

## People's Biodiversity Registers (Modified)

### General/ Grassroot level/ Baseline Information

Name of the Panchayat Samity:

Taluk:

District:

State:

Geographical Area:

Population: Male/ Female

Habitat and Topography:

Climate (Rainfall, Temperature and other weather patterns)

Land Use (Nine fold classification available with village records)

Date, Month and Year of PBR preparation

Management Regime: Reserve Forests (RF) / Joint Forest Management (JFM) / Protected Areas (PA) / Community Owned and Managed Forests (COM)

### Annexure 1

**Details of Biodiversity Management Committee (BMC) of the panchayat (One elected Chairperson and six persons nominated by the local body; not less than one third to be women and not less than 18% belonging to SC/ST)**

1) Name of the Chairperson:

Age:

Gender:

Address:

Area of specialization

### Annexure 2

**List of *Vaids*, *hakims* and traditional health care (human and livestock) practitioners residing and or using biological resources occurring within the jurisdiction of the village**

Name:

Age:  
Gender:  
Address:

Area of Specialization:  
Location from which the person accesses biological material:  
Perception of the practitioner on the resource status:  
Medicinal use:

### **Annexure 3**

#### **List of individuals perceived by the villagers to possess Traditional Knowledge (TK) related to biodiversity in agriculture, fisheries, and forestry**

Name:  
Age:  
  
Gender:  
Address:  
Area of specialization:

### **Annexure 4**

#### **Details of schools, colleges, departments, universities, government institutions, non-governmental organization and individuals involved in the preparation of the PBR** You may add names of more institutions / NGO / Individuals, etc. if necessary.

1)Contact person Name and Address:

### **Annexure 5**

#### **Details of access to biological resources and traditional knowledge granted, details of the collection fee imposed and details of the benefits derived and the mode of their sharing**

No	Name and address of the Person/ Institution/ Company/ Others	Local and Scientific name of the biological material accessed and quantity	Date and resolution of the BMC and endorsement by the Panchayat	Details of collection fee imposed	Anticipated mode of sharing benefits or quantum of benefits shared

**Part II**  
**PBR – Formats**

**AGROBIODIVERSITY**

**Format 1: Crop plants (Cultivated Agricultural/ Horticultural: Cereals/ Pulses/ Vegetables/ Fruit/ Fodder/ Ornamental/ Medicinal etc.)**

1.	2.		3.	4.	5.	6.	7.		8.	9.	10.	11.	12.	13.	14.
Crop	Local Name	Plant type/ Habit	Scientific Name	Variety	Landscape / Habitat	Approx. Area sown	Local status		Special features	Cropping season/ Season of fruiting	Uses/ Part used	Associated TK	Other details Mark et/ Own use	Source of Seeds/ Plants / Seedling material	Community/ Knowledge Holder
							Past	Present							

**Format 2: Weeds**

1.	2.	3.	4.	5.	6.	7.		8.	9.	10.	11.	12.
Plant	Scientific Name	Local Name	Affected crop	Impact	Landscape/ Habitat	Local Status		Uses if any	Management Options	Associated TK	Other details like exotic	Community / Knowledge Holder
						Past	Present					

**Format 3: Pests/ Diseases of Crops**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Host	Insect / Animal	Scientific name	Local name	Habitat	Time / season of attack	Management Mechanism	Associated TK	Other details	Community knowledge holder

**Format 4: Markets for Crop produce/ Medicinal plants/ Other produce etc.**

1.	2.	3.	4.	5.	6.	7.	8.	9.
Name of the market & location	Weekly (D)/ Fortnightly (D)/ Monthly (D)/ Biannual (M)/ Annual (M) [1]	Types of Produce brought and sold [2]	Type and average quantity/ number of transactions in a day	Places from which produce is brought	Places to which the produce is sold/ transported	Name and location of special grain/ vegetable/ other markets	Types of produce sold	Source of produce

**Format 5: Peoplescape**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Community & Population	Families & Major occupation	Sub-occupation	Depending Landscape	Major resources accessed and seasons of access	Landscape Management Practices	Resource management practices	Cast / tribe	Social condition	Nature of inhabitants	No. Of HHs

**Format 6: Landscape**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Major Landscapes	Sub -	Feature	Ownershi	Genera	Genera	User	Manageme	Genera	Associate	Other	Communit
Agricultural land	Pond Fallow land	s and approx. area	p	l flora	l fauna	group	nt practices	l uses	d TK	detail	y accessed

**Format 7: Waterscape**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Waterscape element type	Sub-type	Features and approx area	Ownership	General flora	General fauna	Major uses	User Groups	Management Practices	General uses	Associated TK	Other details	Community accessed

**Format 8: Soil type**

1.	2.	3.	4.	5.	6.	7.	8.
Soil Type	Color & Texture	Features	Soil management	Plants / crop suitable	Flora and fauna	Associated TK	Other information

## DOMESTICATED BIODIVERSITY

**Format 9: Domesticated Animals**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Animal Type	Local Name	Scientific Name	Breed (local/ hybrid)	Features	Method of keeping	Local status	Uses	Associated TK	Commercial rearing	Other details including products and services	Community Know. Holders
						Past					

**Format 10: Aquatic (Fresh water/ Marine) Biodiversity (Cultured Fisheries/ Others)**

1	2	3	4	5	6	7		8	9	10	11	12
Fish Type	Local Name	Scientific Name	Variety	Features	Waterscape (pond/bheri/talao)	Local status		Uses	Associated TK	Commercial rearing	Other details	Community Know. Holders
						Past	Present					

**Format 11: Markets/ Fairs for Domesticated Animals, Fish and other products**

1.	2.	3.	4.	5.	6.	7.	8.	9.
Name of the Weekly Market / Fair	Location	Weekly / Fortnightly & Others Bi-annual / Annual	Day held	Month incase of bi-annual or annual market fair	Types of Animal bought and Sold	Number of animals (average) transacted in a day	Places from where the animals are arrived	Places to where the animals are transported

## WILD BIODIVERSITY

**Format 12: Medicinal Plants (Herbs, Shrubs, Trees etc.)**

1.	2.	3.	4.	5.	6.	7.		8.	9.	10.	11.	12.
Plant Type	Local Name	Scientific Name	Variety	Landscape/ Habitat	Source of plant/seeds	Local status		Uses (usage)	Part used	Associated TK	Other details market/own use	Community/ Know. Holders
						Past	Present					

**Format 13: Ornamental Plants/ Trees/ Climbers etc.**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Plant Type	Local Name	Scientific Name	Variety	Source of plant/seeds	Commercial/ non- Commercial	Uses	Associated TK	Other details	Community/ Know. holder

**Format 14: Timber Plants/ Trees**

1.	2.	3.	4.	5.		6.	7.	8.	9.	10.
Plant Type	Local Name	Scientific Name	Habitat	Local status		Wild/ home- garden	Other uses (multi)	Associated TK	Other details	Community/ Know. holder
				Past	Present					

**Format 15: Fumigatory/ Masticatory (Chewing) Plants**

1.	2.	3.	4.	5.	6.		7.	8.	9.	10.	11.
Plant (Herb, Shrub, Tree)	Local Name	Scientific Name	Variety	Habitat	Local Status		Uses (usage)	Part used	Associated TK	Other details (mode of use)	Community knowledge holder
					Past	Present					

**Format 16: Other Flora (Herbs/ Climbers/ Shrubs/ Trees/ Tubers/ Grasses etc.)**

1.	2.	3.	4.	5.	6.		7.	8.	9.	10.	11.		
Plant Type	Local Name	Scientific Name	Habit	Habitat	Local status		Commercial / own use	Part collected	Importance economic, cultural etc	(as social, TK	Associat ed TK	Other details	Communi ty Knowledg e Holder
					Past	Presen							

					t						
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**Format 17: Wild relatives of Crops**

1.	2.	3.	4.	5.		6.	7.	8.	9.	10.
Local Name	Scientific Name	Associated crop	Landscape/ Habitat	Local Status		Uses (usage)	Part Used	Associated TK	Other details	Community / Knowledge Holder
				Past	Present					

**Format 18: Wild Aquatic (Fresh water/ Marine) Flora**

1.	2.	3.	4.	5.	6.
Sl. No.	Local Name	Scientific Name	Variety	Importance	Trends

**Format 19: Wild Plant Species of Importance**

1.	2.	3.	4.	5.	6.
Sl. No.	Local Name	Scientific Name	Variety	Importance (as economic, social, cultural etc.)	Status

**Format 20: Wild Animals (Mammals/ Reptiles/ Amphibia/ Birds/ Insects/ Others)**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
Animal Type	Local Name	Scientific Name	Habitat	Description	Season when seen	Local Status		Uses (if any)	Associated TK	Mode of Hunting, collecting (if any)	Other details	Community/ Knowledge Holder
						Past	Present					

**Format 21 B: Aquatic (Fresh water/ Marine) Fauna**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Animal Type	Local Name	Scientific Name	Habitat	Local Status	Parts Collected	Commercial Uses	Other Uses	Associated TK	Community/ Knowledge Holder

				Past	Present	(if any)	(if any)			
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**Format 22: Wild Animal/ Aquatic fauna of importance**

1.	2.	3.	4.	5.		6.	7.	8.	9.	10.
Animal	Local	Scientific	Habitat	Local Status		Parts	Commercial	Other	Associated	Community/
Type	Name	Name		Past	Present	Collected (if any)	Uses (if any)	Uses	TK	Knowledge Holder

**Format 23: Any other information of local importance**

1.	2.	3.
Sr. No.	Information of local importance	Remarks

*End of Part II*



## Part III

# Guide to Field Study

### Profile of the Study Area

#### 3.1 General Profile

Each study area has its own characteristics. The PBR is to include the general profile of the area – its geographical location, district, block, gram panchayat, J.L no. from Mouza / Ward map, altitude, latitude, longitude (whenever possible). The boundary of the study area and also its connectivity should be additional point in the general profile.

#### 3.2 Socio-Economic Profile

An outlined socio-economic profile of the study area will help to understand people's dependency on the biological resources, either for internal use or for external supply. The following information will be required to get the socio-economic profile:

- Population – to get the total population of the study area individual household survey is to be carried out with reference to the following parameters.
  - ◆ Total number of members
    - Male - below 18 years, 18 – 65 years, above 65 years
    - Female - below 18 years, 18 – 65 years, above 65 years
    - Literacy rate
  - Male – 4-18 years, 18-65 years, above 65 years
  - Female – 4-18 years, 18-65 years, above 65 years
- Drinking water – Source, Number (in case of dug well and tube well)
- Sanitation - Sanitary latrine present or absent
- Land holding
  - Agricultural land – Upto 5 cottah,  
5 cottah – 1 bigha,  
  
1 – 5 bigha,  
  
Above 5 bigha  
(1 cottah – 720 sq.ft; 1 bigha – 14400 sq.ft)

- Occupation
  - Agriculture
  - Fisheries
  
  - Animal husbandry
  - Trading
  
  - Manufacturing
  - Other unorganized worker
  
  - Organized worker
- Family wise monthly income
- Healthcare and dependency on traditional medicine
- Fuel use and source
- Daily food habit
  - Staple food
  - Pulses
  - Vegetables
  - Oilseeds
  - Fish, egg, meat
- Domesticated animals – number, types and breed (e.g., cow, goat, chicken, duck)
- Type of housing – Kutchha, Pucca
- Respondent's awareness to biological diversity

Special focus should be given to the more knowledgeable individual, men and women. During the survey, the following format may be used for recoding of information of knowledgeable individuals:

### **Natural Resources: Survey and Documentation**

Natural Resources include non-living elements like air, water, soil, minerals and also living elements like, plants, animals and microorganisms. Together the nature provides the life sustaining system.

## **1.0 Non-Living Natural Resources**

### ***1.1 Land Resource:***

Land and soil is a vital resource supporting biological diversity. Soil is not an inert substance. It provides shelter to tiny microbial organisms like bacteria and fungi as also micro arthropods and earthworms, not easily visible to naked eyes.

In order to understand land and soil, it is therefore essential to prepare a basic target area (urban, non-forest rural, forest, mountain, coastal, island etc.) based land use map. To prepare such a map one has to study the following:

***For Urban Area:***

- (I) Land for human habitation
  - a. How much land is used
  - b. What type of land is preferred
- (II) Roads
  - a. Length of the Pucca road
  - b. Length of the Kutchha road
- (III) Institutional and Commercial Area
  - a. Small scale industries
  - b. Markets
  - c. Institutions like office, educational institution
- (IV) Parks, Gardens and Open Space
  - a. Total park and garden area
  - b. Total open space area
- (V) Wetlands
  - a. Name, location, ownership, area and current uses of wetlands (Details are given under Water Resource)
- (VI) Rivers / Canals / Creeks – to understand the flowing water profile (if any)
  - a. Length of the river/canal
  - b. Current uses of river/canal water

***For Non-Forest Rural Area:***

- (I) Agricultural Land
  - a. How much water is accumulated in low, medium and high land?
  - b. Whether such land is used for single crop, two crops or more?
  - c. What type of irrigation is currently practiced?
  - d. What are the major crops used for cultivation?
- (II) Wetlands
  - a. Name, location, ownership, area and current uses of wetlands in the village (Details are given under Water Resource)

- (III) Land for human habitation
  - a. How much land is used?
  - b. What type of land is preferred?
- (IV) Fallow Land
  - a. Area of fallow and their location
  - b. Vegetation in the fallow land
  - c. Fauna in the fallow
  - d. Whether it is used for any religious purposes?
  - e. Whether permanent fallow or current fallow?
- (V) Rivers / Canals / Creeks – to understand the flowing water profile
  - a. Origin of the river/canal
  - b. Length of the river/canal
  - c. Current uses of river/canal water
- (VI) Roads
  - a. Length of the Pucca road
  - b. Length of the Kutchha road
- (VII) Jungle / bushes / forest patch
  - a. Location
  - b. Area
- (VIII) Sacred Grove / Pond
  - a. Location
  - b. Area
  - c. History
  - d. Salient features

***For Forest Area:***

- (I) General features
  - a. Forest types (Deciduous, evergreen, dry, wet etc.)
  - b. Area under closed forest
  - c. Area under open forest
  - d. Category of forest (protected, reserved, unclassified)
- (II) Wetlands
  - a. Name, location, area and current uses of wetlands (Details are given under

Water Resource)

- (III) Rivers / Canals / Creeks – to understand the flowing water profile
  - a. Origin of the river/canal
  - b. Length of the river/canal
  - c. Current uses of river/canal water
- (IV) Forest village, if any
  - a. Location of the village
  - b. Size of the village
  - c. Road length and type
- (V) Sacred Grove / Pond
  - a. Location
  - b. Area
  - c. History
  - d. Salient features

***For Mountain Area:***

- (I) General features
  - a. Altitude
  - b. Slope
- (II) Land under Forest
  - a. Forest types (Deciduous, evergreen, dry, wet etc.)
  - b. Area under closed forest
  - c. Area under open forest
  - d. Category of forest (protected, reserved, unclassed)
- (III) Barren land
- (IV) Landslide zone
- (V) Agricultural Land
  - a. How much water is accumulated in low, medium and high land?
  - b. Whether such land is used for single crop, two crops or more?
  - c. What type of irrigation is currently practiced?
  - d. What are the major crops used for cultivation?
  - e. Area under abandoned Jhum land
  - f. Area under terrace cultivation
- (VI) Wetlands

- a. Name, location, ownership, area and current uses of wetlands in the village  
(Details are given under Water Resource)

(VII) Land for human habitation

- a. How much land is used?
- b. What type of land is preferred?

(VIII) Rivers / Canals / Creeks – to understand the flowing water profile

- a. Origin of the river/canal
- b. Length of the river/canal
- c. Current uses of river/canal water

(IX) Roads

- a. Length of the Pucca road
- b. Length of the Kutchha road

(X) Jungle / bushes / forest patch

- a. Location
- b. Area

(XI) Sacred Grove / Pond

- a. Location
- b. Area
- c. History
- d. Salient features

***For Coastal Area:***

(I) General features

- a. Location
- b. Length of coastline
- c. Current uses:
  - i. Human habitation
  - ii. Area without habitation
  - iii. Coastal industries
  - iv. Coastal fisheries
  - v. Coastal forest
  - vi. Coastal agriculture
  - vii. Coastal road
  - viii. Coastal wetland

Note: Details under each category can be followed as given above.

After studying the above, a Land Use Map is to be prepared on the basis of Mouza map to

- a. Demarcate target areas
- b. Identify parcel of land under each category (as shown above under I , II, III.....)
- c. Color code the land uses on the map

## **1.2 Water Resources**

Water is a vital resource sustaining life forms. Collect the information on ground water (from dug well data and hand pump data) and surface water and document

- Surface Water Resource
  - a. River, Canal, Wetland – location / name
  - b. Area
  - c. Uses – drinking / cooking / irrigation
  - d. Producers of wetlands – fishes / vegetables / flower / aquatic plant
  - e. Birds in the wetland
  - f. Does the wetland acts as receptacle during flood / serve as water recharging area?
  - g. Recreational use
- Groundwater Resources (except in Mountain ecosystem)
  - a. Number of hand-pumps used for lifting drinking water and approx. depth of each
  - b. Number of shallow and deep tube wells used for irrigation – horsepower of motors used for each, hours of operation per day

## **2.0 Living Natural Resources**

### **2.1 Animal Diversity (Fauna)**

- How to observe animals in the field?

In every target area, diverse groups of animals can exist in tropical climates. These may include animals without backbones (invertebrates) like earthworm, insects, spiders, scorpions, mollusks etc., or animals with backbones like fishes, toads and frogs, snakes, lizards, turtle, tortoises, birds and mammals (squirrels, rat, mole, civet cat, fox etc). Since the animals occur at different period of time and season, they have to be observed both seasonally and also diurnally (day and night). Some animals are best observed during early morning (e.g., Birds) or at the dusk time (e.g., Bat) while others may be observed before the day temperature increase (e.g. Butterflies). It has to be remembered that animals inhabit different habitats viz., upper branches of the tree, grassland, banks of river, deep foliage, holes in the tree trunk, under the bark, on the ground or underground.

- Selection of sites for observation

It will be useful to select the best possible site for observation where diverse biological species may be available. These may include the agricultural land, culturable fallow, village orchards, village ponds, forest patch, canal side and roadside. A complete information base can only emerge if year round, seasonal observations and recording is carried out.

A brief outline of methods of observation for selected group of animals is given below:

### 2.1.1 Invertebrate Animals

Invertebrate animals can occur both in land and water in specific habitat condition (under the stone, in rotten logs, in the flowers, on fruit trees, in bushes, in agricultural fields etc.). The smallest invertebrate animal called protozoa (body with single cell) cannot be seen by naked eyes but they may exist in soil, water even within the body of the human being or other animals. Normally the visible animal species are recorded in PBR. These include:

#### 2.1.1.1 Earthworms

Earthworms normally live in mineral rich soil. To observe and collect earthworm specimen:

- f* Select agricultural and other land; make 1 ft x 1 ft x 1 ft deep cavity at least in 5 / 10 places and collect earthworm sample in small plastic glass vial containing 70-80 percent alcohol (spirit).
- f* Note the date, time and place of collection in the field notebook.
- f* Local names can be further validated by scientific names once identified by a subject specialists.

#### 2.1.1.2 Insects & Spiders

Insects comprise the largest number of living organisms in the world. So far nearly 8,50,000 species of insects have been documented in the world. Scientists believe this is only 4-5 percent of the total insects species that may exist in today's world;

that means 95 percent of the insects are yet to be described and named. Obviously, the largest numbers are expected from southern tropical countries including India. So far only 6.5 percent of the insect species of the world have been recorded from India. Out of 29 orders of insects, representatives of 27 orders have been located in the country.

Usually insects are considered as enemies to the human society because they cause considerable damage to the agricultural crop and many species can act as vectors and transmit pathogens causing serious diseases in plants, animals and human being (Cholera, Malaria, Kala Azar, Dengue are some of the insect borne diseases). On the other hand, a number of insects offer useful services to the plant kingdom and to the human society as pollinators, as natural enemies for pests, as providers of silk, honey, lac etc. Insects are the largest group of pollinators in the natural world.

Spiders may occur in several forms. Spiders act as predators for many of the insects and provide food to the higher animals like lizards and birds.

In general, the goods and services from insects and the spiders can be listed as follows:



- Provide honey, lac and silk.
- Act as pollinators in agriculture, forestry and horticultural crops.
- Act as food in many parts of the world.
- Act as predator for pest insects (larva of Lady bird beetle)
- Help to increase fertility of the soil (soil inhabiting insects)
- Provide aesthetic pleasure and lessons in social behavior (e.g., butterflies and honey bees)
- Many insects and spiders are used for medicinal purposes by the tribal communities
- Play an important role in the food chain in nature.

### $\frac{3}{4}$ General Characteristics of Insects

Insects and spiders have jointed legs; the same character can also be seen in crustacean (Prawn, Shrimp and Crabs), centipedes and millipedes. Insects have normally a pair of antenna and an exoskeleton. Adult insects have three distinct parts – head, thorax and abdomen. Insects have three pairs of legs and usually one or two pairs of wings. Male and female insects may vary in colour, shape and size.

### $\frac{3}{4}$ Collection and Observation

To collect insects and spiders, several methods can be used viz.,

- Hand collection with a soft camel hair-brush (soft body insects) or with a pair of forceps. Such insects are normally preserved in 70 percent alcohol in glass vial.
- Net collection – Butterflies and other flying insects can be collected with the help of a specially prepared aerial net with a long handle or with a sweeping net attached to a short handle.
- Traps – Insects can also be collected by setting up different types of traps, viz.,
  - Light trap: Light attracts insects at night especially at dark nights. An illuminated electric bulb or a petromax lamp can be used as a light source in the open field; a piece white cloth (3 ft X 3 ft) may be placed on the grass near the light source; when the insects are attracted to the light and settle on the white cloth they can easily be collected.
  - Pitfall Trap: This is a simple devise of using a plastic cup (9 cm X 8 cm), which is placed in a dug out pit at the floor level. Such cups are covered by a wire mesh and then by leaves and twigs. The cups should contain some attractant food or liquid. Such containers should be kept for 3-days and then taken out for observation.

### $\frac{3}{4}$ To observe and collect insects:

- f Select a site and demarcate an area measuring 50m X 10m.
- f Observe and collect the insects and spiders by hand, net and traps (for methods, see above).
- f This can be repeated depending on the total area of the selected site.
- f To preserve the collected specimens, first kill the insects and spiders using chloroform or benzene. Preserve butterflies and moths in envelopes in dry condition and other insects in plastic or glass viol containing 70% alcohol (spirit).
- f Put serial number in the collected specimens and write it in the field notebook. Also note the date, time, description of the site, type of insect collected and number of each type.

¾ Identification of collected insect specimen:


Firstly, it should be identified whether the collected specimen is insect or not. For these following steps to be adopted:

- f Presence of two pairs of antennae and not less than five pairs of legs – crustacean
- f Presence of four pairs of legs and no antenna – arachnid
- f Presence of three pairs of legs and adult specimen possessing wings (except in some cases like Springtails, Lice, Earwigs etc.) – insect


¾ Characteristics of insects of different orders:

Insects are divided into 29 orders. The characteristics of most common insects are given below:


A. Odonata:

	<ul style="list-style-type: none"> <li>i. Two pairs of wings with several or many cross veins</li> <li>ii. Large compound eyes present on the head</li> <li>iii. Three pairs of legs with exoskeleton</li> </ul> <p>e.g. Dragonflies, Damselies</p>
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B. Orthoptera

	<ul style="list-style-type: none"> <li>i. i. Two pairs of wings, fore wings are thin, hind wings are large with cross veins</li> <li>ii. Hind legs are thick and long, used for jumping e.g. Grass hoppers, Crickets</li> </ul>
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### C. Phasmida

	<ul style="list-style-type: none"><li>i. Body flat leaf like or long and slender, stick like</li><li>ii. Wingless</li></ul> e.g. The Walking Sticks,
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### D. Dictyoptera

	<ul style="list-style-type: none"><li>i. Body flattened, swift on foot</li><li>ii. Upper wings are bright and thin</li><li>iii. Lower wings with cross veins</li></ul> e.g. Cockroaches
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### E. Mantodea

	<ul style="list-style-type: none"><li>i. Two pairs of wings present</li><li>ii. Front legs adapted for catching insect preys</li></ul> e.g. Praying Mantis
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### F. Isoptera

	<ul style="list-style-type: none"><li>i. Soft body</li><li>ii. Wings are equal in size and with indistinct veins</li><li>iii. In some forms wings are absent.</li><li>iv. Winged insects normally comes out during rainy season.</li></ul> e.g. Termites, White Ants
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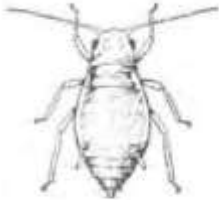
### G. Thysanoptera

	<ul style="list-style-type: none"><li>i. Small in size</li><li>ii. Pigmented body</li><li>iii. Thin wings with veins and hairs</li></ul> e.g. Thrips
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## H. Heteroptera

	<ul style="list-style-type: none"><li>i. Large, hard body</li><li>ii. Fore wings thick, sometimes needle like</li><li>iii. Hind wings with cross veins</li><li>iv. Suck blood from other animal's body</li></ul> <p>e.g. Bug</p>
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## I. Homoptera

	<ul style="list-style-type: none"><li>i. Generally small insect</li><li>ii. Soft legs, two pairs of wings with cross veins</li><li>iii. Anterior part of head with sucking mouthparts</li><li>iv. Wing less insects are also found in some stage of life cycle</li></ul> <p>e.g. Aphids, Cicada, White flies, Leaf hoppers</p>
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### J. Coleoptera

	<ul style="list-style-type: none"><li>i. Two pairs of wings, fore wings hard called elytra, hind wings with cross veins</li><li>ii. Bright in colour</li></ul> <p>e.g. Lady bird beetle, Dung beetle</p>
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### K. Hymenoptera

	<ul style="list-style-type: none"><li>i. Two pairs of wings with cross veins</li><li>ii. Hind wings are always smaller than fore wings</li></ul> <p>e.g. Honey bee, Ant, Wasps</p>
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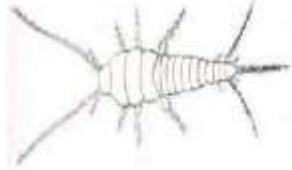
### L. Diptera

	<ul style="list-style-type: none"><li>i. Generally smaller in size</li><li>ii. Only fore wings present with less cross veins</li></ul> <p>e.g. Flies, Mosquito</p>
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### M. Lepidoptera

	<ul style="list-style-type: none"><li>i. Two pairs of wings with fine scales</li><li>ii. Body and wings are thin and flat</li><li>iii. Wings are bright in colour</li></ul> <p>e.g. Butterflies, Moths</p>
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### N. Thysanura

	<ul style="list-style-type: none"><li>i. Small, wing less, soft body</li><li>ii. Whole body is covered with silvery hairs</li></ul> <p>e.g. Silverfish, Bristletails</p>
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### O. Collembola

	<ul style="list-style-type: none"><li>i. Small, wing less, soft body</li><li>ii. Spring like structure present at the end of the tail, help in jumping</li></ul> <p>e.g. Springtail</p>
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### 2.1.1.3 Mollusk

Mollusks are represented by snails, mussels etc. They can be found in marshy areas as well as in the high land. Observation place for mollusks may be marshy land, agricultural field during monsoon, bund area of the field etc.

## 2.2 Vertebrate Animals

### 2.2.1 Fishes

Fishes can be found from small ponds, beels and rivers in the village. Fishes can be distinguished based on the structure, scales, colour, size etc. A total of 2586 species of fishes have been recorded from India.

To observe fish diversity of the particular place :

- f* Collect the names of fishes cultured in the village wetlands
- f* Collect the names of non-cultured fishes
- f* Also collect the information regarding the fishes which are not found nowadays from elderly people

### 2.2.2 Amphibia

The group amphibian is represented by frogs, toads and newts. They are the cold blooded animals. Night time is the best time to observe Amphibia. In India about 209 species of amphibians have been recorded. Frogs and toads eat harmful insects of paddy field and therefore beneficial for the human being.

To observe and collect Amphibia specimen

- f* Pit fall trap can be used near the water bodies or paddy field. The trapped specimen can be collected and observed later on. Amphibia can also be collected by cloth nets and by hand.
- f* Species can be identified by the call of the Amphibia

### 2.2.3 Reptiles

Reptiles include snakes, lizards, crocodiles, turtles etc. Snakes may be poisonous or non-poisonous. A total of 485 species of reptiles are found in our country. These animals can be found during day time as well as night time.

Reptiles may be observed

- f* at the selected sites by direct sighting (on trees, on ground, under stone, in crevices, near water) by the molt of the snakes from the elderly people about the common reptiles found in the area
- f*

### 2.2.4 Birds

Birds are colorful feathered animals. The male and female birds can be easily distinguished as the males are more colorful than females. Early morning and dusk time are the best for observing birds. The call, colour, structure of wing, beak, legs etc. are important for observing a bird species.

Birds can be observed at the places where insects, amphibia, reptiles etc are observed.

- f Select 50 m., long site. Imagine a circle of 10 m., radius at the two end points of the 50 m., long site.
- f Stand at the centre of the circle and observe the birds for 10-15 minutes.
- f Note the name of the known birds. Record major features of the unknown birds.

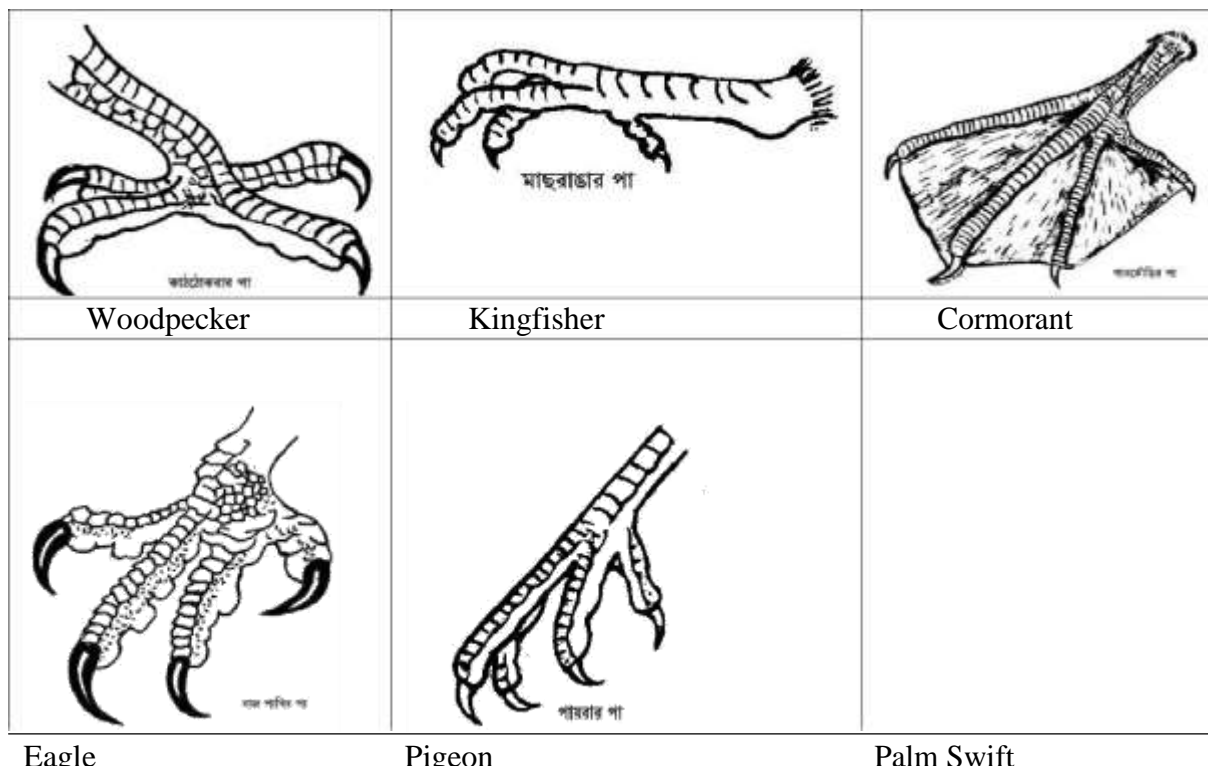
### 2.2.5 Mammals

Mammals are placed at the highest level of animal kingdom. They are characterized as warm-blooded animals with hairy body and by the presence of mammary glands. In India, a total of 372 species of mammals are found. The smell, call, foot-print, excreta etc., are important for observing mammalian species. Generally most of the mammalian species come out during night. Therefore for direct observation, night time is preferred. Indirect information may be collected from their foot-print, call, habitat etc.





### 2.2.6 Domesticated Animals

Domesticated animals include cow, buffalo, sheep, goat, poultry chicken, duck etc.

**Figure: Different types of Legs of Birds**



**Figure: Different types of Beaks of Birds**

		
Eagle	Fantail Snipe	Egret
		
Parakeet	Vulture	Duck

### 3.0 Plant Diversity (Flora)

Plant kingdom can be divided into Gymnosperms and Angiosperms.

#### 3.1 Gymnosperms

Gymnosperms are non-flowering plant group and reproduces by spores. This group can be divide into three sub-groups:

- Thalophyta: Generally once-celled or multi cellular body. In case of multi-cellular species, body parts cannot be differentiated. e.g. Algae, Fungi
- Bryophyte: Small, shoot, leaves present, generally grows on marshy land. e.g. Moss
- Pteridophyte: The plant is having distinct root, shoot and leaves. Vascular bundle present. e.g. Fern

#### 3.2 Angiosperms

These are the flowering plants and reproduce by seed. This group is further divided into two groups:

- When the seeds are open without any external coating. e.g. Pine, Cycas
- When the seeds have outer seed coating. This may again be divided into two groups called Monocot and Dicot. The first one having only one undivided seed, like rice and wheat and the second one has got divided seed, like gram, mango etc.

The dicot group is again divided into following three sub-groups:



### 3.2.1 Herbs:

- f* Plants with soft shoot
- f* Herbs can be on the basis of duration of lifecycle.
  - f* Life cycle completes in one year. e.g. Paddy, Wheat
  - f* Life cycle completes in two years. e.g. Radish
  - f* Life cycle completes in more than two years. e.g. Ginger
- f* Herbs can also be divided in to climbers and creepers

### 3.2.2 Shrubs:

- f* The plants larger than herbs but smaller than trees.
- f* Woody stem, medium height, branched. e.g. China rose,

### 3.2.3 Trees:

- f* Plants with long, woody stem.
- f* Branching out after a certain height from the ground. e.g. Mango, Banyan

## Observation Procedure for Plants

### a. Wild Plants:

- f* Demarcate 50 m., long area
- f* Demarcate five 10 m., X 10 m., quadrant, one at the middle of 50 m., length and two each at the two sides of end two points
- f* Write description of the site
- f* Write down the uses of the plants especially medicinal use, abundance, and plants, which were present and used in the earlier times but no longer available. this data can be collected from the help of local villagers specially the elderly people.

### b. Agricultural Crop Plants

Agricultural crops include cereals, pulses, vegetable, spices, oil seeds, fiber yielding plants, sugar yielding plants, cultivated fruit and flowers, green manure etc.

[S=Summer; M=Monsoon; PM=Post Monsoon; W=Winter]

Paddy:

Paddy can be of many varieties, both indigenous as well as high yielding. Farmers are the best source for getting the information regarding cultivation of rice varieties. The morphological characters to be noted are:

- f* Total plant: seedling height, plant height

- f* Culm: culm number
- f* Leaf: leaf length and width, leaf angle, flag leaf angle and colour
  
- f* Panicle: panicle type, length, weight, secondary branching pattern, number of grains, proportion of sterile grains, panicle axis
  
- f* Grain: grain length and width, 100-grain weight, brown rice length and width, brown rice colour, aroma etc

Disease and pest resistance of plants may be observed directly by the rate incidence of pest insects and diseases.

#### c. Horticultural Plants

This includes flowering and fruit-bearing plants like Mango, Guava, China Rose, Jasmine etc.

#### d. Timber yielding Plants

This type includes woody plants grown for timber. E.g. Teak, Mahogany etc.

### **Preparation of herbarium sheets for identification of plant species**

Herbarium sheets are important tools for identification of plants species. Specimen can be kept for many years as herbarium sheet for future research. Herbarium sheets must be prepared in case the plants cannot be identified at the site.

Following materials are needed for herbarium sheet preparation:

- f* Bag (jute, paper, polythene) for keeping the specimen collected
- f* Knife for cutting the plant specimen
- f* Note book and pencil for note down the information required
- f* Weight for pressing the plant specimen between newspapers

Procedure:

- f* Collect the plant specimen with leaves, flower and fruit. The size of the specimen must be 30 cm. x 20cm. Put necessary label with number, location, date of collection and name of the collector.
- f* Now write down these information in the notebook for future reference
- f* Put the specimen in between two newspapers and place the leaves, flowers and fruit properly
- f* Put the specimen within the paper on a plain surface and place some weight on it Change the newspaper as and when required for complete drying the specimen.

- f Place the dried specimen outdoor for sun-drying
- f Take a hard art paper of size 41.7 cm., X 26.5 cm. Place the dried specimen at the center of the paper and glued or stitched it with the paper.
- f Put herbarium label at the lower right hand side of the herbarium sheet with information like scientific name, family, location/place, date, collects name, altitude from msl etc.

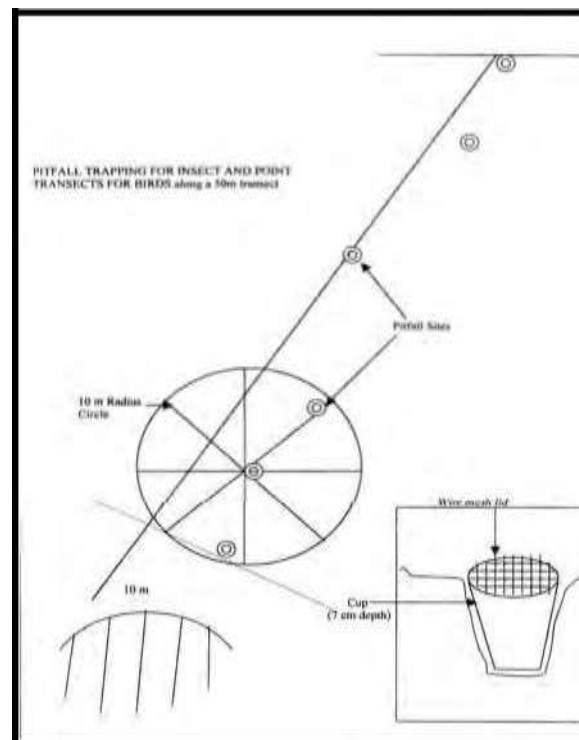
This complete herbarium sheet can be preserved for many years with proper care.

### 3.3 Medicinal Plants Survey

In case the area is rich in medicinal plants, special focus is to be given to document the resources and its current use pattern. Based on the results of the documentation the BMC will be in a position to determine the resource potential, prospects of cultivation, sustainable use and trading.

### 3.4 Ritualistic and Social Use of Biodiversity

The population in the study area may use different biological resources for religious and other ritualistic purposes. In the rural areas, such materials are normally collected from nature but in the urban areas such materials are traded through commercial stores.



*End of Part III*



