Study on Implication of Forest Rights Act (FRA) in the context of sustainability of the forest resources on one hand and right of the individuals and communities under the act on the other, special reference to the implementation of Community rights

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CONTENTS

1. INTRODUCTION

India is rich in biodiversity and it is one of the 12 mega-diversity countries in the world. However rapid strides in agriculture and unbalanced commercial exploitation of forests resulted in a rapid decline of many different plant forms. Even due to increasing demands of forest products and various anthropogenic activities many plant species have been disappearing without even being documented and the forest scenario has been changing rapidly. There is a full possibility that plant wealth in India will deteriorate further because the multinational companies are eyeing India as an immense sources of precious herbs. If proper care is not taken then it may be possible that many plant species (and associated fauna life too) in the forest will disappear in coming few decades. The alarming rate of forest depletion has considerable impact not only on the forest ecosystem but also on the alteration of flora, associated fauna of forest areas and also the dependent local communities' life support systems.

Forest management and biodiversity conservation can provide great opportunities for livelihoods improvement and food security, especially in remote rural areas. Sustainable use of forest resources generates considerable income at local and national level, however with the migration and mobility of wildlife (flora and fauna), wildlife management and conservation goes beyond national borders and has to be addressed at regional, continental or even global level.

The progression of Forest laws in India*

There are records of forests being regulated by set of laws before the advent of the British. Vedic literature indicates that forests were held in high esteem. Certain trees were considered as celestial. Inscriptions of 'Pipal' and 'Babul' were found in seals and pottery recovered from the Indus valley. Kautilya's Arthshastra also suggests a systematic management of forests. There were also provisions of punishment for felling of trees. By degrees, forest management was conditioned by the need for the promotion of forest based industries or craft, exploitation of forest wealth in making household articles and defense purposes[*]. The Mughal period was characterized by a continuous destruction of forests for timber and clearance for cultivation[†]. By the middle of the 19th century, the depletion of forests emerged as a serious issue. The British

* (Adapted from Santanu Sabhapandit, October 2005)
[*] P LeelaKrishnan "Environmental Law in India" p7
[†] Rangachari CS and Mukherjee SD " Old roots New shoots" Winrock International Foundation

Govt. was forced to recognize that forests in India were not inexhaustible. In 1856, Lord Dalhousie emphasized the need for a definite forest policy. However, the instantaneous reason for this emphasis can also be attributed to the fact that adequate supplies of timber was required for the great extension of railway lines that were being undertaken[‡]. There was also a great demand for Indian Teak. In 1865, the first Indian Forest Act was passed. It was amended in 1878, when a comprehensive Law, the Indian Forest Act VII, came into force. The provisions of the Act established a virtual state monopoly over the forests in a legal sense on one hand, and attempted to establish, on the other, that the customary use of forests by the villagers was not a 'right' but a 'privilege' that could be withdrawn at will.

In the period up to 1980s there were two major policy statements purporting to give direction to the role of the government in relation to the alternate functions performed by forests. They were the policy statements of 1894 and 1952. In practice, it was the Forest Act of 1927 that guided governmental actions for much of the period. Assertion of central control and emphasis on the role of forests as providers of timber and industrial raw materials is the common thread running though these major statements of policy. There is a view that, the 1894 policy, even though it came from a colonial government was more sensitive towards local interests. The role of forests as essential on climatic and ecological grounds was realized and the significance of local user's was also pointed out. Notably it was provided that no restriction should be placed upon local demands, merely in order to increase state revenue. On the other hand, in the National Forest Policy 1952, it was made clear that local priorities and interests and claim of communities around forest areas should be subservient to the larger national interests. Forests were viewed as national asset[§]. In 1976, through the 42nd Constitutional Amendment 'forest' was transferred as a subject in the State list (7th Schedule of the Constitution) to the Concurrent list. It thus re-emphasized the role of Central Govt. in the management of forests. In view of the continuing forest depletion, in 1980, the Forest Conservation Act was enacted. It also emphasized Central Govt.'s involvement in deciding land use. Community interests found emphasis only through the introduction of the National Forest Policy 1988.

1) The Indian Forest Act, 1927 (IFA 1927)

This act provides for the conversion of Reserved Forests into Village Forests (VF) if the local communities ask for the same and fulfill certain requirements as per the Act. The concerned communities are then vested the powers of the Forest Department for the management of VFs.

[‡] Smythries EA "India's Forest Wealth" India of Today Vol. VI Oxford University Press
[§] Chopra "Forest and other sectors:critical role of Government policy" EPW 1995

2) **Wild Life Protection Amendment Act, 1972 as amended in 2003 (WLPAA 2003)**

Two new categories of Protected Areas (PAs), namely Community Reserves and Conservation Reserves can be declared on privately owned or community lands (the definition of which is not clear). Conservation Reserves can be declared by the government on government owned lands in consultation with the local people.

3) **Environment Protection Act, 1986 (EPA 1986)**

Ecosystems and landscapes can be notified Ecologically Sensitive Areas (ESA). This would enable control or restriction of certain identified commercial, industrial and development activities.

4) **Panchayati Raj (Extension to Scheduled Aeas) Act 1996 (PESA 1996)**

Mandates decentralization of governance to rural bodies, like Panchayats (village councils) and Gram Sabhas (village assemblies) in predominantly tribal ("Scheduled" under Constitution) areas. Confers the ownership and decision-making rights over non-timber forest products (NTFP) to local institutions. Mandates consultation with local communities regarding many developmental and other issues relevant for a site.

5) **Biological Diversity Act, 2002 (BDA 2002)**

Mandates creation of Biodiversity Management Committees (BMC) at the village level. BMCs are supposed to help communities in management, protection and recording of local biological diversity. Provides for the declaration of areas being conserved for agricultural or wildlife biodiversity as Biodiversity Heritage Sites (BHS). The Act includes all elements of biological diversity, domestic and wild and provides for protection of all kinds of ecosystems the National Biodiversity Authority (NBA) and the State Biodiversity Boards (SBB) established under the Act are required to consult the local BMCs while taking decisions related to the use of biological resources and knowledge associated with such resources.

6) **Wild Life Protection Amendment Act, 2006 (WLPA 2006)**

This sets up a National Tiger Conservation Authority (NTCA), and provides a process of notifying tiger reserves.

7) **National Forest Policy, 1988 (NFA 1988)**

This national level policy deals with conservation and management of forests, afforestation and with the rules governing people's access to government owned forests and their products.

8) **National Wildlife Action Plan, 2002-2016 (NWAP)**

This plan deals with policy imperatives and strategic actions to conserve wildlife in and outside PAs, to manage these PAs, to prevent illegal trade on endangered species, to ensure people's participation in the conservation of wildlife, to promote ecotourism in PAs, among others.

9) National Biodiversity Strategy and Action Plan, 2004 (NBSAP 2004)

This draft policy recognizes community conservation initiatives and stresses on legal, administrative and all other kinds of support for Community Conserved Areas. NBSAP also stresses on developing guidelines for implementation of Joint Protected Area Management (JPAM). This draft of NBSAP which was developed through country wide participation from scientists, non government organizations, bureaucrats, communities and other stake holders was submitted to the MoEF in 2003 **was not accepted by the government.**

10) Forest Rights Act, 2006 (FRA 2006) …. Base of the current study

This Act (See complete Act- Annex. 2) is aimed to correct the historical mistakes of inadequate recognition and settlement of rights of the local communities pre- and post-independence. The tribes are vested with the responsibility to use the forest land for their livelihood and the authority for sustainable use of forests. Following are some of the rights that the Scheduled Tribes and traditional forest dwellers are vested with, as mentioned in Chapter II of the Act -

The right to hold and live in forest land under individual or common occupation;

Community rights such as *Nistar* (use rights);

The right of ownership, of collection, of use, and dispose of minor forest produce which has been traditionally collected and community rights of entitlements such as fish and other products of water bodies, grazing and traditional seasonal resource access of nomadic or pastoralist communities;

Rights of settlement and conversion of all forest villages, old habitation unsurveyed villages and other villages in forest, whether recorded, notified, or not, into revenue villages;

Right to protect, regenerate, conserve or manage any community forest resource, which they have been traditionally protecting and conserving for sustainable use;

Rights of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;

Any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers excluding the right of hunting or trapping or extracting a part of the body of any species of wild animal;

Right to in situ rehabilitation where these communities have been illegally evicted or displaced from forest land without receiving their legal entitlement or rehabilitation prior to the 13th of December 2005 (Forest Rights Act, 2006)

The traditional forest dwellers are defined as member or community who has been residing in and who depends on the forest land for livelihood needs for at least three generations prior to December, 2005. The Act also provides the provision of diverting some forest land for facilities like school, dispensary, *anganwadi*, vocational training centres, shops etc. to be managed by government but the land allotted to each facility should be less than one hectare and maximum seventy five trees per hectare can be cut for this purpose which is creating concerns over biodiversity conservation. The legislation also empowers the community to protect the wildlife, forest and biodiversity of their area and also ensure that the cultural and natural heritage is preserved from any kind of destructive activity (Chapter III, Forest Rights Act, 2006).

The main decision making authority in this Act at village level is Gram Sabha which has been vested with many responsibilities like initiating the process of determining and documenting the nature and extent of forest rights of individuals and community, permitting the construction of facilities mentioned above, constituting committees for the protection of wildlife, forest and biodiversity, resolving conflicts related to boundary issues of forests and villages, constituting Forest Rights Committee to record the forest rights of individuals and community. Vesting Gram Sabha with all these responsibilities is one of the concerns of the Act, since in many villages in India these institutions are either non-existent or dysfunctional or not capable of taking so many decisions.

The other concern over the Act is that it has not mentioned the role of other agencies, civil society institutions and NGOs, and has only referred to Gram Sabha, Forest Rights Committee (to be constituted by Gram Sabha), Sub-Divisional Level Committees, District Level Committee, and State Government as the decision making and participating institutions. In issues related to tribes and local communities, it is very important to include the local agencies as they play a major role in community and resource mobilization, capacity building, effective interaction and in dissipating information about the Act in the community. Other concern is that

this Act is said to be "in addition to and not in derogation of the provisions of any other law for the time being in force" but has not provided any framework to resolve any conflict that may arise between two Acts.

Though the Act provides us with the opportunity of recognizing the rights of tribes and credit them with what they have deserved for years but on the other hand the above mentioned concerns can have negative impact over livelihood security and biodiversity. Though the Act mentions that Gram Sabha will have to take action and constitute committee for biodiversity conservation but it has not specified the role of other agencies or the community and also the framework to follow for conserving forests and biodiversity.

The Act mentions the sustainable use of resource but the ambiguous nature of sustainability can have negative impact on both livelihood security and conservation.

This study was conducted in different areas of Gujarat State (Table 1) to understand the ecological perspectives and changing patterns under the umbrella of FRA 2006.

The current study only gives an ecological account and related livelihood scenario of the study regions. No effort done on the individual case or community case submission or entitlement process analysis.

Table 1: Study conducted in the various categories of forests provided by the Indian Forest Act

Category	Purpose	Area studied in the current study
A. Reserved Forest	It may be constituted by the state govt. on any forestland or wasteland which is the property of the govt. or on which the govt. has proprietary rights. In Reserved forests most uses by local People are prohibited, unless specifically allowed by a forest officer in the course of settlement.	Kawant range of Chhota Udepur forest division*
B. Protected forest	State govt. may constitute any land other than reserved forests as protected forests over which the govt. has proprietary rights. In Protected forests the govt. retains the power to issue rules regarding the use of such forests, but in the absence of such rules, most practices are allowed. Among other powers, state can reserve specific tree species in protected forests.	
Sanctuary	An area can be declared as a sanctuary if it is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating or developing wild life or its environment.	Jessore WLS, Balaram-Ambaji WLS
National Park	Same as that of sanctuary	
Conservation Reserve	Area adjacent to national park or sanctuary or linking two protected areas can be declared as conservation reserve for protecting landscapes, seascapes, flora, fauna and their habitat.	Area between Jessore WLS & Ambaji-Balaram WLS (pers. com. with officials and secondary information

		referred).
Community Reserve	Where the community or an individual has volunteered to conserve wild life and its habitat, the state govt. may declare any private or community land not comprised within a National Park, sanctuary or a conservation reserve, as a community reserve, for protecting fauna, flora and traditional or cultural conservation values and practices.	
C. Village Forest	The state govt. may assign to any village community the rights of the govt. to or over any land, which has been constituted a reserve forest. The state govt. may also make rules for regulating the management of such forests.	Amba Dungar
*: two forests of Kawant were studied in detail. (1) Ambadungar is the village forest and protected by village community (2) Hafeshwar is forest area and encroached for agriculture purpose, not protected.		

2. Gujarat State

Biogeography classification

According to Rodgers and Panwar (1988) biogeographic regions are classified into four levels. They are as follows:

1. **The Biogeographic Zone:** Large distinctive units of similar ecology, biome representation, community and species.
2. **The Biotic Province:** Secondary units within a zone, giving weight to particular communities separated by dispersal barriers or gradual change in environmental factors.
3. **The subdivisions or Region:** A tertiary set of units within a province, indicating different land forms.
4. **The Biome:** This is an ecological unit, not a biogeographic unit. A biome such as swamp/wetland or temperate broad leaf forest would be found in several biogeographic provinces. Based on the above classification India has been classified into ten biogeographic zones (*Annexure 1*):
    1. Trans-Himalayan with one province
    2. The Himalayan with one province
    3. The Indian Desert with one province
    4. The Semi-arid zone with two provinces
    5. The Western ghats with two provinces
    6. The Deccan peninsula with two provinces
    7. The Gangetic plain with two provinces
    8. North-east India with two provinces
    9. The Islands with three provinces
    10. The Coasts with two provinces

BIOGEOGRAPHIC AREAS OF GUJARAT STATE

According to the above classification Gujarat has parts of four biogeographic zones:

Zone 3. The Indian Desert: Province 3A - Kachchh

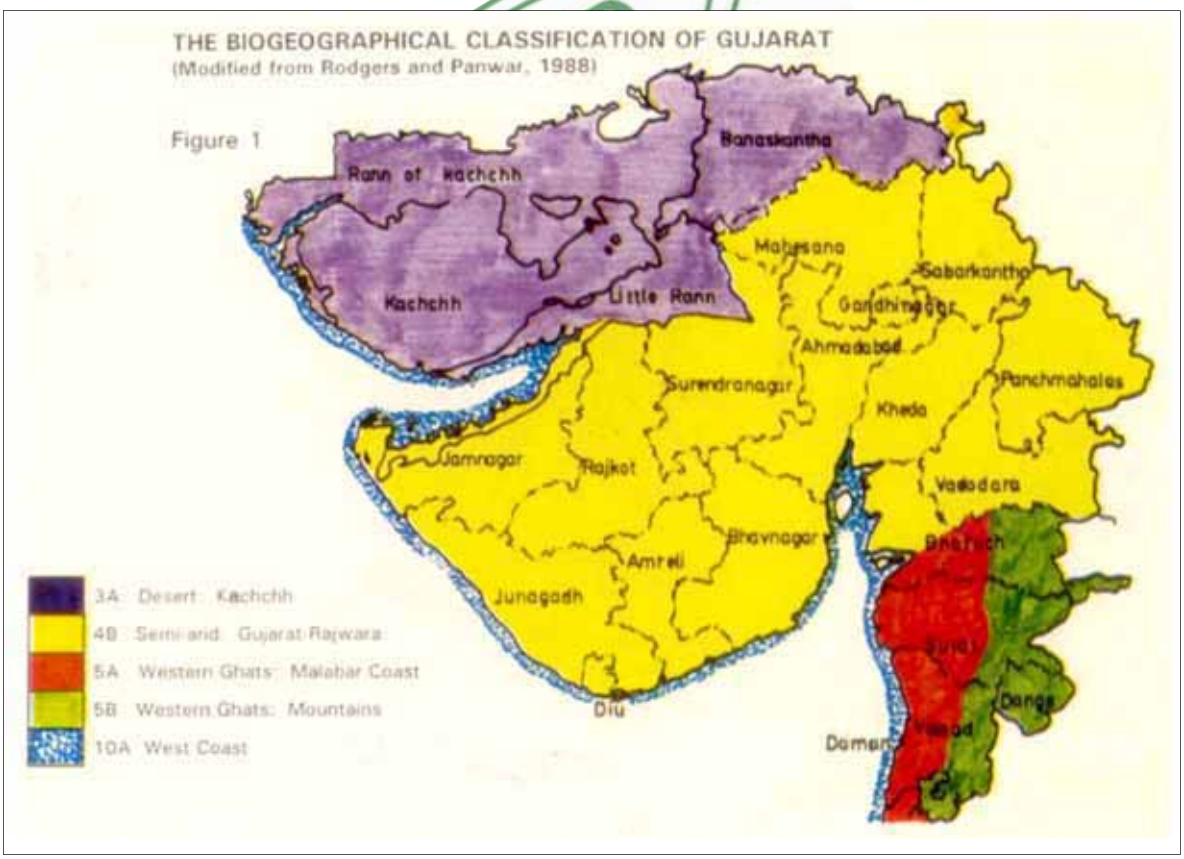
Zone 4. The Semi-arid Zone: Province 4B - Gujarat - Rajwara

Zone 5. The Western Ghats: Province 5A - Malabar Coast
Province 5B - Western Ghat Mountains

Zone 10. The Coast of India: Province 10A - West Coast

By and large Zones 3, 4 and 10 are tenable with geographical, geological and climatical characteristics. The fauna and flora of these zones also complement with the biogeographic demarcation. However, the Zone 5A and 5B are shown reaching up only to Tapti river basin. This is mainly due to the fact that floristic and faunal characteristic of these provinces were based on the studies of Dangs forest. The range of Malabar coast (5A) and Western Ghats (5B) fauna extend up to the left bank of Narmada i.e. in the Shoolpaneshwar Wildlife Sanctuary, Rajpipla and Gora ranges [Sabnis and Amin, 1992; Chavan, 1992; Pilo et al., 1993 (birds); Naik and Vinod, 1994 (amphibians)].

Interestingly, the fauna also support the "Satpura Hypothesis" of Hora (1949). This hypothesis explained that North-East forms migrated along the Satpura range which lines the Narmada River to Western Ghat ranges. The Western Ghat range becomes confluent with the Satpura range in the Shoolpaneshwar Wildlife Sanctuary area. Another interesting observation is that the Shoolpaneshwar Wildlife Sanctuary is the northern most range for many amphibians found in both Malabar Coast and Western Ghat mountain provinces of Zone 5. The provinces 5A and 5B have modified as extending up to the left bank of the Narmada River (Fig. 1).



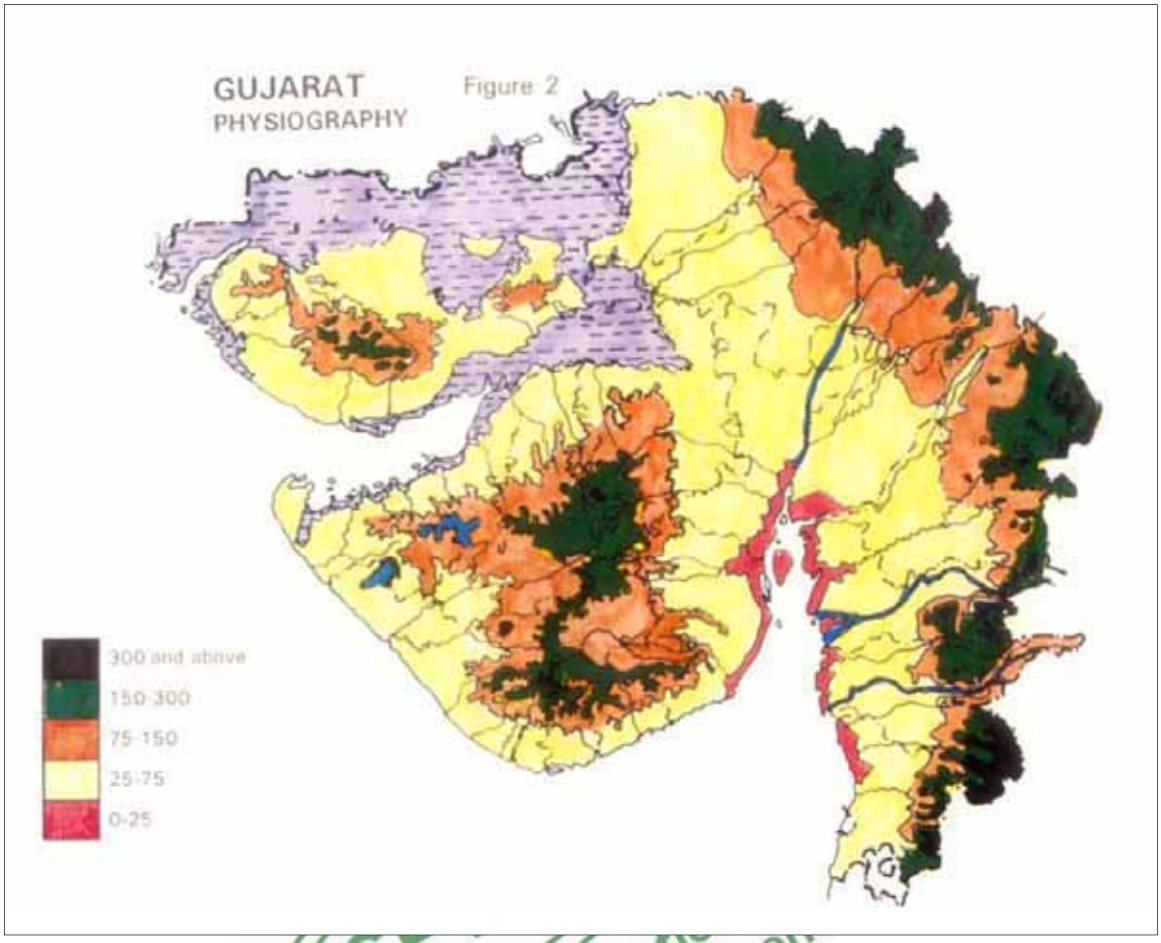
GUJARAT: PHYSIOGRAPHY AND CLIMATE

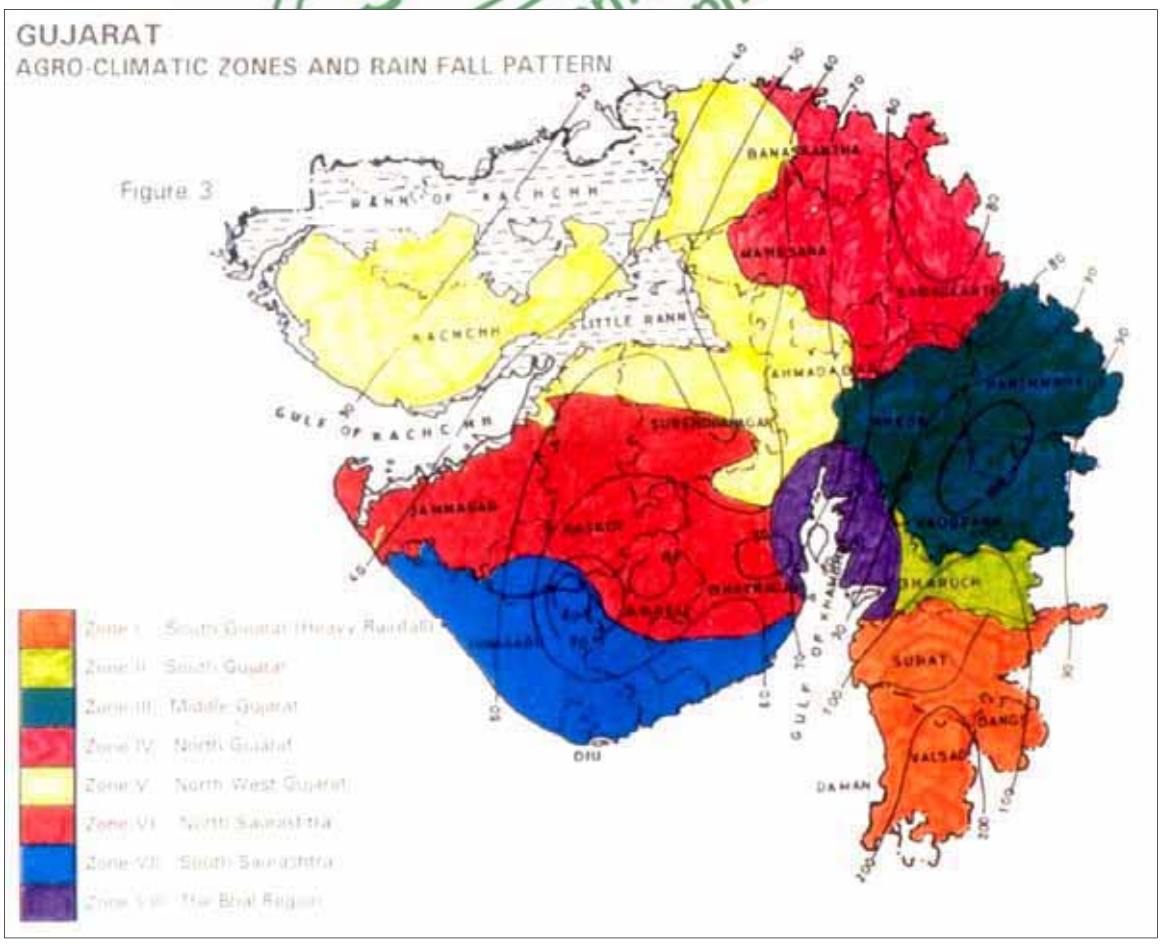
The State of Gujarat has a land mass of 1,96,02,400 hectares that accounts for about 6 per cent area of the country of which 23,34,400 hectares are under irrigation. The State has 8,48,300 hectares under permanent pasture and grazing land. In addition to this, 8,62,800 hectares are under fodder crops. The State has 1600 km. of coastal area. Considering the rainfall pattern, topography, soil characteristics and the climate in general the State can be divided into eight agro-climatic zones (Figs. 2 and 3). Rainfall varies from about 340 mm in the western arid district of Kachchh to about 1800 mm in the southern hills of Dangs and Bulsar. Most parts receive rainfall of around 800 mm. The climate varies from arid to dry sub-humid in Kachchh and Bulsar districts. Nearly 25 per cent of the geographical area in the western part is arid. Another 34 per cent of the area in north is semi arid and about 50 per cent of the talukas in middle Gujarat is arid/ semiarid. Nearly 20 per cent of the area (42 talukas in 19 districts) is considered drought prone.

A large variation in soil types can be seen across the State. Deep black and coastal alluvium soils are predominant in South Gujarat. Medium black is prevalent in middle Gujarat, gray brown and coastal alluvial soils are in north and north-west whereas the Saurastra peninsula has calcareous medium black and to some extent coastal alluvial soils. The Bhal region is of peculiar type. The soil is clay in texture and prevents percolation of water. Though the rain fall in this area is only about 700 mm considerable part of the land becomes marshy during monsoon season. Also, the soil develops salinity.

All along the eastern border of Gujarat State there is a discontinuous chain of hilly forest areas (Fig. 2). These hilly regions form the part of Aravallis, Vindhyas and western most spurs of Satpura ranges and northern spurs of Sahyadri ranges. The vegetation becomes denser when one moves from the north to South Gujarat, as the rainfall increases towards the south and is maximum at Dharampur and in the Dangs forests.

The soils are also richer in South Gujarat than in North Gujarat and Saurashtra. South of the river Narmada patches of moist deciduous forests start and slowly merge with the completely moist deciduous forests with some elements of evergreen species on the southern side of the Tapti River. On the other hand, the forests are dry deciduous in the hilly areas in the north and central Gujarat slowly merging with thorny scrub jungles, especially where grazing pressures and other biotic interferences are high. Saurashtra and Kachchh together form about half of Gujarat State.


GUJARAT
PHYSIOGRAPHY
Figure 2
300 and above
150-300
75-150
25-75
0-25


GUJARAT
AGRO-CLIMATIC ZONES AND RAIN FALL PATTERN
Figure 3
BANASKANTHA
MAHESANA
SABARKANTHA
AHMADABAD
KACHCHH
LITTLE RANN
GULF OF KACHCHH
SURENDRANAGAR
JAMNAGAR
RAJKOT
PORBANDAR
JUNAGADH
AMRELI
BHARUCH
SURAT
VALSAD
DAMAN
DIU
Zone I
Zone II
Zone III
Zone IV
Zone V
Zone VI
Zone VII
Zone VIII

Tropical dry deciduous forest also exists in Junagadh district. Northern parts of Saurashtra are more arid and the vegetation is more like that of the Rann of Kachchh (scrub forest). Littoral type of forest is found in the creeks along the coast line in Kachchh, Jamnagar and Junagadh district. Gujarat State is endowed with a great diversity of natural ecosystem ranging from desert, semi-arid, mangroves, coral-reefs rich coast and forest with dry deciduous, moist deciduous and evergreen trees.

The current study highlights some ecological aspects of two areas of Gujarat State.

1. **Zone 4.** The Semi-arid Zone: **Province 4B - Gujarat – Rajwara: Kawant (Vadodara)**
2. The Semi-arid Zone: North Gujarat: **Jessore WLS and adjoining area (Banaskantha)**

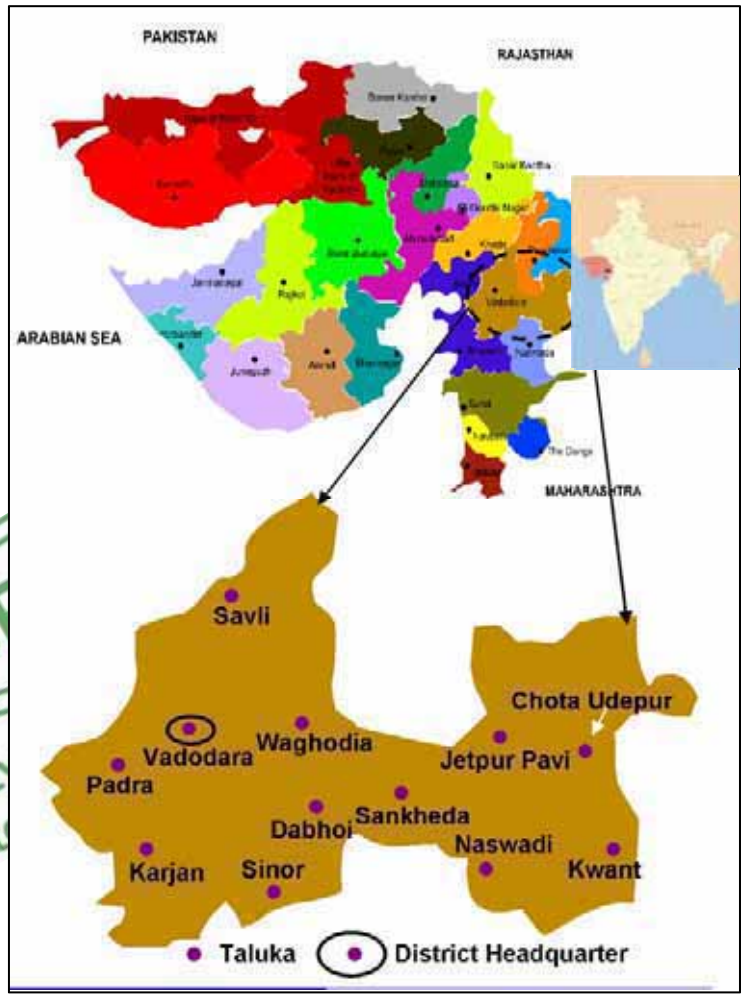
Characteristics of Zone 4 – Mountain Ecosystem

Before going for the detailed accounts of the studied areas, it is important to understand the characteristics of the zone. Both the areas, Jessore and Kawant are having mountain ecosystem. Mountain regions are very important in sense of biodiversity as well as management aspect. Biodiversity is high in mountain regions because of their wide range of habitats, varied micro-climates, and ecological conditions. These factors have resulted in a high degree of genetic diversity in terms of crop and livestock species and their wild relatives in the zone. Altitudinal gradients and ecological zones provide plants with different exposures over short distances. The topography itself is a varied and a fragmented mosaic of habitats or genetic 'islands in the sky'. Mountain environments respond strongly even to small changes in temperature because their vertical (altitudinal) dimensions create gradients of temperature, precipitation, and solar radiation. One can pass through several climatic systems in ascending one mountain slope and each system is a microcosm, a habitat in itself.

3. Detail account: Kawant (Central Gujarat)

3.1 Introduction

Vadodara district is located between 21 degree to 23 degree longitude and 73 degree to 74 degree latitude. Panchmahal district is on the north side of Vadodara district, Kheda district at the border of north-west border, Bharuch district in the south and in north-west direction. Jhabua district of Madhya Pradesh in the north direction and Dhuliya district of Madhya Pradesh is in the direction of Agni borders. In the north and south direction river Mahi-Sagar and Narmada are situated.



Kawant taluka is located in the heart of the Rathva and Dungara-Bhil homeland near the town of Chhota Udepur about a 100 kms from Vadodara, the gathering arena for a tribal group since time immemorial. Out of total tribal population in Gujarat 12.6 % resides in Vadodara district only. Kawant block of Vadodara with 133 villages has about 92 % of the tribal population in total population of 1,70,524. As per the report by Cowlagi Committee (2006)**, it ranks first as the most underdeveloped blocks in the state. As much as 71.2 % of the population is below poverty line. About 57.7 % is employed in agriculture. Agriculture/ casual work fetches barely Rs.20/- to Rs.25/- per day and so about 30 % people migrate to other regions of the state to work as agricultural labourers or as construction workers where they get better wages (Rs.50/-per day). The area is dominated by Rathva, Dungara Bhil and other tribal communities. The major holy places of the region Fenai Mata and Hafeshwar are very important for the local people.

** Retired IAS officer VRS Cowlagi had done the ranking on the basis of 44 socio-economic indicators in 2004.

Vadodara district has only 497 sq.km area under the forest cover, which constitutes only 6.37% of the Total Geographical Area (TGA) of the district (7549.50 sq.km). Within the district 183 sq.km of forest lies within the study area Kawant (TGA 619 sq.km). Kawant taluka shares its land border with the neighboring State Madhya Pradesh and water border (River Narmada) with State Maharasthra.

Kawant area is a hilly terrain with less soil depth. Agriculture, forest based economy and animal husbandry are primary livelihood sectors. In case of secondary sector no major industries apart from fluorspar mining by Gujarat Mining Development Corporation (GMDC[††]) are noticeable. The traditional "haat" (once in a week on Monday) is prevalent till today which is the major place to buy and sell for the local people. There are a range of products from Bamboo works to non timber forest produce (NTFP) to cattle and from small groceries to handmade goods which are put up for sale. Tribals trade valuable NTFP, agricultural and handmade products at cheaper rates for essential commodities like oil, spices, clothes etc. Tribals of Madhya Pradesh and Maharashtra also sell their NTFPs in this 'haat'.

A typical tribal hut structural-design: Multiple use of one asset: shelter, storage, protection

The Jambughoda Wildlife Sanctuary nearby is known for its sloth bear, flying foxes and diverse flora and fauna. Apart from this protected area, Panvad and Kawant forest ranges fall under the categories of reserved forests. These patches harbour a variety of wildlife including, leopard, Jackal, blue bull, many kinds of birds etc. The forest tracts of the area are highly undulating with broken ranges of hills of height ranging from 100 to 700 m. above mean sea level. The important hills of the area are Kawashya dungar, Bhandon, Helaja dungar, Indrayo dungar, Paravyo dungar, Amba dungar, Ghutalyo dungar and Ghanmal hills of the Satpura ridge. The hills and hillocks form a network of catchments leading to a big valley, locally called *Nallah/ Kara*, entering the plains and draining into the river Narmada and other small streams like, Kawatiyo Karo, Sapen Nadi and Bhukhyo Kotar, etc.

[††] The GMDC Fluorspar Project is located 11 km away from Taluka HQ Kawant in tribal area and is at an altitude of 330 m from sea level. The fluorspar mine is located at 600 m altitude from sea level. Fluorspar is chemically CaF2. The fluorspar deposit of Ambadungar was discovered in 1935 during the construction of forest road. GSI started field work in 1960-61 and established an 11.6 mT estimated reserves for the area. It is hydro-thermal deposit. GMDC is holding two mining leases for fluorspar mine ; 31.2 ha and 32 ha at Village Ambadungar of Taluka Kawant. GMDC started mining operation in this area in 1964. GMDC is having 500 tpd capacity Beneficiation Plant located at Village Kadipani (3 km away from Ambadungar) to upgrade the low grade fluorspar ore from 23% - 25% CaF2 to 90 – 95% CaF2 by flotation method.
Fluorspar is mainly used in production of hydro-fluoric acid and in refrigerant gases. it is widely used in metallurgical industries as flux.

As per the forest classification by Champion and Seth (1968), the Kawant region supports southern dry mixed deciduous forests 4B 3, 4B 4, 5A/C3. The forest on hills supports *Boswellia* and *Lannea* forests at the top, the intermediate regions of the hills are covered by *Acacia*, and the foot hills are dominated by *Anogeissus* forests. Apart from these species, the Satpura range supports an abundance good density of Teak (*Tectona grandis*) and bamboo species.

3.2 Ecosystem classification

Two types of ecosystems are found in the area: (A) natural ecosystem (B) manmade ecosystem. Classification of these ecosystems is mentioned below.

A. NATURAL ECOSYSTEM

1. Aquatic ecosystem - Limnic (fresh water Ecosystem)

1.1 Lotic ecosystem - Flowing

1.1.1 Perennial

1.1.2 Seasonal

1.1.3 Riparian

1.2 Lentic ecosystem - Stagnant

1.2.1 Seasonal, almost covered with floating / emergent natural vegetation

1.2.2 Perennial, almost covered with floating / emergent natural vegetation

1.2.3 Dams and reservoirs

2. **Terrestrial ecosystem**

2.1. Forest

2.1.1 Dry deciduous

2.1.2 Degraded dry deciduous

2.2.3 Scrub

2.2.4 Grassland

B. MAN MADE ECOSYSTEM

1 Human habitation (home gardens, hedges, etc.)

2 Cultivation- annual/ biennial/ seasonal crops

3 Perennial plantation/ orchard crops

4 Roads, cart tracks, foot paths (*pug dandi*)

5 Quarries, mines

With the help of the local organization AAJ (Adivasi Jan Uthan Trust, Bhekhadiya, Kawant), some forest areas were selected to do detail study on the basis of forest conserved by local

community or encroachment of forest for various purposes. Line transects were laid to do ecological study in the selected patch of the forest of Hafeshwar and Ambadungar of Kawant forest range.

3.3 Field Observations:

It was observed that many parameters are playing a role in changes in ecosystem functioning. Ecosystems are sensitive to changes in the number and kinds of species found in their communities. Because species can vary dramatically in their contribution to ecosystem functioning, the identity of the species present in a community is important. Declining species richness can lead to deterioration in overall levels of ecosystem functioning. Loss of functional groups or reductions in the number of species that occupy a particular level in the food web (grazers, browsers, predators, decomposers) can also cause a decline in ecosystem functioning. Plant species, which are not "economically important" from the classical forest management point of view, as well as "weeds", which are present at one or more stages of succession enhance nutrient cycling, act as biological dams following disturbance, provide unique habitat and food for animals, and modulate fire severity.

The following detail gives first the detail account on the flora and fauna of Kawant region in general and then the ecological picture of Ambadungar and Hafeshwar (the forests where line transects were laid).

3.3.1 Flora

Each component of floral diversity is important to discuss here like, algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms, angiosperms, etc. Each group has its own importance in plant kingdom and in forest ecosystem at large. Each one is unique in terms of primary colonizers, secondary colonizers, eco-services, functions, in succession process, etc.

(a) Planktons

Forest and non-forest areas of Kawant range are having several water bodies. Such water bodies are a dynamic inland aquatic system that supports and maintains a balanced adaptive community of organisms having diverse species composition, and the functional organization of all the organisms supports a unique biotic integrity. Plankton constitutes an important link in the aquatic food webs, transferring energy from the producers to aquatic carnivores. Ecologically, they form an important level of animals, which are also referred to as indicator species of pollution, fishery potentials and productivity of water bodies. Planktons are the ecological

indicators of the water bodies, and their distribution and abundance is an index for the health of an aquatic environment. They can be considered as the most suitable organisms for the toxicological studies and appropriate environmental monitoring of freshwater habitats, especially lakes, ponds, which is mainly due to their shorter life span and wide distribution. Based on their life cycle, it is possible to distinguish two major groups; the meroplankton, that spends only a part of their life cycle as plankton (temporary plankton) and the haloplankton, are the permanent plankton. They are dominated by Protozoans, Rotifers, Ostracods and the sub-classes of the crustaceae, the Cladocerans and the Copepods. It is essential to doa detailed study on planktons.

(b) Algae

Among the autotrophic plants at least - and possibly within the whole of the plant kingdom, the algae are unexcelled for variation in structure, range of habitat and diversity of role. Algae produce 50-70% of atmospheric O_2 and base of aquatic food chains for fish, mammals. They occur as endosymbionts in lichens, corals, etc. Build ocean limestone and silica deposits. Some cause harmful blooms.

Table 2: Algae of the area

Sr	Species Name	Family	Group
1	*Oedogonium* sp.	Oedogoniaceae	Chlorophyta
2	*Oscillatoria* sp.	Oscillatoriaceae	Cyanophyta
3	*Anabaena* sp.	Nostocaceae	
Detail systematic study is needed because many species are yet to be identified			

(c) Fungi

Fungi play very important role in forest ecology. Their major services are as (1) Saprophytes, which degrade dead organic matter (decomposers, mineral recyclers) (2) Parasites degrade living plant & animal tissues (pathogens); (iii) Symbionts, which obtain food from living autotrophs without killing them. Two types of symbionts are there: Lichens - green algae and/or cyanobacteria and a fungal partner and mycorrhizae ("fungus roots") an association between plant roots and fungal partners. Micro and macro, both groups are found in the area. Common micro fungi observed is belonging to Saprolegniaceae family. Detail systematic study is needed to explore other micro fungi in the area, their availability, status, impacts, etc. Among the macro fungi, non gilled and gilled species are found in the area belong to the families Agaricaceae, Polyporaceae, etc. (Table 3)

Table 3: Macro fungi of the area			
Sr	**Species Name**	**Subgroup**	**Group**
1	*Ganoderma sp.*	Polypores	Gilled
2	*Polyporus sp.*	Polypores	
3	*Amanita fulva*	Amanitoid	
4	*Amanita sp.*	Amanitoid	
5	*Agaricus sp.*	Lepiotoid	
6	*Coprinus sp.*	Mycenoid	
Detailed systematic study is needed because many species are yet to be identified			

(d) Lichens

As it is mentioned already, lichens are symbionts, formed by association of green algae and/or cyanobacteria and fungi. They either grow on stones and rocks (saxi-colous) or on bark of tress and bushes (corticolous). Though they can endure prolonged drought, however they are commonly seen in cool and moist areas. Crustaceous, foliacious and fructicose are the three types of lichens. Detail study is required to understand the lichen species and their distribution status.

(e) Bryophytes

Bryophytes occupy an important place in the plant kingdom, although they were thought to be of little economic value. They are the simplest and the most primitive of the land plants. They are the pioneers to colonize terrestrial habitat from aquatic environment. Their adaptation to a terrestrial mode of life is partial as water is indispensable in one stage or another in their life cycle. Hence, they are also known as the amphibians of the plant kingdom. They have a remarkable capacity to absorb water and turn fresh in no time, which has given them the name, the resurrection plants. These plants occur more commonly during rainy seasons and also in humid areas. Their growth is gregarious and within a short period they become so abundant to occupy large areas, but usually do not form a very conspicuous part of the vegetation. Usually, bryophytes show a preference to inhabit microclimatic niches such as crevices of rocks and trees, near small shady springs and so on. But they are seen growing on a wide range of substrata. They may be old discarded/abandoned leather, rubber and wooden goods, tiled and asbestos roofs, on mortar of stone and mud walls. Besides these, growing as epiphytes on barks of trees (corticolous), on rocks (rupicolous), on pebbles and stones

(saxicolous), on fallen logs (lignicolous), river banks and road side cuts is a common sight. They form the secondary colonizers after lichens on barren rocks. They are extremely good soil binders as they form large mats on forest floors and roadside cuts, thus controlling soil erosion. They are a good source of humus and hence a haven for a number of soil-dwelling invertebrates likes earthworms. They form very good seed beds for seedlings and saplings. They are very good indicators of environmental pollution. Five species were reported from the area during the study (Table 4).

Table 4: Bryophytes of area		
Sr	**Scientific Name**	**Family**
1	*Marchantia polymorpha* L.	Marchantiaceae
2	*Plagiochasma intermedium* L.et G.	Aytoniaceae
3	*Riccia sp*.	Ricciaceae
4	*Targionia hypophylla* L.	Targioniaceae
5	*Funaria hygrometrica* Var. hygrometrica Hedw.	Funariaceae
Detailed systematic study is needed because many species are yet to be identified		

(f) Pteridophytes

Pteridophytes are also known as 'ferns'. Ferns are terrestrial and aquatic too. They are more developed in the vascular plant kingdom. Life forms of pteridophytes are herb and giant tree also. Terrestrial pteridophytes can serve as indicators of disturbance or forest quality as many species show clear habitat differentiation with regard to light conditions and/or humidity. Eight species were reported from the region (Table 5).

Table 5: Pteridophytes of area		
Sr	**Scientific Name**	**Family**
1	*Actinopteris radiata* (Swartz) Link.	Pteridaceae
2	*Adiantum capillus-veneris* Linn.	Pteridaceae
3	*Adiantum lunulatum* Burm.	Pteridaceae
4	*Azolla pinnata* R.Br.	Azollaceae
5	*Cheilanthus albomarginata* Clarke	Pteridaceae
6	*Hypodematium crenatum* (Forsk.) Kuhn.	Aspidiaceae
7	*Marselia minuta* L.	Marsileaceae
8	*Pteris vittala* Linn.	Pteridaceae

(g) Gymnosperms

There were no gymnosperm species found in the wild.

(h) Angiosperms

Among the angiosperm group, 320 species were reported from the region (Table 7). The detailed systematic study is required to explore more diversity in the area. The list of plants includes

aquatic plants, parasitic plants, epiphytic plants, wild relatives, key stone species, umbrella species and invasive species. The statistical review of 320 species is given below.

Table 6 : Status of plant species across different Life forms				
#	Life form	No.of wild species	No.of domestic species	Total
1	Climber	11	1	12
2	Grass	27	3	30
3	Herb	115	16	131
4	Shrub	28	9	37
5	Tree	70	15	85
6	Twiner	12	1	13
7	Undershrub	12		12
	Total	**275**	**45**	**320**

All the plants belong to 103 families. Of the total families, highest number of plants is recorded in Poaceae (28). Among others, Fabaceae (22), Acanthaceae (14), Asteraceae (13), and Convolvulaceae (13) were dominant families from species richness point of view. Out of 103 families, 57 families were represented by single species (mono-specific families).

The results pertaining to the distribution of species across genera revealed that of the total 267 genera, *Ipomoea* is the most represented genera with 8 species followed by *Acacia* and *Cassia* (7 and 6 species each) and *Indigofera* represented by 4 species As many as 239 genera were mono-specific, represented by single species.

For all the 320 species, the ratio of Family: Genera (1:2.4) was for only wild plants excluding cultivated, ornamental and garden plants. On the other hand, the ratio of Genera: Species was (1:1.2), while the ratio of family: species was (1:2.9).

However, all these records are obviously quite low as compared to the ratios at national level, which was recorded as 1:7.

The substantially low ratios of plants at different taxonomic levels in Kawant as compared to the national level ratios are mainly due to the difference in the area coverage in terms of geographical extent, variation in habitat and ecosystem. Nevertheless, the low taxonomic ratios indicate relatively low plant diversity in the area, which could be attributed to the semi-arid kind of climatic conditions. To go for any final conclusion, it also needs to be kept in mind that there are different kinds of biotic pressures operating in the area, which one way or other negatively affect the plant diversity in the area. Such an inference can be drawn only after a systematic study of vegetation requiring sufficient time for data collection and also by capturing the seasonal variations in plant composition, supplemented with the quantified information on the types of threats and their magnitude.

Plant genetic resources are the most valuable and essential basic raw materials to meet the current and future needs of crop improvement programmes. A wider genetic base, thus, assumes priority in plant breeding research aimed at developing new varieties for increased crop production. This diversity comprises native landraces, local selections, elite cultivars and wild relatives of crop plants. Around thirteen species were reported from the area. Detailed systematic studies are required to confirm all species and their ecological status.

Table 7: Higher plant species of Kawant region

Sr	SPECIES	Local Name	Family	Habit *	Habitat #
1	*Abelmoschus manihot* (L.) Medic.	Ran bhindi, Jangli bhindi	Malvaceae	Us	w
2	*Abrus precatorius* L.	Chanothi, Gunja	Fabaceae	Tw	w
3	*Abutilon indicum* (L.) Sw.	Khapat, Dabliar, Kangsi	Malvaceae	Us	w
4	*Acacia catechu* (L.f.) Willd.	Kher	Mimosaceae	T	w
5	*Acacia chundra* (Roxb. ex Rottl.) Willd.		Mimosaceae	T	w
6	*Acacia ferruginea* DC.	Kagar	Mimosaceae	T	w
7	*Acacia leucophloea* (Roxb.) Willd.	Rinjdo, Hermobaval, Hiver, Samadi, Ronjiya	Mimosaceae	T	w
8	*Acacia nilotica* Subsp. *indica* (Bth.) Brenan	Deshi Baval, MithoBavar	Mimosaceae	T	w
9	*Acacia senegal* (L.) Willd.	Gorad, Mitho kher, Kumbhat	Mimosaceae	T	w
10	*Acalypha indica* L.	Dadari, Dadarjo, Vaichikato	Euphorbiaceae	H	w
11	*Acanthospermum hispidum* DC.		Asteraceae	H	w
12	*Achyranthes aspera* Var. aspera L.	Anghedi, Anghedo, Aghado	Amaranthaceae	H	w
13	*Adhatoda zeylanica* (L.) Nees	Ardusi	Acanthaceae	S	w
14	*Adina cordifolia* (Roxb.) Bth. & Hk.	Haldarvo	Rubiaceae	T	w
15	*Aegle marmelos* (L.) Corr	Bili	Rutaceae	T	w
16	*Aerides crispum* Lindl.		Orchidaceae	H	w
17	*Aerva lanata* (L.) Juss.	Kapuri	Amaranthaceae	H	w
18	*Aerva persica* (Burm.f.) Merrill	Buv, Bau, Gorakhganjo	Amaranthaceae	S	w
19	*Agave americana* L.	Ramban, Ketaki	Liliaceae	H	w
20	*Ailanthus excelsa* Roxb.	Rukhdo, Moto arduso	Simaroubaceae	T	w
21	*Alangium salvifolium* (L.) Wang.	Ankol, Ankoli	Alangiaceae	T	w
22	*Albizia lebbeck* (L.) Bth.	Sirish	Mimosaceae	T	w
23	*Albizia odoratissima* (L.f.) Bth.	Dholo Shirish, Sarasadi	Mimosaceae	T	w
24	*Alhagi pseudoalhagi* (M. Bieb.) Desv.		Fabaceae	H	w
25	*Allium cepa* L.	Dongari	Liliaceae	H	d
26	*Allium sativum* L.	Lasan	Liliaceae	H	d
27	*Aloe barbadensis* Mill.	Kunvarpato, Ariyo, Gingwar	Liliaceae	S	w

28	*Alternanthera sessilis* (L.) DC.		Amaranthaceae	H	w
29	*Alysicarpus longifolius* (rottl. Ex Spr.)W.&A.	Ghodasamaervo, Ubhosamervo	Fabaceae	H	w
30	*Alysicarpus monilifer* (L.) DC.		Fabaceae	H	w
31	*Alysicarpus tetragonolobus* Edgew.	Samervo	Fabaceae	H	w
32	*Amaranthus lividus* L.	Miji bhaji, Tandaljo	Amaranthaceae	H	w
33	*Amaranthus viridis* L.	Rajgaro Adbau Rajgaro	Amaranthaceae	H	w
34	*Ammannia baccifera* L.	Jal agio, Lal agio	Lythraceae	H	w
35	*Anagallis arvensis* L.		Primulaceae	H	w
36	*Andrographis echioides* (L.) Nees	Kariyatu	Acanthaceae	H	w
37	*Anisomeles indica* (L.) O.K.	Chodharo	Lamiaceae	S	w
38	*Annona squamosa* L.	Sitaphal	Annonaceae	T	w
39	*Anogeissus latifolia* (Roxb. ex DC.) Well. ex Guill. & Perr.	Dhavda	Combretaceae	T	w
40	*Anticharis sp*.		Scrophulariaceae	H	w
41	*Antigonon leptopus* Hk. & Arn.		Polygonaceae	Cl	w
42	*Apluda mutica* L.		Poaceae	G	w
43	*Arachis hypogaea* L.	Magfali, Bhoysingh	Fabaceae	H	d
44	*Argemone mexicana* L.	Darudi, Aredi	Papaveraceae	H	w
45	*Argyreia nervosa* (Burm. f.) Boj	Samudrasok, Samadar, Sog	Convolvulaceae	Cl	w
46	*Aristida adscensionis* L.		Poaceae	G	w
47	*Aristida funiculata* Trin. & Rupr.	Lanp	Poaceae	G	w
48	*Aristolochia bracteolata* Lam.	Kidamari, Norvel	Aristolochiaceae	Cl	w
49	*Asparagus racemosus* Willd.	Satawari, Naharkanta, Avalkati	Liliaceae	Cl	w
50	*Asphodelus tenuifolius* Cav.	Dungro	Liliaceae	H	w
51	*Asystasia gangetica* (L.) T.Anders.		Acanthaceae	H	w
52	*Azadirachta indica* A. Juss.	Limdo, Neem	Meliaceae	T	w
53	*Bacopa monnieri* (L.) Wettst.		Scrophulariaceae	H	w
54	*Balanites aegyptiaca* (L.) Del.	Ingorio, Hingoriyo, Angario	Balanitaceae	T	w
55	*Barleria prionitis* L.	Kadha aserio, Kanta aserio	Acanthaceae	S	w
56	*Bauhinia racemosa* Lam.	Asotri, Kasotri, Rakta kachnar, Apto	Caesalpiniaceae	T	w
57	*Bergia ammannioides* Roxb. Ex Roth		Elatinaceae	H	w
58	*Bidens biternata* (Lour.) Merr. & Sherff	Karakokdi, Samara kokdi	Asteraceae	H	w
59	*Blainvillea acmella* (L.) Philip	Dholu Foldu	Asteraceae	H	w
60	*Blepharis linariaefolia* Pers.	Kandhera/ Ubhera gokhru	Acanthaceae	H	w
61	*Blepharis repens* (Vahl) Roth	Zinku Utingan	Acanthaceae	H	w

62	*Blumea mollis* (Don) Merrill	Bhutaco, Chanchadmari	Asteraceae	H	w
63	*Boerhavia chinensis* (L.) Druce	Sanidhokriar Achhisatodi	Nyctaginaceae	H	w
64	*Boerhavia diffusa* L.	Satodi	Nyctaginaceae	H	w
65	*Boerhavia verticillata* Poir.	Zeri Satodo	Nyctaginaceae	H	w
66	*Bombax ceiba* L.	Savar, Shimlo	Bombacaceae	T	w
67	*Borassus flabellifer* L.	Taad	Arecaceae	T	w
68	*Borreria stricta* (L.f.) K. Schum		Rubiaceae	H	w
69	*Boswellia serrata* Roxb. ex Coleb.	Salar	Burseraceae	T	w
70	*Bothriochloa intermedia* (R. Br.) A. Camus	Dharfo, Sarvu	Poaceae	G	w
71	*Bouchea marrubifolia* Schauer		Verbenaceae	H	w
72	*Bougainvillea glabra* Choisy	Boganvel	Nyctaginaceae	Cl	w
73	*Bougainvillea spectabilis* Willd.	Boganvel	Nyctaginaceae	Cl	w
74	*Brachiaria ramosa* (L.) Stapf.		Poaceae	G	w
75	*Bridelia retusa* Juss.	Dantio, Lampana, Asan	Euphorbiaceae	T	w
76	*Buchnania lanzan* Spr.	Charoli	Anacardiaceae	T	w
77	*Butea monosperma* (Lam.) Taub.	Khakharo, Palash, Kesudo	Fabaceae	T	w
78	*Cadaba fruticosa* (L.) Druce	Khordu, Kalo pinjolo, Kormo	Capparaceae	S	w
79	*Caesalpinia bonduc* (L.) Roxb.	Kath karanj	Caesalpinioideae	T	w
80	*Caesalpinia crista* L.	Kankcha, Kangsa	Caesalpiniaceae	S	w
81	*Cajanus cajan* (L.) Millsp.	Tuver	Fabaceae	H	d
82	*Caladium bicolor* Vent		Araceae	H	d
83	*Calotropis gigantea* (L.) R. Br.	Dholo akado	Asclepiadaceae	S	w
84	*Calotropis procera* (Ait.) R. Br.	Nano Akado	Asclepiadaceae	S	w
85	*Campylanthus ramosissimus* Wt.		Scrophulariaceae	Us	w
86	*Canna indica* L.	Bajarbutt	Cannaceae	H	d
87	*Capparis decidua* (Forsk.) Edgew.	Kerdo, Kera	Capparaceae	S	w
88	*Capparis sepiaria* L.	Kanthar, Kantharo	Capparaceae	S	w
89	*Capsicum annuum* L.	Marchi	Solanaceae	H	d
90	*Cardiospermum halicacabum* L.	Trigharivel, Gadhedavel	Sapindaceae	H	w
91	*Carissa congesta* Wt.	Karamada	Apocynaceae	S	w
92	*Carvia callosa* (Nees) Bremek.		Acanthaceae	S	w
93	*Cassia angustifolia* Vahl		Caesalpiniaceae	H	w
94	*Cassia auriculata* L.	Aval, Avali, Avar	Caesalpiniaceae	S	w
95	*Cassia fistula* L.	Garmalo, Chambhar	Caesalpiniaceae	T	w
96	*Cassia obtusifolia* L.	Kuvandio, Povadio	Caesalpiniaceae	H	w
97	*Cassia siamea* Lam.	Kasid	Caesalpiniaceae	T	d
98	*Cassia tora* L.	Puvadiya	Caesalpinioideae	H	w
99	*Casuarina equisetifolia* L.	Saru	Casuarinaceae	T	w

100	*Catharanthus roseus* (L.) G. Don	Barmasi	Apocynaceae	H	d
101	*Cayratia carnosa* (Lam.) Garnep.	Khat-Khatumbo	Vitaceae	Cl	w
102	*Celastrus paniculatus* Willd.	Malkagani, Malkankni, Mali	Celastraceae	Tw	w
103	*Celosia argentea* L.	Lambdi, Lampdi	Amaranthaceae	H	w
104	*Cenchrus ciliaris* L.	Dhaman	Poaceae	G	w
105	*Cenchrus setigerus* Vahl	Dharamnu, Dhaman ghas	Poaceae	G	w
106	*Ceratophyllum demersum* L.		Ceratophyllaceae	H	w
107	*Ceropegia bulbosa* Roxb.	Kundher, Loriyavel, Patalkumbhi	Asclepiadaceae	Tw	w
108	*Chenopodium album* L.	Chil, Chilni, Bhaji	Chenopodiaceae	H	d
109	*Chlorophytum borivillianum* Sant. ex Ern.	Safed Musli, Dholi Musli	Liliaceae	H	w
110	*Chloris barbata* Sw.	Mindadiu	Poaceae	G	w
111	*Chrozophora rottleri* (Geis.) Juss.	Kalo okharad	Euphorbiaceae	H	w
112	*Chrysanthemum indicum* DC.	Guldaudi	Asteraceae	H	D
113	*Chrysopogon fulvus* (Spr.) Chiov.	Draf, Khad-Sundhiu	Poaceae	G	W
114	*Cicer arietinum* L.	Chana	Fabaceae	H	D
115	*Cissampelos pareira* L.	Venivel, Karandiu, Phadvel	Menispermaceae	Tw	W
116	*Citrullus colocynthis* (L.) Schrad	Indravarna, Indroni, Tru	Cucurbitaceae	H	W
117	*Citrus limon* (L.) Burm.	Limbu	Rutaceae	S	D
118	*Cleome gynandra* L.	Ghandhatu	Capparaceae	H	W
119	*Clerodendrum inerme* (L.) Gaertn	Arani, Tapvel, Tappan	Verbenaceae	S	D
120	*Clitoria ternatea* L.	Garni, Gokaran, Koyal, Bibli	Fabaceae	Tw	W
121	*Cocculus hirsutus* (L.) Diels	Vevdi, Achipad, Karipat	Menispermaceae	H	W
122	*Cochlospermum religiosum* (L.) Alston.	Ganiyari	Bixaceae	T	W
123	*Coldenia procumbens* L.	Okhrad, Basario	Boraginaceae	H	W
124	*Combretum ovalifolium* Roxb.	Madhvel	Combretaceae	Cl	D
125	*Commelina benghalensis* L.	Sishmuliu	Commelinaceae	H	W
126	*Commiphora wightii* (Arn.) Bhandari	Gugal	Burseraceae	S	W
127	*Convolvulus arvensis* L.	Khetrau Phudardi, Veldi	Convolvulaceae	H	W
128	*Convolvulus auricomus* Var.auricomus Bhandari	Ruchhad neri	Convolvulaceae	H	W
129	*Convolvulus microphyllus* (Roth) Siev. Ex Spr.	Shankhvali, Mankhani, Biraval	Convolvulaceae	H	W
130	*Corbichonia decumbens* (Forsk.) Exell		Aizoaceae	H	W
131	*Corchorus trilocularis* L.	Ubhi munderi	Tiliaceae	H	W
132	*Cordia dichotoma* Forst.	Moto Gundo, Lisuda	Ehretiaceae	T	W
133	*Crotalaria burhia* Buch.-Ham.	Kharshan, Sangetaro	Fabaceae	Us	W

134	*Crotalaria juncea* L.	Shun, Shan, Shaniyu	Fabaceae	Us	W
135	*Crotalaria medicaginea* Lam.		Fabaceae	H	W
136	*Croton bonplandianum* Baill.	Pardeshi thuvar	Euphorbiaceae	H	W
137	*Cryptostegia grandiflora* Br.	Rabarvel	Asclepiadaceae	S	D
138	*Ctenolepis cerasiformis* (Stocks) Hk. F.	Ankh Futmani	Cucurbitaceae	Cl	W
139	*Cuscuta reflexa* Roxb.	Amarvel Anatvel	Cuscutaceae	Tw	W
140	*Cymbopogon citratus* (DC.) Stapf		Poaceae	G	D
141	*Cymbopogon martinii* (Roxb.) Watr.		Poaceae	G	W
142	*Cynodon dactylon* (L.) Pers.	Dub, Daro, Darabh, Chhabar	Poaceae	G	W
143	*Cyperus bulbosus* Vahl	Khed	Cyperaceae	G	W
144	*Cyperus rotundus* L.		Cyperaceae	H	W
145	*Cyperus triceps* (Rottb.) Endl.		Cyperaceae	G	W
146	*Dactyloctenium aegyptium* (L.) P.Beauv.		Poaceae	G	W
147	*Dalbergia paniculata* Roxb.	Passi, Pihi	Fabaceae	T	W
148	*Datura innoxia* Mill.	Kalo daturo	Solanaceae	Us	W
149	*Dendrocalamus strictus* (Roxb.) Nees.	Vans	Poaceae	G	W
150	*Dendrophthoe falcata* (L. f.) Spreng.	Vando	Loranthaceae	S	W
151	*Derris indica* (Lam.) Bennet	Karanj, Kanji	Fabaceae	T	W
152	*Desmostachya bipinnata* (L.) Stapf	Dabh	Poaceae	G	W
153	*Dichanthium annulatum* (Forsk.) Stapf	Jinjavo, Denai	Poaceae	G	W
154	*Dichrostachys cinerea* (L.) W. & A.		Mimosaceae	S	W
155	*Digera muricata* (L.) Mart.	Kanjro, Lolar	Amaranthaceae	H	W
156	*Dioscorea sp.*	Chairo	Dioscoreaceae	H	W
157	*Diospyros melanoxylon* Roxb.	Timru, Tendu	Ebenaceae	T	W
158	*Diplocylos palmatus* (L.) C. Jeffrey	Shivlingi	Cucurbitaceae	Cl	W
159	*Dipteracanthus patulus* (Jacq.) Nees	Tutadi, Sisodi, Ambliejezad	Acanthaceae	H	W
160	*Dolichandrone falcata* (Wall. ex DC.) Seem.	Mersuing	Bignoniaceae	T	W
161	*Drypetes roxburghii* (Wall.) Hurusawa		Euphorbiaceae	T	W
162	*Duranta repens* L.	Doranta	Verbenaceae	S	W
163	*Echinochloa colonum* (L.) Link	Samo, Motujiriu	Poaceae	G	W
164	*Echinops echinatus* Roxb.	Shulio, Utkanto	Asteraceae	H	W
165	*Eclipta prostrata* (L.) L.	Bhangaro, Kalo bhangaro	Asteraceae	H	W
166	*Emblica officinalis* Gaertn.	Ambla	Euphorbiaceae	T	W
167	*Enicostemma axillare* (Lamk.) Roynal	Mamejavo	Gentianaceae	H	W
168	*Eranthemum roseum (Vahl.)*	sisawadu	Acanthaceae	H	W

	R.Br.				
169	*Ervatamia divaricata* (L.) Burkill	Chandani, Tagar	Apocynaceae	S	D
170	*Erythrina* sp.		Fabaceae	T	W
171	*Eucalyptus globulus* Labill.	Nilgiri	Myrtaceae	T	D
172	*Euphorbia caducifolia* Haines	Thor, Thoriya	Euphorbiaceae	S	W
173	*Euphorbia hirta* L.	Vadi dudhi, Vadi rati dudhi	Euphorbiaceae	H	W
174	*Euphorbia nivulia* Buch.-Ham.	Thor	Euphorbiaceae	S	W
175	*Evolvulus alsinoides* L.	Kalishankhavali, Zinifudadi	Convolvulaceae	H	W
176	*Ficus benghalensis* L.	Vad	Moraceae	T	W
177	*Ficus racemosa* L.	Umaro, Umbar, Gular	Moraceae	T	W
178	*Ficus religiosa* L.	Piplo	Moraceae	T	W
179	*Flacourtia indica* (Burm.f.) Merril.		Flacourtiaceae	T	W
180	*Fumaria indica* (Haussk.) Pugsley	Pitapapdo	Fumariaceae	H	W
181	*Garuga pinnata* Roxb.	Kakad, Kapta	Balanitaceae	T	W
182	*Glinus lotoides* L.	Mitho Okharad	Molluginaceae	H	W
183	*Gmelina arborea* L.	Sivan	Verbenaceae	T	W
184	*Gomphrena globosa* L.		Amaranthaceae	H	w
185	*Goniogyna hirta* (Willd.) Ali		Fabaceae	H	w
186	*Gossypium herbaceum* Var. acerifolium (Guill. & Perr.) Chevalier	Kapas, Desi Kapas	Malvaceae	S	d
187	*Grewia tiliaefolia* Vahl	Dhaman	Tiliaceae	T	w
188	*Helicteres isora* L.	Maradsing, Atedi, Kon, Matota fali, Ati, Aiti, Atai	Sterculiaceae	T	w
189	*Heliotropium supinum* L.	Ghedio Okharad	Boraginaceae	S	w
190	*Heteropogon contortus* (L.) P.Beauv.ex R. & S.	Dabhsuliu, Kagadiu, Sukhli	Poaceae	G	w
191	*Hibiscus ovalifolius* (Forsk.) Vahl	Chanak bhindo	Malvaceae	H	w
192	*Hibiscus sabdariffa L.*	Khati bhindi	Malvaceae	H	W
193	*Holarrhena antidysenterica* (Roth.) A. DC.	Kaludado, Kuda	Apocynaceae	T	w
194	*Holoptelea integrifolia* (Roxb.) Planch.	Kanjo, Papda, Audo-aodo	Ulmaceae	T	w
195	*Hydrilla verticillata* (L. f.) Royle		Hydrocharitaceae	H	w
196	*Hygrophila auriculata* (Schum.) Heine	Kantashelio, Akaro, Akharo, Talimkhana	Acanthaceae	Us	w
197	*Indigofera astragallina* DC.		Fabaceae	H	w
198	*Indigofera cordifolia* Heyne ex Roth		Fabaceae	H	w
199	*Indigofera oblongifolia* Forsk.	Zil, Ziladi, Zildo	Fabaceae	S	w
200	*Indigofera tinctoria* L.	Gali, Nil, Gudi	Fabaceae	H	w
201	*Ipomoea aquatica* Forsk.	Narivel	Convolvulaceae	H	w
202	*Ipomoea coptica* (L.) Roth ex Roem. & Schult.		Convolvulaceae	H	w

203	*Ipomoea eriocarpa* R. Br.	Bodi Fudardi	Convolvulaceae	Tw	w
204	*Ipomoea fistulosa* Mart. Ex Choisy	Akari, Nafatvel, Besharmi	Convolvulaceae	S	w
205	*Ipomoea nil* (L.) Roth	Kalandana	Convolvulaceae	Tw	w
206	*Ipomoea obscura* (L.) Ker-Gawl	Vad fudardi	Convolvulaceae	H	w
207	*Ipomoea pes-caprae* (L.) Sw.	Maryad vel, Dariyani vel	Convolvulaceae	H	w
208	*Ipomoea quamoclit* L.	Ganesh vel	Convolvulaceae	Cl	w
209	*Jatropha curcas* L.	Ratanjyot	Euphorbiaceae	S	w
210	*Justicia procumbens* L.	Pittpapdo, Rati manjrado	Acanthaceae	H	w
211	*Kickxia ramossisima* (Wall.) Janch.	Bhini ghilodi, Bhini chat	Scrophulariaceae	H	w
212	*Kirganelia reticulata* (Poir.) Baill.		Euphorbiaceae	T	w
213	*Lagerstroemia parviflora* Roxb.		Lythraceae	T	w
214	*Lannea coromandelica* (Houtt.) Herrill	Madhol, Modhad, Miniyo, Moyno	Anacardiaceae	T	w
215	*Lantana camara* L.	Dano	Verbenaceae	S	w
216	*Launaea procumbens* (Roxb.) Ram. & Raj.	Moti bhonpatri, Galjibhi	Asteraceae	H	w
217	*Lawsonia inermis* L.	Mehndi	Lythraceae	S	w
218	*Lemna minor* L.		Lemnaceae	H	w
219	*Lepidagathis trinervis* Wall.	Harancharo, Paniru	Acanthaceae	H	w
220	*Leptadenia reticulata* (Retz.) W. & A.	Dodi, Khirdodi, Nani Dodi	Asclepiadaceae	Tw	w
221	*Leucas aspera* (Willd.) Spr.	Kubi	Lamiaceae	H	w
222	*Limonia acidissima* L.	Kotha	Rutaceae	T	w
223	*Livistona rotundifolia* Mart.	Pankha Tad	Arecaceae	T	d
224	*Luffa acutangula* Var. amara (Lam.) Cl.	Jangli Turiya	Cucurbitaceae	Cl	w
225	*Madhuca indica* J.f. Gmelin.	Mahudo	Sapotaceae	T	w
226	*Mangifera indica* L.	Aambo, Keri, Aam	Anacardiaceae	T	w
227	*Manilkara hexandra* (Roxb.) Dubard.	Rayan	Sapotaceae	T	w
228	*Martynia annua*L.		Martyniaceae	H	w
229	*Maytenus emarginata* (Willd.) D. Hou	Vico, Vikdo, Vingo	Celastraceae	T	w
230	*Medicago sativa* L.	Lachko, Rajko	Fabaceae	H	d
231	*Melanocenchris jacquemontii* J. & S.		Poaceae	G	w
232	*Merremia gangetica* (L.) Cufod.	Undardi, Undarkani, Undari	Convolvulaceae	H	w
233	*Miliusa tomentosa* (Roxb.) Sinclair	Humkumbh, Unbiya	Annonaceae	T	w
234	*Mimusops elengi* L.	Borsali	Sapotaceae	T	w
235	*Mirabilis jalapa* L.	Gulbas	Nyctaginaceae	H	w
236	*Mitragyna parviflora* (Roxb.) Korth.	Kabda, Kadamb	Rubiaceae	T	w
237	*Mollugo pentaphylla* L.		Molluginaceae	H	w
238	*Monsonia senegalensis* Guill. & Perr.	Rati fuldi	Geraniaceae	H	w

239	*Morinda tomentosa* Heyne ex Roth	Aledi, Aal, Rangori	Rubiaceae	T	w
240	*Moringa oleifera* Lam.	Saragvo, Mittho saragvo	Moringaceae	T	d
241	*Mucuna pruriens* (L.) Dc.	Kaucha	Fabaceae	Tw	w
242	*Nelumbo nucifera* Gaertn.	Vado Kamalful, Kamal	Nymphaceae	H	w
243	*Nerium indicum* Mill.	Lal karen	Apocynaceae	S	w
244	*Nothosaerva brachiata* (L.) Wt.		Amaranthaceae	H	w
245	*Nyctanthes arbortristis* L.	Parijatak, Harisingar	Oleaceae	T	w
246	*Ocimum americanum* L.	Bapchi, Tukmariya, Jungli tulsi	Lamiaceae	H	w
247	*Ocimum basilicum* L.	Damro, Maruo	Lamiaceae	H	w
248	*Ocimum sanctum* L.	Tulsi	Lamiaceae	H	d
249	*Oldenlandia corymbosa* L.	Parpat, Parpapti	Rubiaceae	H	w
250	*Opuntia elatior* Mill.	Fafda thor, Nagfani	Cactaceae	S	w
251	*Oroxylum indicum* (L.) Vent.	Farri	Bignoniaceae	T	w
252	*Ougeinia oogeinsis* (Roxb.) Hochr.	Tanach	Fabaceae	T	w
253	*Oxalis corniculata* L.	Changeri, Navari	Oxalidaceae	H	w
254	*Panicum sp.*		Poaceae	G	w
255	*Parthenium hysterophorus* L.		Asteraceae	H	w
256	*Paspalidium flavidum* (Retz.) A. Camus		Poaceae	G	w
257	*Pavonia zeylanica* Cav.		Malvaceae	H	w
258	*Pedalium murex* L.	Ubhu gokharu	Pedaliaceae	H	w
259	*Pennisetum typhoides* (Burm.f.) Stapf & Hubb.	Bajri	Poaceae	G	d
260	*Pentatropis spiralis* (Forsk.) Decne.	Dhodha, Shingroti	Asclepiadaceae	Tw	w
261	*Pergularia daemia* (Forsk.) Chiov.	Chamardudheli, Dudhela	Asclepiadaceae	Tw	w
262	*Peristrophe paniculata* (Forsk.) Burm.	Adhedi, Kali anghedi	Acanthaceae	H	w
263	*Phoenix sylvestris* (L.) Roxb.	Khajuri	Arecaceae	T	w
264	*Phyla nodiflora* (L.) Greene		Verbenaceae	H	w
265	*Phyllanthus fraternus* Webst.	Bhonyamli	Euphorbiaceae	H	w
266	*Physalis minima* L.	Popti, Parpopti	Solanaceae	H	w
267	*Pithecellobium dulce* (Roxb.) Bth.	Goras amli	Mimosaceae	T	w
268	*Plumeria rubra* L.	Khadchampo	Apocynaceae	T	w
269	*Polyalthia longifolia* (Sonn.) Thw.	Asopalav	Annonaceae	T	d
270	*Polycarpaea corymbosa* (L.) Lam.	Jangli soa, Rupa puli	Caryophyllaceae	H	w
271	*Polygala erioptera* DC.	Patsan, Bhonysan	Polygalaceae	H	w
272	*Polygonum glabrum* Willd.		Polygonaceae	H	w
273	*Portulaca quadrifida* L.		Portulacaceae	H	w
274	*Prosopis juliflora*	Gando baval, Kajado	Mimosaceae	S	w
275	*Psoralea corylifolia* L.	Bavachi	Fabaceae	H	w
276	*Pterocarpus marsupium* Roxb.	Biya	Fabaceae	T	w
277	*Pupalia lappacea* (L.) Juss.	Bhurat, Gadar bhurat	Amaranthaceae	Us	w
278	*Rhynchosia minima*	Nahnikamalvel	Fabaceae	H	w

	Var.minima (L.) DC.				
279	*Ricinus communis* L.	Diveli, Divelio, Erandi	Euphorbiaceae	S	d
280	*Ruellia tuberosa* L.	Bandhukadi	Acanthaceae	H	w
281	*Russelia sp.*		Scrophulariaceae	H	d
282	*Saccharum spontaneum* L.	Kans, Kakudu	Poaceae	G	w
283	*Santalum album* L.	Chandan	Santalaceae	T	w
284	*Sapindus emarginatus* Vahl.	Aritha	Sapindaceae	T	w
285	*Schrebera swietenioides* Roxb.	Mokha	Oleaceae	T	w
286	*Sehima nervosum* (Rottl.) Stapf.		Poaceae	G	w
287	*Setaria glauca* (L.) P. Beauv.	Kunchi	Poaceae	G	w
288	*Sida cordifolia* L.	Bala, Baldana, Kharenti	Malvaceae	Us	w
289	*Solanum incanum* L.	Ubhi Ringni	Solanaceae	S	w
290	*Solanum nigrum* L.	Kanpiru, Pannir	Solanaceae	H	w
291	*Solanum surattense* Burm.	Adariyal, Audeli, Bhoringni	Solanaceae	H	w
292	*Sorghum halepense* (L.) Pers.	Baru, Barua	Poaceae	G	w
293	*Sphaeranthus indicus* L.	Gorakh mundi, Bhurandi	Asteraceae	H	w
294	*Sterculia urens* Roxb.	Kadaya, Kadua	Sterculiaceae	T	w
295	*Striga asiatica* L.	Agiyo	Scrophulariaceae	H	w
296	*Syzygium cumini* (L.) Skeels	Jambu	Myrtaceae	T	w
297	*Tagetes petula* L.	Galgota, Hajari	Asteraceae	H	d
298	*Tamarindus indica* L.	Amli	Caesalpiniaceae	T	w
299	*Tecoma stans* (L.) H. B. & K.	Tilottama	Bignoniaceae	T	d
300	*Tectona grandis* L.f.	Sag	Verbenaceae	T	d
301	*Tephrosia purpurea* (L.) Pers.	Sarpankho	Fabaceae	Us	w
302	*Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn.	Arjun	Combretaceae	T	w
303	*Terminalia bellerica* (Gaertn.) Roxb.	Baheda	Combretaceae	T	w
304	*Terminalia crenulata* Roth	Hadad, Sadad	Combretaceae	T	w
305	*Themeda quadrivalvis* (L.) O.Ktze.	Ratedu, Gundeli	Poaceae	G	w
306	*Thevetia peruviana* (Pers.) Merr.	Pili Karen, Kaniyar	Apocynaceae	S	w
307	*Tinospora cordifolia* (Willd.) Miers	Nimgiloy, Amarvel, Ambarvela, Gadu, Galo	Menispermaceae	Tw	w
308	*Trema orientalis* (L.) Bl.		Ulmaceae	T	w
309	*Trianthema portulacastrum* L.	Satodo	Aizoaceae	H	w
310	*Tribulus terrestris* L.	Bethu gokhru, Akanti	Zygophyllaceae	H	w
311	*Tridax procumbens* L.	Pardesi bhangaro	Asteraceae	H	w
312	*Triticum aestivum* L.	Gahun	Poaceae	G	d
313	*Triumfetta rhomboidea* Jacq.	Bhurati, Japati	Tiliaceae	Us	w
314	*Verbascum chinense* (L.) Sant.	Kalhar, Kolhala, Kutki	Scrophulariaceae	H	w
315	*Vernonia cinerea* (L.) Less.	Sahadevi, Sadedi	Asteraceae	H	w
316	*Vitex nigundo* L.	Nagod	Verbenaceae	T	w
317	*Wrightia tinctoria* (Roxb.) R. Br.	Dudhkudi, Dudhi	Apocynaceae	T	w
318	*Xanthium strumarium* L.	Verandiya, Bada gokharu	Asteraceae	H	w
319	*Ziziphus xylopyrus* (Retz.) Willd.	Ghatbor	Rhamnaceae	T	w

320	*Zizyphus mauritiana* Lam.	Bor, Ber	Rhamnaceae	T	w
*:Cl: climber; G: grass; H: herb; S: shrub; T: tree; Tw: twiner; Us: under shrub #: d: domestic species; w: wild species					

(i) Forest based Economy of Kawant region - Role of Minor Forest Produce (MFP) in local livelihood

Minor forest products (MFPs) refer to a wide array of economic or subsistence materials that come from forests, excluding timber. Similar terms include "nonwood," "non timber," "secondary," and "special" or "specialty" forest products.

There are many kinds of animal and plant resources that are derived from forests, including fruits, nuts, mushrooms, essential oils, medicinal products, herbs and spices, dyes, resins, and animal products such as honey and wild game in both the regions (Jessore WLS and Kawant forest). MFPs are important parts of the biodiversity and are considered as component of livelihoods in terms of their economic, social and ecological value. As history shows, local communities have used these resources for food security and trade for centuries.

As a result of the population growth and shrinking of the forest area, the pressure upon the existing forest and pasture is being increasing. Indiscriminate collection of MFPs is not only a cause but undaunted regulatory procedure or recognized management practices has threatened the survival of some species and reduced the quality and quantity of MFPs in forests especially in Hafeshwar forests. Some economically important MFPs of the area were reported during the study from field and local markets (Table 8 & 9).

Table 8 : Market price of MFPs available in Kawant and adjoining boundary areas (MR, MP)

SR	SPECIES	Local Name	Habit *	Habitat #	Plant part	Rs/20kg
1	Abrus precatorius L.	Chanothi	Tw	w	Seed	1400
					Leaves	2000

2	*Acacia catechu* (L.f.) Willd.	Kher	T	w	Bark	300
3	*Acacia nilotica* Subsp. *indica* (Bth.) Brenan	Deshi Baval	T	w	Bark	180
					Seed	300
					gum-black	900
					gum-red	1200
4	*Aegle marmelos* (L.) Corr	Bili	T	w	whole fruit	200
					inner part of fruit	400
5	*Alangium salvifolium* (L.) Wang.	Ankol	T	w	Seed	300
6	*Annona squamosa* L.	Sitaphal	T	d	Leaves	300
					Seed	400
7	*Argemone mexicana* L.	Darudi, Aredi	H	w	Seed	300
8	*Asparagus racemosus* Willd.	Satawari	Cl	w	Root	1800
9	*Azadirachta indica* A. Juss.	Limdo, Neem	T	w	Bark	180
					Leaves	200
					Fruit	200
					Seed	400
					Oil	1200
10	*Buchnania lanzan* Spr.	Charoli	T	w	Seed	4000-5000
11	*Butea monosperma* (Lam.) Taub.	Khakharo	T	w	Flower	200
					Oil	4000
12	*Caesalpinia crista* L.	Kangsa	S	d	Fruit	1100
13	*Cassia fistula* L.	Garmalo	T	w	Pod	150
14	*Cassia obtusifolia* L.	Kuvandio	H	w	Seed	200
15	*Celastrus paniculatus* Willd.	Malkagani	Tw	w	Seed	1600
					Oil	4800
16	*Chlorophytum borivillianum* Sant.ex Ern.	Musli	H	w	Musli (forest)	1200/kg
					Musli (agri)	500/kg
17	*Commiphora wightii* (Arn.) Bhandari	Gugal	S	w	Resin	1200
18	*Dendrocalamus strictus* (Roxb.) Nees.	Vans	G	w	Leaves	300
19	*Derris indica* (Lam.) Bennet	Karanj, Kanji	T	w	Seed	300
					Oil	1300
20	*Emblica officinalis* Gaertn.	Ambla	T	d	Fruit	800
					whole fruit	600
21	*Enicostemma axillare* (Lamk.) Roynal	Mamejavo	H	w	Whole	450
22	*Helicteres isora* L.	Maradsing	T	w	Pod	400
23	*Lawsonia inermis* L.	Mehndi	S	w	Leaves	400
24	*Madhuca indica* J.f. Gmelin.	Mahudo	T	w	Bark	300
25	*Mangifera indica* L.	Aambo, Keri	T	d	Bark	200
					Leaves	200
26	*Mimusops elengi* L.	Borsali	T	w	Seed	1800
27	*Moringa oleifera* Lam.	Saragvo	T	d	Bark	300
					Gum	1200
28	*Mucuna pruriens* (L.) Dc.	Kaucha	Tw	d	seed black	2400
					seed white	2000
29	*Nelumbo nucifera* Gaertn.	Kamal	H	w	Seed	1100
30	*Pterocarpus marsupium* Roxb.	Biya	T	w	Bark	280
31	*Ricinus communis* L.	Diveli, Erandi	S	d	Seed	600
32	*Sapindus emarginatus* Vahl.	Aritha	T	w	Whole	300
33	*Sterculia urens* Roxb.	Kadayo	T	w	gum-white	3000
34	*Syzygium cumini* (L.) Skeels	Jambu	T	d	Seed	700

35	*Tamarindus indica* L.	Amli	T	w	Seed	200
					Pod	450
36	*Tectona grandis* L.f.	Sag	T	d		300
37	*Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn.	Arjun	T	w	Bark	140
38	*Terminalia bellerica* (Gaertn.) Roxb.	Baheda	T	w	fruit bark	200
					Seed	800
39	*Terminalia crenulata* Roth	Hadad, Sadad	T	w	Bark	460
					whole fruit	220
40	*Tinospora cordifolia* (Willd.) Miers	Gadu, Galo	Tw	w	Stem	300
41	*Tribulus terrestris* L.	Bethu gokhru	H	w	Fruit	1000
*:Cl: climber; G: grass; H: herb; S: shrub; T: tree; Tw: twiner; Us: under shrub #: d: domestic species; w: wild species						
Market prices provided by Ajay traders, Chhota Udepur (90 years old MFP shop of the region)						

Some other agriculture and wild products of the region

Table 9: Market price of some agro and wild products (as per 2008-09 market rate)

sr	Product name	Rs/Kg	sr	product	Rs/Kg
1	Bavchi oil	160	17	Putrakjiviseed	60
2	Tuver	40	18	kala vavding	75
3	Mug	30-50	19	Vaykumbha	30
4	Maize	10	20	Indrajav kadva	75
5	Chana	30	21	Indrajav mitha	50
6	Bhindi seed	20	22	Pitpapado	20
7	Deshi cotton	30	23	Bavchi (clean)	55
8	Groundnut	25	24	kala adad	40
9	Kusum wax	70	25	Mochras	90
10	Khakhra wax	30-35	26	Kimej	55
11	Bili wax	35	27	Fatajadi- white	10
12	Kadachhal	13	28	Sugandhi bavacho	40
13	Simdachhal	12	29	Nagarmoth	17.5
14	Chimed	130	30	Kalathi seed	20
15	Kalijiri	80	31	Jivanti (kadavi)	13
16	Soyabean	30	32	Ayar pan	20
			33	Dhamaso	15
Market prices provided by Ajay traders, Chhota Udepur (90 years old MFP shop of the region)					

The above detail reveals the economy of the forest based products of the region. It is very necessary to do comprehensive action research on MFPs of the area to strengthen and sustain the local economy other than agriculture and animal husbandry. A small river transect in Narmada River towards border areas of Maharashtra State was done and it was seen that the plant diversity (economic too) in terms of richness and abundance is far better than the areas of Gujarat State i.e. the nearest one Hafeshwar.

(j) Indicator species

Plants are dependent on a particular soil type, topography and climate through biological adaptation. Because of their immobility, plants generally require those components that are specific to a site. An ecological or biological indicator is a species the presence or observes of which is indicative of a particular set of environmental conditions. Indicator species are used as a standard in identifying similar communities. Their decline may indicate a disturbance that alters the ecosystem. Different ecosystems and different stages of ecosystem have different indicators. Indicator species give important information about ecosystem. Few indicators found in the area are given below:

Table 10 : Some indicator plant species of the area

Sr.no	Name of indicator	Indicates the condition
1	*Cassia tora*	Indicates overgrazed grasslands
2	*Aristida sp.*	Indicator of overgrazed and depleted site
3	*Melanocenchrus jacquemontii*	Indicator of overgrazed and depleted site
4	*Saccharum spontaneum*	Indicates poor soil drainage
5	*Carissa congesta*	Indicates intense soil erosion in forest area
6	*Butea monosperma*	Badly drained clay soil

(k) Major Ecological service provider agents:

There are agents in wild, helping in fruit and seed dispersal. The wide dispersal helps to forest extension. Some animals, birds and the adjoining tribal communities are also contributing their role for fruit and seed dispersal. Some of them are mentioned in the Table11.

Table 11: Agents for fruit and seed dispersal

Sr	Agent	Species dispersed
1	Cattle	*Albizia lebbeck, Ficus benghalensis*
2	Goat	*Acacia catechu, Acacia leucophloea*
3	Fruit bat	*Ficus benghalensis, Mangifera indica, Madhuca indica*
4	Squirrels	*Carissa congesta, Madhuca indica, Mangifera indica*
6	Hanuman langur	*Annona squamosa, Diospyros melanoxylon, Ficus benghalensis, Mangifera indica, Miliusa tomentosa, Syzygium heyneanum*
7	Man	*Annona squamosa, Cordia dichotoma, Derris indica, Diospyros melanoxylon, Grewia asiatica, Madhuca indica, Miliusa tomentosa, Pithecellobium dulce, Syzygium cumini, Syzygium heyneanum, Tamarindus indica, Zizyphus mauritiana*
8	Birds	*Acacia leucophloea, Albizia lebbeck, Azadirachta indica, Butea monosperma, Carissa congesta, Diospyros melanoxylon, Ficus benghalensis, Grewia sp., Lannea coromandelica, Mangifera indica, Phoenix sylvestris, Pithecellobium dulce, Tamarindus indica*
9	Wind	*Wrightia tinctoria, Holoptelea integrifolia*

Nature of losses to seeds

Table 12: Agents responsible for seed loss

Sr	Agent	Seed loss of Species
1	Grazing	*Holoptelea integrifolia, Wrightia tomentosa*
2	Human consumption/ activities	*Azadirachta indica, Dendrocalamus strictus, Derris indica,*

		Madhuca indica, Mangifera indica, Sterculia urens
3	Premature fruit collection	*Derris indica, Jatropha curcas*
4	Parakeets	*Albizia lebbeck, Butea monosperma, Carissa congesta*
5	Langur	*Carissa congesta*

Local factors affecting Flowering & Fruiting in wild

Table 13: Factors affecting flowering and fruiting		
Sr	**Affecting factor**	**Species influenced**
1	Grazing/ browsing/ cutting	*Bauhinia sp., Bombax ceiba, Boswellia serrata, Holarrhena antidysenterica, Holoptelea integrifolia, Pithecellobium dulce, Syzygium sp., Wrightia tinctoria, Zizyphus mauritiana*
2	Human consumption/ activities	*Ailanthus excelsa, Albizia procera, Anogeissus latifolia, Azadirachta indica, Bombax ceiba, Boswellia serrata, Casearia elliptica, Derris indica, Firmiana colorata, Lannea coromandelica, Terminalia crenulata*
3	Collection of flowers	*Butea monosperma, Madhuca indica*
4	Collection of twigs	*Azadirachta indica*
5	Cutting of wood	*Acacia catechu, Albizia lebbeck*
6	Branch cutting for fuel wood	Many trees
7	Branch pruning for fodder	Many trees

(l) Phenology: An important aspect of survival of forest

The study was conducted in the months of December-January. The flowers of different colours with different size and aroma represent the natural and virgin beauty of the forest. The colours like, yellow, red, pink, brown, purple, white and their shades as well as tinges make the beautiful look of the rainbow in forest. Some times flowers become so important that the plant species also get unique name like, '*The flame of forest – Butea monosperma*'. The bi-coloured catkin of *Dichrostachys cinerea*, '*Painted Thorn Bush*', is thorny but has a beautiful look. Not only the flowers but the different colours of fruits also increase the beauty of the flora like, the shining red coloured fruits of *Casearia elliptica* and *Alangium salvifolium.* Dark purple coloured fruiting of *Carissa congesta* climbs on the white flowered *Mahuwa* tree creates a very graceful look. Some tree species are host for some attractive epiphytic Orchids and other parasites also. They are also hosting some elegant climbers. Some gorgeous colours from the forests of Kawant are shown in Table14.

Table 14: Different colours of flowers of different plant species		
Sr	**Colour of Flower**	**Plant species**
1	Cream-yellow	*Emblica officinalis, Phoenix sylvestris*
2	Green-yellow	*Balanites aegyptiaca, Casearia elliptica, Holoptelea integrifolia, Zizyphus mauritiana*
3	Pale-yellow	*Acacia leucophloea, Terminalia crenulata*
4	Whitish- yellow	*Mitragyna parvifolia*
5	Yellow	*Acacia nilotica, Adina cordifolia, Ailanthus excelsa, Anogeissus latifolia,*

		Anogeissus sericea, Cassia fistula, Diospyros melanoxylon, Gmelina arborea, Grewia asiatica, Jatropha curcas, Mangifera indica, Miliusa tomentosa, Pterocarpus marsupium, Sterculia urens, Tamarindus indica
6	Red	*Euphorbia caducifolia, Ficus benghalensis, Lannea coromandelica*
7	Dark Orange	*Firmiana colorata*
8	Orange	*Butea monosperma*
9	Pink	*Bombax ceiba*
10	Whitish pink	*Bauhinia variegate*
11	Whitish purple	*Syzygium cumini*
12	Yellow-white-pink-purple	*Dichrostachys cinerea*
13	Creamy white	*Bridelia retusa, Dalbergia paniculata, Garuga pinnata, Madhuca indica, Terminalia bellirica*
14	Green white	*Hymenodictyon excelsum, Pithecellobium dulce*
15	White	*Acacia catechu, Alangium salvifolium, Albizia lebbeck, Annona squamosa, Azadirachta indica, Bauhinia racemosa, Boswellia serrata, Carissa congesta, Cordia dichotoma, Derris indica, Holarrhena antidysenterica, Sapindus laurifolius, Syzygium Tectona grandis, Wrightia tinctoria*

In 1750 the Swedish scientist and artist C. Linnaeus turned plant watching into a systematic science. He made calendars of flowering times for 18 places in Sweden, also noting the exact climatic conditions at these times. This knowledge revealed over centuries was the foundation of modern plant phenology, which spread to many European countries.

Phenological calendar is an important tool in forestry, agroforestry, agriculture, land management, and horticulture; it helps farmers, foresters, and forest dwellers to predict the best time for planting, mulching, harvesting, irrigating, and fertilizing crops, and for controlling pests. Such calendar is helpful to identify summer, winter and monsoon seeder plant species. A detail study on phenology is required to understand the changes in climatic conditions and other biotic factors.

Table 15 shows the seeding time of species like: winter, peak summer, late summer or early monsoon. Their average dormancy level, storing capacity (for how long seeds can be stored) and according to the dormancy and storing capacity, input for sowing activities.

Table 15: Practical applicability of phenology

Sr	Parameter	Winter	Peak Summer	Late Summer or Early Monsoon
1	**Seed production**	*Annona squamosa, Emblica officinalis, Sapindus laurifolius*	*Acacia catechu, Acacia leucophloea, Albizia lebbeck, Acacia nilotica, Adina cordifolia, Alangium salvifolium, Albizia procera, Anogeissus latifolia, Bombax ceiba, Boswellia serrata, Butea monosperma, Carissa congesta, Casearia elliptica, Cassia fistula, Cordia dichotoma, Derris indica, Dichrostachys cinerea, Diospyros melanoxylon, Firmiana colorata, Grewia asiatica, Holarrhena*	*Azadirachta indica, Madhuca indica, Mangifera indica, Syzygium cumini*

			antidysenterica, Holoptelea integrifolia, Jatropha curcas, Lannea coromandelica, Mitragyna parvifolia, Pithecellobium dulce, Pterocarpus marsupium, Tamarindus indica, Terminalia bellirica, Terminalia crenulata, Wrightia tinctoria	
2	**Average dormancy**	More dormant	Less dormant	No dormancy
3	**Storing ability**	Can be stored for many months*	Can be stored for many months* which is generally less than winter seeders	Can not be stored except a few days or weeks
4	**Treatment / Input**	Need pre-sowing treatment	Need pre-sowing treatment	Should be sown without pre sowing treatment

3.3.2 Fauna

(a) Arthropods

Arthropods are animals with segmented bodies and jointed appendages. They are the largest animal group. They are the most successful animals on earth, found everywhere; on the land, in the soil, flying in the sky, in freshwater and in the oceans. Some of the most familiar arthropods are butterflies, beetles, flies, cockroaches, spiders, ants, termites and bees. Cotton bugs were observed frequently in the cotton fields. It is very essential to confirm the cotton seed variety as the local farmers claims them as "BT Cotton". The population of these bugs is massive and increasing loss to the farmers (photo).

Table 16: Some Arthropods from Kawant (other than Spiders and Butterflies)

Sr.	Order	Scientific name	Common name
1	Orthoptera	*Teratodes monticollis*	Hooded Grasshopper
2	Orthoptera	*Gryllodes domesticus*	House Cricket
3	Orthoptera	*Acheta domestica*	Black Field Cricket
4	Neuroptera	-	Termite
5	Hymenoptera	*Xylocopa s*p.	Carpenter Bee
6	Hymenoptera	*Apis dorsata* F.	Rock Bee
7	Hymenoptera	*Apis indica*	Indian Bee
8	Hymenoptera	*Eumenes conica*	
9	Hymenoptera	*Oecophylla smaragdina*	Red Weaver Ant

* Each seed has its own viability period. Seeds can be stored in live condition during this period only.

10	Hymenoptera	*Holcomyrmex scabriceps*	Granary Ant
11	Hymenoptera	*Pogonomyrmex barbatus*	Harvester Ant
12	Coleoptera	*Scarabacus sacer*	
13	Coleoptera	*Luciola sp.*	Fire-fly
14	Coleoptera	*Evides elegans*	Jewell Beetle
15	Diptera	*Musca domestica*	Common House-fly
16	Homoptera	*Tachardia lacca*	Lac insect
17	Hemiptera	*Dysdercus cingulatus*	**Cotton Bug**
18	Anisoptera	*Diplacodes lefebvrei*	Black Ground Skimmer
19	Anisoptera	*Orthetrum triangulare*	Blue tailed Forest Hawk

(b) Spider diversity

Arthropods comprise more than 900,000 described insect species and about 34,000 described spiders. Spiders have a very significant role to play in the ecology by being exclusively predatory (Wise, 1993) and thereby regulate insect populations (as biocontrol agents). A detail study on spider diversity and their response to the changing environment in the region is needed.

Table 17: Spiders of the area (Araneae)

Sr.	Family	Scientific name	Common name	Habitat
1	Hersilidae	*Hersilia savignyi*	Two Tailed spider	Tree trunks
2	Pholcidae	*Crossopriza iyoni*	Pholcid spider	inside house
3	Psechridae	*Psechrus sp.*		Moist deciduous forest
4	Salticidae	*Plexippus paykullii*	Zebra jumper	Tree trunks
5	Sparassidae	*Heteropoda venatoria*	Huntsman spider	human habitation
6	Tetragnathidae	*Nephilia maculata*‡‡	Giant Wood Spider	primary & secondary forests, wasteland
7	Araenidae	*Argiope arecuata*	Signature spider	Moist deciduous forest

Various research studies (Daniel et.al.) suggested that *Crossopriza iyoni* could form an important component of integrated control of *Aedes aegypti* mosquitoes in foci of dengue (the most common viral pathogen transmitted by mosquitoes) transmission.

(c) Butterflies

Butterflies are messengers of nature, not only adding brilliance to their surroundings but also providing various ecoservices to the natural world. Their sheer numbers supply a vast food source for predators, and they are significant plant pollinators. With their acute sensitivity to pesticides and toxins, their presence, diversity and relative abundance indicate the overall well-being of ecosystems. Only 41 butterfly species were reported during the short period is not enough to understand their status in the region, hence, a comprehensive study is needed.

‡‡ The gene for the silk of *Nephila maculata* has been cloned and the spinning technology needs to be perfected.

Table 18: Butterfly diversity of Kawant			
Sr.	**Family**	**Scientific name**	**Common name**
1	Papilionidae	*Graphium agammemnon*	Tailed Jay
2	Papilionidae	*Pachliopta asistolochiae*	Common Rose
3	Papilionidae	*Papilio polytes*	Common Mormon
4	Papilionidae	*Princeps demoleus*	Lime Butterfly
5	Pierinae	*Anapheis aurota*	Pioneer
6	Pierinae	*Catopsilia pomona*	Common Emigrant
7	Pierinae	*Catopsilia pyranthe*	Mottled Emigrant
8	Pierinae	*Cepora nerissa*	Common Gull
9	Pierinae	*Chilades pandava*	Plain Cupid
10	Pierinae	*Colotis danae*	Crimson Tip
11	Pierinae	*Eurema hecabe*	Common Grass Yellow
12	Pierinae	*Freyeria trochylus*	Grass Jewel
13	Pierinae	*Ixias marianne*	White Orange Tip
14	Pierinae	*Ixias pyrene*	Yellow Orange Tip
15	Pierinae	*Jamides celeno*	Common Cerulean
16	Pierinae	*Lampides boeticus*	Pea Blue
17	Pierinae	*Pseudozizeeria maha*	Pale Grass Blue
18	Pierinae	*Spindasis vulcans*	Common Silverline
19	Pierinae	*Zizeeria knyasna*	Dark Grass Blue
20	Pierinae	*Zizula hylax*	Tiny Grass Blue
21	Lycaeninae	*Lepotes plinius*	Zebra Blue
22	Lycaeninae	*Tarucus nara*	Rounded Pierrot
23	Nymphalinae	*Ariadne merione*	Common Castor
24	Nymphalinae	*Cynthia cardui*	Painted Lady
25	Nymphalinae	*Danaus chrysippus*	Plain Tiger
26	Nymphalinae	*Danaus gnutia*	Striped Tiger
27	Nymphalinae	*Euploea core*	Common Crow
28	Nymphalinae	*Euthalia nais*	Baronet
29	Nymphalinae	*Hypolimnas bolina*	Great Eggfly
30	Nymphalinae	*Hypolimnas misippus*	Danaid Eggfly
31	Nymphalinae	*Junonia almana*	Peacock Pansy
32	Nymphalinae	*Junonia atlites*	Grey Pansy
33	Nymphalinae	*Junonia hierta*	Yellow Pansy
34	Nymphalinae	*Junonia iphita*	Chocolate Pansy
35	Nymphalinae	*Junonia lemonias*	Lemon Pansy
36	Nymphalinae	*Junonia orithya*	Blue Pansy
37	Nymphalinae	*Melanitis leda*	Common Evening Brown
38	Nymphalinae	*Phalanta phalantha*	Common Leopard
39	Nymphalinae	*Tirumala limniace leopardus*	Blue Tiger
40	Nymphalinae	*Triumala septentrionis*	Dark Blue Tiger
41	Nymphalinae	*Ypthima ceylonica*	Common Four-ring

(d) Fish fauna

The scales of fish indicate the water condition, drought condition before years and many more things. The local fishermen collect fish from the river Narmada and the dried fishes are sold in the local markets.

Table 19: Fish fauna of the area			
Sr.	**Scientific name**	**Common name**	**Local name**
1	*Catla catla*	Catla	Bawas, Catla
2	*Caprimus carpio*	Common Carp	Carp
3	*Wallago attu*	Fresh Water Shark	Magara, Muley
4	*Labeo fimbriatus*	Fringe-lipped Carp	Begado, Bilgi
5	*Labeo caliasu*	Kalbasu	Begado, Kalavat
6	*Cirrehina marigala*	Mrigal	Nagari
7	*Labeo rohita*	Rohu	Rohu
8	*Ophiocephalusstiatus*	Snake headed fish	Murral, Dol

(e) Amphibians

Amphibians play a pivotal role in ecosystem as secondary consumers in many food chains. Tadpoles have significant impact in nutritional cycling. They are herbivorous to omnivorous and are the prey items for both invertebrates and vertebrates. Adult amphibians are the best biological pest controllers. Invertebrates and vertebrates also predate them. Because of their importance in ecosystem, decline or extinction of their population has significant impact on other organisms along with them. From the ecological perspective, amphibians are regarded as good ecological indicators. Due to high degree of sensitivity, either during tadpole stage or as adults, they respond to very slight change in the environment. Such responses have been used to indicate habitat fragmentation, ecosystem stress, impact of pesticides, and various anthropogenic activities. Detailed systematic study is needed for the Amphibian fauna.

(f) Reptiles

Fifteen species of Reptiles were reported from the field by direct sighting and from the local people.

Table 20: Reptiles of the area			
Sr.	**Scientific Name**	**English Name**	**Local Name**
1	*Bungarus caerulens*	Common Indian Krait	Kalotro
2	*Echis carinatus*	Saw Scale Viper	Chitar
3	*Eryx johni*	John Sandboa	Andhdi Chakan
4	*Naja naja*	Indian Cobra	Nag
5	*Natrix piscator*	Chequred Keelback	Deendu
6	*Oligodon venestus*	Wolf Snake	
7	*Psamnophis leithi*	Sand Snake	
8	*Ptyas mucosus*	Rat Snake	Dhaman
9	*Python molursus*	Indian Python	Ajgar
10	*Typhlops braminus*	Common Blind Snake	
11	*Vipera russelli*	Russel's Viper	Chitar, Fuisa
12	*Mabuya carinata*	Common Skink	Bodi bamani
13	*Hemidactylus flaviviridis*	House Lizard	Garoli
14	*Calotes versicolor*	Indian Garden Lizard	
15	*Geochalone elegans*	Starred Tortoise	Kachbo

(g) Avifauna

Birds are important for pollination in flowers, as a natural pest controller, as seed dispersal agents (many birds including frugivores), etc. The following bird species were reported from the forests of Kawant area. Detailed study is needed on Avifauna of the region.

Table 21: Birds of the area

Sr.	Scientific Name	English Name	Family
1	*Tachybaptus ruficollis*	Little Grebe	Podicipedidae
2	*Palacrocorax niger*	Little Cormorant	Phalacrocoracidae
3	*Egretta garzetta*	Little Egret	Ardeidae
4	*Bubulcus ibis*	Cattle Egret	Ardeidae
5	*Ardeola grayii*	Indian Pond Heron	Ardeidae
6	*Pseudibis papillosa*	Black Ibis	Threskiornithidae
7	*Sarkidiornis melanotos*	Comb Duck	Anatidae
8	*Elans caeruleus*	Black-shouldered Kite	Accipitridae
9	*Milvus migrains*	Black Kite	Accipitridae
10	*Neophron percnopterus*	Egyptian Vulture	Accipitridae
11	*Gyps bengalensis*	White–rumped Vulture	Accipitridae
12	*Gyps indicus*	Long-billed Vulture	Accipitridae
13	*Accipitter badius*	Shikra	Accipitridae
14	*Spizaetus cirrhatus*	Changeable Hawk Eagle	Accipitridae
15	*Francolinus pictus*	Painted Francolin	Phasieanidae
16	*Francolinus pondicerianus*	Gray Francolin	Phasieanidae
17	*Coturnix coturnix*	Common Quail	Phasieanidae
18	*Perdicula asiatica*	Jungle Bush Quail	Phasieanidae
19	*Gallus sonneratii*	Grey Junglefowl	Phasieanidae
20	*Pavo cristatus*	Indian Peafowl	Phasieanidae
21	*Gallinula chloropus*	Common Moorhen	Rallidae
22	*Vanellus indicus*	Red-wattled Lapwing	Charadriidae
23	*Actitis hypoleucos*	Common Sandpiper	Charadriidae
24	*Calidris minuta*	Little stint	Charadriidae
25	*Columba livia*	Rock Pigeon	Columbidae
26	*Streptopelia senegalensis*	Laughing Dove	Columbidae
27	*Streptopelia chinensis*	Spotted Dove	Columbidae
28	*Psittacula eupatria*	Alexandrine Parakeet	Psittacidae
29	*Psittacula krameri*	Rose-ringed Parkeet	Psittacidae
30	*Psittacula cynocephala*	Plum-headed Parkeet	Psittacidae
31	*Clamator jacobinus*	Pied Cuckoo	Cuculidae
32	*Eudynamys scolopacea*	Asian Koel	Cuculidae
33	*Centropus sinensis*	Greater Coucal	Cuculidae
34	*Tyto abla*	Barn Owl	Strigidae
35	*Bubo bubo*	Eurasian Eagle Owl	Strigidae
36	*Bubo coromandus*	Dusky Eagle Owl	Strigidae
37	*Athene barma*	Spotted Owlet	Strigidae
38	*Caprimulgus asiaticus*	Indian Nightjar	Caprimulgidae
39	*Alcedo atthis*	Common Kingfisher	Alcedinidae
40	*Halcyon smyrnensis*	White-throated Kingfisher	Alcedinidae
41	*Ceryla rudis*	Pied Kingfisher	Alcedinidae
42	*Merops orientalis*	Green Bee-eater	Meropidae
43	*Coracias benghalensis*	Indian Roller	Coraciidae
44	*Upupa eops*	Common Hoopoe	Upupidae

45	*Megalaima zeylanica*	Brown-headed Barbet	Captonidae
46	*Megalaima haemacephala*	Copersmith Barbet	Captonidae
47	*Jynx torquilla*	Europeon Wryneck	Picidae
48	*Dinopinum beghalense*	Black-rumped Flameback	Picidae
49	*Hirundoi concolor*	Dusky Crag Martin	Hirundinidae
50	*Lanius schach*	Long-tailed shrike	Laniidae
51	*Lanius excubitor*	Great Grey-shrike	Laniidae
52	*Oriolus xanthornus*	Black-hooded oriole	Oriolidae
53	*Dicrurus macrocercus*	Black Drongo	Dicruridae
54	*Dicrurus Caerulescens*	White- bellied Drongo	Dicruridae
55	*Sturnus pagodarum*	Brahminy Starling	Sturnidae
56	*Acridotheres tristics*	Common Myna	Sturnidae
57	*Acridotheres ginginianus*	Bank myna	Strigidae
58	*Dendrocitta vagabunda*	Rufous Treepie	Corvidae
59	*Carvus splendens*	House Crow	Corvidae
60	*Pericrocotus cinnamomens*	Small Minivet	Campephagidae
61	*Aegithina tiphia*	Common Iora	Irenidae
62	*Pycnonotus cafer*	Red-vented Bulbul	Pycnonotidae
63	*Turdoides caudatus*	Common Babbler	Muscicapidae (Sf) Timalinae
64	*Turdoides malcolmi*	Large Grey Babbler	Muscicapidae (Sf) Timalinae
65	*Turdoides striatus*	Jungle Babbler	Muscicapidae (Sf) Timalinae
66	*Culicicapa ceylonensis*	Grey-headed Canary Flycatcher	Muscicapidae (Sf) Muscicapinae
67	*Terpsiphone paradisi*	Asian Paradise-Flycatcher	Muscicapidae (Sf) Muscicapinae
68	*Prinia socialis*	Ashy Prinia	Muscicapidae (Sf) Sylviinae
69	*Sylvia currca*	Lesser Whitethroat	Muscicapidae (Sf) Sylviinae
70	*Orthotomus sutorius*	Common Tailorbird	Muscicapidae (Sf) Sylviinae
71	*Copsychus saularis*	Oriental Magpie Robin	Muscicapidae (Sf) Turdinae
72	*Saxicoloides fulicata*	Indian Robin	Muscicapidae (Sf) Turdinae
73	*Phoenicurus ochruros*	Black Redstart	Muscicapidae (Sf) Turdinae
74	*Parus xanthogenys*	Black- lored Tit	Paridae
75	*Anthus rufulus*	Paddy field Pipit	Motacilliadae
76	*Motacilla alba*	White Wagtail	Motacilliadae
77	*Motacilla maderaspatensis*	White- browed Wagtail	Motacilliadae
78	*Motacilla flava*	Yellow Wagtail	Motacilliadae
79	*Nectarinia asiatica*	Purple Sunbird	Nectariniidae
80	*Zosterops palp-ebrosus*	Oriental White-eye	Zosteropidae
81	*Passer domesticus*	House Sparrow	Ploceidae (Sf) Passrinae
82	*Ploceus philippinus*	Baya Weaver	Ploceidae (Sf) Ploceinae
83	*Lonchara malabarica*	Indian Silverbill	Ploceidae (Sf) Estrildinae
84	*Melophus lathami*	Crested Bunting	Emberizidae
(Sf): Subfamily			

(h) Mammals

Eighteen mammalian species are listed (Table 22) through field visits, local community's opinions, and individual experts.

Table 22: Mammals of the area

Sr.	Scientific Name	Common Name	Family
1	*Melursus ursinus*	Sloth Bear	Ursidae
2	*Muntiac muntjak*	Barking Deer	Bovidae
3	*Tetracerus quadricornis*	Four horned Atelope	Bovidae

4	*Canis aureus*	Jackal	Canidae
5	*Pteropus giganteus*	Indian Flying Fox	Canidae
6	*Vulpes bengalensis*	Indian fox	Canidae
7	*Presbytis entellus*	Common Langur	Cebidae
8	*Macaca mulatta*	Rhesus monkey	Cercopithecidae
9	*Felis chaus*	Jungle cat	Felidae
10	*Panthera pardus*	Panther	Felidae
11	*Prionailurus rubiginosa*	Rusty spotted cat	Felidae
12	*Herpestes edwardsii*	Common mongoose	Herpestidae
13	*Herpestes smithii*	Ruddy mongoose	Herpestidae
14	*Hyaena hyaena*	Stripped hyaena	Hyaenidae
15	*Lepus nigricollis*	Indian hare	Leporidae
16	*Bandicota bengalensis*	Indian mole rat	Muridae
17	*Rattus rattus*	Common house rat	Muridae
18	*Funambulus pennanti*	Five stripped palm squirrel	Sciuridae
19	*Hystrix indica*	Indian Porcupine	Hystricidae

(i) Indicator species- Fauna

Some fauna species are found in the area are very important indicators. Their population size indicates many things about the local ecological changes. Some of them are mentioned below.

Table 23: Indicator animal species of the area

Sr.	Name of indicator	Indicates the condition
1	Large Gray Jungle Babbler	Indicates open forest
2	Jungle Babbler	Indicator of dense forest
3	Common Babbler	Indicator of highly degraded forest/ desertic conditions
4	Spotted Dove	Indicator of dense forest
5	Chinkara	Indicates open grassland

Dependency on natural resources of the local community is rated as “very high”. Natural products collected regularly include poles and timber used for house construction, furniture and household items; trees used for the construction of dug out boats; grass for thatching and fibres serve for mats, baskets and fish-traps. The natural environment also contributes to the steady supply of wild fruits, mushrooms, honey, beeswax, traditional medicines and fish and game meat (legally or illegally). Firewood is the main source of domestic energy for cooking for over ninety percent of all households in the region with no affordable energy alternatives.

Looking at the history of the area, traditional management systems controlled by ethnic groups have been lost and finally replaced with a centralistic state monopolizing the management of forest and other natural resources. That way communities living at and from the resource base lost control and ownership for the resources of their immediate environment. The Government however, was not able to provide enough resources for the protection and adequate law enforcement and consequently an “open access system” to the resources developed. In

Hafeshwar part of the region in particular biodiversity suffered from these phenomena, also called “the tragedy of the commons”, and was exacerbated by the isolation and limited accessibility of this area.

3.4 Ecological picture of Ambadungar:

The total population of Ambadungar is around 1562 and out of them 1546 is of the tribe Dungara Bhil (census 2001). The local slang is Dungara-Bhil, which is different from the State language Gujarati. Ambadungar is very near to Kadipani (3 km far). There is two parts of the forest area of Ambadungar-mountain forest part and valley forest part (photos). A one-way road is crossing through these two forest parts towards the GMDC mine area.

The forest at Ambadungar can be differentiated into three layers:

The Upper Layer: The hilly slope is covered with dense dry Deciduous Forest. The major tree species reported here are *Tectona grandis*, *Terminalia crenulata*, *Morinda tomentosa, Anogeissus latifolia, Dalbergia latifolia, Wrightia tinctoria, Cassia fistula, Lannea corommandelica, Acacia leucophlaea, Alangium salvifolium* and *Bridelia sp.* The forest is economically valuable because of the presence of valuable timbers. *Tectona grandis* is dominant and growing 15-20 m. high. Next to Teak trees are *Terminalia crenulata* and *Dalbergia latifolia.* The giant climber of *Bauhinia* (Khakhar Vel) was also observed everywhere in the forest.


Khakharvel

The Middle Layer: The composition of this part of the forest is *Tectona grandis*, *Anogeissus latifolia, Feronia limonia, Cordia dichotoma, Carissa congesta* and *Holarrhena antidysenterica.*

The Lower Layer: The vegetation noted at the base of the hill comprise of *Acanthospermum hispidum*, *Chloris barbata, Convolvulus microphyllus, Cynodon dactylon, Dipteracanthus patulus*, *Euphorbia hirta, Pergularia daemia* and *Tephrosia purpurea*.

Among the lower plants, Lichen species were observed on the rocks and Mushrooms near the base of the hill part. Bryophytes and Pteridophytes create the green cover on the ground of the forest. All these species are mentioned in the detail tables.

The local people of Ambadungar village collect NTFPs from the forest are Timru leaves, fruits of Kusum, Sitafal, Aegle (Bili) fruits, Aaldi fruits, Datiya fruits, leaves of Khakhara, fuelwood and many other medicinal plant parts in their season.


Kaucha

Many individuals of *Mucuna pruriens* (Kaucha) were observed in the valley, which is highly important medicinal plant and it is sold in the local markets.


Civet excreata

Among the climbers and lianas in the forest, the most important climber is '*Khakhar vel*', which is a giant climber and supports a big association of life.

Different species of Spiders were observed in the valley part of the forest, major attraction was the Giant Wood Spider. Indirect sightings/ evidences were reported of some wild mammals in the valley forest area.


Nest of ***Bubo coromandus***

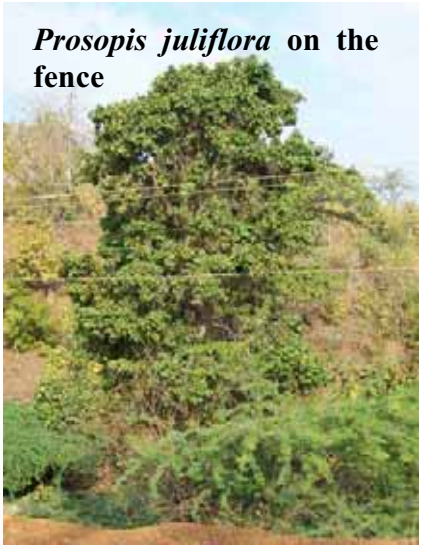
The berries of *Vitis* climbers were the major food source of different bird species during the season. Many bird nests were reported in Ambadungar forest (Table24). The tree cover supports many birds from the smaller one Baya Weaver to the bigger one Dusky Eagle Owl.

Table 24: Different bird nests reported on tree species in forest areas

Sr	Tree species	Local name in Dungara-Bhil	Bird species nesting
1	*Acacia farnesiana*		Purple Sunbird, Common Babbler
2	*Acacia nilotica*	Bavle	Red-vented Bulbul
3	*Azadirachta indica*	Nibalu	Common Myna, Small Minivet
4	*Butea monosperma*	Khakharo	Black Drongo
5	*Celastrus paniculatus*		Brahminy Myna
6	*Ficus benghalensis*	Vole	Large Grey Babbler
7	*Prosopis juliflora*	Gandu bavlu	Baya Weaver
8	*Terminalia catappa*	Hodalayo	Common Tailorbird, Spotted Owlet
9	*Zizyphus mauritiana*	Bor	Indian Silver Bill

The overall ecological condition of the forest is good and supports each component of the foodweb (all the biological elements explained above) but there are some dangers at the door of the forest, which can be harmful for the local vegetation and associated fauna.

Prosopis juliflora was planted on the fence of the forest for protection but now it has invaded the border part of the forest, which can be clearly seen near the road sides. Due to this, regeneration and recruitments of *Prosopis juliflora* are increasing in all the layers in the forest. This can affect the indigenous vegetation of the forest. It is very essential to work on such invasive species eradication from the dense and fringe parts of the forest.



***Prosopis juliflora* on the fence**

Some grazing evidences like, dung, dropping of goats, lopping, etc. were seen which indicates that there are some problems in the protection mechanism in the community efforts.

Negative impacts of mining on the forest resources exist but this phenomenon was not studied in detail. As this is a community conserved area, such parameters are very important for the management aspect. In discussion with the community it was not clear whether mining will compensate for damage to the forest.

Some eco-service providers of Ambadungar forest

Aerides sp.
An epiphytic Orchid

Eranthemum roseum
A butterfly host plant

Harvester Ant -
Collects & stores seeds, dead insects in nest on ground for food

3.5 Ecological picture of Hafeshwar

Hafeshwar is the first village in Gujarat in context of FRA, entitled 500 individual cases under FRA.

Key problems of the area: Loss of tree cover, forest degradation, habitat loss, soil erosion, low availability of fodder, over grazing, wild and domestic animal conflicts, Invasion, improper practice of gum collection (tapping of Gum), decreasing MFPs resources, improper agriculture practices, lesser crop production, negative impact of encroachment on forest

The forest of Haf is on the border of Madhya Pradesh and Maharashtra states extended with Turkheda forest, is known as Hafeshwar due to the temple '*Hafeshwar*'. Hafeshwar area has historical and mythological importance as it is on the bank of Narmada River and now this part is the backwater area of Narmada Dam, the official resting point of Narmada Parikrama[§§]. Almost 60-70% of the tree cover of Hafeshwar forest has been converted to agriculture land. Remaining forest cover consist low abundance and less biodiversity in comparison to the Turkheda and Ambadungar forest cover.

High degradation: no Tree cover on hills

The loss of green cover resulted in forest degradation. Due to the degradation, the entire area is losing the top soil layer in every rainy season. Hence, there is no live or physical barrier to arrest the soil erosion, almost all hills and terreins remain with a very thin soil cover.

Due to the soil erosion and loss of moisture in the land, many kinds of fodder bearing species are not growing in the area (which were there earlier), and are available in the forest only, but their population is low and do not provide enough fodder for the wild animals as well as the

[§§] Narmada is worshiped as a river deity by Indians throughout the country and is circumambulated in her entire length of 1312 Km. This circumambulation is called Narmada Parikrama involves walking alongside the river Narmada from her origin at Amarkantak to the sea, crossing to the other side, and then walking back to its origin. The total journey in a properly done Parikrama involves at least 2624 K.m. in a period of 3 years, 3 months and 13 days.

domestic ones. Since, there is no substantial fodder availability in the village parts, over grazing has increased in the forest areas and has resulted in wildlife-human-conflicts. Invasion of non-native species is also a critical issue. The local floral diversity is adversely affected due to soil erosion and invasive species too.


Buchnania lanzan

The forest has lost the essential part of the green cover which was providing economy to the local community in shape of many kinds of plants and animal based produces (MFPs). (It was observed that many costly and important plant-parts were imported in the local '*Haat*' for selling by the tribals of Madhya Pradesh and Maharashtra regions, which were existed earier in the forests of Kawant area.) The undulating landscape of the forest has potential to re-establish the local flora and can sustain the local forest-based economy. It was observed that the regeneration ratio is very low in the forest area of Hafeshwar but still some important NTFP providing plant species existing, which are very mature or old trees. Some trees can be considere the last generation in the forest (*Buchnania lanzan* an important economic tree, very few numbers remain in area: Photo). In addition to all these hurdles, the NTFP collection practices are improper especially in case of Gum-resins. Local people make various cuts on the bark of big sized trees of *Boswellia serrata* for gum collection (photo). This practice is harmful for the trees and increasing threat on the species.

For last many years the local communities are doing agriculture in the region. But gradually the cultivation practices have changed from the native seeds to hybrids and GM seed (BT Cotton). The entire change in cropping pattern has resulted in massive use of harmful chemicals (pesticides, insecticides) in fields. Due to such chemicals it was seen that there was lesser presence of bees, spiders, dragonflies in fields which are helping in pollination and pest control.

Already the fields are facing soil erosion, so after lots of considerable expense on chemicals and seeds, the local farmers are not getting adequate benefits from agriculture. Also their current agriculture practice does not provide sufficient fodder for their animals.

Due to the high degradation and soil erosion (photo), the adverse effects can be seen easily on agriculture and animal husbandary livelihoods. In addition to this, the heavy soil erosion affects the water quality of the River Narmada (back water area). This affects the fish population and so the fishing economy too.

3.6 Issues around FRA:

The above detail clears the biodiversity spectrum and current issues in the region Kawant. Under the provision of FRA, around 500 individual cases for forest land have been cleared and given to the local people. It is clear that the manner in which FRA cases have been granted only take into account land being cultivated by farmers and the process of understanding the totality of the nature of dependance of the forest dwellers on the forest has not been followed. In this context, when we examine the livelihood practises of the farmers, one can observe many unsustainable practises which will end up destroying the local ecosystem on one hand and ultimately result in the destruction of the livelihood systems of the local communties themselves.

The forest degradation and soil erosion has already decreased the growing potential of biomass (forest and agriculture). In Hafeshwar there is no tree cover in the agriculture fields and cultivation against the slope on the undulating lands, result in a large amount of soil being washed away into the River Narmada every year. With the life of the dam being threatened as a result, not only are the livelihoods of the local communities endagered as mentioned above, the supply of valuable irrigation water to a large number of farmers in the State will be threatened. **In the absence of a proper ecological approach to FRA, the concept of recognition of rights of forest dwellers gets converted into recognition of agricultural rights alone**. Such distortion from the intents and main purpose of the act, instead of facilitating the local community to protect the forest in the context of long term sustainability of their life supoort systems will result in further alienation from the forests and consequently its destruction. This alienation from the forest will make them go for the short term immediate

gains (ie. further conversion of forests into agriculture plots) and unsustainable practice of harvesting of NTFPs.

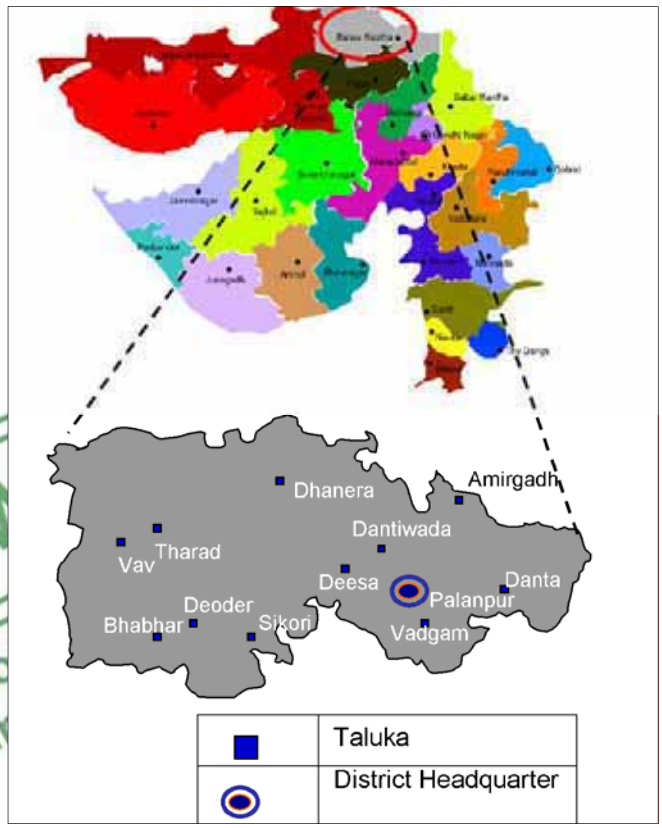
While the land polices of this country have many restrictive clauses, the issue of land grab is common. Despite all restrictions, a lot of the lands in the scheduled areas have been taken over by people from general category in violation of the law through *Benami* deals. Selling of land by individuals and land conversion is taking place. The expansion of Cities many times follows this route of unplanned development which is later legalized. The creation of resorts, farm houses in Udaipur for instance also follow this pattern. Land prices, indebtedness and inadequate livelihood support systems prompt many to take advantage of the plight of hapless tribals.

On one hand an attempt is been made to recognize the right of tribals and other traditional forest dwellers on the other hand tribal land is been usurped in the name of urbanization, development (resorts, mining) etc. and for farm houses of the affluent. These processes restrict the habitat available to the tribal and other traditional forest dwelling communities in the context of their life support systems. These force them to bite the hand that feeds them (environmental destruction of the habitat like the cases discussed above).

4. Detail account: Banaskantha (North Gujarat)

4.1 Introduction

The present study was carried out in Banaskantha district of North Gujarat Region. The north Gujarat region comprises 15.68% (2955.87 km2) of the total forest cover (18,868.28 km2), of Gujarat state. Within North Gujarat, 1500.25 km2 of forest lies within the study area i.e. Banaskantha district and the rest falling within Mehsana (178.16 km2) and Sabarkantha (1277.46 km2) (Forest Survey of India 1997).



Banaskantha district lies between 23° 35' to 24° 43' North and 71° 0' to 73° 0' East on the Banas River. Banaskantha District lies on north-west side of Gujarat State. The District is surrounded by Marwad and Sirohi regions of Rajasthan State in the north, Sabarkantha District in the east, Mehsana District in the south and Patan District in the west. Border of Pakistan touches the desert. Strategically, Banaskantha District is of much importance because of its sensitive borders.

The entire region experiences much variation in temperature with a minimum of 5°C in winter and a maximum of 46° C in summer. The topography varies from plains to low hills, with elevation gradients of 10m to 600m above mean sea level. The mean annual rainfall of 765 mm is received mostly during the monsoon season from July to mid September. Winters from October to February and summers from March to the end of June. The average rainfall of 765 mm provides ideal environmental condition for diverse flora and fauna.

The area of the district is 12703 km^2 and constitutes 5.5 % percent of the total area of Gujarat state. Banaskantha is the third largest district in the state. Habitats within the district consist of saline to sandy desert areas in the west and undulating hilly terrain of the Aravalli Mountain Range in the north and northeast (photo). The forests of the sanctuary play an important role in

conservation of depleting Aravali ecosystem. This area acts as a buffer and separates the desert ecosystem from the dry deciduous type of ecosystem. The tree clad terrain helps in arresting the process of desertification and advancement of Thar Desert. The district shares its border with the neighboring State Rajasthan and creating a corridor between the forest areas of both the states.

Two wildlife sanctuaries lie within the district, viz. Balaram Ambaji and Jassore Wildlife Sanctuaries; both protected areas harbour sloth bears. Apart from these protected areas, Danta and Ambaji forest ranges fall under the categories of reserved forest and unclassed forests. These patches also harbour a variety of wildlife including sloth bear, leopard, hyena, blue bull etc.

The forest tracts of the area are highly undulating with broken ranges of hills of height ranging from 170 to 923 m. above mean sea level. Most of the hilly tract is steep with slopes ranging from 90 to 100 percent in some places. The important hills of the area are Koteshwar, Gabbar, Surmata, Diwania, Kaleto, Trishulia, Virampur, Hathidra and Chamunda hills. The hills and hillocks form a network of catchments leading to a big valley, locally called Nallah, entering the plains and draining into the rivers and small streams.

During the study, Jessore WLS, Ambaji-Balaram WLS, Danta and adjoining forest areas were explored.

As per the forest classification by Champion and Seth (1968), this region supports southern dry mixed deciduous forests 4B 3, 4B 4, 5A/C3. The forest on hills supports *Boswellia* and *Lannea* forests at the top, the intermediate regions of the hills are covered by *Acacia*, and the foot hills are dominated by *Anogeissus* forests. Apart from these species, the Ambaji range supports an abundance good density of Teak (*Tectona grandis*) and bamboo species (photo).

4.2 Forest types classification

DRY TROPICAL FORESTS

Group 5. TROPICAL DRY DECIDUOUS FORESTS

Subgroup 5A. Southern Tropical Dry Deciduous Forests

C1. Dry Teak bearing Forest

C1a. Very Dry Teak Forest

C1b. Dry Teak Forest

C3 Southern Dry Mix Deciduous Forest

Subgroup 5B. Northern Tropical Dry Deciduous Forests

C2 Northern Dry Mix Deciduous Forest

Seral Types

1S1 Tropical Riverine Forest

Edaphic Climax

E1 *Anogeissus pandula* Forest

DS1 *Anogeissus pandula* Scrub

E2 *Boswellia* Forest

E3 *Acacia nilotica* Forest

E5 *Butea* Forest

E6 *Aegle* Forest

E8 *Phoenix* Grove

E9 Dry Bamboo Brakes

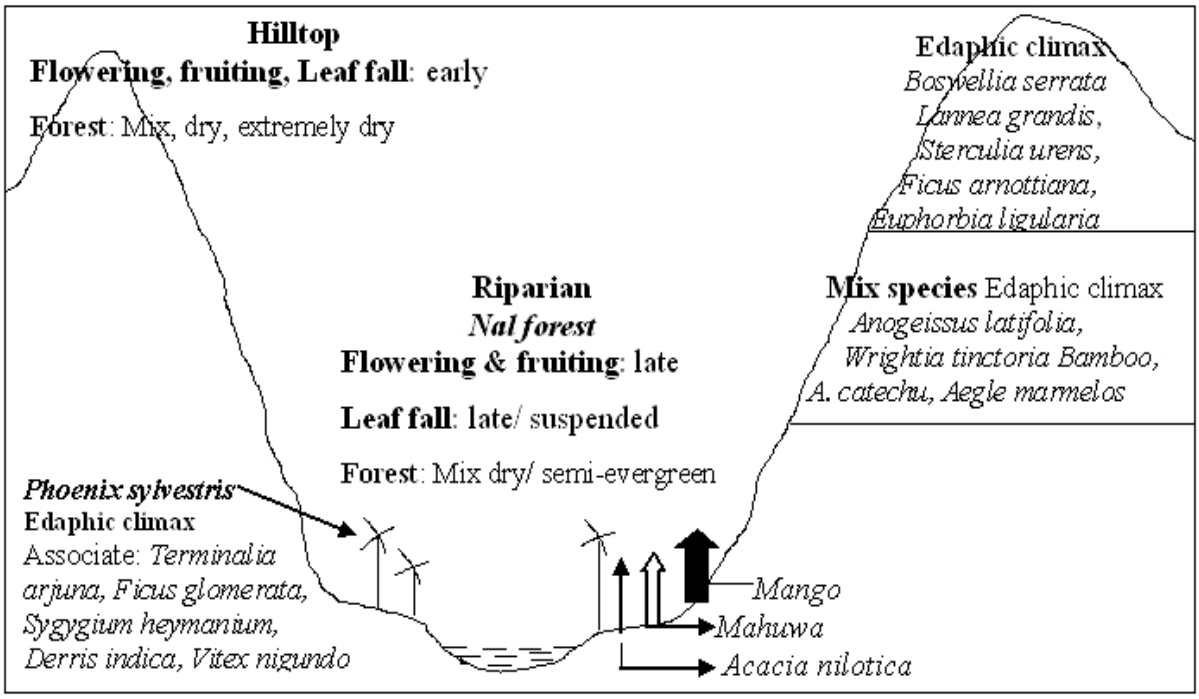
Degradation Stages

DS1 Dry Deciduous Scrub

DS3 *Euphorbia* Scrub

DS4 Dry Grassland

Diagrammatic representation of forests of Jessore and Balaram WLS



The diagram shows that on the hilltop, forests are mix dry or sometimes extremely dry. In such condition, flowering, fruiting, leaf fall are found early while in the valley it is found late. Such valley forest also called riparian forest (*Nal* forest), are mix dry to semi-evergreen.

4.3 Flora:

The climate of the forest area is semi arid. The area is mostly hilly and rocky. The major part of the forest is covered with tropical deciduous trees and shrubs.

Lower plants (Thallophytes, Bryophytes, Pteridophytes):

Lower plants generally need a breezy and moist micro-climate to survive. Several localities are available in and around Jessore WLS, Amirgarh, Balaram WLS, etc., which provide best micro-climate to lower plants.

Thallophyta includes algae, fungi, bacteria and lichens. Due to time and resource limitations, justification could not be done with these taxa. Moist, shady forest floor and vertical faces of rocks having seepage in Jessore, support many bryophytes like, *Riccia* spp., *Fumaria sp*. and *Plagiochasma* sp. (Table 25).

Table 25: Bryophytes in forest areas of Jessore		
Sr	**Scientific Name**	**Family**
1	*Marchantia polymorpha* L.	Marchantiaceae
2	*Plagiochasma appendiculatum* L.et.L.	Aytoniaceae
3	*Plagiochasma intermedium* L.et G.	Aytoniaceae
4	*Riccia billardieri* Mont. Et.Nees.	Ricciaceae
5	*Riccia crystallina* L.	Ricciaceae
6	*Funaria hygrometrica* Var. hygrometrica Hedw.	Funariaceae
7	*Physcomitrium cyathicarpum* Mitt.	Funariaceae

The ecological distributional survey of the pteridophytes (ferns and fern allies) of the forest is considerable importance from phytogeographical and diversity view point. Pteriphytes are very good ecological indicators to examine the forest health. Usually Pteridophytes grow in different habitats. They grow on i) Moist or dry rocks and boulders, ii) on tree trunks, iii) as hydrophytes in water pools and lakes, iv) on forest floor and borders, v) along perennial streams in deep ravines, vi) inside dark gorges and may cover vast areas of grasslands or meadows in sunny situations. Some species are reported from the region are, *Cheilanthes farinosa* (Forssk.) Klf, flourish well in exposed dry situations along forest margins, roadside and bridle paths. It is popularly known as Silver Fern because of the presence of glandular cells with white-colored exudations is well adapted to the xeric conditions. These hairs are an adaptation to xeric conditions in order to reduce the excessive heat and adverse environmental conditions. Another fern reported on the community observation is, *Hypodematium crenatum* (Forssk.) Kuhn. Its dorsiventral and creeping rhizome densely covered over by large golden brown scales penetrate the fissures in the bare rocks (photo). This is a true rock fern species and grows under extremely xerophytic conditions. This species is also used by the local people.

Amongst the small sized ferns, which grows in the crevices of dripping rocks near waterfalls or in the ravines (behind the Balaram temple) are included *Adiantum capillus–veneris* Linn. and *Ampelopteris prolifera* (Retz.) Copel. (photo).

Table 26: Pteridophytes in forest areas of Jessore		
Sr	**Scientific Name**	**Family**
1	*Actinopteris radiata* (Swartz) Link.	Pteridaceae
2	*Adiantum capillus-veneris* Linn.	Pteridaceae
3	*Adiantum incisum* Forsk.	Pteridaceae
4	*Adiantum lunulatum* Burm.	Pteridaceae
5	*Ampelopteris prolifera* (Retz) Copel.	Thelypteridaceae
6	*Azolla pinnata* R.Br.	Azollaceae
7	*Cheilanthus albomarginata* Clarke	Pteridaceae
8	*Cheilanthus farinosa* (Forsk.) Kaulf.	Pteridaceae
9	*Hypodematium crenatum* (Forsk.) Kuhn.	Aspidiaceae
10	*Marselia minuta* L.	Marsileaceae

Higher plants (Angiosperms):

Growth of the principal tree species is generally slow and trees species which generally attain a fair size are *Tamarindus indica, Mangifera indica, Syzygium cumini, Mitragyna parvifolia, Diospyros melanoxylon, Teminalia bellirica, Terminalia arjuna, Holoptelia integrifolia, Schrebera swietenioides, Soymida febrifaga, Miliusa tomentosa, Feronia limonia, Boswellia serrata, Anogeissus latifolia, Dalbergia sisso Azadirachta indica, Albizia lebbek, Butea monosperma* and *Ficus glomerata* etc.

Tectona grandis is a gregarious tree and is often found in pure stands in middle slopes of the hills in the district Danta (photo). Its common associates are *Zizyphus jujuba, Bauhinia racemosa, Wrightia tinctoria, Ehretia laevis, Flacourtia indica, Dichrostachys cinerea, Moringa sp., Diospyros melanoxylon* etc. In upper patches it is found mixed with *Boswellia serrata, Anogeissus latifolia, Lannea coromandelica, Miliusa tomentosa, Sterculia urens, Anogeissus latifolia, Euphorbia neriifolia, Crataeva nurvala* whereas in lower patches, ie. at the base of the hills, in valleys and along nallahs it is mixed with *Butea monosperma, Holoptelia integrifolia and Balanites aegyptica.*

The forest contains a high percentage of *Butea monosperma*. The forest characteristically indicates hard and badly drained soils. Leaves of *Butea monosperma* trees are auctioned under minor forest produce. Leaves are also collected as a fodder for buffaloes and for making *"Pattal and Dauna"* (leaf plates and cups) and for thatching purposes.

Bamboo is found along nallahs in associated with *Tectona grandis* and *Boswellia serrata*.

Few numbers of *Mallotus Philippensis* (Sindoor plant) are existing on the bank of the river in Balaram forest area behind the Balaram temple. This species is available in this location only in the region (photo).

Anogeissus latifolia is the principal species growing in these forests, which is an edaphic climax in tropical dry deciduous forests according to Champion and Seth (1968).

The common associates of *Acacia catechu* are *Anogeissus latifolia* and *Boswellia serrata*. The vegetation is better and the trees may reach a hight of 6-8 metres. In more humid condition like near nallahs, *Acacia catechu* is found mixed with *Dendrocalamus strictus*.

In addition to this, a variety of *Butea monosperma* also reported for the first time during this study is ***Butea monosperma* Var. lutea (Witt.) Maheswari.** Few numbers of trees of yellow flowered *Butea monosperma* var. *lutea* are existing near the water body in the path of the 'Khata Amba Van Kedi (environment education trail developed by Forest Dept. in the Sanctuary), is a new addition to flora of Jessore WLS and globally endangered (photo). It is also reported near the forest nursery of Pancha (Pers. Com. Mr. Y L Varma, DCF, Willife, Banaskantha FD).

Although edaphic factors are not so favorable in this area (in the buffer zone of the Sanctuary) for better development of trees yet indiscriminate and continuous grazing and hacking have further accented the process of degradation.

Out of 410 plant species (Table 27), therophytes constitute 44.65 %. The **dominance of therophytes over other life forms indicates a highly disturbed habitat or dry climate of the forest**!!

Sterculia urens and *Anogeissus sericea* which are listed in the Red data book as endangered species are also recorded in the Jessore forest region.

Jessore forest region is rich in herb species. The ground flora is mainly constituted by annuals. They all regenerate with the onset of monsoon and form a thick coverage during peak rainy season.


Schrebera swietenioides

Forest is well known for *Chlorophytum borivilianum* (Dholi Musali), which is listed in the Red Data Book as endangered species.

The common species growing in the ravine areas are *Maytenus emarginata*, *Balanites aegyptica*, *Butea monosperma*, *Flacourtia indica, Salvadora oleoides* with occasional *Soymida febrifuga Schrebera swietenioides* and *Tecomella undulata.*


Tecomella undulata

Cassia auriculata, an indicator of degradation is seen at the fringe area of the Sanctuary.

Status of **Orchids** in the forest is yet to be studied. Two species of this most beautiful flora group reported are, *Aerides crispum* and *Habenaria sp. Habenaria* is a herbaceous terrestrial orchid growing up to 50 cm tall. It is growing in Mt.Abu WLS also. *Aerides crispum*, an epiphytic orchid was reported on old trees of *Madhuca indica* and *Butea monosperma* as these huge crowned old trees with rough bark provide congenial environment to epiphytic orchids. One more orchid, *Eulophia ochreata*, is widely used (food, medicine) among the tribal communities, locally known as 'Salam Mishri', was not observed in the field but there exist possibilities in the forest for this terrestrial orchid as many patches of Jessore WLS and Amirgarh are having ideal habitat for this species. The detailed study of this species is important as it is over exploited from forest areas for many ayurvedic formulations. Mt.Abu is the richest source for sellers and buyers as bulbs of Salam Mishri are sold illegally in huge quantities. Jessore and Amirgarh forests have large potential to conserve and preserve these orchids.


Aerides crispum

Invasive species are the non-indigenous species that adversely affect the habitats they invade economically, environmentally or ecologically. Biological species invasions alter ecological systems in a multitude of ways. All non-indigenous species are not harmful to their new adopted

environment. Some species are reported as an invasive species in the area: *Xanthium indicum, Lantana camara, Prosopis juliflora, Acanthospermum hispidum,* and *Parthenium hysterophorus*.

Table 27: Higher plants of Jessore WLS and surrounding forest area

Sr	SPECIES	Local Name	Family	Habit *	Habitat #
1	*Abelmoschus manihot* (L.) Medic.	Ran bhindi, Jangli bhindi	Malvaceae	Us	w
2	*Abrus precatorius* L.	Chanothi, Gunja	Fabaceae	Tw	w
3	*Abutilon indicum* (L.) Sw.	Khapat, Dabliar, Kangsi	Malvaceae	Us	w
4	*Acacia catechu* (L.f.) Willd.	Kher	Mimosaceae	T	w
5	*Acacia chundra* (Roxb. ex Rottl.) Willd.		Mimosaceae	T	w
6	*Acacia ferruginea* DC.	Kagar	Mimosaceae	T	w
7	*Acacia leucophloea* (Roxb.) Willd.	Goradio baval	Mimosaceae	T	w
8	*Acacia nilotica* Subsp. *indica* (Bth.) Brenan	Deshi Baval	Mimosaceae	T	w
9	*Acacia senegal* (L.) Willd.	Gorad, Mitho kher, Kumbhat	Mimosaceae	T	w
10	*Acalypha indica* L.	Dadari, Vaichikato	Euphorbiaceae	H	w
11	*Acanthospermum hispidum* DC.		Asteraceae	H	w
12	*Achyranthes aspera* Var. aspera L.	Anghedi, Aghado	Amaranthaceae	H	w
13	*Adansonia digitata* L. Sp.	Rukhd o, gorakh	Bombacaceae	T	w
14	*Adhatoda zeylanica* (L.) Nees	Ardusi	Acanthaceae	S	w
15	*Adina cordifolia* (Roxb.) Bth. & Hk.	Haldaryo	Rubiaceae	T	w
16	*Aegle marmelos* (L.) Corr	Bili	Rutaceae	T	w
17	*Aerides crispum* Lindl.		Orchidaceae	Epi	w
18	*Aerva lanata* (L.) Juss.	Kapuri	Amaranthaceae	H	w
19	*Agave americana* L.	Ramban, Ketaki	Liliaceae	H	d
20	*Ailanthus excelsa* Roxb.	Rukhdo, Moto arduso	Simaroubaceae	T	w
21	*Alangium salvifolium* (L.) Wang.	Ankol, Ankoli	Alangiaceae	T	w
22	*Albizia lebbeck* (L.) Bth.	Sirish	Mimosaceae	T	w
23	*Aloe barbadensis* Mill.	Kunvarpato, Ariyo, Gingwar	Liliaceae	S	w
24	*Alternanthera sessilis* (L.) DC.		Amaranthaceae	H	w
25	*Alysicarpus monilifer* (L.) DC.		Fabaceae	H	w
26	*Amaranthus lividus* L.	Miji bhaji, Tandaljo	Amaranthaceae	H	w
27	*Amaranthus spinosus* L.		Amaranthaceae	H	w
28	*Amaranthus viridis* L.	Rajgaro Adbau Rajgaro	Amaranthaceae	H	w
29	*Ammannia baccifera* L.	Jal agio, Lal agio	Lythraceae	H	w
30	*Ampelocissus latifolia* (Roxb.) Planch.	Jangali draksh	Vitaceae	Cl	w
31	*Anagallis arvensis* L.		Primulaceae	H	w

32	*Andrographis echioides* (L.) Nees	Kariyatu	Acanthaceae	H	w
33	*Andrographis paniculata* (B.f.) Wall.	Kariyatu	Acanthaceae	H	w
34	*Anisomeles indica* (L.) O.K.	Chodharo	Lamiaceae	S	w
35	*Annona squamosa* L.	Sitaphal	Annonaceae	T	d
36	*Anogeissus latifolia* (Roxb. ex DC.) Well. ex Guill. & Perr.	Dhavda	Combretaceae	T	w
37	*Anogeissus sericea* Brandis.	Dhavdo	Combretaceae	T	w
38	*Antigonon leptopus* Hk. & Arn.		Polygonaceae	Cl	w
39	*Areca cathechu* L.	Supari	Arecaceae	T	w
40	*Argemone mexicana* L.	Darudi, Aredi	Papaveraceae	H	w
41	*Argyreia nervosa* (Burm. f.) Boj	Samudrasok	Convolvulaceae	Cl	w
42	*Aristida funiculata* Trin. & Rupr.	Lanp	Poaceae	G	w
43	*Aristolochia bracteolata* Lam.	Kidamari, Norvel	Aristolochiaceae	Cl	w
44	*Aristolochia indica* L.	Kidamari	Aristolochiaceae	Cl	w
45	*Asparagus racemosus* Willd.	Satawari, Naharkanta, Avalkati	Liliaceae	Cl	w
46	*Asphodelus tenuifolius* Cav.	Dungro	Liliaceae	H	w
47	*Asystasia gangetica* (L.) T.Anders.		Acanthaceae	H	w
48	*Azadirachta indica* A. Juss.	Limdo, Neem	Meliaceae	T	w
49	*Bacopa monnieri* (L.) Wettst.		Scrophulariaceae	H	w
50	*Balanites aegyptiaca* (L.) Del.	Ingorio, Hingoriyo	Balanitaceae	T	w
51	*Baliospermum montanum* Willd.		Euphorbiaceae	H	w
52	*Barleria cristata* L.		Acanthaceae	H	w
53	*Barleria prionitis* L.	Kanta aserio	Acanthaceae	S	w
54	*Basella rubra* L.	Poi	Basellaceae	Cl	w
55	*Bauhinia purpurea* L.	Kanchner	Caesalpiniaceae	T	w
56	*Bauhinia racemosa* Lam.	Asotri, Kasotri, Rakta kachnar, Apto	Caesalpiniaceae	T	w
57	*Bergia ammannioides* Roxb. Ex Roth		Elatinaceae	H	w
58	*Bergia capensis* L.	Jal jambvo	Elatinaceae	H	w
59	*Bergia suffruticosa* (Del.) Fen.	Gandharo okhrad	Elatinaceae	H	w
60	*Blainvillea acmella* (L.) Philip	Dholu Foldu	Asteraceae	H	w
61	*Blepharis repens* (Vahl) Roth	Zinku Utingan	Acanthaceae	H	w
62	*Boerhavia chinensis* (L.) Druce		Nyctaginaceae	H	w
63	*Boerhavia diffusa* L.	Satodi	Nyctaginaceae	H	w

64	*Boerhavia verticillata* Poir.	Zeri Satodo	Nyctaginaceae	H	w
65	*Bombax ceiba* L.	Savar, Shimlo	Bombacaceae	T	w
66	*Borreria articularis* (L.f.) F.N.	Ganthiyu	Rubiaceae	H	w
67	*Borreria stricta* (L.f.) K. Schum		Rubiaceae	H	w
68	*Boswellia serrata* Roxb. ex Coleb.	Salar	Burseraceae	T	w
69	*Bougainvillea glabra* Choisy	Boganvel	Nyctaginaceae	Cl	w
70	*Bougainvillea spectabilis* Willd.	Boganvel	Nyctaginaceae	Cl	w
71	*Brassia campestris* L.	Sarsav	Brassicaceae	H	d
72	*Brassia oleracea* L.	Fulavar	Brassicaceae	H	d
73	*Brassica juncea* (L.) Czern.	Rai	Brassicaceae	H	d
74	*Bryophyllum calycinum* L.	Panfutti	Bryophyllaceae	H	w
75	*Butea monosperma* (Lam.) Taub.	Khakharo, Palash, Kesudo	Fabaceae	T	w
76	*Cadaba fruticosa* (L.) Druce	Khordu, Kalo pinjolo, Kormo	Capparaceae	S	w
77	*Caesalpinia crista* L.	Kankcha, Kangsa	Caesalpiniaceae	S	d
78	*Caesalpinia pulcherrima* L.	Galtoro	Caesalpiniaceae	S	w
79	*Cajanus cajan* (L.) Millsp.	Tuver	Fabaceae	H	d
80	*Calotropis gigantea* (L.) R. Br.	Dholo akado	Asclepiadaceae	S	w
81	*Calotropis procera* (Ait.) R. Br.	Nano Akado	Asclepiadaceae	S	w
82	*Canna indica* L.	Bajarbutt	Cannaceae	H	d
83	*Canscora diffusa* (Vahl) R.	Zinkukariatu	Gentianaceae	H	w
84	*Capparis decidua* (Forsk.) Edgew.	Kerdo, Kera	Capparaceae	S	w
85	*Capparis grandis* L.	Thikari	Capparaceae	S	w
86	*Capparis sepiaria* L.	Kanthar, Kantharo	Capparaceae	S	w
87	*Capsicum annuum* L.	Marchi	Solanaceae	H	d
88	*Cardiospermum halicacabum* L.	Trigharivel, Gadhedavel	Sapindaceae	H	w
89	*Carica papaya* L.	Papaiyu	Caricaceae	S	d
90	*Carissa congesta* Wt.	Karamada	Apocynaceae	S	w
91	*Casearia elliptica* Willd.		Flacourtiaceae	S	w
92	*Cassia auriculata* L.	Aval, Avali, Avar	Caesalpiniaceae	S	w
93	*Cassia fistula* L.	Garmalo, Chambhar	Caesalpiniaceae	T	w
94	*Cassia oxidentalis* L.	Kasundro	Caesalpiniaceae	H	w
95	*Cassia pumila* Lam.		Caesalpiniaceae	H	w
96	*Cassia roxburghii* DC.		Caesalpiniaceae	H	w
97	*Cassia tora* L.	Puvadiya	Caesalpiniaceae	H	w
98	*Cassine glauca* (Rottb.) O.		Celastraceae	T	w
99	*Casuarina equisetifolia* L.	Saru	Casuarinaceae	T	w
100	*Catharanthus pusillus* (Murr.) G.	Morli	Apocynaceae	H	w

101	*Catharanthus roseus* (L.) G. Don	Barmasi	Apocynaceae	H	d
102	*Cayratia carnosa* (Lam.) Garnep.	Khat-Khatumbo	Vitaceae	Cl	w
103	*Celastrus paniculatus* Willd.	Malkagani, Malkankni, Mali	Celastraceae	Tw	w
104	*Celosia argentea* L.	Lambdi, Lampdi	Amaranthaceae	H	w
105	*Centella asiatica* (L.) Urb.	Moti brahmi	Apiaceae	H	w
106	*Cestrum nocturnum* L.	Ratni rani	Solanaceae	S	w
107	*Chenopodium album* L.	Chil, Chilni, Bhaji	Chenopodiaceae	H	d
108	*Chloris barbata* Sw.	Mindadiu	Poaceae	G	w
109	*Chlorophytum borivilianum* Sant.	Safed musli	Liliaceae	H	w
110	*Chlorophytum tuberosum (*Roxb.) Baker.	Musli	Liliaceae	H	w
111	*Cicer arietinum* L.	Chana	Fabaceae	H	d
112	*Cissampelos pareira* L.	Venivel, Karandiu, Phadvel	Menispermaceae	Tw	w
113	*Cissus rependa* Vahl.	Gandavelo	Vitaceae	Cl	w
114	*Citrus limon* (L.) Burm.	Limbu	Rutaceae	S	d
115	*Cleome gynandra* L.	Ghandhatu	Capparaceae	H	w
116	*Cleome viscosa* L.	Pili tilvan	Capparaceae	H	w
117	*Clerodendrum inerme* (L.) Gaertn	Arani, Tapvel, Tappan	Verbenaceae	S	d
118	*Clerodendrum multiflorum* (Burm.f.) O.	Arni	Verbenaceae	S	w
119	*Clitora biflora* Dalz.		Fabaceae	H	w
120	*Clitoria ternatea* L.	Garni, Bibli	Fabaceae	Tw	w
121	*Coccinia grandis* (L.) Voigt. T	Giloda, tindora	Cucurbitaceae	Cl	w
122	*Cocculus hirsutus* (L.) Diels	Vevdi, Achipad, Karipat	Menispermaceae	H	w
123	*Coldenia procumbens* L.	Okhrad, Basario	Boraginaceae	H	w
124	*Commelina benghalensis* L.	Sishmuliu	Commelinaceae	H	w
125	*Commelina diffusa* Burm.	Shishmuliu	Commelinaceae	H	w
126	*Convolvulus microphyllus* (Roth) Siev. Ex Spr.	Shankhvali, Mankhani, Biraval	Convolvulaceae	H	w
127	*Corbichonia decumbens* (Forsk.) Exell		Aizoaceae	H	w
128	*Corchorus aestuans* L.	Chunch	Tiliaceae	H	w
129	*Corchorus capsularis* L.	Bor chunch	Tiliaceae	H	w
130	*Corchorus olitorius* L.		Tiliaceae	H	w
131	*Cordia dichotoma* Forst.	Moto Gundo, Lisuda	Ehretiaceae	T	w
132	*Cordia gharaf* (Forsk.) Ehrenb.	Liar gundi	Ehretiaceae	T	w
133	*Cordia sebestena* L.		Ehretiaceae	T	w
134	*Coriandrum sativum* L.	Kothmir, dhana	Apiaceae	H	w
135	*Crateva nurvala* Buch	Vayvarno, varno	Capparaceae	T	w
136	*Crinum asiaticum* L.	Nagdamni	Amaryllidaceae	H	w
137	*Crotalaria burhia* Buch.-Ham.	Kharshan, Sangetaro	Fabaceae	Us	w
138	*Crotalaria juncea* L.	Shun, Shan, Shaniyu	Fabaceae	Us	w
139	*Crotalaria medicaginea* Lam.		Fabaceae	H	w

140	*Croton bonplandianum* Baill.	Pardeshi thuvar	Euphorbiaceae	H	w
141	*Cryptostegia grandiflora* Br.	Rabarvel	Asclepiadaceae	S	d
142	*Ctenolepis cerasiformis* (Stocks) Hk. F.	Ankh Futmani	Cucurbitaceae	Cl	w
143	*Cucurbita maxima* Duch.	Kolu	Cucurbitaceae	Cl	w
144	*Curculigo orchioides* Gartn.	Kali musli	Hypoxidaceae	H	w
145	*Curcuma pseudomontana* Grah.		Zingiberaceae	H	w
146	*Cuscuta chinensis* Lam.	Nani amar vel	Cuscutaceae	parasite cl	w
147	*Cuscuta reflexa* Roxb.	Amarvel, Anatvel	Cuscutaceae	parasite cl	w
148	*Cynodon dactylon* (L.) Pers.	Dub, Daro, Darabh, Chhabar	Poaceae	G	w
149	*Cyperus rotundus* L.		Cyperaceae	H	w
150	*Cyperus triceps* (Rottb.) Endl.		Cyperaceae	G	w
151	*Dactyloctenium aegyptium* (L.) P.Beauv.		Poaceae	G	w
152	*Dalbergia latifolia* Roxb.	Sisam	Fabaceae	T	w
153	*Dalbergia sissoo* Roxb.	Motosisam	Fabaceae	T	w
154	*Dalechampia scandens* L.		Euphorbiaceae	Cl	w
155	*Datura metel* L.	Dhanturo	Solanaceae	H	w
156	*Daucus carota* L.	Gajar, ratadiyu	Apiaceae	H	w
157	*Delonix elata* (L.) Gamble.	Sandesro	Caesalpiniaceae	T	w
158	*Delonix regia* (Boj.) Raf.	Gulmohor	Caesalpiniaceae	T	w
159	*Dendrocalamus strictus* (Roxb.) Nees.	Vans	Poaceae	G	w
160	*Dendrophthoe falcata* (L. f.) Spreng.	Vando	Loranthaceae	S	w
161	*Derris indica* (Lam.) Bennet	Karanj, Kanji	Fabaceae	T	w
162	*Desmodium velutinum* (Willd.) DC.		Fabaceae	H	W
163	*Dichrostachys cinerea* (L.) W. & A.		Mimosaceae	S	W
164	*Didymocarpus pygmaea* Cl.		Gesneriaceae	H	W
165	*Digera muricata* (L.) Mart.	Kanjro, Lolar	Amaranthaceae	H	W
166	*Dioscorea bulbifera* L.	Kanak	Dioscoreaceae	Cl	W
167	*Diospyros chloroxylon* Roxb.	Makrodi	Ebenaceae	S	W
168	*Diospyros melanoxylon* Roxb.	Timru, Tendu	Ebenaceae	T	W
169	*Diplocylos palmatus* (L.) C. Jeffrey	Shivlingi	Cucurbitaceae	Cl	W
170	*Dodonoea viscosa* (L.) Jacq.	Jakhmi	Sapindaceae	S	W
171	*Drypetes roxburghii* (Wall.) Hurusawa		Euphorbiaceae	T	W

172	*Duranta repens* L.	Doranta	Verbenaceae	S	W
173	*Echinops echinatus* Roxb.	Shulio, Utkanto	Asteraceae	H	W
174	*Eclipta prostrata* (L.) L.	Bhangaro	Asteraceae	H	W
175	*Ehretia laevis* Roxb.	Vadhwardi	Ehretiaceae	T	W
176	*Elytraria acaulis* (L.f.) Lind.		Acanthaceae	H	W
177	*Emblica officinalis* Gaertn.	Ambla	Euphorbiaceae	T	D
178	*Enicostemma axillare* (Lamk.) Roynal	Mamejavo	Gentianaceae	H	W
179	*Ervatamia divaricata* (L.) Burkill	Chandani, Tagar	Apocynaceae	S	D
180	*Erythrina suberosa* Roxb.	Jangraiyo-hakharo	Fabaceae	T	W
181	*Erythrina variegate* L.	Pangaro, pangara	Fabaceae	T	W
182	*Eucalyptus globulus* Labill.	Nilgiri	Myrtaceae	T	D
183	*Euphorbia caducifolia* Haines	Thor, Thoriya	Euphorbiaceae	S	W
184	*Euphorbia hirta* L.	Vadi dudhi	Euphorbiaceae	H	W
185	*Euphorbia nerifolia* L.	Thor	Euphorbiaceae	H	W
186	*Euphorbia orbiculata* H.		Euphorbiaceae	H	W
187	*Euphorbia parviflora* L.		Euphorbiaceae	H	W
188	*Euphorbia tirucalli* L.	Kharsani thor	Euphorbiaceae	H	W
189	*Evolvulus alsinoides* L.	Kalishankhavali	Convolvulaceae	H	W
190	*Ficus benghalensis* L.	Vad	Moraceae	T	W
191	*Ficus carica* L.	Anjir	Moraceae	T	D
192	*Ficus hispida* L.	Dhedhumardo	Moraceae	T	W
193	*Ficus racemosa* L.	Umaro, Umbar, Gular	Moraceae	T	W
194	*Ficus religiosa* L.	Piplo	Moraceae	T	W
195	*Flacourtia indica* (Burm.f.) Merril.		Flacourtiaceae	T	W
196	*Foeniculum vulgare Mill.*	Valiari	Apiaceae	H	W
197	*Glinus lotoides* L.	Mitho Okharad	Molluginaceae	H	W
198	*Gloriosa superba* L.	Kankasani	Liliaceae	Cl	W
199	*Gmelina arborea* L.	Sivan	Verbenaceae	T	W
200	*Gomphrena globosa* L.		Amaranthaceae	H	W
201	*Goniogyna hirta* (Willd.) Ali		Fabaceae	H	W
202	*Gossypium herbaceum* Var. acerifolium (Guill. & Perr.) Chevalier	Kapas, Desi Kapas	Malvaceae	S	D
203	*Grevillea robusta* Cunn.	Silver oak	Proteaceae	T	W
204	*Grewia subinequalis D.C.*	Phalsa	Tiliaceae	H	W
205	*Grewia tenax (*Forsk.) Fiori.	Nagbala, gangeti	Tiliaceae	S	W
206	*Guazuma ulmifolia* Lam.	Rudrakshi	Sterculiaceae	T	W
207	*Gymnema sylvestre* (Rretz.) Schult.	Madhunasini	Asclepiadaceae	Cl	W
208	*Helicteres isora* L.	Maradsing, Atedi, Kon, Matota fali	Sterculiaceae	T	W
209	*Heliotropium indicum* L.	Hathi sundho	Boraginaceae	H	W
210	*Heliotropium subulatum* Hochst.	Pilo hathisundho	Boraginaceae	H	W
211	*Hemidesmus indicus* (L.) R.	Dudh vel, dudhli	Periplocaceae	Cl	W

212	*Hibiscus caesius* Garcke.		Malvaceae	H	W
213	*Hibiscus hirtus* L.	Baporis	Malvaceae	H	W
214	*Hibiscus ovalifolius* (Forsk.) Vahl	Chanak bhindo	Malvaceae	H	W
215	*Hibiscus rosa-sinensis* L.	Jasud	Malvaceae	H	D
216	*Hibiscus vitifolius* L.	Van bhindo	Malvaceae	H	W
217	*Holarrhena antidysenterica* (Roth.) A. DC.	Kaludado, Kuda	Apocynaceae	T	W
218	*Holoptelea integrifolia* (Roxb.) Planch.	Kanjo, Papda	Ulmaceae	T	W
219	*Holostemma annularium* (Roxb.) K.	Khir dodi	Asclepiadaceae	Cl	W
220	*Hybanthus enneaspermus* (L.) F.		Violaceae	H	W
221	*Hydrilla verticillata* (L.f.) Royle		Hydrocharitaceae	H	W
222	*Hygrophila auriculata* (Schum.) Heine	Kantashelio, Akaro, Akharo, Talimkhana	Acanthaceae	Us	W
223	*Impatiens balsamina* L.	Takmaria, gulmendi	Balsaminaceae	H	W
224	*Indigofera cordifolia* Heyne ex Roth		Fabaceae	H	W
225	*Indigofera linnaei* Ali.	Fatakiya, bhonygal	Fabaceae	H	W
226	*Ipomoea aquatica* Forsk.	Narivel	Convolvulaceae	H	W
227	*Ipomoea biloba* Forsk.	Samudraphen	Convolvulaceae	Cl	W
228	*Ipomoea fistulosa* Mart. Ex Choisy	Akari, Nafatvel, Besharmi	Convolvulaceae	S	W
229	*Ipomoea palmata* Forsk.	Narvel	Convolvulaceae	Cl	W
230	*Ipomoea pes-tigridis* L.	Photial, wagpadi	Convolvulaceae	Cl	W
231	*Ipomoea quamoclit* L.	Ganesh vel	Convolvulaceae	Cl	W
232	*Ixora coccinea* L.		Rubiaceae	H	W
233	*Jasminum flexile* Vahl.	Jui	Oleaceae	Cl	D
234	*Jatropha curcas* L.	Ratanjyot	Euphorbiaceae	S	W
235	*Justicia procumbens* L.	Pittpapdo	Acanthaceae	H	W
236	*Justicia simplex* D.		Acanthaceae	H	W
237	*Kickxia ramossisima* (Wall.) Janch.	Bhini ghilodi, Bhini chat	Scrophulariaceae	H	W
238	*Kigelia pinnata* (Jacq.) DC.	Topgola	Bignoniaceae	T	W
239	*Kirganelia reticulata* (Poir.) Baill.		Euphorbiaceae	T	W
240	*Lannea coromandelica* (Houtt.) Herrill	Madhol, Modhad, Miniyo, Moyno	Anacardiaceae	T	W
241	*Lantana camara* L.	Dano	Verbenaceae	S	D
242	*Launaea procumbens* (Roxb.) Ram. & Raj.	Moti bhonpatri, Galjibhi	Asteraceae	H	W
243	*Lawsonia inermis* L.	Mehndi	Lythraceae	S	W
244	*Leea indica* (Burm.f) Merrill.	Hathani	Leeaceae	H	W
245	*Leonotis nepetifolia* (L.) R.		Lamiaceae	H	W
246	*Lepidagathis trinervis* Wall.	Harancharo, Paniru	Acanthaceae	H	W
247	*Leptadenia reticulata* (Retz.) W. & A.	Dodi, Khirdodi, Nani Dodi	Asclepiadaceae	Tw	W

248	*Leucas cephalotes* (Roxb.ex Roth) Spr.	Khetarau, kubo	Lamiaceae	H	W
249	*Limonia acidissima* L.	Kotha	Rutaceae	T	W
250	*Lindenbergia muraria* (Rox.ex.D.Don) P.	Zamarval	Scrophulariaceae	H	W
251	*Lindernia ciliata* (Coism.) Pennell.		Scrophulariaceae	H	W
252	*Lindernia oppositifolia* (R.) Mukerje.		Scrophulariaceae	H	W
253	*Ludwigia octovalvis* (Mich.) Raven.	Panlavang	Onagraceae	H	W
254	*Luffa cylindrica* (L.) M.	Ghee-turai, galku	Cucurbitaceae	Cl	D
255	*Luffa echinata* Roxb.		Cucurbitaceae	Cl	W
256	*Lycopersicon lycopersicum* (L.) Karst.	Tamata, tamatu	Solanaceae	H	D
257	*Madhuca indica* J.f. Gmelin.	Mahudo	Sapotaceae	T	W
258	*Maerua oblongifolia* (For.) A.	Hemkand	Capparaceae	H	W
259	*Mangifera indica* L.	Aambo, Keri, Aam	Anacardiaceae	T	D
260	*Manilkara hexandra* (Roxb.) Dubard.	Rayan	Sapotaceae	T	W
261	*Manilkara zapota* (L.) Van.	Chikoo	Sapotaceae	T	D
262	*Martynia annua*L.	Vinchhudo	Martyniaceae	H	W
263	*Maytenus emarginata* (Willd.) D. Hou	Vico, Vikdo, Vingo	Celastraceae	T	W
264	*Medicago sativa* L.	Lachko, Rajko	Fabaceae	H	D
265	*Melia azedarach* L.	Bakanlimdo	Meliaceae	T	W
266	*Melilotus alba* Lam.	Jangali methi	Fabaceae	H	W
267	*Merremia gangetica* (L.) Cufod.	Undardi, Undarkani	Convolvulaceae	H	W
268	*Miliusa tomentosa* (Roxb.) Sinclair	Humkumbh, Unbiya	Annonaceae	T	W
269	*Millingtonia hortensis* L.	Deshi buch	Bignoniaceae	T	W
270	*Mimosa hamata* Willd.	Kasi, kaibaval	Mimosaceae	S	W
271	*Mimosa pudica* L.	Lajamani	Mimosaceae	H	W
272	*Mimusops elengi* L.	Borsali	Sapotaceae	T	W
273	*Mirabilis jalapa* L.	Gulbas	Nyctaginaceae	H	W
274	*Mitragyna parviflora* (Roxb.) Korth.	Kabda, Kadamb	Rubiaceae	T	W
275	*Mollugo pentaphylla* L.		Molluginaceae	H	W
276	*Momordica charantia* L.	Karela, kareli	Cucurbitaceae	Cl	W
277	*Momordica dioica* Roxb.	Kankoda, kantola	Cucurbitaceae	Cl	W
278	*Morinda tomentosa* Heyne ex Roth	Aledi, Aal	Rubiaceae	T	W
279	*Moringa oleifera* Lam.	Saragvo	Moringaceae	T	D
280	*Morus alba* L.	Shetur	Moraceae	T	W
281	*Mucuna prurita* Hk.f.	Kaucha	Fabaceae	Tw	D
282	*Mukia maderaspatana* (L.) M.	Chanak chibhdi	Cucurbitaceae	Cl	W
283	*Murraya koenigii* (L.) Spreng.	Kadipatta	Rutaceae	T	D
284	*Murraya peniculata* (L.) Jack.	Kamini	Rutaceae	S	W

285	*Musa paradisiaca* L.	Kelu, kela	Musaceae	H	D
286	*Nerium indicum* Mill.	Lal karen	Apocynaceae	S	W
287	*Neuracanthus sphaerostachyus* Dalz.	Ganthera	Acanthaceae	H	W
288	*Nothosaerva brachiata* (L.) Wt.		Amaranthaceae	H	W
289	*Nyctanthes arbortristis* L.	Parijatak, Harisingar	Oleaceae	T	D
290	*Nymphaea pubescens* Willd.	Poynu, kumudini	Nymphaeaceae	H	W
291	*Ocimum americanum* L.	Bapchi, Tukmariya	Lamiaceae	H	W
292	*Ocimum basilicum* L.	Damro, Maruo	Lamiaceae	H	W
293	*Ocimum sanctum* L.	Tulsi	Lamiaceae	H	D
294	*Oldenlandia corymbosa* L.	Parpat, Parpapti	Rubiaceae	H	W
295	*Opuntia elatior* Mill.	Fafda thor, Nagfani	Cactaceae	S	W
296	*Oroxylum indicum* (L.) Vent.	Farri	Bignoniaceae	T	W
297	*Oryza sativa* L.	Chokha	Poaceae	H	D
298	*Ottelia alismoides* (L.) Pers.		Hydrocharitaceae	H	W
299	*Oxalis corniculata* L.	Changeri, Navari	Oxalidaceae	H	W
300	*Pancratium triflorum* Roxb.		Amaryllidaceae	H	W
301	*Parkinsonia aculeata* L.	Ram baval	Caesalpiniaceae	T	W
302	*Passiflora foetida* L.		Passifloraceae	Cl	W
303	*Pavetta crassicaulis* Bremek.	Papat	Rubiaceae	T	W
304	*Pedalium murex* L.	Ubhu gokharu	Pedaliaceae	H	W
305	*Pedilanthus tithymaloides* Poit	Vilayti kharsani	Euphorbiaceae	H	W
306	*Peltophorum pterocarpum* (DC.) Backer.	Tamrafali	Caesalpiniaceae	T	W
307	*Pennisetum typhoides* (Burm.f.) Stapf & Hubb.	Bajri	Poaceae	G	D
308	*Pentatropis spiralis* (Forsk.) Decne.	Dhodha, Shingroti	Asclepiadaceae	Tw	W
309	*Pergularia daemia* (Forsk.) Chiov.	Chamardudheli, Dudhela	Asclepiadaceae	Tw	W
310	*Peristrophe paniculata* (Forsk.) Burm.	Adhedi, Kali anghedi	Acanthaceae	H	W
311	*Phoenix sylvestris* (L.) Roxb.	Khajuri	Arecaceae	T	D
312	*Phyla nodiflora* (L.) Greene		Verbenaceae	H	W
313	*Phyllanthus fraternus* Webst.	Bhonyamli	Euphorbiaceae	H	W
314	*Physalis minima* L.	Popti, Parpopti	Solanaceae	H	W
315	*Pimpinella tomentosa* Dalz.	Jangali jiru	Apiaceae	H	W
316	*Pithecellobium dulce* (Roxb.) Bth.	Goras amli	Mimosaceae	T	W
317	*Plumbago zelanica* L.	Chitrak	Plumbaginaceae	H	W
318	*Plumeria rubra* L.	Champo	Apocynaceae	T	D
319	*Polyalthia longifolia* (Sonn.) Thw.	Asopalav	Annonaceae	T	D

320	*Polycarpaea corymbosa* (L.) Lam.	Jangli soa, Rupa puli	Caryophyllaceae	H	W
321	*Polygala chinensis* L.	Pili bhonysal	Polygalaceae	H	W
322	*Polygala erioptera* DC.	Patsan, Bhonysan	Polygalaceae	H	W
323	*Polygonum barbatum* L.		Polygonaceae	H	W
324	*Polygonum glabrum* Willd.		Polygonaceae	H	W
325	*Polygonum plebeium* R.		Polygonaceae	H	W
326	*Portulaca grandiflora* Hk.		Portulacaceae	H	D
327	*Portulaca olearacea* L.	Motiluni	Portulacaceae	H	W
328	*Portulaca quadrifida* L.		Portulacaceae	H	W
329	*Prosopis cineraria* (L.) Druce.	Khijado, shami	Mimosaceae	T	W
330	*Prosopis juliflora*	Gando baval, Kajado	Mimosaceae	S	W
331	*Psidium guajava* L.	Jamphal	Myrtaceae	T	D
332	*Pterospermum acerifolium* Will.	Muchkund	Sterculiaceae	T	W
333	*Punica granatum* L.	Dadam	Punicaceae	S	D
334	*Pupalia lappacea* (L.) Juss.	Bhurat, Gadar bhurat	Amaranthaceae	Us	W
335	*Quisqualis indica* L.	Madhu malti	Combretaceae	Cl	W
336	*Raphanus sativus* L.	Mulo	Brassicaceae	H	D
337	*Rhynchosia minima* Var.minima (L.) DC.	Nahnikamalvel	Fabaceae	H	W
338	*Ricinus communis* L.	Diveli, Erandi	Euphorbiaceae	S	D
339	*Ruellia tuberosa* L.	Bandhukadi	Acanthaceae	H	W
340	*Rungia repens* (L.) Nees.		Acanthaceae	H	W
341	*Saccharum officinarum* L.	Shardi, ganna	Poaceae	H	D
342	*Salvadora oleoides* Decne.	Piludi	Salvadoraceae	T	W
343	*Salvadora persica* L.	Pilvo, piludi	Salvadoraceae	T	W
344	*Santalum album* L.	Chandan	Santalaceae	T	D
345	*Sapindus emarginatus* Vahl.	Aritha	Sapindaceae	T	W
346	*Schrebera swietenioides* Roxb.	Mokha	Oleaceae	T	W
347	*Scirpus articulatus* L.		Cyperaceae	H	W
348	*Sclerocarpus africanuus* L.		Asteraceae	H	W
349	*Sesamum indicum* L.	Tal	Pedaliaceae	H	W
350	*Sesbania sesban* (L.) Merr.	Shevari, jayanti	Fabaceae	S	W
351	*Setaria glauca* (L.) P. Beauv.	Kunchi	Poaceae	G	W
352	*Sida acuta* Burm.	Bala	Malvaceae	H	W
353	*Sida cordifolia* L.	Bala, Baldana, Kharenti	Malvaceae	Us	W
354	*Sida retusa* L.		Malvaceae	H	W
355	*Solanum indicum* L.	Ubhi ringni	Solanaceae	H	W
356	*Solanum nigrum* L.	Piludi	Solanaceae	H	W
357	*Solanum surattense* Burm.	Bhoringni	Solanaceae	H	w
358	*Sonchus asper* Hill.	Son chudi	Asteraceae	H	W
359	*Sorghum bicolor* (L.) Moench.	Jowar, jar	Poaceae	H	D

360	*Sorghum halepense* (L.) Pers.	Baru, Barua	Poaceae	G	W
361	*Soymida febrifuga* (Roxb.) A.	Rohan, royan	Meliaceae	T	W
362	*Spergula arvensis* L.		Caryophyllaceae	H	W
363	*Sphaeranthus indicus* L.	Gorakh mundi	Asteraceae	H	W
364	*Spilanthes calava* DC.	Akkalgaro	Asteraceae	H	W
365	*Sterculia urens* Roxb.	Kadaya, Kadua	Sterculiaceae	T	W
366	*Striga asiatica* L.	Agiyo	Scrophulariaceae	parasite herb	W
367	*Syzygium cumini* (L.) Skeels	Jambu	Myrtaceae	T	D
368	*Syzygium heyneanum* Wall.	Jambu	Myrtaceae	T	W
369	*Tamarindus indica* L.	Amli	Caesalpiniaceae	T	W
370	*Tecoma stans* (L.) H. B. & K.	Tilottama	Bignoniaceae	T	D
371	*Tecomella undulata* (Sm.) Seem.	Ragat rohido	Bignoniaceae	T	W
372	*Tectona grandis* L.f.	Sag	Verbenaceae	T	D
373	*Tephrosia purpurea* (L.) Pers.	Sarpankho	Fabaceae	Us	W
374	*Tephrosia strigosa* (Delz.) Sant.		Fabaceae	H	W
375	*Tephrosia vilosa* (L.) Pers.		Fabaceae	H	W
376	*Terminalia bellerica* (Gaertn.) Roxb.	Baheda	Combretaceae	T	W
377	*Terminalia catappa* L.	Desi badam	Combretaceae	T	W
378	*Terminalia chebula* Retz.	Harde, hirda	Combretaceae	T	W
379	*Terminalia crenulata* Roth	Hadad, Sadad	Combretaceae	T	W
380	*Thespesia populnea* (L.) Soland.	Paras piplo	Malvaceae	T	W
381	*Thevetia peruviana* (Pers.) Merr.	Pili Karen, Kaniyar	Apocynaceae	S	W
382	*Tinospora cordifolia* (Willd.) Miers	Nimgiloy, Amarvel, Gadu, Galo	Menispermaceae	Tw	W
383	*Trianthema portulacastrum* L.	Satodo	Aizoaceae	H	W
384	*Tribulus terrestris* L.	Bethu gokhru, Akanti	Zygophyllaceae	H	W
385	*Trichodesma indicum* (L.) R.	Undha fuli	Boraginaceae	H	W
386	*Trichosanthes cucumerina* L.	Jangali parval	Cucurbitaceae	Cl	W
387	*Tridax procumbens* L.	Pardesi bhangaro	Asteraceae	H	W
388	*Trigonella foenum-graecum* L.	Methi	Fabaceae	H	D
389	*Triticum aestivum* L.	Gahun	Poaceae	G	D
390	*Triumfetta pentandra* A.	Zipti	Tiliaceae	H	W
391	*Triumfetta rhomboidea* Jacq.	Bhurati, Japati	Tiliaceae	Us	w
392	*Tylophora indica* (Burm.f.) Merril	Damni vel	Asclepiadaceae	Cl	W
393	*Typha angustata* Bory.	Ghabajariu	Typhaceae	H	W

394	*Uraria picta* Desv.	Pilosamervo	Fabaceae	H	W
395	*Urginea indica* (Roxb.) Kunth.	Jangli dungli	Liliaceae	H	W
396	*Verbascum chinense* (L.) Sant.	Kalhar, Kutki	Scrophulariaceae	H	W
397	*Vernonia cinerea* (L.) Less.	Sahadevi, Sadedi	Asteraceae	H	W
398	*Vicoa indica* (L.) DC.	Sonasali	Asteraceae	H	W
399	*Vitex nigundo* L.	Nagod	Verbenaceae	T	D
400	*Vitis vinifera* L.	Draksh	Vitaceae	Cl	D
401	*Waltheria indica* L.		Sterculiaceae	H	W
402	*Withania somnifera* (L.) Dunal.	Ghodasn, ghodakun	Solanaceae	H	W
403	*Woodfordia fruticosa* (L.) Kurz.		Lythraceae	H	W
404	*Wrightia tinctoria* (Roxb.) R. Br.	Dudhkudi, Dudhi	Apocynaceae	T	W
405	*Wrightia tomentosa* R.	Dudhlo	Apocynaceae	T	W
406	*Xanthium strumarium* L.	Bada gokharu	Asteraceae	H	W
407	*Zea mays* L.	Makai	Poaceae	H	D
408	*Zizyphus mauritiana* Lam.	Bor, Ber	Rhamnaceae	T	W
409	*Zizyphus xylopyra* (Retz,) Willd.	Ghotbor	Rhamnaceae	S	W
410	*Zornia gibbosa* Span.	Samarapani	Fabaceae	H	W
*:Cl: climber; G: grass; H: herb; S: shrub; T: tree; Tw: twiner; Us: under shrub #: d: domestic species; w: wild species					

4.4 Fauna:

The forest supports a diversity of different fauna species including insects, reptiles, birds, mammals, etc.

Non-Chordate Fauna

Due to time and resource constraints, no detailed work was done on the non-chordate fauna group like, Phyllum-Protozoa, Porifera, Coelenterata, Helminthes, and Annelida. Few species of Phyllum Annelida seen in the fresh water body was the fresh water leech *Hirudinaria sp.* This affects animal skin when they go to the water body for drinking and bathing. Earthworms were also seen in the dense parts of forest. The Banaskantha forest division has raised many beds for wormy compost development using such earthworms (photo).

From the Acaridea group, Red velvet mite *(Mutella occidentolis)* a symbol of monsoon was seen. This mite is not parasitic and is not harmful. Their population is decreasing due to unimpeded use of chemicals in agriculture.

Some species reported which belong to the Phyllum Arthropoda like, a fresh water Crab (*Paratelphusa sp.*); among spiders *Argiope arecuata* (photo) and *Crosspriza lyoni* were seen commonly. The detail study on spider is very essential as spiders are very good ecological indicators and biological pest-controller too.

The insect diversity is very rich in Jessore and other forest areas of the district. Some of them which were observed in field are:

Danaid Eggfly

Various Butterflies species exist in and around forest areas, helping in pollination. As the diversity and richness of butterfly species are decreasing in the area, it is very essential to work on creating butterfly nests and safe habitats in the forest areas. Some of them were reported in the field were Blue Tiger, Common Tiger, Common Gull, Common Three Ring, Common Evening Brown, Danaid Eggfly, Yellow Pansy, Painted Lady, Common Grass Yellow, etc.

Dragonflies and Damselflies are very important indicators for water availability and water quality, also reported from the river bed behind the Balaram Temple were, Scarlet Marsh Hawk, Black-Ground-Skimmer, Ruddy Marsh Skimmer, etc.

Apis dorsata (Rock Bee), making its hives in limb of gigantic trees and at the over-hangs of rocks (honey of these bees used in countless ayurvedic formulations). Its population is decreasing due to heavy disturbances like, phenological changes (flowering season irregular), fumes of burning plastics in adjoining villages, etc. This affects pollination and results in declining forest. Due to the decreasing population of Bees, the formations of Bee Hives are also declining and adversely affect the honey production and honey & wax economy.

Table 28: Non-Chordate fauna of Jessore region

Sr	Scientific name	Common name	Order
1	*Poecilocerus pictus*	Common Painted Grasshopper	Orthoptera
2	*Teratodes monticollis*	Hooded Grasshopper	Orthoptera

3	*Gryllodes domesticus*	House Cricket	Orthoptera
4	*Acheta domestica*	Black Field Cricket	Orthoptera
5	-	Termite	Neuroptera
6	*Apis dorsata*	Rock Bee	Hymenoptera
7	*Apis indica*	Indian Bee	Hymenoptera
8	*Holcomyrmex scabriceps*	Granary Ant	Hymenoptera
9	*Dinoderus* sp.	Common Bamboo-borer	Coleoptera
10	*Luciola* sp.	Fire-fly	Coleoptera
11	*Diplacodes lefebvrei*	Black Ground Skimmer	Anisoptera
12	*Orthetrum triangulare*	Blue tailed Forest Hawk	Anisoptera
13	*Aethriamanta brevipennis*	Scarlet Marsh Hawk	Anisoptera
14	*Crocothemis servilia*	Ruddy Marsh Skimmer	Anisoptera
15	*Argiope arcuata*	Speckled Band Four-leg spider	Araneae
16	*Crossopriza lyoni*	Box Long-leg Spider	Araneae
17	*Plexippus paykullii*	Zebra Jumper	Araneae
18	*Stegodyphus pacificus*	Social spider	Araneae
19	*Argiope arecuata*	Signature spider	Araneae
20	*Hyblaea puera*	Teak defoliator (Moth)	Lepidoptera
21	*Pyrausta machaeralis*	Teak Leaf Skeletonizer (Moth)	Lepidoptera
22	*Papilio polytes*	Common Mormon	Lepidoptera
23	*Pathysa nomius*	Spot Swordtail	Lepidoptera
24	*Princeps demoleus*	Lime Butterfly	Lepidoptera
25	*Anapheis aurota*	Pioneer	Lepidoptera
26	*Catopsilia pomona*	Common Emigrant	Lepidoptera
27	*Cepora nerissa*	Common Gull	Lepidoptera
28	*Eurema hecabe*	Common Grass Yellow	Lepidoptera
29	*Ixias pyrene*	Yellow Orange Tip	Lepidoptera
30	*Cynthia cardui*	Painted Lady	Lepidoptera
31	*Danaus chrysippus*	Plain Tiger	Lepidoptera
32	*Danaus gnutia*	Striped Tiger	Lepidoptera
33	*Euploea core*	Common Crow	Lepidoptera
34	*Hypolimnas misippus*	Danaid Eggfly	Lepidoptera
35	*Junonia hierta*	Yellow Pansy	Lepidoptera
36	*Junonia orithya*	Blue Pansy	Lepidoptera
37	*Melanitis leda*	Common Evening Brown	Lepidoptera
38	*Tirumala limniace*	Blue Tiger	Lepidoptera
39	*Ypthima ceylonica*	Common Four-ring	Lepidoptera

Chordate Fauna

No observations done on the Amphibian diversity in the field. Many Reptile species (Herpetofauna) are present in the forests but few species were seen in the field are, Common Garden Lizard, Starred Tortoise, Indian Chameleon (photo) and Common Skink.

Jessore Wildlife Sanctuary and other forest areas posses a variety of habitats like rivers, nallahs, dense forest, grassy patches, human habitations- agriculture zone amidst of forest, vertical cliffs, caves, rock

outcrops, water springs etc. As per the IUCN classification many rare and endangered species of birds are also found in this area. Forest areas are very rich in Avifauna diversity like, Common Babbler, Jungle Babbler, Small Green Bee-eater, Red-vented Bulbul, House Crow, Asian Koel, Black Drongo, Cattle Egret, Indian Pond Heron, Common Hoopoe, Indian Peafowl, Rock Pigeon, Red-wattled Lapwing, Indian Roller, House Sparrow, Common Myna, Rose-ringed Parakeet, Plum-headed Parakeet, Collared Dove, etc.

Scat of Sloth Bear

Among the Mammal group, Blue bull (*Boselaphus tragocamalus*), small Indian civet (*Viverricula indica*), jungle cat (*Felis chaus*), Indian Ratel (*Mellivora capensis*), Striped Hyena, Sloth Bear (*Melursus ursinus*) and Leopard (*Panthera pardus*) are present.

Scat of Hyena

Few indirect evidences were seen and reported from the field like, the pugmarks and scats of Sloth Bears on the whole track of 'Khata Amba Van Kedi', broken termite hives and scratches on tree barks by Sloth Bear. Sloth Bears are Termite eater and fruits of some plant species also favored by Sloth Bears as food are *Cassia fistula, Diospros melanoxylon, Ficus Glomerata, Mangifera indica, Syzigium cumini, Zyzypus jujuba, etc.* (Scat observations (photo) and Pers.com. Mr. Y L Varma, DCF Wildlife, Banaskantha FD).

Pugmark of Leopard in the river bed

Pugmark of Leopard was also seen in the river bed behind the Balaram Temple. Scats of Hyena were also observed in the track of the Khata Amba Van Kedi.

So in conclusion it can be said that the Jessore WLS, Balaram WLS and other forest areas are rich in biodiversity of flora and fauna species. But there are several problems, affecting the forest health.

4.5 Problems in forest areas:

The area of Balaram WLS is around 545 km^2 and 95 villages are situated in the Sanctuary while, area of Jessore WLS is about 180 km^2 and 18 villages existing in the Sanctuary. Hence, both the PAs are highly disturbed. Forests are facing many problems (maximum in Balaram WLS) like, Forest degradation and biotic loss, Drought, Decreasing water regime, Scarcity of surface water, Habitat alteration and loss, Fragmentation of forest cover, Over grazing, Degradation of grasslands, Weeds, invasive species, Encroachment, Increasing use of forest land in non-forestry works, Heavy anthropogenic pressure, Increasing Minings, Forest fire, Electrocution, Pollution, Road trampling, Human settelement inside PAs, Dispersed habitations, Changed agriculture trends, Overuse of Pesticides/ insecticides, Destructive harvesting of NTFPs from forests, Well without parapet walls in habitation areas around forests, Antipathy and the four lane national highway running through the WLS.

Large groups of nomadic pastoralists crossing (and grazing) the forest areas and their cattle and small ruminants add dung and droppings in the forests. This acts as good manure for the forest and increase the soil health. But the local villagers collect these litter-resources for their agriculture fields. And hence, forests get fodder loss, which is necessary for the small and big herbivores on one hand and also do not get any benefit (manure).

4.6 FRA and related issues:

Around 2500 individual cases have been approved under FRA (Pers. Communication, DCF Mr. Y L Varma) the major issues are hence similar to that described in Kawant. Many Rabaris came from outside and settled here after 1965; they have also filed cases for forest land. Many cases are fake, there are also others without proper proof, without proper '*punchnama*'. Several border issues are also in the queue. As the district Banaskantha shares its interstate border with Rajasthan, many cases are on the border buffer line. Authentication of such cases is very difficult. For such issues the Act is silent and there is no proper provision to resolve border issues. There are less numbers of cases claimed under FRA in comparison to Chhota Udepur forest division. Study on the cultivation practices and other forest based livelihoods is essential to understand how the ecological changes will come in the region due to the practice of agriculture done on forest lands under FRA. The overall scenario gives a clear picture that the forests of this zone are facing tremendous problems.

During the course of the study it was found that the local people are more or less aware about important medicinal and other miscellaneous uses of many plants. Besides, they also view trees as sources of fuel wood and fodder which often result in felling of certain important trees such as *Terminalia bellerica* (Behda), *Butea monosperma* (Khakhro), *Sterculia urens* (Kadaya), etc. While we have realized that in some members of communities there is lack of ecological consciousness, it is also equally important to acknowledge the role of poverty in making these communities over-dependent on the scarce forest resources. To preserve the rich biodiversity, especially the more threatened Wildlife Sanctuary, which is adjacent to the area, it is therefore essential to work on both aspects- **Conservation agenda** as well as **Livelihood enhancement** in the area.

5. Conclusion & Recommendation

Lack of basic data and basic understanding in community and supporting agencies on ecological aspects, succession, numerous eco-services of forests and inter-linkages among all natural resources.

Role of NGOs, academicians and other members of civel society in implementation of FRA:

Before granting rights, there is a need to check the potential of the resource and it should be related to sustainable management. The local NGOs can play a key role with the local communities and forest officials for asessing status of forest resource and nature of dependence of community on the resource. Granting of forest land as individual or community land is not only a social process but it is an ecological process too, where biodiversity resources are equally important for sustainable livelihoods of the forest dwelling communities. There is a need to create appropriate stake-holder forum for facilitating institutional development for sustainable use, management and development of the forest resource and converted agro-resources.

Ecorestoration & management:

Both the areas are having undulating terrain and these regions facing enormous pressures as a result of changes taking place like, direct drivers of environmental changes include climate change, changes in land use and land cover, and introduction (*Jetropha*) or removal of species; and indirect drivers include demographic, economic, and sociopolitical changes. Such changes have negative impacts on biodiversity conservation, ecosystem services, and the well-being of people living in both regions. Land-use, land cover, and climate change have already led to a contraction in species' range as well as extinctions. Only 10 to 15 percent tree layers are found on the boundary. In big chunk that much trees are not available on the boundaries.

The inventory and assessment of biodiversity resources and ecosystem dynamics have become essential for policy-making and management strategies as well as for developing and testing scientific hypotheses. Mapping of biodiversity and natural resource databases for both the areas need to be compiled and made available to the wider community in order to implement sustainable agro-forestry models scientifically as such terrain supports agro-forestry better than pure agriculture.

Invasive species mapping and their impact assessment is necessary for the management of wild and village biodiversity (uprooting can be strategically planned if needed). Jessore WLS and adjoining areas are having massive invasion by *Prosopis juliflora*.

Multi-storey ecorestoration is necessary in heavy degraded areas. Hafeshwar forests are highly degraded and facing massive soil erosion. *Agave* plantation can support to arrest the soil erosion along the water-lines and near back water (in Kotar) areas. Plantation and conservation of natural regeneration of trees and shrubs like, Taad, Mahuda, Neem, Charoli, etc. is highly recommended in forest areas as they are ecologically and economically very important.

Identification of a diversity of indigenous plant species appropriate to different ecological regimes, representing different successional stages, belonging to different growth forms and requiring different periods to start yielding useful produce, and providing manifold services.

Based on the current study the following strategies are recommended for conservation and management of MFPs in forest regions.

(1) There are no detailed studies done or no proper mechanism works in the areas, so that the local forest dwellers get proper benefits. It is very essential to establish a permanent base (MFP cooperative) in this region (like Samarthak Samiti in Southern Rajashan).

(2) Survey and documentation of MFP resource base.

(3) Socio-economic aspects of MFP

(4) Ecological changes in availability of MFPs in the wild areas

(5) Field based strategy development for significant MFPs production and so the local economy enhancement

(6) *Ex*-Situ and *in*-situ cultivation of important MFP.

(7) Standardization of cultivation practice of medicinal plants.

(8) Scientific collection, processing and value addition.

(9) Institutional financing and development of effective marketing infrastructure.

(10) Involvement of VFPMCs and other VBIs in collection, marketing and management.

(11) Research and protection of intellectual property rights.

(12) Enhanced investment for conservation, development and sustainable harvesting of MFP.

(13) GIS domain MFPs database and Mapping of distribution of important MFPs. Application of GIS in the preparation of management plans for Afforestation.

(14) Study to prepare an inventory of threatened, endangered and endemic species including fauna species.

(15) Creation of MFP museum and genebank at regional or district level: for conservation and awareness.

There are many possibilities of availing NREGA and Watershed developmet funds to support many of the component activities such as promotion and conservation of natural regeneration, raising seedlings in nurseries, undertaking ecological plantations (not mechanical) along with necessary soil and water conservation measures. Also it is important to do regular ecological audits to measure the progress of such activities. Hence, to understand the ecological health of the area, database of ecological indicators need to be prepared and regularly updated with local community participation.

Since the ecosystem is highly disturbed in Hafeshwar area, it is essential to develop Biodiversity hubs of different seasonal native species, which provide suitable habitat for different biological agents like, pollinators, pest-controllers, soil health improvers, recyclers, etc. (bees, birds, butterflies, beetles, etc.). Such biodiversity hubs can be created in forests, on the hedge of fields, near river beds, wastelands, forest periphery, etc.

People's Biodiversity Registers (PBR) could be a very effective tool of managing and regenerating biodiversity (See details in Annex: Biodiversity Act). (The Ashram Shala of AJJ organization in Kawant area and the Ecodevelopment Committee are ready and ideal instituitions for developing PBR).

Environment Education Programmes (EEP) could be an efficient tool for regular capacity building and awareness generation process. All the age groups, land use groups, communities and stake holders can be covered in holistic way for betterment and sustainability of the local agriculture, forestry and related all kinds of livelihoods (animal husbandry, fishing, MFP collection, etc.).

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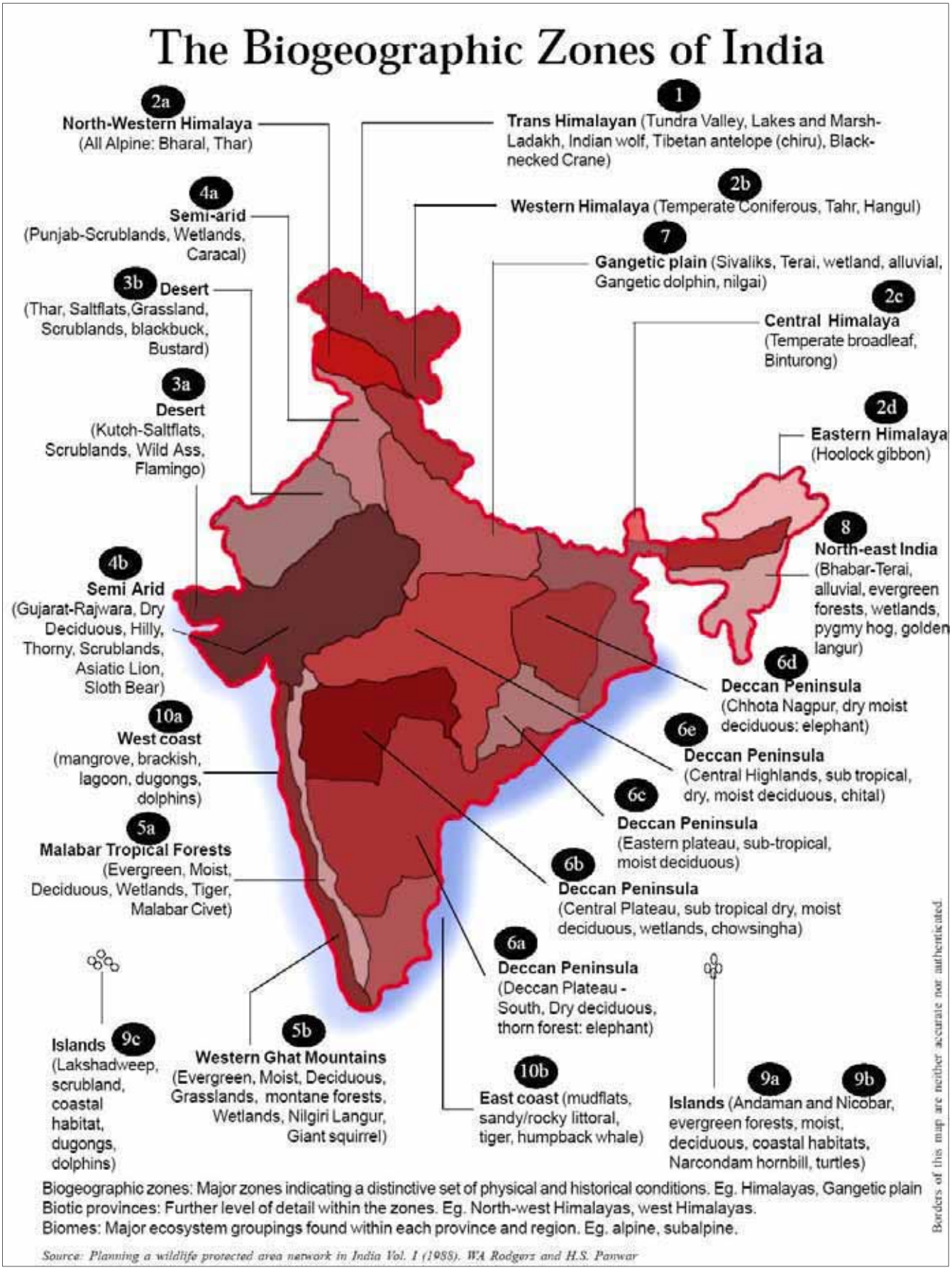
Annexure 1: Biogeographic Zones of India



Annexure 2

रजिस्ट्री सं० डी० एल०—(एन)04/0007/2006—08 REGISTERED NO. DL—(N)04/0007/2006—08

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इस भाग में भिन्न पृष्ठ संख्या दी जाती है जिससे कि यह अलग संकलन के रूप में रखा जा सके।
Separate paging is given to this Part in order that it may be filed as a separate compilation.

MINISTRY OF LAW AND JUSTICE

(Legislative Department)

New Delhi, the 2nd January, 2007/*Pausa* 12, 1928 (*Saka*)

The following Act of Parliament received the assent of the President on the 29th December, 2006, and is hereby published for general information:—

THE SCHEDULED TRIBES AND OTHER TRADITIONAL FOREST DWELLERS (RECOGNITION OF FOREST RIGHTS) ACT, 2006

No. 2 OF 2007

[29*th December,* 2006]

An Act to recognise and vest the forest rights and occupation in forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded; to provide for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land.

WHEREAS the recognised rights of the forest dwelling Scheduled Tribes and other traditional forest dwellers include the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance and thereby strengthening the conservation regime of the forests while ensuring livelihood and food security of the forest dwelling Scheduled Tribes and other traditional forest dwellers;

AND WHEREAS the forest rights on ancestral lands and their habitat were not adequately recognised in the consolidation of State forests during the colonial period as well as in independent India resulting in historical injustice to the forest dwelling Scheduled Tribes and other traditional forest dwellers who are integral to the very survival and sustainability of the forest ecosystem;

(*j*) "nodal agency" means the nodal agency specified in section 11;

(*k*) "notification" means a notification published in the Official Gazette;

(*l*) "prescribed" means prescribed by rules made under this Act;

(*m*) "Scheduled Areas" means the Scheduled Areas referred to in clause (*1*) of article 244 of the Constitution;

(*n*) "sustainable use" shall have the same meaning as assigned to it in clause (*o*) of section 2 of the Biological Diversity Act, 2002; 18 of 2003.

(*o*) "other traditional forest dweller" means any member or community who has for at least three generations prior to the 13th day of December, 2005 primarily resided in and who depend on the forest or forests land for *bona fide* livelihood needs.

Explanation.—For the purpose of this clause, "generation" means a period comprising of twenty-five years;

(*p*) "village" means—

(*i*) a village referred to in clause (*b*) of section 4 of the Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996; or 40 of 1996.

(*ii*) any area referred to as a village in any State law relating to Panchayats other than the Scheduled Areas; or

(*iii*) forest villages, old habitation or settlements and unsurveyed villages, whether notified as village or not; or

(*iv*) in the case of States where there are no Panchayats, the traditional village, by whatever name called;

(*q*) "wild animal" means any species of animal specified in Schedules I to IV of the Wild Life (Protection) Act, 1972 and found wild in nature. 53 of 1972.

CHAPTER II

FOREST RIGHTS

Forest rights of Forest dwelling Scheduled Tribes and other tradional forest dwellers.

3. (*1*) For the purposes of this Act, the following rights, which secure individual or community tenure or both, shall be the forest rights of forest dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands, namely:—

(*a*) right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers;

(*b*) community rights such as *nistar*, by whatever name called, including those used in erstwhile Princely States, Zamindari or such intermediary regimes;

(*c*) right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries;

(*d*) other community rights of uses or entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities;

(*e*) rights including community tenures of habitat and habitation for primitive tribal groups and pre-agricultural communities;

(*f*) rights in or over disputed lands under any nomenclature in any State where claims are disputed;

(*g*) rights for conversion of *Pattas* or leases or grants issued by any local authority or any State Government on forest lands to titles;

(*h*) rights of settlement and conversion of all forest villages, old habitation, unsurveyed villages and other villages in forests, whether recorded, notified or not into revenue villages;

(*i*) right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use;

(*j*) rights which are recognised under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribals under any traditional or customary law of the concerned tribes of any State;

(*k*) right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;

(*l*) any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers, as the case may be, which are not mentioned in clauses (*a*) to (*k*) but excluding the traditional right of hunting or trapping or extracting a part of the body of any species of wild animal;

(*m*) right to *in situ* rehabilitation including alternative land in cases where the Scheduled Tribes and other traditional forest dwellers have been illegally evicted or displaced from forest land of any description without receiving their legal entitlement to rehabilitation prior to the 13th day of December, 2005.

(*2*) Notwithstanding anything contained in the Forest (Conservation) Act, 1980, the Central Government shall provide for diversion of forest land for the following facilities managed by the Government which involve felling of trees not exceeding seventy-five trees per hectare, nemely:— 69 of 1980.

(*a*) schools;

(*b*) dispensary or hospital;

(*c*) *anganwadis*;

(*d*) fair price shops;

(*e*) electric and telecommunication lines;

(*f*) tanks and other minor water bodies;

(*g*) drinking water supply and water pipelines;

(*h*) water or rain water harvesting structures;

(*i*) minor irrigation canals;

(*j*) non-conventional source of energy;

(*k*) skill upgradation or vocational training centres;

(*l*) roads; and

(*m*) community centres:

Provided that such diversion of forest land shall be allowed only if,—

(*i*) the forest land to be diverted for the purposes mentioned in this sub-section is less than one hectare in each case; and

(*ii*) the clearance of such developmental projects shall be subject to the condition that the same is recommended by the Gram Sabha.

CHAPTER III

RECOGNITION, RESTORATION AND VESTING OF FOREST RIGHTS AND RELATED MATTERS

Recognition of, and vesting of, forest rights in forest dwelling Scheduled Tribes and other traditional forest dwellers.

4. *(1)* Notwithstanding anything contained in any other law for the time being in force, and subject to the provisions of this Act, the Central Government hereby recognises and vests forest rights in—

(a) the forest dwelling Scheduled Tribes in States or areas in States where they are declared as Scheduled Tribes in respect of all forest rights mentioned in section 3;

(b) the other traditional forest dwellers in respect of all forest rights mentioned in section 3.

(2) The forest rights recognised under this Act in critical wildlife habitats of National Parks and Sanctuaries may subsequently be modified or resettled, provided that no forest rights holders shall be resettled or have their rights in any manner affected for the purposes of creating inviolate areas for wildlife conservation except in case all the following conditions are satisfied, namely:—

(a) the process of recognition and vesting of rights as specified in section 6 is complete in all the areas under consideration;

(b) it has been established by the concerned agencies of the State Government, in exercise of their powers under the Wild Life (Protection) Act, 1972 that the activities or impact of the presence of holders of rights upon wild animals is sufficient to cause irreversible damage and threaten the existence of said species and their habitat; 53 of 1972.

(c) the State Government has concluded that other reasonable options, such as, co-existence are not available;

(d) a resettlement or alternatives package has been prepared and communicated that provides a secure livelihood for the affected individuals and communities and fulfils the requirements of such affected individuals and communities given in the relevant laws and the policy of the Central Government;

(e) the free informed consent of the Gram Sabhas in the areas concerned to the proposed resettlement and to the package has been obtained in writing;

(f) no resettlement shall take place until facilities and land allocation at the resettlement location are complete as per the promised package:

Provided that the critical wildlife habitats from which rights holders are thus relocated for purposes of wildlife conservation shall not be subsequently diverted by the State Government or the Central Government or any other entity for other uses.

(3) The recognition and vesting of forest rights under this Act to the forest dwelling Scheduled Tribes and to other traditional forest dwellers in relation to any State or Union territory in respect of forest land and their habitat shall be subject to the condition that such Scheduled Tribes or tribal communities or other traditional forest dwellers had occupied forest land before the 13th day of December, 2005.

(4) A right conferred by sub-section *(1)* shall be heritable but not alienable or transferable and shall be registered jointly in the name of both the spouses in case of married persons and in the name of the single head in the case of a household headed by a single person and in the absence of a direct heir, the heritable right shall pass on to the next-of-kin.

(5) Save as otherwise provided, no member of a forest dwelling Scheduled Tribe or other traditional forest dweller shall be evicted or removed from forest land under his occupation till the recognition and verification procedure is complete.

(*6*) Where the forest rights recognised and vested by sub-section *(1)* are in respect of land mentioned in clause *(a)* of sub-section *(1)* of section 3 such land shall be under the occupation of an individual or family or community on the date of commencement of this Act and shall be restricted to the area under actual occupation and shall in no case exceed an area of four hectares.

(7) The forest rights shall be conferred free of all encumbrances and procedural requirements, including clearance under the Forest (Conservation) Act, 1980, requirement of paying the 'net present value' and 'compensatory afforestation' for diversion of forest land, except those specified in this Act. 69 of 1980

(8) The forest rights recognised and vested under this Act shall include the right of land to forest dwelling Scheduled Tribes and other traditional forest dwellers who can establish that they were displaced from their dwelling and cultivation without land compensation due to State development interventions, and where the land has not been used for the purpose for which it was acquired within five years of the said acquisition.

Duties of holders of forest rights.

5. The holders of any forest right, Gram Sabha and village level institutions in areas where there are holders of any forest right under this Act are empowered to—

(a) protect the wild life, forest and biodiversity;

(b) ensure that adjoining catchments area, water sources and other ecological sensitive areas are adequately protected;

(c) ensure that the habitat of forest dwelling Scheduled Tribes and other traditional forest dwellers is preserved from any form of destructive practices affecting their cultural and natural heritage;

(d) ensure that the decisions taken in the Gram Sabha to regulate access to community forest resources and stop any activity which adversely affects the wild animals, forest and the biodiversity are complied with.

CHAPTER IV

AUTHORITIES AND PROCEDURE FOR VESTING OF FOREST RIGHTS

Authorities to vest forest rights in forest dwelling Scheduled Tribes and other traditional forest dwellers and procedure thereof.

6. *(1)* The Gram Sabha shall be the authority to initiate the process for determining the nature and extent of individual or community forest rights or both that may be given to the forest dwelling Scheduled Tribes and other traditional forest dwellers within the local limits of its jurisdiction under this Act by receiving claims, consolidating and verifying them and preparing a map delineating the area of each recommended claim in such manner as may be prescribed for exercise of such rights and the Gram Sabha shall, then, pass a resolution to that effect and thereafter forward a copy of the same to the Sub-Divisional Level Committee.

(2) Any person aggrieved by the resolution of the Gram Sabha may prefer a petition to the Sub-Divisional Level Committee constituted under sub-section (*3*) and the Sub-Divisional Level Committee shall consider and dispose of such petition:

Provided that every such petition shall be preferred within sixty days from the date of passing of the resolution by the Gram Sabha:

Provided further that no such petition shall be disposed of against the aggrieved person, unless he has been given a reasonable opportunity to present his case.

(3) The State Government shall constitute a Sub-Divisional Level Committee to examine the resolution passed by the Gram Sabha and prepare the record of forest rights and forward it through the Sub-Divisional Officer to the District Level Committee for a final decision.

(4) Any person aggrieved by the decision of the Sub-Divisional Level Committee may prefer a petition to the District Level Committee within sixty days from the date of decision of the Sub-Divisional Level Committee and the District Level Committee shall consider and dispose of such petition:

Provided that no petition shall be preferred directly before the District Level Committee against the resolution of the Gram Sabha unless the same has been preferred before and considered by the Sub-Divisional Level Committee:

Provided further that no such petition shall be disposed of against the aggrieved person, unless he has been given a reasonable opportunity to present his case.

(5) The State Government shall constitute a District Level Committee to consider and finally approve the record of forest rights prepared by the Sub-Divisional Level Committee.

(6) The decision of the District Level Committee on the record of forest rights shall be final and binding.

(7) The State Government shall constitute a State Level Monitoring Committee to monitor the process of recognition and vesting of forest rights and to submit to the nodal agency such returns and reports as may be called for by that agency.

(8) The Sub-Divisional Level Committee, the District Level Committee and the State Level Monitoring Committee shall consist of officers of the departments of Revenue, Forest and Tribal Affairs of the State Government and three members of the Panchayati Raj Institutions at the appropriate level, appointed by the respective Panchayati Raj Institutions, of whom two shall be the Scheduled Tribe members and at least one shall be a woman, as may be prescribed.

(9) The composition and functions of the Sub-Divisional Level Committee, the District Level Committee and the State Level Monitoring Committee and the procedure to be followed by them in the discharge of their functions shall be such as may be prescribed.

CHAPTER V

OFFENCES AND PENALTIES

Offences by members or officers of authorities and Committees under this Act.

7. Where any authority or Committee or officer or member of such authority or Committee contravenes any provision of this Act or any rule made thereunder concerning recognition of forest rights, it, or they, shall be deemed to be guilty of an offence under this Act and shall be liable to be proceeded against and punished with fine which may extend to one thousand rupees:

Provided that nothing contained in this sub-section shall render any member of the authority or Committee or head of the department or any person referred to in this section liable to any punishment if he proves that the offence was committed without his knowledge or that he had exercised all due diligence to prevent the commission of such offence.

Cognizance of offences.

8. No court shall take cognizance of any offence under section 7 unless any forest dwelling Scheduled Tribe in case of a dispute relating to a resolution of a Gram Sabha or the Gram Sabha through a resolution against any higher authority gives a notice of not less than sixty days to the State Level Monitoring Committee and the State Level Monitoring Committee has not proceeded against such authority.

CHAPTER VI

MISCELLANEOUS

Members of authorities, etc., to be public servants.

9. Every member of the authorities referred to in Chapter IV and every other officer exercising any of the powers conferred by or under this Act shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code. 45 of 1860.

Protection of action taken in good faith.

10. *(1)* No suit, prosecution or other legal proceeding shall lie against any officer or other employee of the Central Government or the State Government for anything which is in good faith done or intended to be done by or under this Act.

(2) No suit or other legal proceeding shall lie against the Central Government or the State Government or any of its officers or other employees for any damage caused or likely to be caused by anything which is in good faith done or intended to be done under this Act.

(3) No suit or other legal proceeding shall lie against any authority as referred to in Chapter IV including its Chairperson, members, member-secretary, officers and other employees for anything which is in good faith done or intended to be done under this Act.

Nodal agency.

11. The Ministry of the Central Government dealing with Tribal Affairs or any officer or authority authorised by the Central Government in this behalf shall be the nodal agency for the implementation of the provisions of this Act.

Power of Central Government to issue directions.

12. In the performance of its duties and exercise of its powers by or under this Act, every authority referred to in Chapter IV shall be subject to such general or special directions, as the Central Government may, from time to time, give in writing.

Act not in derogation of any other law.

13. Save as otherwise provided in this Act and the Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996, the provisions of this Act shall be in addition to and not in derogation of the provisions of any other law for the time being in force. 40 of 1996.

Power to make rules.

14. *(1)* The Central Government may, by notification, and subject to the condition of previous publication, make rules for carrying out the provisions of this Act.

(2) In particular, and without prejudice to the generality of the foregoing powers, such rules may provide for all or any of the following matters, namely:—

(a) procedural details for implementation of the procedure specified in section 6;

(b) the procedure for receiving claims, consolidating and verifying them and preparing a map delineating the area of each recommended claim for exercise of forest rights under sub-section *(1)* of section 6 and the manner of preferring a petition to the Sub-Divisional Committee under sub-section *(2)* of that section;

(c) the level of officers of the departments of Revenue, Forest and Tribal Affairs of the State Government to be appointed as members of the Sub-Divisional Level Committee, the District Level Committee and the State Level Monitoring Committee under sub-section *(8)* of section 6;

(d) the composition and functions of the Sub-Divisional Level Committee, the District Level Committee and the State Level Monitoring Committee and the procedure to be followed by them in the discharge of their functions under sub-section *(9)* of section 6;

(e) any other matter which is required to be, or may be, prescribed.

(3) Every rule made by the Central Government under this Act shall be laid, as soon as may be after it is made, before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive

sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule.

K. N. CHATURVEDI,
Secy. to the Govt. of India.

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