



**Central India Ecoregional Biodiversity Strategy & Action Plan  
(Vidarbha & Bastar )**

**PREPARED UNDER  
THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN - INDIA**



**Coordinating Agency  
Vidarbha Nature Conservation Society  
Tidke Ashram, Ganeshpeth, Nagpur 440 010**

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**Biodiversity Strategy & Action Plan (BSAP) , Central India Ecoregion (Vidarbha & Bastar)**

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**BIODIVERSITY STRATEGY & ACTION PLAN, CENTRAL INDIA Ecoregion  
(VIDARBHA & BASTAR)**

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## **PREFACE AND ACKNOWLEDGEMENT**

### *PREFACE*

Central India comprises part of Madhyapradesh, Chattisgarh, Orissa, Andhra and Vidarbha of Maharashtra. This area is unique in biodiversity of flora, fauna, agricultural crops, livestock and culture.

Central India Ecoregion was identified and included in the process of National Biodiversity Strategy & Action Plan (NBSAP). It was a herculean task and challenge to encompass the whole area in a short span of time of one and a half year. Therefore, it was decided in the workshop of NBSAP partners held at Delhi to include only Bastar Region of Chattisgarh State and East Vidarbha Region of Maharashtra State.

Bastar and Vidarbha form a continuous patch of dense forest, sheltering various floral and faunal species. Some of the species have become threatened and need urgent efforts to save them. The people of this area, particularly tribals, have played a vital role in protecting and conserving biodiversity of the region. Most of them are dependent on forest resources as it is the source of their livelihood. Development is inevitable, but it is necessary to set the tone of development, so that the biodiversity is well protected and livelihood of local tribals and people from deprived sections of the society will not be disturbed. Rich tribal culture and their traditions depict their sense of respect to the mother nature.

The people, government agencies, NGOs/ CBOs and public representatives are the main actors, who have definite and significant role to play in conservation of biodiversity. Therefore, every effort was made to make NBSAP process participatory in true sense by involving most of the governmental agencies, which have an important role to play in the conservation and management of biodiversity of the area and people from all walks of life like agriculturists, fishermen, tribal, women, landless labour, youths, students, scientists, social workers, traders, educationists, lawyers, and individuals playing roles as community leaders like Patel, Manjhi, Chalaki, Perma and Gaiti etc.

NGOs & CBOs are the key actors in identifying problems and solutions to various issues related to community development, forest management, agricultural development, human rights etc and bridging the gap between government and people. We have tried to involve NGOs/ CBOs, network of NGOs, SHGs, JFM Committees and youth groups of the area in BSAP process. We received overwhelming response from all of them, which made this process very meaningful and participatory.

Biodiversity Strategy & Action Plan of Central India Ecoregion has emerged out as a comprehensive plan of action addressing all issues related to law, policies and programmes, floral & faunal species, wetlands, grasslands, agricultural crops, livestock and poultry, fishes, microfauna, flora, culture and the livelihood rights of people, tribals, women, landless people etc.

We have tried to portray a clear picture of biodiversity, as regards the present status and threats, laws and policies, ongoing programmes of the government and non-governmental agencies, traditions of people, food security, and livelihood issues. But, it may still be inadequate in its formative representation due to the fact that the time duration was very short and moreover, it was very difficult to bring all governmental agencies together, which were already lacking coordination amongst themselves. Some political leaders did participate in the process. But, in general, the response from them was not encouraging; it may possibly be due to their heavy political involvement. But at the same time, we even made appeals through media to contribute in the process by sending their inputs.

#### **ACKNOWLEDGEMENT**

I have great pleasure in acknowledging help of all the members of Working Group, Advisory Committee and Sub-working Groups, who contributed in every possible way to prepare BSAP. I am also thankful to all governmental agencies, NGOs, CBOs, community members, scientists, nature lovers, experts, educationists, administrators, representatives of the people, lawyers, agriculturists, youths and students, teachers and NGOs Networks for their involvement and valuable contribution. I cannot possibly mention their individual names, even though I appreciate the significance.

I, along with the members of Working Group met and convinced personally most of the government agencies about their role and requested them to get involved in this process. The Chattisgarh State Government and Maharashtra State Government agencies from Nagpur Division realized the importance of NBSAP and offered all round help voluntarily.

It is worth to mention a few names, without whose help this process would not have been reached to the destination. I am thankful to Dr. K. K. Chakravarty, Principal Secretary – Forest, Chattisgarh State, Mr. Ravindra Sule, PCCF – Maharashtra State (Retd), Mr. J. S. Sahariya, Divisional Commissioner, Nagpur Division, Mr. P.C. Dalei – Divisional Commissioner – Bastar, Mr. Vivek Dhand, Secretary – PWD, Chattisgarh State, Dr. S. B. Suklikar of VNCS, Mr. A. S. Kalasakar, Divisional Manager, FDCM, Brahmapuri, Mr. Sanjay Thakre, Dy. C. F, Chandrapur, Mr. Kaushalendrakumar, Ex. Director, Kanger Valley National Park, Jagdalpur, Mr. S. C. Verma of BASCON, Mr. M. A. Iqbal of Adivasi Harijan Kalyan Samittee and Mr. Dinesh Gholve of Environment Global.

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I am thankful for the most generous help I have received from all of my colleagues, whom I have consulted. They have supplied with me the information and reference and also read and commented on many of drafts.

Finally, I remain indebted to the cross sections of the society, especially tribals, women, youths, agriculturists, students and scientists of this ecoregion, without whose invaluable inputs into the whole process, this document would have been incomplete.

**Dilip Gode,**  
**Coordinator, BSAP,**  
**Central India Ecoregion (Vidarbha & Bastar)**

## **NATIONAL BIODIVERSITY STRATEGY & ACTION PLAN (NBSAP) Central India Ecoregion (Vidarbha & Bastar)**

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### **Chapter I: Profile and Biodiversity**

#### ***1.1 Brief background to the SAP:***

Need to conserve biodiversity at global level was discussed for the first time at United Nations Conference on Human Environment held in Stockholm in 1972. However the systematic and concerted efforts were started in late 1980. An adhoc-working group was constituted in 1987, which started its work in 1989 culminating the Convention on Biological Diversity (CBD) at UN conference on Environment and Development held at Rio in 1992.

In India, the Union Ministry of Environment & Forests started a national process of preparing Biodiversity Strategy and Action Plan in June 2000. A Technical Policy Core Group (TPCG) was constituted to coordinate this process for 30 states, 10 ecoregions, 16 sub-state (Local) sites and 14 thematic areas.

Some biologically significant areas cut across two or more states and form a compact unit of ecosystem. Such areas, known as inter - state Ecoregions, are rich in biological diversity. The Central Indian Forest Belt (Dandakaranya) is one of such areas that cut across Orissa, Madhya Pradesh, Chattisgarh, Andhra Pradesh and Maharashtra.

The Technical Planning Core Group of NBSAP and Union Ministry of Environment & Forests identified Central India Ecoregion, reduced part of eastern Vidarbha (Nagpur, Bhandara, Gondia districts and Protected Areas of Gadchiroli & Chandrapur districts) of Maharashtra and whole Bastar region (Bastar, Dantewada, Kanker district) of Chattisgarh to cover under NBSAP process. This area is unique due to rich biodiversity in flora, fauna, agricultural crops, domestic livestock and culture. The communities of this predominantly tribal area have rich traditions and culture. Their age old practices are conservation oriented and honor natural resources. Therefore this area has become an integral part of the national process of Biodiversity Strategy & Action Plan.

Vidarbha Nature Conservation Society was appointed as the coordinating agency and Mr. Dilip Gode, Secretary VNCS as the Co-ordinator for Central India Ecoregion (Vidarbha and Bastar). The Co-ordinator and other members of the Working Group (List attached) have compiled the information from cross sections of people like fishermen, agriculturists, livestock breeders, government officials, youths, women, NGOs, politicians, scientists, traders, manufacturers, medical practitioners, vaidus, lawyers, universities and colleges, research and educational institutes and many others, who are concerned with the process. Rich biodiversity of natural ecosystems like forests, wetlands and grass lands, wildlife inhabiting these areas, agricultural ecosystems and domesticated species have been observed in this ecoregion.

### ***1.2 Scope of the SAP (Area covered):***

The area covered in the SAP is only one of its kinds as far as flora, fauna and bioculture is concerned. Over the last few decades' forests and wetlands of the area are diminishing due to biotic interference, anthropogenic pressure and monoculture drive illegal forest cutting, poaching, shifting cultivation (only in Gadchiroli district) and smuggling of medicinal plants and body parts of wild animals. Further rapid industrialization, mining and urbanization of the area along with establishment of thermal power stations and hydroelectric projects (Recent example: Totladoh, proposed Ichampalli), also result in bio-ecological degradation.

### ***1.3 Objectives of the SAP:***

Objectives of the SAP are as follows:

- a. Assessment of broad-spectrum biodiversity of Central India ecoregion,
- b. Identification of threats to the biodiversity,
- c. Knowing various biodiversity conservation practices adopted in the ecoregion,
- d. Identifying the gaps in the conservation measures,
- e. Recommending strategy for sustainable development, bridging the gaps and strengthening the on going initiatives,
- f. Formulating specific project proposals and short-listing the agencies that can implement these projects for biodiversity conservation and
- g. Documenting of the indigenous species found in the study area.

All the above objectives were achieved through active participation of the major stakeholders like agriculturists, fishermen, livestock breeders, local traders, tribals and vaidus including all ruralities, and so also enlightened groups of urban areas – academicians of colleges and Universities, government officials, lawyers, manufacturers, medical practitioners, NGOS, politicians and scientists.

### ***1.4 Contents of the SAP:***

The Strategy and Action Plan was prepared on the basis of following opinions expressed at various platforms by the people, policymakers and other stakeholders from rural and urban areas who feel more concerned about conservation of natural resources for the overall betterment of society and safeguarding of ecosystems.

1. This area has vital flora and fauna with their specific role in nature's cycle. Various pressures pose threats to their existence. Due to apathy of policy makers, administrators and specific sections of society, most of such resources either become threatened, endangered, extinct or on the verge of extinction.
2. The economy of this area is based on agricultural diversity, which is linked to food security. The changed tone of government policies and their programmes have disturbed and damaged agricultural biodiversity, leading most of the traditional crop varieties to become endangered and extinct.  
In Bastar, the earlier agricultural development programme caused minimal damage due to their non-acceptance by the native tribal communities. The introduction of new

agricultural technology based on use of High Yielding Varieties (HYV), fertilizers and pesticides to maximize production per unit area and time had the least respect for conservation of biodiversity. Further promotion of exotic varieties in agriculture, horticulture, pisciculture and social forestry has put a question mark on the survival of local species and germ plasm.

3. Livestock diversity is under danger due to introduction and insistence of exotic breeds of cattle and poultry.
4. The soil cover varies enormously in origin, properties and extensiveness across the landscape along with difference in quality and productivity. Since the careful preservation of this soil mantle can be the difference between the prosperous society and poverty, developing strategies not only to increase the agricultural production sustainably but also to reverse the process of degradation and improving the soil quality are the key issues. Present farming practices and food habits are influenced by a wide range of physical and socio – economic conditions and therefore achieving overall development, potential land use in future should be planned against this background of available information of our soil resources.
5. This ecoregion has more than 20,000 water bodies, made and maintained by community members, to harvest rainwater. This community resource played a vital role in ecology by recharging ground water and providing habitat to numerous species of aquatic flora and fauna. Further their role as supplementary irrigation sources to crops and household uses in an uncertain monsoonic climate and extending pisciculture are also equally important. Most of them need proper management with institutional structure.
6. Community people started realizing the threat to the biodiversity and its relevance in maintaining ecological balance along with offering food security for each and every living creature in the area. and
7. Biological resources need to be conserved and managed through proper policies and instruments, involving policymakers, administrators, scientists, technicians, communities, landless labourers, women, youths including students and all others who have stake in biodiversity.

The major SAP contents like specific strategies and actions related to above concerns, have emerged out through various participatory programmes organized.

### **1.5 Brief description of methodology used in preparation of SAP.**

NBSAP process was introduced and discussed with all the participants through various programmes such as Meetings of government agencies, NGOs, locals and village level communities, Personal interviews, Gram Sabhas, Workshops, Surveys through PRA / RRA,



Seminars, Conferences and Camps. Some meetings were chaired by Principal Chief Conservator of Forests (Maharashtra State) and the Divisional Commissioners of both the regions to invite active participation of the stakeholders. The officers of Revenue, Forests, Irrigation, Agriculture, Fisheries, Veterinary, Tribal Welfare, Social Welfare and Public Health departments, Universities, Coal Mines, Zilla Parishad/Panchayat, NGOs and people from various walks of life attended these meetings.

Advisory Committee of expert members from government agencies and NGOs was constituted for conceptualization and guidance. A working group of members from government and non-government organizations, subject matter experts and grass root organizations was formed to cover specific areas of biodiversity like flora, fauna, agriculture, animal husbandry and allied aspects like legal and policy matters, institutional framework, education - training and extension and livelihood issues. These working group members held meetings at local level, visited various areas, contacted and interacted personally with people as well as through various field-workers of different NGOs. The collection of information was done through personal interviews and questionnaires pertaining to various subjects/ fields. Existing network of NGOs of the region was of immense help.

In Vidarbha region, Vidarbha Nature Conservation Society, Nagpur has a network of groups of young environmentalist (Tarun Paryavaranwadi Mandals-TPM) in 56 villages in and around Protected Areas, actively involved in the field of natural resource management. The members of TPM have collected data on traditional crop varieties, flora, fauna and age-old community practices of biodiversity conservation. Dedicated volunteers arranged meetings with youths, communities and government agencies in camps. Libraries were consulted for collection of references and data. The key community actors like tribals; agriculturists, dalits, fishermen, and women were contacted to get information. In Bastar area, the working group members met local tribals at weekly haats (weekly markets) and mandais in selected villages. Wherever necessary photographs were taken in the field. The list of other agencies participating in the process is appended. All the activities were closely monitored by the coordinating agency.

The process was made known to the electronic and print media who were enthusiastically receptive in giving wide coverage in local newspapers, television, cable networks and radio. Special emphasis was given to involve NGOs and CBOs working in the fields of forest and wildlife management, panchayat management, soil and water conservation, sustainable agriculture, human rights, education, poverty alleviation, self – help groups etc. The members of some renowned and active networks and NGOs such as Joint Forest & Wildlife Management - Vidarbha, Young Environmentalist Movement of VNCS, Bastar Society for Conservation of Nature, Harijan Adiwasi Kalyan Samittee, Jagdalpur played a significant role in taking the NBSAP process to the grass root level and framing recommendations.

### ***1.6 Brief History:***

The Gondwana region (Dandakaranya) is a continuous stretch comprising parts of Orissa, Chattisgarh and east Vidarbha of Maharashtra.

The Gaolis and dynasties of Vakatakas, Shail, Rastrkuta, and Gond king Jatba, Bakhtbuland Shah, ruled **East Vidarbha region**. Since 1741, Maratha king Raguji - I was ruling the area from Chattisgarh to Chanda in the east and Berar in the west. This area was brought under the

governance of British from 1861, called as Central Provinces and Berar. After independence, this area was a part of Madhya Pradesh from 1947 to 1956 with its capital at Nagpur. During the state reorganization of 1956, the Chattisgarh was transferred to reorganized Madhya Pradesh, while Nagpur region including Berar became a part of Bombay state from 1956 to 1960 and subsequently of Maharashtra.

**BASTAR**, a part of the Chattisgarh area, was ruled respectively by Bhosalas of Nagpur and the British from 1741 to 1860 and 1861 to 1947 till independence. Thereafter, it was an integral part of old Madhya Pradesh from 1947 to 1956 and subsequently of re-organized Madhya Pradesh till 2000. The Chattisgarh was separated from MP recently in the year 2001 and declared as a new state.

Bastar region is well known for its biological diversity and rich culture of tribals. This predominantly tribal area has 59.6 % forest cover<sup>1</sup> with valuable species of flora and fauna. Most of the tribal population (80% of total) inhabiting in forestlands are engaged in agriculture. Their livelihood depends on forest and other natural resources. Their age-old traditional practices being conservation oriented form a true example of sustainable lifestyle. Bastar is one of the last natural resource frontiers in India – perhaps in the world.<sup>1</sup> The founder ruler of Bastar used to stay, most of his time, under bamboo groves, hence the region was named by a local word *Banstari*<sup>2</sup>, means the shade of bamboos.

### **1.7 Profile of the area:**

#### **Geographical profile:**

The CENTRAL INDIA ECOREGION spread over an area of 84386 Km<sup>2</sup>, comprises (A) Lower Maharashtra (Deccan) plateau (metamorphic), with elevations ranging from 150 to 450 m and (B) Bastar Division of Chattisgarh state representing the dominant plateau character.

The whole landscape of Lower Maharashtra (Deccan) plateau is located between 18<sup>0</sup> 50' and 21<sup>0</sup> 30' N latitude, 78<sup>0</sup> 0' and 83<sup>0</sup> 33'E Longitude. The extreme east region of Maharashtra (EAST VIDARBHA) includes Bhandara, Gadchiroli and parts of Chandrapur and Nagpur districts. The whole landscape of East Vidarbha in general, is a broad valley interspersed by elongated Satpuda ranges. The area lying at 150 – 450 m above MSL is covered with alluvium, marked with isolated hillocks of metamorphic rocks towards the east. The region has pre-Cambian to Pleistocene exposures. Much of the area is underlain by granite-gneisses or granite-rhyolite exposed all along Wainganaga valley with occasional exposures of basic and ultra basic rocks of Dharwar system.

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1. R. S. Anderson & W. Huber, The hour of the fox, p 137. 2. Chattisgarh Feudatory States.

In Painganga valley, beds consist of quartzite, coal beds of lower Gondwana. Nagpur forms the eastern most extension of basaltic plateau with inter-trappen lameta beds where the trap thins out and forms a thin capping of hills. This region further can be divided into three sub-regions such as the Northern border upland covering Arvi and Ramtek uplands, Wardha – Wainganaga plain and the eastern hills. The Arvi Ramtek uplands have an average elevation of 400 – 450 m above MSL. The tributaries of Wardha and Wainganaga rivers dissect these lands.

Various landforms observed in Nagpur district are the northern hilly terrain comprising the Satpuda ranges, north – westward extension of Arvi upland and the central and eastern low lying plains drained mainly by Kanhan river and its tributaries – Pench, Kolar, Chandrabhaga, Nag and Sand, besides the Pilkapar hills and several detached hills and hillocks scattered over the areas. Ramtek hills are the offshoots of the Satpudas, well known for their scenic beauty. Wardha and Wainganaga rivers flowing along the north–western and eastern borders respectively have bifurcated the drainage of the district. The principal tributaries of Wardha river are Bor and Wena flowing towards the south, while Jam and Kar towards the west; the other rivers of importance are Wainganaga, Bawanthadi, Sur and Amb.

Wainganaga originates from North Deccan plateau area of of Chindwara, covering the Satpuda ranges, flows in a northeast- southly course through Chindwara and Balaghat districts (MP) and enters the area covering Bhandara district in MS, (including newly separated Gondia district at present) from the north. Among a number of its sub-basins in the upper stream, the important sub-basins lying on lower Maharashtra Plateau (Metamorphic) and occupying the area of Bhandara district are of Bagh, Bawanthadi and Kanhan.

An extreme outline of the Satpudas entering in the district from the north-west direction are Ambagarh hills, which project about 200 m above Wainganaga valley floor towards west. The scattered and isolated hill ranges and hillocks are observed in the valley, such as Paoni and Gayatri hills in the central, densely forested Darekassa hills in the extreme east and Adyal, Chichgarh, Nawegaon, Palasgaon, Pratapgarh, Purkabil and Sangadi hills towards the south-eastern parts of the districts.

The sub region of Wardha – Wainganaga plain is formed by the tributaries of Wardha and Wainganaga rivers at about 250 m above MSL. Chimur hills separate out the plains of Wardha and Wainganaga rivers. This plain is very significant, keeping in view the agriculture of the region, as it supports major farm, fruit and vegetable crops. The eastern most extremity of Maharashtra plateau consists of Nawegaon, Gadchiroli, Surajgarh and Ahiri hills from north to south with an elevation of about 400 m MSL that form a water divide between Godavari and Mahanadi water systems. The area is a part of main Godavari basin, drained by its tributaries, Wardha – Wainganaga, Pranhita and Indravati rivers and finally by Godavari to Bay of Bengal. The type of drainage is dendritic.

Bhandara and Gondia districts are known as lake districts as 13,758 large and small irrigation tanks are scattered all over the area. The main tanks are at Nawegaon, Seoni, Khairbandh, Bodalkasa, Chorakmara and Chandpur.

**Bastar** division located in the Southern Chattisgarh lies between 17<sup>0</sup>- 46' & 20<sup>0</sup>--34' N Latitude and 81<sup>0</sup>- 10' & 82<sup>0</sup>-15' East Longitude. Its total geographical area is 39114.61 sq. km having length of 290 km in the north – south direction and breadth of 200 km in the east – west direction. Recently Bastar has been divided in three revenue districts namely Bastar (Jagadapur) covering the area of Central Bastar, Dantewada covering South Bastar and Kanker covering North Bastar. The Bastar region enjoys a central location between the Chattisgarh Basin in the north, Maharashtra plateau in the west, Andhra plateau in the south and Eastern Ghats toward south and east, which drop sharply and steeply towards the east coastal plain. It is surrounded by the states of Maharashtra in the west, Andhra Pradesh in the south and Orrisa (particularly Kalahandi and Koraput districts comprising the Ghats) in the southeast. Godavari,

Indravati and Mahanadi rivers form outer drainage of Bastar, largely acting as a barrier for the migration of flora and fauna. Thus, Bastar is confluence of above three states and this enhances its position for biodiversity conservation.

Dense forest cover exists mostly in the central, south and western parts of Bastar covering various places like Amabeda, Antagarh, Awapali, Bailadaila, Bhanupuri, Biapur, Bhopalpattanam, Chotte Donger, Darbha, Gollapalli, Indravati National Park, Kanger Valley, Kurschel Valley, Machkot, Makdi, Paramed, and Sonepur.

### **Climatic Conditions**

The Climate of EAST VIDARBHA (MS) has been categorized under sub-tropical monsoonic type having three distinct season viz., rainy from June to September / October, winter from November to February and summer from March to May. The rainfall varies from 110 to 150 cm, distributed over 60 to 70 days and the rainy season is confined mostly to South West monsoons receiving nearly 80-90% of the total annual precipitation. A few showers from retreating Northwest monsoons associated with cyclonic storms are also received during winter season in the month of January and February. However the dates of onset of monsoons, intensity and seasonal distribution and also its total amount display large variations in time and space. In some years when the rain falls below or above the normal, situation may occasionally lead to distrouous consequences of droughts or floods and crop failures. However, the total amount received in normal years is adequate.

The mean winter and summer temperature of the area are 13<sup>0</sup> C and 43<sup>0</sup> C respectively during the coldest month (December) and hottest month (May) showing a wide annual range of 20<sup>0</sup>. C The area experiences wide variations in temperatures and humidity in a year, (in view of high temperature associated with low humidity in summer and high humidity in rainy season.

The entire BASTAR region characterized by sub tropical monsoonic hot and humid climate. The temperature varies from 19<sup>0</sup> C in the coldest month (December) to 31<sup>0</sup> C in the hottest month (May) showing a considerable annual range of 12<sup>0</sup> C. The rainfall in the region occurs characteristically between June and September ranging between 125 and 150 cm (Singh 1971 and Bhattacharjee etal 1980). Sixty years average rainfall of 153.2 cm has been reported. The period between December to February remains generally dry. The region however, suffers from uneven distribution, unreliability and uncertainty of rainfall.

The uplands receive more rainfall during summer than the plains and valleys. While the Kanker basin in the north and the Godavari -Sabari plains in the Southwest are too hot, the Bastar Plateau remains relatively cool. In winter months, the plains become pleasantly cool whereas the plateau and hills are fairly cold. During the summer, while the plains are unpleasantly warm and sweating, the high lands enjoy comfortable weather due to frequently blowing winds.

The rainfall, fairly heavy though irregular and unevenly distributed, is mostly caused by the Southwest monsoon. The sporadic rains, especially during winter months are negligible. The variability of rainfall from normal is relatively high, but since the annual precipitation is fairly high, floods are bigger menace than droughts. Such climatic conditions are essentially suitable for either growing crops such as paddy, or favouring luxuriant growth of natural vegetation.

## EAST VIDARBHA SOILS:

East Vidarbha is transitory between the Deccan trapean and pre-Cambian masses. The region is marked by messes, buttes and isolated plateaus lying at 400-450 m above MSL and furrowed by Wardha, Wainganaga and Kanhan rivers. Deep alluvial plain lying at 250m above MSL towards the west is interrupted by residual hills projecting over the valley floor while the dissected rotting landscape towards the east is formed of sub-dued hills and hillocks with intervening valleys. The soils developed from granite, gneisses, schists and alluvium vary according to topographic locations under the sub-tropical monsoonic climate.

Physiographic Unit	Main features with Taxonomic names as per USDA Taxonomy
Gently sloping summits and spurs	Brown, shallow, well drained, calcareous, neutral to alkaline fine loams underlain by weathered parent material /stony substrate with low water and nutrient holding capacity; these soils (Typic Ustorthents/ Lithic Ustorthents) are severely eroded.
Gently sloping undulating lands	Brown to yellowish brown, shallow to moderately deep, well drained, neutral loamy, fine loamy and fine soils (Typic Ustorthents and Typic Haplustepts) with low water and nutrient holding capacity.
Very gently sloping undulating lands	Dark brown, deep to very deep, moderately well drained clays (Vertic Haplustepts and Typic Haplustept); these moderately eroded soils have high water and nutrient holding capacity.
Moderately sloping hills and ridges	Brown, shallow, well-drained, neutral loamy skeletal soils (Lithic Ustorthents and Typic Ustorthents) with severe erosion and moderate stoniness.
Gently sloping pediment surfaces (graded slopes)	Yellowish brown, slightly deep, well drained loams (Typic Haplustepts and Typic Ustorthents) with severe erosion; at places Loams are dark gray / grayish brown, well-drained, slightly acidic fine loams rich in organic matter are observed. These (Typic Haplustolls and Typic Haplustepts) soils are moderately eroded.
Very gently sloping pediment surfaces	Dark grayish brown /grayish brown to brown, very deep, well drained, calcareous, neutral to alkaline, cracking, clayey soils (Typic Haplusterts, Typic Haplustepts and Vertic Haplustepts) will have high water holding capacity and high exchange capacity.
Very gently sloping alluvial plains,	Very dark grayish brown, very deep, moderately well drained neutral, cracking clayey soils (Typic Haplusterts, Vertic Haplustepts and Typic Haplustepts). These soils have shrink-swell

potential with high water holding capacity and high exchangeable bases.

Gently sloping valleys      Dark brown, very deep, moderately well drained, calcareous, neutral to alkaline fine loams (Fluventic Haplustrepts and vertic Haplusteps) with moderate erosion.

Out of the total soil cover surveyed, studied and mapped in East Vidarbha, Entisols (Typic & Lithic Ustorthents), Inceptisols (Typic Haplustepts, Vertic Haplustepts & Fluventic Haplustepts), Mollisols (Typic Haplustolls) and Vertisols (Typic Haplusterts) constitute respectively 14.3, 52.9, 9.2 and 23.6 percent (Challa et al 1995 and 1999).

The deforestation and encroachment of marginal lands for cultivation are the major soil problems in the hilly non-arable areas. Therefore the summits and spurs, buttes and mesa should be covered with forest vegetation along with enforcing restrictions on the cultivation of marginal lands. In arable lands soil erosion and drainage are two problems and therefore adopting of suitable soil and water measures through watershed based approach appears an essential (Challa et al 2001).

#### **Natural Vegetation and Forest.**

It is the combined effects of relief and the elements of overhead climate in the pattern of natural vegetation (an assemblage of plant species growing in association with each other in a given environmental/ecological frame). The most common loosely used word by the administrators and public is forest which denotes only a large area covered by trees with undergrowth of shrubs and grasses for assessing its economic benefits. However, the natural vegetal cover is not that natural because of its violent destruction for timber and firewood, and occupancy of lands for shifting and sedentary cultivation and grazing till the Government proclamation of Forest Policy in 1894. Thereafter the exploitation continued through over grazing and clearing of forest areas/lands under a cover of vague rights appearance with poor grass cover, few scattered shrubs and stunted trees, particularly in areas adjoining villages.

Presently the areas in East Vidarbha covering the off shoots of Satpuda ranges- Ramtek Hills and the eastern most hilly terrain consisting of Navegaon, Godchiroli, Surajgarh and Aheri hills supports good forest, covering nearly 16, 30, 32 and 75 percent of TGA of Nagpur, Bhandara, Chandrapur and Gadchiroli districts (Table 2).

Note: Entisols are undeveloped soils, without pedogenic horizons. Inceptisols are slightly developed soils, with pedogenic horizons of alteration / concentration but without accumulation of translocated materials other than carbonates or silica. Mollisols are soils with nearly black, organic –rich surface horizon and high basic cation supply. Vertisols are soils with high content of swelling clays, deep wide cracks develop during dry periods.

Tropical moist deciduous grading to tropical dry deciduous forest along with some evergreen species are observed. Teak (*Tectona grandis*) and Salai (*Boswellia Serrata*) forests under high rainfall thrive well at sites such as steep hills and ridges with very good drainage. Suitable edaphic conditions along with good supply of moisture help in establishing good forest cover,

however protective measures are absolutely necessary, List of various trees, shrubs and grasses of East Vidarbha has been enclosed (Annexure 19 C).

During recent years, an increase in forest areas has been observed due to State Govt's social forestry programme implemented through the Dept. of Forests. This was clear from general information presented by Sahasrabudhe et al (1969). The percentages of district wise areas relating Nagpur, unbifurcated Bhandara and Chandrapur prior to 1970 were reported as 6 & 24 and 60 When compared with present LUS data (Table 2) respective increases were 9.9, 6.1 and 6.4.

The implementation of various Grow more food and agricultural extension programmes of the State Govt. during pre and after independence periods in Bastar could result in deforestation and clearing of forest lands with a view to increase cultivable lands. In Bastar, inspite of these Govt. sponsored activities, the region appears to be exceptionally rich in forest wealth, mostly confined on the upland rims. The typical cover is of the moist tropical deciduous forests, Sal (*Shorea robusta*) being the most dominant species. In the drier and hotter plateaus and the adjoining areas, the moist deciduous species are replaced by drier teak (*Tectonia grandis*) forests.

Bastar is the most forested region covering about 60% of TGA. Apart from the predominating teak and sal forests, the other common species yielding economically viable forest produce have been included in the list with their botanical names (annexure-20).

Presently a high proportion of the forest in the region is either reserved or protected. The shifting cultivation, as a destructive agent, has declined the forest cover almost everywhere. The forest wealth is still an important asset of State revenue on account of an appreciable sale proceeds of timber.

### **Land Utilization and Cropping Pattern.**

Out of the total geographical area TGA of the districts covering EAST VIDARBHA, 52.8, 37.7, 44.2 and 12.5 percent of the lands are under cultivation (net) in Nagpur, Bhandara, Chandrapur and Gadchiroli districts. The total percentage of areas available for cultivation respectively constitutes 66.7, 46.0, 53.2 and 16.1 (Table 4), which include lands either under miscellaneous tree crops and groves or lands left as cultivable waste and fallows. The remaining areas are either under forest vegetation and non-agricultural use or barren and uncultured.

Hilly terrain with steep slopes and areas with shallow soil cover have restricted the cultivated area, which has low productivity due to variation in rainfall and restricted irrigation facilities (3.1 to 19.8% of T.G.A. (Table 1).

Of the gross cropped area (GCA), major percentage of areas are cultivated for different cereals, such as paddy, jowar, wheat and others like maize and misc. hilly millets, are 32.0, 72.5, 53.6 & 78.7 in Nagpur, Bhandara, Chandrapur and Gadchiroli distts; followed by oilseeds and pulses contributing to 33.2, 9.8, 19.0 & 5.2 and 17.3, 14.3, 14.2, & 14.1 percent respectively. Fiber crops, mainly cotton, cover only 7.8, 0.2, 9.9, and 0.1 only. The percent of the areas growing

vegetables, spices (Chilies), sugarcane and fruit crops (mainly mandarin oranges amongst citrus) and guavas appears minor as compared to CGA's. Chilies, cotton, groundnut, soybean and vegetables (grown around urban settlements) are the cash crops of the region.

The dominant crops are mainly determined by the duration of rainy season and supply of water. Paddy is the predominant crop grown in Kharif (wet Season) in Bhandara, Chandrapur and Gadchiroli districts. Soybean and Chilies are grown in Kharif, while gram and wheat in Rabi (Post-Monsoon) on deep Black soils with sustainable irrigation facilities. Dry sub-humid border areas receiving moderate annual rainfall (100-120cm) have cotton and jowar based cropping pattern, while in the major portions of Chandrapur, Bhandara, Gondia and Gadchiroli districts with high annual rainfall (120-160 cm) are paddy based. A gradual or rapid onset or decline of heavy rains creates difficulties in preparatory tillage, puddling and transplantation of wet lands paddy. Dry sub-humid border areas also suffer from vagaries of south-west monsoons, such as either in adequacy of moisture for sowing or abnormal delays in weed control associated with continuous rains. Presently Soybean is encroaching the areas of Cotton and Chilies

Few showers from NW monsoons received during January and February; benefit Rabi crops – wheat, gram and linseed on soils high in clay. Sequential cropping has been possible with existence of conditions for plant growth beyond kharif season. Nearly 19, 44, 20 and 13 percent of net area sown in double cropped in Nagpur, Bhandara, Chandrapur and Gadchiroli districts. Kharif, jowar varieties cannot tolerate excessive wetness till August, whereas Rabi jowar fits better with receding monsoons, when their drought tolerance is maximum. In predominantly paddy growing areas, direct seeding of lathyrus has been practiced immediately after harvesting of Kharif wet land paddy. Some farmers grow tuar (redgram) on bunds. Pulse crops like green gram, black gram and lentil are also grown with residual soil moisture. These pulses enrich fertility of paddy soils.

Agriculture in BASTAR is almost totally dependent on rainfall (subsistence farming.).Owing to difficult terrain, extensive forest cover (59.6 percent of the TGA), and shallow soils, the net sown area in BASTAR cover only 22 to 24 percent under cultivation of various crops (Singh 1971, Shaw 2000). The remaining area is either under fallows or barren/unculturable and put to non- agricultural use.

Being predominated division of Chattisgarh State (67.4 percent tribals out of 22.7 lakhs total population as per 1991 census) the practices of shifting cultivation (Podu chasa) is still prevalent in some areas of the forests on uplands which depleted valuable forest and soil cover and in the long run not only the productive capacity but even the physiography of the area is considerably affected. The Kanker-Kotri plain in the north and the Godavari-Sabari plains in the South benefited through outside contacts and the permanent cultivation in these plains has discouraged the practice of shifting the settlements and consequently the cultivation.

Agro-climatic zoning of Bastar as reported by Shaw (2000) into six sub-zones (in parentheses) coincides broadly with physiographic sub regions in parentheses (Singh 1971).

#### (A) Bastar Uplands

I Kanker-Kotri basin (Northern Low Lands)

II Bastar plateau (Keskul escarpments to the north Abujhmar hills in the west & NE plateau)

III Middle Indravati Course separating Bastar plateau from Bailadilla-Jagdarpur plateau



#### IV Bailadilla-Jagdarpur plateau (Southern plateau)

##### (B) Indravati -Sabri plains (Southern Low Lands)

###### I Lower Indravati plains.

###### II Sabari-Sideru plains.

The annual rainfall ranges from 1200 to 1400 mm with possibilities of winter rains every year. Mean rainfall (mm) of 1277,1362,1400 and 1223 has been reported at Jagdalpur, Dantewada, Kondagaon and Kanker by Shaw (2000). Thus, usually sufficient quantum of well distributed rains favour the growth many crops even under harsh conditions. The soil types vary widely depending on the configuration of surface such as poor rocky soils with thin veneer of loams on the plateau and hill slopes and fertile alluvial soils in the plains. Based on topography, five farming situations have been identified on the Bastar plateau. These are -

Badi situation, which surrounds home with fields richly manured and unbunded but well fenced: it is suitable for maize, toria, vegetables and fruit orchards;

Top upland (Marhan) with very shallow soil of coarse sandy texture and poor in water retentivity and fertility:

Tikra on sloping uplands having shallow sandy soil with slightly high water retentivity and fertility than Marhan;

Mal on leveled upland with sandy loams and usually banded and

Gabhar having low lying lands of silty clays with higher water retentivity and fertility adapting double cropping, Small millets, sesamum, toria, maize, niger, horsegram, blackgram and arhar are mainly grown on Mrahan and Tikra lands with low productivity as compared to Mal and Gabhar Lands

The principal crop of paddy (*Oryza sativa* L.) occupies 6.67 lakh ha with total production of 743.12 thousand metric tones followed by small hilly millets in about 1.2 lakhs ha with 36.5 thousands tones of production. Hilly millets comprise of kodo, little millet, finger millet, barnyard millet, common millet/kosra/cheema and foxtail millet. Out of these, foxtail millet is only restricted to south Bastar. Even though the area under small millets is declining due to encroaching of more remunerative crops as per Govt. policy, the farmers of Bastar still grow small millets particularly under shifting cultivation in forest areas on account of their dietary role. Other minor cereals are maize and sorghum.

Among the pulses horse gram/ (kulthi/ harwa) and black gram are common pulses of kharif and rabi seasons. Grass pea (*Lathyrus*) is grown by tribals as component of pair cropping. The total area covered by these major pulses in Bastar is 57 thousand ha with production of 26.25 thousand metric tones. Urid, tuar, rice bean (locally known as Bhadori), green gram and gram cover minor areas. The oilseeds such as ramtil, roselle, sesamum, toria and various spices, tubers and vegetables are other crops of the region.

Soils observed in BASTAR plateau vary widely. The underlying parent rocks/materials do have imprints on the soils but the dominating effects of sub tropical monsoonic climate has been modified by the topographical configuration of the plateau land (slope) aspect and elevation). The changes in topography create locally arid and humid regimes despite the overhead climate being the same over the region.

**Soils on Plateau (Archaean granites and gneiss) at 400-700 m above MSL are given.**

While the peaks of the region nearly of 815 m have bare rock almost devoid of vegetative cover moderately to steeply sloping hills with escarpments, residual hills and isolated hillocks (400-500m) have a shallow cover of reddish brown, slightly acidic, loamy skeletal soils of uneven depth underlain by hard granite (Lithic Ustorthents), which limits cultivation and indicates suitability for teak, bamboo, and coarse grasses. These excessively drained and very severely eroded soils under forests have low available water holding capacity (AWC) and fertility.

Gently sloping plateau at higher elevation 640 m above MSL consists of deep to very deep, bright yellowish brown, slightly acidic cracking (clay loams to clays) fine soils, (Chromic Haplusterts) with moderate erosion, high AWC and fertility. These soils grow commonly paddy in kharif and gram and wheat in rabi.

Deep yellowish red, slightly acidic fine loamy soils with sub-surface accumulation of clay are observed on undulating to rolling plateau with basic dykes (at 480m). These Typic Haplustalfs are well-drained and severely eroded with medium AWC and fertility and grow kodo-kutki, mustard and paddy.

Very gently sloping plain lands (at 300-400m) with isolated hillocks/ mounds consists of deep to very deep, yellowish brown to pale brown or brown slightly acidic to neutral, fine loams (Typic Haplustalfs,). These soils are well drained and moderately eroded with medium AWC and fertility and grow kodo-kutki, mustard and paddy.

Gently sloping valley bottom (at 400m) with basic dykes consists of deep to very deep, yellowish red slightly acidic, fine loamy (sandy loam to sandy clays) soils (Udic Haplustalfs) underlain by weathered granitic parent material. The soils are well drained but severely eroded with low AWC and fertility supporting crops of hilly millets, mustard and forest species like sal, tendu, palas. The physiographic location of soils in valley bottom supplies adequate moisture most of the year.

Gently sloping intervalley basins lying at slightly higher altitudes than valley bottoms are (Vertic Ustropepts pale brown, slightly acidic, fine soils covered with very deep, very pale brown-to-brown, slightly acidic, fine, soils cracking moderately and with moderate AWC and fertility. These well-drained but slightly eroded soils are developed on granites to gneisses and grow cultivated crops like paddy in kharif and wheat grows in rabi alongwith common forest species.

Moderately steep sloping hills with escarpments on lateritic plateau in (at 450m above MSL) somewhat excessively drained covers also shallow reddish brown to dark reddish brown, slightly acidic, Loamy Lithic Ustorthents, underlain by hard rock, limiting the cultivation. These poor soils are of Low AWC are very severely eroded and under forest.

**Soils observed on Plateau (sedimentary parent material) at 150 – 600 m above MSL are-**

Gently sloping plain land (at 450 m above MSL) consists of very deep, light yellowish brown, neutral, fine (Chromic Haplusterts) cracking of clayey soils over alluvium from sandstone with high AWC and fertility. Steeply sloping hills (at 400m elevation) with graded slopes or pediments cover shallow, reddish brown to dark reddish brown, slightly acidic loams of uneven

depth underlain by weathered sedimentary parent material (Lithic Ustorthents). Moderately drained and eroded deep cracking clayey soil supports both the cultivated crops and forest species. While somewhat excessively drained and very severely eroded shallow Lithic Ustorthents support only forest species due to their unsuitability for cultivation.

Gently sloping slightly dissected plain (at 160m elevation) cover well drained deep, brown to dark brown slightly acidic (clayey) fine soils (Typic Haplustepts) of medium AWC and fertility. These soils are moderately eroded and support forest. The problem of soil erosion is quite serious and therefore anti-erosion measures are necessary to prevent in both open as well as undulating areas.

Out of the total area of Bastar, surveyed, studied and reported by NBSS&LUP, NGP (Tamgadge et al 1999); Lithic Ustorthents (Ertisols) Typic and Udic Haplustalts (Alfisols), Chromic Haplusterts (Vertisols) and Typic & Vertic Haplustepts (Inseptisols) occupy respectively 32.4, 42.0, 22.4 and 2.2 percent.

BASTAR has an undulating topography with well-marked elevations and depressions. While the region in general, represents typical wide forest clad plateaus and hilly tracts including highly dissected plateaus and the Abujhmar Hills in the west and gradually rising Eastern Ghats bordering Orrisa.

There are a few extensive plains comprising a part of Chattisgarh Plain in the north and Godavari Sabari Plain in the south – west. The plateaus, however, are the dominant land forms of the region covering about two – thirds of its area, with approximately 190 kms in length right from Jeypore Ghat to Keskhal Ghat and variable breadth between 80 to 130 Km at an abrupt descent from Keskhal Ghat to the Kanker Basin. An elevation of Bastar plateau ranges from 550 – 750 m above MSL.

As regards general internal relief, these plateaus are slightly dissected with the existence of fretted scarps in the east and the north due to deep and narrow cutting by the tributary streams. But they are highly dissected to the west by the tributaries of Godavari including the Indravati. The western dissected edge of Bastar plateau, lying to the north of the Indravati is marked by the Abujhmar Hills, which provide one of the richest iron ore deposits of the country at Bailadilla range. Much of the Bastar plateau is undissected, formed of the gneisses of the Dharwar and Cuddapah systems. The plateau drops on all sides except in the south- east border towards the Eastern Ghats (Orrisa), where they are considerably eroded to form the Godavari plain.

The well-marked scarp edge of the Bastar Plateau extends the Kalahandi Plateau from 250 m to 300 m in elevation (Orrisa) towards the east. The Kanker basin (450 m) lies to the north – west of the region, a southward extension of Chattisgarh Plain crossed by few higher ridges of quartzite. Another extensive plain spreading in the southward portion, designated as Godavari – Sabari plain, is drained by tributaries of the Godavari chiefly the Sabari and the Sileru.

The geology of the region reveals that the southern and northern parts are dominated by the schists and gneisses. The disintegrated granitoid rock predominates in the northeastern portion

around Kanker. In the Eastern Ghats section, charnockites dominate, while dykes are mostly dolerites and the ridges are mainly composed of haematite-quartzites of Bailadilla series.

The climate is favourable for luxuriant growth of vegetation and as such about two third of the area is under thick canopy of moist deciduous species. However, the valleys and basins constituting in about one third of the area are under cultivation.

The drainage of Baster may be classified into two river systems viz. Mahanadi river system in the north, draining the northern part of Bastar (Kanker basin) and the Godavari river draining about three-fourths of the region, including the central plateaus and the southern plains. Both the systems join the Bay of Bengal. Godavari, the biggest east flowing river of the peninsular India, flows along the south – western limit of the region for about 16 kms, where it coincides near Bhadrakali. Since it flows through high lands on both the sides, its valley is narrow at this place than in the lower reaches. The Indravati river, a major tributary of the Godavari, flowing through the central part of Bastar region, with about 41,655 Km<sup>2</sup> catchment areas in Bastar and Orissa, originates at an altitude of 915m from Kalahandi district (Orissa) on the western slopes of the Eastern Ghats. It flows westwards through the Koraput district (Orissa) and Bastar region, turns south and joins Godavari about 530 kms from its source at an elevation of 82 m near Bhopalpattanam. The river while descending from the quartzite sandstone to the Archean granite and gneisses, makes a 30m waterfall at Chitrakot.

The major tributaries of Indravati river are the Narangi, Boradhig, Kotari (Kotri), Banda and Nibra flowing from its right and Nandiraj as well as Berudi, Chinta, Wager and Dantera with its feeders like Sankini, Dankini and Sapgonda from the left. On the north the Narangi and Boardhig drain the northeastern plateau while the Gudra flows through the eastern Abujmar hills. The Abujmar hills lying between the Indravati, the Gudra and the Nibra exhibit radial drainage pattern on account of a number of tiny streamlets originating from the hills. The southern tributaries of the Indravati, smaller than the northern ones; drain the Bailadilla and Usur hills as well as the slopes of the southern plateau of Bastar.

The Sabari, another important tributary of the Godavari rising at an altitude of 1372 m in Sinikaran hill range of the Eastern Ghats, drains the southern uplands of the region. The Sileru, a major tributary of Sabari, rises at an altitude of 1220 m and flows mainly in Orissa for about 306 kms before joining the Sabari above its confluence with Godavari. The Sabari and Sileru together cover a catchment area of about 20, 427 km<sup>2</sup>. The Kanger and Malingar are its two other important tributaries. The former rises at Tangiri and the later in the Bailadilla hills. Both flow towards south to join the Sabari. The Kanger makes a 45m fall at Tirthgarh while descending from the Cuddappah quartzitic sandstone.

Most of the rivers are perennial though with fluctuating regime and consequently very negligible amounts of their water is useful for agriculture. The local streams are seasonal and dry up as soon as the monsoon ends. Rapid run off and evaporation from the lands induce water scarcity in summer. The topographical and the stratigraphical features indicate mostly the deficiency of underground water resources.

### **Socio Economic Profile**

#### **Major Ethnic Groups of the Study Area:**

#### **Socio-Economic Features**

The total population of East Vidarbha as per 2001 Census is 94,35,299, out of which 73.86% is rural, mainly depend on agriculture. Scheduled Tribes and Scheduled Castes contribute respectively 40.6%, out of the total population and therefore it is predominantly a scheduled tribal area. The population of Scheduled Castes (SC) mainly comprise of various castes such as Basor, Bhangi, Chambhar, Ganda, Holia, Kaikadi, Katia, Khanger, Khatik, Kori, Madgi, Mahar, Sai and others.

Major castes of population in the area including ST are Bramhins, Thakurs, Marathas, Vaishas and backward castes like Kunbi, Koshti, Lohar, Mali, Teli, and Wadai etc. The tribal population includes Gonds, Rajgond, Dhurgond, Halbas and Pradhan.

Bastar, well known for tribal culture, is inhabited by primitive tribes. The main occupation of the people is agriculture and collection of forest produce. Out of the total population, scheduled tribes and scheduled castes form 74.4 % and 4.3 %. The main tribes of the area are the Gonds, Halbas, Madias and Murias. The Madias and Murias are also regarded as sub tribes of Gonds. Among Madias, the Hill Madias inhabit the Abujhmar tract covering the western part of Bastar. They are hardworking people. The bison horn madias inhabit southern part of Bastar. Murias inhabit north Bastar and this tribe is well known for their social institute "Gotul". Halbas migrated around 18<sup>th</sup> century with Bhosla military. In addition, some other tribes like Bhatras, Parja, Dhruwa, Rajamura, Jhoriamura, and Dorlas inhabit Bastar. The Banjaras, Panhars, Pankas, Rauts, Koshtas, Loharas and Agarias are nomadic tribes

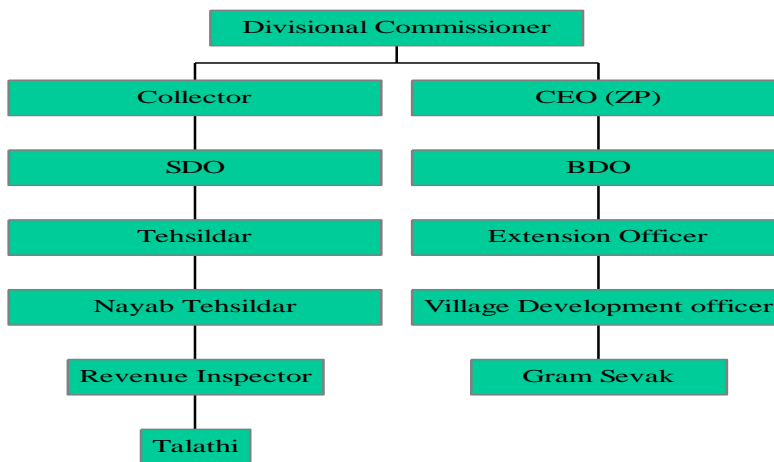
### **Political profile:**

Present Administrative Structure:

East Vidarbha, comprising of five districts namely Bhandara, Chandrapur, Gondia, Gadchiroli and Nagpur, is under the administrative control of Divisional Commissioner, Nagpur Revenue Division, Nagpur, which is the second capital of Maharashtra State. Bastar is a revenue division of newly formed Chattisgarh state with three districts Bastar, Dantewada and Kanker. The Divisional Commissioner is the administrative head in Bastar at Jagdalpur. The District Collectors primarily look after the law and order. The Chief Executive Officers (CEOs), the administrative head, of Zilla Parishads / Panchayats, are held responsible for the implementation of various development programmes of Agriculture, Animal Husbandary Education, Minor Irrigation, Public Health, Rural Development etc through Panchayat institutions.

Bastar has been divided into three Revenue districts and four Police regions at Jagdalpur (Bastar), Dantewada, Kanker and Bijapur. The Divisional Commissioner (Revenue) and I. G. of Police stationed at Jagdalpur. The administration and management of forests are governed through two forest circles at Jagdalpur and *Kanker* with 10 territorial Divisions, two National parks (Indravati Tiger Reserve and Kanger Valley National Park) and two Sanctuaries (Pamed and Bhairamgarh).

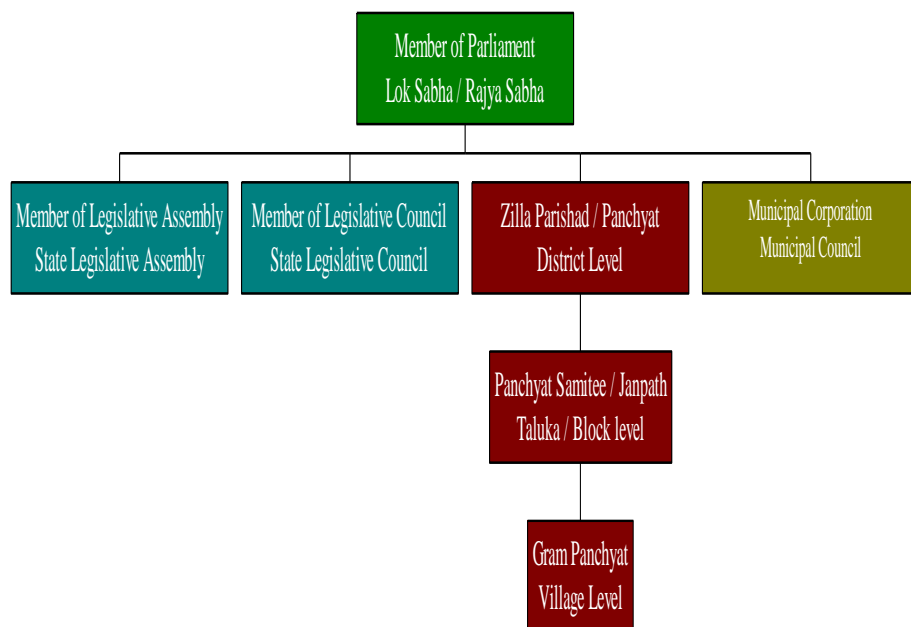
### General Administrative Setup



The following departments are related to biodiversity management:

- i. Forest Department
- ii. Forest Development Corporation
- iii. Agriculture Department
- iv. Fisheries Department
- v. Animal Husbandry Department
- vi. Irrigation and Power Department
- vii. Police Department
- viii. Pollution Control Board
- ix. Revenue Department
- x. Mining
- xi. Industries.

## Political Setup of the Area



### 1.8 Uses of Ecosystem:

#### Land and Water Uses:

In this area, the land is mostly used for agriculture, urban initiatives, mining, industries, irrigation projects, roads, and construction of bridges and buildings.

Mineral resources constitute the most valuable asset. Coal (Barkar series of the Gondwana system) is the principal mineral of East Vidarbha; being mined from the coal-fields of Kamptee, Umrer and Khaperkheda in Nagpur district and Wardha valley in adjoining areas of the river course adjoining Chandrapur and Yavatmal distts. Large deposits of limestones and dolomites occurring in these districts are mainly utilized by the cement manufacturing factories, located in the vicinity of sources. Iron ores, respectively of sedimentary and igneous origin are mined from Chandrapur and Bhandra distts. High-grade manganese ores (Gondite series of Dharwar system) located near Tumsar (Bhandara) and Khapa (Nagpur) are mined by MOIL. Besides, various ores like chromite, china clay, copper ores and mica are also available in the region

**Table 3:** Land use statistics of Vidarbha \* (1994-95)

Particulars	Nagpur	Area ('ooha) Bhandara/Gon dia	Chandrapur	Gadchiroli
Total Geographical Area (TGA) reported for Land Use Statistics	9864	9321	10695	14380
Forests	1568 15.89	2796 (30.1)	3509 (32.1)	11209 (75.1)
Barren and Uncultural land	328 (3.3)	297 (3.2)	229 (2.1)	148 (1.0)
Area under non- agricultural use	858 (8.7)	836 (9.0)	917 (8.4)	608 (4.1)
Permanent pastures and other grazing lands	535 (5.4)	1030 (11.1)	455 (4.2)	548 (3.7)
Land under miscellaneous tree crops and groves, not included in net area sown (a)	111 (1.1)	43 (0.5)	73 (0.7)	65 (0.4)
Culturable waste land (b)	426 (4.3)	123 (1.3)	283 (2.6)	183 (1.2)
Fallow lands other than current fallow ( c )	347 (3.5)	559 (6.0)	390 (3.5)	139 (0.9)
Current fallows (d)	492 (5.0)	102 (1.1)	235 (2.2)	154 (1.1)
Net area sown (NAS) (e)	5199 (52.8)	3493 (37.7)	4827 (44.2)	1863 (12.5)
Area sown more than once	989	1540	972	238
Gross cropped area (GCA)	6188	5033	5769	2101
Area available for cultivation (a+b+c+d+e)	6575 (66.7)	4320 (46.6)	5808 (53.2)	2403 (16.1)

Figures parentheses indicate % of TGA

\* Season and Crop Report, MS – 1994 - 95 (1998) Commissionerate of Agriculture, Pune.

The mining activities even though accelerated establishment of mineral based and other associated units and economic growth & urbanization of the region, but these developments disturbed adjoining lands by surface mining and created problems of land degradation through erosion and sedimentation disturbing local bio-diversity. Restoring disturbed lands and revegetation of all abandoned sites is an expensive and highly technical process, not undertaken



by many cost-conscious businesses. The measures presently being undertaken by Western Coal Fields and Moil in collaboration with NEERI as per directives of the State and Central Govts. are far from satisfaction.

The iron ore deposits are the most significant mineral occurrences of Bastar. One of the richest iron-ore deposits of the country occurring at Bailadilla Range, stretching for about 48 km in length from North to South and lying at 104 km from Jagdalpur. The flat tops of these ridges are the main iron ore blocks associated with banded haematite quartzites and ferruginous schists of the Bailadilla series. Another laterite capped iron ore band similar to Bailadilla, known as Rowghal deposits lies in Narainpur tehsil close to the Antagarh Narainpur Road. These are mainly haematite with some limonite at places and occur in the precipitous hills of 450 m elevation. Large limestone deposits occur at several places and of quartz and quartzites in Ziram area; besides small china clay deposits in Madpal, Maganpur, and western kukri- Dongri areas.

Mining activities at Bailadilla hills ruined the natural landscapes, supporting good forest cover and increased land erosion and sedimentation in rivers through drastic disturbances of lands and the underlying geologic strata. The activities also ruined the life of local tribals. The compensatory afforestation and resettlement activities have been undertaken by NMDC, which however appear too formal and meager in the face of horrendous damages to regional lands and natural flora & fauna.

#### **Bastar:**

A period from 1976 to 1981 was crucial to determine the relation between ideas of development and traditional conservation practices of local communities. During this period plan for industrial development for Bastar was prepared. Bailadilla mine operation was started for shipping iron ore to Japan and exploiting major chunk of the forest. This NMDC managed project destroyed vital, rare and endemic flora and fauna of Bailadilla area. The tribal community members were not accommodated in the employment force of mine, except as casual laborers, and tribal women as the domestic servants. There was a growing demand to start paper and pulp industry due to rich availability of raw material in Bastar. It was advocated that such project would create an employment opportunities for the tribals in Bastar.

A project called "Bastar Pine Plantation" was started with an intention to convert sal forest into pine forest that attracted so many controversies about its feasibility and fitness to protect biological diversity. It has neither contributed to supplement the livelihood of tribals nor enriched ecological conditions. Moreover this has ruined the sal vegetation of Bastar, which was the source of food security for the local communities. Much criticism was voiced against this project by biologists and ecologists at local and national level.

It was proposed to establish a paper and pulp mill at Tumnar and Hydel Power Project at Bodhghat. Local communities and environmentalists, on the ground that they would cause immense damage to the local ecology depriving the majority of the community people from their livelihood as well as great destruction to rare flora and fauna of the area, opposed both the projects. Since the formation of new Chhattisgarh State, the voice of industrial development is being aired to create scope for industrial units. It is a crying need of time to select projects in consideration of the survival of local people and natural resources.

Industrial policy of Bastar region needs to be considered in favour of conservation of natural resources and food security for tribal communities, who cannot survive in absence of forest and its resources, for their subsistence.

**Livelihood:**

Livelihoods of the major population of East Vidarbha depend on agriculture .The predominantly tribal areas like Deolapar, Ramtek and Katol have good forest cover and most of the locals depend on agriculture and forest as sources for their livelihoods. Some communities like Dhiwar, Koshti and Momin are involved in pisciculture and weaving respectively. The prominent Non Timber Forest Produce (NTFP) that are used by people are amla, behada, hirda, charoli, grasses, gum, honey, kattha, lakh (sealing wax), mahuwa flowers, leaves and seeds, tendu leaves & fruits, marking nut, medicinal plants, silk cocoon and jamun etc.

**The land is also used for following purposes:**

Major area of land is utilized for agriculture and forestry. Other uses are listed – grazing and various non-agricultural purposes like defence establishments, human settlements, industries and recreation & tourism.

**The pattern of utilizing various forest produce by the tribals from the area is given below.**

1.	Total number of plant species used by tribals:	252
2.	Number of wild edible plants used by tribals:	118
3.	Number of medicinal plants used by tribals:	111
4.	Number of medicinal plants used by tribals: for other requirements	48
5.	Number of primitive cultivars or their wild relatives recorded from the tribal area:	5

Padhye, *Ethno biological & Floristic Investigation of Chandrapur*

**Water Uses:**

Various sources of water are nallas, rivers, tanks and wells, which is mainly used for civil supply, fisheries, industries and irrigation.

**Past Forest Management of Bastar:**

Bastar was ruled by various dynasties from Nagwanshi to Somwanshi Kakatiyas. Raja was exercising recognized official powers in judicial as well as fiscal matters. They used to manage

natural resources with involvement of their community members. Local tribal community has a traditional & symbiotic relationship with forests, as they consider forest as their home, livelihood and their very existence of life. Forest gives them all kind of food.

From 1862 to 1876, feudatory chief was responsible for the forest management. The first forest policy was declared in 1894 & new forest regulations were imposed as the part of British Policy. Thus, the transformation of the powers of management of Bastars natural resources from royal control to Britishers took place. In British period, exploitation of forest resources started at large scale giving rise to felling of trees and during second world war; there was liberal supply of timber from all over the state. No marking or felling rules were observed for this supply. The forests were managed and worked on selection cum improvement system as an interim measure.

After Independence the government administered the management of forest as per the scheme laid down by Mr. C. Hewittson in 1952. This resulted in exploitation of natural Sal trees. No cultural operations were carried out to improve the young growth. In some areas good response from the crops were observed after thinning operations. Most of the timber was used for railway sleeper operations. The high quality Sal forest bordering Kanger River was preserved for their bio-aesthetic and landscape values

The forests of the area were managed very irregularly till the early part of this century. Shifting cultivation was prevalent everywhere. The working plan prepared by Mr. D. N Tiwari and Mr. R. L. Awasthi (during 1955 to 1971) was introduced for systematic management of reserved forests. The protected forests were surveyed, demarcated and managed on adhoc basis. Under the intensive management plan, supply of raw materials was made to the industries. After expiry of this plan, the forests were managed on adhoc basis from 1985 – 1988. A pine experimental circle was introduced in central, east and south Bastar as per management plan during the year 1974 –85. This plan has become an experiment of controversies.

Forest was divided into three categories: viz. Reserved Forests, Protected Forests and Village Forests. The forest department managed the reserved forests and permitting minor concessions on payment of dues for collection of fruits and grass. The protected forests were also managed by the department, but with rights of the community members over collection of NTFP, timber for the use of agriculture and household activities, and not for sale. The village forests were managed by the communities without any regulatory mechanism and hence depleted.

## Chapter II: Flora and Fauna

### 2.1 Ecological Profile:

Ecosystems that are prevalent in the region are:

#### 1) Natural

- a. Forests
- b. Grasslands
- c. Wetlands

#### 2) Man made ecosystems:

- a. Agricultural - Irrigated
- b. Agricultural - Non-Irrigated

#### Forests:

#### Vidarbha:

As per the classification of Champion and Seth following type of the forests occur in the area:

Southern Tropical Dry Deciduous Forests  
Southern Tropical Moist Deciduous Forests

Various botanists have investigated the flora of this area<sup>9</sup>

The vegetation is mostly dry deciduous type with semi evergreen species in certain areas. An admixture of a few evergreen species with dry deciduous species have been observed particularly in Nagpur and Bhandara districts of Vidarbha.

Forests are providing several services to mankind and ecology fulfilling requirements like food, fodder, medicines, fuel wood, timber and raw material to various industries in the form of gum, resins, medicines, honey etc. The forest play an important role in ecology like soil and water conservation, ground water recharging and providing shelter to various species of flora & fauna

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9. Hooker (1856), Brandis (1874), Witt (1908), Haines (1912 – 14 & 1916), Burkill (1910), Graham (1911), Sagreiya (1938), Mirashi (1954, 1957, 1960, 1961,1962, 1963). Kapoor, Vinodini, Donde (1966), Balapure (1966), Ugemuge & Padhye (1977,1978,1979), ) Ugemuge (1986), and Vinodini Donde (1966).

The major tree species in the region are Ain (*Terminalia tomentosa*), Lendi (*Lagerstroemia parviflora*), Dhavda (*Anogeisus latifolia*), Bija (*Pterocarpus marsupium*), Tendu (*Diospyros*

*melanoxydon*), Sag (*Tectona grandis*), Semal / Katesawar (*Bombax ceiba*), Mowai (*Lannea grandis*), Salai (*Boswellia serrata*), Haldu (*Adina cordifolia*), Surya (*Xylia xylocarpa*) along nullahs Arjun (*Terminalia arjuna*), Jamun (*Syzygium cumini*), Kusum (*Schleichera oleosa*), Hirda / Harra (*Terminalia chebula*), Anjan (*Hardwickia binata*), Mowai (*Lannea grandis*). Many shrubs and herbs like Dudhi (*Holarrhena antidysentrica*), Dudhi (*Wrightia tinctoria*) Dhyati (*Woodfordia fruticosa*), Murud sheng (*Helicteres isora*) are found in the region. Many climbers like Wasan vel (*Cocculus hirsutus*), Khobar vel (*Hemidesmus indicus*), Ichnocarpus fruticans, Hiwar vel (*Combretum decandrum*), Yeruni (*Zizyphus oenoplia*), Khajkujali (*Mucuna pruriens*), Chilati (*Acacia pinnata*) etc. are of common occurrence.

The species *Tectona grandis* has association with *Adina cordifolia*, *Terminalia tomentosa*, *Anogeissus latifolia*, *Pterocarpus marsupium*, *Lagerstroemia spp.*, *Madhuca indica*, and Bamboo – *Dendrocalamus strictus*. This Species often grows with *Hardwickia binata* (Anjan) and *Lannea grandis* (Mowai). These last two species suggest the dry nature of environment. The presence of *Adina cordifolia*, abundance of *Mangifera indica* in places suggests better conditions of rainfall. The climate is very hot and intolerable for about 4 months in summer and kills many non-woody species.

In Bhandara district, to a certain extent in Nagpur and to a greater extent in Chandrapur & Gadchiroli districts, we can observe several elements growing together, like the flora of upper Gangetic plains, flora of Khandesh, flora of Bastar in Chattisgarh and Orrisa. This is probably because of the gaps in Satpuda mountain ranges through which the plants of Vindhyan origin have come down to this area. The dry deciduous elements in the forests are more or less common, however their abundance and growth in different parts of it are not the same.

The flora of the Protected Areas of Chandrapur and Gondia districts belong to the tropical dry deciduous forest type with the domination of teak plants. The angiospermic plants dominate the region. Due to heavy rainfall and humidity the trees are loaded with epiphytic orchids like *Vanda tessellata* and parasites like *Cassytha filiformis*, *Dendrophthoe falcata*, *Viscum articulatum* etc. Bamboos are plentiful. There is no information available on the wetland habitats, rare and endemic plant species of Protected Areas of Chandrapur & Gadchiroli. In this region, large number of ponds (small and large) and the intersecting nullas and rivers are quite common. Aquatic plants such as *Ceratophyllum demersum*, *Nelumbium nucifera*, *Nymphaea nouchali*, *N. stellata*, *Pistia stratiotes*, *Dentella repens* are common. Besides this, herbaceous plants of *Eriocaulon diana*, *E. truncatum*, *Paspalum vaginatum*, *Rotala indica*, *Zyris pauciflora* are seen in marshy places. There are no endemic species for hardly a few have been recorded.

In Nagpur district, angiospermus flora is quite rich and varied with listing of 1136 plant species that fall under 669 genera and 142 families. The dicots surpass the monocots. The dry deciduous forests are found mostly in Pench, Deolapar, Ghatpendhri, Mansinghdeo, Kondhali range of Nagpur district. In Bhandara and Gondia districts dry deciduous forests are found in Nawegaon, Salekassa, Darekassa, Sakoli and Bhandara forest ranges. These forests mainly flourish with teak, *Anogeissus*, *Lagerostomia*, *Hardwickia binata*, *Madhuca indica*, *Pterocarpus (bija)* and other trees.

In the past, Nagpur district had total forest cover of 2419.06 sq. Kms (i.e. 24%) out of which 1336.4459 sq. Kms, i.e. 13% of the district, was owned by government and 1082.62 sq. Kms was private forest. Out of this private forest 466.2 sq. Kms was tree forest and 611.24 sq. Km

was scrub jungle (Zudpi) and grasslands. At present Nagpur district has 2007 sq. Kms of forest area, thus losing 412.06 sq Kms forest cover. <sup>2</sup>

Out of the total area of Bhandara & Gondia districts, 4299.37 Sq. Kms (45.81%) is forest area. Category wise, forest area is, 1343.34 Sq. Kms (31.24 %) Reserved Forest, 2167.16 Sq. Kms (50.41 %) Protected Forest and the remaining 788.86 Sq. Kms. (18.35 %) unclassified forest. The RF and PF are under the management of Forest Department and the unclassified forest is under Revenue Department. The present forest cover in Bhandara district is 3033.63 Sq. Km, thus losing 1265.74 Sq. Km

Zudpi jungle (Scrub forest) exists only in Vidarbha region of Maharashtra State. It is mostly in the jurisdiction of Revenue Department. Zudpi jungle is a forest of low growing plants with several woody stems coming from the roots – mostly wild, in uncultivated lands with or without trees.

#### **Bastar:**

The total forest area of Bastar is 20488 sq. Kms (52.198% of TGA) of which Reserve Forest is 10123 sq. km, Protected Forest is 5943 sq. km and Unclassified Forest is 4422 sq. km.

The forests of the region are classified as under (Champion & Seth):

- |      |   |
|------|---|
| I.   | Moist Peninsular high-level sal forest. |
| II.  | Moist Peninsular valley sal forest      |
| III. | Southern Moist mixed deciduous forest.  |
| IV.  | Slightly moist teak forest.             |

The forest cover mainly consists of sal and their associates. Sal is found in northern and middle Bastar and teak in the south Bastar (Dantewada district) and to some extent in north Bastar. Miscellaneous forests occupy mostly the hilly tracts. These can be diversely classified as follows:

- |    |                 |      |   |
|----|-----------------|------|---|
| 1. | Sal Forests:    | i    | Sal forest on the plateau.  |
|    |                 | ii   | Sal forest on the hilly region.                                       |
|    |                 | iii  | Under – stocked and degraded sub – types.                             |
| 2. | Teak forests:   |      | Alluvial teak forest  |
| 3. | Mixed Forests:  | i.   | Hill type with dense bamboos.   |
|    |                 | ii.  | Hill type with scattered or without bamboos                           |
|    |                 | iii. | Plains with scattered or without bamboos                              |
|    |                 | iv.  | Under – stocked and degraded sub – types.                             |
| 4. | Bamboo forests: |      | Bamboo forest overlapping sal and other miscellaneous forest species. |

### **People's Forest – Cooperative Forestry Management:**

Regulations were introduced after 1927 to allow privileges and concessions of the people in the forest called *Nistari*. The Forest Policy of 1894 stated that the state forests were to be managed in the interest of the people of India as a whole. Though the policy was intended to promote conservation, but all practices were performed to fetch production revenue. The Cooperative Forestry arrangements were instituted in Bastar in the late 1930 with remarkable success. The Forest Department along with community members decided to introduce simple working schemes for forest areas under control of Panch Committees, appointed by the villagers. The scheme was devised for nistari block of around 25 sq. Kms. and called Ulnar Scheme, which catered the need of 15 villages around Jagdalpur with 1600 houses and more than 6,000 cattle.

The area was demarcated, surveyed, mapped and brought under community management for protection and sustainable use. Each village in proportion to land revenue assessment financed the scheme. This scheme operated for a period of 16 years. The entire area was found regenerated very well and could meet nistari requirement (small timber, bamboo etc.) of villagers. This is the success story of people's forest that was created and worked by the people and for the people.

A report written by Aurora and Reynolds in 1975<sup>10</sup>

### **Grasslands:**

There are no extensive grasslands in the region, however small extent of grassland (1565 ha) exists in Umred range of Nagpur district, which is managed by Forest Department. Villages Champa, Vihirgaon, Makardhokda, Fukeshwar in Umrer Taluka and Mahalgaon in Nagpur Taluka of Nagpur district are ideal for the habitat of Great Indian Bustard and Lesser Florican.

The types of the grasslands are "Sehima -Dicanthium". The predominant species of grasses Cynodon found in the region are Themeda quadrivalvis, Isolema laxum, Apluda varia, Eragrostis tenella, Cynodon dactylon, Imperata cylindrica, near the lake – Vetiveria zizanioides, Heteropogon contortus, Sehima nervosum etc. with Bamboos.

### **Aquatic Ecosystem:**

Wetlands of the region form diverse habitats ranging from rivers and their tributaries, rain fed tanks and lakes to swamps harbouring enormous floral & faunal species. Some of the species are endangered. Nagpur District was having 1100 irrigation tanks and nearly 800 wells earlier<sup>11</sup>. Most of the tanks are dilapidated and only 218 tanks exist at present. The wetlands in Umrer taluka are famous for aquatic floral biodiversity, and as much the tanks in Ramtek taluka offer shelter to varied species of aquatic flora and fauna.

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10. R. Anderson, W. Huber, *The Hour of the fox*, chap.3, pg.40 – 41, 11. Nagpur District Gazetteer

Some wetlands in urban areas have biological significance due to diversity in flora and fauna acting as major rainwater harvesting systems. Ambazari, Futala, Gorewada and Sonegaon are major tanks in Nagpur city.

The aquatic vegetation of Nagpur district includes about 115 dicots, 90 monocots and pteridophytes. The major species are *Ceratophyllum demersum*, *Lemna* sp., *Nelumbo nucifera*, *Nymphaea nouchali*, *N. stellata*, *Pistia stratiotes*, *Trapa bispinosa*, *Utricularia* sp and number of algal forms like *Chara*, *Spirogyra* etc. Recent study on Wetland areas of Bhandara<sup>12</sup> confirmed that 73% aquatic flora of Maharashtra is represented by Bhandara and Gondia districts.

Bhandara and Gondia districts are called as “ Lake Districts ”. There are about 14,338 (580 large/13758 small) water tanks, situated in gneissic terrain and favouring longer retention of water. These water bodies were constructed by the community people and malgujars to harvest rainwater. These wetlands are rich with aquatic flora and shelters variety of water birds, fishes, otters and other micro fauna. They also constitute an important and vital source of irrigation.

Some of the biologically significant water tanks are Itiadh, Chulbandh, Seoni Bandh, Chorakhamara, Bodalkasa, Mangad and Nawegaon bandh. The major rivers flowing in the area are Wainganga and its tributaries like Pench, Kanhan, Kolar, Sand and Bagh that are known to contribute for the aquatic ecosystem. The most common aquatic vegetation includes *Aponogeton*, *Bixa*, *Nelumbo*, *Potamogeton* and *Pistia*.

## 2.2 Current range and Status of Biodiversity:

The forests, grasslands and wetlands are prominent natural ecosystems of the region. The forest ecosystem occupies larger area and assures importance from the biodiversity point of view. Various biotic pressures pose a threat to the biodiversity conservation efforts, in the region.

### Flora of Vidarbha region:

The forest ecosystem of the ecoregion covers 45029 sq. Kms area. The region wise forest cover is 22670 sq. Kms in Vidarbha and 20488 sq Kms in Bastar. Which represents 50.30 % and 52.19 % of total geographical area (TGA) of the regions respectively. The extreme east part of Maharashtra State (Nagpur, Bhandara, Gondia, Chandrapur and Gadchiroli districts) has rich forest cover, and possesses vast biodiversity in respect of angiosperms and non flowering plants like algae, fungi etc. The plant biodiversity appears dominated by the angiosperms in all districts of east Vidarbha.

The forest areas of these districts have not only excellent quality of timber species but also the species of economical and medicinal importance. The minor forest products like *Butea monosperma*, *Diospyros melanoxylon*, *Emblica officinalis*; *Madhuca indica*, *Terminalia bellirica*, *Terminalia chebula* etc. are the source of livelihood for the locales. Apart from these tree species, herbaceous flora of this region is very unique that includes many important medicinal plants such as *Andrographis paniculata*, *Asparagus racemosus*, *Chlorohytm borivalianum*, *Curculigo orchioides*, *Chlorophytum tuberosum*, *Gloriosa superba* etc. An indigenous species “ *Scirpus kernii* “ is recorded in Ambala tank near Ramtek in Nagpur district. This plant is found only in Africa.

(12. Bhuskute, S.M. 1995, Wetlands of Bhandara)

**Table 5: Floral Biodiversity in Vidarbha** <sup>13</sup>



Angiosperms			
District/ Ecosystem	Dicot	Monocot	Total
Nagpur	866	302	1168
Bhandara/ Gondia	476	120	596
Chandrapur/ Gadchiroli	905	293	1198
Wetlands	115	90	205
Pteridophytes			Total
Nagpur			19
Bhandara/ Gondia			6
Chandrapur & Gadchiroli			30

The information on plant diversity in the study area appears fragmentary. Only higher plants, that is Angiosperms were given attention while the information regarding lower plant groups, that is Pteridophytes, Bryophytes and Thallophytes received very meager attention and far from satisfaction. Even the academicians have not given proper justice to an inventory of these groups, since the lower plant groups are the primary producers.

The plants found exclusively in Bhandara & Gondia districts of East Vidarbha region are listed<sup>14</sup>:

1. Alocasia fornicata Edgen
2. Eriocaulon maritimum Wallion ex Koernick
3. Hemionitis arifolia (Burm) Moore
4. Isoetes mahadevensos Srivastava, Pant & Shukla)
5. Lasia spinosa (L.) Thw
6. Molineria trichocarpa (Wight) Balakr
7. Ophioglossum nudicaule Linn var. macrorrhizum (kunz) clausen
8. Stylidium tenellum Sw
9. Utricularia foveolata Edgew
10. Utricularia minutissima Vahlia

13. Ugemuge, N. 1986. *Flora of Nagpur district.*, Bhuskute, S. 1989, 1990, 1991, 1995. *Indian Botanical Report.*, Mirashi, M.V. and Paradkar, S. A. 1961. *Current Science*, PP 30, 4., *Gazetteer of Bhandara district.* 1979., Malaohtra, S. K, and Rao, K.M. 1987. *J Econ Tax*, Vol. 2, PP 107 – 136., Bhuskute S. 1996. *Biodiversity of Wetlands in Bhandara district*, PP 23, Moghe, and Patil. 1991, 1993. *Ph. d Thesis on Flora.* Malhotra, and Moorthy. 1974. *Current Science, 1961*, Bhuskute, *Biodiversity in Wetlands of Bhandara District.* Malhotra & Moorthy. 1974., Moghe, Ph.D. Thesis, 1991-93

14. Bhuskute, S.M. 1993. *Indian Fern Journal*, v. 10, pp 75 – 76 and 1997, pp 19 – 20., Bhuskute & Yadav. 1999. *Journal of BNHS*, issue no.96, pp 176 – 179.

**The following areas have rich floral-diversity.**

Nagpur district: Forests in Khapa, Katol, Kondhali, Ramtek and Umrer ranges including an area of Pench National Park.  
Gondia district: Forest ranges of Amgaon, Arjuni Morgaon, Chichgad, Deori, Goregaon, Rajoili, Salekasa including Nagzira Wildlife Sanctuary & Nawegaon National Park.  
Bhandara district: Bhandara, Pauni, Sakoli, Tumsar, Tiroda and ranges.

There are sensitive areas, which are listed below, where threatened species are found. Some species of this area are not present elsewhere in the state.

- In Nagpur:     1.     Ghatpendhri – Salaighat area  
                  2.     Pench region  
                  3.     Pilkapar hills  
                  4.     Ramtek  
                  5.     Umrer region for aquatic biodiversity
- In Bhandara:  1.     Darekasa  
                  2.     Itiadoh region  
                  3.     Gaykhuri ranges  
                  4.     Khairi hills near Gondia  
                  5.     Navegaon hills  
                  6.     Nagzira region
- Gadchiroli & Chandrapur districts:
- |                       |                          |
|-----------------------|--------------------------|
| 1.     Bhamragarh     | 2.     Binagunda         |
| 3.     Bedgao Korachi | 4.     Jimalgatta region |
| 5.     Kuwakodi       | 6.     Kopela            |
| 7.     Pendhri        | 8.     Ramdegi           |
| 9.     Tipagarh       |                          |

### Flora of Bastar:

#### Status of Forest in Jagdalpur Circle:

##### 1.     Bailadila, Pamed & Awapalli Forest-

This dense forest area lies to the south of Dantewada and comprises mainly sal and bamboo. Bailadila forest is comparable to Himalayas (Sikkim, Assam), Satpura and Nilgiris because of its location on high altitude and forming continuous ecoregion in the past as per Satpura hypothesis. The flora and fauna is remarkably different from the adjacent forests, which includes many varieties of *Rudraksh* (*Elaeocarpus* sp.), *tree fern* and *oranges* etc.

Pamed Sanctuary and Awapalli forest is situated adjacent to Bailadilla.

##### 2.     Bijapur, Bhopalpattanam and Indravati National Park-

It is situated in the middle – west of Bastar and has very dense forest cover, mainly comprising of sal, bamboo and their associates, including medicinal plants

### 3. Kanger Valley, Machkot and Darbha Forest.

This area is rich in flora and consists of sal, bamboo and their associates with small ecotone of sal and teak. Kanger Valley National Park is a hotspot for floral diversity in the Central India Ecoregion having forest density of 0.6 and above. Sub – terrain long limestone caves like Kotamsar, Kailash, Dandak, Devgiri, Aranyak are also found in the Kanger Valley National Park.

### 4. Golapalli and Kistaram Forest in South Bastar-

The area comprises teak and miscellaneous forest.

**Table 6 : Plants found in Bastar region**

The plants listed in the Bastar area	
<b>I) Total plants species</b>	<b>273</b>
Trees	130
Shrubs and Herbs	66
Climbers & Parasites	48
Grasses	29

Source: 1. Working Plan for Central Bastar Forest division, Jagdalpur circle, Volume - I,  
2. Working Plan, Narayanpur Forest Division

#### Medicinal Plants:

The important areas in Bastar are Abujmar, Antagarh, Chhote Donger, Kurandi, Kanger Valley, Machkot, Awapalli, Bijapur, and Bailadilla and Bhanpuri. Medicinal plants mainly found are *Safed musli*, *Kali musli*, *Adrak*, *Shatwari*, *Tikhur*, *Sarpagandha*, *Kuchala*, *Harra*, *Baheda*, *Awala*, *roots and tubers*, *Tejraj*, *Wild sugarcane*, *wild turmeric*, *Wild onion*, *Brinjal* etc.

#### Status of Trees:

Trees are dotted with epiphytes, which grow in high rainfall and humid climate. The trees are tall, without any forking, and the climbers have twined trees. Woody climbers were also common. Principal trees are *Sal (Shorea robusta)*, *Teak (Tectona grandis)*, *Saja (Terminalia tomentosa)*, *Mango (Magnifera indica)*, *Dhawda (Anogeissus latifolia)*, *Haldu (Adina cardifolia)*, *Harra (Terminalia chebula)*, *Bahera (T. belerica)*, *Seona or Gomhar (Gmelina arborea)*, *Kusum (Schleichera oleosa)*, *Tendu (Diospyros melanoxylon)*, *Rhoni (Soyimida febrifuga)*, *Bhirra (Chloroxylon swietenia)*, *Karmeta (Dillenia pentagyna)*, *Arjun (Terminalia arjuna)*, *Sinduri (Mellotus philipensis)*, *Karanj (Pongamia pinnata)*, *Mahua (Madhuca indica)*, *Sulphi (Caryota urens)*, *Tar (Borassus flabellifer)*, *Chind or Wild Date Palm (Phoenix sylvestris)* etc.

Threatened floral species in the area are *Rudraksh (Elaeocarpus genitrus and other sp.)*, *Garud*, *Anjan (Hardwick a binata)*, *Awala (Emblia officinalis)*, *Kanta Siris (Albizza odoratissima)*, *Tejam (Xanto oxylumresta)*, *Char (Buchania lanzam)*, *Bija (Pterocarpus marsupium)*, *Salai (Boswellia serrata)*, *Kuchla (Strychnos nuxvomica)*, *Shisam (Dalbergia latifolia)*, *Jamrasi (Elaeodendron glaucum)*, *Champak (Michelia champaca)*, *Semel (Bombax ceiba)*, *Munga (Moringa oleifera)*, *Cane (Calamus tenuis)*, *Khair (Acacia catechu)* and many medicinal plants etc.

Floral species, *Uraria prunellaefolia*, once located in 1952 in the Bastar forest, appears extinct. *Hoya wrightii* (Asclepiadaceae), a large perennial climber found in Bailadilla hills, becoming totally epiphytic is rare because of habitat destruction due to clear felling of forest trees.

#### Status of Forest in Kanker Circle:

1. **Kurschel Valley** situated towards south of Medki rive between Antagarh and Narayanpur . Its total area is 2840 ha and forms catchments of Kurschel nullah. This valley forest has dense vegetation with density of 0.7 & above. It is mainly southern moist mixed deciduous forest with trees having average height above 40 m and girth above 5 m. Trees are mostly miscellaneous with little sal, teak and bamboo.
2. **Sonepur Forest** is located near Sonepur adjacent to Kurschel Valley. The area is dense sal forest.
3. **Chhote Donger Forest** is located on the banks of Indravati River opposite Barsoor, and the dense forest area is 80 sq. km.
4. **Makdi Forest** is located in East Kondagaon. The land is mostly flat and forest cover consisting of mainly Sal is 92% with density varying between 0.5 and 0.8.
5. **Antagarh Forest** is located in Bhanupratappur division near Antagarh. This 40 sq. Kms. area of dense forest is dominated by Sal.
6. **Paralkot Forest** is situated in Paralkot adjacent to Maharashtra border and Abujmar area comprising mainly sal and bamboo. Reported dense forest area is about 82 km<sup>2</sup>.
7. **Amabeda and Korar Forest** (90 sq. km) is sal forest whereas Korar forest is of miscellaneous type (30 sq. km).

**Rich areas of medicinal plants in Kanker circle are** Makdi, Korar, Antagarh and Chhote Donger.

Most of the forest areas in Bastar have encroachments in large scale and honey combed throughout forest. Good forest cover restricted to small patches. Rare and threatened species found are *Bija*, *Tinsa*, *Dhoban*, *Kermeta*, *Salai*, *Awla*, *Haldu*, *Kullu*, *Semal*, *Keked*, *Maida/Mendha* (*Litsea sebifera*), *Pader* (*Stereospermum suaveolens*), *Siris*, *Shisham*, *Maked tendu*, *Shikakai*, *Khammar*, *Baheda*, *Kusum*, *Ganfunas*, *Kachnar*, *Kadam*, *Khair*, *Bis tendu* (*Diospyros montana*). Apart from sal and teak all other trees are on the verge of extinction.

#### Fauna:

This area has a rich faunal diversity that includes pisces, reptiles, amphibians, birds, mammals etc. The varied climatic and geographical conditions provides ideal habitat to broad range of faunal species. Almost all species recorded in central India are found. The animals like gaur, leopard, sambar, sloth bear, spotted deer, wild dogs are found in open deciduous hill forest. The wild buffalo and swamp deer are found in moist forest areas of Bastar and adjoining area of Gadchiroli district (East Vidarbha). The other major species of the area include tiger, hyena,

four – horned antelope (chausingha), neelgai, chinkara, blackbuck, otters, slender loris, crocodile etc. Nearly 49 species of fishes, 236 species of birds, 181 species of insects, 49 species of butterflies, 68 species of odonata (Andrew & Tembharye) and 20 species of snakes have been recorded in this area. Various species of insects, micro fauna, and reptiles are not documented.

In Vidarbha, important species like Slender Loris, Blackbuck, Great Indian Bustard, Gaur, Crocodile, Lesser Florican, Mouse Deer, Danid Egg fly (Butterfly), Adjutant Stork and Sarus Crane etc. occur. In this region, seven Protected Areas (3 National Parks and 4 Wildlife Sanctuaries) are constituted for the conservation of flora & fauna. The wildlife wing of State Government, with the objectives of biodiversity conservation, is managing PAs and so, there is more thrust on fauna and its habitat. There is a higher degree of protection to the fauna and its habitat as compared to the other forest and non-forest areas. In non-PAs, including forest and non-forest, wildlife is vulnerable to various pressures like habitat destruction, poaching, diseases etc. The extent of such areas is more, and therefore, there is an urgent need to tackle problems, relating to the conservation of these areas.

Earlier, Wild buffaloes were reported in Gondia & Gadchiroli districts of Vidarbha. They are not sighted at present, barring sporadic sightings in Kamlapur range of Gadchiroli district, adjoining to Bastar. Tigers occur in all five districts of Vidarbha. Recent census of 2001, revealed higher population, as 66 in PAs and 50 in non-PA areas. But, present population is far less than found some 15-20 years before. The Great pied Hornbill is sighted in the moist belts of Nawegaon & Pench National Parks. Fresh water crocodile is found in Pench and Tadoba National Parks.

Slender loris, which is an interesting nocturnal animal, has been reported in Nawegaon National Park and it is the first record from the area. Great Indian Bustard, a magnificent bird of grassland, is predominantly seen in agricultural fields in Nagpur district. Another grassland bird lesser florican has also been reported from Nagpur district. These have very restricted distribution. The wetlands of Bhandara & Gondia districts are extensive aquatic habitats, for range of fauna from invertebrates to mammals. Tiger was the common animal found in the Bastar region. All the faunal species that are known as the habitat of Central India Ecoregion are found. At present the existence of all the wild animals has become a threat due to uncontrolled poaching. *Elephant*, *Lesser Indian Rhinoceros (Rhinocerosondaicus)* got extinct some 200 to 300 years ago, from Bastar. Swamp deer (Barsingha) was reported extinct for the last 20 years, but recently it was seen in the Indravati National Park. *Caracal (Felis caracal)*, *Lesser tiger cat (Felis viverrina)*, *Badger*, *Hedgehog*, *Ratel* are no more sighted and probably they might have become extinct from the Bastar region. Other threatened animals are *Wild buffalo*, *Gaur*, *Tiger*, *Leopard*, *Leopard cat (Felis bengalensis)*, *Jungle cat (felis chaus)*, *Fishing cat*, *Civet cat*, *sloth bear*, *Four horned antelope*, *sambhar*, *Barking deer*, *Otter*, *Ghariayl*, *Binturong*, *Flying squirrel*, *Giant squirrel*, *Hog deer*, *Loris*, *Mouse deer*, *Monitor lizard* etc.

**Table 7: National Parks & Wildlife Sanctuaries of Vidarbha region (area in sq. Kms)**

Area	Total Geographical Area (Sq. Kms)	Protected Area	Percentage of total geographic Area (%)
Maharashtra State	3,07,713	15,684	5.09%
Vidarbha Region	97,404	3,604.48	3.71%
Nagpur Division	51,377	1,408.93	2.74%
Nagpur Dist.	9,892	257.26	2.60%
Bhandara Dist.	9,321	286.69	3.00 %
Chandrapur Dist.	11,443	625.82	5.46%
Gadchiroli Dist.	14,412	239.16	1.6%

**Table 8: Districtwise National Parks and Wildlife Sanctuaries of Vidarbha/Bastar Region**

District	Area km <sup>2</sup>		Total Area
	National Park	Wildlife Sanctuary	
Nagpur	Pench (257.26)	_____	257.26
Bhandara including Gondia	_____	_____	_____
Chandrapur	Nawegaon (133.88)	Nagzira (152.81)	286.69
Gadchiroli	Tadoba (116.55)	Andhari (509.27)	625.82
Bastar	_____	1. Chaprara (134.78) 2. Bhamragad (104.38)	239.16
Dantewada	Kanger Vallye (1020) Indravati (1258.37)	Bhairamgarh (138.95) Pamed (262.12)	1020 1523.44
Kanker	_____	_____	_____

Bastar once was a paradise of all types of Indian birds, but due to hunting and poisoning, the faunal diversity is depleting at an alarming rate. Common birds were Pea fowl, red jungle fowl (*Gallus ferrugineus*), Grey jungle fowl (*G. Sonnerati*), Rain quail, Painted quail (*Lawa*), Red vented bulbul, Drongo, Racket tailed Drongo or Bhringraj. Tree pie, Wood pecker, Magpie robin, Indian robin, Oriole, Bee eater, Owl, Night Jar, Indian Myna, Pigeon, Parakeet, Munia etc.

#### **Bastar Hill Myna:**

The Hill myna (*Gracula religiosa*) is endemic to Bastar. It was found in abundance in Kanger range during 1988- 92. Because of its great demand as an excellent talking bird, its young ones are removed from the nest and then reared to be sold in the local market

Among the threatened species of birds are *Bastar Hill Myna (Gracula religiosa pennisularis)*, *Lesser florician or likh (Syphiotis aurita)*, *Hornbill*, *Hareba*, *Ibis*, *Crane*, *Sarus*, *Bittern*, *Coot*, *Bronze winged Jacana (Metopidus indicus)*, *Purple moorhen (Porhyrio policephalus)*, *Wood snipe (Gallinago nemoricola)*, *Painted spur fowl (Galloperdix lunulata)*, *Red spur fowl (G. Ferruginesus)* etc.

Among ducks almost all are either threatened or under the threat of extinction, which include small whistler or ahiri (*Dendrocycna javanica*), *Bhurrei*, *Tufted pochard or Dumur*, *Comb duck (nakta)*, *Sheldrake*, *Wood duck*, *Cotton teal*, *Pink headed duck (Rhodonessa caryophyllacea)*, *Pintail or Dauna*, *Spotted Bill or gugal*, *Gadwall*, *Blue winged duck* etc.

In the Kanker Forest Circle, status of wild animals appear poor. All wild animals including tiger, leopard, cheetal, sambar, wild boar, barking deer, sloth bear and gaur are decreasing at an alarming rate due to poaching activities.

#### **Insects /Dragonfly and micro organisms /fish faunal diversity of Bastar:**

The dragonflies are known to be one of the best biological indicators of ecological degradation and pollution in the water bodies. They form an integral part of a food chain in the ecosystem. This group of insects is, therefore directly associated with the welfare of mankind in particular, and concerned with agriculture, medicine, veterinary and environmental sciences.

Adult dragonflies are of great agricultural importance as active feeders of various pests of paddy, wheat, cotton, sunflower & swarms of termites and thus acting as natural “friends of the farmers”. The dragonfly larvae feed on various dipteran larvae, including mosquitoes and other vectors, which spread fatal diseases like malaria, filaria, yellow fever, dengue etc.

#### **Dragon Fly:**

**This area has 66 species of Dragonflies that are one of the best biological indicators of the ecological degradation & pollution in water bodies. They are active feeders of various pests of paddy, wheat, cotton, sunflower & swarms of termites and thus act as natural friends of farmers. Their larvae feed on the larvae of mosquitoes & various dipterans flies which spread fatal diseases like malaria, filarial, yellow fever & Dengue.**<sup>15</sup>

The ecological conditions of Bastar provide excellent breeding habitats like forest, grasslands, rivers, hill-streams, water bodies and paddy fields for dragonflies. Nearly 128 species of the dragonflies are reported from Bastar area.

Information relating fauna in different ecosystems of Bastar plateau is vital not only to know about their status, but also to focus upon their conservation in natural and agro – ecosystems.

The lifestyle of different organisms in different seasons of a year is not uniform

**Insects Reported in Bastar:**

Mayflies, Dragonflies, Damselflies, Mantids, mole Cricket, Grasshoppers, Locusts and Cricket, Termites or White ants (*Odentotermes* sp., *Microtermes* sp.), Bird lice, Bugs (Reduviid bugs, Tea – mosquito bug, Pentatomid bugs, Water bugs), Tree hoppers, Mango hoppers, white fly, Aphids, Scale insects and Mealy bugs, Lac insects – *Laccifer lacca*, Thrips, Moths and Butterflies – Bark borers, Leaf webber, Tamarind fruit borer, Tussor silk moth, Red hairy caterpillars, spingid moth, Greasy cutworm, Fruit sucking moth, Gall midges, Fruitflies, Braconids, Wasp, Eulophids, Ants, Bees *Apis indica*, *Apis dorsata*, *Apis florea*, Beetles – water beetles, Dung beetles, white grubs, Rhinoceros beetles, Lady bird beetles, Mango stem borer, Teak borer, Sweet potato weevil.

Source: Suribabu.1999. *Insect diversity of Bastar*

**Fisheries:**

Bastar region has perennial water streams, rivers and ponds, that shelters diverse aquatic fauna. The fish is the major aquatic fauna found throughout Bastar. Nearly 49 species of fish has been reported from Indravati River, of which the carp family is abundant and *Kokia* (*Channa punctatus*) is highly priced for its medicinal properties.

Bastar has predominantly tribal population that largely depends on Indravati and other rivers for their livelihood. A population of Maria and Muria gonds and other ethnic groups with Kuruk fishermen, who represent a sub class of the Gond occupy all the major fishing spots.<sup>15</sup>

It is the common practice in Bastar to construct a series of embankments for retaining and supplying rainwater for the paddy fields. During the rainy season small traps are made out of reeds and canes to capture small fish that get stranded in the fields. The villagers build *bisar*, wicker – work platforms supported by large boulders, sloped against the stream so that small fish like the kotri (*Barbus stigma*) are unable to pass and thrown out from running water on the platform.

In the event of poor harvest, villagers supplement their diet with wild edible plants, fish and small mammals that are abundant in the area. Tribals have knowledge of fish fauna, their role in ecology and techniques to protect them for sustainable use. They also have skill of fishing by indigenous methods. Micro fauna consists of phytoplankton, zooplankton and others.

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15. Z. Cooper, *Around Chitracot fall*, Imprint, September 1981.

Macro fauna consists of fishes, small prawns, crabs, tortoises and turtles. There are some specific areas, where particular species are easily located, especially fish fauna. *Anguila* sp (*dudum*) can be found only in the river towards west from chitrakot fall, *Bagarius bagarius* (*bodh*) near Barsoor and lesser in the vicinity of Chitrakot and major carps near Godawari confluence. Local majors are the only dominant fish fauna.

The State Government, under the name of development, implemented various schemes for the development of pisciculture within region by introducing exotic species (Sarkari Machli) like rohu, katla, mrigal in various water bodies and most of them feed on small fishes; as a result



local fish species have become endangered. It is difficult to locate fish like Sarangi (*Chela bacila*), Dhesara and fish like Dudul (*Anguila bicolor*), which are almost on the verge of extinction. Dudul and Dudum fish have medicinal value in treating TB patients. This fish is only available in Bastar and if sporadically caught will be sold at high prices in Durg, Jagdalpur and Raipur markets.<sup>16</sup> The fish fauna forms an integral part of ecosystem playing a vital role in controlling various pests and also acting as a source of livelihood for tribals. It is the need of time to protect these treasures by structuring and executing wisely various developmental schemes relating to pisciculture.

Most of the minor carps and small sized fishes feed on phytoplankton, except *Glossogobius* sp. Green and blue green algae form an important food item of fishes viz. *Esomus* sp. *Puntius* sp. etc. Insects and their larvae form also an important food of piscivorous adult *Glossogobius*. It is recommended that the fishes like *Pangasius pangasius* may be transplanted for efficient utilization of molluscan fauna.

#### **Some threatened Wildlife Species of the Area:**

Great Indian Bustard  
Jerdons Courser  
Lesser Florican  
Sarus Crane  
Blackbuck  
Gaur  
Leopard  
Slender Loris  
Sloth Bear  
Swamp Deer  
Tiger  
Wild Buffalo  
India Wild Dog  
Wolf  
Lesser Adjutant  
Fresh water crocodile

#### **Biodiversity in Sericulture:**

Bastar is well known for its traditional Tasar silkworm rearing by its tribal people; it is non-mulberry silk production. Tasar silk is mainly a product of *Anthera mylitta*, a species feeding on foliage of *Terminalia tomentosa* and *Terminalia arjuna* found in the jungles. The Tasar silkworms also exist in natural forest. Its cocoons are collected by the tribals during certain seasons.

The first crop (seed crop) is raised in May-June whereas the commercial crop is raised in May-June, whereas the commercial crop is raised during October-November. Moths emerge from the cocoons of the November crop in June. The female moths are allowed to lay eggs after

copulation with the males in small baskets called manias. The eggs, after collection are tied to the trees so that the green coloured larvae, after hatching, crawl up to reach the leaves of the food trees. The wild rearing exposes the worms to the vagaries of nature and predators. The larvae pass four months before completing their larval duration of 30-32 days and thereafter; the Larvae crawl in search of hideouts to spin cocoons.

The cocoons are large and brown yellow. The cocoons after collection are cooked in hot water and either reeled or spun to extract the fiber for manufacturing of coarse silk fiber. Other species are *Antherea roylei* and *Antherea Permyi*. Their hybrids are commercially exploited for production of quality tasar silk. These species exhibit voltinism; particularly univoltines and bivoltines are reared in central India. Therefore a clean and specific strategy and action plan after conducting long-term studies is required to conserve native wild strains and to promote substantial utilization.

Nearly 26 lakhs cocoons were utilized during the period from 1992-2000 for different field area of 16 potential forest ranges out of 21 ranges in Bastar identified for the availability of naturally grown cocoons. The harvests are poor because of special nature rearing. The available data suggests a collection of 300 lakhs cocoons per year of *A.roylei* eco-race in the Bastar forest, which includes respectively 200, and 100 lakh cocoons during the first and second season collection.

#### **Biodiversity in Medicinal Plants:**

Bastar forest, in addition to meeting the routine requirement of firewood, grazing and timber are rich source of medicinal plants. Local tribals use the crude botanicals as medicines for their illness and also source of diets, indicating their total dependence on biodiversity of forest. Their traditional lifestyle has many rituals, religious and spiritual persuasions, habits and beliefs etc. That is a two-way link existing between their culture and biodiversity.

Natural Sal forests in Bastar are rich source of medicinal plants (70-80% plants of forest undergrowth) than sal forest of Madhya Pradesh and other parts of Chattisgarh because of less biotic pressure and favourable climatic conditions. The tribals collect a variety of tubers, seeds, rhizomes, nuts, flowers and barks which are either utilized for domestic purposes or sold to local traders at nominal prices. Treasures of medical flora are mainly located in forests of Abujhmar, Bailadilla Hills, Kanger valley and Kurundi. Other potential areas of forest are Antagarh, Awapath, Bhanpuri, Bilapur, Chhote-Donger, Dantewada, Darbha, Keshkal Valley, Korar, Mochkot, Makdi, Sukma and Raoghat. Nearly 174.3 species have been reported from Raoghat (North Bastar). The SFRI Jabalpur listed 645 species of medicinal plants in Bastar. The villagers collect varieties of tubers, rhizomes, leaves, flowers, barks, seeds, nuts etc. of great medicinal value for the domestic purposes and rest are purchased by the local traders and contractors at nominal rates. Following are the well-known storehouses of Medicinal Plants.

- 1) Abujhmar
- 2) Bailadilla Hills
- 3) Kanger Vallye
- 4) Kurundi

#### **Other potential hot spots are:**

Antagarh, Chhote Donger, Makdi, Raoghat, Korar, Machkot, Awapalli, Bijapur, Bhanpuri, Keshkal valley, Darbha, Sukma and Dantewada.

### Tribal Culture and Biodiversity <sup>17</sup>:

Tribal community worship nature. Forests and its resources are considered sacred, as these are important in their life. All their deities are worshiped at a sacred place in the forest and, it is believed that all tribal deities reside on different types of trees. All parts of trees are given place in cultural programs like a bridegroom wears crown of leaves in marriage. They depend on tubers, roots, fruits, flowers and leaves as their food. All their religious, social and cultural activities, right from their birth to death, reveal that they have deep attachment & symbiotic relationship with forest and its resources.

#### **Bailadila hills:**

Comprisons of rare flora and fauna of this region with the flora and fauna of Western Ghats as well as the Northeast states gave rise to Satpuda Hypothesis. Two Hypes called Nandi raj and Pitoorani are between 3000 and 4000 feet above sea level. The gully valley is a wide and verdant of land gleaned more like an Assam valley more than the Central India Ecoregion. Down near the river there is a dense almost impassable evergreen jungle full of wild banana, bamboos, trees, ferns and giant trees of many wear kinds. Hill stream fish - a collection of 13 kinds of hill stream fish was made from the perennial streams that flow from Bailadila. There are two species of Rudraksha (*Elaeocarpus genitrus*, *Elaeocarpus lancofolia*) having affinity with eastern Himalayas, Sikkim, Ociai hills and Eastern Ghats

13 species of fish were recorded from the perennial streams that flow from Bailadilaby Dr.H.Crookshank.

1. Mastacembelus armatus (lacepede)
2. Danio aequininnatus (McClelland)
3. Rasbora Daniconices (hamilton)
4. garra mullya (Sykes)
5. Parapsilorhynchus tentaculatus (Annandale)
6. Barbus amphibius (Cuvier & Valenciennes)
7. Barbus pinnauratus (Day)
8. Barbus tictocto (Hamilton)
9. Nemachilus botia var. aureus (Day)
10. Nemachilus dayi (Hora)
11. Nemachilus evezardi (Day)
12. Glyptothorax dekkanensis (Gunther)
13. Ophicephalus gachua (Hamilton)

17.Taram P., *Environment, Cultural, Forest Conservation* and Verma, S.C.2000.A unpublished note on *Bastar*

Tribals identify and maintain different sites with tree cover for various social and cultural programmes like village boundary, crematory, cattle yard, gotul / sipahi gudi, market yard and panchyats meeting place, deogudi, river bank, pond and bunds, hut for women in menstruation. They protect all species of trees found at these places. This is the best example of Community Managed Conservation Sites.

Tribals worship air, water, hills, soil, and forests as a deity. Their gotra (Clan) is concerned with various species of wildlife, birds and plants. Bastar tribals worship nearly 30 deities. It is believed that the specific deity reside on a particular tree species, e.g. Buddhadeo & Lingopen on Saja, Amaltas & Karanj, Raopen on Saja and Amaltas, Phirantin Mata on Bargad, Peepal and Guler, Mauli Mata on Sal, Aam and Saja, Bhairam Baba on Sal, Saja, Mahua and Aam etc. They use trees like Mahua, Sulfi, Sal, Tad, Chind, Saja, Bans, Guler, Jamun, Ghaas, Kusum, Aam and Sagwan in various rituals, like celebration of births, marriages, cremations, re-marriage of widow and widower and marriage of trees. Trees & their parts are used during

festivals and for different household and agricultural activities, particularly for fencing, cattle yard, watchtower, housing, preparing bowl & plates, and as fuel wood.

“ Mati Pujari” is a knowledgeable person & religious headman of the village, who guides and helps tribals in cultural and religious programs. He is a person from the first family that arrived & settled in the area. Mati pujari is called as the Gaita or Perma in some areas. Considering his major role in the social and cultural life of tribals, he can be involved as a leading actor in the management of biodiversity at village level. Most of the tribal people have an adequate knowledge about plants, wild animals, insects, fishes, medicinal flora and their uses. This community knowledge needs to be recorded and to be given due recognition.

To a vast number of the tribal people, **FOREST** is their well – loved home, their livelihood and their very existence. It provides food – fruits of all kinds, edible leaves, honey, nourishing roots, wild games, fish and materials to build their arts. By collecting forest produce they can supplement their meager income. It keeps them warm with its fuel and cool with its grateful shade. Their religion leads them to offer special sacrifices to the forest gods. In many places offerings are made to a tree before it is cut and there are usually ceremonies before and after hunting. It is striking to see how in many of the myths and legends the deep sense of identity with the forest is emphasized. From time immemorial, the tribal people enjoyed the freedom to use the forest and hunt wild animals and this has given them a conviction that remains even today in their hearts that the forests belong to them.<sup>19</sup>

Various laws and regulations related to the forest management have created a conflict in the relation of tribal and government. The working of the forest was done by the State Forest Department to earn more revenue. The poor tribals of Bastar were considered as destroyer of forest wealth without giving any proper justification and no scope was given for community members to share the benefits in production revenue. It is necessary to establish strong instrument and structure of social institutions to safeguard the livelihood of tribal communities who live in the harmony with nature by adopting sustainable use and conservation oriented practices. Without involvement of Bastar tribal the efforts of managing and protecting forest and other natural resources will be in vain.

(19. R. Anderson, W.Huber. *The Hour of the fox, chap.3, p.40 – 41*)

The roles of Bastar women play in sustainable collection of forest produce and agriculture cannot be ignored. They have adequate knowledge about natural resources and management. This knowledge needs to be respected and recognized through empowering women to involve in natural resource management and sharing of benefits.

#### Women in NTFP Management and Marketing

A Primary Forest Produce Cooperative Society (PFCS) at Bajawund is a landmark example of successful management of forest resources for use and marketing of NTFP through involvement of women. Mrs. Kalawati, a Bhatra tribal woman from Asna village was elected as the first President of this PFCS and now, she is leading this process since 1995. Nearly 25 villages are covered by this society with mostly village women involved in collection of tendu leaves and sal seeds. Presently, stakeholders are getting rate of Rs. 45/- per five thousand leaves instead of Rs. 5/- which they got earlier before formation of PFPS.

### **2.3 Habitat Destruction**

#### **Exploitation of firewood:**

Rural population of the area is totally dependent on the firewood for cooking and their need is met largely from the forest and to a smaller extent from agricultural wastes and byproducts. Firewood is either purchased by the locals from government depot or brought illegally from the forest or under nistar rights by the villagers, who also sell to other users. This acts as the main source of livelihood for the weaker section of the society.

As per the *Statistical Report on forest resources of Nagpur district, 1997* published by State Forest Department. Total demand for firewood in Nagpur district was 5 lakhs metric tones (MT) that appeared quite high. The production was approximately 2444 cubic meters & 2056 beats (1800 Mt) indicating a deficit of approximately 4,98,200 MT. The requirement is mostly fulfilled from the forest area through large-scale illicit cutting of trees.

In addition, the hotels, roadside-dhabas, small-scale industries, brick kilns and charcoal manufacturers use firewood. If this additional requirement is taken, the total requirement increases by many folds. While obtaining the firewood through unscientific felling of trees, other associated wild species like woody climbers (*Bauhinia vahlii*) get destroyed and causes serious degradation of the habitat.

#### **Exploitation of Timber:**

Every year the Forest Department through various agencies exploits approximately 5000 cubic meters of timber. The requirement of Nagpur dist., is met from adjoining areas like M. P, Chandrapur district, etc. Nagpur city itself houses approximately 400 Sawmills, which also import huge quantity of timber from Burma, Nigeria etc. Similarly cut blanks of wood are also exported to other parts of the country, mainly Delhi & Chandigarh. The increasing demand for timber contributes to escalation of prices of timber and in turn promotes indirectly illicit felling in forests. The departmental felling could contribute to cater very meager demand of the market. The over exploitation of timber is causing threats to the following important indigenous species:

1. *Adina cordifolia* (Haldu)
2. *Dalbergia latifolia* (Shisam) and
3. *Pterocarpus marsupium* (Bija)

Since regeneration of these timber species is difficult, these species have become rare.

#### **Exploitation of Non Timber Forest produce (NTFP):**

##### **East Vidarbha**

##### **Bamboo:**

The area is rich in bamboo, (mainly two species: *Dendrocalamus strictus* & *Bambusa arundinacea*) observed as under story in many of the forest areas. *Dendrocalamus strictus* is widespread and seen growing in the moist areas along the riverbanks, stream banks etc. Bamboo is a very important to the villagers, which is being used for making hutments, mats, baskets and agricultural equipments. Bulk is being used in paper industry.

The Burad; a community traditionally engaged in manufacturing of bamboo baskets and mats depends on bamboo from the forest as the raw material. They are enjoying nistar rights over this natural resource and the Government of Maharashtra is committed to supply bamboos at concessional rates. The Government has identified families of Burads and issued them a card (Basodvahi). This community is mainly concentrated in Bhandara district and some parts of Nagpur districts.

The constant and increasing demands of the mats for the building of hutments and mainly its, industrial use has attracted the attention of smart traders and exploited these Burads by involving them in illicit felling. As a result the community have cleared sizeable forest areas in Gondia district. A village Saundad, in Gondia district, is a center of illegal bamboo trade. The local traders purchase bamboo mats from these artisans and supply to various parts of Maharashtra and country. The Burads illicitly encroached the areas of Nagzira Wildlife Sanctuary, Navegaon National Park and other forest areas. The bamboo cover of these areas is fast depleting, resulting into habitat loss of the wild animals. The regeneration process has been arrested due of over exploitation. This is an example of a pure commercial exploitation encouraged by vested interests.

The state of Maharashtra has defined bamboo as the forest produce but not bamboo mats. The traders have taken the advantage of this lacuna in legislature to promote illicit felling of bamboos.

The bamboo exploitation should be governed by enforcing bamboo-cutting rules. All clumps should be retained in the first year and clumps of second year should be kept in such a manner to support first year's clumps. Bamboo is to be removed every third year. No such appropriate norms are being followed, which resulted in damaging the habitat. Dry bamboos are hazardous since in the case of forest fire, these dry bamboos get burst and help it spread to larger areas.

**Tendu (*Diospyros melanoxylon*)** This is a very important tree of the area because of use of its leaves are for making bidi, seeds for oil extraction and fruits as source of nutrients. The majority of the human population from forest areas is engaged in collection of tendu leaves during summer, which provides employment, particularly during this lean period of the agriculture.

Most of the contractors adopt non-silvicultural practices to collect maximum yield of tendu leaves. For obtaining maximum quantity and good quality of tendu leaves, it is a routine practice to lit fire to the ground vegetation for enhancing foliage growth. Further, people cut the tree for quick harvest. All such illegal practices are undertaken without any control of the authorities. These man made fires have destroyed the diversity of ground flora & fauna and also arrested regeneration ratio. It is observed in a span of last twenty years that tendu trees have disappeared from the area due to continuous harvesting of tendu leaves. Though, collection of tendu leaves is

prohibited in Protected Areas; collectors intrude and disturb water holes, which affect activities of the wildlife.

**Mahua (*Madhuca indica*)** is a sacred tree for the tribals. Mahua, flower and fruits, is food of and animals and birds. Locals use mahua flowers as their staple food, fodder for cattle and raw material for preparing liquor. Mahua seeds are used for extracting edible oil and lubricants. Its leaves are used for preparing plates and bowls. Mahua flowers fallen on ground are collected by burning debris. This practice destroys ground flora and fauna and arrests regeneration. In most of the area mahua trees have depleted to an alarming level.

**Char (*Buchnanian lanzan*)** is a middle-sized tree grown in the forest areas. The entire plant is cut down for the collection of edible drupes.

The locals collect other crude botanicals by removing entire plant (medicinal as well as economically important species).

**Forest fire:** Most of the forest fires are caused due to human interference for NTFP collection. The areas covering forests have a large quantity of dry combustible undergrowth, which catches fire easily and allows in enhancing its spread, beyond the control of human efforts.

The following impacts are noticed -

1. Arresting regeneration of the species.
2. Loss of habitat
3. Loss of food and fodder for the wild animals.
4. Burning of dispersed seeds, which hamper future regeneration.
5. Destruction of micro flora and fauna.
6. Over exposure of area to soil erosion through loss of vegetative cover.
7. Destruction of unique habitats like snags and fallen logs etc.
8. Destruction of Human life.

**Grazing:** Cattle population in this ecoregion is very high and is ever increasing at an alarming rate. The cattle are grazed on forest areas. There is no proper control over the grazing of cattle, sheep and goats and the practice of rotational -grazing is not adapted. The indiscriminate grazing lead to the deterioration of grasslands and thus loss of habitats. Some important species like *Ophioglossum* spp, *Urgenia indica*, *Iphiginai* spp. and *Scilla indica* have disappeared from the area. Moreover, it has resulted into transmission of Zoonotic diseases from domestic species to wild species. Loss of grasslands further lead to non – availability of fodder for wild animals and shelter for various species of fauna. The wildlife species of grassland like blackbuck, great Indian bustard have disappeared from the area.

**Industries:** This ecoregion has rich coal other ores and rich forest. This easily available raw material has helped establishment of thermal power stations for electric power generation and other industries like textiles, paper, steel and other alloys etc. Mining activities increased the dumping of underground material over nearby land, which could result in increased erosion of lands & heavy sedimentation of nearby streams and rivers.

**Insecticides and Fertilizers:** The indiscriminate use of chemical fertilizers and pesticides is proving hazardous for the growth of micro as well as macro flora and fauna. It has affected the reptiles, herpato fauna and birds.

**Change in the plantation pattern:** While raising plantation of various species generally the bushes are cut back or single down resulting in damaging the habitat of particular flora and fauna.

**Anthropogenic pressure:** The fast growing human population has applied tremendous pressure on natural resources for their requirements of food & fodder. Neither new resources are planned and created nor existing resources are properly managed and enhanced to maintain demand and supply ratio. The industries based on forest produces played a significant role in aggravating the situation. All such factors pushed natural resources into depletion.

**Introduction of exotic plant species:** While importing food grains, edible and commercial plant materials, many exotic plants species are unknowingly introduced in the region. Exotic weeds (e. g Parthenium hysterophorus, Lantana camara, Argemone mexicana and recently introduced Alternanthera tenella which is a Brazilian weed) are established on lands, replacing indigenous plant species and destructing other associated species.

**Monoculture:** The forestry operations are based on revenue production Therefore the species of commercial value are raised in nurseries and planted which include teak, eucalyptus, and prosopis. The clear felling of the trees was practiced till 1986, and was stopped after the ban imposed by Supreme Court of India. Forest department & Forest Development Corporation of Maharashtra cleared virgin, dense, mixed forests and planted species like teak with an intention to fetch bulk revenue. This resulted into development of monotonous forestry. Such habitats were insufficient to provide shelter to the wild animals and supply food & fodder to the locales. The local people and the environmentalists opposed this, on the ground that it would create ecological imbalance as well as deprive people from getting natural resources for their household & other activities.

In some selected pockets, cashew nut plantations were raised to provide economic benefits to the local people. This project could not produce expected results due to various biological factors & technical lacunae, and ultimately was dropped by the department, which clearly shows lack of foresight. The adotion of monoculture has destroyed biodiversity of natural forests.

**Poisoning / hunting:** The wild animals and birds are killed for their skin, bones, feathers, vital body organs and flesh. It is observed that most of the wild animals like sambar, nilgai, chital, peacock are killed by poisoning water using chemical fertilizers or insecticides such as urea, dimicron, indo sulphon etc. Tigers are killed by poisoning its kill, wild boars by using explosives in baits, usually of mahua flowers. Explosives are also mixed with rice balls, jowar spike etc.

Traps and snares are used to capture herbivores, carnivores and birds like peafowls, partridges, quails, pigeons etc. Parakeets are captured from the nest in tree hollows, tortoises by using nets. Birds like coots, waterfowls by using erected nets on the banks of the tanks. W.

Pond herons, cattle egrets and little egrets form nesting colonies, particularly on tamarind trees. Generating foul odour of excreta. It is observed recently that villagers cut down trees for financial benefits, and because of the foul odor and disturbances. Local people collect eggs and young birds from their nests. All such factors are responsible to pose a threat to the survival of herons.



The paste of the bark of *Cleistanthus* (Garadi), *Feronia* (Wood apple), *Azadirachta* (Neem) etc. is used as the poison for capturing fish. Major species like tiger, panther, sloth bear, gaur, wild buffalo are killed by the poachers because of their commercial value and demand in international markets.

Tiger is restricted to few protected and non - Protected Areas of Vidarbha (Tadoba & Pench NP, Chandrapur Forest Division). This magnificent animal of the forest is almost threatened or vanished from densely forested areas of Chandrapur, Gadchiroli, Gondia, Nagpur and Bhandara districts. It is difficult to locate wild buffalo in Gadchiroli and Bhandara districts except at Kutru in Indravati Tiger Reserve of Bastar. The gaurs of Navegaon National Park are under grave threat of survival due to poaching.

Hunting of birds and wild animals is a common practice in Bastar region. Organized hunting called “Paradh” is practiced locally during the summer season. In other seasons animals are hunted when sighted or the need arises. All kinds of traps, snare, spear, bow and arrow, fire, net, poison are used for killing. Hunting is a food gathering, entertaining and communal activity of the tribals. The system is still in use along with the increased use of guns, and poisons. Almost all wild animals, from rat to wild buffalo in the region are threatened. The cases of electrocution are reported in the interior of forest areas, where poison is not easily available. In the last 5 years hundreds of culprits are booked for offences like illegal trade of animal skin and the other body parts. Jagdalpur is a hub of illegal trade of skins. The skins that are seized are mostly of leopards, tigers, spotted deer, sloth bear, fox, mongoose, and otter. Sale of parakeets, partridge, Lawa etc is a common practice in the area.

#### **Loss of source of indigenous knowledge:**

In the tribal areas, people use medicinal herbs and other plants as medicine to cure illness and also in diet. The knowledge of medicinal use of herbs is not transferred to the next generation either due to apathy or vast change in the life style of people. Moreover, no efforts were made to document this knowledge by the scientists, academicians or locals.

## **2.4 Root causes of loss in biodiversity**

### ***Unsustainable models of development:***

#### **Pharmaceutical companies:**

The pharmaceutical companies, particularly ayurvedic, need plant and its components like roots, bark, flowers, fruits, seeds, and tubers to manufacture medicines. These crude botanicals are collected from forest areas. Their indiscriminate and faulty methods of exploitation have resulted in loss of important species of medicinal plants e.g. Safedmusli, Kalihari, Gudmar, Sargandha and Shatawari etc.

#### **Paper mills:**

Paper mills require huge quantity of Bamboo and other plant species that are obtained from forest areas. The extraction of bamboo is promoted irrespective of the regeneration potential of the areas under working. The entire requirement is met from forests and no efforts are being made to promote agro forestry production of bamboo on wastelands, community or

governmental lands. The continuous commercial working of bamboo compartments is revenue oriented. and the aspect of biodiversity conservation is missing.

#### **Construction of dams and Rehabilitation:**

In Vidarbha dams are constructed for power generation and irrigation. A large chunk of forest areas have been diverted for dam construction, submergence, canals, residential colonies, and roads.

Many settlement schemes like, rehabilitation of refugees from Bangladesh and Tibet, and the project affectees have usurped lot of forestland.

#### **Introduction of exotic species of fish:**

Introduction of commercial species of fishes like Rohu and Katla have badly affected the local fish fauna like Maral and Waghul. Introduction of grass carp (fish), which is voracious and feeds on a wide range of aquatic vegetation, has adversely affected the flora of the prevalent aquatic ecosystem. The importance of local varieties of fish in biological control has not been studied or considered while preparing schemes by fisheries department.

#### **Human Settlements:**

The human habitats, in and around Protected Areas (PAs) and other non-PAs, has created tremendous pressure on these ecosystems because of the growing demands of its occupants to meet their bonafide needs. This has resulted in man-management conflicts. The villagers residing in forests and bordering areas are reluctant to involve in forest and wildlife protection because of failure of administration in handling problems like crop damages, cattle kills and injuries to humans, non-fulfillments of basic requirements of fuel, fodder, small timber, bamboos and grass etc. Previously the supply of these basic needs was allowed from forest areas earmarked under nistar rights, which have been converted into reserve forest. This has resulted in loss of sentimental attachment and sense of belongingness to the forests.

#### **Social, political and economic inequities:**

The percentage of literacy is less in tribal areas. People have no access to sell forest produce at competitive rates in the open market. Various commercial interests, active in the area exploited these natural products illegally through locals. Political system, in nexus with commercial interests, makes this exploitation acceptable by the locals taking disadvantage of their poverty and financial compulsions.

Traders, government employees, money lenders, rich agriculturists and political leaders are found involved in all the activities related to exploitation of timber, NTFP, minerals etc., because of their strong financial position and control over management. Most of the schemes related to management of natural resources and development of people could not produce desired results because of centralized system of planning and execution. Politicians, bureaucrats and traders influence these schemes. All the above-mentioned actors obviously could not give a reasonable consideration to biodiversity conservation.

The social workers, politician and even the ministers generally criticize the Forest Conservation Acts and other allied acts leading to misinformation. Big industrial houses exert their political pressure and try to influence the bureaucrats for diversion of prime forestland for establishing industries. The exploitation of locals (particularly tribals) by government servants, businessman and politicians has led tribals to gain sympathy of naxalites. Their movement is almost like a parallel government in tribal areas and the locals are not scared to abide by government rules.

**Unclear and inappropriate land tenure systems:**

The government policy of regularization of encroachments on forestlands is encouraging the locals and migrants to clear the forest.

**Inappropriate / contradictory policies:**

Government of Maharashtra has amended section 61 of the forest act, thereby empowering the forest officer to confiscate tools, boards, cattle, vehicles used in forest offence related to timber, firewood, charcoal and sandalwood only. This amendment has created a severe impact on illegal transportation and felling. This amendment is required to be made applicable to illicit transportation of murrum, sand, gitti, mahua flowers, fruits, tendu leaves, gums, Vanda, Euclafia nuda, Bulbophyllum, bamboo etc.

It is therefore proposed that this amendment should include wildlife and all forest produce when brought from forest. This will deter the offender and avoid time-consuming court procedure.

The Government of India has banned clear felling since 1986. The working plan, which is mostly revenue oriented, prepared by State Governments and needs mandatory sanction before its implementation. There was a move towards changing tone of working plan from production to conservation. It has been observed that working plans are neither amended nor prepared in time.

Usually, the working plans are applicable for execution for a period of ten years and such exorbitant delay affects specified working mentioned there in. Therefore, it should be made mandatory to amend or prepare and approve the working plan before one year of the expiry of existing working plan.

These management/working plans are generally production oriented. There is lack of orientation in terms of conservation of biodiversity. There is no prescription for the conservation of wetland ecosystem, no clear policy for management of sacred groves, heronaries / medicinal plants, fishes, threatened species of wild animals and birds, wild relatives of agricultural crops and areas under the management of forest protection committee / gram sabha/ communities. There is no effective & proper institutional framework that can effectively manage and monitor conservation activities.

In the changing ethical and social scenario there is need for providing special status to these valuable patches, particularly under management of communities, so that privileges or the rights of the local communities are not disturbed. The issues related to biodiversity conservation either receive no consideration or receive very low priority in different strategic documents like EIA, EMP, public hearing documents. The enforcing agencies also lack the required expertise in monitoring the environmental provision in general and biodiversity in particularly..

### **Forest prosecutor and Forest Courts:**

A number of cases are pending before court for final decision. The public prosecutors are overburdened possibly due to more number of cases. The forest officers and Public Prosecutors are not well versed with the latest constitutional amendments. Therefore it is necessary to appoint a separate forest prosecutor.

### **Root causes of biodiversity destruction in Bastar:**

1. The encroachment on forestland is not an easy thirst to quench. Encroachment has social and political dimensions. Political will is needed to control this menace.
2. The public does not consider any development programme implemented by Government as their own programme for their long-term welfare. Tribals lack entrepreneurship due to illiteracy & incorrect governance of the state over commercial forces. Panchayats do not fulfill their duties in a democratic and transparent way. So implementation of any new strategy will have to pass through many tests and hurdles. Great patience and time is needed for new strategies.
3. People harvest all types of resources from the forest but they hardly help to replenish. Forest resources are easily available cash crops without any input and care. They are life support systems, however the public does not at all consider this viewpoint.
4. Protection of wild animals is of the least concern to people and their elected representatives.

### **Mining, a threat to the Biodiversity and Livelihoods of tribal in Bastar**

NMDC is mining for iron ore in Bailadila hills since--- which has ruined this landscape, creating a threat to the survival of various species of the flora & fauna and making life of the thousands of tribals miserable due to destruction of their lands, water, air and livelihood. Most of the streams and major River Shankini has become depository of the silt in the form of red slurry of washed iron ore. The flowing water is not potable to human beings & wild animals. Destruction of area's known and unknown biological diversity, illegal felling of trees and poaching of wild animals is rampant. Together with increase in human population (both from outside and local residents) and human settlement, the forestlands are fast degrading. Exploitation of forest resources in the form of mining activities has put a question mark on the conservation of this unique ecoregion and well being of local inhabitants. Moreover, this area has become heavily infested with Naxalite activities since last 25 years.

### **Factors affecting the biodiversity of Bastar region:**

The continuous exploitation of flora & even crude botanicals, without any conservation efforts, has made some medicinal plants threatened. Some important drug yielding species like *Rauwolfia*, *Dioscorea*, *Wild tumeric* and *Eclipta alba* have become rare and threatened.

The major reasons for the depletion of the medicinal plant resources in the region are:

1. Extensive mining activities in the vicinity of the forest area.  
Excavation of iron ore has caused immense damage to the biologically sensitive & significant hill landscape of Bailadilla and adjoining water resources. No measures were undertaken to restore biodiversity or to save further deterioration.
2. Illicit felling of trees in the forest areas.
3. Practice of shifting cultivation (Zoom cultivation).
4. Unchecked and uncontrolled smuggling of medicinal plants.
5. Lack of scientific awareness towards medicinal plants amongst the tribals.
6. Irregular and unscientific collection of medicinal and aromatic plants.
7. Encouragements by the contractors / traders for excessive and exhaustive collection of these resources through tribals.

It is a crying need of the time to control such exploitations by law enforcing authorities and community institutions.

#### **Forest Destruction of Bailadilla**

**National Mine Development Corporation** started exploitation of iron deposits in 1962 for exporting to Japan for which railway line from Kirandur to Vishakapattanam was constructed. Influx of people from outside and mechanical and manual mining operations have greatly ravaged and damaged the hill area from bottom to top, denuding a large part of it, which can be clearly seen around kirandur, Bachel & Bhansi where units of NMDC are working.

Neither the State Forest department and the NMDC nor the civil departments took notice of it resulting in loss of floral wealth forever. The undulating land lies arid and gives a deserted look. People have experienced rise in temperature and the annual rainfall has gone down. Forest destruction continues unabated there, to this date for iron ore mining, timber and firewood requirements. Mining operations caused tremendous pollution in the water of river Shankani, all other rivers and streams. It has also caused socio - economic deterioration of the tribals. Compensatory Aforestation is too formal limited to the small area, unmindful to scientific approach; unuseful species like Eucalyptus, Peltophorum, Acacia

### **2.5 Major Stakeholders and their role:**

#### **1. Governmental agencies:**

The state forest department including FDCM along with the department of Agriculture, Animal Husbandry, Fisheries and Irrigation are the key actors in biodiversity conservation. Forest department and the FDCM are managing Forest and grassland ecosystems larger water bodies are under the control of Irrigation & Fisheries Departments.

The management plans for the wetlands are not prepared .It is necessary to have such plans focusing on biodiversity and its inventory, conservation and monitoring. The industrial

establishments like Coalmines, MOIL, Thermal Power Stations, and various other industries do not take the biodiversity conservation aspect into consideration.

The department of Fisheries has introduced production-oriented schemes. They have selected hybrid fish species that gain weight in short time thereby the local species of biological importance are ignored from protection.

## **2. Citizens group and NGOs:**

There are many NGOs & citizens groups working in the area of human right protection, rehabilitation, education, health, panchayati raj programme, rural development, forest management, community development etc. There are few NGOs and citizens groups with qualitative approach, orientated exclusively to biodiversity conservation as compared to the NGOs working in the field of social development.

NGOs involved in biodiversity and related aspects are active in studying flora/fauna/agricultural diversity, public education & awareness, law and advocacy. They actively undertake projects like joint forest and wildlife management, soil and water conservation, sustainable agriculture, forest plantation, conservation of local breeds of livestock and poultry, conservation of wetland, protection of sarus crane/ tiger, Protected Area Management, and networking.

Forest is the life support of people, who extract timber and NTFP like fuel wood, bamboo, timber, flower, fruits, roots and tubers, grasses, leaves, herbs, medicine, minerals, water, tendu leaves, Imli, Sal seed, Harra, Mahua flower and seed, Kosa cocoon, Mango, Jack fruit in large quantities. Jamun fruits, mushroom, bamboo shoots, roots, tubers are extracted in small quantity, from forests. They are used for domestic consumption and marketing in local hats. Weekly market is held regularly at prominent places where both tribals and non-tribals trade. People religiously attend weekly markets because of economic, social and cultural values. Cock fighting, selling and drinking of rice beer, sulfy etc. are still a regular feature of the market. Males, females and even the children attend these markets.

Bastar people grow paddy, pulses, millets and vegetables in their fields. The families share the harvest and surplus is sold in market. In the event of poor harvest, people, particularly women and children, gather of edible plants, tubers, flowers, fruits, fish and small mammals as food. The women and children sing on their way to the field from where they collect chiur grass (*Cryptocoryne retorspiralis*) that carpets the sandbar through the dry season. During monsoon, they collect variety of edible mushrooms of which they have proper knowledge. The wild plant siali (*Bauhinia vahlii*) is a robust climber that has multipurpose value. The seeds of this climber are eaten, the leaves are used for making bowls and inner of the stem is used for making ropes. In summer, people armed with bows and arrows, roam in the forests for hunting any animal that might come in their way, as this is the season for paradh, which is their annual ritual hunt. Earlier this area was the home of wild buffaloes, tigers, leopards, sambars and other fauna. But with the hunting of animals and encroachment for agriculture, much of the game is now confined to the west, south and north – west of the district.

## **3. Women Stakeholders:**

Women, at large, are involved in collecting food, firewood and NTFP, agriculture, upkeeping of poultry and cattle. They sell the harvest to the local consumers and traders at very cheaper

rate. They have knowledge about various natural resources and their role in ecology. women can play effective role in the biodiversity management, and need to be oriented accordingly.

#### **4. Forest labourer Cooperative Society (FLCS):**

Earlier the forests were exploited as per the prescription of the working plan through the contractors. The contractors used to exploit poor illiterate tribals by paying them very meager wages. They also used to cut and remove timber illegally from the forest areas.

Maharashtra government has formed FLCS with the local people as members; they work in the forest and earn proper wages and benefits. There are 36 forest laborer cooperative societies in Nagpur, Bhandara and Gondia districts. These societies should initiate activities like tree plantation and conservation, soil and water conservation, protection of wildlife in their area of operation. It will render help in the biodiversity conservation.

#### **5. Self help group (SHG):**

In most of the areas women are playing vital role in creation of Self-help groups at the community level/ village level. Most of the women, particularly in the tribal areas are engaged in house hold activities that includes collection of fodder and firewood, NTFP and crude medicinal. They have unique tendency to respect conservation values of natural resources. Unfortunately, this important segment of the society is totally neglected. Their involvement through SHG must be encouraged in the process of natural resource management and biodiversity conservation programmes of the study area.

#### **6. Panchayati Raj Institutions and Tribal Self Rule:**

The enactment of 73rd amendment of the Constitution and its extension to the schedule areas (Tribal Self Rule-TSR) has made proper scope for the people to get involved in natural resource management. In the present situation though all the management and development programmes are being revised, no attempt is being made to conserve biodiversity.

The panchayat institutions can play an important role in biodiversity conservation related to flora, fauna, agriculture, and livestock and create livelihood opportunities.

#### **7. Local medicine or Vaidus:**

Local herbs are used by the Vaidus as medicine for curing human and animal diseases or ailments. Their knowledge of medicinal herbs is based on their close association with the biodiversity. For many generations this knowledge was imparted and passed to the next generations. However due to exploitation of these medicinal plants, alongwith the apathy of new generation towards the profession of Vaidus, there is every possibility that this ethnic information may vanish in near future.

#### **8. Agriculture:**

Conservation is the most important concern with the maintenance of species population in their natural habitat (either wild plant community or cultivated plants). The traditional agricultural practices are sources of crop genetic diversity. The total genetic diversity in gene pool production is a result of natural process unaided by human selection. The in-situ conservation has the advantages of continuous evaluation in adoption of plant material and conserving wider range of biodiversity. The conservation of biodiversity at all levels that is in ecosystem, improves the livelihood source for the poor farmer, increases control over their genetic resources and integrates the farmers into the national plant genetic resource conservation system.

On farm biodiversity programme, empowers the farmers to participate in the research and development program for the conservation of biodiversity. Initiating the farmers and consumers through public awareness adding benefits to the policy can further strengthen this program. The biodiversity conservation program will succeed only if local community and grass root level organizations are involved at different stages considering their needs and problems.

This programme can be strengthened only if the farming community is made keen to participate in the biodiversity fairs, monitoring the local crop biodiversity registers etc. The agricultural communities have preserved some varieties of crops by constantly planting these varieties over a long period, though they have to face many odds, particularly the low yield. They have, so far, not yielded to high yielding hybrids.

#### **9. Donors:**

In this area Forest Department, FDCM, FDCMP and Social Forestry Department are provided with financial assistance through the Maharashtra & Madhya Pradesh Forestry Project. Provisions have been made for strengthening the infrastructure, capacity building, staff, raising plantations and implementation of JFM programs. Besides, many programmes in the forestry sector have been implemented in the past.

#### **10. Industry and Corporate sector:**

Industries including thermal power stations, cement factories, coalfields, iron & manganese mining, paper and pulp, chemical fertilizers, textile and tanneries, MOIL etc. have created adverse impact on floral, faunal and agricultural biodiversity. The pharmaceutical units engaged in manufacturing ayurvedic medicines are obtaining raw materials from the forest areas. Target oriented and unscientific harvesting of botanicals is the main reason for damaging floral biodiversity.

### **2.6 On going themes related to biodiversity/ Strengths and opportunities**

#### **1. Government policy and legal measures:**

The Forest Policy (1988), made certain provisions for the first time relating to following matters:

- |                              |   |   |
|------------------------------|---|---|
| Claims of local people       | : | to be the first change.                               |
| b) Claims of Agriculture     | : | Good agricultural land not to be converted in forest. |
| c) Enhancement of tree Cover | : | to be increased substantially.                        |
| d) Revenue                   | : | subordinate to principle aim.                         |



- e) Grazing : Limited to carrying capacity.
- f) Wildlife management : Protected Area Network prescribed.
- g) Environmental stability : provided .
- h) Massive people movement : provided.
- i) Conserving natural heritage : provided.
- j) Preservation of Biodiversity : provided.
- k) Forest area : hills 66.67% (previous policy had 60% hills).

Expert Committee of Indian Board of Wildlife suggested to have 5% of the total geographical area under Protected Area of which 1% should be under private land and 4% should be forestland. Providing Protection to endangered species in the wildlife conservation is also equally important. Biodiversity conservation is aimed towards scientific management of Protected areas and so also of significant sites, outside the PA's, where wildlife is prominently sighted. Thus formal and non-formal PA's will be covered under the ambit of management.

The strategy will include:

Conservation Management efforts in areas outside Integrated Protected Area Network (IPAN).

The sustainable management of wetlands and other ecologically important sites would promote conservation of flora and fauna and also help to fulfill human needs.

Managing the impact of regional and developmental activities on ecosystem and species within and outside IPAN.

Ensuring complementary managerial efforts between other sector policies and programs and conservation interest.

Improving capacity of institutions in relation to planning, management and monitoring of biodiversity.

Improving laws and regulations relating to conservation and sustainable utilization of biological resources.

Improving knowledge, information and understanding of biological resources, understanding biodiversity and conservation needs.

The wildlife and wildlife products trade management.

**Strengthening of Protected Areas:**

This can be achieved by:

- a. Creation of new Protected Areas
- b. Up gradation of existing areas and
- c. Extension of PAs

**Research Policy:**

Ministry of Environment and Forests (MoEF), New Delhi had enunciated National Forest Policy, 1988, on December 7, 1988 according to which, policy on Forestry Research (Para 4.12) spells out:

With the increasing recognition of the importance of forests for environmental health, energy and employment emphasis must be laid on scientific forestry research, necessitating adequate strengthening of the research base as well as new priorities for action.

Some broad priority areas of research and development needing special attention are:

- i. Increasing the productivity of wood and other forest produce per unit of area per unit time by application of modern scientific and technological methods.
- ii. Reservation of barren, marginal, waste, mined lands and water shed areas.
- iii. Effective conservation and management of existing forest resources (mainly natural forest ecosystem).
- iv. Research related to social forestry for rural and tribal development.
- v. Development of substitutes to replace wood and wood products.
- vi. Research related to wildlife and management of National Parks and Sanctuaries.

National Wildlife Action Plan (NWAP) also focuses its attention to “ Research and Monitoring” as one of the ten areas contemplated under it. Wildlife Research Advisory Committee to advise and review the research activities proposed under Biodiversity Conservation program was constituted vide Government Resolution no FDM 1092/CR-31/ Part 12/F2 Mantralaya, Mumbai- 400032, Dated 8<sup>th</sup> November 1993. As per agenda item no 2, 39 different projects for conducting research work were identified. However only 14 projects of these were recommended to the Government of Maharashtra for seeking approval Eventually the revenue and Forest Department, Mantralaya, Mumbai-400032 vide their letter no MFP 1096/case/ 381/F-11 dated 6/11//1997, approved only 5.

Accordingly, in Vidarbha region, 3 projects were undertaken and these were given to Vidarbha Nature Conservation Society, Nagpur and Vidarbha Nature & Human Science Center, Nagpur. These documents are useful as field guide to PA managers.

Some more projects proposed for research activities:

Crop raiding - site specific studies of problems and remedies.

Wildlife offences - reasons for commission of offences i.e. social, political, economic, administrative etc.

Effects of forest fires - soil, ground vegetation, tree growth, fauna, breeding on biology etc.

4. Effects of grazing on - flora, fauna, etc., regeneration with special reference to Ungulates.
5. Butterflies and fish.
6. Ecological evaluation of PA.
7. Effect of pollution on - wildlife, birds.

8. Biological diversity of PAs.
9. Dependence of local population on PAs for meeting their needs in the absence of alternative arrangements.
10. Evaluation of individual beneficiary schemes and VED schemes with special reference to PA management.
11. Illegal trade in wildlife, products and derivatives. Modus operandi adopted.

## **2. Non - Governmental agencies:**

Various non-governmental organizations (NGOs) enlisted below are active in the field of environmental protection, education & awareness, joint forest and wildlife management, sustainable agriculture, community development etc.

Vidarbha Nature Conservation Society, Nagpur  
Surajya Pratishthan, Nagpur  
Award, Nagbhir, Dist. Chandrapur  
Vikalpa, Nagpur  
Prerana Nisarga Mandal, Brahmapuri, Dist.Chandrapur  
Vidarbha Paryavaran Parishad (a network of NGOs)  
Environment Global, Nagpur  
Paryavaran Suraksha Samitee (NGOs Network for Nagpur city)  
Joint Forest Management Network-Maharashtra (NGOs network)  
Joint Forest & Wildlife Management Network- Vidarbha (NGOs network)  
Bastar Society for Conservation of Nature, Jagdalpur  
Bastar Paryavaran Saurakshan Sangh, Jagdalpur  
Vanya., Kumaharrams, Dist.Dantewada  
Adivasi Harijan Kalyan Samittee, Asana, Dist: Bastar  
Dharohar, Kondagaon (Bastar)  
Ramakrishna Mission, Narayanpur, Dist: Kanker  
Dr.Salim Ali Cooperative Society for the conservation of Birds, Nawegaon, Dist. Gondia  
Green Cross-, Bhandara  
Vidarbha Nature & Human Science Center, Nagpur

### *Activism:*

These organizations have shown activism for:

1. Crusade against illicit cutting and poaching,
2. Save wetland,
3. PIL for saving trees along roads,
4. Disposal of Garbage,
5. Drive against extraction of ores, metals from sensitive areas,
6. Environmental education to students,
7. Awareness amongst the masses about biodiversity conservation,
8. Crusade against mining in Bailadilla, pine plantation in Bastar, Bodhghat. Pariyojana, Ichampallli dam etc.,

9. Rights of the tribals over natural resources,
10. Community involvement in NTFP trade, JFM and
11. Rehabilitation of project affected people (from Protected Areas).

**Research:**

The organizations have carried out research on following important aspects of biodiversity.

1. Biodiversity of Insect Fauna of Pench Tiger Reserve,
2. Study of the habitat of Great Indian Bustard,
3. Study of Sarus Crane,
4. Avifauna of TATR,
5. Ecological study of Protected Areas,
6. Inventory of indigenous species of paddy and oilseeds,
7. Floral Studies of Nagpur, Bhandara, Gondia and Gadchiroli Districts,
8. Butterflies of Nagzira WLS,
9. Odonata species of Nagpur and Chandrapur districts,
10. Environmental status of Nagpur city,
11. Wetlands of Bhandara,
12. Diversity of wetland flora of Umrer Taluka and
13. Endangered wild animals of Nawegaon National park.

**NGOs involved in framing Policies, Programmes and Interventions:**

1. Recommendations for framing National Forest Policy,
2. Framing Guidelines for Joint Forest Management,
3. Advocacy for creating program on Joint Protected Area Management
4. Capacity building of communities and volunteers of Non – Governmental Organizations.
5. Intervention in resolving the man – management conflicts in Melghat and Pench Tiger Reserve.
6. Training to Forest Staff about Census
7. Active participation in various Governmental programs related to biodiversity conservation.

**3. Communities and people's movement:**

**I. Joint Forest Management (JFM):**

It was realized that the forest department alone cannot protect forest and its resources and therefore participation of people is envisaged as the prime requirement to achieve the desired goals. The programme of Joint Forest Management is designed with an intention to create a wider scope for the community members to involve in the management of forest resources and sustainable use.

Maharashtra state has total forest cover of 64335 sq. Kms. and out of that, an area around 17,000 sq. Kms. (24%) is under degraded forest. The government of Maharashtra has issued a notification on 16<sup>th</sup> March 1992 making this program applicable in degraded forest areas. Maharashtra forest depart (MFD) has selected 50 and 42 villages in 1993-94 and 1994-95 respectively and formed 103 Forest Protection Committees. As per information provided by CCF-JFM, this programme was introduced in 480 villages till 1999.

The programme is intended to involve people and it is claimed that it would produce excellent results, but people and NGOs have doubts in mind about the intention of forest department. It is observed that in most of the villages JFM committees are on paper and some are working under the guidance of vested interests and government employees. Most of the committees are formed to achieve target and to spend the funds provided for programmes under World Bank Aid. State government has sought funding from World Bank to complete first phase and demanding Rs.700 crore to complete second phase and proposed to accommodate 3000 villages under this programme.

The NGOs & JFM Networks of NGOs have identified thrust areas and started program of educating & motivating people to involve in JFM activities. NGOs have raised following relevant points, which have put a question mark on the fate of JFM in Maharashtra.

1. What is the legal status of the agreement made by JFM committee?
2. How to share benefits in standing forest and degraded areas through legal agreement. Is that a part of working plan (WP)? and if so, how can the same be incorporate in WP. {No clear policy document or guidelines issued so far }
3. Felling is banned by the Central Government and therefore how can we allow working in JFM areas as stated in micro-plans or committed to the people.
4. Micro working plans are prepared by most of the JFM committees, but participation of all the stakeholders is not encouraged or ensured.
5. No financial provisions exist to execute micro working plans.
6. Most of the officers are reluctant to execute JFM.
7. It is said that JFM has become a World Bank programme.
8. Controversy over seeking funds from World Bank.
9. Process adopted by MFD is not transparent.
10. The degraded forests are mostly found in western Maharashtra while Vidarbha region has dense forest cover. It is the opinion of NGOs that MFD is not instrumental in activating JFM in Vidarbha region.
11. No coordination amongst managers and lower staff of MFD.
12. No proper coordination amongst forest employees and people.
13. No interdepartmental coordination or involvement of line Departments like Revenue, Fisheries, Irrigation, Agriculture and Panchayat (ZPs),
14. Lack of political will.

In Bastar area though JFM is introduced, it could not take a proper shape. NGOs have doubts about this process. They consider it as the programme of Government and World Bank & not capable to empower people. It is necessary to redesign JFM programme by eliminating lacunae and making more participatory in true sense.

## **II Duchan forest:**

The forest areas lying in the vicinity of the villages, Duchans, were earmarked to meet the bonafide requirements of villagers, viz. demands of fuel wood and fodder and also small quantities of timber required for agricultural implements and construction of huts. The Village Panchayats were authorized to regulate beneficiaries. The Govt. authorities, while allowing these benefits to the villagers, asked the Panchayats to share their preservation/ upkeep.

In the beginning, the demands were marginal in comparison to the available resources. The fast growing population enhanced the demands and huge gaps were created on account of natural limitations on forest resources and therefore the villagers started to exploit ruthlessly the forests, overlooking their conservation and aspects relating biodiversity. Activities like excavation of boulders, murrum, soil, and stones from these areas deteriorated their status, because the Panchayats could not exercise their authority appropriately. Ultimately the Duchans forests could not sustain. The extent of Duchan forest areas were further reduced either due to encroachments or their conversion into protected or reserve categories. The areas surrounding villages were set apart for meeting daily requirements like fuel wood, fodder and small quantities of timber for agricultural equipments and construction of huts.. The village Panchyats regulated these areas.

Duchan Forest includes the double area of forest, as compared to the village areas under cultivated lands. Duchans were earmarked to meet the bonafide requirements of the villagers. In the beginning the requirements were marginal in comparison to the resources available. The fast growing population enhanced demands in manifold and a huge demand and supply gap is created in meeting the community requirements. Since the requirements were plenty, the villagers started exploiting these forests ruthlessly overlooking the biodiversity conservation aspects. The Duchan forest could not sustain this pressure. The extents of Duchan forest areas were further reduced due to encroachment and conversion of these areas into protected/reserve forest. The activities like excavation of murrum, soil, boulders, stones from these areas further contributed to the degradation& shrinking of this area.

### **III Tanks / Amarai / Fishing:**

#### **Tanks (Bodi, Khari, and Talav):**

Bhandara and Gondia districts are major districts involved in paddy cultivation. There are more than 14,000 lakes, which in addition shelter various floral and faunal species. These lakes were built by the communities of this area, well known for their age-old traditional knowledge, for rainwater harvesting. The methodology of construction was gained through their experiences and by involving local people. Some medium / large size tanks were constructed for the use of a group of villages (e.g. Nawegaon & Shahapur tank). Local people were involved in their management through panchayat till the state Government acquired these lakes. In some villages, few small lakes are still under management of local people.

#### **Fishing:**

The fishermen communities were enjoying full rights over the fishing in these lakes. Free fishing for own purposes was permitted, the fisherman communities including tribals also with full knowledge of local fish fauna were conscious about their conservation. Some practices like ban on fishing during breeding season, use of proper net-size and gears, release of brood stock etc. were followed. The Government has permitted fishermen's Cooperative Societies to harvest fish from the local lakes. State government ignoring the rights of fishermen, holds auctions to fetch revenue, which attracts contractors; FCS has protested the policy. To promote productive revenue oriented pisciculture, the state introduced exotic species. There is no control over fishing practices, most of which are detrimental to the conservation of fishes. There is a need to make programs, oriented towards the conservation of biodiversity.

#### **Mango Groves (Amarai):**

The villagers developed amrais (mango grove on private or community lands.) Aamrai is a grove of mango trees grown and maintained by villagers. This is a good example of involvement of people in conserving this important fruit crop. There are no proper records about the number and characteristics of mango varieties. However, it is estimated that more than 250 species of mangoes were observed in the area. This diversity of mango species exists in Bastar because of the traditional conservation practices of local tribals. Unfortunately, most of the mango trees in Vidarbha were illicitly cut down for timber to make wooden cartons for packing oranges. Environmentalists of the area have demanded complete ban on felling of mango trees.

#### **IV Medicinal / Aromatic Plants:**

This area is rich in medicinal and aromatic plants. Tribals have excellent knowledge about this vital flora. The vaidus (local person having knowledge of medicinal plants) prepare ayurvedic medicines and treat for various diseases. Vaidus are reluctant to give their knowledge to others, may be because of their intention to protect source from overexploitation. In most of the areas, new generation is not willing to acquire this knowledge from old people and this may disrupt a process of transferring inherent knowledge from one generation to the next.

It is necessary to formulate policies to document this community wisdom and information and motivate youths to acquire the same, for further use for the welfare of communities. This will also help to control illegal trade or face problems of patent or IPR.

#### **V. Social Conservation ethics:**

Certain species of trees like banyans, bel, khadsingi, mahua, mango, palas, peepal, tulsi and umbar are culturally and traditionally considered to be sacred and are not cut by local communities. Felling of trees such as bamboo, teak and other miscellaneous species has been phased out, the activity was discouraged during Shukla Paksha as per Hindu almanac (from the new moon day to the full moon day) while it was preferred during Krishna Paksha (from the full moon day to the new moon day). The reason behind this practice might have been the harboring of immature stages of insects in the trees and attaining maturity and leaving the hideouts in Krishna Paksha on account of their basic nocturnal nature. Since this traditional practice was known to locals, they scrupulously followed resulting the total avoidance of ruthless tree felling in all the seasons of the year.

People in Vidarbha worship animals every year on auspicious days viz. bulls and bullocks on Pola, cows and buffaloes during Deepawali celebrations and Cobras on the Nagpanchami day. Killing of some animals and birds is considered as sin such as cats, bulls and cows, lizards, owls and parakeets. The beginning of harvesting crops / fruits is done by offering the new crop to God. The tribals in Bastar and east Vidarbha respect crops, fruits and vegetables and arrange celebrations during their harvest.

#### **VI Protest by the Communities against Distribution and unequal sharing:**

- Earlier, only local fishermen were utilizing water bodies for harvesting fish and this system was going on smoothly. Presently, fishing rights in water bodies are auctioned by

the state Government in Vidarbha to fetch more revenue. Private commercial enterprises are actively involved in pisciculture, by purchasing the rights over tanks. They follow unsustainable practices oriented to collect maximum harvests. The local fishermen are engaged as contract labourers by these enterprises and are paid meager wages as compared to their inputs.

- The tribals and fishermen are protesting against fishing by poisoning water, which destroyed local species and also micro fauna of ecosystem.
- The discharge of industrial wastes in water bodies causes damage to the ecosystem affecting finally its qualitative and quantitative productivity.
- The local people in Vidarbha are engaged by contractors for collecting Tendu leaves. The rates for collection vary from place to place (e.g. in Bhandara district the collection rate is Rs. 64/- and in the Gondia District rate Rs. 90 /-for 1000 leaves). This has created discontent amongst the people and they are protesting for uniform rates. In Gadchiroli and Chandrapur districts higher rates are paid under the pressure of naxalites.
- The Forest Department in Vidarbha has promoted planting of Subabool and Prosopis in the past. These fast growing species have created problems by dominating over local flora. These species have encroached fertile lands and prevented regeneration of other species. Moreover, larger spread of root systems, wide and fast dispersal of seeds has made their eradication is difficult. Plantation of Prosopis in high forest areas was opposed by the Naxalites. The NGOs have also opposed planting Gulmohar, Peltophorum, eucalyptus etc. by advocating planting of indigenous species like Mango, Tamarind, Neem, Vad, Peepal for avenue and community land plantations.
- The Kathiawadi nomads have migrated from Gujrat to Maharashtra and Chattisgarh states along with their livestock. They graze their animals such as camels, cows, goats and sheeps in forest areas destroying ground flora and tree foliage. They intruded agricultural and community lands and even protected areas. The owners of the herds forcibly graze their animals on grazing areas of villages. This type of exploitation has destroyed forests, pasturelands and created fodder scarcity
- It is alleged that the employees of Forest Department and some politicians protect the interests of these migrants. The people and NGOs have protested and demanded legal ban on the entry of migratory cattle herds from other states.
- The groups of nature lovers and local communities have recorded protest against the illegal trade of Partridges, Herons, tortoises, green pigeon, munias, hill myna, quails, parakeets and other wildlife. These groups have taken various steps to control this illegal trade and are helping forest and other government officials in arresting offenders.
- In 22 villages of Gadchiroli district tribals have launched a movement called “ Mawa Natte Mawa Raj ”, which is an example of people’s governance at local level. They have stopped working of natural resources by Government and industries, particularly for bamboo and timber and established control over all these natural resources under their jurisdiction.



- In some villages people are managing their forests through Forest Protection Committees and Gram Sabhas. They are also involved in control of wildlife poaching and illicit felling of trees.
- Communities have lodged protest against proposed construction of Ichampalli Dam in Gadchiroli district. It is feared that the construction of dam will destroy precious biodiversity of the area and ruin tribal life.
- Conscious people and communities have realized hazardous impacts of chemical fertilizers and insecticides on human beings, flora and fauna and are protesting against its use from available platforms. These groups are encouraging natural farming.
- Various groups are protesting against policies creating centralized and biased governance of natural resources (e.g. leasing natural resources to commercial organizations) which cause immense damage to community resources.

#### **Strengths of Bastar flora:**

1. Still 60% of the land area is still covered by forest, rich in diversity of all kinds of flora and fauna, mineral resource natural springs, spectacular landscapes, waterfalls, network of drainage system and tribal culture.
2. The tribals, who are highly dependent on the forest produce, inhabit forest. They have vast knowledge about natural ecosystem. Their cultural practices have been proved as conservation oriented and linked to their in-depth knowledge. This knowledge helped them to develop sustainable model of lifestyle and symbiotic relationship with Nature.
3. Weekly *haat*, (tribal markets) are held regularly at prominent places throughout Bastar. These markets are epicenter of social, cultural and economic activities.
4. Inter – state smuggling in timber and fauna is low.
5. Bastar has plenty of rainfall during the rainy season (1200 – 1500 mm), which helps luxuriant growth of the floral species (luxuriant growth).
6. Forest is a reservoir for large number of medicinal plants.
7. Ground water level in dense forest is shallow and there is a network of perennial rivers, nullahs and streams providing waterholes for animals.
8. Availability of natural salt licks in forest areas for wild animals.

Productivity of minor forest produce like Sal seed, Kosa, Tendu patta, Mango, Harra, root, tubers and medicinal plants is high

#### **Opportunities - Bastar flora:**

1. Conservation oriented traditional practices of the communities, their in depth knowledge about natural ecosystems and social participatory hierarchy can be tapped and exploited for the purpose of biodiversity conservation.

2. Bastar has fair opportunities due to the good forest cover, perennial water resources, and diversity in food and culture. The conservation oriented attitude and traditional practices of the local tribal communities has helped to maintain ecological balance in spite of various commercial and political threats.
3. Marketing of forest produce at fair price and value addition would help to uplift people economically and create livelihood support.
4. Bastar has great potential for development of eco and bicultural tourism. It has dense forests, national parks, waterfalls, big limestone caves, shrines, temples, tribal culture & art, folklore etc. Sights are connected by good network of roads. Proper training and orientation of laws is needed. This will also develop an attitude and culture for the protection of forest and nature.
5. Large chunk of revenue lands, private forestlands are wastelands, which can be put to appropriate land use by planting horticultural, medicinal, fuelwood and suitable crop.
6. The botanical impact of adivasi land use is conservation oriented, so also their traditions that are ecologically responsive to the environment.
7. People have the tradition of protecting forests at Deogudi, burial grounds, cattle-shades and village boundaries. Folklores have reverence for trees and wild animals. These old traditions along with culture of forests and wildlife conservation should be exploited It can be inter - played by suitable intervention by NGOs and other development agencies.
8. Strengthening of traditional social institutions like Manzi Pargana Panchayat by involvement of Patel, Chalki, Mati Pujari and tribal Vaidus in the villages will strengthen protection of common property resources in villages.
9. Interest of the tribal women in forest management on account of their active role in collecting NTFP/seeds/ food from forest area and involving in agriculture. They love to protect their resources due to linkage with their livelihood.
10. Exposure to places where good conservation work within Bastar is going on will enhance the outlook on the conservation of biodiversity.

**Conservation of eroding diversity:**

The in-situ practices for conservation includes:

- 1) Development of Herbal parks at identified natural habitats.
- 2) Identifying Sanctuaries, National Parks, Biosphere Reserves and involving local community in conservation programmes..

The ex-situ conservation methods are most important, especially for preserving the endangered flora. The ex-situ conservation method includes:

- 1) Cultivation and domestication of wild medicinal plants.
- 2) Development of Herbal Gardens at the village cluster, Taluka, District, Regional, State and National level.
- 3) Establishment of Gene Banks, Botanical Gardens etc.
- 4) Cryogenic preservation
- 5) Invitro conservation.
- 6) Cultivation of Herbs.

There is an urgent need for developing suitable strategies for in-situ and ex-situ conservation in order to prevent the erosion of diversity of the medicinal flora of the region.

Most of the medicinal herbs, tubers and roots continue to be gathered from wild undergrowth in forests to meet the increasing demand of the medicine manufacturers, which could result in their over exploitation along with natural forest resources. Despite of the rich heritage of knowledge on the use of crude botanicals and their curative properties as per ayurved, very little attention was paid to the studies relating to their natural habitats and nature of genetic. It may be due to the rapid extension of the allopathic system of medicinal treatment under the British rule. Some progress in research of ayurved was made after independence. The efforts were made in last few decades to introduce medicinal herbs into Indian agricultural studies, emphasizing on their cultivation, which found suitable and remunerative. Many of the species selected for cultivation are not indigenous. In general, agronomic practices for growing belladonna (*Atropa belladonna* Linn.) , Cuichona ( *cuinachona ledgeriana* Linn.), Dill/ Sowa (*Anethum graveolens* Linn.), Dioscorea tubers (non-edible dioecious species ), Foxglove ( *Digitalis lamata* Enrh.), isabgol ( *Plantago ovata* Forsk.), ipecac ( *Cephaelis ipecacuanha* Bort. A. Rich), opium poppy (*Papavev somniferum* Linn.) and Senna (*Carria angustifolia* Vahl.) have been developed and there are now localized areas of their commercial cultivation. Even through the pharmaceutical industry has made massive investment during the last four decades on pharmacological, clinical and chemical researches in an effort to discover still more potent drugs. Few new drug plants have successfully passed the tests of commercial testing. The benefits of this labour should reach the masses when the corresponding support for agricultural studies for commercial cultivation is provided. As regards the indigenous wide variety of crude botanicals with medical values, concentrated efforts of the Central & State Governments are required by involving ICAR. ICAR and Botany, Chemistry, Environment and Pharmacology departments of various Universities in the country.

Bastar district is well known for its thick forests and tribal heritage. Tribal communities living in and around the forest area are primary source of using traditional medicinal knowledge associated along with crude botanicals But unfortunately over the last few decades, factors such as increasing deforestation, increasing urbanization and changes in socio economic environment adversely affected the cultural and traditional life (breakup in kin relationship) and with the passage of time and transfer of knowledge from one generation to another has been limited. It is therefore, imperative, that unique knowledge of crude medicinal botanicals available with the

tribal people should be properly documented, conserved and integrated with modern scientific values before it is lost forever.

There is scope of conservation of medicinal resources by involving different target groups strengthening:

- i. Linkages between various departments.
- ii. Campaigning to increase awareness.
- iii. Involvement of NGOs in the tribal development programmes.
- iv. Improving the functioning of tribal cooperatives.
- v. Imparting skill oriented trainings in the utilization pattern of herbal resources.
- vi. Demonstration of cultivation of threatened medicinal plants.

There is a need to identify all the important medicinal plant resources that are either used by the local communities or needed by the pharmaceutical industries within or outside the country. A survey should be conducted involving NGOs, Agricultural universities and representatives of Government organizations, trade and industries.

Medicinal herbs are the major source of income for the tribals. This means of hand to mouth livelihood for the villagers in tribal areas has proved to be a hindrance in the way of conserving biodiversity of medicinal flora because of gathering from forests with heavy strain on their health and over exploitation by local traders. The linkage between biodiversity and sustainable use of medicinal plants by community members should be receiving due recognition and consideration, in the plans and associated regulations at the national and local levels. There are a number of medicinal plants that show potential for cultivation which need to be identified along with their market potentials. Efforts in this area will go a long way in acting their goals on sustainable basis.

Training and transfer of available technology should also be extended to community-based enterprises so as to increase stake of rural communities particularly tribals, NGOs etc, in the conservation and sustainable use of medicinal plants. Plans should also include documentation of available knowledge, collection of species, studies relating the suitability of various lands, climates etc. in various regions of India, genetical and physiological makeup etc.

### ***2.7 Alternative Developmental models and Experiments:***

The mining industries have initiated restoration of degraded areas using appropriate technology from environment protection agencies and NEERI. Efforts also include stabilization of steep slope of the overburdened heaps; revegetation and planting of ecologically adapted and useful plant species on the hostile land.

#### **Use of Vermiculture:**

In Vidarbha, communities, NGOs and Government Departments have started using vermi compost. The FDCM has started commercial production of Vermi compost involving local unemployed youths and communities that will tremendously help to reduce the use of chemical fertilizers and at the same time it generate employment.

#### **Use of Biofertilizers:**

MOIL in consultation with NEERI is developing over burden dumps in Gumgaon mine located in Nagpur District. The main biofertilizer used is Azotobactor. It is still in the experimental stage and results are awaited.

#### **Use of Root trainers:**

The State Forest Department and FDCM raise seedlings on large scale in root trainers. The adoption of this technology in rural areas will be very useful.

#### **Collection of Germplasm:**

Maharashtra Van Sanshodhan Sanstha, Chandrapur has established a research station that has collected 257 clones of teak from all over India. There is a bud multiplication garden of these clones for raising clonal plants that are to be planted in the field. The State Forest Department has also initiated seed production of different forest species through identification and propagation of genetically superior trees and establishment of permanent preservation plots in different forest types at different locations. Permanent preservation plots are going to conserve gene pool.

Presently the Institute of Science, Nagpur is preserving endemic species that are exclusively found in Maharashtra state. The ex – situ conservation of indigenous species of plants brought from western Ghats are planted at Botanical Garden, Nagpur that has been funded by the Ministry of Environment & Forests, Government of India. The executing agency should be instructed to plant and maintain locally available floral species instead of planting species from different climatic zones.

FRLHT under MPCC, Pune has selected some Protected Areas of forests to study the indigenous medicinal flora found in this region. The nurseries of local species are being raised.

FDCM has established a seed certification unit for the identification of superior seeds, their collection, preservation and propagation. A laboratory has been setup at Nagpur and field staff has been appointed in the potential forest areas.

### **2.8 Gap analysis**

#### **I. Gaps in information**

1. Gaps in gathering and disseminating information related to biodiversity. The Forest Department, NGOs, Scientists and the local communities are working in isolation. The information collected by any of these stakeholders is not properly shared among the groups.

## **Key Actors:**

### **1. Forest Department**

There is no coordination among different wings of the Forest Department e.g. Advanced research done by FDCM is not shared with the concerned stakeholders in the field. Forest and other departments do not utilize the uncoded community information and techniques. A Complete data on forest biodiversity is not available. The academicians and scientists of Research Institutes, Universities and Line Departments work in isolation and do not share information in respect of the management of biological resources. Hence, the department does not know the exact status of various indigenous species. Proper management cannot be expected from different wings of Forest Department like territorial divisions, wildlife, social forestry, silviculture, planning, education and training and Forest Development Corporations etc. The programme of JFM has lack of visiosn and proper coordination to address various issues related to management and biodiversity conservation.

2. The problems relating biodiversity tackled by the Academicians / Scientists/ Research officers are very much different from ground realities and more weightage is given to the theoretical aspects. The problems of biotic pressures like cattle grazing, illicit tree felling, forest fire etc. are not properly studied and managed.
3. No policies and proper programmes of the protection & management of wildlife in areas, other than Protected Areas.
4. The success stories of different stakeholders are not shared.
5. The information generated through research based project, involving local community members, is not made available to communities as well as concerned governing bodies.
6. Sharing of the information is lacking. For example, the local indigenous knowledge does not reach to the academicians for authentication and vice-versa. So also, the scientific information does not reach to the ground level. The available knowledge is restricted only to the large species.
7. Many threatened indigenous species are not studied and so also information related to their status, habitat, use and their associations in different ecosystem is lacking. The status, threats and management of Butterflies, Dragonflies, Moths, Amphibians, Tortoises, Snakes, Great Indian Bustard, Slender lorries and Wild buffaloes need priority consideration.

## **II. Lacunae in the existing linkages:**

1. Inadequate silvicultural knowledge about regeneration, propagation and harvesting.
2. Lack of infrastructure to impart knowledge for the sustainable collection and uses of indigenous medicinal plants.

3. Sustainable commercial exploitation by the industrial sector.
4. The harvesting practices are mostly destructive which pose threat to the genetic stock and the biodiversity of the region.
5. Traditional information is not documented and, therefore, it could not be transferred to the next generation.

### **III. Gaps in Vision:**

The aspect of biodiversity conservation is not considered while planning schemes and formulations of the working plans. The impact of biodiversity conservation in these plans / schemes need to be anticipated.

The environmental impact assessment is not studied in advance. In most of the cases such impacts are measured only after appearance of adverse reactions. For example, adverse impact of fly ash on micro fauna and flora of the region, changes in the surrounding atmosphere have not been fully evaluated.

Biodiversity conservation ensures food security and livelihood for local people. The political workers are not fully aware of biodiversity and its implications and therefore, they are main hurdles in biodiversity conservation.

The bonafide requirements of grass root stakeholders need to be considered while preparing developmental schemes and working plans for example: the wild boars damage crops in the villages mostly around Protected Areas. The forest officials generally to protect crops from wild animal menace.

There is a big gap in visualizing results while taking key decisions. For example, the migrants from Bangladesh and Tibet were rehabilitated deep in to the forest areas. Such human settlements have posed threats to biodiversity.

Lack of integrated approach is the root cause behind failure of most of the developmental projects. The line departments viz. Agriculture, Animal husbandry, Fisheries, Forest, Panchayat, Irrigation, Revenue etc should be held responsible for conservation of flora, fauna crop varieties and livestock breeds and their habitats. Most of the conservation areas are under control of multiple agencies.

The programmes of most of the state departments are designed and executed without considering aspect of biodiversity conservation and the role of concerned line departments. As a result many schemes lack vision and its implementation adversely affects the biodiversity of the study area such as advocating wide use of chemical fertilizers and pesticides by Agriculture Deptt; castration of Gaolao bulls, cross breeding with exotic breeds to eliminate local drought cattle by Animal Husbandry Deptt; supply of modern fishing equipments to fisherman and introduction of exotic fish species in biologically significant wet lands by Fisheries Deptt; providing financial assistance and permission for goat rearing in forest areas by forest Deptt.' permission for establishing paper mills near nallahs and rivers by Revenue Deptt. etc.

Latent values associated with biodiversity and its importance could not be visualized by most of the stakeholders like policy and lawmakers and governmental agencies, which have created a wide gap in understanding importance of biodiversity by developmental agencies. The communities associated with the protection of precious natural wealth are not at all consulted by developmental agencies.

Some examples are providing financial assistance for goat rearing in forest areas, supply of modern equipments to the fishermen, promoting use of chemical fertilizers and pesticides by agriculture department, introduction of exotic fish species by department of fisheries, lease of biologically significant wetlands for fish, permission for paper mills near rivers and nallahs, cross breeding with exotic breeds eliminating local draught cattles, etc.

#### **IV Inherent value of biodiversity:**

Inherent values associated with biodiversity is not a matter of mere transfer of knowledge from old generation to the young, who should have interest; pain staking efforts are necessary to create interest in their minds. Well-versed old people kept secrecy and lack of proper documentation appear additional causes/ reasons.

#### **V Gaps in policy and legal structure:**

Water Pollution and Prevention Control Act (1974) and Air Pollution & Prevention control Act do not make a specific reference either in the provision or standard of emission of pollutants, which has adverse impact on the biodiversity resources.

Synergetic impact on changes in microclimate, due to the gaseous pollutants in ambient air, affects the sensitive flora and fauna adversely. But this has not been referred in any of the provision under the existing Acts. There is a need to consider following aspects while formulating policies and legal structure:

- a. Local / regional strategy & Action plan.
- b. State level strategy & action plan.
- c. Inter – state ecoregional strategy action plan.
- d. National strategy & action plan.
- e. Separate detailed thematic strategy & action plan.
- f. Several brief review papers on specific topics to be integrated in to relevant SAP.
- g. Detailed project proposal for Action plan.
- h. Legal coverage provided to domesticated flora & fauna components.
- i. Conservation of wide range of flora and fauna.



- j. Existing policies on compensatory afforestation in lieu of diversion of previous forestland rich in biodiversity do not ensure restoration of lost biodiversity.
- k. The existing legislation related to biodiversity has conviction, pertaining mainly, to use and exploit biological resources than conservation.

There is no proper provision, concern and committed approach to wildlife conservation and management in forests other than Protected Areas, community land, wetlands, Pastures, agricultural land.

The Irrigation Department considers biodiversity conservation in catchment areas of the dams is the responsibility of Forest Department. The catchment areas of the dams under their control have rich biodiversity. Irrigation Department has not considered various related components of biodiversity conservation and their proper management while formulating development programmes.

#### **VI Gaps in institutional and human capacity:**

The institutes related to biodiversity conservation are:

1. State Depts of Agriculture, Animal Husbandry, Fisheries, Forest, Industries, Irrigation Power, Law, Mining, Planning & Development, Police, Revenue, Social Forestry, Social Welfare, Tribal Development.
2. Forest Development Corporation of Maharashtra.
3. Maharashtra Social Sensing Application Centre, Nagpur.
4. Pollution Control Boards.
5. Botanical Survey of India.
6. Human Resources Development.
7. National Laboratories.
8. Research Institutes.
9. Universities.
10. Zoological Survey of India.
11. Community based organizations.
12. Non-Govt. organizations.
13. Panchayat Institutes.

#### **Gaps identified in these institutes:**

1. Forest department has been entrusted with primary responsibility of protection of the biodiversity. However there is no comprehensive mechanism for its study and protection biodiversity aspects. The relevant data essential for appropriate management is lacking.
2. Forest Development Corporation is operating in the areas having rich biodiversity such as in adjoining areas of Pench Tiger Reserve, Nagzira WLS, and Nawegaon NP. This corporation has neither any adequate mechanism to control poaching / illicit trade of flora & fauna nor any programme of biodiversity conservation.

3. Wildlife conservation aspect is attended in Protected Forest Areas, where as it is neglected in non-PA areas. There is no policy document or relevant proper mechanism to deal with protection and management and of wildlife, vital flora & fauna, medicinal herbs in wetlands, corridors and community conservation sites.
4. Most of the forest areas are managed without any scientific working plans .It is necessary to review working plan code with long-term approach. The areas without working plan need a special type of prescription for adhoc working till the formulation and approval of regular working plan.
5. The working plan prescriptions are written on the basis of the data collected for specific purposes of protection and production without giving main stress on biodiversity conservation.
6. Normally the execution of the working plan is deviated due to the lack of financial provisions.
7. The State Government in true spirit, regarding adequate regeneration of trees after felling, is not following the orders of the Supreme Court.
8. The Maharashtra State Corporation for Tribal Development (MSCTD) was established in 1977. The corporation did not adequately encourage sustainable harvesting of minor forest produce. The corporation further did not train the tribals to adopt appropriate technique .No suitable infrastructure was established to purchase NTFP from the tribals at proper rates, store and sell in the open markets at lucrative rates; as a result traders are indirectly controlling the system and exploiting the tribals.
9. Irrigation Department:

State Govt. acquired Malgajari tanks and irrigation dams constructed on forest lands are managed by Irrigation Deptt. to serve the main objectives of providing supplementary irrigation to crops and drinking water. Rich floral and faunal biodiversity exists in the catchment areas of tanks and large water reservoirs mainly controlled by Irrigation Deptt. Appropriate attention is not paid to ecological aspects and preservation of bio-diversity. Theses wetlands have very important medicinal and vital plants like *Asteracantha rongifolia*, *Bacopa monnieri* and *Centella asiatica* of medicinal importance, whereas *Nelumbo nucifera* species of *Nymphea*, *Trapa bispinosa* and *Scirpus casiar* are economically important plants and a source of livelihood of the locals. Vegetables like *Ipomea aquatica*, *Ottelia alismoides* are growing in the vicinity of the tanks have local market value. Some of the rare species found only in the lake districts of Gondia and Bhandara are *Aponogeton* sp, *Drosera indica*, *Isoetes*, *Ultricularia* sp that has academic value. .

The *Khus (Vetiveria Zizanioides)* is in abundance at the edges of dams and in the catchment areas. Their roots are used in making curtains for the coolers. The volatile oil is used in perfumes. The *Khus* is a very strong soil binder and also a good habitat for small birds and reptiles. Irrigation Department takes care of *khus* possibly due to

its role as a soil binder. As no control is exercised either by Irrigation or Forest Department, traders are smuggling khus grass and roots, lotus bulbs on large scale.

Apart from vital flora mentioned above, a wild variety of paddy, *Oryza rufipogon* (Deodhan) with religious importance naturally grows in large areas. It is a good source of food for aquatic birds. This specie of paddy is threatened due to over-exploitation of khus roots and lotus bulbs. The ecological importance of flora & fauna is ignored while preparing management plan by Irrigation Department. The catchment areas of these tanks and lakes are rich in faunal biodiversity mainly amphibians, reptiles, fishes and indigenous species of water birds.

10. Revenue Department:

A large part of the area belonging to Revenue Deptt. includes mainly stream (nallah) and riverbanks, unclassified forest lands adjoining villages, grazing lands and agriculture lands. The vegetal cover growing wildly along the banks includes bushes, rough grasses and trees, which offers shelter to riverine type of flora and fauna. Such areas are prone to serious erosion if the cover is not well protected; huge deposits of silts/sands mixed with pebbles and small boulders are sometimes observed after floods. A strip of the vegetative cover of at least 50 m length on either side of streams/rivers should be maintained as per government rules for managing such areas.

The unclassified forestlands and grazing grounds are subjected to non-forestry/grazing use viz. construction of approach roads, mining for metal (gitti) extension of village habitation areas due to increasing population etc. Grazing cattle encroach nearby forests because of loss of grazing grounds. All such activities destroy bio-diversity of natural biota, lending towards their degradation. While granting or issuing permission, even though the Revenue Department has specified the code of conduct is not followed strictly. Over grazing, removal of bushes/trees for firewood or mining for sand/murum are illicitly carried out either by the villagers or the contractor, resulting finally in depletion of valuable natural resources degradation of land with loss of bio-diversity. Patwaris and Gram Panchayat overlook all these illegal activities. Further the displaced villagers affected by various projects also cause deterioration of new lands with loss of biodiversity where the State Govt has ordered their resettlements.

In the context, the staff of Revenue Deptt. should be made aware about the Land management for sustainable use and bio-diversity conservation; however there is lack of suitable infrastructure.

11. Fisheries:

The Fisheries Department has introduced exotic species of fishes in various water bodies primarily to earn more revenue, without assessing the environmental impact. The population of local varieties has been diminishing because of exotic

introduction. Ecological importance of local fish species and their role in conservation has not been studied so far.

12. Animal Husbandry Department (AHD):

The Department of animal husbandry is responsible for the development of livestock, conservation and upgradation of local breeds, mostly operating in rural areas. Their maximum programmes are not conservation oriented. There is a lack of information on the present status of local breeds of cattle and poultry. The role of AHD in the management of wildlife and pasturelands is crucial.

The wild animals often come in contact with domestic cattle while grazing in forest areas or on waterholes. Thus, various contagious diseases like foot & mouth and other viral diseases can be transmitted. There are chances of crossbreeding of wild buffalo with domestic buffalo or of local poultry with red or gray jungle fowl, which require further investigations. Some of the programmes of AHD are counter-productive, e.g. crossbreeding of locals with exotic species, introduction of foreign milch cows, castration of indigenous bulls. Animal husbandry department should undertake research and study of the threat perceptions related to wildlife. The extension work of animal husbandry department should be motivate people to practice stall-feeding and rotational grazing, so as to minimize pressure of cattle grazing on forest areas. The Department should formulate clear policy addressing need of biodiversity conservation and management.

13 Tribal Development:

Most of the schemes relating tribal development are concentrated on benefits of individuals, instead of community sharing. The sustainable management of NTFP is linked to livelihood of tribals. It is observed that Maharashtra State Cooperative Tribal Development Corporation (MSCTDC) has no orientation to adopt integrated approach while dealing with demands and rights of the people. Long-term management of resources is needed to fulfill their needs. The corporation has however failed to formulate suitable strategies and programmes conducive to sustainable management of biological resources. The MSCTDC has been collecting only few products like Mahua flowers, the middlemen who are exploiting tribals purchase fruits, gum etc and the rest of the produce. The MSCTDC did not develop sufficient infrastructure and never exerted will and efforts for grading and development of NTFP.

The present programmes of tribal development are not competent to fulfill the needs of tribals. They need to arrange programmes in collaboration with department of forest, fisheries and NGOs in such a way that tribals can get maximum yield out of harvest of NTFP through proper management of the sources. Aspect of Biodiversity conservation should be estimated and incorporated in all policies & programmes. Deolapar in Ramtek taluka (Nagpur Distt.) and Sindevahi and Mul taluka in Chandrapur Distt. have major population of tribal. Therefore there is need to declare these areas as the scheduled areas.

14. Agriculture:

Most of the policies and programmes of Agriculture are contradicting biodiversity conservation. The introduction of hybrid wiped out indigenous species of crop plants. Indiscriminate use of chemical fertilizers and pesticides caused irreparable damage to the flora, fauna and human health. There is a constant conflict between farmers and Forest Department on account of crop damage by wild animals like wild boar, blue bull, deer and langur.

There are neither research studies nor appropriate documentation of wild relatives of the crops and threatened /endangered/extinct species of local crop varieties. Agriculture Department hardly paid any attention to protect crop diversity of the area and involvement in biodiversity conservation.

15. Police Department:

Police department is responsible to take action by detecting and prosecuting offenders involved in smuggling and destruction of biodiversity. It is observed that the police consider Forest Department as the sole agency responsible to deal with crimes related to poaching of wildlife; illicit tree felling, smuggling of natural resources etc. The forest officials are not manned with tools and weapons and thus, they cannot sustain the pressure of criminals. There is no provision of training of the police officials to deal with offences related to biodiversity.

16. Judicial Departments:

The role of judiciary is also crucial in protecting our natural resources. They have to deal with numerous cases related to the poaching, illicit trade of body parts of the wildlife, and timber, illicit mining and excavation of valuable minerals, misuse of wetlands etc. Their perception and knowledge about biodiversity conservation helps them to deal such cases with proper justice.

There is a major gap in assigning jobs to proper authorities. The Judicial Magistrate (First Class) has no powers to release tools, boats, cattle and vehicle etc. used in commission of the forest offence under section 52 of the Indian Forest Act, which are liable for confiscation under Section 61 / A of Indian Forest Act. The competent officers under section 61 D of this act are Conservator of Forests and Session Judge to give custody of the tools, boat, cattle, vehicle on commission of forest offence. However, in some cases confiscated vehicles are released by the JMFC resulting in demoralization of forest officials, who have done stupendous job of catching hold of offenders.

17. Planning Department:

While formulating and sanctioning various schemes, the conservation of biodiversity is not considered.

18. Panchayat Institutions

The Panchayat Institutions are expected to play a major role in formulating policies and allied programmes for development of communities. The 73<sup>rd</sup> amendment of the constitution, “ Panchayati Raj Act ” has given special attention on formulating sustainable model of development based on the natural resource conservation with involvement of the locals. Most of the Panchayat institutions are directly or indirectly working under the influence of political leaders and the aspect of people’s involvement is poorly ensured.

Panchayat Institutions are responsible for Activities relating Agricultural and other lands, Buildings and Construction, Education, Fisheries, Horticulture, Sanitation, Social Welfare and Water Supply. The aspect of biodiversity conservation is missing from most of the ongoing programmes. Some major programs like fisheries, horticulture, live stock development, soil & water conservation etc are planned, executed without giving emphasis on biodiversity conservation related to flora, fauna, local varieties of crops, local cattle and poultry breeds. But due to lack of this consideration, most of the schemes have turned materialistic. The 73<sup>rd</sup> amendment to the constitution has not been invoked in the true sense in Maharashtra.

19. Universities and Research institutes:

- a. Most of the studies in universities, research institutes and national laboratories, on biodiversity are of inventory type. The institutes like Zoological Survey of India and Botanical Survey of India are mostly engaged in the revisionary work, collecting and maintaining the herbarium and faunal specimens. They are not involved in suggesting action plan for conservation or management of biodiversity or setting Botanical & Zoological Gardens where these species can be conserved.
- b. There is no coordination between different line institutes that are responsible for the exchange of scientific and technological information at the state and national level.
- c. Results of the researches carried out are not published or circulated to the concerned agencies like the Deptt. of Forest, Fisheries, Agriculture departments etc.

20. Remote Sensing Department:

The MRSAC Nagpur has vast data collected through satellite images. The data can be used to cross check the ground truth. Various Deptt. of the State Govt, Social institutions and scientific organizations require it for preparing action plan but the charges are very high and information is not easily available.

21. Non- Governmental organizations:

Most of the NGOs are working on protection of human right, agricultural development, wildlife conservation and forest protection etc. Most of their actions are linked with multiple issues in isolation. An integrated approach is needed while dealing with joint forest management to address agricultural practices, Fisheries and irrigation food and fodder, livestock management and grazing land sanitation, soil and water conservation etc. But, it is observed that most of the NGOs prefer to concentrate on a particular issue of their choice and therefore, it is difficult to achieve goal.

They lack integrated approach to solve such problems on a long-term basis. Most of the NGOs working in the human right activism have ignored the vital role of biodiversity conservation for the survival of mankind.

There are very few NGOs, having proper expertise and capacity to deal with the issues related to biodiversity. Most of the programmes of NGOs are based on the livelihood fundamentals and economical benefits. There is no proper coordination between the NGOs and research bodies, policymakers and administrators.

## 22. HIGH RATE OF ACQUITTALS: Reasons

- a) Faulty investigations
- b) Ignorance of Forest officials towards legal framework and paper work.
- c) Hyper- technical attitude of judicial officers.
- d) Separation of investigating Forest officials and Public Prosecutors.
- e) Communication gap between Prosecutors and investigating officers.
- f) Lack of accountability at all levels.
- g) Legal system facing the critical problem of lack of accountability of judicial branch.
- h) Putting entire weight on prosecution has miserably failed in India, as it cannot go hand in hand with the luxury of Anglo-Saxon jurisprudence soaring the crime graph. Criminal jurisprudence needs change.
- i) Amendments in the evidence act and Cr. P. C to make procedures less cumbersome.
- j) Drastic changes needed in criminal justice system. Putting some burden on the accused. (on the lines of P. C. Act, 1988)
- k) Faulty, incomplete, unscientific investigations.
- l) Misuse of human rights reports.
- m) Non-availability of authorized publications of Statutes/ Acts/ Orders/ Rules/ Notifications.
- n) Inadequate training facilities.
- o) Turning Government Witness hostile by allurements.
- p) Non-availability of authentic maps and forest records.
- q) Complaint cases u/s 55 (Wildlife Protection Act, 1972) are tried by lower magistrates, which consume a lot of time. The cases are required to be filed before District and Sessions Judges for awarding more stringent penalties and to save time in convictions.
- r) Many a times clues for investigation are not available to forest officers, as provision of forest custody and right methods of interrogation are not adopted. In Police cases, the accused readily discloses the information leading to detection of crime sheerly out of fear of Police.

- s) Reluctance on the part of experts to depose before court as regards to their technical opinion.
- t) The facility of operating secret fund has not been provided to Forest department.

**Gaps identified in Bastar region:**

1. Encroachment on the forestland is an acute problem. Encroachment is done by the local tribals and outsiders (people out of Bastar Division) trying to settle in Bastar, despite being a scheduled area.
2. Illiteracy is the major problem faced by local community in establishing contacts with outside market and negotiating for the fair price of NTFP. Lack of appropriate efforts in local government staff has drastically changed the tone of age – old sustainable development of local community members. This has led agony and apathy of people against administration.

**Story of Special Protection Areas \* (Genetically rich areas):**

A conference of the Chief Conservator of Forest and Forest Secretaries held at New Delhi on 28<sup>th</sup> and 29<sup>th</sup> August 1986 agreed upon to identify minimum 5 % forest area in the state as special protection areas that are ecologically rich to preserve genetic diversity. Such areas are to be identified in consideration of the rare forest type, richness in biological diversity, areas containing endangered or rare species of flora and fauna and areas of social and religious significance, individual group of trees (singular in dimension, extreme rarity or differing in any other physical qualities), freak trees or associations that are unique. The areas so identified will not only be protected from any type of damage but also excluded from all types forestry operations. The main objective was to preserve genetic biodiversity of all such areas. As a result, an area of Pine Plantations raised by MP Forest Department from the year 1972 –81 over an area of 15.11sq.kms. have been identified as Special Protection Areas.

*The areas with rich floral and faunal diversity had not been identified and put under such category.*

\* Working Plan for Central Bastar FD, 1988 – 98, Volume - I

3. Outsiders, who have no concern or ethos for conservation of forest, have settled down in all parts of Bastar, including the interior areas. Trading is their main source of earning. The Abujhmar hill area is under severe biotic pressure due to the outsiders who intruded in the area from Andhra Pradesh. They have cleared forest cover on large areas. This is because of the weak protest by local Abujhmaris, who are very calm and quiet and moreover illiterate. Some naxalite groups are active in the area.



Lack of inter agency and inter departmental coordination has been observed to identify and address conservation programmes at various levels.

Crops are grown only in Kharif season. During monsoon & summer, tribals are busy in collecting NTPF and hunting and trapping of wild animals, which includes *Monkey, Gaur, Wild buffalo, Leopard, Deer, Cattle, Snake, birds, insects* etc. Due to easy access to the interior areas and easy availability of illegal guns and poisons; poachers and traders lure tribals for illegal hunting for meager sums.

Conservation & protection of forest/ natural resources is of least concern to the politicians and most of the administrators. The purpose of protection and conservation is not easily addressed by most of the ongoing programmes of the Government & understood by the people at large, mostly of whom are the outsiders. Alienation of people from participatory management of forest has become a cause of irresponsibility towards government managed forest areas.

## Chapter III: Agriculture

### 3.1 Current knowledge:

The region covering East Vidarbha receives annual rainfall ranging from 110 to 150 cm, which increases from west to east. About 42% of the TGA supports good forest cover and it is potential area for teak wood production. 5.7% of TGA is under permanent pastures and other grazing lands, 34.2% of TGA is under net cultivation and 9.4% for non-agricultural use, including barren and uncultured lands. The percentage of area potentially available for cultivation arrives to 42.5, when land under miscellaneous tree crops and groves and all fallows are included.

Paddy is predominant crop grown in kharif in the districts of Bhandara, Chandrapur and Gadchiroli, while pulses like gram and lythyrus in rabi. In Nagpur district, cotton, soybean, sorghum and chillies and gram in kharif, while linseed, gram and wheat in rabi in deep clayey soils with sustainable irrigation facilities. In recent years soybean is encroaching the areas of cotton, sorghum and chillies. Various vegetable crops and at places fruits like citrus (mainly oranges) and guava are grown.

Canals, tanks and wells are the main sources of irrigation. Net area irrigated as percentage coverage of TGA is 8.8. Nearly 24.3% of cultivated area is double cropped, which indicates 42.5% TGA as Gross Cropped Area.

The region has assured rainfall of more than 120 cm and the soils of the plains are deep with high water holding capacity and fertility. .

The deforestation and encroachments of marginal areas for cultivation are the major problems in non-arable hilly areas. Whereas soil conservation and drainage are the two problems of arable lands. Watershed based approval to conserve both soil and water resources are necessarily to be followed.

Agriculture is the main occupation and people depend on variety of crops to meet their requirement of food. The following groups of crops are grown in the area.

The crops grown in Vidarbha are:

- a. Cereals and millets** - paddy (*Oryza sativa* L.), wheat (*Triticum* spp.), bajara (Pearl millet), jowar (*Sorghum* spp.), maize (*Zeamays* L.).
- b. Pulses** - black gram (Urid), bengal gram (Chana), lentil (Musor), Chickling or Lakholi (*Lathyrus sativas* L.) cow pea (Chauli), green gram (Mug) and pigeon pea (Tur).
- c. Oil seeds** – castor (Erandi), groundnut (Mungphali), mustard, (mohri), sunflower (kardi), linseed (jawas), sesmum (Til), Niger (Karale, ramtil), soybean.
- d. Major Fruits:** aonla (*Embllica officinalis*), ber (*Zizyphus jujuba*), banana (Kela), custard apple (Seetafal), guava (Jamb/Peru), Sour lime (Kagazi Limbu), mango (*Mangifera indica* L.;Amba), papaya ( *Carica papaya* L.), Santra / Orange ( *Citrus reticulata* Blanco).
- e. Major vegetables:** ash gourd (Kohala), bitter gourd (Karela) , bottle gourd (Lauki), brinjal ( Vange), Cabbage (Patta gobi), Cauliflower (Phool gobi), Chilli (Mirachi), Cucumber (Kakadi), coraider (Dhania/Kothimbir), Febugreek (Methi),garlic(Lassun), ginger (adrak/aale) Lady’s finger (Bhendi), Onion (Kanda), Pumpkin (Kashi phal), radish (Mula), red pumkin (Lal bhopala), Smorth gourd (Gilka), Snake gourd (Padwal), spinach (Palak), tomato (Tamatar), turmeric (Haldi).
- f. Cash Crops** – cotton (kapas)

The farming communities were growing crop varieties of diverse range until 1970, which were selected on the basis of soil types, rainfall pattern, adaptability to local conditions, yields etc. A meagre information appeared available on indigenous crop varieties.

**The youth volunteers (Young Environmentalist) of Vidarbha Nature Conservation Society**, working in 56 villages from 5 districts of East Vidarbha, have collected information from communities on indigenous species, which were either grown earlier on large scale or at present in sporadic patches by the interested cultivators. As per information, paddy has 18 wild varieties out of which only two, *O. sativa* and *O. glaberrima* are grown. The cultivators used to grow about 45 indigenous and 47 upgraded / hybrid varieties of paddy, 12 local and 13 hybrid varieties of sorghum, 4 indigenous and 7 upgraded varieties of maize, 3 indigenous and 13 upgraded varieties of wheat, 12 species of cotton, 48 species of oranges, 18 species of lemon, 7 species of tomato and 12 types of green vegetables.

Within a span of last 30 years, State Government has introduced various hybrid seeds for higher production. Which has encroached upon local crop varieties to a greater extent., almost all the indigenous varieties of sorghum appear extinct from the area, as is also the case of paddy. It is

encouraging to note that few cultivators are still growing indigenous crop varieties of sorghum, paddy, red gram etc. (Annexure 19).

Based on the agro climatic and physiographic conditions, **Bastar region** is divided into six sub-zones namely Northern low lands, Keshkal scarpments, Abujmar hills, North Eastern Plateau, Central Plateau and Southern low lands. The annual rainfall ranges from 1200 to 1400 mm with possibilities of winter rains every year. Thus sufficient quantum of well-distributed rains favours many crops to grow even under harsh conditions. The soils vary according to in topography, colour depth, fertility, texture

Thus, based on topography, five farming situations have been identified in Bastar. This plateau zone is known for its rich biodiversity in agriculture due to variety of crops and their local land races. Agronomical and horticultural crop include plantation vegetables and tuber crops.

**In Bastar region**, out of the total geographical area, 60% is covered under the forest vegetation and 22 – 24 % area under net cultivation of various crops. In forest area, some land is under shifting cultivation of hill millets and other crops. Paddy is a major crop of this zone grown in area of 6.67 lakh hectares with the total production of 743.12 thousand metric tonnes followed by small millets in about 1.2 lakh hectares with the production of 36.5 thousand metric tonnes. The main millets being grown in this zone are *kodo (Paspalum scrobiculatum L)*, (*Echinochloa frumentacea L*), *common millet / Kosra / Cheena (Panicum milliaceum L.)* and *Fox tail millet (Setaria italica L.)*. Out of these, *foxtail millet is only restricted to South Bastar*.

## **Major crops of the central India Ecoregion:**

### **1. Paddy (*Oryza sativa L.*):**

In Vidarbha, up to 1970 farmers were growing 70 to 145 indigenous varieties of paddy by using organic manures such as FYM (Farm yard manure) and composts, with their traditional methods of pest control. The attack of the pests was minimum and it could have been easily brought under control by using indigenous methods. The diseases that are observed today were not reported earlier. Old traditional method of broadcasting appeared responsible for the low production of paddy. Grasses and weeds adversely affected the paddy crop, when their control measures were not possible due to unfavourable seasons. Transplanted paddy gave more outturn per ha.

Paddy is normally grown in soils covered with standing water, 5-10 cm deep kept by enclosing bunds. Soils used for growing paddy are usually fine textured, which retain rain/irrigation water. Pudding-repeated tillage during saturation helps to reduce percolation losses of standing water and dissolved plant nutrients to control weeds and to facilitate hand transplanting of paddy seedlings. A commonly seen insect pest like Gall Fly (Gad) was controlled by spraying water extract of locally available botanicals, garadi, beshram and neem leaves and disease such as blast (karapa) by removal of weeds and surrounding widely growing host plants (field sanitation) and growing lathyrus/gram (legume) on residual moisture after paddy. The indigenous species of fish like belona (*Chana lecopunctatus*), botri (*Chana gachua*) etc. breeding and multiplying in standing water of paddies, were considered to exercise biological control over paddy pests through predation. However, biological control through natural enemies in the form of parasites and predators suffered a set back owing to large scale and indiscriminate use of modern pesticides advocated during the Green Revolution of 1970's. The local farmers

consider that the persistent attack of midge fly and gallfly appears mainly because of the local absence of belona and botari fish in the paddies.

The yield potentials of old paddy varieties were low. The Deptt. of Agriculture recommended moderate doses of fertilizers on the basis of a large number of field trials conducted on the Govt. farms and cultivators' fields. The main objectives were verifying their overall field performance and the yields of varieties. Moreover, these varieties had a low fertilizer response. The short-statured hybrid varieties like IR-8 introduced during the mid-sixties, brought green revolution and accelerated the pace of agro-technology transfer through the Deptt. of Agriculture and Zilla Panchayat. The major nutrients required by paddy are N, P and K and among the micronutrients, zinc is becoming important. P & K are incorporated during preparatory tillage –before sowing. Nearly 30% of the total fertilizer, now available in the country is used for the paddy crop alone. However, the paddy growing conditions are equally conducive to rapid losses of applied nutrients, particularly true of nitrogen, which is usually deficient in most of the paddy areas. The 60 to 80 percent of added nitrogen is lost from the soil system through mineralization-nitrification-denitrification reactions and therefore, N applications need to be based on the crop-growing conditions and the physiological growth stages of the crop that are more important; these were not followed appropriately resulting misuse.

Inputs like hybrid varieties; fertilizers and pesticides were made available at the doorstep of every farmer by providing necessary credit and subsidy by the Govt. agencies. The production increased; however the fertilizer use was mostly imbalanced. Application of N alone and that too excessive increased foliage growth and could result in lodging of the crop. The farming community also neglected the partial supply of nutrients through organic resources (manures), which are important in the formation of productive soils. The high susceptibility of these varieties to pest and diseases could lead to increased use of pesticides/fungicides. Broadly it can be said that the misuse of inputs like fertilizers, irrigation water and biocide chemicals could result in loss of soil fertility and bio-diversity, with increased risks of soil degradation.

In **Bastar**, paddy is the major crop of the zone and being cultivated in over 67% of the total cultivated area. Bastar is a home for local land races of rice. During seventies, 19093 rice accessions were explored from whole of Madhya Pradesh and Chattisgarh. Out of these 5622 were collected from Bastar itself. These are now being stored in medium range preservation unit at Indira Gandhi Krishi Vidhyapith (IGKV), Raipur. Local rice races were further collected by ZARS and presently 73 accessions are being maintained.

### **2. Maize (Zea mays) and Sorghum (Sorghum bicolor):**

Maize & Sorghum are important kharif coarse cereals of the zone. Productivity of both the crops is good in Bastar agro – climate conditions. The I. G. A. R has collected local land races of maize and Sorghum in 42 & 30 numbers respectively. These accessions have been sent to NBPGR, New Delhi for preservation. The zone is under exploration in this regard and need intense explorations.

### **3. Minor Millets:**

The zone is having varieties of minor millets in existence. These crops play a vital role in the food habits of tribals. The main minor millets that are being cultivated are Kodo, Kutki, Ragi, Sawan, and Kakun. A good number of land races of these crops have been collected and have been sent to NBPGR, New Delhi for long-term conservation.

#### **4. Pulse crops:**

Amongst the pulses horse gram (*Macrotyloma biflorum* L.) and black gram (*Vigna mungo* L) are the common pulses grown by the farmers of this zone. Horse gram locally called “Kulthi” or Harwa ” is the major tribal pulse of kharif and rabi season cultivated in thirty thousand hectares with a production of 7 to 8 thousand tones annually in Bastar. It is being cultivated in both kharif and rabi season. The other major pulse of the region is the black gram grown in the area of 20 thousand hectares and 21800 hectares during Kharif and Rabi seasons respectively, producing 8.25 thousand tones of pulse in the kharif and 10 thousand tones in the rabi season. Grass pea (*Lathyrus*) is another tribal pulse but grown in only 5000 hectares as pair – cropping. The diversity in the pulses is as under:

##### **Horse gram (*Macrotyloma uniflorum* L):**

A total of 239 germplasm were collected and evaluated for three years. Out of these 35 accessions found promising for various traits, which have been sent for long-term conservation to the National Bureau of Plant Genetic Resources (NBPGR), New Delhi. These included 190 accessions mainly from the Tokapal, Lohandiguda, Bakawand, Kondagaon, Narayanpur, Bastar, Bastanar, Darbha, Jagdalpur blocks of Bastar district and 24 accessions from the Dantewada district (this includes Geedam, Chhindwara, Bijapur, Bhopalpattanam, Sukma, Kuakonda & Konta blocks) and 25 accessions from the Kanker district which includes villages of Kanker, Charama, Narharpur, Bhanupratappur, Durgakondal, Antagarh blocks.

##### **Rice Bean:**

It is another important pulses crop of the region. It is locally known as “Bhadai”. Attempts have been made to explore the local land races of this pulse. A total of six accessions were collected which have been sent to NBPGR, New Delhi. It needs further explorations.

##### **Black Gram and Bengal Gram:**

These are important pulse crops of this region. Thirty & four number of accessions has been collected during exploration, which has been sent to NBPGR, New Delhi for long-term preservation. The gram crop is not suitable in the soil of this plateau; hence very meager area is under cultivation.

#### **5. Oil seed crops:**

##### **Niger (*Guizotia abyssinica*) Ramtil:**

Total 162 collections of local niger were collected from Bastar division and evaluated for three consecutive years. As a result 35 promising accessions had already been sent to NBPGR, New Delhi. These accessions included 122 of Bastar District mainly from Tokapal, Lohandiguda, Bakawand, Kondagaon, Narayanpur, Bastar, Bastanar, Darbha, Jagdalpur blocks and 35 accessions from the Dantewada district (this includes Geedam Chhindgarh, Bijapur, Bhopalpattanam, Sukma, Kuakonda & Konta blocks) and 5 accessions from the Kanker district, which includes villages of Kanker, Charama, Narharpur, Bhanupratappur, Durgakondal, and Antagarh blocks.

##### **Toria (*Brassica* Sp. var “toria”):**

Toria is a mid season and badi crop grown under maize based cropping. Only spreading cultivars are being grown having a typical plant type called as Lotani. In all 70 accessions were collected from the different parts of Bastar region which includes 30 from Tokapal, Lohandiguda, Bakawand, Kondagaon, Narayanpur, Bastar, Bastanar, Darbha, Jagdalpur blocks of Bastar district and 28 accessions from the Dantewada district (this includes Geedam Chhindgarh, Bijapur, Bhopalpattanam, Sukma, Kuakonda & Konda blocks) and 12 accessions from the Kanker district which includes villages of Kanker, Charama, Narharpur, Bhanupratappur, Durgakondal, Antagarh blocks. Out of these 29 accessions has already being submitted to NBPGR, New Delhi.

Roselle (*Hibiscus sebdariffa* L):

This is lesser-known oil cum fiber crop of the region. The leaves of this crop are also consumed as a vegetable. The part of calyx also has medicinal value generally being used against sunstrokes and abdominal problems. The farmers of the region take out this crop in mixture with either maize, sorghum or with other minor millets. Hence, there is a need to explore the local land races of this crop since no attempt has been made to explore such important tribal crop.

Apart from these, agronomical crops like wheat, sunflower, lentil, linseed, sugarcane, and seasamum are cultivated in the small pockets of Bastar region. The prevailing land races of these crops are not being maintained and there is a need to explore whole Bastar for the documentation of such crops.

## **6. Horticultural Crops:**

Climate wise this zone is very much suitable for horticultural crops including fruits, vegetables, tubers & species. Looking into the varieties of horticultural crops prevailing in this zone a systematic exploration needs to be carried out for collection, documentation, evaluation & preservation of local land races. So far as coconut palm & Cashew nut is concerned, only 22 and 43 number of accessions respectively have been collected and maintained. The major horticultural crops include spices & condiments.

## **7. Tuber Crops:**

Bastar is considered as the native home for the varieties of tuber crops. The main tuber crops being cultivated in the region are tapioca, sweet potato; elephant foot yam, dioscorea, colocasia, mishri kand and other minor tuber crops. Many collections of major tuber crops have been made, whose details have been given in the annexure. However intensive exploration is needed for minor tuber crops.

It has been reported that the rapid use of genetic resources, high population pressure, fast and multi dimensional agricultural and industrial developments have caused a gradual erosion of genetic biodiversity. Such points should be given due importance. Thus, preservation of gene base is an integral part of the food security, particularly in the tribal belt.

## **3.2 Habitat Destruction:**

### **Population:**

Enormous growth in population exercised tremendous pressures on our finite land and water sources due to increasing demands for food, fibre and fuel. The burgeoning population has its effect on encroachment of agriculturally potential areas near cities for settlements and in bringing the marginal areas under plough through deforestation. The situation has aggravated further due to competitive demands by growing industrial networks.

**Transfer of agricultural land:**

The cultivable fertile land around urban areas was diverted for industrial use and urban habitats.

**Destruction of trees surrounding the cultivable land:**

Illicit cutting of local important species of mango and tamarind trees for the preparation of planks and fabricating boxes to pack oranges for their outside marketing.

**Introduction of exotics and monoculture:**

Introduction of various exotic plants and weeds like *Parthenium hysterophorus* (Congress grass), *Lantana camara* (Ghaneri), *Ipomoea fistulosa* (Besharam) and Amaranth has degraded grazing land and their unchecked luxuriant competes with crop on agricultural land. The menace of parthenium has created severe health problems like allergies, skin diseases and respiratory troubles in human beings and cattle.

The tempting attitude of the cultivators to grow continuously crops like cotton or to plant oranges without asserting the suitability of soils and the misuse of available irrigation could result in rapid increase of insect population (sudden pest outbreaks).

During the green revolution in 1970's with introduction of high yield varieties, with the increase in irrigation facilities, associated with high usage of fertilizers and pesticides, the production did show an increasing trend. The increase was associated with the pollution and environmental degradation. At present, majority of the land resources are degraded (depletion of fertility and increased erosion) and needs an immediate attention and care before they lose their resistance. Thus, developing the strategies to slow down the degradation processes or ameliorate the lands to bring back normalcy are the major issues today.

Some observations relating impact of green revolution are-

- i) The indigenous crop varieties are on the verge of extinct.
- ii) Full utilization of available organic resources was not attempted due to increased availability of fertilizers. Organic manures are in short supply, while considering their increased demand for intensive cropping. The growers have nearly stopped green manuring.
- iii) Imbalance fertilizer use depleted soil fertility and
- iv) The indiscriminate use of biocidal pesticides even though controlled the target organisms, killed the natural population of parasites and predators (amphibians, birds, fishes, spiders etc.).

**Harmful Practices:**

1. Land and water are two basic resources of human sustenance and security. Overgrazing, extensive deforestation bringing sub-marginal under cultivation, shifting cultivation, improper use and treatments of lands etc. are contributory causes, which wasted our land resources. Therefore, watershed based approach to conserve both soil and water is necessary.
2. Continuous cropping aimed for more profits throughout year has resulted in depletion of fertility of the soil.
3. Excessive use of water for irrigation has resulted in water logging of the soil and associated problems because of lack of drainage. And
4. Increased cropping intensity could result in the outbreak of various pests and diseases due to availability of ample substrates.

#### **Loss of knowledge Source:**

The information relating traditional agriculture (region wise) was not considered by advocates of Agriculture development and therefore, could not be documented. The age-old practices followed in various regions of the country were based on the actual experiences and existing socio-economic conditional of farming community.

### **3.3 Root causes:**

#### **1. Unsustainable models of development:**

1. Constructions of big dams like Gosikhurd, Itiadh and Pench etc., and industrial establishments have utilized prime agricultural lands. The industries polluted agricultural land and water by releasing industrial effluents in rivers and exerted pressure in terms of over exploitation of water resources, electric power and manpower. Even though by State and Central Govt. have made pollution control measures mandatory many cost-conscious industrial establishments not undertaken these provisions seriously.
2. The-cropping pattern is influenced by different state policies and programs, which are encouraging use of hybrid seeds, particularly cereals with chemical fertilizers and pesticides. The hybrid varieties are fertilizer responsive and susceptible to pests and diseases. It has resulted in killing of target pests or organisms and predators and parasites. The zone wise crop production package are necessary while considering local conditions. Agricultura Extension Workers did not attend
3. In green revolution Govt. supplied hybrid seeds, chemical fertilizers and pesticides on credit at subsidized rates. As a result majority of farming community did not attend the preservation of indigenous crop varieties on account of low yields and neglected use of FYM, composts and green manures, which made agriculturists dependable on government help. Of late, they have realized their mistake and a few cultivators have focused their efforts in this direction.

#### **2. Alienation of citizens from natural resources:**



1. Loss of soil nutrients, water scarcity, non-availability of fuel wood and fodder for cattle has made cultivator economically weak.

2. Illicit felling of trees:

Loss of village grazing lands compelled the people to graze their cattles in nearby forest areas. The locals meet their requirement of fuel wood and timber through forests. This biotic pressure resulted into loss of forest cover and depletion of ground water level. The occurrence of pest attacks on agricultural crops has increased due to depletion of forest cover on large scale and migration of forest pests for substrate.

3. Forests play a dominating role in the conservation of soil and water resources especially in a predominantly agricultural region like the study areas. Rapidly increasing human and livestock population and growing competition of land for agriculture and other uses has caused large scale destruction of forest resulting accelerated soil erosion, floods and untold misery of the nearby people. Most of the rivers and streams are dry in this region after rainy season leading to acute water shortage.

### 3. **Social/ Political/ economical inequity:**

#### ***Social:***

- Family breakdown from joint families to nucleus families.

Under joint family system, entire agricultural land of the family used to be collectively managed by the family members. The break down of joint family into nucleus families resulted in partitioning of the land into small pieces. Moreover, many of the landholders shifted for seeking employment from villages to the cities, leaving the land uncultivated. It has also resulted into change of crop pattern, mostly switching over to high yielding varieties from indigenous low yielding varieties and cash crops like sugar cane, oranges etc.

- Migration from rural areas to urban settlement for livelihood, as agriculture is considered as non-profitable and non-lucrative.
- Loss of the spirit of cooperation and sharing of information.
- The control of politicians and bureaucrats over formulation of farm strategies and programmes neglecting biodiversity conservation (e. g. In Maharashtra more stress is given on farming of soybean, sugarcane and other cash crops, promoting hybrid seeds, subsidies on the use of chemical fertilizers and pesticides etc.)
- Maximum government policies and programmes are directed towards promoting hybrid varieties and growing cash crops. As a result, growing traditional varieties of crops was neglected.

- Present policies and programmes have been found incompetent to solve the problems of landless labourers, marginal agriculturists, village artisans like carpenter / potter / blacksmith / cobbler etc.
- Draught cattle are required for tillage operations during cultivation of crops. In most of the areas draught cattle are not available because of the government-aided programme of castrating of bulls of local breeds for introduction of exotic species of milch cow. It is economically difficult for the marginal agriculturists to purchase a pair of bullocks at price ranging from Rs. 15,000 to 25,000/-. Other livestock are reared for meat and milk.
- Inadequate infrastructure of state government.  
  
Maharashtra government sponsored scheme for agriculturist in Vidarbha, who grow medicinal plants and Sita Ashok by providing a subsidy of Rs. 35000/- per ha. The department selected beneficiaries but failed to supply saplings.
- Various crop breeders working under the jurisdiction of Dr. Punjabrao Krishi Vidyapeeth, Akola maintain crop museum on a small scale due to lack of sufficient finance from the State Government.

#### **Economical:**

- In the older days, when the village economy was more or less self sufficient, the marketing of agricultural produce presented no difficulty; the farmers sold their produce directly to the consumers or local traders on cash or barter basis. Even today small landholders sell their produce in nearby village markets / urban clusters directly to the customers.
- The situation however changed during the British rule from 1866 with population growth, creation of transport facilities, development of marketing centers in urban areas and export of grains and agricultural produce to foreign lands. Marketing involved a series of transfers – village merchants, traders, wholesalers and retailers. The unreasonably low returns that the farmers got for their produce and the excessive margin of profits retained by the intermediaries and the various mal practices rampant in the markets attracted the attention of Government of India. Marketing surveys were conducted by establishing the office of the Marketing Advisor, now known as Directorate of Agricultural Marketing and Inspection under the Ministry of Agriculture and Irrigation in 1935 and parallel establishments in the states. Regulated markets were established through legislation in 1937. The primary objective was to remove the handicaps from which the producer/sellers were suffering but also to increase their income by ensuring fair prices. The regulated markets helped to build up the confidence among the producers- sellers (farmers) in their own abilities to bargain with the traders. The management provided necessary facilities such as market yards, grading and storage sheds for safeguarding the interests of farming community as required under the law.
- It is estimated that the 50 – 70 percent of the agriculture produce is available with the country as marketable surplus depending upon the type. Even though the producers got fair returns from production efforts and better share in the prices paid by the consumers,

creation of modern infrastructures and better facilities for processing, grading and storage in all markets lagged-

- The farming community desires that selling prices fixed at present are not remunerative while considering the increased costs of inputs like seeds, fertilizers and biological chemicals etc. The sale prices should fully cover the total cost of production, plus reasonable profit. All Agricultural Universities have published leaflets relating the calculation of total production cost per hectare and necessary formats, but most of the farmers do not maintain records, which can render valuable help to plead their cases as per different crops grown under various farming situations.
- Presently it is a crucial time, when the country has entered in an era of production surpluses. The Government actions because of political interferences and bureaucratic pressures, should not nullify the advantages gained by the farmers on the production front at the face of the vagaries of monsoons and related various natural calamities.

#### **Political:**

Political leadership at the center and state level mainly governs the policies and programs. Some wrong policies have brought economical inequities between the farmer and others in rural areas.

The major emphasis was always given to grow cash crops e.g. sugarcane and use chemical fertilizers and pesticides (e. g. sugarcane). Politicians and bureaucrats influence programs related to selection of seeds, providing subsidies, market support. The agriculturists or their representatives were never consulted during formulation of Policies

#### **4. Fragmentation of lands:**

(Owing to various socio- economic factors that have operated in the past over a long period,) agricultural holdings have become greatly fragmented and dispersed with the result that an average farmers has to suspend much time and resources without realizing even the economy obtainable from small land holding.

#### **5. Ethical / moral changes:**

The entire value system in the rural sector has undergone fast deterioration in the recent past on account of encroaching western enticement. The farmers were viewed as respected Annadevta in the community. The same esteem /feeling has vanished. The young and educated generation is remaining away from the land due to loss of aptitude for sincere handwork. Their unemployment has further weakened their ethical and moral values.

#### **6. Inappropriate or contradictory policies and laws:**

During last 25 years these districts had to face constant changes in laws related to subsidies in agro-input, crop insurance, forest laws, health, irrigation facilities, power supply and taxes etc.

Section 96 of Bombay Tenure Acquisition Act states that only agriculturist or landless agriculturist can purchase a land in his name and it will be documented on 7/12 format of talathi record. But this act is not applicable to the lands acquired by the Government and handed over to the Industries. While acquiring such lands the components like fertility and productivity of the soil, crop pattern, livelihood of landowner and other dependants like village artisans are not taken into consideration. Simply, an amount as per prevailing Government rate was paid to the affectees and it becomes very difficult for the affectees to purchase suitable land of same status elsewhere.

Land - Ceiling Act resulted in fragmentation of small land holdings, which could lead to inefficient management of agriculture and uneconomical productivity. Curtailment of the subsidies for agricultural inputs weakened the farmers in strengthening cultivation practices. The State Government has given top priority to supply water for industrial and urban use by diverting directly from irrigation sources. Thus, supply of water to agricultural land has been given secondary importance.

There is lack of technical know-how at the doorstep of agriculturists. It has been observed that most of the officers relating to agricultural development stay out of the reach of common farmers, who remain neglected in sharing of information.

Mechanical slaughterhouses kill enormous number of cattle, which created scarcity of good bullocks for draught and transport purposes. It also affected the production of dung and milk in rural areas.

Some policies of State Government has adversely affected conservation of agricultural biodiversity, e.g. agricultural price commission does not recommend support price for traditional crop varieties, monoculture in crop pattern, emphasis to grow selected varieties like cotton, sugarcane, soyabean, distribution of selected cereals like wheat and rice in PDS, nutritional value crops varieties is ignored, inadequate crop loan overlooking the actual cultivation cost of the crops.

#### 7. **Over centralization:**

- The Panchayati Raj system was introduced in 1962 with emphasis on the decentralization of power. But, the same is not implemented in true sense at the village level. e.g. the powers are not vested on local Panchyats for quantum of water to be released, collection of land revenue, sale of agriculture produce in the market. Most of the decisions were taken at district level and then implemented at Panchayat level.

Though, Gram Panchyats are given some powers, the role of Gram Sabha is ignored. In most of the cases few influential members of the Gram Panchyats and government employees take decisions. The opinion of common people is not taken for to decide on the following matters:

1. Selection and Supply of seeds.
2. Village water management
3. Village land and forest management.

4. Formulation of schemes for agricultural development.
  5. Management of lakes for harvesting of fish and selection of fish varieties.
  6. Selection and use of fertilizers.
  7. Rearing of bulls for artificial insemination, cross breeding of cattle and poultry.
  8. Soil and water conservation.
  9. Management of grazing grounds, nistar lands and lease for mining, and
  10. Selection of beneficiaries from deprived class of society.
- The formulation of policies and programmes of agricultural development and animal husbandry is done at state level with the involvement of politicians and bureaucrats, supposed as scientists and technologists, without involving the representatives of communities.

#### **8. Lack of administrative coordination:**

Agriculture is the backbone of rural economy. Agricultural development is a multidimensional process which involves various factors like land and climatic conditions, supply of seeds, power and irrigation water, availability of manpower and finance, marketing facilities, education and awareness of farmers, political cum socio-economical changes, livestock and poultry, harvesting of NTFP, availability of fuel wood for cooking and fodder for cattle etc.

Even though, the Department of Agriculture is a major actor in processing the policies and programmes for agricultural development, other line agencies like Department of Animal husbandry, Cooperatives, Forests, Irrigation, Marketing, Power Supply, Revenue, Transport etc. have major roles to play in the integrated development of villages, but proper coordination amongst these line agencies is lacking.

#### **9. Unclear or inappropriate land tenure system:**

1. The average size of operational holding in Vidarbha is much lesser as compared to the other part of the state. One of the many causes responsible for the slow growth of agriculture is the fragmentation of land holdings. As a result the holdings do not consist of a single compact block but a number of small-scattered plots irregular in shape, spread over the different parts of village. The main causes of fragmentation are as follows:
  - a. Excessive population pressure on land.
  - b. Law of inheritance and succession.
  - c. Loss of alternative sources of employment
  - d. Village moneylender and indebtedness of ruralites
  - e. Decline in rural and cottage industries.
  - f. Uncertainty of production and
  - g. Poverty
2. The agricultural practices have become uneconomical because of uncertainty of rainfall coupled either with water scarcity or water logging and non-availability of labour or

increased labour cost. Moreover the agriculture produce do not get proper price and therefore farmers become economically weak.

3. The root cause of the loss in agricultural biodiversity is the evolution of land tenure system. It consists of legal and customary system under which land is actually owned and means the system under which land is actually cultivated and the product is divided in between the owner and cultivator. This system is determined by geographical, economic, social and political conditions, which has adversely affected the efficiency of cultivation and the distribution of the produce.

### **3.4 Major actors:**

#### **1. Governmental agencies:**

The various governmental agencies relating agricultural development are as follows:

1. State Departments of Agriculture, Animal Husbandry, Fisheries and Forests are responsible for formulating policies and programmes and their implementation in the state.
2. Zilla Panchyats/ Parishads:  
Principal Panchayat institute responsible to plan and execute maximum schemes related to integrated development of the rural area.
3. Vasantao Naik Institute of Agriculture, Nagpur  
The institute imparts training to administrative staff of various departments.
4. Maharashtra Council of Agriculture Research and Education, Pune  
A State level body, chaired mostly by a politician, formulates policies and programmes for State Government and Agricultural Universities.
5. Central Institute for Cotton Research (ICAR), Panjari, Wardha road, Nagpur.  
A national institute engaged in research for cotton crop. It has collected 6000 accessions.
6. Central Integrated Pest Management Center, Nagpur.  
Pest management.
7. National Bureau of Soil Survey & Land Use planning (ICAR), Nagpur  
A national institute involved in soil resource inventories & land use planning.

8. National Bureau of Plant Genetic Resources (ICAR), New Delhi with its regional centers at Akola and Amravati.

An extension of NBPGR activities.

9. National Research Center for Citrus (ICAR), Nagpur.

The center is engaged in research on citrus fruit crops.

10. Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola

The Panjabrao Krishi Vidyapeeth, based at Akola, carries out various programs of research in the field of agriculture. It has eight colleges, one postgraduate college and seven agricultural schools and training centers. This university undertakes documentation and research work related to agricultural development.

The PDKV has research unit for sorghum, cotton, pulses, wheat, millets, oilseeds, paddy, sugarcane, fruits and vegetables, medicinal plants including dry land agriculture and water shed management. Most of the research is focused on development of high yielding varieties.

Various crop specialists keep museum of varieties. However this aspect of upkeep is limited due to shortage of funds.

11. Indira Gandhi Agricultural University, Raipur.

The University is engaged in education and research relating agriculture in Chattisgarh State. It has undertaken work on germplasm collection of agricultural and horticultural crop varieties.

12. Zonal Agricultural Research Station , Jagdalpur (under IGAU, Raipur )

The station carries out research on agriculture in Bastar and is presently engaged in inventorying & documenting of crop diversity and local crop varieties and breeds of poultry, ducks.

13. Regional Remote Sensing Service Center, Nagpur (Deptt. of Space ISRO, Govt. of India) and Maharashtra Remote Sensing Application Center, Nagpur (under State Government), offer help in the use of imaginaries to various central and state Deptts. in their respective areas of subjects on payment basis.

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## 2. Citizens and NGOs:

The education and awareness is a basic tool to handle various critical problems that are contradicting biodiversity conservation. Knowledgeable citizens like college teachers and scientists; NGOs and CBOs can bring awareness amongst rural people and encourage their involvement in agricultural biodiversity.

Number of NGOs and CBOs are working in the areas of rural and agricultural development, especially soil & moisture conservation, advocacy and lobbying for fair price and marketing agricultural produce etc. Unfortunately, very few NGOs have understood the role of biodiversity conservation in agro – ecology. They are mainly working in the field of sustainable agriculture, soil and water conservation and Joint Forest Management. Renowned NGOs of the area are:

1. Surajya Pratishthan, Nagpur (Water shed area development)
2. Krushak Charcha Mandal, Saighata Distt. Chandrapur.(Agricultural development and JFM)
3. Gramin Yuva Pragatik Mandal, Bhandara (Sustainable agriculture)
4. Nisarga Sanskar Vidyapeeth, Mohpa Distt. Nagpur (Sustainable agriculture)
5. Vidarbha Nature Conservation Society, Nagpur (sustainable Agriculture and Natural Resource Management). and
6. Adarsh Gaon Samittee, Walani Distt. Nagpur (rural development, soil & water conservation).

### **3. Local communities:**

There are a few villages with some knowledgeable resident cultivators, who protect indigenous species of sorghum, paddy, mandarin oranges and mangoes. These cultivators with their keen and day to day observations and high perception have estimated crop characteristics of these indigenous varieties (eye estimates) with full awareness towards their quality relating taste, perishability etc. They still grow in small areas on their farms and consume the produce in their own homes. For example, some cultivators on Goregaon and Arjunimorgaon talukas of Gondia distt. and Tumsar taluka of Bhandara distt. grown paddy varieties like Dubraj, Luchai, Kali-Kamod, Katechinnore, Chinnore, Badshahbhod, Kalimooch, and Ludaka etc. These scented varieties are grown in fields manured with FYM and are not at all fertilized. A few selected farmers from Kahapa area of Nagpur distt. grow special Wani varieties of sorghum; their grains are consumed as green delicacy.

Numbers of farmers have realized the adverse effects of chemical fertilizers and biocidal chemicals (Fungicides, insecticide and weedicide) on their farms; they have known the ill effects of giving only nitrogenous fertilizers through their constant observations. They are fully aware of cost of extra produce obtained in comparison with cost of inputs for deciding future use and have recognized the roles of organic manures like FYM, composts, green manuring and biofertilizers (microbial inoculants) in the formation of productive lands inspite of high labour incentive practices. Some section of farming community have started using biopesticides prepared from locally available botanicals instead of costly synthetic biocidal chemicals.

Success stories of such farmers, who have utilized available resources on their own farms or obtained benefits of localities and tried to attain self-sufficiency, need to be given wide publicity so that their experiences can be shared by others.

### **4. Donors:**

The Government funds are limited for implementing conservation programmes. Therefore, new resources are required to be tapped. The establishment of “ Paryavaran Kosh” can be tried at Divisional and District levels.



### **3.5 Ongoing biodiversity related programs:**

#### **1. Government sector:**

At present several Government programmes are being implemented for agricultural development but has no focus on agro - diversity conservation. Programmes like development of wastelands, integrated pest management, soil and water conservation, use of biofertilizers and watershed development etc. have greater impact in the conservation of agro-biodiversity. It is observed that, such programmes are implemented in isolation and without coordination amongst other line departments. For example: Soil and water conservation programme is being implemented by constructing check bunds and ponds. The role of vegetative cover at appropriate sites in the village area is not given due consideration and as a result the surface runoff is not checked. .

It is necessary to assess community requirements, status of crop varieties, threats and solutions, social and economic problems and assessing requirement of the people. Therefore, common people should be empowered through social / community institutes to plan and execute programmes for their development by themselves only. Empowering them will be effective only if their rights are accepted and implementation is allowed by giving necessary funds.

#### **2. Non-Governmental Organization:**

More than 100 NGOs are working in the field of agriculture, education and creating awareness and watershed area development in the Central India Ecoregion. Even though a few NGOs are doing good work in their fields, most of them are not organized and integrated.

The State Government has recently floated a programme “Adarsha Gaon Karyakram (Ideal Village Development Programme)”, based on an integrated development of Ralegan Siddhi, which was initiated and successfully demonstrated by a noted social worker Shri Anna Hajare. The State appointed him as Chairman of State Committee responsible for execution in the whole state of Maharashtra. Because of lack of understanding, co-ordination and dedication on the part of politicians and administrators, it could not make headway and finally failed. The programme is unique and has integrated approach for rural development involving various issues such as conservation of local crop varieties, protection and regeneration of forests, management of grazing areas/ water bodies, protection of livestock and their up gradation, up keeping and improvement of health and hygiene in villages and creating awareness among the ruralites and educating them indirectly. The State Govt. should identify competent NGOs having expertise in the field of soil and water conservation and management of agro-biodiversity for implementation at grass root level.

#### **3. Local communities and people’s movement:**

There are a few villages with some knowledgeable resident cultivators, who protect indigenous species of sorghum, paddy, mandarin oranges and mangoes. These cultivators with their keen and day-to-day observations and high perceptions have estimated crop characteristics of indigenous varieties (eye estimates) with full awareness towards their quality and consume the produce in their own homes. For example, some cultivators in Goregaon and Arjuni-morgaon talukas of Gondia districts and Tumsar taluka of Bhandara district grow paddy varieties like Dubraj, Luchai, Kali-kamod, Kate-chinnor, chinnor, Bhashabhog, Kalimooch, Ludka etc. These scented varieties are grown in fields manured with FYM only and fertilized. A few selected

farmers from Khapa area of Nagpur district grow special Wani varieties of Sorghum; their grains are consumed as green delicacy.

Number of farmers have realized the adverse effects of chemical fertilizers and biocidal chemicals like fungicides, insecticides and weedicides on their farms; they have known the ill effects of giving only nitrogenous fertilizers through their constant observations. They are fully aware of cost of extra produce obtained in comparison with cost of inputs for deciding utter use and have recognized the rates of organic manures like FYM, composts, green manuring and biofertilizers (microbial inoculants) in the formation of productive lands inspite of high labour operation. Some sections of farming community have started using biopesticides prepared from locally available botanicals instead of costly synthetic biocidal chemicals.

Success stories of such farmers, who have utilized available resources on their own farms or obtained benefits of localities and tried to attain self-sufficiency, need to be given wide publicity so that their experiences can be shared by others.

### **3.6 Gap analysis:**

#### **I. Gaps in information:**

1. The information available with research institutes is not properly disseminated to the stakeholders. There is a gap in between the extension worker and the research personnel.
2. The lack of documentation on indigenous varieties of crops, their nutritional value, suitability under different agro climatic zone and resistant to the pests and diseases.
3. Lack of proper information on handling and adverse impacts of chemical fertilizers and biocidal chemicals such as weedicides, insecticides, pesticides and fungicides.
4. Non-visualization of the impact of erosion while constructing dams and deforestation and loss of biodiversity.
5. Impact of continuous cropping with application of nitrogen fertilizers, leads to infertility and depletion of soil micro flora.
6. Loss of indigenous crop varieties.
7. Dependency on the hybrid seed for high yield as compared to the local breeds.
8. Selection of hybrid seeds which are not resistant to the local climatic conditions.
9. The improper policies of Agricultural Price Commission (APC).
10. Weak implementation of 73<sup>rd</sup> constitutional amendment of Panchayati Raj Act. Community institutions are not properly empowered to take their decisions through participatory process. The administration does not follow decisions, taken by Gram Sabha.

11. A meager documentation on region wise enumeration of flora and fauna
12. Increase in use prime agricultural land for urban settlements and industrial establishments.
13. Dry land cultivation (rain fed agriculture) by following appropriate technologies are not attended on priority.
14. Water logging of soils by excess irrigation.
15. Deterioration of nutrient value in the agriculture commodities needs investigations.
16. No proper attention in using genotypically pure seed material and mother plants for multiplication, plantation and cultivation.
17. Lack of coordination between the institutes involved in the process of biodiversity conservation and their inability to involve the community and other stakeholders or beneficiaries.
18. The innocence, illiteracy, apathy of the resource personnel towards traditional knowledge to next generation act as a deterrent in delivering good results.

### **3.7 Major strategies to fill these gaps:**

1. Effective dissemination of technical knowledge to the stakeholders and beneficiaries.
2. Promotion of judicious and minimum use of agro chemicals and assessing impacts through scientific studies.
3. The models of development should be sustainable.
4. Inclination towards the straight varieties of crops.
5. Changes in cropping pattern in consideration of status of land and nutritional value of the agricultural produce.
6. Assured price for indigenous / traditional crops having high nutritional value (e.g. sorghum, bajri, pulses like red gram, pigeon pea)
7. Empowering Gram Sabha through lawful legislation for planning policies, formulating and implementing programmes relating agriculture with more stress on permitting locals to grow indigenous crops.
8. Restriction on converting agricultural lands for non-agricultural uses such as establishment of industrial and urban habitation clusters.
9. Emphasis on dry land agriculture.

10. Judicious use of irrigation facilities.
11. Value added product in agricultural commodity should be given highest priority.
12. Procurement, storage and propagation of pure seeds of indigenous local varieties under technical guidance of Agriculture Department.
13. Establish coordination between line agencies, NGOs, CBOs and community stakeholders.
14. Involve community members in decision making

## **Chapter IV: Livestock**

### **4.1 Diversity:**

The central India ecoregion comprising of Vidarbha and Bastar has a great diversity in agricultural practices, social customs, and role of livestock due to a range of different climatic element. Primarily an agricultural farming has a close linkage with domesticated livestock as male cattle are used for all agricultural operations and transport. Milk Production from female cattle serves as supplementary occupation. Bastar region is predominantly a tribal area having good forest cover. In Nagpur, Bhandara and Gondia Districts 93% of the livestock population is found in rural areas and the remaining is found in urban areas. Thus livestock is the backbone of agriculture and important source of livelihood in villages.

In the central ecoregion, although indigenous livestock is predominating, following breeds have been registered in the district gazetteer and Kulkarni 1953.

Name of the Breed:

Cattle:

1. Gaolao
2. Umardha

Buffalo:

1. Nagpuri

Goat:

1. Berari

Poultry:

1. Berad
2. Gidhadi
3. Kulan
4. Mulaki
5. Sawadh

#### **Umardha:**

The breed Umardha was registered as recognized cattle breed in east Vidarbha, which seems to be extinct at present. Animals of this breed were mostly of white and red color with black and white muffle with large nostrils, which was a distinct characteristic. Males were used for all agricultural operations and transport.

#### **Gaolao:**

A white colored cattle with long legs and bulging forehead and nostrils, short horns, long tail with black switch. A very good draught, traction and plough males, locally popular and adopted. A dual purpose (milk and draught breed) breed of cattle said to have come to Vidarbha Region, as per mythology when Lord Krishna came with a herd of fast white cattle in the guise of a Gooli with his soldiers to rescue his lady Rukmini. He is supposed to have established a base near Arvi prior to the rescue effort and some of the soldiers who incidentally were from the dairymen's race settled with the cattle there.

The cattle is white, with bulging /domed forehead with Roman nose and wide spaced nostrils. The eyes are black, almond shaped and appear as if accentuated by kohl. It walks at a fast pace and a subtype is a good milch cattle. They have very short horns and in some the horns are loose at base. They have a long tail with black switch. They have two subdivisions one with tight and slightly yellowish skin and these animals are renowned for their speed. Other subdivision has more pronounced forehead and loose skin and the colour is absolutely white, they tend to be good producers of milk. They withstand high temperatures easily and come in to first season much earlier than other indigenous breeds. They are regular breeders and as such ideal for dairy purposes. They have well spaced teats and the udder is not pendulous and are thus resistant to mastitis. They survive well on low quality fodder. The bulls can pull very heavy carts at high speeds and are renowned for their endurance and beauty.

Many Gaolao like breeds are found from Pakistan though Haryana, Rajasthan, Neemad in Madhya Pradesh to Vidarbha and ending in Ongole in Andhra Pradesh. Unfortunately hardly any ideal specimens are left to speak of and a concentrated effort needs to be made to recreate this breed.

#### **Nagpuri (Buffalo):**

Medium sized animal with lyred horns backward, white mark on eyes, pasterns and switch. A locally adopted animal and found in large numbers. Their other important characteristics are annual breeding habit, ability to letdown milk without suckling of calf and ability to give higher fat content milk comparable in quantity with the Murrah breed. Another subspecies called Naklabondi; indicating longitudinal white mask on half portion of the Nose and known for high milk production, is found here.

#### **Berari (Goat):**

Small sized, of mixed color. It is adapted to hot climatic conditions of the region and reared by farmers and nomadic tribes.

#### **Poultry (Fowl):**

Kulan:

A small red colored bird found in Bhandara & Gondia district.

Berad:

A breed of poultry of varied color ranging from red to black in various combinations having long legs.

Gidhadi:

A poultry breed of Bhandara region characterized by absence of plumage on the neck and head.

Mulaki:

A poultry breed of mixed color found in Nagpur, Bhandara & Gondia districts. All the above breeds of livestock and poultry thrive well on locally available scanty vegetation and cereals.

## **4.2 Current Status:**

No systematic information in the form of surveys or pilot studies on the existing indigenous breeds of this region to determine their current status has been carried out by the state or national governmental agencies. Consequently, detailed information in relation to the number, their utility, feeding and management procedures are not known except for the inputs given by the rural communities and other stakeholders during the formation of BSAP. Taking these inputs into account following is the current status of livestock breeds in the study area:

### **Umardha:**

As the concerned government and other related agencies have not documented the information about this breed properly, no such information is available about this breed. It is feared that this breed has probably become extinct.

### **Gaolao:**

Although the state breeding policy is mainly for a pure breeding system, for this breeding tract of Wardha, Nagpur and Gondia district, no specific efforts have been made to implement this policy by the concerned governmental agencies. The contact with the rural communities of livestock owners and the BSAP makers has shown a great enthusiasm among the Gaolao breeders due to its specific characteristics for local climate adoptability and valuable male progenies for traction, draught and plough purposes. In view of government policy of promoting Jersey and Holstein Friesian breeds for enhancing milk production, this breed has been dropped in the background with a public murmur for its usefulness. Due to neglect in promoting these breeds, in spite of interests of farmers, few good herds are available in the breeding tract and this has become threatened species and also its population is dwindling day by day.

### **Nagpuri (Buffalo):**

This breed is predominantly available in Nagpur district. Economical precious in terms of large production of milk as compared to Murrha breed, this is found in few pockets of Nagpur and Wardha districts.

No specific programme for development of this breed is undertaken by the Veterinary and Dairy departments, resulting in its quantitative as well as qualitative deterioration. In the absence of any efforts to promote this breed and to chalk out any specific breeding programs the exact population of this breed is not recorded. Because of its existence inspite of neglect, there is much scope for developing this breed in this region by scientific programs.

### **Berari (Goat):**

This also has reduced in numbers and mixed up due to indiscriminate breeding. Being locally adopted, there is a scope of conservation and improvement of this breed in this region.

**Table 9: Livestock Population of Vidarbha region: 1999**

<b>District</b>	<b>Livestock Population (in thousands)</b>					
	Cattle	Buffaloes	Sheep	Goat	Total Livestock	Poultry
Nagpur	635	88	17	308	1091	599
Bhandara & Gondia	770	185	02	399	1371	883
Chandrapur	666	108	41	253	1078	863
Gadchiroli	565	78	15	181	866	715

State Statistical Department, Maharashtra State.1999.*Maharashtras Economy in figures*.  
Poultry breeds:

Among the locally available poultry breeds having local names like, Kulan, Gidhadi, Berad, Mulki are also becoming rare in population in the absence of any development programme taken up by the livestock development authorities for these local strain, in view of invasion on local population by White Leg Horn on which too much of scientific work has been done. It is feared that these species are endangered and are likely to become extinct, without any specific program for their survey, study and promotional activities.

In the two districts of Nagpur and Bhandara, out of the 9.71 lakhs of the poultry 93% is found in rural area. In place of introduced exotic breeds of poultry, improved strains of above local breeds will play an important role for rural poultry enterprise, if the state government makes strategic efforts. In the absence of any specific recognized indigenous strains of sheep, pigs existing development program by government are sufficient.

### **Livestock biodiversity in Bastar region**

In Bastar division, the agriculture is the major source of income for the tribals. Livestock forms the backbone of unmechanized agriculture as prevalent in the Bastar region. Almost every household possesses certain agricultural land where they cultivate paddy. To prepare the cultivable land, they have to depend on the draught power of the livestock. Apart from this they keep other animals like goats, sheep, pigs, ducks and poultry to use for themselves as food and on certain occasions of religious functions. In addition, they sell them and earn money as and when needed. Various breeds of the poultry are used for cock - fighting, which is a favorite game of tribals.

People of Bastar are closely associated with the domestic animals and birds in their day – to – day life, but they do not see them as potential source of regular income. In the religious scenario



of Bastar tribal community, it is quite common to sacrifice animals during festivals. Similarly, to show their hospitality towards their guests, it is customary to serve cuisines/dishes made from animal flesh.

The rearing of animals and birds plays an important role in the economy of the tribal community. They buy and sell livestock for economic profits but the investment for animal husbandry is almost negligible. The animals are allowed to graze in the nearby forest during the day and sheltered at night.

Tribals are reluctant to consume cattle & buffalo milk and they rear cattle for obtaining bulls for draught purposes and to some extent flesh and skin. Cattle and buffaloes and other grazing animals trample the germinating shoots by their hooves and thus do not allow germination of new trees and plants. One of the major reasons for tribal not taking the second crop after paddy is the damage done to their fields by grazing of their animals.

#### **In-situ conservation:**

In-situ conservation requires maintenance of breeds in their original habitat without any interference in the form of management, feeding or other conditions,

1. Conservation of indigenous draught cattle in their home tract and preservation of genetic resources of poultry breeds like Kadaknath, Aseel, Berad, and Gidadi to maintain the purity.
2. Selective breeding of ongole cattle breed with local animals of abujmar area.
3. Upgrading of non-descript animals with dual-purpose breed in selected products through Controlled Cattle Breeding Program. Such types of programs have already been started for Sahiwal, Bijapuri (Bastar) for ongole cattle breed.
  - a. Number of bull centers should be increased to bring effective improvement in the study area.

**Table 10: Livestock population of Bastar region:** (Census report, 1997 – Department of Animal husbandry)

S. No	Species	District			Total
		Bastar	Kanker	Dantewada	
1.	Cattle	488678	305290	513465	1307433
2.	Buffaloes	107811	52987	42098	202896
3.	Sheep	21221	4885	6139	32245
4.	Goats	147980	101176	203555	250360

5.	Pigs	76565	39135	85496	201196
6.	Poultry	557816	230101	383140	1171057
7.	Ducks	36565	4544	23195	73304

4. Selection of bulls and conservation of selected indices.
5. NGOs, Goshalas and Cattle Breeding Farms could be used for conserving cattle / buffalo breeds.
6. Establish organized breeding farms for draught cattle breed.

Cock fighting is very popular in Bastar villages, especially on market days and is a major source of entertainment to the villagers. For this purpose of cock fighting Aseel breed is used.

**Aseel:**

Aseel breed of poultry, found in Bastar, is well known for its martial quality and noted pugnacity, high stamina and majestic gait. Although poor in productivity they are known for their meat qualities.

The face is long, slender and not covered by feathers. Eyes are compact and well set. Neck is long, well set but not fleshy. Body is round and short with a broad breast, straight back and close set strong tail foot. Legs are strong, straight and set well apart. Aseel birds are very popular among the cock – fighters who believe that Aseel prefer death to dishonour.

*Source: A note of Dr.P.N. Shinde, Department of Animal Husbandry, Jagdalpur*

In the national context, the various root causes and proximate causes of the loss in biodiversity are applicable to each distinct unit of our country. This is so because of down flow of policies of development for situation specific conditions of their states. There was no forum where problems of livestock inventory, their characterization, identification of their biological qualities and further efforts for making a national program for its conservation, promotion and multiplication for use in the needed areas.

The following are the general causes of loss in biodiversity in respect of breeds of livestock & poultry.

I. Introduction of exotic breeds:

Due to experiences of exotic breed in the military dairy farm in early decades of the 20<sup>th</sup> century by the British administrators, different temperate breeds are used for crossing indigenous breed at military dairy farm with optimum management conditions to supply milk to army. Due to low productivity of indigenous cattle enthusiastic animal husbandry scientists were also impressed with this scheme for its application in the civil areas. Without proper experimentation in all the agro – climatic and socio – economic strata of the country this was extended all over the country with variable results. Consequently the breeding policies of state were confusing and not object oriented.

In the light of above general condition of country, Vidarbha region, a part of Maharashtra, developed unclear object oriented policies resulting in using Jersey to cross all the indigenous cattle. For Gaolao, fortunately, only Gaolao bulls were recommended in the breeding tract. Due to non-implementation of state policy, Jersey was also used in the breeding tract resulting into diminishing of the indigenous breed, Gaolao.

Thus it is clear that introduction of exotic breed has not only disturbed the genetic architecture of indigenous livestock but also has not provided any clear cut directions in the absence of timely evaluation and cost benefit studies of this introduction.

#### **4.4 Root causes of the loss of biodiversity / Weaknesses**

##### **Unsustainable model of development:**

##### **I. Lack of vision on breeding policy:**

The large land holding in Vidarbha, before imposition of land ceiling act allowed rearing of large herd of cattle for organic farming system with fringe benefit of milk production. Fragmentation of land compelled the farmers to find alternate financial sources like milk production. At this stage, due to lack of proper directives the farmer was pushed to adopt the cross breeding program which itself was untested system of development for government. This resulted in indiscriminate cross breeding, ignoring role and importance of indigenous breed.

##### **II. Reduction of grazing land (sources of feed & fodder)**

Besides the land ceiling act as the major cause of reduction of grazing land, the forest management system also reduced the land available for grazing from the forest area due to pressures of expansion of mega cities, systems of forest plantations. Major reasons for causing reduction in grazing land are as follows:

##### **III. Conversion of grazing land into agricultural land:**

The “Gochar” area of the villages that were earmarked for grazing for the village cattle is being converted into agricultural land. Even the forest grazing land has also been encroached. The grazing land has also been utilized for many other purposes, reducing the available grazing area.

##### **IV. Diversion of Grazing land to agro – forestry and mining industry:**

Huge area of cultivable and grazing land has been diverted to mining and other industries by the government and additional agricultural lands acquired and given on lease to the major industries on low lease charges resulting into shortage of animal feed.

##### **V. Reduction of grazing land due to change in agricultural practices:**

Due to change in varieties of grains that are not producing animal feed as their residue, fodder shortage has been increased. Promotion of new cash crops like sugarcane, cotton, orange and

other horticultural crops by government has also reduced the animal feed availability. An area under dam and water conservation efforts has reduced the available grazing land.

#### VI. Over grazing:

Reduction in natural grazing land was a result of over grazing in small pockets that were available. This prevented regeneration of grasses ultimately converting them into fallow land. There was no plan in managing and improving village grassland.

Above various causes of reduction in grazing land has created several adverse reactions and effects for rearing of livestock in the rural areas. Firstly, it has adversely affected the availability of feed and fodder for the cattle. The shortages are recognized to be 60 –65 % in general, culminating into increased cost of these nutritional inputs and disenchantment towards rearing livestock.

Another adverse impact was on the loss of profitable occupation available in the villages in livestock keeping, resulting into migration of landless labourers from rural areas to urban areas, where employment potential due to physical development was more alluring. Other detrimental causes for the livestock keeping in rural areas are the lack of control over slaughter of livestock, improper health and disease surveillance and optimum preventive measures in the rural sector and lack of appropriate livestock conservation and improvement program keeping in view availability of high quality of indigenous germ plasm in the Vidarbha region.

#### VII. Alienation of livestock keepers:

In view of the adverse situation created for the livestock enterprise due to unsustainable model of development in the field of livestock, agriculture and forest, there was an alienation of livestock keepers. Since the independence in 1947, various five-year plans provided for the development of different sectors of overall development.

It has been established that in most of the five-year plans the budget provisions of livestock development was very less as compared to crop production activity. This also has resulted in diversion of the livestock breeders towards new opportunities in crop production activities. Thus, it was probably not possible for developing sustainable livestock model to attract farmers sticking to original occupations. This imbalance between the programs for crop and animal also created economic inequities and discouragement for livestock sector.

#### VIII Lack of appropriate policies and national coordination:

Even the Royal Commission of agriculture in 1928 and subsequent British animal husbandry experts before independence have identified the importance of indigenous breeds for Indian agriculture and has established livestock breeding farms in the areas including farms at Hetikundi for Gaolao breed. They were very clear on the issue of maintaining draught quality of indigenous breed and adverse effect of cross breeding on the characters of indigenous breeds. After independence, several programs of development were designed on the lines followed in the western countries.

Importation of exotic breeds and their use in unplanned manner, although has resulted in some increase in the milk production, has left the thread of development of indigenous breeds. If this

could have been properly taken up right after independence in some organized and scientific manner giving emphasis on record keeping of animals and their products, selection of animals on the basis of qualities and production based on data, introduction of scientific sire selection programs using either progeny tests or other sib selection methods on the available high quality animals in each of Indian breeds, there would have been not only conservation of livestock biodiversity but also sustainable model of development.

In the sphere of poultry development, in an over enthusiasm to introduce White Leg Horns for improving egg production, strange schemes of exchanging White leghorns with the local indigenous poultry were introduced, resulting in adverse effect on biodiversity because of killing of exchanged indigenous birds.

Several governmental and non – governmental agencies cropped up for improving livestock and poultry in state as well as at the national level. Either at state level or national level, there was no proper coordination between the developmental agencies in respect of policies and programs. The absence of dialogues between the developmental agencies like veterinary, dairy and research organizations like University, ICAR and private organizations like BAIF, NDDDB, Live Stock Corporation, Milk Federation, Milk Industries, Livestock Feed Industries and the grass root beneficiaries resulted in very hazy and confusing information about the results of development of the livestock sectors. The model of development in western countries is based on killing of surplus unproductive livestock and making the scientific selection procedure effective. Under Indian conditions, due to several social customs and reasons a sustainable model of development for all the different species keeping in view their population, availability of feed, incidence of contagious & infectious diseases have not been worked out.

#### **Weakness – Bastar Livestock:**

1. In Bastar as such no specified, described or characterized breed of livestock is available except for Aseel breed of fighting birds. It needs to determine the geographic and demographic distribution of the breed and to assist the need for conservation.
2. Though people utilize the livestock and poultry birds as their food, money, draught power and entertainment, they are ignorant about their proper feeding, breeding and maintenance.
3. There are more than 14 varieties of Aseel found in the country, which is native to Andhra Pradesh. Unfortunately, none of the governmental agencies in A.P are working in the field of preservation of aseel birds. However, in 1980s Government of Madhya Pradesh took a step to conserve the Aseel germplasm by undertaking Aseel breeding at Govt. Poultry Farm, Jagdalpur in the Bastar region. The strength has been restricted to 200 birds only. Moreover, the productivity of Aseel is low as Aseel hen gives 55 - 60 eggs annually. This is a constraint in commercialization of this breed.
4. Tribals are reluctant to consume cattle and buffalo milk and they rear cattle for obtaining bulls for draught purpose and to some extent for flesh and skin. This indicates that they are not utilizing animal's full potential.
5. There is quite a good potential to identify local breed of cattle, poultry. But no survey or documentation has been done. Suitable local germplasm for conservation is not thus, identified by its morphological productive & reproductive characters.

Breed wise survey of existing animal biodiversity in the state for identifying the poultry, pigs, ducks, cattle are not carried out.

#### **4.5 Major actors and their current role relevant to biodiversity:**

##### **I. Governmental organizations:**

Governmental organization has given emphasis on increasing the production of livestock especially milk, wool, eggs, meat & meat products. In their hurry and enthusiasm there was no time to give a detailed evaluation of the high quality germ plasm in respect of the areas of milk production, draught capacity, heat tolerance, disease resistance capacity of the indigenous livestock to thrive under harsh conditions of climate and nutrition. Not only they have ignored priority on this aspect of livestock development, but also no efforts have been made to make an inventory of different types and local strains of cattle, buffalo, sheep, goats, and poultry with their biological characteristics. Even after developing large research organizations like ICAR, agricultural universities spread all over the country. Only now in the 21<sup>st</sup> century some results of the characterization in terms of biological characteristics, immunological characters will be available in some breeds like Nimari, Malavi, when they are diminishing in number and without plan for their development.

For the wild animals no efforts have been made to maintain the biodiversity due to inappropriate policies and lack of coordination with various stakeholders. There is apathy of the law enforcing agencies, pollution control boards and various other biological societies towards the problems of biodiversity of the livestock in this region.

A complete lack of coordination between the forest, agriculture, dairy, and animal husbandry departments for various developmental activities is a cause for loss in biodiversity.

##### **II. Non – Governmental Organizations:**

No organization is working for the promotion of Gaolao breed in this region, except organizations like Gorakshan Sabha, Nagpur and Govigyan Kendra, Deolapar. These two institutions have a clear perception of conserving this breed but needs resources; as such venture needs the capital investment. The other species are completely ignored by any of the agencies. Due to lack of attention to this aspect, the governmental agencies and even local communities in rural and urban areas have no perception to biodiversity in livestock and ways to conserve it.

##### **III. Agricultural and Veterinary Universities:**

The eastern part of Vidarbha region lies under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and Maharashtra Animal and Fisheries Science University, Nagpur. Due to recent initiatives by National Bureau of Animal Genetic Resources established at Karnal, a scheme of biological characterization and assessment of productivity has been submitted by the scientists of the above-mentioned university. There is a scope for submitting further projects on Gaolao, Berari goats and poultry strains.

##### **IV. Industrial and Corporate sector:**

Recently some government initiated autonomous bodies like Sheep and Goat Development Corporation and Shivaji livestock estate farms near Kalmeshwar in Nagpur district are engaged in development of sheep and goat, but none of them have promoted the indigenous breeds found in this central India ecoregion.

#### **4.6 Ongoing biodiversity related activities / strengths and opportunities:**

##### **I. Governmental Organizations:**

As already stated elsewhere, there is no specific program initiated by the state or central government for study or maintaining biodiversity in any of the livestock species. Only a Government farm was established in pre independence period at Hetikundi (Wardha Dist.) for the preservation of Gaolao and it still exists. Government in their breeding policy have shown use of pure breed Gaolao bulls in Wardha district of Vidarbha, but this seems to be only on paper as no good Gaolao bull of high quality based on the scientific selection was kept on government farm or at frozen Semen center at Nagpur. Besides low priority to promote Gaolao breeding, the exotic breed like Jersey is introduced into the breeding tract due to lack of proper supervision and commitment for promoting this breed.

The Government programs of poultry development of government in Vidarbha have negative impact on biodiversity conservation efforts due to introduction of White Leghorns, Rhode Island Red and Black Cornish. The local breeds mentioned elsewhere are survived due to efforts of few fancy breeders in the region. In Bastar region, government has definitely made efforts to maintain Kadaknath and Aseel though they are not local breeds, but brought from neighboring Andhra and Orrisa/Bihar areas. These breeds have very specific characteristics, which are not found in other breeds. These breeds are popular amongst tribal population and needs conservation efforts.

##### **II. Non – Governmental Organizations:**

In respect of cattle at least two institutions engaged in preservation and promotion of Gaolao breed in the study area are Gorkshan Sabha, Nagpur and Govigyan Kendra Deolapar. They are maintaining large herds of pure Gaolao breed and providing them feed, fodder as well as proper shelter and other facilities. They are also making awareness efforts amongst the rural livestock owners for the need and methods of preservation of this breed.

##### **III. Universities:**

Maharashtra Animal and Fisheries Science University, Nagpur has initiated a study on the biological and economical characteristics of Nagpuri buffalo breed. This effort needs to be intensified by the state government. The scientists at Nagpur Veterinary College have initiated similar efforts for the characterization of indigenous poultry breeds in the Bhandara district.

##### **IV. Community and peoples' moment:**

In the absence of any awareness regarding conservation of biodiversity in rural economy even in government sector, this idea has not caught up in the rural communities except in breeding tracts of cattle and fancy poultry breeders spread over the different parts of ecoregion. There are some

outstanding Gaolao breeders who are very sincere in maintaining pure breeding herds and reject introduction of exotic blood in their herds.

#### **Strengths – Bastar region:**

1. Though the enormous number of livestock is found in Bastar, they are non – descript or so called “ Desi” and are not properly looked after by the owners but still contribute to the entire draught power required and flesh, leather and milk to a little extent. So the villagers always welcome any initiative towards improvement of livestock. There is sentimental attachment of livestock with the tribals.
2. Cock fighting is a great source of entertainment and wager for the tribals and has become part and parcel of their culture. The Aseel breed of poultry is basically brought from the adjoining areas of Andhra Pradesh and 1. Kalimurgi 2. Sahi 3. Rawana & 4. Sawadh from Balaghat are used for Cock fighting. Out of more than 14 varieties of Aseel identified, at least 5 varieties named Yakut (black and brown coloured), Noorie (white colored), Peela (golden yellow coloured), Chitta (black and white spotted) and Sabza (yellow and white colored) are seen throughout the Bastar. This suggests that quite a broad genetic base is available for the particular breed and thus selection and breeding improvement can be done effectively.
3. It is tribal dietary habit to consume meat as their food. So their animals serve as a source of flesh to them and not to mention as the source of animal protein.
4. The livestock and birds are the source of cash to the tribals at the time of economic crisis.
5. The livestock and birds are well adapted to the limited resources available in villages and tend to thrive well. They are resistant to many diseases. Indigenous breeds especially Kadaknath (*brought from Zabua*), Aseel (*though termed as local, but brought from adjoining area of AP*), Berad, Savaj, and Gidhadi, poultry birds in their home tract need to be evaluated. Tribal community love to keep poultry birds, pigs and ducks.

#### **Opportunities - Bastar region:**

1. Bastar covers a vast area and as such 4 –5 varieties of Aseel & many non-descript breeds are found almost in all the three districts with even distribution. This provides a broad genetic base from which more desirable characters can be selected, preserved and maintained through proper selection and breeding methods.
2. Through the provision of basic veterinary skills in the villages like vaccination, deworming / delousing and animal first aid, the mortality; and thus the loss of the biodiversity can be prevented. To undertake successful vaccination program in the villages of Bastar division an effective and sustainable para veterinary system must be developed. Steps have been initiated in this regard by state department of Animal Husbandry by training the Gosevaks and the village facilitators, who have received multi- disciplinary, practical oriented, field based trainings through DANIDA – BILDIP.



At present 300 Gosevaks and 140 VFs are working in their respective villages. It is strongly recommended to sensitize these animal health workers regarding the issues related to biodiversity conservation in their training program.

3. The chicks of Aseel breed are distributed from the Government Aseel breeding farm in the tribal area under different schemes. The capacity of this farm is not sufficient to fulfill the demand of rural mass of the study area. Hence, strength of this farm is recommended to be increased up to 5000.
4. The cattle, sheep, goats or pigs cross breeding programs can be taken up for local breed up gradation & in this context artificial insemination centers of Deptt. of Animal Husbandry are working in this direction. It is necessary to make the beneficiaries aware regarding concept of artificial insemination and then regarding the signs and symptoms of heat in cows coming in heat and its importance.
5. Tribals like ducks (Naghans) and black pigs due to religious importance.

## **4.7 Gap Analysis / Threats:**

### **1. Gap in information:**

#### ***I. Governmental agencies:***

As far as, no government project or programme has been undertaken to prepare inventory of locally adopted strains of cattle, buffaloes, poultry, horses, goats, sheep, pigs and other domesticated species. Countries rearing various species in geographically isolated pockets have given certain specific features and characters to these species due to adoption, while the local people can describe some of these features and have developed fancy to raise such livestock due to the reasons of their sustainable production and reproduction in the area. Although, a very clear cut hint on these locally adopted breeds / strains have been given even before independence by Royal Commission of Agriculture, the planning process was only for increasing productivity for meeting the scientific nutritional needs irrespective of the adverse consequences on the root biological material in terms of livestock. Even some attention is being paid to Gaolao breed in the form of establishing breeding farm in Wardha district. No efforts to multiply, improve and extend such indigenous genetic material are taken. On the other hand the review of such livestock farms has shown deterioration.

Nagpuri buffalo adapted to this region have never caught attention of the governmental agencies of this region. Introduction of exotic poultry like White Leghorn dominated the minds of planners due to the same reason and neglected to categorize the biodiversity of poultry in this ecoregion. Only the information from the people has been included in this BSAP.

#### ***II. NGOs, Industrial Sector and others:***

The information on the existence of indigenous local strains of livestock, poultry with the citizen groups is also very sketchy. There is no breed society or any NGO to collect information about the biological characteristics of the indigenous species of livestock in the prevalent study area. Recent efforts have been initiated by few NGOs like Gorakshan Sabha, Nagpur & VNCS without any encouragement from the government. The local strains of cattle, buffalo, goat,

sheep, poultry identified in this region are due to the true knowledge of some of the individuals from the local communities in the rural areas.

## **2. Gaps in Vision:**

As already pointed out elsewhere in this SAP, the basic reason for the lack of information on the livestock biodiversity or its existence, is due to lack of recognition of the fact that for sustainable ecological balance in the nature, existence of human beings, livestock, vegetation and agriculture is also needed. Biodiversity was very vital force for the concept of organic farming giving importance to the indigenous breeds of livestock due to their special characteristics suitable to the climatic conditions of this study area. Concept of this was developed when the short cut methods of increasing productivity through the introduction of exotic for pure or cross breeding or use of fertilizers and chemical pesticides in agriculture started producing adverse effects in the society. This is further initiated for the biological characteristics of the indigenous breeds of cattle like Malivi, Nimari and Kadaknath; Assel of poultry indicates positive change in the vision for sustainable existence.

## **3. Gap in policy and legal structure:**

Above discussion on gaps in vision leads to lack of appropriate policy and legislation for inventory promotional activity for maintaining biodiversity of local genetic strains / germplasm. Even the half hearted efforts of establishing nucleus herds of indigenous breed of cattle at Hetkundi in Wardha district and for other breeds of cattle in other parts of the country were not properly planned, monitored and extended to the indigenous cattle population by a proper breeding policy and breeding system. The closed nucleus breeding systems at these farms had a very slow and discouraging result due to improper planning and its implementation. The cattle preservation acts were not properly enforced due to the apathy towards their duties by the governmental agencies. There was no system of periodical technical evaluation of various livestock development programs made with and without any linkage with the conservation of biodiversity concept.

## **4. Gap in institutional and human capacity:**

In general the institutions and the human material has capacity to work for the inventory, study and utilize the biodiversity of their region, but this was not done by them due to lack of government vision and appropriate policies for preservation and development of livestock and poultry for sustainable economic development of farmers.

Since now national outlook and vision appears to be changing, there is a need for orientation to the researchers, teachers of the veterinary colleges, universities, and the administrators controlling livestock projects like IRDP, DR, PA and livestock breeders at large.

All these processes would require a changed outlook of various actors and simultaneous generation of information about the detailed biological productivity characteristics of various native strains of livestock and poultry species in the region.

## **5. Gaps in on-going government programs:**

The agricultural and veterinary universities, NGOs of the region should be the principal leaders in the work of identification and study of biological and utility characters of the indigenous strains / Germ plasm. National Bureau of Animal Genetics and breeding under ICAR have already initiated such programs in other important Indian breeds of livestock and poultry in the other parts of the country.

Similar work should also be carried in this region which includes stratified sampling surveys by the supervisors / enumerators and NGOs in the breeding tract of these genetic species by an information format and personal visits. This information format should include the name & addresses of livestock breeders along with the population of cattle they are rearing, their type and their productivity along with their biological characteristics. This information format should also include the personal views of these breeders. Besides the above information, the blood samples for biotechnological studies like chromosomes; DNA types etc must be undertaken. This will enable us to determine genetic distance between the various strains.

Since such breeds may be still valuable source of major genes prevalent in disease resistance, tolerance to extreme climatic condition, conservation of such genetic group, biodiversity is very crucial to systematize the conservation program and record all the available variability in the local breed. Since it is also necessary to pin point exactly what to conserve and how this biodiversity can be monitored for a period of time. The procedures of DNA, finger prints for geno analysis and genom mapping of these animals. Already such work of studying through micro satellites has started in some buffalo breeds and such methods are also important in other local breeds.

Once we finalize the action plan and implement and decide what to conserve in the different breeds, logical steps to conserve, improve and monitor the biodiversity will be essential. This is all-important because these breeding programs are capital intensive and the resources do not permit to conserve all the indigenous breeds in the other regions and the study area. In the absence of such information on the Genomic analysis related to the special traits in these breeds, the existing breeding system and improvement will have to be continued with the modification for their conservation.

As said earlier, there is number of cattle breeding farms, including one for Gaolao at Hetikundi in the country but the results have been discouraging in some of these indigenous farms due to the pressure of rising productivity, crossing with superior indigenous breeds. In most of these farms more or less a closed nucleus breeding system has been adopted which has resulted in stopping the entry of superior germ plasm of the same breed in to that nucleus herd except for out crossing and situation of extreme in breeding.

Selection and to avoid all these limitations of the pure breeding systems, open nucleus breeding systems should be introduced in all the species including cattle, buffalo, poultry, goat breeds of this region. This will require identification of the spread of the breeding tract, so that a suitable farm can be designated as a nucleus herd with government, NGOs and cooperative effort.

The operating area of this program will be that region, those talukas and villages surrounding this nucleus herd that maintains such indigenous breed. Such management is necessary for properly monitoring conservation and maintaining these breeds. Initially, the young sires from good pedigree would be used for improving the nucleus herd and the surplus semen either liquid

or frozen could be utilized to breed the heifers and cows of the operational area. At least 30 progenies from each sire should be evaluated for the polygenetic traits selected for conservation and improvement. The sires could be used for breeding of the next generation in the farm and in the operational area. The next batches of sire for progeny testing would come from both nucleus herd and from the herds of private breeders in the operational area and ensure that their ranking is superior.

The regular culling of the females of the nucleus herd will be carried out annually and replacement could come from the nucleus herd itself or provided by the private breeders in the operational area. These cycles will be repeated years after years in the nucleus herd and private herds for selection of males and females used for breeding.

Above suggested action plan for open nucleus breeding scheme differs from the existing policy used in both the replacement of sire and hereafter to come from nucleus herd and in operational area. Thus, there is a two-way exchange of genetic material from and to the nucleus herd and the private herds. This system has been found to be supervising and bringing higher rate of genetic progress and also to avoid inbreeding due to a very broad genetic base and large population for this program. Such ONBS should be planned and carried out for Gaolao cattle, Nagpuri buffaloes, and Berari goats.

It is possible that if the traits selected were not found to be polygenetic and only due to one or two genes in genom analysis, simple individual selection methods would suffice for conservation, multiplication and propagation of the genes.

In order to carry out and implement program of ONBS it will be necessary to establish a unit of subject matter specialist including geneticist, reproductive physiologists, nutritionists, and also fully equipped laboratories for the above motioned experts. NGOs, veterinary experts, Universities and State Animal Husbandry department who can provide resources for these efforts will carry out such work. Combining ONBS with multiple ovulation and Embryo transfer can also help in effective utilization of females of both nucleus herd and herds in the operational area. This system can also help in early selection program, information in full sibs and half sibs cutting the generation interval.

Such in-situ conservation program would involve not only the efforts of the institution, but also the cooperation of animal / herd owners in the operational area. Therefore, it is necessary that they are given orientation and awareness for this program and they should also be involved at the planning stage and the other stages of this program. Registration of identified germplasm goes a long way in sustaining the various genomes in the natural habitat.

Ex-situ conservation efforts should also be taken up by long-term storage of the germ plasm for use in prosperity. Such germplasm should be sampled from a large population showing genetic biodiversity. This could be done in form of semen preservation or preservation of embryo or DNA material.

In the field of livestock, unlike the crop, the extension methods for the transfer of technology generated and the value of various livestock products are not efficiently transmitted in villages.

It is considered necessary that a very intensified awareness program through effective extension methods and materials by a trained livestock extension specialist should be carried out. Not only there will be awakening amongst the livestock keepers about the value of their enterprise in national economy but also will encourage them for adopting scientific methods of conservation and management.

This will require strengthening of the extension education programme of the university, which is presently not effective or absent. There is a need to train and involve subject matter extension specialist, who could be interested in this work and coordinate this activity with rural developmental programme.

The post independence experience of executing livestock developmental programs through the governmental agencies has indicated that the various programs in respect of breeding, feeding, disease control measures, marketing have not yielded proper or expected results in proportion to the financial investments in these efforts. It has been found that cooperative societies, NGOs, SHGs, and the local communities have shown better results in carrying out the development programs. Further, under the concept of giving autonomy to the smallest unit, the administration must be encouraged to take up diversified developmental programme. This necessitates proper awareness and training of these various groups, performing role in livestock and various scientific methods of their management.

The veterinary universities and the state animal husbandry department should shoulder the responsibilities through NGOs for such rural awakening programs that will go a long way in identifying and conserving not only livestock but also the inherent biodiversity.

Although the region is predominantly having agriculture as the base occupation, a question of feeding did not arise until the land ceiling act was brought into force. The fragmentation of land holding created a very discouraging situation for feeding and maintaining livestock population. In the first few 5-year plans the maximum attention was given to grain and cereal production under the current fragmented holding. This resulted in complete lack of attention on animal feed and fodder requirement of the region. The agriculture department developed the policies, which directed the stakeholders to take out grain and cereal production and cash crops, completely ignoring a place for the types and volumes of animal feed and fodder or by product. The forest department also did not take full responsibility of all the fodder available with them in systematic manner to meet the requirements.

Thus responsibility was more or less handed over to animal husbandry department who had no control over land use pattern and utilization of policies. It would be seen that all the three departments that are concerned with the livestock had no complete responsibility for solving shortage of feed and fodder for the livestock. All had a continual neglect on these aspects. This resulted in gradual negative impact on the existence and rearing of livestock and consequently the livestock keepers cultivated slowly from these enterprise to alternate employment. Thus, the livestock conservation and improvement efforts were sidelined and the question of biodiversity amongst them was a far-fetched concept that was completely ignored.

The Agriculture Department generally formulates state and regional policies of crop rotation, crop production and guides the farmers for production. But in their policies there is no mention

about the cultivation of feed and fodder crops in any seasonal rotation. Although there is a shortage of fodder in a village ecoregion experiments on comparing crop farming and mix farming and livestock farming have indicated that the mix farming system is most remunerative in the different parts of the region. In spite of this information the agricultural department continues the crop production of cereals, legumes and cash crops.

The Agricultural Department further did not care for the quality and sustainability of the products like straws, etc produced from the agricultural crops. The newly introduced crop varieties have been selected on the basis of grain production and not on the straw that gives fodder for the livestock feeding.

The agro forestry has been introduced without any experimental evidence that it is more remunerative and useful for the livestock sector.

The Forest Department supplies grass from the area under their control to the villagers. The cutting of such grass is not done at a proper time causing great nutritional losses. There is a scope of improving fodder production either by improving grasslands by seeding, fertilizing and cutting at proper intervals but also growing fodder trees in a scientific manner.

**Threats:**

1. Since the production potential of Aseel birds is genetically low, rearing of birds at commercial level may not be financially viable. For this reason, its evaluation should not be done on profit or loss basis.
2. The so-called non-descript poultry in Bastar are depleting & disappearing fast from the villages. The villagers are now mostly seen purchasing discarded old layers (hens) and ducklings (brought from Andhra Pradesh) in the market of Bastar. The same is true about bullocks, which in recent past were exported to adjoining Maharashtra, Andhra Pradesh and Chattisgarh plain. Now, they are brought from outside to meet demand of the local people.
3. Since the Aseel birds are habituated of living under scavenging system, it will be harmful for their survival if kept under farm conditions. For this, at least semi – scavenging system should be advocated.
4. Present policies and programme (like distribution of Holstein & Jersey breed of milch cow) run by the state government contradicting the conservation of local breeds of livestock & such programs needs to be restructured. Introduction of hybrid poultry breeds like White Leg Horn, Red Island Red and distribution of milch cow would differ from the objective of the conservation of local breeds.
5. State Cattle Breeding & poultry farms are not used to maintain the herds & flocks of important indigenous breeds / species of animal & birds.

6. State Animal Husbandry Department has not done reservation of indigenous stock either in small number with farmer in their different breeding zones or preservation and collection of frozen & embryo in gene bank (except Aseel and Kadaknath).
7. Increasing number of livestock & practices of keeping relatively unproductive cattle near forest areas has resulted in over exploitation of the grazing resources.

#### **4.8 Major strategies to fill the gaps:**

1. Identification and study of the genetic strains and their biological and other utility characters for the different geographical belts in the ecoregion
2. Conservation, improvement and propagation of various species of livestock and poultry species like Gaolao, Nagpuri buffalo, Berari goats and poultry breeds like Kulan, Berad, Gidhadis, Mulki.
3. To built up strong centers for transfer of information and technology to the livestock and poultry breeders.
4. Involve the Self Help Groups (SHG) and NGOs like Breeder's Societies in the rural areas in the promotion of knowledge and utilization of various genetic strains

The feed and fodder for the livestock and poultry is a very crucial factor for their promotional and developmental programmes. This needs to be discussed among the three primary agencies like Department of Agriculture, Animal Husbandry and Forest in cooperation with various administrative units like Zilla Parishad, Gram Panchayat, Gram Sabha etc.