಂಗ್ರಹಿಸುವವರ ಹೆಸರು	ಉತ್ಪನ್ನದ ಹೆಸರು	ಬಳಕೆ(ಸ್ವಂತಕ್ಕಾಗಿ–ಮಾರಲು)
ಸುಬ್ರಾಯ ವೈದ್ಯ	ರಾಂಪತ್ರೆ	ಸ್ವಂತಕ್ಕಾಗಿ
ರಾಮಾ ನಾಗು ಸಿದ್ಧಿ	ಉಪ್ಪಾಗೆ	ಮಾರಲು
ರಾಮಚಂದ್ರ ಹೆಗಡೆ	ದಾಲ್ಚಿನ್ನಿ	ಸ್ವಂತಕ್ಕಾಗಿ
ಸತ್ಯಾ ಸುಬ್ಬಾ ಹೆಗಡೆ	ಮುರುಗಲು	ಮಾರಾಟಕ್ಕೆ
ಠೀಕ್ರು ರಾಮಾ ಮರಾಠಿ	ವಾಟೇಕಾಯಿ	ಮಾರಾಟಕ್ಕೆ
ಗಣಪತಿ ಶಿವು ನಾಯ್ಕ	ಅಣಲೆಕಾಯಿ	ಮಾರಾಟಕ್ಕೆ
ಶಂಕರ್.ನಾಗು ಸಿದ್ಧಿ	ನೆಲ್ಲಿಕಾಯಿ	ಮಾರಾಟಕ್ಕೆ
ಗಂಗಾಧರ.ಜೆಟ್ಟಾ.ಕುಣಬಿ	ಜೇನುತುಪ್ಪ	ಮಾರಾಟಕ್ಕೆ
ನಾರಾಯಣ.ಪುಜಾರಿ	ಉಪ್ಪಿನಕಾಯಿಮಿಡಿ	ಮಾರಾಟಕ್ಕೆ

೨.ಕಾಡಿನ ಉತ್ಪನ್ನಗಳಿಗೆ ಗುತ್ತಿಗೆ ನೀಡುತ್ತಾರೆಯೇ?

ಹೌದು. ನಮ್ಮೂರಿನಲ್ಲಿ ಕಾಡಿನ ಉತ್ಪನ್ನಗಳಿಗೆ ಗುತ್ತಿಗಯನ್ನು ನೀಡಲಾಗುತ್ತದೆ. ನೀಡುವ ಬೆಳೆಗಳೆಂದರೆ:– ಉಪ್ಪಾಗೆ, ಅಚಿಡಿ, ವಾಟೆಕಾಯಿ,ಮುರುಗಲು,ಜೇನುತುಪ್ಪದ ಸಂಗ್ರಹಣೆ, ರಾಂಪತ್ರೆ, ಅಣಲೆಕಾಯಿ, ದಾಲ್ಚಿನ್ನಿ ಇತ್ಯಾದಿ.

೩.ಕಾಡಿನ ಉತ್ಪನ್ನಗಳನ್ನು ಸಂಘ ಸಂಸ್ಥೆಗಳು ಸಂಗ್ರಹ ಮಾಡುತ್ತವೆಯೇ?

ಸಂಘ ಸಂಸ್ಥೆಗಳು	ಕಾಡಿನ ಉತ್ಪನ್ನ	ವಾರ್ಷಿಕ ಸಂಗ್ರಹಣೆ/ಆದಾಯ
ಗ್ರಾಮ ಅರಣ್ಯ ಸಮಿತಿ(ವಿಎಫ್‌ಸಿ)	ಉಪ್ಪಾಗೆ	೧೨೦೦೦೦೦ ರೂಪಾಯುಗಳು
ಸಹಕಾರಿ ಸಂಘಗಳು	ಉಪ್ಪಾಗೆ	೫೦೦೦೦೦ರೂಪಾಯಿಗಳು
ಅಧಿಕೃತ ಏಜೆಂಟರು	ಮುರುಗಲು	೧೦೦೦೦೦ರೂಪಾಯಿಗಳು
ಸ್ಥಳೀಯ ವ್ಯಾಪಾರಿಗಳು	ಉಪ್ಪಾಗೆ	೩೦೦೦೦೦ ರೂಪಾಯಿಗಳು
	ಮುರುಗಲು, ವಾಟೆಹುಳಿ	೧೦೦೦೦೦ ರೂಪಾಯಿಗಳು
	ರಾಂಪತ್ರೆ	೧೦೦೦೦೦ ರೂಪಾಯಿಗಳು

ಗ. ವ್ಯವಸಾಯ

ಗ್ರಾಮದಲ್ಲಿನ ಬೆಳೆಗಳು–ತಳಿಗಳು

ಬೆಳೆ	ತಳಿಯ ಹೆಸರು	ರೈತನ ಹೆಸರು	ಅಂದಾಜು ವಿಸ್ತೀರ್ಣ
ಭತ್ತ	ಇಂಟಾನ್	ಸುಬ್ರಾಯ ವೈದ್ಯ, ಕಕ್ಕಳ್ಳಿ	೪ಎಕರೆ ೫ಗುಂಟೆ
ಭತ್ತ	ಮುಳ್ಳರಿಯಾ	ಸುಬ್ರಾಯ.ಹೆಗಡೆ,ಗದ್ದೆಮನೆ	೨ಎಕರೆ ೩ಗುಂಟೆ
ಭತ್ತ	ಹೇಮಾವತಿ	ಎಮ್.ಎನ್.ಭಟ್,ತೋಟಿಮನೆ	೩ಎಕರೆ ೬ಗುಂಟೆ
ಭತ್ತ	ಆಲೂರುಸಣ್ಣ	ಕೃಷ್ಣ.ವೈದ್ಯ,ಹೊಸ್ಮನೆ	೨ಎಕರೆ ೧೫ಗುಂಟೆ
ಭತ್ತ	ಗೌರಿ	ವಿಶ್ವೇಶ್ವರ.ಭಟ್,ಕಕ್ಕಳ್ಳಿಮಠ	೧ಎಕರೆ ೮ಗುಂಟೆ
ಭತ್ತ	ಮಲ್ಲಿಗೆ	ಗಣಪತಿ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	೩ಎಕರೆ ೪ಗುಂಟೆ
ಭತ್ತ	ಕಣ್ಣೂರು	ಮಹಾದೇವ.ಹೆಗಡೆ,ಕಾನಮುಸ್ಕಿ	೨ಎಕರೆ ೩ಗುಂಟೆ
ಭತ್ತ	ಪದ್ಮರೇಖಾ	ದೇವರು.ಭಟ್,ಮೇಲಿನಕೇರಿ	೧ಎಕರೆ ೧೦ಗುಂಟೆ
ಭತ್ತ	ಕಾವೇರಿ	ಕೃಷ್ಣ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	೩ಎಕರೆ ೪ಗುಂಟೆ
ಭತ್ತ	ಸಾವಿರದ ಒಂದು	ಕೃಷ್ಣ.ಸುಬ್ಬಾ.ಗೌಡ	೧ಎಕರೆ ೨೦ಗುಂಟೆ
ಕಬ್ಬು	ಕೋಣನಕಟ್ಟೆ	ಶ್ರೀಪಾದ.ಭಟ್,ತೋಟಿಮನೆ	೨೦ಗುಂಟೆ
ಕಬ್ಬು	ದಾಸಕಬ್ಬು	ರಾಮಾ.ಸುಬ್ಬಾ.ಗೌಡ	೧೦ಗುಂಟೆ
ಕಬ್ಬು	ಬಿಳಿಕಬ್ಬು	ರಾಮಕೃಷ್ಣ.ಭಟ್,ಕಾನಮಸ್ಕಿ	೧೫ಗುಂಟೆ
ಕಬ್ಬು	ಮೋರೀಸ್	ಸೀತಾರಾಂ.ಹೆಗಡೆ,ಅಸ್ತಾಳ್	೧೨ಗುಂಟೆ
ಅಲಸಂದಿ	ನಾಟಿತಳಿ	ರಾಮಾ.ಗೌಡ	೩ಗುಂಟೆ
ಅಲಸಂದಿ	ನಾಟಿತಳಿ	ಕೃಷ್ಣಾ.ಸಿದ್ಧಿ	೫ಗುಂಟೆ
ಶೇಂಗಾ	ನಾಟಿತಳಿ	ನರಹರಿ.ಹೆಗಡೆ,ಕಾನಮುಸ್ಕಿ	೧೫ಗುಂಟೆ
ಉದ್ದು	ಐಒನ್	ಶ್ರೀಧರ.ವೈದ್ಯ,ಹೊಸ್ಮನೆ	೧೬ಗುಂಟೆ

೨.ವ್ಯವಸಾಯ ಬೆಳೆಗಳು–ವಿಶೇಷ ಗುಣಗಳು

ಬೆಳೆ	ತಳಿ	ರೈತನ ಹೆಸರು	ವಿಶೇಷತೆ
ಭತ್ತ	ಇಂಟಾನ್	ಸುಬ್ರಾಯ ವೈದ್ಯ, ಕಕ್ಕಳ್ಳಿ	ಇಳುವರಿ:–೧೩ರಿಂದ ೧೫ಕ್ವಿಂಟಲ್(ಎ).ಕೆಂಪು ಅಕ್ಕಿ,ಮೆದುಹುಲ್ಲು ೫ ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಮುಳ್ಳರಿಯಾ	ಸುಬ್ರಾಯ.ಹೆಗಡೆ,ಗದ್ದೆಮನೆ	ಇಳುವರಿ:–೧೦ರಿಂದ ೧೩ಕ್ವಿಂಟಲ್(ಎ) ಮಿಶ್ರ ಬಣ್ಣದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು, ೪ತಿಂಗಳು ಬೆಳೆ

ಭತ್ತ	ಹೇಮಾವತಿ	ಎಮ್.ಎನ್.ಭಟ್,ತೋಟಿಮನೆ	ಇಳುವರಿ:–೧೫ರಿಂದ ೧೭ಕ್ವಿಂಟಲ್(ಎ) ಬಿಳಿ ಬಣ್ಣದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು, ೪½ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಆಲೂರುಸಣ್ಣ	ಕೃಷ್ಣ.ವೈದ್ಯ,ಹೊಸ್ಮನೆ	ಇಳುವರಿ:–೧೨ರಿಂದ ೧೪ಕ್ವಿಂಟಲ್(ಎ) ಸಣ್ಣ ಕೆಂಪು ಬಣ್ಣದ ಅಕ್ಕಿ, ಮಧ್ಯಮ ಉದ್ದದಹುಲ್ಲು, ೪½ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಗೌರಿ	ವಿಶ್ವೇಶ್ವರ.ಭಟ್,ಕಕ್ಕಳ್ಳಿಮಠ	ಇಳುವರಿ:–೧೨ರಿಂದ ೧೩ಕ್ವಿಂಟಲ್(ಎ) ಕೆಂಪು ಬಣ್ಣದ ಅಕ್ಕಿ, ಮೃದುಹುಲ್ಲು ೪ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಮಲ್ಲಿಗೆ	ಗಣಪತಿ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	ಇಳುವರಿ:–೧೫ರಿಂದ ೧೭ಕ್ವಿಂಟಲ್(ಎ) ಬಿಳಿ ಬಣ್ಣದ ಉದ್ದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು ೪½ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಕಣ್ಣೂರು	ಮಹಾದೇವ.ಹೆಗಡೆ,ಕಾನಮುಸ್ಕಿ	ಇಳುವರಿ:–೧೦ರಿಂದ ೧೨ಕ್ವಿಂಟಲ್(ಎ) ಬಿಳಿ ಬಣ್ಣದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು ೩½ತಿಂಗಳು ಬೆಳೆ
ಭತ್ತ	ಪದ್ಮರೇಖಾ	ದೇವರು.ಭಟ್,ಮೇಲಿನಕೇರಿ	ಇಳುವರಿ:–೧೪ರಿಂದ ೧೫ಕ್ವಿಂಟಲ್(ಎ) ಕೆಂಪು ಮಿಶ್ರಿತ ಬಣ್ಣದ ಉದ್ದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು ೪ತಿಂಗಳು ಬೆಳೆ, ದಪ್ಪ ದಡಿ
ಭತ್ತ	ಕಾವೇರಿ	ಕೃಷ್ಣ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	ಇಳುವರಿ:–೧೫ರಿಂದ ೧೭ಕ್ವಿಂಟಲ್(ಎ) ಬಿಳಿ ಬಣ್ಣದ ಉದ್ದ ಅಕ್ಕಿ, ಉದ್ದಹುಲ್ಲು ೪ತಿಂಗಳು ಬೆಳೆ, ದಪ್ಪದಡಿ

೪. ವ್ಯವಸಾಯ ಉತ್ಪನ್ನಗಳ ಸಂರಕ್ಷಣಾ ವಿಧಾನ

ಆಹಾರಧಾನ್ಯ	ಸಂರಕ್ಷಣಾ ವಿಧಾನ/ಸಂಗ್ರಹಣಾ ವಿಧಾನ
ಅಕ್ಕಿ	ಹುಳ ಆಗದಂತೆ ಲಕ್ಕಿ ಸೊಪ್ಪು, ಬೆಳ್ಳುಳ್ಳಿ ಸಿಪ್ಪೆಗಳನ್ನು ಹಾಕುತ್ತಾರೆ. ಸಂಗ್ರಹಣೆ:–ಗೋಣಿಚೀಲಗಳಲ್ಲಿ.
ಅಕ್ಕಿ	ಸಂಗ್ರಹಣೆ:–ಒಣಹುಲ್ಲಿನಿಂದ ಮೂಡೆಯನ್ನು ಕಟ್ಟುವುದು.
ಭತ್ತ	ಬಣತದಲ್ಲಿ, ಬಿದಿರಿನ ಕಣಜದಗಳಲ್ಲಿ ಶೇಖರಿಸಿ ಇಡುವುದು.
ಭತ್ತ	ಸಂಗ್ರಹಣೆ:–ತಗಡಿನ ಕಣಜಗಳಲ್ಲಿ ಬಿದಿರಿನ ಕಣಜಗಳಲ್ಲಿ.

ಭತ್ತ, ದ್ವಿದಳ ಧಾನ್ಯಗಳು	ಸಂಗ್ರಹಣೆ:–ಮಣ್ಣಿನಿಂದ ನಿರ್ಮಿಸಿದ ಶೈತ್ಯಾಗರದಲ್ಲಿ
ಧವಸಧಾನ್ಯಗಳು	ಸಂಗ್ರಹಣೆ:–ಪ್ಲಾಸ್ಟಿಕ್ ಡ್ರಂ, ತಾಮ್ರದಹಂಡೆ. ಸಂರಕ್ಷಣೆ:–ಗೋಡಂಬಿಗಳನ್ನು ಹಾಕಿರುತ್ತಾರೆ.

೫. ವ್ಯವಸಾಯ ಮಾಡುವ ಮಾದರಿ ಕೃಷಿಕರು:–

ಮಾದರಿ ಕೃಷಿಕರ ಹೆಸರು	ಇವರು ಆದರ್ಶ ಕೃಷಿಕರಾಗಲು ಕಾರಣಗಳು:–
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ,ಗದ್ದೇಮನೆ	ಸಾವಯವ ಗೊಬ್ಬರ ಬಳಸಿ, ಅಡಿಕೆ, ಯಾಲಕ್ಕಿ, ಮೆಣಸಿನ ಬೆಳೆಯಲ್ಲಿ ಅಧಿಕ ಇಳುವರಿ ಪಡೆದಿದ್ದಾರೆ.
ಸುಬ್ರಾಯ.ವೈದ್ಯ,ಹಣಗಾರ	ಭತ್ತ ಮತ್ತು ಕಬ್ಬು ಬೆಳೆಯಲ್ಲಿ ಜೈವಿಕ ಗೊಬ್ಬರದಿಂದ ಅಧಿಕ ಇಳುವರಿ ಪಡೆದಿದ್ದಾರೆ.
ಸೀತಾರಾಮ್.ಹೆಗಡೆ,ಗದ್ದೇಹಳ್ಳಿ	ಸಾವಯವ ಗೊಬ್ಬರದಿಂದ ವೆನಿಲ್ಲಾ ಕೃಷಿಯನ್ನು ಯಶಸವಿಗೊಳಿಸಿದ್ದಾರೆ.
ಶ್ರೀಧರ.ಭಟ್,ಅಸ್ತಾಳ್	ಗೋಮೂತ್ರ ಬಳಸಿ ಕಾಳು ಮೆಣಸಿನ ಕಟ್ಟೆರೋಗ ನವಾರಣೆ ಮಾಡಿದ್ದಾರೆ.
ಗಣಪತಿ.ಭಟ್,ತೋಟಿಮನೆ	ಯಾಲಕ್ಕಿ ಬಳೆಯಲ್ಲಿ ಕುರಿಗೊಬ್ಬರ ಬಳಕೆಯಿನದ ಅಧಿಕ ಇಳುವರಿ ಪಡೆದಿದ್ದಾರೆ.
ಅನಂತ.ವೈದ್ಯ,ಹೊಸ್ಮನೆ.	ತೆಂಗುಬೆಳೆಯಲ್ಲಿ ನೈಸರ್ಗಿಕ ಗೊಬ್ಬರದಿಂದ ಅಧಿಕ ಉತ್ಪನ್ನ ಪಡೆದಿದ್ದಾರೆ.
ರಾಮಕೃಷ್ಣ.ಸುಬ್ರಾಯ.ಭಟ್ಟ,ಕಕ್ಕಳ್ಳಿ	ಮಗೆಕಾಯಿಯನ್ನು ಹೈವಿಕ ಗೊಬ್ಬರದಿಂದ ಉತ್ತಮ ರೀತಿಯಲ್ಲಿ ಬೆಳೆಯಲಾಗಿದೆ.

೬. ಬೀಜ ಚಿಕಿತ್ಸೆ:–

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆ	ಬೀಜಸಂಗ್ರಹಣೆ	ನಾಟಿಯ ಮುಂಚೆ ಬೀಜ ಚಿಕಿತ್ಸೆ	ಬೀಜ ಚಿಕಿತ್ಸೆಗೆ ಉಪಯೋಗಿಸುವ ವಸ್ತು
ಸುಬ್ರಾಯ.ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	ಭತ್ತ	ಬೇರೆ ಬೀಜ ಮಿಶ್ರವಾಗದೆ ಪ್ರತ್ಯೇಕ ಸಂಗ್ರಹ	೨ಳತಾಸು ಬೀಜ ನೆನೆಸಿ ಒಗ್ಗು ಹಾಕುವುದು	ಗೋಣೀ ಚೀಲ ಪ್ಲಾಸ್ಟಿಕ್ ಚೀಲ
ಶ್ರೀಪಾದ್.ಭಟ್,ತೋಟಿಮನೆ	ಕಬ್ಬು	ಕಬ್ಬಿನ ತಲೆಯ ಬಾಗ ಕತ್ತರಿಸಿ	೮ದಿನ ನೀರಿನಲ್ಲಿ ನೆನೆಸಿ, ಪೊರಕೆ	ಬಾಳೆ ಪಟ್ಟಿಯಲ್ಲಿ ಹೊರೆ ಕಟ್ಟಿ

		ಸಂಗ್ರಹ	ಸುಲಿದು ನೆಡುವುದು	ನೆರಳಲ್ಲಿ ಇಡುವುದು
ರಾಮ.ಗೌಡ	ಅಲಸಂದಿ	ಬೆಳೆದ ಸೋಡಿಗೆಯನ್ನೇ ಸಂಗ್ರಹಿಸುವಿಕೆ	೩ತಾಸು ನೆನೆಹಾಕಿ ರೈಜೋಬಿಯಂ ಜೀವಾಣುವಿನಿಂದ ಬೀಜೋಪಚಾರ	ಡಬ್ಬದಲ್ಲಿ ಸಂಗ್ರಹಿಸಿಡುವುದು
ಶೇಖರ್.ಹೆಗಡೆ	ಶೇಂಗಾ	ದಷ್ಟ ಪುಷ್ಟ ಬೀಜಗಳ ಆಯ್ಕೆ	೨ತಾಸು ನೆನೆಹಾಕಿ ಪಿಎಸ್‌ಬಿಯಿಂದ ಬೀಜೋಪಚಾರ	ಡಬ್ಬ ಮತ್ತು ಪ್ಲಾಸ್ಟಿಕ್ ಚೀಲ
ಶ್ರೀಧರ.ವೈದ್ಯ,ಹೊಸ್ಮನೆ	ಉದ್ದು	ಪ್ರತ್ಯೇಕ ಬೀಜ ಸಂಗ್ರಹಣೆ	ಪಿಎಸ್‌ಬಿಯಿಂದ, ಗೋಮುತ್ರದಿಂದ ಬೀಜೋಪಚಾರ	ಡಬ್ಬ ಮತ್ತು ಪ್ಲಾಸ್ಟಿಕ್ ಚೀಲ

ಹ.ತೋಟಗಾರಿಕೆ

ತೋಟಗಾರಿಕಾ ಬೆಳೆಗಳು–ತಳಿಗಳು

ಬೆಳೆ	ತಳಿಹೆಸರು	ರೈತನ ಹೆಸರು	ಅಂದಾಜು ವಿಸ್ತೀರ್ಣ
ಅಡಿಕೆ	ಸ್ಥಳೀಯ	ಅನಂತ.ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	೩ ಎಕರೆ ೨ಗುಂಟೆ
ತೆಂಗು	ಸ್ಥಳೀಯ	ಶ್ರೀಧರ.ಭಟ್, ಕಕ್ಕಳ್ಳಿಮಠ	೧ಎಕರೆ ೨೦ಗುಂಟೆ
ಕಾಳು ಮೆಣಸು	ಮಲ್ಲೀಸರ	ರಾಜೇಂದ್ರ.ಹೆಗಡೆ,ಮುಸ್ಕಿ	೨.೧೫.೦೦
ವೀಳ್ಯದೆಲೆ	ಕರಿನಾಗಬಳ್ಳಿ	ಗಣಪ.ಸುಬ್ಬಾ.ಗೌಡ	೦.೧೫.೦೦
ಮಾವು	ಕರಿಈಶಾಡು,ಮಲ್ಲಿಕಾ	ವೆಂಕಟ್ರಮಣ.ಃಎಗಡೆ,ಕೋಟಿಕೆರೂಪ್ಪ	೧.೦೦.೦೦
ಮಾವು	ಸಿಂಧು,ಬೆನೆಟ್	ಗಣಪತಿ.ಹೆಗಡೆ,ಕಾನಬಾಗಿಲು	೦.೩೦.೦

			೦
ಮಾವು	ರತ್ನಾಗಿರಿ,ಆಮ್ರಪಾಲಿ	ಕೃಷ್ಣ.ನಾಗು.ಸಿದ್ಧಿ	೦.೨೦.೦೦
ಹಲಸು	ಬಕ್ಕೆ	ಪುಟ್ಟಾ.ಗಣಪ.ಕುಣಬಿ	೦.೧೫.೦೦
ಹಲಸು	ಅಂಬ್ಲಿ	ಜೆಟ್ಟಾ.ರಾಮ.ಪೂಜಾರಿ	೦.೧೮.೦೦
ಬಾಳೆ	ಜಿ–೯, ಮಿಟಿಕ,ಕರಿಬಾಳೆ	ಕೃಷ್ಣ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	೩.೦೦.೦೦

ತೋಟಗಾರಿಕಾ ಬೆಳೆಗಳ ವಿಶೇಷ ಗುಣಗಳು

ಬೆಳೆ	ತಳಿಹೆಸರು	ರೈತನ ಹೆಸರು	ವಿಶೇಷ ಗುಣ
ಅಡಿಕೆ	ಸ್ಥಳೀಯ	ಅನಂತ.ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	• ಕವಳಕ್ಕೆ • ವೀಳ್ಯದೆಲೆಪಟ್ಟಿ • ಔಷಧಿಗೆ • ವಾಣಿಜ್ಯ ಬೆಳೆ
ತೆಂಗು	ಸ್ಥಳೀಯ	ಶ್ರೀಧರ.ಭಟ್, ಕಕ್ಕಳ್ಳಿಮಠ	• ಆಹಾರಕ್ಕಾಗಿ • ಎಣ್ಣೆಗಾಗಿ • ನಾರಿನಿಂದ ಕತ್ತದ ತಯಾರಿಕೆ
ಕಾಳು ಮೆಣಸು	ಮಲ್ಲೀಸರ	ರಾಜೇಂದ್ರ.ಹೆಗಡೆ,ಮುಸ್ಕಿ	• ಸಂಭಾರ ಪದಾರ್ಥ • ಔಷಧಿಗೆ • ವಾಣಿಜ್ಯ ಬೆಳೆ
ವೀಳ್ಯದೆಲೆ	ಕರಿನಾಗಬಳ್ಳಿ	ಗಣಪ.ಸುಬ್ಬಾ.ಗ್ಷಡ,ಕಕ್ಕಳ್ಳಿ	• ಸಾಂಪ್ರದಾಯಿಜ ಪೂಜಾವಿಧಾನ • ಕವಳಕ್ಕೆ • ತುಪ್ಪದ ಸಂಸ್ಕರೆಣೆಗೆ
ಮಾವು	ಮಲ್ಲಿಕಾ	ವೆಂಕಟ್ರಮಣ.ಃಎಗಡೆ,ಕೋಟಿಕೊಪ್ಪ	• ಆಹಾರ ಪದಾರ್ಥ • ಉಪ್ಪಿನಕಾಯಿಗೆ • ವಾಣಿಜ್ಯ

			ಬೆಳೆ,ಪಾನೀಯ
ಹಲಸು	ಬಕ್ಕೆ	ಪುಟ್ಟಾ.ಗಣಪ.ಕುಣಬಿ	• ಆಹಾರ ಪದಾರ್ಥ • ಕಡಬು,ಹಪ್ಪಳ,ಚಿಪ್ಸ್ ತಯಾರಿಕೆ • ಮಾರಾಟ ವಸ್ತು
ಬಾಳೆ	ಜಿ–೯, ಮಿಟಿಕ	ಕೃಷ್ಣ.ಹೆಗಡೆ,ಗಜ್ಜನಮನೆ	• ಆಹಾರ ಪದಾರ್ಥ • ಹಣ್ಣಿಗಾಗಿ,ಮನೆ ಬಳಕೆ • ಮಾರಾಟಕ್ಕಾಗಿ • ಊಟದ ಎಲೆಗಾಗಿ

ತೋಟಗಾರಿಕಾ ಉತ್ಪನ್ನಗಳ ಸಂಸ್ಕರಣಾ ವಿಧಾನ

ತೋಟಗಾರಿಕಾ ಉತ್ಪನ್ನ	ಸಂಗ್ರಹಣಾ,ಸಂಸ್ಕರಣಾ ವಿಧಾನ
ಅಡಿಕೆ	ಸಂಗ್ರಹಣೆ:–ಅಟ್ಟದ ನೆರಳಲ್ಲಿ ಸಂಗ್ರಹಿಸಿ ಚೀಲದಲದಲಿ ತುಂಬಿಡುವುದು ಸಂಸ್ಕರಣೆ:–ಸಿಪ್ಪೆ ಸುಲಿದು, ಬೇಯಿಸಿ, ೬–೭ ದಿನ ಬಿಸಿಲಿನಲ್ಲಿ ಒಣಗಿಸಿ, ಚೀಲ ತುಂಬುವುದು.
ತೆಂಗು	ಸಂಗ್ರಹಣೆ:–ಕೋಣೆಯಲ್ಲಿ ಸಂಗ್ರಹಿಸಿಡುವುದು ಸಂಸ್ಕರಣೆ:– ಸಿಪ್ಪೆ ಸುಲಿದು,ಕರಟದಿಂದ ಬೇರ್ಪಡಿಸಿ, ೪ಭಾಗ ಮಾಡಿ, ಬಿಸಿಲಿನಲ್ಲಿ ಒಣಗಿಸಿ, ಡಬ್ಬ, ಪ್ಲಾಸ್ಟಿಕ್ ಚೀಲದಲ್ಲಿಡುವುದು.
ಕಾಳು ಮೆಣಸು	ಸಂಗ್ರಹಣೆ:–ತಾಡಪತ್ರಯಲ್ಲಿ ಸಂಗ್ರಹಿಸುವುದು. ಸಂಸ್ಕರಣೆ:– ಕಾಳನ್ನು ಗುಂಜದಿಂದ ಬೇರ್ಪಡಿಸಿ ೫–೬ ಬಿಸಿಲಿನಲ್ಲಿ ಒಣಗಿಸಿ, ಗೋಣೀಚೀಲದಲ್ಲಿ ಪ್ಲಾಸ್ಟಿಕ್ ಇಟ್ಟು ಬೇರ್ಪಡಿಸುವುದು.
ಬಾಳೆ	ಸಂಗ್ರಹಣೆ:– ಕೊನೆಗಳನ್ನು ಕಡಿದು, ಬಾಳೆ ಎಲೆಗಳಲ್ಲಿ ಸಂಗ್ರಹಿಸಿಡುವುದು. ಸಂಸ್ಕರಣೆ:– ಡಬ್ಬದಲ್ಲಿ ಊದುಬತ್ತಿ ಹಚ್ಚಿಟ್ಟು ಹಣ್ಣನ್ನಾಗಿಸುವುದು.
ಏಲಕ್ಕಿ	ಸಂಗ್ರಹಣೆ:– ಬಕೇಟ್‌ನಲ್ಲಿ ಸಂಗ್ರಹ ಮಾಡಿ ಇಡುವುದು. ಸಂಸ್ಕರಣೆ:–ತಗಡಿನ ಮೇಲೆ ಬಿಸಿಲಿನಲ್ಲಿ ಒಣಗಿಸಿ, ತೊಟ್ಟು ಮುರಿದು, ಡಬ್ಬ ಮತ್ತು ಚೀಲದಲ್ಲಿಡುವುದು..

ತರಕಾರಿ ಬೆಳೆಸುವ ಕುಟುಂಬಗಳು

ಸಂದರ್ಶನ ಮಾಡಿದ ಕುಟುಂಬ	ತರಕಾರಿ ಬೆಳೆ ಇದೆ/ಇಲ್ಲ	ಬೆಳೆಯುವ ತರಕಾರಿಗಳು	ಇಲ್ಲದಿದ್ದಲ್ಲಿ ಮುಖ್ಯ ಕಾರಣ
ಗಣಪತಿ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	ಇದೆ	ಬದನೆ,ಹರಗೆ,ತೊಂಡೆ,ಗೋಳಿ,ಮಗೆ,ಸೌತೆ	
ಕೃಷ್ಣಾ.ಸಿದ್ಧಿ, ಕಾನಬಾಗಿಲು	ಇಲ್ಲ		ಸ್ಥಳದ ಅಭಾವ
ಪುಟ್ಟಾ.ನಾಗು.ಕುಣಬಿ,ಕಕ್ಕ	ಇದೆ	ಅಂಬೆಕೊಂಬು,ಶುಂಠಿ,ಮೂಲಂಗಿ,ನವಿಲುಕೆ	

ಳ್ಳಿ		ೂಲು	
ರಾಮಾ.ಪೂಜರಿ,ಗದ್ದೇವನೆ	ಇದೆ	ಹಾಗಲಕಾಯಿ,ಸೋಡಿಗೆ,ಅಂಗಿಕಸೆ	
ರಾಮಾ.ೀಕು,ಮರಾಠಿ,ಕಕ್ಕಳ್ಳಿ	ಇಲ್ಲ		ಕೀಟಗಳ ಭಾದೆ
ನರಹರಿ,ಭಟ್,ಕಾನಮುಸಿಕ	ಇದೆ	ಬದನೆ,ಹರಿಗೆ,ಮೂಲೋಗಿ,ನವಿಲಕೋಲು	
ಶಂಕರ್.ಸಿದ್ಧಿ, ಕಾನಬಾಗಿಲು	ಇದೆ	ಹಾಗಲಕಾಯಿ,ಮಗೇಕಾಯಿ,ಸೋಡಿಗೆ	
ನಾಗು.ಗೌಡ,ಕೋಟಿಕೊಪ್ಪ	ಇಲ್ಲಾ		ಪ್ರತಿಕೂಲ ಹವಾಗುಣ
ಅನಂತ.ಹೆಗಡೆ,ಗದ್ದೇಮನೆ	ಇದೆ	ಟೊಮೆಟೋ,ಸೌತೆಕಾಯಿ	
ಜೆಟ್ಟಾ.ಕುಣಬಿ	ಇಲ್ಲ		ವಿಪರೀತ ಸಸ್ಯ ರೋಗಗಳು

ಮಾದರಿ ತೋಟಗಾರರು

ತೋಟಗಾರರು	ಆದರ್ಶ ತೋಟಗಾರರಾಗಲು ಕಾರಣಗಳು
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ, ಗದ್ದೇಮನೆ	ಸಾವಯವ ಗೊಬ್ಬರ ಬಳಸಿ, ಅಧಿಕ ಇಳುವರಿ ಪಡೆದು ಆದರ್ಶ ತೋಟಗಾರರು ಎನಿಸಿದ್ದಾರೆ.
ಸುಬ್ರಾಯ.ವೈದ್ಯ,ಹಣಗಾರ್	ಜೀವಾಮೃತ,ಗೋಮೂತ್ರ, ಸಗಣಿ ಗಬ್ಬರ ಬಳಸಿ, ಅಡಿಕೆ ಬೆಳೆಯಲ್ಲಿ ಅಧಿಕ ಇಳುವರಿಯನ್ನು ಪಡೆಯಲು ಯಶಸ್ವಿಯಾಗಿದ್ದಾರೆ.
ದತ್ತತ್ರೇಯ,ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	ಜೈವಿಕ ಕೀಟನಾಶಕ, ಎರೆಹುಳು ಗೊಬ್ಬರ ತಯಾರಿಸಿ ಬಳಸಿಕೊಂಡು ತೋಟಗಾರಿಕೆ ವಿಧಾನದಲ್ಲಿ ಯಶಸ್ವಿ ರೈತರೆನಿಸಿದ್ದಾರೆ.
ಅನಂತ.ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	ಜೈವಿಕ–ರಾಸಾಯನಿಕ ಎರಡೂ ವಿಧಾನಗಳ ಮೂಲಕ ಭತ್ತ,ತಂಗು,ಕಬ್ಬು ಬಳೆಗಳನ್ನು ಬೆಳೆಯುತ್ತಾರೆ.

ಶಾಲಾ ಆವಾರದ ಹಣ್ಣಿನ ಮರಗಳು

ಹಣ್ಣಿನ ಮರದ ಹೆಸರು	ಸಂಖ್ಯೆ
ಮಾವಿನ ಮರ	೦೪–೦೫
ಹಲಸಿನಮರ	೦೫–೦೮
ನೇರಳೆ ಮರ	೦೩–೦೫
ಚಳ್ಳೆ ಮರ	೦೯–೧೨
ಕಾಫೀಗಿಡ	೦೮–೦೯
ಚಿಕ್ಕು	೦೩–೦೪
ಪೇರಲ	೦೮–೦೯
ಸೀತಾಫಲ	೦೩–೦೪

ಕಾಯಿ ಹಣ್ಣಾಗಿಸಲು ಬಳಸುವ ವಿಧಾನ

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆಗಳು	ಬಳಸುವ ವಿಧಾನಗಳು
ಕೃಷ್ಣ.ರಾ.ಭಟ್	ಬಾಳೆ	ಕೊನೆಯ ಮೇಲೆ ಸುಣ್ಣ ಉದುರಿಸುವುದು
ನಿಶಾಂತ್.ಹೆಗಡೆ	ಬಾಳೆ	ರತ್ನಗಂಟಿಗೆ ಅಥವಾ ಊದು ಬತ್ತಿಯನ್ನು ಡಬ್ಬದಲ್ಲಿ ಹಾಕಿಡುವುದು.
ದಿನೇಶ್.ಭಟ್	ಸೀತಾಫಲ	ಅಕ್ಕಿಯ ಹಂಡೆಯಲ್ಲಿ ಭದ್ರವಾಗಿ ಇಡುವುದು.
ರಾಮಾ.ಮರಾಠಿ	ಚಿಕ್ಕು	ಅಕ್ಕಿಯ ಹಂಡೆಯಲ್ಲಿ ಭದ್ರವಾಗಿ ಇಡುವುದು.
ಚರಣ್.ಪೂಜಾರಿ	ಬಾಳೆ	ಬಾಳೆ ಕೊನೆಯ ತುದಿಗೆ ರಾಸಾಯನಿಕ ಹಚ್ಚುವುದು
ಗಣಪಾ.ಸಿದ್ಧಿ	ಕಿತ್ತಳೆ	ಕಾಯಿಗಳನ್ನು ತಂದು ಹರವಿ ಇಡುವುದು.

ಹಣ್ಣುಗಳ ಸಂಗ್ರಹಣೆ–ಸಂಸ್ಕರಣೆ

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆಗಳು	ಸಂರಕ್ಷಣೆಸಂಸಂಸ್ಕರಣೆ	ಉಪಯೋಗ ಸ್ವಂತ/ಮಾರಾಟ
ಕೃಷ್ಣ.ರಾ.ಭಟ್	ಬಾಳೆ	ಕೊನೆಯನ್ನು	ಸ್ವಂತಕ್ಕೆ.ಮಾರಾಟ

		ಎತ್ತರದಲ್ಲಿ ಕಟ್ಟಿ ಇಡುವುದು	ಕ್ಕೆ
ನಿಶಾಂತ್.ಹೆಗಡೆ	ಸೀತಾಫಲ	ಅಕ್ಕಿಯ ಹಂಡೆಯಲ್ಲಿ ಹುಗಿಸಿಡುವುದು	ಸ್ವಂತಕ್ಕೆ
ದಿನೇಶ್.ಭಟ್	ಪೇರಲ	ಸರಿಯಾಗಿ ತಂದು ಭದ್ರವಾಗಿಡುವದು	ಸ್ವಂತಕ್ಕೆ
ರಾಮಾ.ಮರಾಠಿ	ಚಿಕ್ಕು	ಅಕ್ಕಿಯ ಹಂಡೆಯಲ್ಲಿ ಹುಗಿಸಿಡುವುದು	ಸ್ವಂತಕ್ಕೆ
ಚರಣ್.ಪೂಜಾರಿ	ಕಿತ್ತಳೆ	ಕಾಯಿ ತಂದು ಸರಿಯಾಗಿ ಹರಗಿ ಇಡುವುದು.	ಸ್ವಂತಕ್ಕೆ
ಗಣಪಾ.ಸಿದ್ಧಿ	ಅಂಜೂರ	ಸರಿಯಾಗಿ ತಂದು ಭದ್ರವಾಗಿಡುವದು	ಸ್ವಂತಕ್ಕೆ

ಮಾದರಿ ಫಾರ್ಮ್‌ಗಳು:–

ಮಾದರಿ ಫಾರ್ಮ್ ಹೊಂದಿದವರು	ಸೌಲಭ್ಯಗಳು															
	ಅ	ಆ	ಇ	ಈ	ಉ	ಊ	ಋ	ೠ	ಎ	ಏ	ಐ	ಒ	ಓ	ಔ	ಅಂ	ಅಃ
ಶಿವರಾಮ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	√		√	√	√		√			√						
ದೇವರು.ಹೆಗಡೆ,ಮೇಲಿನಕೇರಿ	√	√			√					√						
ಸುಬ್ರಾಯ.ವೈದ್ಯ,ಹಣಗಾರ್		√	√	√				√								
ಅನಂತ.ಹೆಗಡೆ, ಗದ್ದೇಮನೆ	√	√	√	√												
ಕೃಷ್ಣ.ನಾಗು.ಮರಾಠಿ,ಮುಸ್ಕಿ						√									√	
ಶಂಕರ್.ಸಿದ್ಧಿ, ಕಾನಬಾಗಿಲು						√										√
ಪ್ರದೀಪ್.ಹೆಗಡೆ,ಶಿರಗುಣಿ	√	√	√	√						√						
ಪುಟ್ಟಾ.ಶಿವು.ನಾಯ್ಕ,ಮುಸ್ಕಿ				√				√								

ಗ್ರಾಮ ಪರಿಸರ ನಿರ್ವಹಣೆ

ಗ್ರಾಮ ಪರಿಸರ ನಿರ್ವಹಣೆಯ ಘಟಕ	ಹೌದು	ಇಲ್ಲ
ನಮ್ಮ ಗ್ರಾಮದ ಅರಣ್ಯ ಸಮಿತಿ ಅಸ್ತಿತ್ವದಲ್ಲಿದೆ. ಚೆನ್ನಾಗಿ ಕಾರ್ಯನಿವಹಿಸುತ್ತಿದೆ.	√	
ಗ್ರಾಮದಲ್ಲಿ ಜೀವ ವೈವಿಧ್ಯತಾ ನಿರ್ವಹಣಾ ಸಮಿತಿ ಅಸ್ತಿತ್ವದಲ್ಲಿದೆ		√
ಪಂಚಾಯತ್‌ದಲ್ಲಿ ಜನವೈವಿಧ್ಯತಾ ದಾಖಿಲಾತಿ ಮಾಡಿದ್ದಾರೆ.	√	
ಪರಿಸರ ಜಾಗೃತಿ ಬಗ್ಗೆ ಕಳೆದೆರಡು ವರ್ಷಗಳಲ್ಲಿ ಸಭೆಯನ್ನು ಮಾಡಿದ್ದಾರೆಯೇ?	√	
ಗ್ರಾಮದಲ್ಲಿ ರೈತಸಂಘ ಅಸ್ತಿತ್ವದಲ್ಲಿದೆ.	√	
ರೈತಸಂಘವು ಕೃಷಿ ಸಮನ್ವಯ ಸಭೆಗಳನ್ನು ನಡೆಸುತ್ತಾರೆ.	√	

ಗ್ರಾಮದಲ್ಲಿರುವ ಜೈವಿಕ ಕೃಷಿಕರು:–

ಕೃಷಿಕನ ಹೆಸರು	ರಾಸಾಯನಿಕ ಬಳಸದೆ ಬೆಳೆಯುವ ಬೆಳೆ	ಉಪಯೋಗ ಸ್ವಂತ/ಮಾರಾಟ
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ, ಗದ್ದೇಮನೆ	ಭತ್ತ	ಸ್ವಂತ
ಸುಬ್ರಾಯ.ವೈದ್ಯ,ಹಣಗಾರ್	ಅಡಿಕೆ	ಮಾರಾಟ
ದತ್ತತ್ರೇಯ,ವೈದ್ಯ,ಕಕ್ಕಳ್ಳಿ	ಯಾಲಕ್ಕಿ	ಮಾರಾಟ
ನರಹರಿ,ಭಟ್,ಕಾನಮುಸ್ಕಿ	ಕಾಳುಮೆಣಸು	ಮಾರಾಟ
ರಾಮಾ.ಸಿದ್ಧಿ, ಕಾನಬಾಗಿಲು	ಬಾಳೆ	ಮಾರಾಟ
ಗಣಪತಿ.ಹೆಗಡೆ,ಕಕ್ಕಳ್ಳಿಮಠ	ಭತ್ತ	ಸ್ವಂತ
ಶಿವು.ನಾರಾಯಣ.ಪೂಜಾರಿ,ಮುಸ್ಕಿ	ತೆಂಗು	ಸ್ವಂತ

ಜೈವಿಕ ಕ್ರಿಮಿನಾಶಕ ಬಳಸುವವರು:–

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆಯ ಹೆಸರು	ರೋಗ ಕ್ರಿಮಿ	ಜೈವಿಕ ಕ್ರಿಮಿನಾಶಕದ ವಿವರಣೆ
ವಿಶ್ವೇಶ್ವರ.ಹೆಗಡೆ	ಭತ್ತ	ಬಿಳಿಕೊಳೆ	ರಮ್ಮನ ಸೊಪ್ಪಿನ ಕಷಾಯ
ನಾರಾಯಣ ಪೂಜಾರಿ	ಅಡಿಕೆ	ಕೊಳೆ ರೋಗ	ಬೋಡೋ೯ ಮಿಶ್ರಣ, ಬಯೋಫೈಟ್
ಹರೀಶ್.ಸಿದ್ಧಿ	ತೆಂಗು	ನುಷಿಪೀಡೆ	ಗೋಮುತ್ರ
ಗಣಪತಿ.ಭಟ್	ಏಲಕ್ಕಿ	ಸುಳಿಕೊಳೆರೋಗ, ಕಟ್ಟೆ	ತುತ್ತದ ನೀರು, ಕಾಸರಕನ ಸೊಪ್ಪಿನ ಕಷಾಯ
ಸ್ವಾಮಿ.ಕುಣಬಿ	ಕಾಳುಮೆಣಸು	ಕಟ್ಟೆರೋಗ	ಗೋಮುತ್ರ
ನರಹರಿ.ಭಟ್	ಬಾಳೆ	ಸುಳಿಕೊಳೆರೋಗ, ಕಟ್ಟೆರೋಗ	ಗೋಮುತ್ರ ಮತ್ತು ಜೀವಾಮೃತ

ಉಪಯೋಗಿಸುವ ಜೈವಿಕ ಕ್ರಿಮಿನಾಶಕಗಳು:–

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆಗಳು	ಜೈವಿಕ ಕ್ರಿಮಿನಾಶಕ ಸಿಂಪಡಣೆಯ ಕಾಲ	ಜೈವಿಕ ಕ್ರಿಮಿನಾಶಕಗಳ ತಯಾರಿಕಾ ವಿಧಾನ	ಖರ್ಚ ಪ್ರತೀ ಎಕರೆಗೆ
ನರಹರಿ.ಹೆಗದೆ	ಭತ್ತ	ಅಗಸ್ಟ್‌ದಿಂದ ಸೆಪ್ಟೆಂಬರ್	ರಮ್ಮನ ಸೊಪ್ಪಿನ ಕಷಾಯ	೧೫೦ರೂ
ಕೃಷ್ಣ.ಹೆಗಡೆ	ಅಡಿಕೆ	ಜೂನ್‌ದಿಂದ ಸೆಪ್ಟೆಂಬರ್	ಬೋಡೋ೯ಮಿಶ್ರಣ, ಬಯೋಫೈಟ್	೩೦೦೦ರೂ
ಸುಬ್ರಾಯ.ವೈದ್ಯ	ತೆಂಗು	ಜೂನ್‌ನಿಂದ ಸೆಪ್ಟೆಂಬರ್	ಗೋಮುತ್ರ	೧೫೦೦ರೂ
ಅನಂತ. ವೈದ್ಯ	ಎಲಕ್ಕಿ	ಜೂನ್‌ನಿಂದ ಸೆಪ್ಟೆಂಬರ್	ತುತ್ತದ ನೀರು, ರೋಗರ್	೮೦೦ರೂ
ೀಕ್ರು.ಮರಾಠಿ	ಕಾಳುಮೆಣಸು	ಜೂನ್‌ನಿಂದ ಸೆಪ್ಟೆಂಬರ್	ಬೋಡೋ೯ಮಿಶ್ರಣ, ಮೊನೋಪಾಸ್	೧೪೦೦ರೂ
ನಾಗು.ಗೌಡ	ಬಾಳೆ	ಜೂನ್‌ನಿಂದ ಫೆಬ್ರುವರಿ	ರೋಗರ್, ತಿಮೇಟ್‌ಗಳು	೧೮೦೦ರೂ

ಗೊಬ್ಬರಗಳ ಬಳಕೆ

ಕೃಷಿಕ	ಬೆಳೆ	ಉಪಯೋಗಿಸುವ ಗೊಬ್ಬರ	ಖರ್ಚು ಪ್ರತಿ ಎಕರೆಗೆ
ನರಹರಿ.ಹೆಗಡೆ	ಭತ್ತ	ದಡ್ಡಿ ಗೊಬ್ಬರ, ಹಸಿ ಸೊಪ್ಪು	೪೦೦೦ರೂ
ಕೃಷ್ಣ.ಹೆಗಡೆ	ಅಡಿಕೆ	ದಡ್ಡಿ ಗೊಬ್ಬರ, ಬೇರುಹುಳದ ಔಷಧಿ, ಸುಣ್ಣ	೮೦೦೦ರೂ
ಸುಬ್ರಾಯ.ವೈದ್ಯ	ತೆಂಗು	ದಡ್ಡಿ ಗೊಬ್ಬರ, ಕುರಿ ಗೊಬ್ಬರ	೮೦೦೦ರೂ
ಅನಂತ.ವೈದ್ಯ	ಎಲಕ್ಕಿ	ದಡ್ಡಿ ಗೊಬ್ಬರ, ಕೋಳಿ ಗೊಬ್ಬರ	೫೦೦೦ರೂ
ೀಕ್ರು.ಮರಾ೮	ಕಾಳುಮೆಣಸು	ದಡ್ಡಿಗೊಬ್ಬರ, ಬೇರು ಹುಳದ ಔಷಧಿ, ಸುಣ್ಣ	೩೦೦೦ರೂ
ನಾಗು.ಗೌಡ.	ಬಾಳೆ	ಸಗಣಿಗೊಬ್ಬರ, 'ಜೈಕಿಸಾನ್' ರಾಸಾಯನಿಕ	೨೫೦೦ರೂ

ಉಪಯೋಗಿಸುವ ರಾಸಾಯನಿಕ ಕೀಟನಾಶಕ–ಶಿಲೀಂಧ್ರನಾಶಕ

ಕೃಷಿಕನ ಹೆಸರು	ಬೆಳೆಗಳು	ಉಪಯೋಗಿಸುವ ಕೀಟ, ಶಿಲೀಂಧ್ರನಾಶಕ	ಖರ್ಚು ಪ್ರತಿ ಎಕರೆಗೆ
ನರಹರಿ.ಭಟ್	ಭತ್ತ	ರೋಗರ್, ಮೊನೋಫಾಸ್ ಕೀಟನಾಶಕ	೧೨೦೦ರೂ
ರಾಮಕೃಷ್ಣ.ಭಟ್	ಅಡಿಕೆ	ಬೋರ್ಡೋಮಿಶ್ರಣ ಬಯೋಫೈಟ್ ಶಿಲೀಂಧ್ರನಾಶಕ	೧೦೦೦ರೂ ೧೨೦೦ರೂ
ಸೀತಾರಂ.ಭಟ್	ತೆಂಗು	ಜೀವಾಮೃತ ಗೋಮೂತ್ರ ಶಿಲೀಂಧ್ರನಾಶಕ	೫೦೦ರೂ
ಕೃಷ್ಣ.ಪೂಜರಿ	ಎಲಕ್ಕಿ	ತುತ್ತದ ನೀರು ರೋಗರ್ ಕೀಟನಾಶಕ	೨೫೦ರೂ
ನಾಗು.ಗೌಡ	ಬಾಳೆ	ರೋಗರ್+ಜೀವಾಮೃತ ತಿಮೇಟ್‌ಗಳು	೧೮೦೦ರೂ

ಸಹಕಾರ

ಗ್ರಾಮದ ಸಹಕಾರ ಸಂಘಗಳು

ಸಹಕಾರಿ ಸಂಘದ ಹೆಸರು	ಕಾರ್ಯವಿಶೇಷ
ಮೆಣಸಿ ಸೇವಾ ಸಹಕಾರಿ ಸಂಘ, (ಮುಖ್ಯ ಕಛೇರಿ–ವಾನಳ್ಳಿ) ಮುಖ್ಯ ಶಾಖೆ:–ಕಕ್ಕಳ್ಳಿ ಶಾಖೆ:–ಜಡ್ಡಿಗದ್ದೆ	• ರೈತರ ಮಹಾಸೂಲು ಮಿಕ್ರಿ ಮತ್ತು ಸಾಲವಿತರಣೆ • ರೈತರಿಗೆ ರಸಗೊಬ್ಬರ, ಕಿರಾಣಿ, ಹಿಂಡಿ, ಅಕ್ಕಿ–ಬೇಳೆ, ಸ್ಟೇಷನರಿ ವಿತರಣೆ • ನ್ಯಾಯಬೆಲೆ ಅಂಗಡಿಯೂ ಆಗಿದೆ. • ನಮ್ಮ ಮೆಣಸಿ ಸೀಮೆಯ ಸಹಕಾರಿ ಸಂಘವು ಕಳೆದ ೫೪ ವರ್ಷಗಳಿಂದ ಸೇವೆ ಸಲ್ಲಿಸುತ್ತಿದ್ದು, ೨೫೦೦ ಸದಸ್ಯರಿರುತ್ತಾರೆ.
ಗ್ರಾಮ ಪಂಚಾಯತ್, ವಾನಳ್ಳಿ ಈ ಸಂಘವು ಕಕ್ಕಳ್ಳಿ, ಜಡ್ಡಿಗದ್ದೆ ಎಂಬಲ್ಲಿ ೨ ಶಾಖೆಗಳನ್ನು ನಡೆಸಿತ್ತದೆ. ಈ ಶಾಖೆಗಳಿಂದ ರೈತರಿಗೆ ಕಾಲಕಾಲಕ್ಕೆ ಅಕ್ಕಿ, ಗೊಬ್ಬರ ಮುಂತಾದ ಅಗತ್ಯ ವಸ್ಯಗಳನ್ನು ಪೈಪೋಟಿ ದರದಲ್ಲಿ ಪೂರೈಸುತ್ತದೆ. ಜೊತೆಗೆ ನ್ಯಾಯಬೆಲೆ ಅಂಗಡಿಯಿಂದ ರೇಷನ್ ವಿತರಣೆಯಾಗುತ್ತದೆ.	ನಮ್ಮ ಸಹಕಾರಿ ಸಂಘದ ಮೂಲಕ ೭೫೦೦ರಿಂದ ೮೦೦೦ಕ್ವಿಂಟಲ್ ಅಡಿಕೆ ವಿಕ್ರಯಿಸಲ್ಪಡುತ್ತದೆ. ಇದನ್ನು ಮನೆ ಬಾಗಿಲಿಗೆ ಹೋಗಿ ಮಾರುಕಟ್ಟೆಯಲ್ಲಿ ವಿಕ್ರಯಿಸಲು ೨ ಸುಸಜ್ಜಿತ ವಾಹನಗಳಿವೆ. ಇಲ್ಲಿಂದ ೧೯ರಿಂದ ೨೦ಕೋಟಿ ಸಾಲ ಬಿಡುಗಡೆಯಾಗುತ್ತದೆ.

ವಾರ್ಷಿಕ ವಸೂಲಾತಿ:–೯೬% ರಿಂದ ೯೭%

ಗ್ರಾಮದ ಸ್ವ ಸಹಾಯ ಸಂಘಗಳು–ಸ್ತ್ರೀ ಶಕ್ತಿ ಸಂಘಗಳು

ಸ್ವ ಸಹಾಯ ಸಂಘದ ಹೆಸರು	ಕಾರ್ಯವಿಶೇಷತೆ
ಕಮಲನಾಥೇಶ್ವರ ಧರ್ಮಸ್ಥಳ ಸಂಘ	• ಸಂಘದ ಫಲಾನುಭವಿಗಳಿಗೆ ಸಾಲವಿತರಣೆ • ವಾರಕ್ಕೊಂದು ದಿನ ಸಂಘದ ಸದಸ್ಯರಲ್ಲೊಬ್ಬರ ಮನೆಯಲ್ಲಿ ಕೃಷಿ ಕೆಲಸ ಮಾಡುವುದು • ಶಾಲಾ ಆವಾರ, ಆಸ್ಪತ್ರೆ ಆವಾರಗಳಲ್ಲಿ ಶ್ರಮಾದಾನ • ಮದುವೆ–ಮುಂಜಿಯಂತಹ ಕಾರ್ಯಕ್ರಮಗಳಲ್ಲಿ ಚಪ್ಪರ ಮುಂತಾದ ತಯಾರಿ ನಡೆಸುವುದು.
ಲಕ್ಷ್ಮೀನರಸಿಂಹ ಧರ್ಮಸ್ಥಳ ಸಂಘ	
ವಕ್ಕಲಿಗರ ಧರ್ಮಸ್ಥಳ ಸಂಘ	
ಸಿದ್ಧಿ ಜನಾಂಗ ಧರ್ಮಸ್ಥಳ ಸಂಘ	
ಶ್ರೀಲಕ್ಷ್ಮೀ ಸ್ತ್ರೀಶಕ್ತಿ ಸಂಘ	• ಗ್ರಾಮದಲ್ಲಿನ ಅಶಕ್ತ, ಶೋಷಿತ, ನೊಂದ ಮತ್ತು ನಿರುದ್ಯೋಗಿ ಸದಸ್ಯರಿಗೆ ಸ್ವಾವಲಂಬಿ ಜೀವನ ನಡೆಸಲು ಸಾಲ ವಿತರಣೆ ಜೊತೆಗೆ ಜೀವನ ಮಾರ್ಗದರ್ಶನ
ಕಾಮಧೇನು ಸ್ತ್ರೀಶಕ್ತಿ ಸಂಘ	

ಸಮೂಹ ಆರೋಗ್ಯ

ವ್ಯಕ್ತಿಯ ಹೆಸರು	ಆರೋಗ್ಯ ಸಮಸ್ಯೆ	ಉಪಚಾರ
ಕೃಷ್ಣಾ.ಸಿದ್ಧಿ	ತದ್ದು, ಚರ್ಮರೋಗ	ವಿವಿಧ ಗಿಡಮೂಲಿಕೆಗಳ ಚೂರ್ಣಗಳ ಮೂಲಕ
ದೇವರು.ಹೆಗಡೆ	ಕೆಮ್ಮು	ವಿವಿಧ ಮಾತ್ರೆ, ಔಷಧೀಯ ಮೂಲಿಕೆಗಳಿಂದ
ನಾರಾಯಣ.ಗೌಡ	ಮೂತ್ರಕೋಶದಲ್ಲಿ ಕಲ್ಲು	'ಶತಾವರಿ' ಗಿಡಮೂಲಿಕೆಯ ಸಹಾಯದಿಂದ
ಜೆಟ್ಟಾ.ಕುಣಬಿ	ತಲೆನೋವು	ಅಡಿಕೆತೇಯ್ದು ಹಚ್ಚುವ ಮೂಲಕ, ಪ್ರಾಣಾಯಾಮದಿಂದ

ರಾಜು.ಭಟ್	ಜ್ವರ	ತಲೆಗೆ ತಣ್ಣೀರಿನ ಪಟ್ಟಿ ಹಾಕುವುದು, ಪೆರಸಿತಮೊಲ ಗುಳಿಗೆ
ಸಂದೀಪ್.ನಾಯ್ಕ	ಕೆಪ್ಪಟ್ಟು	ಕಡದ ಕೋಡನ್ನು ತೇಯ್ದು ಹಚ್ಚುವ ಮೂಲಕ
ಶಿವು.ಸಿದ್ಧಿ	ಸಿಡುಬು	ಬೇಸಾಳ ಸೊಪ್ಪನ್ನು ಹಚ್ಚುವ ಮೂಲಕ
ಶೋಭಾ.ಗೌಡ	ಕಾಂಬ್ಳೆ	ಬಿಳಿಜಾಜಿಸೊಪ್ಪು,ಎಲವರಿಗೆ ಪದಾರ್ಥ ತಯಾರಿಕೆ ಸೇವನೆ.
ಯಮುನಾ.ಸಿದ್ಧಿ	ಹೊಟ್ಟೆನೋವು	ಜೀರಿಗೆ ಕಷಾಯ ತಯಾರಿಸಿ ಸೇವಿಸಬೇಕು.

ಗ್ರಾಮದ ಪ್ರಾಣಿವೈವಿಧ್ಯತೆ

ಸಸ್ತನಿಗಳು	ಪ್ರಮಾಣ			ಸಂಖ್ಯೆ		
	ಹೆಚ್ಚು	ಕಡಿಮೆ	ಮಧ್ಯಮ	ಹೆಚ್ಚುತ್ತಿದೆ	ಕಡಿಮೆಯಾಗುತ್ತಿದೆ	ವ್ಯತ್ಯಾಸವಿಲ್ಲ
ಮಂಗ	√					√
ಜಿಂಕೆ			√		√	
ಮೊಲ	√			√		
ಹಂದಿ	√					√
ಅಳಿಲು	√					√
ಬಾವಲಿ		√			√	
ಪಕ್ಷಿಗಳು						
ನವಿಲು	√			√		
ಗಿಳಿ		√			√	
ಪಾರಿವಾಳ	√					√
ಗುಬ್ಬಿ		√			√	
ಗೂಬೆ		√				√
ಕಂಬೂತ			√			√
ಸರೀಸೃಪಗಳು						
ಬಸವನಹುಳು	√			√		
ಆಮೆ		√			√	

ಹಾವು			√			√
ಎರೆಹುಳು	√			√		
ಸಹಸ್ರಪದಿ		√				√
ಮೀನುಗಳು						
ಬಾಳೆಮೀನು	√					√
ಔಲ್‌ಮೀನು		√			√	
ಕೋರೆಮೀನು		√			√	
ಕರಿಮೀನು			√			√
ಬಾಲದಮೀನು		√			√	
ಮುರುಗೋಡುಮೀನು	√			√		
ಕೀಟಗಳು						
ಸೊಳ್ಳೆ	√			√		
ನೊಣ	√			√		
ಚಿಟ್ಟೆ			√			√
ಮಿಡತೆ		√			√	
ಗೆದ್ದಲು	√			√		
ಇರುವೆ	√			√		
ಇತರೆ ಜೀವಿಗಳು						
ಕಪ್ಪೆ	√			√		
ಏಡಿ	√			√		
ಮುಳ್ಳುಹಂದಿ		√			√	
ಮುಳ್ಳಕ್ಕಿ	√			√		
ಜಿರಲೆ	√			√		
ತಿಗಣೆ		√			√	
ಜೇಡ	√			√		

ಕಾಡು ಪ್ರಾಣಿಗಳ ಬಗ್ಗೆ ಇರುವ ಜ್ಞಾನ

ವ್ಯಕ್ತಿಯ ಹೆಸರು	ಪ್ರಾಣಿಯ ಹೆಸರು	ಇರುವ ಕಾಲ ಮಾಸ/ತಿಂಗಳು	ವಾಸವಿರುವ ಪ್ರದೇಶ	ಸಂಖ್ಯೆ		
				ಕಡಿಮೆ	ಸಾಧಾರಣ	ಹೆಚ್ಚು
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ	ಮೊಲ	ಬೇಸಿಗೆ	ಹುಲ್ಲುಗಾವಲು, ಕಿರಿಜಾಡು		√	
ರಾಮಚಂದ್ರ.ಹೆಗಡೆ	ಜಿಂಕೆ	ಮಳೆಗಾಲ	ಅರಣ್ಯ	√		
ಕೃಷ್ಣಾ.ಸಿದ್ಧಿ	ಗಮಯ	ಸದಾಕಾಲ	ಅರಣ್ಯ			√
ೀಕ್ರು.ಮರಾಠಿ	ಮುಳ್ಳಕ್ಕಿ	ಸದಾಕಾಲ	ಅರಣ್ಯ			√
ಕೃಷ್ಣ.ಮರಾಠಿ	ನರಿ	ಚಳಿಗಾಲ	ಅರಣ್ಯ		√	
ಜೆಟ್ಟಾ.ಕುಣಬಿ	ಕಡ	ಸದಾಕಾಲ	ಅರಣ್ಯ			√
ನಾಗು.ಗೌಡ	ಮಂಗ	ಸದಾಕಾಲ	ಅರಣ್ಯ			√

ಕಾಡು ಪ್ರಾಣಿಗಳಿಂದ ಬೆಳೆನಾಶ

ರೈತನ ಹೆಸರು	ಬೆಳೆನಾಶ ಮಾಡುವ ಕಾ.ಪ್ರಾ	ಬೆಳೆಯುವ ಹೆಸರು	ನಾಶದ ಪ್ರಮಾಣ
ನರಹರಿ.ಭಟ್	ಮುಳ್ಳಕ್ಕಿ	ತೆಂಗು	ಅಧಿಕ
ವಿಶ್ವೇಶ್ವರ.ಹೆಗಡೆ	ಮೊಲ	ಮಗೆಕಾಯಿ	ಅಧಿಕ
ರಾಮಕೃಷ್ಣ.ಭಟ್	ಇಣಚಿ	ತೆಂಗು	ಮದ್ಯಮ
ಗಣಪತಿ.ಭಟ್	ಮಂಗ	ಅಡಿಕೆ	ಅಧಿಕ
ನಾರಾಯಣ.ಪೂಜಾರಿ	ಹಂದಿ	ಕಬ್ಬು	ಮದ್ಯಮ
ದೇವಾ.ಗೌಡ	ಗಮಯಾ	ಮಗೆಸಸ್ಯ	ಅಧಿಕ
ಗಣಪತಿ.ಭಟ್	ನರಿ	ಕಬ್ಬು	ಕಡಿಮೆ
ಗಣಪಾ.ಸಿದ್ಧಿ	ಜಿಂಕೆ	ಸನ್ನೆಂಪು,ಹುರುಳಿ	ಕಡಿಮೆ

ಕಾಡು ಪ್ರಾಣಿಗಳಿಂದ ಗ್ರಾಮಸ್ಥರ ಮೇಲೆ ಹಲ್ಲೆ

ಹಲ್ಲೆಗೊಳಗಾದ ರೈತರು, ಪ್ರಾಣಿಗಳ ಸಂಖ್ಯೆ	ಕಾಡುಪ್ರಾಣಿ ಹೆಸರು
ರೈತರು ೦೨,	ಕರಡಿ
ರೈತರು–೦೨, ಪ್ರಾಣಿಗಳು–೦೩.	ಹುಲಿ
ರೈತರು–೦೪,	ಹಾವು
ಪ್ರಾಣಿಗಳು–೦೩.	ಕರಡಿ

ಕಾಡು ಪ್ರಾಣಿ–ಪಕ್ಷಿಗಳು ತಮ್ಮ ಆಹಾರಕ್ಕಾಗಿ ಬಳಸುವ ಸಸ್ಯಗಳು:–

ವಿವರ ನೀಡಿದ ಗ್ರಾಮಸ್ಥನ ಹೆಸರು	ಕಾಡುಪ್ರಾಣಿ ಹೆಸರು	ಆಹಾರಕ್ಕಾಗಿ ಬಳಸುವ ಸಸ್ಯ
ಕೃಷ್ಣ.ಸಿದ್ಧಿ	ಮೊಲ	ಮಗೆ,ಸೌತೆ,ಗಜ್ಜರಿ ಸಸ್ಯಗಳು
ನಾರಾಯಣ.ಪೂಜಾರಿ	ಜಿಂಕೆ	ಸನ್ನೆಂಪು, ಹುರುಳಿ ಹುಲ್ಲು

ದೇವಾ.ಗೌಡ	ಗಮಯಾ	ಮಗೆ ಸಸ್ಯಗಳು
ಗಣಪತಿ.ಭಟ್	ನರಿ	ಕಬ್ಬಿನ ಸಸ್ಯಗಳು
ವಿಶ್ವೇಶ್ವರ.ಹೆಗಡೆ	ಮೊಲ	ಮಗೆ ಸಸ್ಯಗಳು
ಗಣಪಾ.ಸಿದ್ಧಿ	ಮಂಗ	ಅಡಿಕೆ ಸಸ್ಯಗಳು
ರಾಮಕೃಷ್ಣ.ಭಟ್	ಇಣಚಿ	ತೆಂಗಿನ ಮರಗಳು

ಗ್ರಾಮಕ್ಕೆ ಸಂದರ್ಶನ ನೀಡುವ ಪ್ರಾಣಿ–ಪಕ್ಷಿಗಳು

ಗ್ರಾಮಸ್ಥನ ಹೆಸರು	ಸಂದರ್ಶನ ನೀಡುವ ಪ್ರಾಣಿ/ಪಕ್ಷಿಗಳು	ಸಂದರ್ಶನ ನಿಡುವ ತಿಂಗಳು	ಕಾರಣಗಳು
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ	ರಾಮಗಿಳಿ	ಅಕ್ಟೋಬರ್–ಜನವರಿ	ಧವಸಧಾನ್ಯಗಳು ಮಾಗುವ ಕಾಲ
ಕೃಷ್ಣ.ಸಿದ್ಧಿ	ಗುಬ್ಬಿ	ಅಕ್ಟೋಬರ್–ಜನವರಿ	ಧವಸಧಾನ್ಯಗಳು ಮಾಗುವ ಕಾಲ
ಠೀಕ್ರು.ಮರಾಠಿ	ಕೋಗಿಲೆ	ಜನವರಿ – ಜೂನ್	ಮರಗಳು ಚಿಗುರುವ ಕಾಲ
ಕೃಷ್ಣ.ಮರಾಠಿ	ಪಾರಿವಾಳ	ಫೆಬುವರಿ–ಮೇ	ಮಳೆ ಇಲ್ಲದ ಕಾರಣ
ಜೆಟ್ಟಾ.ಕುಣಬಿ	ಕಾಡುಕೋಣ	ಜನವರಿ – ಡಿಸೆಂಬರ್	ಬೆಳೆ,ಹುಲ್ಲು,ಧವಸಧಾನ್ಯದ ಬೆಳೆ
ರಾಮಚಂದ್ರ.ಹೆಗಡೆ	ಕಡ	ಜೂನ್–ಸಪ್ಟೆಂಬರ್	ಭತ್ತ ಮತ್ತು ಧಾನ್ಯ ಚಿಗುರುವ ಕಾಲ
ನಾಗು.ಗೌಡ	ಮಂಗ	ಮೇ–ಡಿಸೆಂಬರ್	ಅಡಿಕೆ ಮುಗುಡು, ಉಪ್ಪಾಗೆ, ಬಾಳೆಕಾಯಿ ಬೆಳೆಯುವ ಕಾಲ

ಬೇಟೆಗಾರಿಕೆ

೧. ನಿಮ್ಮ ಗ್ರಾಮದಲ್ಲಿ ಬೇಟೆಯಾಡುವ ಜನರಿದ್ದಾರೆಯೇ? ನಮ್ಮ ಗ್ರಾಮದಲ್ಲಿ ಬೇಟೆಯಾಡುವ ಜನರಿದ್ದಾರೆ.
೨. ನಿಮ್ಮ ಗ್ರಾಮದ ಯಾವ ಪಂಗಡ ಸಾಂಪ್ರದಾಯಿಕ ಬೇಟೆಯಾಡುತ್ತಾರೆ? ನಮ್ಮ ಗ್ರಾಮದ ಸಿದ್ಧಿ, ಕುಣಬಿ, ಮರಾಠಿ ಪಂಗಡದವರು ಬೇಟೆಯಾಡುತ್ತಾರೆ.
೩. **ನಿಮ್ಮ ಗ್ರಾಮದಲ್ಲಿ ಯಾವ ಪ್ರಾಣಿ–ಪಕ್ಷಿಗಳನ್ನು** ಬೇಟೆಯಾಡುತ್ತಾರೆ? **ಪಕ್ಷಿ:– ಕಾಡುಕೋಳಿ, ಗರಗಸನ ಹಕ್ಕಿ, ಗಿಡುಗ**

ಪ್ರಾಣಿ:– ಅಳಿಲು,ಮಂಗ,ಹಂದಿ,ಮುಳ್ಳುಹಂದಿ,ಕಾಡುಕುರಿ.
೪. ಅಕ್ಕಪಕ್ಕದ ಗ್ರಾಮಕ್ಕೆ ಹೋಗಿ ಯಾವ ಪ್ರಾಣಿ–ಪಕ್ಷಿಗಳನ್ನು ಬೇಟೆಯಾಡುತ್ತಾರೆ? ಪಕ್ಷಿ:–ಕಾಡುಕೋಳಿ ಪ್ರಾಣಿ:–ಇಣಚಿ,ಅಳಿಲು,ಮಂಗ.
೫. ಎಷ್ಟು ದೂರದವರೆಗೆ ಬೇಟೆಗೆ ಹೋಗುತ್ತಾರೆ? ಸುಮಾರು ೩–೪ಕಿ.ಮೀವರೆಗೆ(ಜಡ್ಡಿಗದ್ದೆ)ವರೆಗೆ ಬೇತಿಗಿ ಹೋಗುತ್ತಾರೆ.
೬. ನಿಮ್ಮ ಗ್ರಾಮದಲ್ಲಿ ಇತರರು ಬೇಟಿಗೆ ಬರುತ್ತಾರೆಯೇ? ಹೌದು. ಇತರ ಗ್ರಾಮದವರು ಬೇಟೆಗೆ ಬರುತ್ತಾರೆ.
೭. ಯಾವ ಗ್ರಾಮದಿದಂದ ಬೇಟೆಗೆ ಬರುತ್ತಾರೆ? ಧೋರಣಗಿರಿ, ವಾನಳ್ಳಿಯಿಂದ ಬೇಟೆಗೆ ಬರುತ್ತಾರೆ.
೮. ಆಹಾರಕ್ಕಾಗಿ ಬಳಸುವ ಪ್ರಾಣಿಗಳು:–ಅಳಿಲು, ಹಂದಿ, ಕಾಡುಹಂದಿ. ಪಕ್ಷಿಗಳು:–ಕಾಡುಕೋಳಿ
೯. ಔಷಧಕ್ಕಾಗಿ ಬಳಸುವ ಪ್ರಾಣಿಗಳು:– ಹಂದಿ, ಮುಳ್ಳುಹಂದಿ. ಪಕ್ಷಿಗಳು:–
೧೦. ಜನರು ಬೇಟೆಯಾಡಲು ಕಾರಣಗಳು:– • ಹವ್ಯಾಸಕ್ಕಾಗಿ • ಆಹಾರಕ್ಕಾಗಿ • ಉದ್ಯೋಗಕ್ಕಾಗಿ
೧೧. ಮಾರಲು ಬಳಸುವ ಪ್ರಾಣಿ–ಪಕ್ಷಿಗಳು:– ಪ್ರಾಣಿಗಳು:–ಕಾಡುಕೋಳಿ
೧೨. ಬೇಟೆಯಾಡುವುದನ್ನು ಪರಂಪರೆಯಾಗಿ ಹೊಂಡಿರುವವರು:– • ಕುಣಬಿ ಜನಾಂಗದವರು ಹಬ್ಬಗಳ ಸಂದರ್ಭದಲ್ಲಿ ಪಾರಂಪರಿಕವಾಗಿ ಬೇಟೆಯನ್ನಾಡುತ್ತಾರೆ. • ಸಿದ್ಧಿ ಜನಾಂಗದವರು ಅಮವಾಸ್ಯೆಯ ದಿನಗಳಲ್ಲಿ ಬೇಟೆಯನ್ನು ಆಚರಿಸುತ್ತಾರೆ.
೧೩. ಸ್ಥಳೀಯ ಜನರು ಬೇಟೆಯಾಡುವ ಬಗ್ಗೆ ಹಾಕಿರುವ ನಿರ್ಬಂಧಗಳು:– • ಹವ್ಯಾಸಕ್ಕಾಗಿ ಬೇಟೆಯಾಡಬಾರದು. • ಅಮೂಲ್ಯ ಪ್ರಾಣಿಗಳನ್ನು ಬೇಟೆ ಮಾಡಬಾರದು. • ವರ್ಷಕ್ಕೆ ಒಂದೆರದು ಬಾರಿ ಮಾತ್ರ ಬೇಟೆಗೆ ಹೋಗಬೇಕು.

ಪಶುಸಂಗೋಪನೆ

ದನ–ಕರು ಸಾಕುವವರು	ದನದ ತಳಿಯ ಹೆಸರು	ಒಟ್ಟೂ ಸಂಖ್ಯೆ
ನರಹರಿ.ಭಟ್	ಕಂಟ್ರಿ ಜರ್ಸಿ	೦೩
ರಾಮಕೃಷ್ಣ.ಭಟ್	ಸಿಂಧಿ,ಗೀರ್,ಎಚ್ಎಫ್,ಸಾಯಿವಾಲ್	೦೬
ಕೃಷ್ಣ.ಹೆಗಡೆ	ಹಳ್ಳಿಕಾರ್, ಮಲ್ನಾಡಗಿಡ್ಡ	೦೩
ಗಣೇಶ್.ಪೂಜಾರಿ	ಎಚ್ಎಫ್	೦೪
ರವಿ.ಭಟ್	ಹಳ್ಳಿಕಾರ್, ಬಿಲ್ಲಾರ್, ಎಚ್ಎಫ್	೦೮
ಸೀತಾರಾಂ.ಭಟ್	ಜರ್ಸಿ, ಮಲ್ನಾಡ್ಗಿಡ್ಡ ಕೋಣ–ಅಮೃತ್ಮಹಲ್	೦೩ ೦೧

ಎಮ್ಮೆಗಳು–ತಳಿಗಳು:–

ಎಮ್ಮೆ ಸಾಕುವವರು	ಎಮ್ಮೆತಳಿಯ ಹೆಸರು	ಒಟ್ಟೂಸಂಖ್ಯೆ
ವಿನಾಯಕ.ಭಟ್	ಸುರುಟಿ	೦೩
ವಿನಯ್.ಭಟ್	ಸೊರಟಿ	೦೨
ಗಣೇಶ್.ಹೆಗಡೆ	ಮುರ್ರಾ	೦೩
ಕಿರಣ್.ಭಟ್	ಆಭವ್ರಿ	೦೪
ರಾಮಾ.ಸಿದ್ಧಿ	ಮುರ್ರಾ	೦೩
ನಾಗು.ಕುಣಬಿ	ಸುರಟಿ	೦೨

ಕುರಿ, ಆಡು, ಕೋಳಿಯ ತಳಿಗಳು:–

ಸಾಕುವವರ ಹೆಸರು	ತಳಿಯ ಹೆಸರು	ಒಟ್ಟೂ ಸಂಖ್ಯೆ
ಕೃಷ್ಣಾ.ಮರಾಠಿ	ಕುರಿ–ಕಂಗುರಿ	೦೫
ಠೀಕ್ರು ಮರಾಠಿ	ಕುರಿ–ಬಂಡೂರು	೦೩
ಕೃಷ್ಣಾ.ಸಿದ್ಧಿ	ಕುರಿ–ಜಮುನಾಪಾರಿ	೦೯
ಆಸುದೇವ್.ಮರಾಠಿ	ಕುರಿ–ಉಸ್ಮನಾಬಾದಿ	೦೪
ಶಂಖರ್.ಸಿದ್ಧಿ	ಕುರಿ–ಜಮುನಪಾರಿ	೦೮
ಗೋಪಾಲ್.ಮರಾಠಿ	ಕೋಳಿ–ಗಿರಿರಾಜ	೦೩

ಜಿಟ್ಟಾ.ಕುಣಬಿ	ಕೋಳಿ–ಗಿರಿರಾಣಿ	೦೮
ನಾಗು.ಗೌಡ	ಕೋಳಿ–ಬನ್ನೂರು	೦೩
ಈಸ್ರು.ಗೌಡ	ಕೋಳಿ–ನಾಟಿಕೋಳಿ	೦೬
ಎಂಕಟಿ.ಮರಾಠಿ	ಕೋಳಿ–ಬ್ಯಾಕೋಲ್	೦೯
ಹರೀಶ್.ಗೌಡ	ಕೋಳಿ–ನಾಟಿಕೋಳಿ	೦೨

ಮೇವಿನ ಲಭ್ಯತೆ

ಸಾಕುವವರ ಹೆಸರು	ಹಸಿ(ದಿನಕ್ಕೆ)ಹಳ್ಳಿನ ಪ್ರಮಾಣ	ಹಸಿಹುಲ್ಲು ಖರೀದಿಸುವಪ್ರಮಾಣ	ಒಣ(ದಿನಕ್ಕೆ)ಹಳ್ಳಿನ ಪ್ರಮಾಣ	ಒಣಹುಲ್ಲು ಖರೀದಿಸುವಪ್ರಮಾಣ
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ	೦೫ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೨ಹೊರೆ	೦೧ಹೊರೆ
ರಾಮಚಂದ್ರ.ಹೆಗಡೆ	೦೩ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೧ಹೊರೆ	೦೧ಹೊರೆ
ಸುಬ್ರಾಯ.ಹೆಗಡೆ	೦೪ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೨ಹೊರೆ	೦೨ಹೊರೆ
ನರಹರಿ.ಹೆಗಡೆ	೦೨ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೨ಹೊರೆ	೦೩ಹೊರೆ
ತಿಮ್ಮಣ್ಣ.ಭಟ್	೦೩ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೨ಹೊರೆ	೦೧ಹೊರೆ
ಕೃಷ್ಣ.ಸಿದ್ಧಿ	೦೪ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೧ಹೊರೆ	೦೨ಹೊರೆ
ನಾಗು.ಗೌಡ	೦೫ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೩ಹೊರೆ	೦೧ಹೊರೆ
ಕೃಷ್ಣ.ಮರಾಠಿ	೦೩ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೪ಹೊರೆ	೦೧ಹೊರೆ
ಗಣಪತಿ.ಹೆಗಡೆ	೦೨ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೨ಹೊರೆ	೦೨ಹೊರೆ
ನಾಗು.ಚಲುವಾದಿ	೦೩ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೧ಹೊರೆ	೦೩ಹೊರೆ
ಕೃಷ್ಣ.ಭಟ್	೦೫ಹೊರೆ	ಖರೀದಿ ಇಲ್ಲ	೦೦ಹೊರೆ	೦೧ಹೊರೆ

ಹುಲ್ಲು ಒಣಗಿಸಿ ಮಾರುವವರ ಸಂಖ್ಯೆ:–

ಕೃಷಿಕನ ಹೆಸರು	ಮಾರುವ ಹಸಿ ಹುಲ್ಲಿನ ಪ್ರಮಾಣ	ಮಾರುವ ಒಣಹುಲ್ಲಿನ ಪ್ರಮಾಣ

ನಮ್ಮೂರಿನಲ್ಲಿ ಹುಲ್ಲನ್ನು ಮಾರುವ ವಿಧಾನ ರೂಢಿಯಲ್ಲಿಲ್ಲ. ಹುಲ್ಲು ನಮ್ಮೂರಿಗೆ ಆಮದಾಗುತ್ತದೆ. ರಫ್ತುಗೊಳ್ಳುವುದಿಲ್ಲ.

ಪರ ಊರಿನಿಂದ ಹುಲ್ಲು ಖರೀದಿಸುವಿಕೆ:–

ದನ ಸಾಕುವವರ ಹೆಸರು	ಹಸಿಹುಲ್ಲು ತರಿಸುವ ಪರಗ್ರಾಮದ ಹೆಸರು	ಒಣಹುಲ್ಲು ತರಿಸುವ ಪರಗ್ರಾಮದ ಹೆಸರು
ಕೃಷ್ಣ.ನ.ಹೆಗಡೆ	ಸ್ವಂತ ಜಮೀನಿನ ಬೆಳೆ	ಜಡ್ಡಿಗದ್ದೆ
ನರಹರಿ.ಸ.ಹೆಗಡೆ	ಸ್ವಂತ ಜಮೀನಿನ ಬೆಳೆ	ದಾಸನಕೊಪ್ಪ
ಗಣಪತಿ.ಸ.ಹೆಗಡೆ	ಸ್ವಂತ ಜಮೀನಿನ ಬೆಳೆ	ಪಾಳ
ರಾಮ.ನಾ.ಚೌಡ್ಯಾ	ದಾಸನಕೊಪ್ಪ	ಮಳಗಿ
ಶಂಕರ್.ಪ.ಸಿದ್ಧಿ	ಜಡ್ಡಿಗದ್ದೆ	ಹಾನಗಲ್
ಕಿರಣ್.ಹೆಗಡೆ	ಸ್ವಂತ ಜಮೀನಿನ ಬೆಳೆ	ಅಂಡಗಿ
ಮಂಜುನಾಥ.ಸಿದ್ಧಿ	ಸಮ್ಮಸಗಿ	ಸಮ್ಮಸಗಿ

ಹಾಲು ಉತ್ಪಾದನೆ

ಹಾಲು ಉತ್ಪಾದಕರ ಹೆಸರು	ಹಾಲು ಉತ್ಪಾದನೆಯ ಸರಸರಿ ಪ್ರತೀ ದಿನಕ್ಕೆ
ತಿಮ್ಮಯ್ಯ.ಹೆಗಡೆ, ಗದ್ದೇಮನೆ	೨ – ೪ಲೀ
ಸುಬ್ರಾಯ.ಹೆಗಡೆ,ಮುಸ್ಕಿ	೪ – ೮ಲೀ
ಕೃಷ್ಣ.ಹೆಗಡೆ,ಅಜ್ಜೀಮನೆ	೧ – ೨ಲೀ
ಶ್ರೀಪತಿ.ಹೆಗಡೆ, ಕೋಟಿಕೊಪ್ಪ	೮ – ೧೬ಲೀ
ಶಂಕರ್.ಸಿದ್ಧಿ	೪ – ೮ಲೀ
ನಾರಾಯಣ್.ಪೂಜಾರಿ	೧ – ೨ಲೀ
ರಾಮ.ಚಲುವಾದಿ	೧ಲೀ
ಕೃಷ್ಣ.ಗುಣಗಿ	೪ – ೮ಲೀ
ಗಣಪತಿ.ಭಟ್,ಕಕ್ಕಳ್ಳಿ	೮ – ೧೬ಲೀ
ಮಂಜುನಾಥ.ಸಿದ್ಧಿ	೨ – ೪ಲೀ

ಹಾಲು ಸಂಸ್ಕರಣೆ ಮತ್ತು ಮಾರಾಟ:–

ಹಾಲು ಉತ್ಪಾದಕರು	ಹಾಲಿನ ಬಳಕೆ–ಉಪಯೋಗ			
	ಮನೆ ಬಳಕೆಗೆ	ಡೈರಿಗೆ ಮಾರಲು	ಗ್ರಾಮದ ಜನರಿಗೆ ಮಾರಲು	ಹಾಲಿನ ಉತ್ಪನ್ನಗಳನ್ನು ಮಾರಲು
ತಿಮ್ಮಯ್ಯ.ಹೆಗಡೆ	√			
ಸುಬ್ರಾಯ.ಹೆಗಡೆ		√		
ಕೃಷ್ಣ.ಹೆಗಡೆ	√			
ಶ್ರೀಪತಿ.ಹೆಗಡೆ		√		
ಶಂಕರ್.ಸಿದ್ಧಿ				√
ನಾರಾಯಣ.ಪೂಜಾರಿ	√			
ರಾಮ.ಚಲುವಾದಿ	√			
ಕೃಷ್ಣ.ಕುಣಗಿ			√	
ಗಣಪತಿ.ಭಟ್	√	√		
ಮಂಜುನಾಥ.ಸಿದ್ಧಿ	√			√

ಸಗಣಿಯ ಉತ್ಪಾದನೆ:–

ದನ–ಕರು ಸಾಕುವವರು	ದನ–ಕರುಗಳ ಸಂಖ್ಯೆ	೧ ದಿನದಲ್ಲಿ ಸಿಗುವ ಸಗಣಿಯ ಪ್ರಮಾಣ
ಶ್ರೀಪಾದ್.ಅ.ಹೆಗಡೆ	೦೩	೩ಬುಟ್ಟಿ
ನರಹರಿ.ಸು.ಹೆಡೆ	೦೨	೩ಬುಟ್ಟಿ
ರಾಮಕೃಷ್ಣ.ಭಟ್	೦೫	೫ಬುಟ್ಟಿ
ಸೀತಾರಾಮ.ಭಟ್	೦೨	೩ಬುಟ್ಟಿ
ಗಂಗಾಧರ್.ಪೂಜಾರಿ	೦೪	೪ಬುಟ್ಟಿ

ಸಗಣಿಯ ಬಳಕೆ:–

ದನ–ಕರು ಸಾಕುವವರು	ಬಳಸುವ ಸಗಣಿಯ ಪ್ರಮಾಣ	ಮಾರಾಟ ಮಾಡಿದ ಸಗಣಿ	ಗೋಬರ್ ಗ್ಯಾಸ್‌ನ ಸಾಮರ್ಥ್ಯ	ಗೋಬರ್ ಗ್ಯಾಸ್‌ನ ಬಳಕೆ	ಗೋಬರ್ ಗ್ಯಾಸ್‌ಗೆ ಸಗಣಿಯ ಬಳಕೆ
ಸುಬ್ರಾಯ್.ವೈದ್ಯ	(೨ಬುಟ್ಟಿ) ೩೦ಕೆಜಿ	ಇಲ್ಲ	೧೧೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೧ಬುಟ್ಟಿ
ನರಹರಿ.ಹೆಗಡೆ	೪ಬುಟ್ಟಿ	ಇಲ	೧೩೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೨ಬುಟ್ಟಿ
ಸೀತಾರಾಮ.ಹೆಗಡೆ	೨ಬುಟ್ಟಿ	ಇಲ	೧೧೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೧.೫ಬುಟ್ಟಿ
ತಿಮ್ಮಣ್ಣ.ಹೆಗಡೆ	೫ಬುಟ್ಟಿ	ಇಲ	೧೫೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೩ಬುಟ್ಟಿ
ಕೃಷ್ಣ.ಪೂಜಾರಿ	೩ಬುಟ್ಟಿ	ಇಲ	೧೩೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೨.೫ಬುಟ್ಟಿ
ನಾಗು.ಗೌಡ	೨ಬುಟ್ಟಿ	ಇಲ	೧೧೦ಸಿಎಫ್‌ಟಿ	ಅಡುಗೆ	೧ಬುಟ್ಟಿ

ದನ–ಕರುಗಳ ಸಾಕುವವರ ಸಮಸ್ಯೆಗಳು:–

- ಹೆಚ್ಚುತ್ತಿರುವ ಪಶು ಆಹಾರಗಳ ಬೆಲೆ
- ಕಡಿಮೆಯಾಗುತ್ತಿರುವ ಗೋಮಾಳಗಳು
- ಅಧಿಕವಾಗಿ ರೋಗಕ್ಕೆ ತುತ್ತಾಗುತ್ತಿರುವ ದನ–ಕರುಗಳು
- ಸೌಲಭ್ಯಗಳ ಕೊರತೆ
- ಪ್ರತಿಕೂಲ ವಾಯುಗುಣ
- ನೀರಿನ–ಹುಲ್ಲಿನ ಅಭಾವ

ದನ–ಕರುಗಳ ಸಾಕಾಣಿಕೆ ಬಗ್ಗೆ ನೀಡುವ ಸಲಹೆಗಳು:–

• ಸರಿಯಾದ ಕೊಟ್ಟಿಗೆಯನ್ನು ನಿರ್ಮಿಸಬೇಕು
• ಉತ್ತಮ ಜಾತಿಯ ಮೇವು ನೀಡಬೇಕು.
• ಅವುಗಳನ್ನು ಮೇಯಲು ಗೋಮಾಳಗಳಿಗೆ ಕಳುಹಿಸಬೇಕು
• ಆಗಾಗ ವೈದ್ಯಕೀಯ ಚಿಕಿತ್ಸೆ ನೀಡಬೇಕು.
• ಉತ್ತಮ ರೀತಿಯ ಪಶು ಆಹಾರ ದೊರಕಿಸಬೇಕು.

ಜೇನು ಸಾಕಾಣಿಕೆ:–

ಕಾಡಿನಿಂದ ಜೇನು ಸಂಗ್ರಹಣೆ:–

ಜೇನು ಸಂಗ್ರಹಿಸುವವರು	ಸಂಗ್ರಹಿಸಿದ ಜೇನಿನ ಹೆಸರು	ಸಂಗ್ರಹಿಸಿದ ಜೇನಿನ ಪ್ರಮಾಣ– ವರ್ಷಕ್ಕೆ	ಮಾರಿದ ಜೇನಿನ ಪ್ರಮಾಣ	ಸಂಗ್ರಹಿಸಿದ ತಿಂಗಳು
ರವಿ.ಭಟ್	ತಿಡವೆ	೫ಕೆಜಿ	೨ಕೆಜಿ	ಏಪ್ರಿಲ್
ನಾಗು.ಗೌಡ	ಹೆಜ್ಜೇನು	೧೦ಕೆಜಿ	೩ಕೆಜಿ	ಮೇ
ಶಂಕರ್.ಸಿದ್ಧಿ	ಮಿಸರಿ	೦೩ಕೆಜಿ	೧ಕೆಜಿ	ಜೂನ್
ಪ್ರದೀಪ್.ಹೆಗಡೆ	ಹೆಜ್ಜೇನು	೦೯ಕೆಜಿ	--	ಮೇ
ಶಿವು.ಸಿದ್ಧಿ	ಕೋಲ್ಜೇನು	೦೮ಕೆಜಿ	೦೮ಕೆಜಿ	ಏಪ್ರಿಲ್
ಮಂಜು.ಚಲುವಾದಿ	ಹೆಜ್ಜೇನು	೧೫ಕೆಜಿ	೦೯ಕೆಜಿ	ಜೂನ್
ಗಣಪಾ.ಕುಣಬಿ	ಹೆಜ್ಜೇನು	೦೯ಕೆಜಿ	೦೭ಕೆಜಿ	ಮೇ

ಗ್ರಾಮದಲ್ಲಿ ಜೇನು ಸಾಕಾಣಿಕೆ:–

ಜೇನು ಸಂಗ್ರಹಿಸುವವರ ಹೆಸರು	ಜೇನಿನ ಡಬ್ಬಿಯ ಸಂಖ್ಯೆ	ಸಂಗ್ರಹಿಸಿದ ಪ್ರಮಾಣ ವರ್ಷಕ್ಕೆ	ಮಾರಾಟ ಮಾಡಿದ ಜೆನಿನ ಪ್ರಮಾಣ
ರವಿ.ಭಟ್	೦೩	೫ ಕೆಜಿ	೨ಕೆಜಿ
ನಾಗು.ಮರಾಠಿ	೦೯	೧೦ಕೆಜಿ	೩ಕೆಜಿ
ಶಂಕರ್.ಸಿದ್ಧಿ	೦೪	೦೩ಕೆಜಿ	೧ಕೆಜಿ
ಪ್ರದೀಪ್.ಹೆಗಡೆ	೦೫	೦೯ಕೆಜಿ	---
ಶಿವು.ಸಿದ್ಧಿ	೦೪	೦೮ಕೆಜಿ	೦೮ಕೆಜಿ

ಮಂಜು.ಚಲುವಾದಿ	೦೯	೧೫ಕೆಜಿ	೦೯ಕೆಜಿ
ಗಣಪಾ.ಕುಣಬಿ	೦೬	೦೯ಕೆಜಿ	೦೭ಕೆಜಿ

ಗ್ರಾಮದಲ್ಲಿನ ಜೇನಿನ ಬಗೆಗಳು:–

• ತುಡವೆ ಜೇನು
• ಹೆಜ್ಜೇನು
• ಕೋಲುಜೇನು
• ಮಿಸ್ರಿಜೇನು

ಜೆನಿನ ಇಳುವರಿಗೆ ಪಾರಕವಾಗಿರುವ ಹೂ–ಸಸ್ಯಗಳು

• ಮತ್ತಿ ಹೂವು
• ಬಬ್ಬಿ ಹೂವು
• ಬನಾಟೆ ಹೂವು
• ಕಟ್ಟೆ(ಗುರಗಿ ಹೂವು)
• ಹೆನ್ನೇರಲು ಹೂವು
• ಅಂಟುವಾಳ ಹೂವು

ಜೇನಿನ ಇಳುವರಿಗೆ ಗ್ರಾಮಸ್ಥರ ಸಲಹೆಗಳು:–

➢ ಜೇನಿನ ಮಕರಂದ ಕರಗಿ ತುಪ್ಪವಾಗುವವರೆಗೆ, ಮಾಗಲು ಬಿಡಬೇಕು.
➢ ಹೆಚ್ಚಿನ ಹೂ ಜಾತಿಯ ಸಸ್ಯಗಳನ್ನು ಬೆಳೆಸಬೇಕು. ➢ ತೋಟದಲ್ಲಿ ಪಟ್ಟಿಗೆಯನ್ನಿಟ್ಟು ಸಾಕಬೇಕು.

ಜೇನು ಸಾಕಾಣಿಕೆ
ತರಬೇತಿ ಪಡೆದವರು–ತರಬೇತಿ ನೀಡಿದ ಸಂಸ್ಥೆ

ರವಿ.ಭಟ್ ಸುಬ್ರಾಯ.ಭಟ್ ಸುಬ್ರಾಯ.ವೈದ್ಯ ರಾಮಚಂದ್ರ.ಭಟ್	ಜೇನು ಸಾಕಾಣಿಕಾ ತರಬೇತಿ ಸಂಸ್ಥೆ

ಜೆನಿನ ಔಷಧಿಯ ಗುಣಗಳು:–

➢ ನಂಜು ನಿವಾಖುಕ
➢ ಕಫ ನಿವಾರಕ
➢ ಮಲಬದ್ಧತೆ ನಿವಾರಣೆ
➢ ತೂಕ ಇಳಿಕೆ
➢ ರಕ್ತದೊತ್ತಡ ಸಮತೋಲನ
➢ ಶೀತ, ಕೆಮ್ಮು,ನೆಗಡಿಗೆ ಸಿದ್ಧೌಷಧ

ಶಕ್ತಿಯ ಮೂಲಗಳು:–

೧. ಉರುವಲಿನ ಲಭ್ಯತೆ–ಬಳಕೆ

ಸಂದರ್ಶಿಸಿದವರ ಹೆಸರು	ಕುಟುಂಬದ ಸದಸ್ಯರ ಸಂಖ್ಯೆ	೧ದಿನಕ್ಕೆ ಬಳಸುವ ಉರುವಲಿನ ಪ್ರಮಾಣ	೨ರುವಲು ಸಿಗುವ ಮೂಲಗಳು		
			ಕೃಷಿ ಅನುಪಯುಕ್ತ ವಸ್ತು	ಸ್ವಂತ ಜಮೀನಿನ ಕಟ್ಟಿಗೆ	ಕಾಡಿನಿಂದ ತರುವುದು
ನಾಗು ಗೌಡ	೦೩	೦೫ಕೆಜಿ			√
ಕೃಷ್ಣ.ಸಿದ್ಧಿ	೦೪	೦೬ಕೆಜಿ		√	
ಮಂಜುನಾಥ.ಚೌಡ್ಯಾ	೦೨	೦೩ಕೆಜಿ	√		
ಶಂಕರ್.ಕುಣಬಿ	೦೬	೦೪ಕೆಜಿ			√
ಶಂಕರ್.ಸಿದ್ಧಿ	೦೯	೧೦ಕೆಜಿ	√		
ಹರೀಶ್ ಗೌಡ	೦೩	೦೫ಕೆಜಿ		√	

೨. ಉರುವಲು ಉಪಯೋಗಿಸುವವರು ನೀಡುವ ಸಲಹೆಗಳು:–

ಉಪಯೋಗಿಸುವವರು	ಸಲಹೆಗಳು
ನಾಗು ಗೌಡ	ಒಲೆಗಳನ್ನು ಉಪಯೋಗಿಸುವಾಗ ಸುರಕ್ಷತೆಯ ಬಗ್ಗೆ ಎಚ್ಚರ ವಹಿಸಬೇಕು
ಕೃಷ್ಣ.ಸಿದ್ಧಿ	ಉರುವಲು ವೆಚ್ಚವಾಗದಂತೆ ನೋಡಿಕೊಳ್ಳಬೇಕು
ಮಂಜುನಾಥ.ಚೌಡ್ಯಾ	ಒಲೆಯ ಧಕ್ಷತೆಯ ಬಗ್ಗೆ ಎಚ್ಚರ ವಹಿಸಬೇಕು
ಶಂಕರ್.ಕುಣಬಿ	ಉರುವಲು ಒದ್ದೆಯಾಗದಂತೆ ನೋಡಿಕೊಳ್ಳಬೇಕು
ಶಂಕರ್.ಸಿದ್ಧಿ	ಉರುವಲನ್ನು ಹಿತ–ಮಿತವಾಗಿ ಬಳಸಬೇಕು
ಹರೀಶ್ ಗೌಡ	ಬೆಂಕಿ ಉರಿಸುವಾಗ ಅಂಗಾಂಗಗಳ ಮೇಲೆ

	ಲಕ್ಷ್ಯವಿಡಬೆಕು

೩. ಗ್ರಾಮದಲ್ಲಿ ಸುಧಾರಿತ ಅಡಿಗೆ ಒಲೆಗಳ ಬಳಕೆ:–

ಉಪಯೋಗಿಸುವವರ ಹೆಸರು	ಒಲೆಯ ವಿಧ	ಉಪಯುಕ್ತತೆ	ಸಮಸ್ಯೆಗಳು
ಕೃಷ್ಣ.ಹೆಗಡೆ	ಅಸ್ತ್ರ ಒಲೆ	• ಉರುವಲು ಉಳಿತಾಯ • ಹೊಗೆ ಮುಕ್ತ	• ಉರುವಲಿನ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗುತ್ತಿದೆ
ರಾಮಕೃಷ್ಣ.ಭಟ್	ಕೆಂಡದ ಒಲೆ	• ಉರುವಲು ಉಳಿತಾಯ • ಹೊಗೆ ಸಂಪೂರ್ಣ ರಹಿತ	• ಕೆಂಡದ ಒಲೆ ಮೈ–ಕೈ ಸುಡುತ್ತದೆ
ರಾಮಚಂದ್ರ.ಹೆಗಡೆ	ಗೋಬರ್ ಗ್ಯಾಸ್	• ಉರುವಲಿನ ಅವಶ್ಯಕತೆಯಿಲ್ಲ • ಹೊಗೆಯಿಲ್ಲ	• ಗೋಬರ್ ಗ್ಯಾಸ್ ಲೀಕೇಜ್ ಆಗುತ್ತದೆ
ಸುಬ್ರಾಯ.ಹೆಗಡೆ	ಅಸ್ತ್ರ ಒಲೆ	• ವಸ್ತು/ಪದಾರ್ಥ ಬೇಗ ಬೇಯುತ್ತದೆ	• ಉರುವಲಿನ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗುತ್ತಲಿದೆ
ಹರೀಶ್.ಭಟ್	ಜಾಳಿಗಿ ಒಲೆ	• ಒಲೆಯಲ್ಲಿ ಬೂದಿಯ ಪ್ರಮಾಣ ಹೆಚ್ಚುವುದಿಲ್ಲ	• ಉರುವಲಿನ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗುತ್ತಲಿದೆ
ರಾಜು.ಭಟ್	ಕೆಂಡದ ಒಲೆ	• ಹೊಗೆರಹಿತವಾಗಿರುತ್ತದೆ	• ಕೆಂಡದ ಒಲೆ ಮೈ–ಕೈ ಸುಡುತ್ತದೆ

೪. ಸೋಲಾರ್ ವಿದ್ಯುತ್ ಬಳಸುವವರು:–

ಬಳಕೆದಾರರ ಹೆಸರು	ಉಪಕರಣ ಅಳವಡಿಸಿದ ವರ್ಷ	ಈ ಸೌಲಭ್ಯ ತೃಪ್ತಿ ತಂದಿದೆಯಾ?	ಸಮಸ್ಯೆಗಳು
ಕೃಷ್ಣ.ಹೆಗಡೆ	೨೦೦೫	ಹೌದು	ಭಾರಿ ಮಳೆ ಗುಡುಗು ಸಿಡಿಲು

ತಿಮ್ಮಣ್ಣ.ಸು.ಭಟ್	೨೦೦೩	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣ ಅಭಾವ
ಗಣಪತಿ.ಸು.ಭಟ್	೨೦೦೭	ಹೌದು	ಭಾರೀಮಳೆ
ತಿಮ್ಮಪ್ಪ.ರಾ.ಹೆಗಡೆ	೨೦೦೫	ಹೌದು	ಗುಡುಗು–ಸಿಡಿಲು
ದತ್ತಾತ್ರೇಯ.ವೈದ್ಯ	೨೦೦೫	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣ ಅಭಾವ
ಗೋಪಾಲ್.ಭಟ್	೨೦೦೩	ಹೌದು	ಗುಡುಗು–ಸಿಡಿಲು

೫. ಎಲ್.ಪ.ಜಿ ಗ್ಯಾಸ್ ಬಳಕೆದಾರರ ಸಂಖ್ಯೆ:–೪೦

೬. ಕಿರುನೀರಿನಿಂದ ವಿದ್ಯುತ್ ಸಂಪರ್ಕಹೊಂದಿದ ಮನೆ:–

ಅಜ್ಜೀಮನೆ – ಕೃಷ್ಣ.ಹೆಗಡೆ

ಅಗ್ರಹಾರ – ರಾಮಕೃಷ್ಣ.ಭಟ್,ಗಜಾನನ.ಭಟ್,ಶಿವು.ಮರಾಠಿ

ಸೋಲಾರ್ ಹೀಟರ್ ಬಳಕೆ:–

ಬಳಕೆದಾರರ ಹೆಸರು	ಉಪಕರಣ ಅಳವಡಿಸಿದ ವರ್ಷ	ಈ ಸೌಲಭ್ಯದಿಂದ ಸಂತ್ರಪ್ತಿ ಹೊಂದಿರುವಿರಾ?	ಸಮಸ್ಯೆಗಳು
ತಿಮ್ಮಪ್ಪ.ಹೆಗಡೆ,ಗದ್ದೇಮನೆ	೨೦೦೩	ಹೌದು	ಮಳೆಗಾಲದಲ್ಲಿ ಸೂರ್ಯನ ಕಿರಣದ ಅಭಾವ
ಸುಬ್ರಾಯ.ಹೆಗಡೆ,ಕಕ್ಕಳ್ಳಿ	೨೦೦೧	ಹೌದು	ಗುಡುಗು–ಸಿಡಿಲುಗಳಿಂದ ತೊಂದರೆ
ಸುರೇಶ್.ಹೆಗಡೆ,ಕಕ್ಕಳ್ಳಿಮಠ	೨೦೦೬	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣದ ಅಭಾವ
ಗಣೇಶ್.ನಾಗು.ಗೌಡ	೨೦೦೩	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣದ ಅಭಾವ
ರಾಜೇಂದ್ರ.ಭಟ್,ಮುಸ್ಕಿ	೨೦೦೯	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣದ ಅಭಾವ
ರಾಮಚಂದ್ರ.ಹೆಗಡೆ,ಕಕ್ಕಳ್ಳಿ	೨೦೦೦	ಹೌದು	ಸೂರ್ಯನ ಕಿರಣದ ಅಭಾವ
ನರೇಶ್.ಪೂಜಾರಿ,ಶಿರಗುಣಿ	೨೦೦೩	ಹೌದು	ಗುಡುಗು–ಸಿಡಿಲುಗಳಿಂದ

			ತೊಂದರೆ
ಶ್ರೀಪತಿ.ಹೆಗಡೆ,ಕೋಟಿಕೊಪ್ಪ	೨೦೦೨	ಹೌದು	ಗುಡುಗು–ಸಿಡಿಲುಗಳಿಂದ ತೊಂದರೆ

ಸ್ಥಳೀಯ ಜನರ ಜ್ಞಾನ ವೈವಿಧ್ಯತೆ:–

ಹೆಸರು ಮತ್ತು ವಿಳಾಸ	ವಿಷಯ	ಜ್ಞಾನ
ಕೃಷ್ಣಮೂರ್ತಿ.ಹೆಗಡೆ	ಹೈನುಗಾರಿಕೆ	ದನದ ರೋಗ ತಜ್ಞರು
ವಿಶ್ವೇಶ್ವರ.ಹೆಗಡೆ	ನಾಟಿವೈದ್ಯರು	ಚರ್ಮರೋಗ ತಜ್ಞರು
ಗಣೇಶ್.ಸಿದ್ಧಿ	ನಾಟಿವೈದ್ಯರು	ತದ್ದು,ಕಜ್ಜಿಗಳ ತಜ್ಞರು
ಜಾನಕಿ.ಮರಾಠಿ	ನಾಟಿವೈದ್ಯರು	ಚಿಕ್ಕಮಕ್ಕಳ ಲಿವರ್ ತೊಂದರೆಗೆ ಔಷಧಿ ತಜ್ಞೆ
ದೇವಿ.ಸಿದ್ಧಿ	ನಾಟಿವೈದ್ಯರು	ರಜಸ್ವಲಾ ದೋಷ ತಜ್ಞೆ
ರವಿ.ಭಟ್	ಹೈನುಗಾರಿಕೆ	ದನಗಳ ರೋಗಗಳಿಗೆ ಔಷಧಿ ನೀಡುತ್ತಾರೆ
ಎನ್.ಜಿ.ಭಟ್	ನಾಟಿವೈದ್ಯರು	ರಜಸ್ವಲಾ ದೋಷಕ್ಕೆ ಪರಿಹಾರ
ಭಾಗೀರಥಿ.ಮರಾಠಿ	ಮೈಕೈನೋವು ನಿವಾರಣೆ	ವಿವಧ ಎಣ್ಣೆಗಳ ಮೂಲಕ ಕೈ–ಕಾಲು ನೋವುಗಳನ್ನು ತಿಕಿ ಸರಿಪಡಿಸುತ್ತಾಳೆ
ಶಂಕರ್.ಸಿದ್ಧಿ	ಅರಣ್ಯ ತಜ್ಞರು	ಅರಣ್ಯದಲ್ಲಿರುವ ಮರಗಳ ಜಾತಿಗಳನ್ನು ತಿಳಿಯಲು
ಕೃಷ್ಣ.ಮರಾಠಿ	ಹೈನುಗಾರಿಕೆ	ದನಕರುಗಳ ಸರ್ವರೋಗ ನಿವಾರಣೆಗೆ

ಆನರ ಸಾಂಪ್ರದಾಯಿಕ ಕರಕುಶಲ ಕೆಲಸ:–

ಕುಶಲಕರ್ಮಿ	ಕರಕುಶಲ ಉದ್ಯಮ	ವಿವರಣೆ
ಪರಮೇಶ್ವರ.ಹೆಗಡೆ	ಶಿಲ್ಪಕಲೆ	ಇವರು ಮಣ್ಣಿನಿಂದ ಗಣಪತಿ ಮೂರ್ತಿಗಳನ್ನು ರಚಿಸುತ್ತಾರೆ
ಶೋಭಾ.ಸಿದ್ಧಿ	ನೇಯ್ಗೆ	ಬಿದಿರು, ನಾರಿನಿಂದ ಬುಟ್ಟಿ,ಚೊಬ್ಬೆ,ಚೂಳಿ,ಬ್ಯಾಗ್‌ಗಳನ್ನು ತಯಾರಿಸುತ್ತಾರೆ
ರಾಮಾ.ಗೌಡ	ಗಂಧದ ಮೂರ್ತಿಗಳ ಕೆತ್ತನೆ	ಇವರು ಶ್ರೀಗಂಧದ ಕೊರಡುಗಳಿಂದ ಸುಂದರ ಗಂಧದ ಮೂರ್ತಿಗಳನ್ನು

		ನಿರ್ಮಿಸುತ್ತಾರೆ.
ದಾಕ್ಷಾಯಿಣಿ.ಭಟ್	ನೇಯ್ಗೆ– ಕಸೂತಿ,ಹೊಲಿಗೆ	ಇವರು ಉಲ್ಲನ್ನಿಂದ ಸ್ವೆಟರ್,ತೋಪಿ,ಶಾಲ್‌ಗಳನ್ನು ತಯಾರಿಸುತ್ತಾರೆ. ಹೂವುಗಳನ್ನು ಬಟ್ಟೆಯಿಂದ ತಯಾರಿಸುತ್ತಾರೆ.
ಕೃಷ್ಣಾ.ಕುಣಬಿ	ನೇಯ್ಗೆ	ಬಿದಿರಿನ ಚೂಳಿ, ಬುಟ್ಟಿಗಳನ್ನು ತಯಾರಿಸುತ್ತಾರೆ.

ಗ್ರಾಮದ ದೇವರ ಬನ–ದೇವರ ಕಾಡು

ದೇವರ ಬನದ ಹೆಸರು	ದೇವರ ಹೆಸರು	ವಿಸ್ತೀರ್ಣ	ಮಾಲಿಕತ್ವ												
				ಜ	ಫ್	ಮಾ	ಏ	ಮೇ	ಜೂ	ಜು	ಅ	ಸ್	ಅ	ನ	ಡಿ
ಜಟಕನ ಮನೆ	ಜಟಕಾ	೦೨ಗುಂಟೆ	ಪೂಜಾರಿ	√	√	√	√	√	√	√	√	√	√	√	√
ಅಮ್ಮೋರ ಗುಡಿ	ಅಮ್ಮ(ಶ್ರೀ ದೇವಿ)	೦೦.೧೦.೦೦	ವಿಶ್ವೇಶ್ವರ. ಹೆಗಡೆ	√	√	√	√	√	√	√	√	√	√	√	√
ಮಾಸ್ತಿ ಮನೆ	ಮಾಸ್ತಿ	೦೦.೦೫.೦೦	ಪೂಜಾರಿ	√	√	√	√	√	√	√	√	√	√	√	√
ನಾಗರ ಬನ	ನಾಗರ	೦೦.೧೦.೦೦	ಪೂಜಾರಿ	√	√	√	√	√	√	√	√	√	√	√	√

ದೇವರ ಬನ – ವಿಶಿಷ್ಟ್ಯ ಸಸ್ಯಗಳು:–

ದೇವರ ಬನದ ಹೆಸರು	ವಿಶಿಷ್ಟ್ಯ ಸಸ್ಯಗಳು
ಜಟಕನ ಮನೆ	ಹಾಲು ವೃಕ್ಷ:– ಆಲ,ಅತ್ತಿ,ಗೊಸಂಪಿಗೆ, ಮಾವು,ಹಲಸು,ಆಲ,ನಂಜಾಟ್ಲೆ
ಅಮ್ಮೋರ ಗುಡಿ	ಮಾವು,ಹಲಸು,ಆಲ,ಅಶ್ವತ್ಥ,ನಂಜಾಟ್ಲೆ,ಕರವೀರ,ಪಾರಿಜಾತ
ಮಾಸ್ತಿ ಮನೆ	ಸುರಗಿ,ಸಂಪಿಗೆ,ರಂಜಲು,ಮಂದಾರ,ದಾಸವಾಳ,ಆಲ,ಅಶ್ವತ್ಥ,ನಂಜಾಟ್ಲೆ
ನಾಗರ ಬನ	ದರ್ಬೆ,ಪರಿಗೆ ಹುಲ್ಲು, ಬಿಲ್ವಪತ್ರೆ,ಶಮೀಪತ್ರೆ,ಮಡಿವಾಳ ಪತ್ರೆ

ದೇವರ ಬನ – ವಿಶೇಷ ಪ್ರಾಣಿಗಳು:–

ದೇವರ ಬನದ ಹೆಸರು	ವಿಶೇಷ ಪ್ರಾಣಿಗಳು

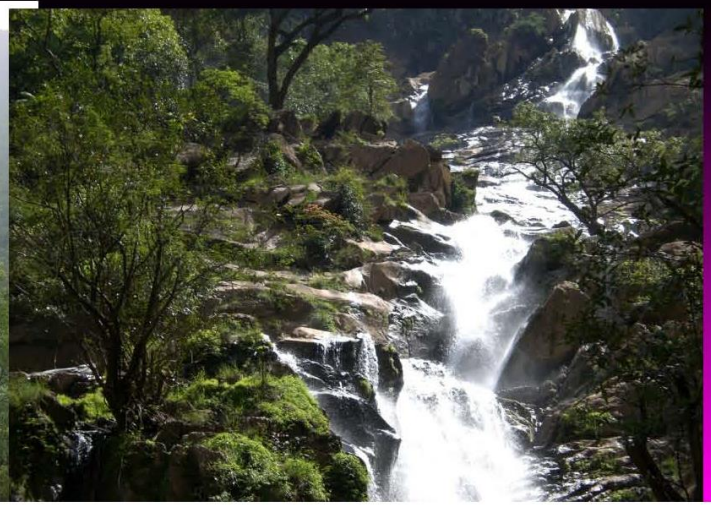
ಜಟಕನ ಮನೆ	ಮಂಗ,ಅಳಿಲು
ಅಮ್ನೋರ ಗುಡಿ	ಮಂಗ,ಅಳಿಲು
ಮಾಸ್ತಿ ಮನೆ	ಅಳಿಲು,ಹಾವು
ನಾಗರ ಬನ	ನಾಗರ ಹಾವು, ಮೊಲ

ಗ್ರಾಮದ ಅಂಕಿ–ಅಂಶಗಳು:–

ವಿಸ್ತೀರ್ಣ	೧೦,೧೨೨ ಹೆಕ್ಟೇರ್, ಕೃಷಿಭೂಮಿ:–೩,೨೦೦ ಹೆಕ್ಟೇರ್
ಮನೆಗಳ ಸಂಖ್ಯೆ	೮೦ – ೮೫
ಕುಟುಂಬಗಳ ಸಂಖ್ಯೆ	೧೦೫
ಆನಸಂಖ್ಯೆ	ಸ್ತ್ರೀಯರು–೨೨೪ ಪುರುಷರು–೨೩೫=೪೫೯ ಜನರು
ಪ್ರಾಥಮಿಕ ಆರೋಗ್ಯ ಕೇಂದ್ರ ಹಿರಿಯ ಪ್ರಾಥಮಿಕ ಶಾಲೆ	೧ ೧
ಅಂಗನವಾಡಿ ಕೇಂದ್ರ ಸ್ತ್ರೀಶಕ್ತಿ ಗುಂಪು	೧ ೨
ನ್ಯಾಯ ಬೆಲೆ ಅಂಗಡಿ ಸಹಕಾರಿ ಸಂಘದ ಶಾಖೆ	೧
ಗ್ರಾಮ ಅರಣ್ಯ ಸಮಿತಿ ಯುವಕ /ಯುವತಿ ಮಂಡಳ	೧ ೧–೧
ಗೋಮಾಳ ಪ್ರದೇಶ ಹುಲ್ಲುಗಾವಲು(ಮರಮಿಶ್ರಿತ)	೧೦೦೦ ಹೆಕ್ಟೇರ್ ೩೦೦೦ ಹೆಕ್ಟೇರ್
ಹೊಳೆಗಳು	ಬಿಳಿಹೊಳೆ(ಅಂದಾಜು ೬೦ಕಿ.ಮೀ.ದೂರ)
ಹಳ್ಳಗಳು	೧.ಹುಲುಹಳ್ಳ(೩ಕಿ.ಮೀ.ನೀರು) ೨.ತೋಟಿಮನೆ ಹಳ್ಳ(೨.೫ಕಿ.ಮೀ.ನೀರು) ೩.ಮಾಸ್ತಿಹಳ್ಳ(೨.೫ಕಿ.ಮೀ.ನೀರು)
ಚೆಕ್‌ಡ್ಯಾಂಗಳು	೩ ೧.ಕಕ್ಕಳ್ಳಿ ೨.ಅಸ್ತಾಳ ೩.ಶಿರಸಗಾಂವ್
ಸದಾಕಾಲ ಹರಿಯುವ ಝರಿಗಳು	೧.ಜಟಕನ ಕೊಡ್ಲು ೨.ಮೂಗಿನ ಮನೆ ಕೊಡ್ಲು ೩.ಬನಾಟಿ ಕೊಡ್ಲು
ಝರಿ ನೀರಿನ ಯೋಜನೆಗಳು	೧.ಸಿದ್ಧೀ ಜನಾಂಗಕ್ಕೆ(ಜಟಕನ ಕೊಡ್ಲು) ೨.ಕುಣಬೀ ಜನಾಂಗಕ್ಕೆ(ಶಿರಸಗಾಂವ್)
ಸರ್ಕಾರೀ ಕೆರೆಗಳು	೦೨

ಸಾರ್ವಜನಿಕ ಬಸ್ ತಂಗುದಾಣಗಳು	೦೭
ದೂರವಾಣಿ ಕೇಂದ್ರ	೦೧
ಮಳೆಮಾಮಪನಾಕೇಂದ್ರ	೦೧
ಪಶು ಚಿಕಿತ್ಸಾಲಯ	೦೧
ಗ್ರಂಥಾಲಯ	೦೧
ದೇವರ ಬನಗಳು	೦೧
ಹಾಲಿನ ಡೈರಿ	೦೧
ಗ್ರಾಮದಲ್ಲಿ ಕಿರುನೀನಿಂದ ವಿದ್ಯುತ್ ಸಂಪರ್ಕ ಹೊಂದಿದ ಮನೆಗಳ ಸಂಖ್ಯೆ	೦೧

ನಮ್ಮ ಗ್ರಾಮದ ಜೀವ ವೈವಿಧ್ಯತೆ



ಪ್ರಸ್ತುತ ಪಡಿಸುವ ವಿದ್ಯಾರ್ಥಿನಿ

- ಕುಮಾರಿ ಭಾಗ್ಯ ನರಹರಿ ಭಟ್ಟ. ಕಗ್ಗುಂಡಿ.
  9 ನೇ ವರ್ಗ ಕನ್ನಡ ಮಾಧ್ಯಮ.
- ಹವ್ಯಾಸ: ಕಥೆ ಓದುವುದು, ಹಾಡುವುದು, ಸಾಹಿತ್ಯ ಓದುವುದು, ನೃತ್ಯ ಇತರೆ. . .
- ಪ್ರವೃತ್ತಿ: ಅಮೂಲ್ಯ ವಸ್ತುಗಳ ಬಗ್ಗೆ ಆಸಕ್ತಿ, ಶಾಲಾ ಸ್ಪರ್ಧೆಗಳಲ್ಲಿ ಭಾಗವಹಿಸುವುದು.

ಮಾರ್ಗದರ್ಶಕರು

ಶ್ರೀ ಕೃಷ್ಣ ವೆಂ. ಭಟ್ಟ.
ಮುಖ್ಯಾಧಾಪಕರು ಶ್ರೀ ಗ. ಮಾ. ಶಾಲೆ ವಾನಳ್ಳಿ.
ಶ್ರೀ ಆರ್. ಎ. ಹೆಗಡೆ. ಸಹಶಿಕ್ಷಕರು. ಶ್ರೀ ಗ. ಮಾ.ಶಾಲೆ. ವಾನಳ್ಳಿ

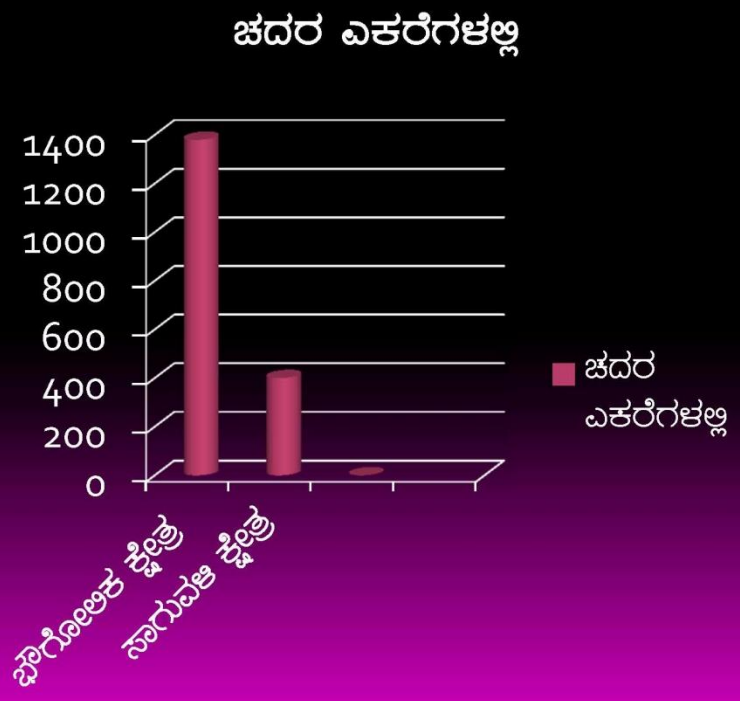
ಆಯ್ದುಕೊಂಡ ಗ್ರಾಮ: ಕಕ್ಕಳ್ಳಿ, ಗ್ರಾಮ ಪಂಚಾಯತ ವಾನಳ್ಳಿ.
ಶಿರಸಿ ತಾಲೂಕುಉ.ಕನ್ನಡ.

ಮಜರೆಗಳು:

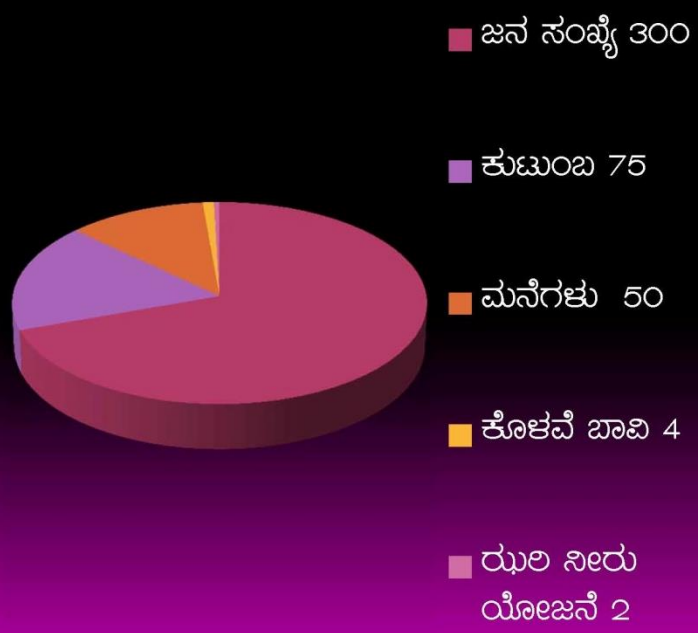
1 ಕಕ್ಕಳ್ಳಿ.
2 ಹೊಸ್ಮನೆ.
3 ಆಸ್ತಾಳ..
4 ತೋಣಿಮನೆ.
5 ಶಿರಸ್ಗಾಂವ.
6 ಹಣಗಾರ
7 ಕಕ್ಕಳ್ಳಿಮಠ.

ಗ್ರಾಮದ ಅಂಕಿ ಅಂಶಗಳು.

ಕ್ಷೇತ್ರದ ವಿಸ್ತೀರ್ಣ.

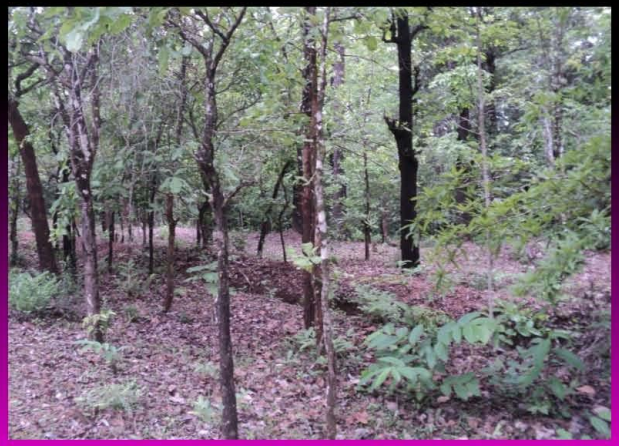


ಜನ ಸಂಖ್ಯೆ, ಕುಟುಂಬ ಹಾಗೂ ಮನೆಗಳು



ಅರಣ್ಯದ ವಿಧಗಳು.

ಎಲೆ ಉದುರುವ ಕಾಡುಗಳು



ಪೊದೆ ಸಸ್ಯಗಳು

ನಿತ್ಯ ಹರಿದ್ವರ್ಣ ಕಾಡು

ಗ್ರಾಮದ ಅರಣ್ಯದ ಒಂದು ಉತ್ಪನ್ನ

ಔಷಧೀಯ ಸಸ್ಯಗಳು

ಅರಿಶಿಣ

ತುಳಸಿ

ಸರ್ಪಗಂಧಿ

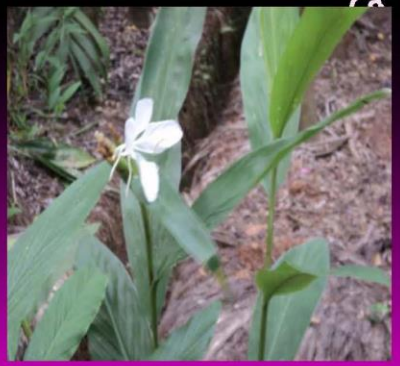
ವಾಲ್ ಸ್ಪೈಸಸ್

ಭೃಂಗ ರಾಜ

ಎಲವರಿಗೆ

ರೇಷ್ಮೆ ÀqÉ

ಬಿಳಿಸುಳಿ ಗಡ್ಡೆ



ಬಿಳಿ ಮಧ್ಯಾಹ್ನ ಮಲ್ಲಿಗೆ

ದಾಳಿಂಬೆ

ಕೊಡಸ

ಬಲಗಣೆ

ಶತಾವರಿ

ಕಳ್ಳಂ ಕಡ್ಡೆ

ಕೋಲಮದ್ದಲ ಸೊಪ್ಪು

ಸೋಮವಾರದ ಗಿಡ

ಪುತ್ರ ಜೀವಿ

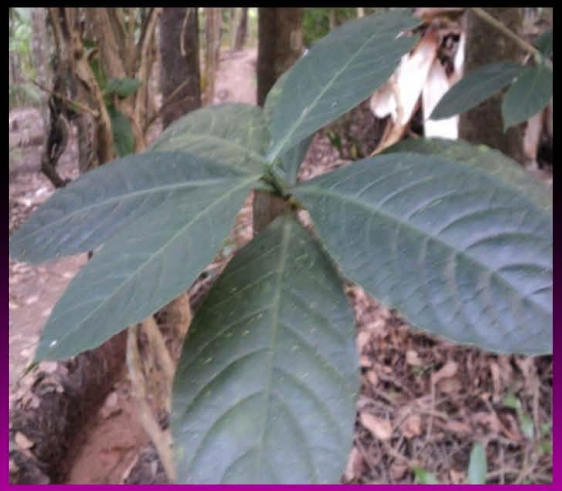
zÁ À

ಬಾಣಂತಿ ಹಸ್ತ

ಕತ್ತಿ ದಾರೆ ಬಳ್ಳಿ

ಕುಸುಮಾಲೆ

ಭೂತಾಳಿ ಸೊಪ್ಪು



ವಾಯು ವಿಳಂಗ

ಪುದೀನ ಸೊಪ್ಪು

ಮದರಂಗಿ

ಜಾಯಿಕಾಯಿ

ಸದಾಪು

ನಮ್ಮೂರಿನ ನಾಟಿ ವೈದ್ಯರು:

ಶ್ರೀ ವಿಶ್ವೇಶ್ವರ ಹೆಗಡೆ.

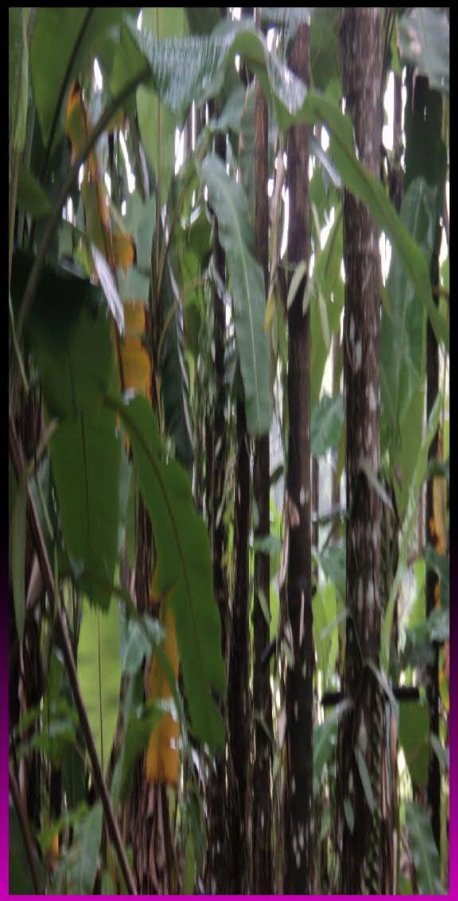
ಶಂಕರ ಸಿದ್ಧಿ ಕಾನಬಾಗಿಲು.

ಶ್ರೀ ಪರಮೇಶ್ವರ ಭಟ್ಟ.

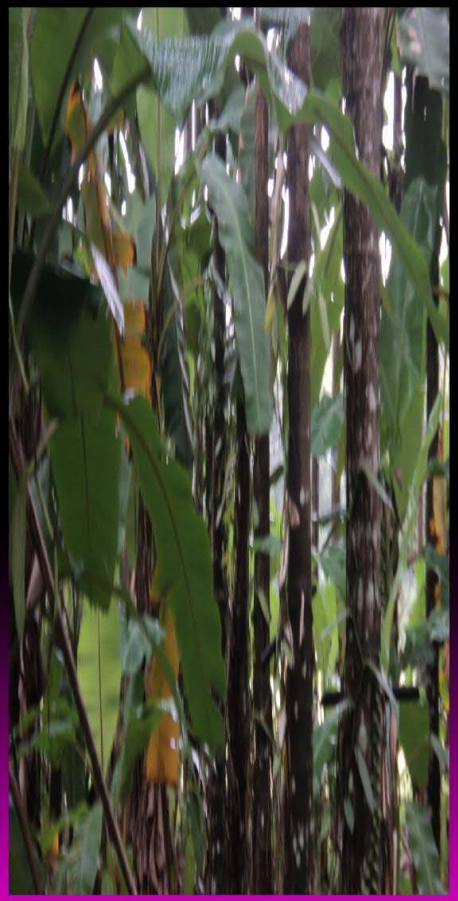
ನಮ್ಮೂರಿನ ಪಾರಂಪರಿಕ ಕೃಷಿ.

ಭತ್ತದ ಗದ್ದೆ.

ಸಮೃದ್ಧ ಅಡಿಕೆ, ಬಾಳೆ, ಕಾಳು ಮೆಣಸಿನ ತೋಟ



ಸಮೃದ್ಧ ಅಡಿಕೆ, ಬಾಳೆ, ಕಾಳು ಮೆಣಸಿನ ತೋಟ

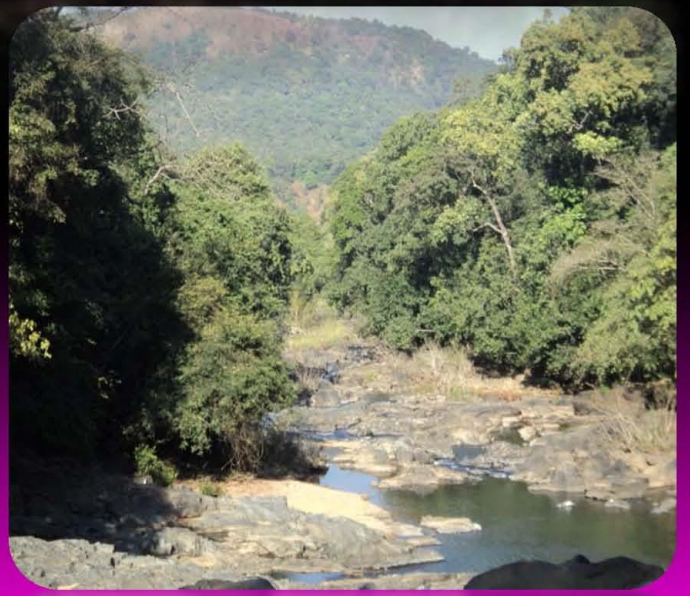


ನಮ್ಮೂರಿನ ಮಾದರಿ ರೈತರು.

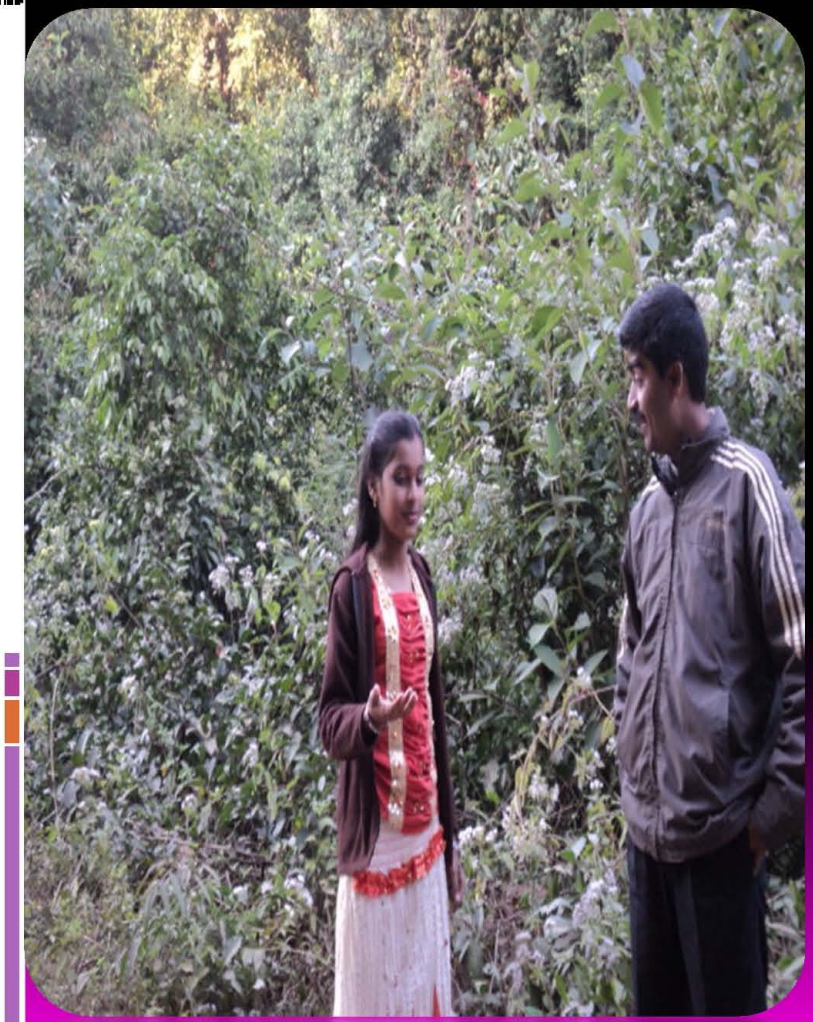
ಊರಿನಲ್ಲಿರುವ ಸಂಘಸಂಸ್ಥೆಗಳು

ದೇವರ ಗುಡ್ಡಗಳು.


ಕರ್ನಾಟಕ ಸರಕಾರ
ಅರಣ್ಯ ಇಲಾಖೆ
ಶ್ರೀದೇವಿ ಅಮ್ಮನವರ ದೇವರಕಾಡು
ಗ್ರಾಮ : ಶಿರಸಂಗಾಂವ (ಮುಸ್ಲಿ)
ಅರಣ್ಯ.ಸ.ನಂ : 122
ವಿಸ್ತೀರ್ಣ : 25.00 ಹೆಕ್ಟರ್
ವಲಯ, ಹುಲೇಕಲ್, ವಿಭಾಗ ಶಿರಸಿ
K
F
D

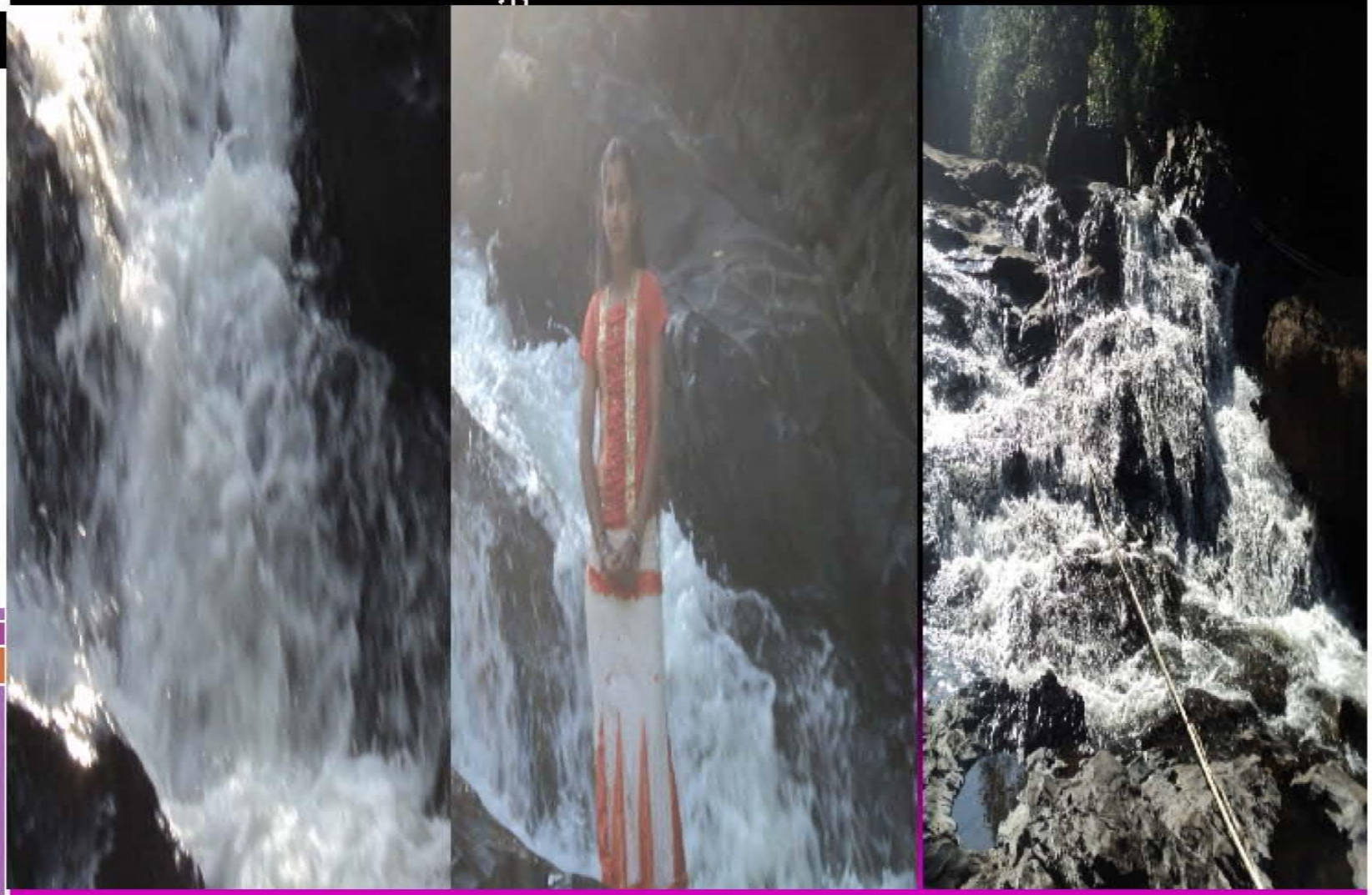


ನಮ್ಮೂರ ಸಮೂಹ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು

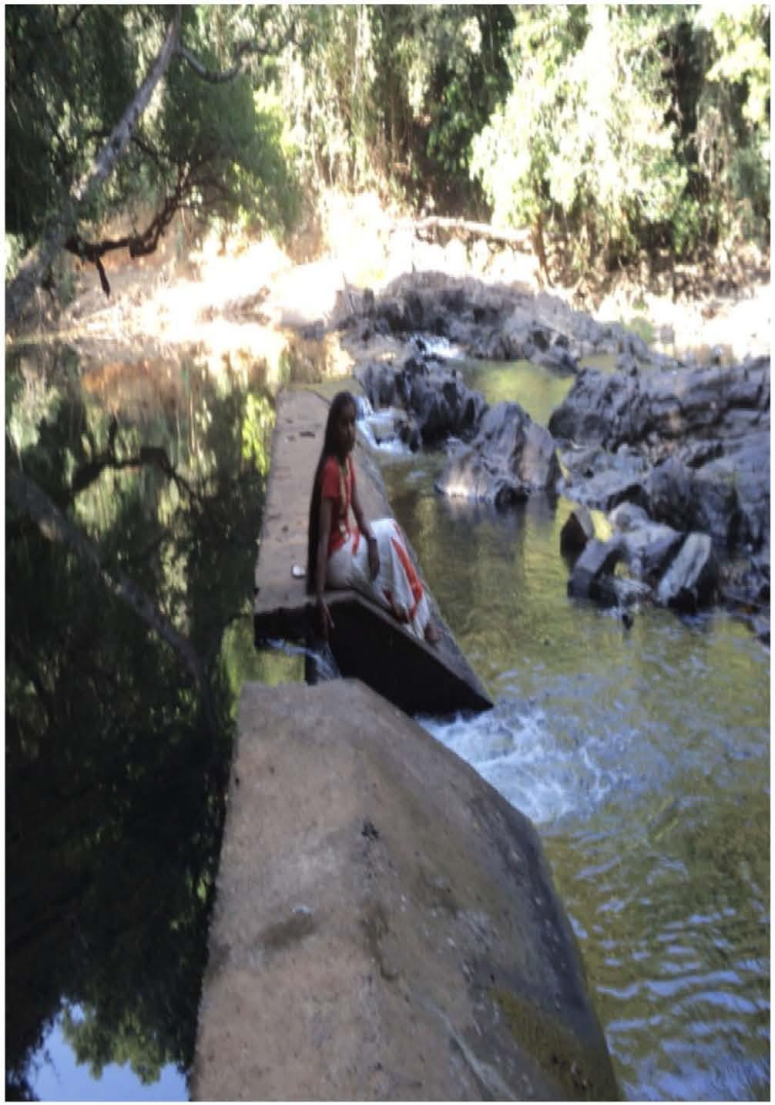


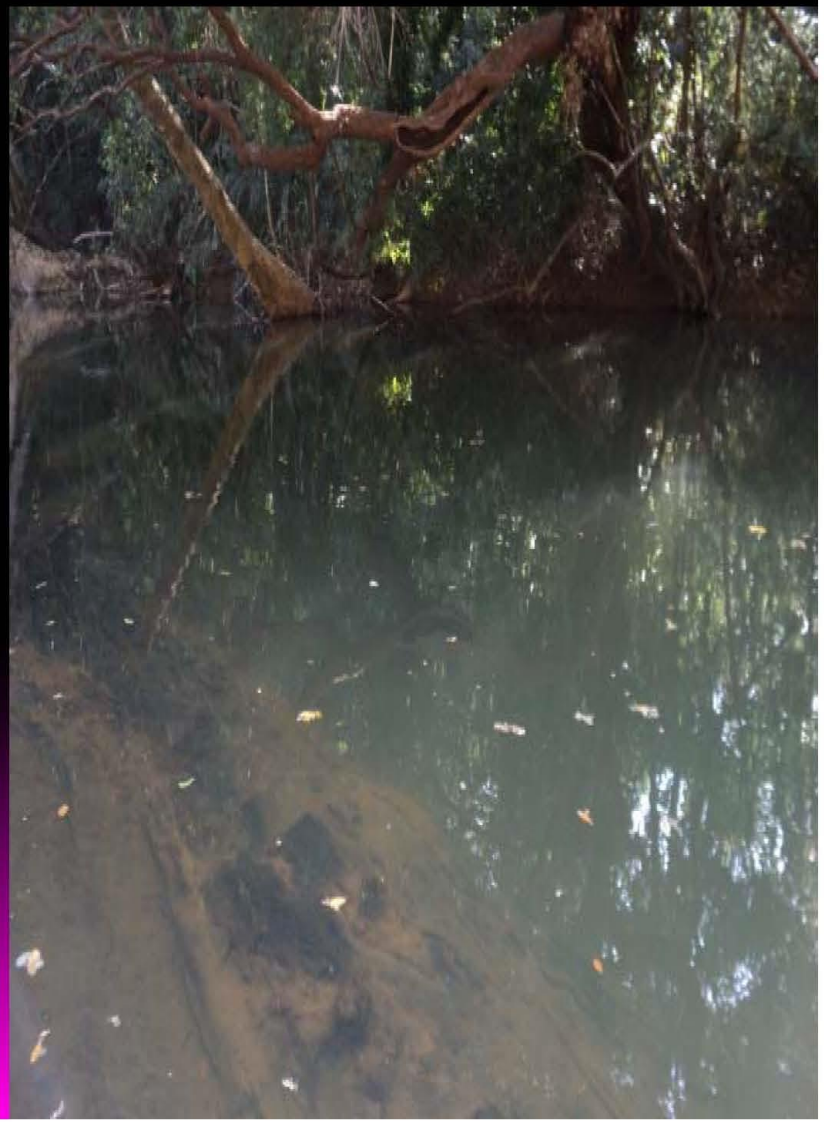
ನಮ್ಮೂರಿನ ಕರಕುಶಲ ಕಲೆಗಳು

ಸುಸಭ್ಬಿಯ ಸುಂದರ ನೋಟ.

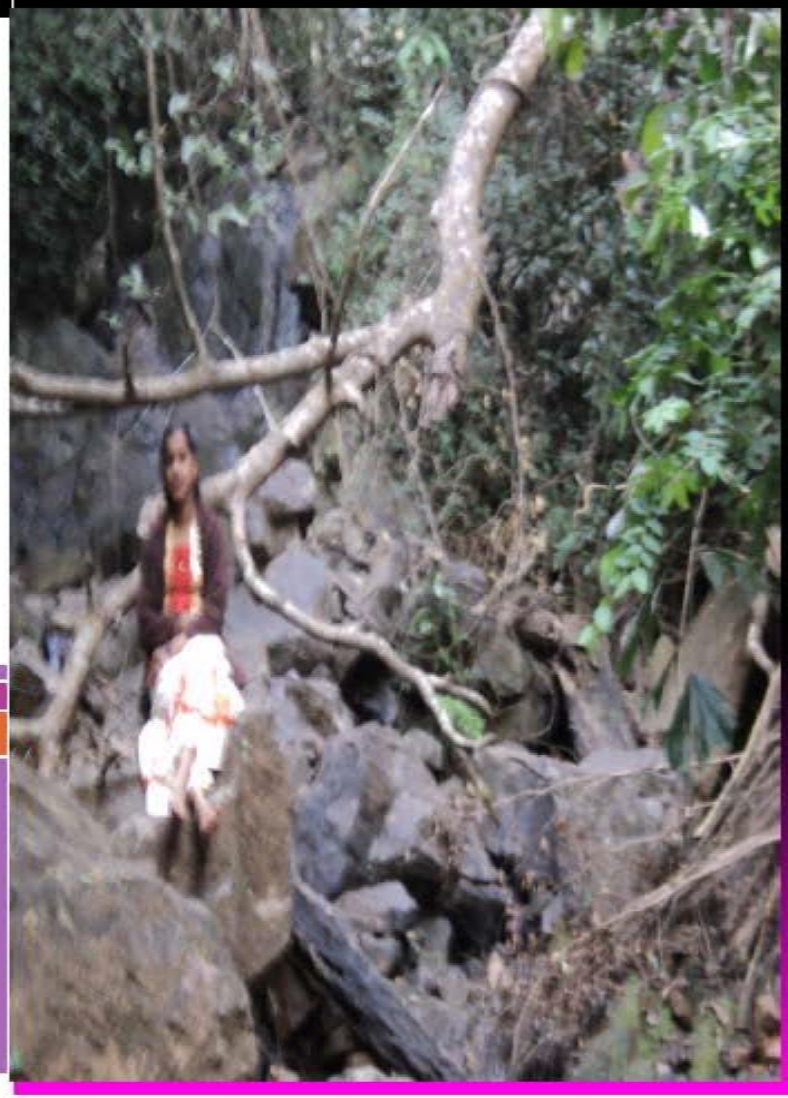


ನೀರಾವರಿ ಯೋಜನೆ.

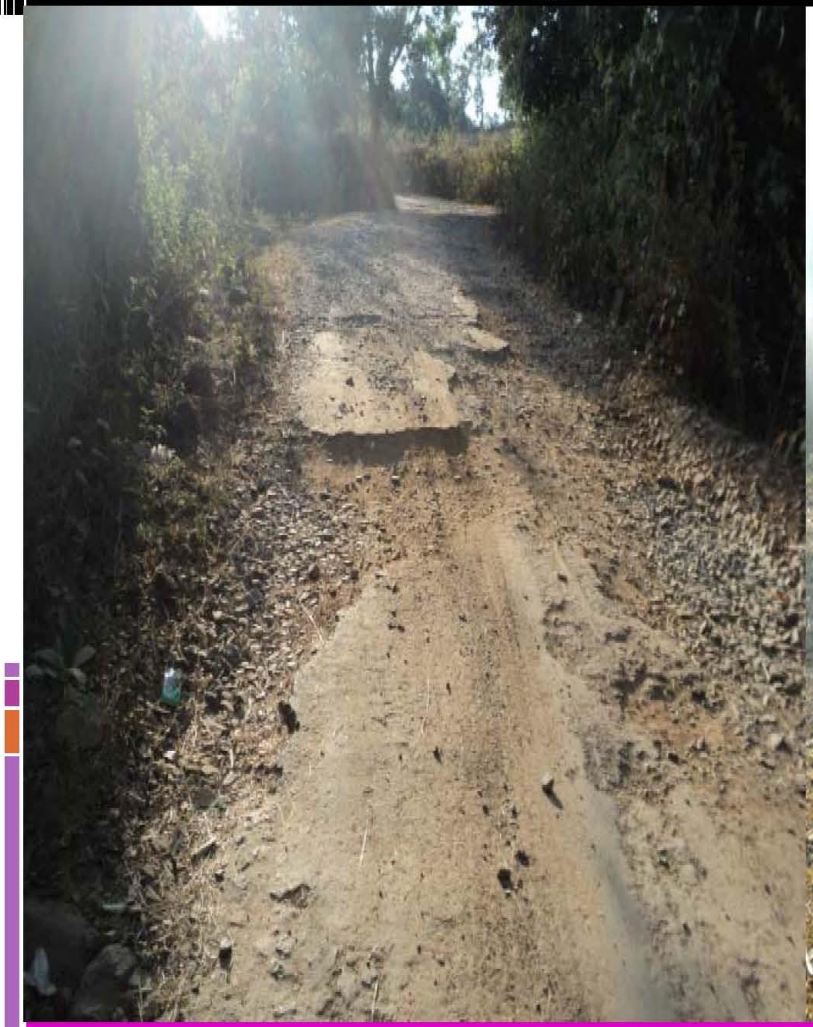




ಝರಿ ನೀರಿನ ಪ್ರದೇಶಗಳು.



ಹದಗೆಟ್ಟ ನಮ್ಮೂರಿನ ಸಾರಿಗೆ ಮಾರ್ಗ.



ನಿಸರ್ಗ ಸುಂದರ ಪ್ರಾಣಿ ಸಂಕುಲ.










ಸಹ್ಯಾದ್ರಿಯ ಜೀವ ವೈವಿಧ್ಯತೆನಾಶಕ್ಕೆ ಬುನಾದಿಯಾದ ಕೈಗಾ ಲೈನ್‌ಗಳು.


ಸಹ್ಯಾದ್ರಿಯ ಉತ್ತುಂಗದಲ್ಲಿ ನೆಲೆಯಾಗಿರುವ
ರಮಣೀಯ ನೋಟಗಳಿಂದ ಕೂಡಿದ ಕಕ್ಕಳ್ಳಿಯನ್ನು
ನೋಡಲೊಮ್ಮೆ ಬನ್ನಿರಿ.
ಧನ್ಯವಾದಗಳು

Lake 2016: Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats

[THE 10TH BIENNIAL LAKE CONFERENCE]

Date: 28-30th December 2016

Venue: V.S. Acharya Auditorium, **Alva's Education Foundation**, Sundari Ananda Alva Campus, Vidyagiri, Moodbidri, D.K. Dist., Karnataka, India – 574227, Phone: +91 8258 238105

Symposium Web: **http://alvascollege.com/upcoming-events/lake2016**

http://ces.iisc.ernet.in/energy

E Mail: lake2016@alvascollege.com; lake2016@ces.iisc.ernet.in; lake2016symposium@gmail.com; cestvr@ces.iisc.ernet.in; energy@ces.iisc.ernet.in

Organised by

Energy and Wetlands Research Group [http://ces.iisc.ernet.in/energy],
Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560012

Alva's College Moodbidri & Alva's Institute of Engineering and Technology, Mijar, Moodbidri, Dakshina Kannada – 574227, Karnataka, India, Phone: 08258-250275, 236531, 08258- 250200 to 207
Fax: 08258-237341, principal@alvascollege.com

Vagdevi Vilas Institutions, Bangalore	Vidyaniketan Public School, Ullal, Bangalore
K.K. High School, Varthur, Bangalore Adamya Chetana, Bangalore	*Sharadamba* Education and Rural Development Society (R), Bhairumbe
Students for Development, Bangalore	World Organization of Students and Youth

Supported by

Karnataka State Pollution Control Board, Bangalore	Karnataka Biodiversity Board, Bangalore
Karnataka Environment Research Foundation	Karnataka State Council for Science & Technology

The Ministry for Environment, Forests and Climate Change, Government of India
NRDMS Division, The Ministry for Science and Technology (DST), Government of India

Lake 2016: Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats

Introduction: Symposium focusing on lakes/wetlands popularly known as "**Lake Symposium**" was initiated by the Energy & Wetlands Research Group at Centre for Ecological Sciences, Indian Institute of Science, Bangalore in the year 1998. The theme was broadened in 2000 (Lake 2000) with a wider participation of education institutions, Governmental and non-governmental organisations, etc. The basic idea of the symposium was to bring out the trends in ecosystem conservation, restoration and management including the hydrological, bio-physical, people's participation and the role of non-governmental, educational and the governmental organizations and the future research needs. **Lake 2016** will be the 10thBiennial Lake Conference focusing on"**Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats"**will be held at foothills of Western Ghats. The theme of World Wetlands day 2016is **Wetlands for our Future: Sustainable Livelihoods** to demonstrate the vital role of wetlands for the future of humanity and specifically their relevance towards achieving the new Sustainable Development Goals. Lake 2016conference provides a unique opportunity to increase understanding of the role ofwetlands in sustaining the food, water and human livelihood with the challenges faced by thesefragile ecosystems.

Wetland ecosystems are cradles of biological diversity, providing water and primary productivity upon which countless species of plants and animals depend for survival. The degradation of these vital ecosystems is linked to continuing problems of land cover changes, deforestation, habitat fragmentation, pollution, indiscriminate disposal of liquid and solid wastes, and issues related to economic productivity and ecological security. The structural changes in the ecosystem due to land cover changes, will influence the functional aspects namely hydrology, bio-geo chemical and nutrient cycle, which are evident in many regions in the form of conversion of perennial streams to seasonal and disappearance of water bodies leading to a serious water crisis. There is growing evidence that biological diversity will be severely threatened by rapid climate change. Also, hydrological changes could be the dominant effect of climate change, as snowmelt increases, as evaporation rates increase and as droughts, storms and floods intensify. Much of the hydrological changes will be reflected in changes in freshwater ecosystems including most of the wetland areas. The biological impacts include dwindling of the biodiversity, habitat damage and loss of spawning grounds of aquatic organisms, reduction in inland fisheries resources and loss of vegetation. Conservation of natural resources through sustainable ecosystem management and development is the key to our secured future. Formulation and implementation of action plans that best conserve wetland resources require an understanding of issues, concerns and threats to water resources. Approaches towards this direction include:

- Fostering participation of all stakeholders to ensure that individuals and organizations are provided an opportunity to participate in the development of aquatic resources conservation activities;
- Encouraging intergovernmental initiatives through partnerships between communities and non-profit organizations;
- Identifying significant natural, recreational, economic, cultural, scenic resources and aquatic ecosystem values;
- Identifying potential threats to aquatic resources and values;
- Recommending policies and actions that can be undertaken to restore, maintain or enhance aquatic and terrestrial resources.
- Recommending policies and action plan towards the conservation and sustainable management of ecologically sensitive regions in Western Ghats – water tower and food bowl for peninsular India.

Scope: Lake 2016– '*Wetlands for our Future: Sustainable Livelihoods'*would demonstrate the vital role of wetlands for the future of humanity and specifically their relevance towards achieving the new Sustainable Development Goals. Lake 2016 conference provides a unique opportunity to increase understanding of the role of wetlands in sustaining the food and water with the challenges faced by these fragile ecosystems. Lake 2016would focus not only on updating of the current knowledge of the scientific community and also would bring in awareness among students, teachers and public. This would provide a platform for interaction among researchers, policy makers, academics and NGOs and address the issues related to wetlands and biodiversity in an era of climate change. This would help in developing a stronger network among experts and institutions in order to develop efficient strategies for the conservation and management of fragile ecosystems. As a part of the conference it has been decided to have theme based lead lectures by the eminent scholars, paper and poster presentations by researchers, school and college students.

Objectives: Focus of **Lake 2016** would be (i) assessment of the present status and conservation aspects of wetlands, lakes, tanks, ponds, swamps, streams and rivers in the Western Ghats, (ii) presentation by researchers, practitioners, students of case studies focusing on biodiversity, ecology, present status, threats, conservation measures required, (iii) discussion of current programmes on restoration, conservation and management of wetlands, (iv) role of education institutions, non-governmental organisations, religious organisations, (v) discussion of people's livelihood and fundamental right towards equitable resource allocation through scientific assessment of ecosystem goods and services, (vi) presentation by students (schools and colleges) based on documentation focusing on wetlands – biodiversity, present status, ecology, conservation and protection needs, (vii) allocation of financial and human resources to conserve and protect ecologically fragile ecosystems, (viii) proposals by students and non-governmental organisations for conservation, protection, restoration and sustainable management of aquatic ecosystems, (ix) discussion on research gaps and activities to be initiated by researchers to evolve appropriate strategies towards conservation of ecosystems in Western Ghats, and (x) developing strategies for conservation and sustainable management of ecologically sensitive regions in Western Ghats to sustain water, food and human livelihood.

THEMES: Papers are invited on the following themes from researchers, planners, development managers, economists and social scientists, school (VIII – XII students) and college students, school and college teachers.

Topics for Paper Presentation/ Poster in Lake 2016:

1. Wetlands for future: sustainable livelihood;
2. Food and water security, people's livelihood;
3. Climate Change and Ecological Sensitiveness of Western Ghats;
4. Biodiversity& Ecology: Western Ghats;
5. Wetlands and swamps: Restoration, Conservation and Management;
6. Aquatic and Terrestrial Ecosystems: Linkages
7. Land use, Land cover dynamics in Western Ghats
8. Carrying Capacity of Western Ghats;
9. Carrying capacity of river basins in Western Ghats;
10. Valuation of Ecosystem Goods and services;
11. Sacred Groves (*kans, devarakadu*) and Myristica Swamps;
12. Eco-Tourism in Western Ghats and Carbon sequestration;
13. Application of Geoinformatics in Wetland Management;
14. Natural and Anthropogenic disasters;
15. Limnology, aquatic ecology, biodiversity and prospects of bio-monitoring;
16. Pollution –terrestrial and aquatic - Monitoring and Management, bioremediation;
17. Sustainable Agriculture and organic farming;
18. Coastal ecosystems – Biodiversity, Ecology, Productivity and livelihood aspects;
19. Prospects of Renewable Energy (solar, biofuel, bioenergy) and Energy Conservation;
20. Environmental Education and Sustainable Development;
21. Environment Ethics and Green Technology;
22. Environment Literacy.

There are **three awards in students and teachers category**— High School (VIII, IX, X); College (XI, XII and UG) and Teachers (school and college). Awards for the best paper presentation would include a Certificate and a Memento. The best posters would be similarly, awarded.

ACCOMMODATION:

- Key speakers and invited delegates would be accommodated at Guest house in the college campus.
- Students and teachers would be accommodated at Student's Hostel on campus
- Delegates whose paper is accepted for technical session will be accommodated at hostel on first come first serve basis.
- Delegates requiring accommodation need to mention the requirement in the registration form. Room rent is required to be paid by the delegates as per the tariff in the respective hotel (Rs. 1000/person/day – non AC room and Rs 1500/person/day for AC room).

Accommodation will be arranged on payment basis upon the request from the delegates.

REGISTRATION FEE

- Delegates*: Rs. 2,500/-, Accompanying person: Rs. 1500/-
- Research scholars and University faculty*: Rs.2000/-
- **Masters students***: INR 1000/- (mandatory to attend all three days)
- **UG students***: INR 500/- (mandatory to attend all three days)
- Representatives* from NGO: Rs. 5,000/ -, Industry:10.000/-, Govt Agency: 5,000/-
- School and College students: Free. The organizing committee has decided to waive registration fee to school students and school teachers whose papers are accepted for presentation in the technical session.

Demand draft be drawn in Favour of the "Lake 2016, Alva's College, Moodbidri, Dakshina Kannada. DD to be sent along with duly filled in registration form.

*Mandatory to attend all the 4 days to get the conference certificate.

The registration fee would include registration kit, working lunch and tea during the symposium. Accompanying person will have access to all technical sessions and hospitality as per delegates except registration kit.

EXHIBITION STALL:

An exhibition of software and hardware related to Restoration and Monitoring technologies, Water quality analysis, Geographic Information System (GIS), Global Positioning System (GPS), Remote sensing, Image processing and Cartography, as well as products and services of other organizations and agencies working in the area related to the theme of the conference, will be organised. Organisations / Agencies can participate in the exhibition on payment of fee of INR 25,000. Registered agencies would be allowed to make 10 minutes presentation. Interested agencies may contact the working President, Lake 2016 and remit the fee through DD drawn in favor of ***"Lake 2016, Alva's College"*** payable at Moodbidri.

Lake 2016 SPONSORSHIP DETAILS:

Lake 2016 welcomes the support through sponsorship. Logo & Name of Sponsors will be displayed appropriately in Backdrop, Stands &Souvenir of Lake 2016. Sponsors will be given adequate mileage thru coverage.

Category of Sponsor Fee		**Complementary delegates & stall**
Diamond Sponsor	Rs. 5,00,000/-	(4 delegates, 12sqm exhibition stall)
Gold Sponsor	Rs. 2,50,000/-	(4 delegates, 6 sqm exhibition stall)
Silver Sponsor	Rs. 1,50,000/-	(2 delegates, 4 sq m exhibition stall))

Demand draft be drawn in favourof "Lake 2016, Alva's College, Moodbidri, Dakshina Kannada. DD to be sent along with duly filled in registration form.

LAKE 2016OrganisingCommittee:

Honorary President:Dr. M. Mohan Alva, Chairman,Alva's Education Foundation®, Moodbidri
President:Mr. Vivek Alva, Trustee, Alva's Education Foundation®, Moodbidri
Working President: Dr. Kurian, Cellphone: +919740668967, principal@alvascollege.com
Chairman: Dr. T.V. Ramachandra, EWRG, CES, IISc, Bangalore 560012

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Snehalatha V.K., Vidyaniketan School, Bangalore	Prem, Students for Development
Sreevidya, Bangalore Blaze Girls High School	Sanjeev Ningobam, World Organisation of Students and Youth

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Akhil C A, CES, IISc, Bangalore	Vishnu Mukri, Sreekanth Naik, CES, Bangalore

Saranya G., CES, IISc	Ravishankar Misra, CES, IISc
Sachin Hegde, CES, IISc	C J Jagadeesha, KERF, Bangalore

Call for papers

Call for Scientific Papers: Delegates interested in presenting papers as oral or poster need to submit the scientific paper as per the guidelines given below.

Guidelines for Paper Preparation: The full text paper (e-version preferably in a CD and one hard copy) formatted to A4 (210 mm x 297 mm) size, after having been scrutinized and accepted, will be printed as received, by offset process. Therefore, the text of the paper in English must confirm strictly to the following requirements and be free from errors.

Template as per: http://wgbis.ces.iisc.ernet.in/energy/lake2014/proceedings.php

Top/bottom margin	25 mm (on first page 35 mm)
Left/right margin	25 mm (all pages)
Typing area	160 mm x 247 mm (including folio), single space single column
Total pages	8 -10 pages including figures, tables, photographs, references etc., if any.
Font type	Times New Roman/Arial
Title	14 point BOLD CAPITALS
Author's Name	**12 point Bold** Upper-Lower (Do not prefix name with/Ms./Dr./Prof.)
Affiliation (designation, organisation and place)	*11 point italics*
E Mail ID, Telephone number and Mobile	11 point
Organisation web URL	11 point
Main headings	10 point **BOLD CAPITALS**
Subheadings	10 point **Bold Upper-Lower**
Text	10 point normal
Print	Laser Print or letter quality

The paper title, name(s) of author(s), affiliation and address, center justified, should be typed in a space of 50 mm from the top margin on the first page. The paper should begin with a synopsis of not more than 200 words describing the aim(s) of the work, methods, results obtained and conclusions. Type the headings, subheadings and paragraphs aligned with the left-hand margin (Align Left). Text justified on both sides is preferred. Use double space between paragraphs, and between section headings/subheadings and paragraphs. Do not number paragraphs, but number section and sub-sectional headings except synopsis, in conformity with established convention. The manuscript should be prepared by using MS Word (suitable for Windows). Figures should be drawn in black Indian Ink on translucent paper or acetate material (Gateway Tissue) with lettering of appropriate size using stencils. The figures should be placed nearest to the first reference in the text. Photographs on glossy paper may be included, if absolutely necessary. The authors must send brief bio-data (100 words) and the recommendations that they would like to be considered as a part of the conference based on their presentations.

Posters: Size A 0 and template as per

http://wgbis.ces.iisc.ernet.in/energy/lake2014/posters/poster_shrikant.pdf

Programme Details:

Date	Morning Session **(9.00 am – 1.00 pm)**	Afternoon Session **(2.00 pm – 7.30 pm)**
Day 1	Inauguration,Presidential Address, Release of Conference Proceedings, Chief Guest address, Keynote – Fragile Ecosystems of Western Ghats: Conservation and Management	Wetlands in Central Western Ghats: Success Stories Session on Temple Ponds Cultural Programme - Yakshagana
Day 2	Western Ghats Biodiversity, Ecology and Livelihood. **Technical Sessions:** Western Ghats – Biodiversity, Eco-Economics, Energy, Geo-visualisation, Livelihood, Environmental Ethics and 10^{th} – 12^{th} Students presentation (parallel sessions)	**Technical sessions:**Terrestrial Ecosystem, Aquatic Biodiversity, Wetlands Ecosystem, Aquatic Toxicology and Waste Water Treatment and 9^{th} and 8^{th} Students presentation (parallel sessions)
Day 3	**Conservation and Sustainable management of ecologically sensitive regions in Western Ghats** **Technical Sessions:**Urban Dynamics, Hydrology and Soil and Teachers presentation (parallel sessions)	**Technical Sessions:**Coastal Ecosystem Interactive Session, Panel Discussion, Cultural programme, ***Sahyadri Young Ecologist Award 2016*** (student)and ***Sahyadri Ecologist Award 2016*** (teacher)**,** ***V***aledictory, prize and certificates distribution.
Day 4	*Field Visit*	

Dates to Remember

Registration [Registration form].	**15^{th} September 2016**
Submission of scientific papers (full length / extended abstract), posters with the Registration Form (with the registration fee, depending on the category) **– delegates presenting papers/posters.**	**15^{th} September 2016**
Review of Papers and posters by the committee	**30^{th}September 2016**
Final submission of the revised manuscript (based on review)	**30^{th} October 2016**
Notification of Acceptance of Papers (on web)	**15^{th} November 2016**
Lake 2016 Conference	28-30^{th} December 2016
Field work	31^{st} December 2016

Paper Acceptance details at:

http://ces.iisc.ernet.in/energy

E Mail: lake2016@alvascollege.com; lake2016@ces.iisc.ernet.in; lake2016symposium@gmail.com; cestvr@ces.iisc.ernet.in; energy@ces.iisc.ernet.in

LAKE 2016: Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats

Registration form:

1	Name		
2	E mail		
3	Mobile		
4	Phone		
5	Fax		
6	Designation		
7	Department		
8	Institution		
9	Organisation Address		
10	Correspondence Address		
12	Presenting -	Paper	poster
13	Title (paper / poster)		
	If Yes, Title of the paper /Poster		
	Enclosed: Abstract / Paper (e–version and hard copy): (Please ensure CD is virus free)		
	e-version of the Abstract and paper may also be sent to	lake2016@ces.iisc.ernet.in; lake2016symposium@gmail.com	
14	Registration fee	Amount: DD No:	Date:
	Bank		
15	Accommodation	Required	YES / NO
	Accommodation Charges	Amount: DD No:	Date:
	Bank		
16	Travel Details	Arrival	Date & time
		Departure	Date & time

(All fields must be filled) *DD in favour of Lake 2016, Alva's college, Moodbidri

Signature of Participant **Signature of HOD/Principal**

Place:_____Date:_____

Organisation

Energy & Wetlands Research Group, CES, Indian Institute of Science, Bengaluru

The Energy and Wetlands Research Group at the Centre for Ecological Sciences (CES), is actively involved in studies and training on issues related to environment, water resources, energy, ecology, wetlands, geographic information systems, environmental impact assessment and natural resource management. The Centre for Ecological Sciences, founded in 1983 with the support of Ministry of Environment and Forests offers exciting opportunities for research in a variety of areas in ecology. Over the past 25 years, and more, CES have instilled a tradition of rigorous enquiry in diverse areas of ecology, evolution and behavior. The projects of CES are often integrative which uses multiple approaches, from theoretical and laboratory studies to field-based research, to explore the research questions. A number of CES research areas are breaking new ground in ecology while others have significant roles in conservation. Details at http://ces.iisc.ernet.in/energy
https://www.researchgate.net/profile/T_V_Ramachandra/publications

Indian Institute of Science (http://www.iisc.ernet.in)

The Indian Institute of Science (IISc) was founded in 1909 as a result of the joint efforts of Jamsetji Nusserwanji Tata, the Government of India, and the Maharaja of Mysore. In 1886, Jamsetji Tata conceived of a university of science that will work for the benefit of India, and in 1898 created an endowment for establishing such an institution.

Over the 105 years since its establishment, IISc has become the premier institute for advanced scientific and technological research and education in India. Beginning with 2 departments and 21 students in 1911, today IISc has 39 departments, units, or centres, 3500 students, and about 500 academic and scientific staff, supported by 600 administrative personnel. Out of this population of students, about 2200 are in various PhD programs, almost 900 are enrolled for various Masters degrees, whereas about 400 are registered in the newly established, research oriented, four-year Bachelor of Science (Research) programme, of which the first batch graduated in 2015.

Alva's Education Foundation (R) Moodbidri (http://alvas.org/)

Alva's Education Foundation (R) Moodbidri, was established in 1995 by visionary chairman Dr. M. Mohan Alva to provide the quality education to the rural students mainly in and around Moodbidri. He has succeeded in developing Moodbidri as education hub in South Canara with 20 various Educational Institutions. These educational Institutions are characterized by quality education across a broad range of disciplines in the field of Medicine and Allied health Sciences, Arts, commerce, Business & Management, Basic Sciences, Engineering & Technology, Social Science, Education, Physical Education, Pre University Courses and Primary Education. The Foundation also organizes many cultural and literary events like "Alva's Virasath" and Alva's Nudisiri" and festivals of all communities to infuse rich meaning in to the contemporary social life which is otherwise fraught with modern monotony and mundane fullness. Alva's Pragati is a mega job fair which provides job to job seeker across the state and have provided more than 25,000 jobs since the inception.

Address for Communication

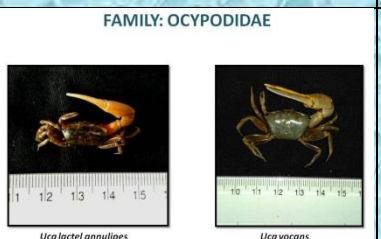
Dr. Kurian Working President, Lake 2016 Principal, Alva's College Vidyagiri, Moodbidri, Dakshina Kannada – 574227 Moodbidri, Karnataka, India, Phone: 08258-250275, 236531, 08258- 250200 to 207, Cellphone: +919740668967 Fax: 08258-237341, principal@alvascollege.com http://alvascollege.com/upcoming-events/lake2016	**Dr. T.V. Ramachandra** Chairman, Lake 2016 Energy and Wetlands Research Group, TE 15, Centre for Ecological Sciences Third Floor, E wing, New Bioscience Building [Near D Gate], **Indian Institute of Science**, Bangalore 560012 Phone: 91-080-22933099/2293 3503 (extn. 101/107) E mail: cestvr@ces.iisc.ernet.in, lake2016@ces.iisc.ernet.in Lake2016symposium@gmail.com Conference Web: http://ces.iisc.ernet.in/energy

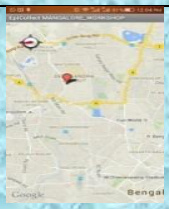
Glimpses of 2014 conference @ Sirsi, Uttara Kannada

LAKE 2014, Conference on Conservation and Sustainable Management of Wetland Ecosystems in Western Ghats
13-15 November 2014

Sahyadri Conservation Series 61

Sonneratia caseolaris in Sharavati river





ENERGY AND WETLANDS RESEARCH GROUP

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Indian Institute of Science, Telephone : 91-80-22933099/22933503(Ext:107)/23600985

Fax : 91-80-23601428/23600085/23600683[CES-TVR]

Email : cestvr@ces.iisc.ernet.in, energy@ces.iisc.ernet.in

Web: http://ces.iisc.ernet.in/energy, http://ces.iisc.ernet.in/biodiversity

Open Source GIS: http://ces.iisc.ernet.in/grass