DRAFT REPORT
BIODIVERSITY STRATEGY & ACTION PLAN FOR BIHAR

MANDAR NATURE CLUB
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CONTENTS

ACKNOWLEDGEMENT

We express our gratitude to the Kalpvriksha, Biotech Consortium and Ministry of Environment & Forests, Govt. of India who assigned and helped us the task of preparing the action plan for Bihar and Jharkhand.

We are thankful to the team of Mandar Nature Club, Bhagalpur which has been extremely concerned to do their best.

We gratefully acknowledge the contribution of Dr. Vidya Nath Jha, Department of Botany, C.M.Science College, Darbhanga, Prof. Anil Kumar, ex. Head, University Deptt. of Geography, T.M.Bhagalpur University, Bhagalpur, Prof. A.K.Pandey, University deptt. of Botany, T.M.Bhagalpur University, Bhagalpur, Prof. S.P.Roy, University Deptt. of Zoology, T.M.Bhagalpur University, Bhagalpur, Prof. R.N.Singh, Retd. Prof. Agriculture College, Sabour, Dr. T.K.Ghosh, University Deptt. of Zoology, T.M.Bhagalpur University, Bhagalpur, Dr. T.K.Pan, University Deptt. of Botany, T.M.Bhagalpur University, Bhagalpur, Dr. G.R.Datta, University Deptt. of Zoology, T.M.Bhagalpur University, Bhagalpur, Dr. Pitambar Pathak, Marwari College, Bhagalpur, Dr. Sunil Agrawal, Gandhi Peace center, Bhagalpur, Sri Parashuram Ram, IFS, Conservator of Forests, Bhagalpur, Dr. Shambhu Nath Khetan, Chairman, District Board, Bhagalpur and others. Many information have been added by Arvind Mishra, State Coordinator, Bihar & Jharkhand, IBCN (a network of BNHS).

The effort by Dr. Manish Kumar Mishra, Ph.D. (Geography) in assisting the whole process is being duly recognized.

We are thankful to Mr. Bipin Kumar Mishra, Cob Web, Computer Center, Bhagalpur for his technical assistance.

INTRODUCTION:

The National Biodiversity Strategy and Action Programme (NBSAP), one of the biggest environmental exercise in the country was initiated in the year 2000. The responsibility was initially was given to the state forest department of Bihar to prepare the action plan for the state. But nothing had been initiated by the forest dept. of Bihar till the end of the year 2003. The National Coordinator (TPCG) of NBSAP, Mr. Ashish Kothari made several attempts to hand over the project to Mandar Nature Club, Bhagalpur and sent many requests to the forest department of the state at secretariat and departmental level in the mid of last year. But nothing materialized. Ultimately Mandar nature Club (MNC) agreed to do something in this regard within a very short period with limited resources.
Practically this draft report of NBSAP for Bihar has been prepared within a period of one month. It would have been prepared in much much improvised form if enough time had been available in hand.

1. METHODOLOGY:

The team of Mandar Nature Club, Bhagalpur collectively put their efforts in inviting inputs from far and wide in the state to prepare this action plan. The team met regularly and the members went all out to contact the contributors on telecommunication and by visiting them in different towns personally. Many technical, institutional and village persons, grass root workers, NGOs, media persons, Govt. officials including forest department, the public representatives were discussed and interviewed. The scientific papers (published and unpublished) and popular articles reviewed available in hand and received through various direct and indirect sources.

2.HISTORY:

Bihar is the home of Emperor Ashoka who preached **"ahimsa"** or non-violence and spread the message of Buddhism throughout the world. The first ever known effort in the history of conservation of biodiversity, and the concept of **"sanctuaries"** for protecting wild fauna and flora was given by him by establishing the rules to protect them. The fifth pillar edict of Ashoka by which game and fisheries laws were introduced into northern India in the 3rd century B.C. He had carved on the enduring stone a list of birds, beasts, fishes and possibly even insects which were to be strictly preserved. The mammals named are Bats, Monkeys, Rhinoceros, Porcupines, Tree squirrels, Barasingha stags, Brahminy bulls and all four footed animals which were not utilized or eaten. The dict further ordains 'that forests must not be burned, either for mischief or to destroy living creatures. Later on the moghal emperors also had shown deep interest to protect wild animals and their habitat.

The pillars of Ashoka were crowned with the statue of one or more **lions denoting the strength**, sitting on top of a pedestal which was inscribed with symbols of wheels. This figure of lions, atop a pedestal, with inscription of a wheel, was adopted as the Official Seal of the independent Republic of India (1947).

The Word "Bihar" has been coined from "Vihara" meaning Buddhist Monasteries. Patna its capital city today, Patliputra in those times was home to one of the greatest monarchs in the history of the world who ruled over much of the Indian - Subcontinent and extended as far as Iran and Afghanistan to the West. Bihar is the fascinating land of great religious leaders like Gautama Buddha, Lord Mahavir and Guru Gobind Singh who had been known for their great works for the **conservation of the environment and biodiversity**. Patna, the Capital of Bihar. It is here that the tenth and last Guru of the Sikhs, Guru Gobind Singh was born and attained the sainthood of Sikhism.

Nearby, Rajgir was the capital of the Mauryan Empire during the reign of Bimbisara. It was frequently visited by Lord Buddha and Lord Mahavira. There are many Buddhist ruins here. It is also well known for its many **hot springs** as natural resources, which are reputed to have medicinal property.

Sher Shah, based at Sasaram was noted as a ferocious warrior but also a noble administrator - in the tradition of Ashoka and the Gupta kings. Several acts of **land reform** are attributed to him.

The kingdom of **Anga**, with its capital at Champa had once ruled by Karna (One of the hero of Mahabhrata period). Description of **Mandar hill** is also found in Indian epics. This hill according to Hindu mythology was used for Sagar Manthan. The stones on small hillocks in this area are the typical characteristics of the marine habtat support the exixtance of sea here time back. The big round stones attached to a pont at the base are seen all around on the hillocks.

River Ganga is the lifeline of Bihar economically, spiritually, culturally and environmentally. It was in this Gangetic plain that the great kingdoms of India like Magadha, Gupta, and Mughals found their home. It was in this place that the essence of Hinduism, Buddhism, Jainism and Sikhisms was established in India. The Ganga flows through Mokama where the famous ‘Hunter turned Conservationist’ **Jim Corbett** had spent his 21 precious years of life.

3. GEOGRAPHY:

Bihar was first a part of the Bengal Presidency. In 1911, Bihar, was separated from the Bengal. In 1936, Bihar and Orissa became separate provinces. A new state, Jharkhand was carved out of Bihar with effect from 15 Nov. 2000.

Bihar gets the worst of the cold and the worst of the heat and plenty of floods. Northern portion of Bihar is almost entirely a level tract, while the south is wooded and hilly. North Bihar is extremely fertile. The land being watered by numerous rivers like Ganga, Kosi, Gandak, Burhi Gandak, Kamla-Balan, Baghmati, Kareh, Mahananda, Adhwara etc.

There are some other rivers that start from the platue area and meet in Ganges or its associate rivers after flowing towards north. Some of them are Sone, Uttari Koyal, Punpun, Panchane and Karmnasha.

Southern Bihar, especially in and around the districts of Chotanagpur and Santhal Parganas is thickly wooded and consists of a succession of hills. The river Ganga flows

right across it from west to east dividing it into two unequal parts, the northern portion being almost double the southern portion.

In the state of Bihar four distinct regions can be recognized. Though the state mainly constituting a significant part of the middle Ganges plain, retains pockets of different Bio Regions.

A. The **North Ganges plain** with its monotonous plain composed of new alluvial derived from Northern Himalayan range and deposited by the snow fed rivers draining through the vast stretch of the state. Rivers are famous for changing the course and their forsaken old channels can be traced along the adjacent areas. Such abandoned channels, wastes of sands during post monsoon turn narrow areas of sand and swamp, wetlands or chours. Such permanent to semi permanent wetlands, dotting the entire plain.
B. Towards the north west in Champaran district the alluvial plains gradually acquire undulation and gives to a broken hilly region known as the Dun or Ramnagar Dun. Someshwar hills extend for about 74 Kms. along the northern state boundary. Below this hilly parts of the lower Himalayan range, lying mostly towards Nepal, a tract of tall seedy grass and Sal trees watered by numerous hill streams extends from west to east along the international boundary of Nepal. A very narrow strip of the terai and sal forest exists in the north eastern corner, east of Kosi river of the state.
C. The **South Bihar plain** extends from the broad east west flowing river Ganges, in north to the state boundary of the Jharkhand in the south. The south plain composed of old alluvials, is drained by rivers originating from the northern edge of the Chottanagpur plateau located in Jharkhand. Streams and rivers are non-perennials and have water during the certain periods of the monsoon and post monsoon months. The hills and hilly tracts frequently intercept the south plain. In comparison to the north plain, water bodies are restricted to few places but its 'tal' areas, just south of Ganges levee, is an unique physiographic area. 'Tal' areas get submerged during monsoon and present a vast stretch of water body extending roughly 16580 Sq. Km. up to the month of November. It is 105 Kms. long and its width ranges from 6.5 kms. to 17 kms. Numerous chours are located in the region. Settlements are located at distance and mainly along its northern and southern edges.

The alluvial filling south of the Ganga is shallow, a mere veneer and the Peninsular edge is very rugged. Many groups of small craggy hills rise up to 488 meters from islands of bare rock or scrub. In the west, where the river Son makes a great deltaic reentrance into the older rocks, this alluvial strip is some 137 Km wide. But in the east where the Rajmahal hills lies on the extreme north-east point of the Peninsula, it goes almost directly on to the Ganga. The river bank itself lies high, except in Bohjpur district and at high water the tributaries are flooded and pushed back. The Punpun valley, parallel to the river Son on the east, is thus annually flooded.

Scattered hills such as Kharagpur – Jamalpur Hills, Rajgir and Jethian hills, though heavily exploited, still represent last habitat for many hill flora & fauna.

Both in the north and the south of Ganga, the construction of railways across the drainage causes local but sometimes disastrous water logging and flooding. Some of these temporary inundations are agriculturally useful, either 'Rabi' crops are grown on them when they dry out or they are bunted for producing dry weather rice.

3.1 Soil and Climate:

Soil:

The Bihar plane consists of a thick alluvial mantle of drift origin overlying in most part. The siwalik and older tertiary rocks. The soil is mainly young loam rejuvenated every year by constant deposition of silt, clay and sand brought by different streams. This soil is deficient in phosphoric acid, nitrogen and humus, but potash and lime are usually present in sufficient quantity.

There are three major types of soil in Bihar:

1. Piedmont swamp soil - found in northwestern part of west Champaran district.
2. Terai soil – found in northern part of the state along the border of Nepal.
3. The Gangetic Alluvium – the plain in Bihar is covered by gangetic alluvium. It is divisible into –
    a. Older alluvium (bhangar soil)
    b. New alluvium (khaddar soil)

Climate:

The climate of Bihar is a part of the climatic pattern of the Indian subcontinent .It enjoys a continental monsoon type of climate owing to its great distance from the sea.

The factors affecting the climate of Bihar are

1. It extends from 22-degree north to 27-degree latitude. Hence its location is tropical to sub tropical.
2. The Himalayan Mountains in the north have a significant bearing on the distribution of monsoon rainfall in Bihar.

1. Cold weather season - December to February.
2. Hot weather season – March to May.
3. Southwest monsoon – June to September.

Retreating southwest monsoon – October to November.

3.2 River basins of Bihar

Sr. No.	**Name of Basin**	**Area Sq. Km.**

1.	Ghaghra Basin	1,27,950
	(i) Nepal	70,303
	(ii) India	57,647
	(iii) U.P.	54417
	(iv) Bihar	3,230
2.	Gandaki Basin	
3.	Gandak Basin	38,680 ?
	(i) Nepal	38,680
	(ii) India	7,620
	(iii) U.P.	968
	(iv) Bihar	6,752
4.	Baya Basin	
5.	Burhi Gandak Basin	12,500
	(i) Nepal	2,130
	(ii) India	10,370
	(iii) Bihar	10,370
6.	Baghmati Basin	8,553
	(i) Nepal	1,472
	(ii) Bihar	7,081
7.	Adhawara Basin	4,907
	(i) Nepal	2,337
	(ii) Bihar	2,570
8.	Kamla-Balan Basin	7,683
	(i) Nepal	1,063
	(ii) Bihar	6,620
9.	Kosi Basin	70,409
	(i) Nepal	59,806
	(ii) Bihar	10,603
10.	Kari Kosi Basin	
11.	Mahananda Basin	25,043
	(i) Nepal	4,500
	(ii) Bangladesh	3,013
	(iii) India	17,440
	(iv) W. Bengal	11,100
	(v) Bihar	6,340

3.3 Natural Resources:

WATER OF THERMAL SPRING AS NATURAL RESOURCE:

Thermal springs are distributed throughout the world their frequency is high in volcanic belts. About 5 thermal springs have been reported from Bihar state viz. Bihmbandh, Rishikund, Sitakund and Rameshwarkund are located in Munger and Rajgir in Nalanda districts.

Among the eight thermal springs Bihmbandh and Rishikund are most natural due less human interference. Sitakund and Rajgir are most disturbed because of intense human activities and extensive use for bathing and washing.

It is also a common sight to find a large number of people suffering from with rheumatism, gaut, echzema and other skin diseases sitting and dipping for hours in the warm waters of thermal springs. The leapers feel that the "divined" water can give life to the degenerating tissues.

Discovery of Animal fossils:

A major breakthrough has been made in unraveling the prehistoric biotic life and its age in the Gangetic plain with the discovery of a large number of vertebrate fossils from the Diara land of Bhagalpur by Arvind Mishra and Uttam Kumar of Mandar Nature Club, Bhagalpur. The fossil material was recovered from a depth of 33 to 52 m. below the present river bed and represents the extinct fauna which inhabitaed the area before the advent of the Great Ice Age. The faunal assembledge is consisting of Fish, Chelonia, Crocodilians, Stegodontidae, Elephantidae, Loxodontidae, Hippopotamidae, Suidae, Equidae, Cervidae, Bovidae, Carpinae, Antilopinae, rodents, snakes and birds. This discovery was unique as such fossils were found in 1993, after 90 years again in India and for the first time in the history of Bihar.

4. BIHAR PROFILE:

Latitude	21 58' 10" to 27 31' 15" North
Longitude	82 19' 50" to 88 17' 40" East
Height above Sea Level	173 Ft
Rainfall - (1998) :	
(i) Normal rainfall (M.M.)	1204.6
(ii) Actual rainfall (M. M.)	1288.3
(iii) Avg. no. of rainy days	52.5
Area	94,164 sq km
Length (north-south)	385kms.
Width (east-west)	483kms.
Geographical boundary	north – Nepal, south – Jharkhand, east --- West Bengal, west--- UP
Rural area	92,257.51 Sq. KM.
Urban area	1,095.49 Sq. KM.
Capital	Patna
Languages	Hindi
Districts	38
Population	82,878,796
Males	43,153,964
Females	39,724,832
Growth Rate (%)1991-2001	28.43

Density (person per sq km.)	880
Urban Population	10.47%
Sex ratio (females per thousand males)	921
Literacy (%)	47.53
Males	60.32
Females	33.57
Birth rate	34.85 per 1000
Death rate	12.1 per 1000
Infant mortality rate	89%
Religion wise population percentage	Hin.—82.42%, mus.—14.18%, ch. – 0.98%, sikh--- 0.09%, jain—0.03%, oth.—1.67%.
Percentage of population below poverty line	40.80
Pre capita income	2193 Rs.
Seats – Lok Sabha	40
Rajaya Sabha	16
Vidhan Sabha	242
Vidhan Parishad	75

POPULATION AND GROWTH RATE :

At 00.00 hours of 1st March, 2001, the state of Bihar, with an area of 94163 sq. kms. approximately, had a population of 82878796 persons. Till 1991 Census, the composite state of Bihar was the second most populous state in the country (containing slightly more than 10 percent of the country's population), next only to Uttar Pradesh. However, after bifurcation of the state of Bihar and creation of the new state of Jharkhand, the rank of Bihar among the states of India has slipped down to third, the states of Uttar Pradesh and Maharashtra occupying the first and the second position respectively.

PROVISIONAL POPULATION TOTALS 2001

FIGURES AT A GLANCE

Population distribution, percentage decadal growth, sex ratio and population density

India/States/	Population 2001			Percentage		Sex ratio		Population	
Union territories*				Decadal		(females per		density	
				Growth		1000 males)		(per sq. km.)	
	Persons	Males	Females	1981-	1991-	1991	2001	1991	2001
				1991	2001				
India	1027015247	531277078	495738169	23.86	21.34	927	933	267	324
Bihar	82878796	43153964	39724832	23.38	28.43	907	921	685	880

Jharkhand	26909428	13861277	13048151	24.03	23.19	922	941	274	338

Population of Bihar

1. Decadal Population Growth (1991-2001)	
(i) Absolute	1,83,48,242
(ii) Percentage	28.43%
2. District With Highest Decadal Growth --- Sheohar	36.16%
3. District With Lowest Decadal Growth --- Nalanda	18.64%
4. Density of Population (Per Sq.Km.)	880
(i) Most Densely Populated District - Patna	1471
(ii) Least Densely Populated District - Kaimur	382
5. Sex Ratio (No. of Females /1000 Males)	921
(i) District having highest Sex Ratio - Siwan	1033
(ii) District having Lowest Sex Ratio - Patna	873
6. District having highest literacy rate --- Patna	63.82%
7. District having lowest literacy rate --- Kishanganj	31.02%
11. Average population of a district of the State	2239967

Administrative Units

1. Divisons	9
2. Districts	38
3. Subdivisons	101
4. CD Blocks	533
5. Panchayats	8471
6. Number of Revenue Villages	45103
7. Number of Urban Agglomerations	9
8. Number of Towns	130
(i) Statutory Towns	125
(ii) Census Towns (Non-Statutory)	5
9. Police Station :-	
(i) Civil Police Station	813
(ii) Railway Police Station	40
10. Police District :-	
(i) Civil	39
(ii) Railways	4

Districts:

1. Araria	8. Buxar	15. Katihar	22. Muzzafarpur	29. Samastipur	36. Vaishali
2. Aurangabad	9. Darbhanga	16. Khagaria	23. Nalanda	30. Saran(Chapra)	37. West Champaran
3. Banka	10. East Champaran	17. Kishanganj	24. Nawadah	31. Sheikhpura	38. Arwal
4. Begusarai	11. Gaya	18. Lakhisarai	25. Patna	32. Sheohar	
5. Bhabhua	12. Gopalganj	19. Madhepura	26. Purnia	33. Sitamarhi	
6. Bhagalpur	13. Jamui	20. Madhubani	27. Rohtas(Sasaram)	34. Siwan	
7. Bhojpur	14. Jehanabad	21. Munger	28. Saharasa	35. Supaul	

People:

The majority of people are Hindu. Muslims comprise a vast minority. Christians are a small minority. Many beautiful Catholic and Protestant church buildings dot the landscape of towns in Bihar. They have spread a good network in the society in the field of education and health. The gurudwara at Patna city that commemorates Guru Gobind Singh, is a sacred place of pilgrimage for the Sikhs. To the Sikhs this holy place is reverentially known as Patna Sahib.

The non-tribal group belong to various castes, prominent among which are: kayasthas, bhumihars, rajputs, and the so-called backward castes - yadavs, koeris, musahars, chamars, and others.

Tribes:

Bihar has very few tribal population after its division spread over in the bordering areas of Jharkhand, at Kharagpur hills in Munger and in the forest area of the state consisting of Santhal, Kharwar etc. Valmikinagar where the two races of tribals are living inside the forest and are moderate in number. They are Tharu and Dhangad. Dhangad claim themselves to be the Uraon tribes but this might not be the established fact.

Bihar State Tribal Co-operative Development Corporation Ltd (STCDC) was established in 1969 to provide support for promotion of tribal Co- operatives in the tribal areas. It was incorporated for procurement of non-nationalized MFPs like tamarind, mahua flower, Chiraunjee, barbatti, tasar cocoon, etc., through LAMPS at lower level and NAFED at the Apex . It accepts loan from NSFDC, NCDC, Commercial Banks and Government assistance as subsidy. It has versatile aims and objectives to educate, co-ordinate, control and consolidate the tribals at different levels in different fields. It collects MFPs through primary co-operatives (LAMPS) and adds value at its own level and give maximum benefits to tribal members of the society. It also establishes manufacturing and processing units for advantageous returns. It is organized by the Board of Directors, but these days, it runs under the administration of an IAS rank officer. Its area of operation is whole of Bihar. In 1994, the Government of India sanctioned Rs. 50 lakh to TCDC and procured MFP of worth Rs. 1.52 crores, benefitting 20,000 tribal families.

Language:

In addition people speak many dialects in different regions. The major dialects are: Bhojpuri, Magahi and Maithili. Bhojpuri is spoken in the districts of Champaran (East and West), Saran, and Shahabad. Magahi is the dialect of Central Bihar, i.e., the districts of Patna, Gaya and Bihar. Maithili, and its variants, is the dialect of the people in the north-east, i.e., the districts of Muzaffarpur, Vaishali, Darbhanga, Samastipur, Saharsa, Purnia and Angika in Bhagalpur.

Economy:

The main occupation of the people is agriculture. The principal food grain crops are rice, wheat, maize and pulses. Main cash crops are sugarcane, oilseeds, tobacco, jute (hemp, related to the marijuana plant, but a source of tough fibers and "gunny bags") and potato. Rich farmland and lush orchards extend throughout the north. Also, cane grows wild in the marshes of West Champaran. The principal fruits are: mangoes, banana, jack fruit and litchis. This is one the very few areas outside China which produces litchi. There is very little industry in the plain region except for the sugar factories that are scattered all over the northern plains, particularly in the western region. Jute is transported to the jute factories located mostly in Calcutta. Major industries include cotton spinning mills, sugar mills, jute mills, rice mills, woolen weaving and leather industries. It is also famous for production of tusser silk. With the creation of Jharkhand, Bihar lost several mineral rich districts. Bhagalpur is noted for its silk production. The silkworm is the source of magnificent silk - characteristically, the tusser or tussah silk. A sericulture institute and an agricultural-research station are located here.

The forests of Bihar yield valuable commercial products besides the timber. Leaves of ‘Kendu’ trees are used in the manufacture of an indigenous product for smoking, i.e., the *bidi*. A resinous material secreted by the lac insect is valuable commercially. It is the source of shellac. Also, bangles made of lac are very popular among women of Bihar.

Role of women in the economy:

Aquatic plant products serve as food in the flood zones of Bihar. Next to Makhana and Singhara, it is Khubahi-Ramdana cottage industry that provides a source of earning to the marginalized farmers in this state. Women perform the popping operation that is full of occupational hazards like the respiratory problems among especially those suffering from tuberculosis. The plains in north and central Bihar remain inundated for three to four months and have witnessed the growth of several aquatic plants, including lotus, bhent, kesaur, chichorh, kauatuthi, ghenchul etc. which are normally collected by the rural women, mostly in underground rhizome/ tuber or seed forms and are utilized as scarcity foods.

5. ART & CULTURE:

The handicrafts heritage of Bihar is fulsome and vast. It covers a variety of material's - from stone, wood, leather, metal to textiles, lacquer and glass.

Some of the handicrafts are world-renowned like Madhubani Paintings, and ‘Sujani’ work on textiles. Today with the onslaught of modernisation hits the artisan and patronage of traditional crafts dwindles.

CARPETS

Bihar Carpets are woven in the finest quality pure wool on traditional looms. Skilled weavers fabricate intricate designs like - Suhagi, Hariz-2, Sherabian, Shiraj, Indo-Hamdan, Dibbi and others suited for use both as wall hangings and floor coverings.

HANDLOOM SILK

The skill of the Indian weaver bears testimony to a tradition handed down through generations. In Bihar, even today, masterpieces are woven by hands that have nurtured the fabled sheen of our silks and sheerness of our muslins - their vibrant, rich colours unaltered. But this small industry is dying for negligence of the govt. and the lack of electric power supply. A variety of silks including the famous Tassar silk from Bhagalpur are available in an extensive range. Mercerised Tassar is also produced. Elegant sarees in Tassar and mulberry, bed sheets and covers sheets of silk materials are the specialities of Bihar.

SIKKI: "SIKKI" a species of wild grass and Bamboo is dyed and woven into intricate patterns to form colourful boxes, dolls, table mats, Christmas tree hangings and other delightful
items for the home,

STONEWARE: Stone carving an ancient Indian craft, is a speciality of Bihar specially in Gaya district which produces a large variety of articles - both for utility and decorative and religious purposes.

Processed foods like Mango Pulp, juice of fresh Lichees and Guava and Nectar, Tomato paste are some of the products available in Bihar. Katarni rice and ‘Chuda’ of Jagdishpur in Bhagalpur district, Sugar, Molasses, Green Vegetables are always available in abundance in the state.

LEATHER: In Darbanga, Sitamarhi, Muzaffarpur and some other areas are known for Aniline leather from cow, buffalo and goatskins. Handbags, purses, wallets, belts, suitcases, briefcases and a variety of other items are made in different factories using latest techniques on sophisticated Machines, producing finished leathers of world standards.

SHELLAC: Shellac has a wide range of applications in, both its raw form and processed state. India produces the best quality shellac and Bihar is the largest producer of shellac in india. Lac is the resinous secretion of Laccifier Lacca. The lac insect thrives on certain host trees like Palas, Kusum, and Ber.

Culture;

There is an excellent culture of the state to announce the sate tree, flower, animal and bird to give special attemtion in this field. The state tree of Bihar is Peepul, State flower is Kachnar, State bird is Indian Roler and state animal yet to be decided (earlier it was Bison).

The Madhubani paintings frequently adorn the nuptial chamber, the kohbar, of a newly married couple on their wedding night. One of the art forms of Bihar. The Madhubani School of Painting, has lately received much attention and poularity.

Manjusha Paintinng is a rural art of Bhagalpur and surrounding districts.
Patna School of Painting or the Patna Qalaam which sadly does not exist any more. The practitioners of this art form were descendants of Hindu artisans of Mughal painting in Patna during late 18th century.

Festivals of Bihar:

Bihar has a long list of celebrations. The months of Bhadon and Ashwin are marked by many religious observances and ceremonies. This is the most critical season of the year to the farmers, when they must have rain.

Chatt Puja: Almost all civilizations have worshipped the 'sun god'..But it has a unique form in Bihar. Chatt Puja is the only occasion where the setting sun is worshipped. The people of Bihar have immense faith in this festival. It is celebrated twice a year. Once in 'Chaitra' (according to the Hindu calendar) which falls in March and in 'Kartik ' which falls in November. For this 4-day festival, people maintain sanctity and purity from even a month ahead. People celebrate this festival with immense faith, the folk songs sung in the honour of 'Surya Dev' and 'Chatti Maiyya'. The people, especially women, offer cow's milk, coconut and other fruits to the sun god. Though it is a festival of the Hindus, some of the Muslims also participate actively in the puja.

Sama – Chakewa: With the advent of the colorful birds migrating from the Himalayas towards the plains during the winter season, celebration of Sama–Chakeva is done especially in Mithila. Mithilanchal dedicates this festival to the celebration of the brother sister relationship. It represents the tradition of this land as well as the art of making idols. This festival starts with the welcoming of the pair of birds sama-chakeva. Girls make clay idols of various birds and decorate them in their own traditional ways. Various rituals are performed and the festival joyfully ended with the 'vidai' of sama and with a wish that these birds return to this land the next year.

Ramnavami: A Hindu festival celebrated in all parts of the country. This is the auspicious day when lord RAMA was born. People celebrate it observing fasts and offering prayers in his honour.

Makar-Sankranti: Also known as Tila Sankranti, the festival marks the beginning of the summer season. People believe that from this day on, the days become longer and the heat of the sun also increases. Every year it is observed on the 14th of January. People celebrate it by giving offerings to the poor. It is a Bathing fairs are held on the banks of rivers.

Bihula: Bihula is a prominent festival of eastern Bihar especially famous in Bhagalpur district. There are many myths related to this festival. People pray to goddess 'Mansa' , the Snake Goddess, for the welfare of their family.

Madhushravani: This festival is celebrated all over mithilanchal with much enthusiasm. It is celebrated in the month of 'Sawan' (Hindu calendar), which falls around august. It teaches how to weave together religion and tradition in day-to-day life.

Anant-brat in gratitude for the ingathering of the bhadai harvest and in the hope of further prosperity.

Navaratri is one of his major festivals connected with the autumnal equinox, beginning on the first and ending on the tenth day of Navaratri.

Dussehra celebrates the victory of Rama over Ravana. Hence it is also called **Vijayadashami**.

Holi the fetival of colours is another very important hindu festival which terminate on the full moon of Phalguna.

Diwali is the third important festival of the Hindus.

Hindu women worship Lord Shiva at **Jeth Amavasya** to ensure the long life of their husband. At **Mauni Amavasya** they sit silently under a pipal tree on the day of a new moon, provided it is a Monday.

Nag Panchami is a festival observed on the fifth day of the bright half of Sravana.

6. TOURISM IN BIHAR:

Bihar offers to tourists a variegated wealth of Indian Civilization, history and culture with exquisite scenic beauties and wild life within its precinct are located, places like Rajgir and Patliputra, ancient capital of mighty magadh empire, Vaishali-the first republican state the world; Bodhgaya where lord Buddha attained the supreme enlightenment, Nalanda and Vikramshila-the great seat of international learning and Patna Saheb-the birth place of Guru Govind Singh, the last Guru of the Sikh. Visit to India remains incomplete, without a visit to Bihar.

Bodh Gaya, Rjgir, Nalanda, Vikramshila, Patna, Vaishali, Pawapuri, Lauria Nandan Garh, Kesaria and many natural falls, lakes and forests are the main tourist spots of the state.

Lack of proper transpor system and criminal activities in some of the areas are affecting the tourism in the state. There is extreme negligence on the part of the govt. to develop tourism in the state which also affects the revenue generation.

7. TRADITION, RELIGION AND BIODIVERSITY:

Bihar has been the land of Buddha, Mahavir, Ashoka and other Magadh emperors who had been the great conservationists of biodiversity in their glorious regime.

Rajgir once ruled by Magadh king Jarasandh is surrounded by 7 hills. Griddhakut hill is one of them where the vultures used to visit very often. 'Ambalatthika' garden of king Bimbisara is there in between Rajgir and nalanda. 'Venuvan' (Bamboo forest) later named as 'Valuvana Kalandakniyapa' where squirrels were moved freely and Mango groves were gifted to Buddha are here. In Pali literature the name of a deer park named 'Maddakuchi' is also mentioned. 'Pippaliguha' and 'Pasan Kaitya' are some other natural places where Buddha had given his Paryavaran discourses.
In Magadh village 'Senanigma' has been a beautiful forest besides a river having clear water is described in 'Majjhimanikay". In the texts of Hien Tsiang, Jainis and Buddhists, there is a mention of 'Kusagrapura' means the land of superior grasses and fragrant vegetation all around.
Some other examples of realizing the importance of biodiversity in earlier days are the 'Jeevak Amarvan' and the proection of hot springs in Rajgir. 'Brihadatthapura' is mentioned in Mahabharata and Purana. Brihadttha was the forefather of king Jarasandh.

At Pawapuri, a jain pilgrimage in Nalanda is known to conserve their all living beings. One can see the density of fish population and birds quite undisturbed.

Basokund in Muzaffarpur is a beautiful natural site where Lord Mahavir was born. But it is no longer preferred by the tourists because of the area is under crime infestation.

Bodhi Vriksha, a peepul tree at Gaya has a special mention of Mahatma Buddha under which he had been enlightened.
In recent days a temple built at holy Mandar hill near Baunsi is named as Ashta Kamal gives value to the ancient knowledge of biodiversity.

The concept of **'Pitrivatika'** in Gaya near Khajuria hills was initiated by the District Magistrate of Gaya, Mrs. Rajbala Verma in the year 1992 to plant a sapling in the memory of the ancestors of the visitors who come here to perform 'Pind Dan' ceremony for the peace of the soul of their departed ancestors. They were paying Rs. 251 for each sapling and the amount was supposed to be spent for the protection and development of the garden. 247 such saplings were planted in the year 1992 and revenue of Rs. 2.11 lakh was given to the forest department. At present the area has turned in to the pastureland due to the negligence of the forest dept.

BOTANICAL ROSERIES AND NON-FLOWER GARLANDS IN ETHNIC LIFE:

In the Mithila region of North Bihar nearly half a dozen plant species utilized for preparing rosaries and non-flower garlands. These rosaries basically meant for counting prayers are made from the seeds of Abrus precatorius, Canna sp., Elaeocarpus ganitrus, Nelumbo nucifera, Ocimum sp., Drypetes roxburghii and Sapindus mukorossi, twigs of Agele marmelos and Ocimum sp.; heart wood of Pterocarpus santalinus and Santalum album; rhizome of Curcuma domestica and roots of Desmostachya bipinnata. The non-flower garlands are prepared from the popped seeds of Euryale ferox and Aechynomene sp. The local inhabitants wear these rosaries around their necks and other parts of the

body to get relief from various kinds of skin and nervous disorders. Rosary made of Drypetes roxburghi is widely used by the people in this region to get relief from urticaria. In general these rosaries are used by the people for their mental peace, well being and over all prosperity

Plant based rosaries used in Mithila regions

Rosaries made of seeds		
Plant species	Vernacular name	Use
Abrus precatorius	Karjani	T
Canna sp.,	Vaijaynti	V
Drypetes roxburghi	Oitaujhia	Sk, V, T
Elaeocarpus ganitrus	Rudraksha	Sv
Nelumbo nucifera	Kamalaksa	L
Ocimum sp	Tulsi	V
Sapindus mukorossi	Haintha	-
Rosaries made of twigs and wood		
Agele marmelos	Bel	T
Aechynomene sp.	Korhila	W
Ocimum sp	Tulsi	V
Pterocarpus santalinus	Raktchandan	Sk
Santalum album	Srikhanda	V
Rosaries made of root and rhizome		
Curcuma domestica	Hardi	T
Desmostachya bipinnata	Kush	T

.

(T- Tanttric rituals, V- Vaishnav Rituals, Sv- Shaiva Rituals, L- Laximi worshipping, Sk- kali woshipping, W- wood)

CERTAIN SCIENTIFIC OBSERVATIONS AS DEPICTED IN INDIAN PHILOSOPHICAL PRINCIPLES:

The central ecological dogma of prey-predator relationship in the trophic chain has been depicted in maxims. There are some **Plants based maxims** point the human behaviour and the pattern of logitating on the basis of observations and experiences of natural patterns of plant behaviour. **Animal based maxims** based on animal behaviour. **Maxims base on physical phenomena** describes various natural phenomena.

The observation of natural phenomena find their mention in the literary and philosophic texts written over millennia. These texts are full of diverse analogies made with plants and animal behaviour. This could help make a proper estimation of the cross cultural nuance in relation to utility patterns of of natural biota. These natural phenomena related with human, animals, plants and various physical attributes have influenced human psyche since ancienttimes. Plants and animals have been profoundly illustrated in myths, tradition, arts and various other forms of folklore.

The described information brings the ancient Indian wisdom to the notice of the present day which hold true even today. These maxims would help the future generation have an easy grasp and understanding the law of nature. These could act as the missing links for the diversity of natural heritage. This elaborates the finding of first enlisting of such information in our ancient text. At some points this indigenous knowledge is being ignored which is of a great use in our life. On the basis of such references India should seek redressal for protection of its intellectual property rights.

Maxims based on ecological principals:

1. **Matsya Nyaya:** The larger organisms predate upon smaller organisms and predated by still stronger organisms. But in human life it states the anarchy.
2. **Vanabyaghra nyaya:** refers to the inevitable relationship between the lions and forest (and other animals forming different steps of trophic chain). One cannot think of an isolation existence. This sutra refers to the age old concept of environment protection by protecting wildlife (herbivores, carnivores) and Jungle together.
3. **Hrad nakra Nyaya:** echoes the sustenance of crocodile and other animals together in a big reservoir.
4. **Kataka rajo Nyaya:** Seeds of Strychnos potatorum and other plants like Moringa oleifera (drum stick), Sterculia urens(kateera gum), S. potatorum are used by traditional people and tribals for water purification.
5. **Padmapatramivambhasa Nyaya:** refers to the phenomena of water droplet becoming round on waxy lotus leaves like a pearl preaches us to remain unattached to the worldlu pleasures and sorrows.
6. **Niraksiraviveka Nyaya:** this maxim refers to the Swan to differentiate between milk and water. The interpretation is that it feeds upon rhizomes like Nelumbo and Nymphaea for nutritional and medicinal value leaving apart other things in water.
7. **Kadamba koraka Nyaya:** the simultaneous biurst of Kadamba (Anthocephalus cadamba) buds denotes simultaneous rise rise or fulfillment of a number of human desires.
8. **Narikela phalambu Nyaya:** presence of liquid juice i.e. endosperm having very high nutrition and other properties is covered with 3 layered hard fruit coat. The coconut is offered to deities for the fulfillment of of wordly desires.
9. **Pilu patra Nyaya:** the leaves of Salvadora oleoides are bitter in taste but its fruits are sweet. The leaves are used for camel fodder and as a pergative for the horses. The truth may be bitter but it is sound for the health of all living beings.

10. **Kadali Phala Nyaya:** the inflorescence of Musa spp. Comes out of its pseudostem and signifies end of the plant. The plant however gives out underground buds which sprout into fresh plants.
11. **Champaka pata vasa nyaya;** Michelia champaca (champa) retains intense fragrance for much longer time and is used for itra and perfumes in differerent uses.
12. **Ikshu danda Nyaya;** refers to the more sweet juice near root as compared to the apical portion.
13. **Dadhi trapusam prtyaksho jwara Nyaya:** Citrullus colocynthis (cucurbitaceaea) is known to cure obesity. But it refers to the induction of high fever in one who takes curd and colocynth together.
14. **Sali sampattau kodravasana Nyaya:** it speaks of the use of Rice (Oryza sativa) than Kodo millet (Paspalum scrobiculatum). The immature and moulded grains of Kodo are supposed to have poisonous and psychoactive. They are advised to take at least six months after the maturity. Otherwise the plants are used as an antidotes in scorpion sting and decoction of the roots and rhizomes serves as an alternative in childbirth and the juice of the stem is useful in corneal opacity.
15. **Luta tantu Nyaya:** refers to the fine network of fibres. The spider silk is five times more stronger than steel and far more elastic than rubber. This is something like the creation of world by God of no external material or instrument.
16. **Kurmanga Nyaya:** refers to the soft body of turtle protected by hard shell. The animal is worshiped by a section of populace claiming their origin from them (Kashyaps in hindus and Kachhaps in adivasis). The shell is used as a lamp base during marital rituals.
17. **Gajabhuktakapittha Nyaya:** refers to the excretion of the fruits of Feronia elephantum in the gut of the elephant with their outer coat seemingly intact.
18. **Vriscikigarbha Nyaya:** refers to the large number of offsprings emerging out of the body of a scorpion (or a crab) and the mother often gets killed in this process. This points to the limitation of the family.
19. **Ustra kantaka bhaksana Nyaya:** it refers to the capacity developed in the camels to feed upon thorny accias plants growing in desert.
20. **Mandukapluti Nyaya:** frogs are the excellent swimmers but has developed emergency adaptation to jump excellently to escape from the predators.
21. **Kakapika Nyaya:** this refers to the Cuckoo (Koel) lays eggs in the nest of the crow and the crows incubate them nurse their young ones. Because the eggs are similar to that of the crows.
22. **Pipilika gati Nyaya:** Ants leave scent trails for their successors to follow and they move in line. This indicates the discipline and solidarity of the followers. Ants also forecast rain specially when they move upwards on tree with eggs in their mouth. Mentioned in Parasara samhita.
23. **Kakolukanisavat Nyaya:** refers to the difference in internal structure of the eyes of a crow and an owl providing them the capacity of vision in different condidions of illumination.
24. **Swapucchonnayan Nyaya:** refers to the tail of a dog that cannot be straight.
25. **Laksarasavasikta Nyaya:** this refers to the natural dyes as the capacity of Lac juice to induce cotton fibers in to red tinged.

26. **Gaddarikapravah Nyaya:** it refers the continuous rush of sheep and thus the saying is ‘blind following of others like a flock of sheep’.
27. **Simhavalokan Nyaya:** this refers the habit of a lion of looking in front and behind after killing its prey to see if there is any rival of its possession.
28. **Patanga Dipika Nyaya:** it refers to the attraction of the insects to a source of light. This controls the number of insects after and that the lighting of Diyas in Deepawali is scientific.
29. **Vyala Nakula Nyaya:** it refers to the innate antipathy between snakes and mongoose.
30. **Kedari Kulya nyaya**: this refers to the ancient knowledge of irrigation since Vadik period of collecting water from rivers and catchments through canals.
31. **Sthali pulaka Nyaya:** it refers to the maxim of cooking rice in the same pot. All the grains are cooked equally boiled in the same vessel.
32. **Kupa yantra ghatika Nyaya:** it deicts the maxim of the pots attached to waterwheel of a well. As the wheel revolves, some of the pots go up and others go down. Some are full of water and some are empty. This shows the cyclical changes in the life and cycle of life and death.
33. **Vici taranga Nyaya:** it refers to the sound comes from undulating waves (sea) to the seat of hearing.
34. **Isuvega ksaya Nyaya:** refers to the gradual diminution of the speed of an arrow.
35. **Trinaranimani Nyaya:** refers to the simile of straw, arani wood and the burning of gem as meansproduction of fire.
36. **Lauha cumbaka Nyaya:** depicts the attraction of iron towards magnet.
37. Jala taila Nyaya: depicts the immiscibility of water with oil.
38. **Vahnisphulling Nyaya:** depicts the sparks around fire.
39. Na hi marumarici sarasi kramasah susyati: refers to the unending mirages giving false impression of water in sandy deserts.
40. **Purvahna chaya Nyaya:** refres to the shadow of morning shortens gradually and diminishes when sun is over head.
41. **Aparahna chaya Nyaya:** depicts the shorter noon shadow gradually getting longer up to the day.

Indigenous colours:

People are utilizing indigenous sources like- plants and animals to extract different colors for painting purpose since long time. People uses over three dozen plants in deriving vegetable colors for the exquisite Mithila painting and about 9 plant extracts added as fixatives for providing durability to the extracted colors.

Throughout the state, the ‘Palas’ tree has traditionally been used to extract saffron colour from its flowers which is used to play ‘Holi’. ‘Harshingar’ flowers are used for saffron colour with Sandal in offerings. ‘Sindur’ tree is used for vemillion.

Plants utilized for extraction of colors used in Mithila painting

Plant	Family	Vernacular name	Colour obtained
Seeds:			
Basella rubra	Besellaceae	Poro	Red
Bixa orellana	Bixaceae	Sita sindur	Annatto
Brassica campestris	Brassicaceae	Sarson	Yellow
Eleusine coracana	Poaceae	Marua	Black
Hordeum vulgare	Poaceae	Jau	Black
Oryza sativa	Poaceae	Caour	White
Sesamum indicum	Pedaliaceae	Til	Black
Root:			
Artocarpus heterophyllus	Moraceae	Katahar	Ochre and shades of red
Beta vulgaris	Chenopodiaceae	Chukandar	Red
Daucus carota	Apiaceae	Gajar	Shades of red
Ficus religiosa	Moraceae	Papal	Shades of red
Rizome:			
Curcuma domestica	Zingiberaceae	Hardi	Yellow
Leaves:			
Aegle marmelos	Rutaceae	Bel	Green
Camellia sinensis	Theaceae	Cai	Brown
Cannabis sativa	Cannabinaceae	Bhang	Green
Euphorbia pulcherrima	Euphorbiaceae	Lalpatia	Brown
Indigofera tinctoria	Fabaceae	Nil	Blue
Lablab purpureus	Fabaceae	Sem	Green
Lawsonia inermis	Lythraceae	Mehandi	Henna
Spinacia oleracea	Chenopodiaceae	Palak	Green
Wood:			
Acacia catechu	Mimosaceae	Khair	Chocolate
Pterocarpus santalinus	Fabaceae	Raktacandan	Deep red
Bark:			
Bauhinia variegata	Caesalpiniaceae	Kacnar	Blue
Psidium guajava	Papaveraceae	Kataiya	Yellow
Butea monosperma	Fabaceae	Palas	Orange
Carthamus tinctorius	Asteraceae	Kusum	Scarlet
Clitoria ternatea	Fabaceae	Aparajita	Sky blue
Crocus sativus	Iridaceae	Kesar	Saffron

Helianthus annuus	Asteraceae	Suryamukhi	Yellow
Hibiscus rosasinensis	Malvaceae	Arhul	Lighter shads of black
Impatiens balsamina	Balsaminaceae	Tyora	Shade of red
Mirabilis jalapa	Nyctaginaceae	Sanjha	Crimson
Nyctanthes arbortristis	Oleaceae	Harsingar	Orange
Tagetes erecta	Asteraceae	Genda	Yellow
Bract:			
Bougainvillea spectabilis	Nyctaginaceae	Baganvilas	Purple red
Fruit :			
Anthocephalus cadamba	Rubiaceae	Kadamba	Off pink
Kirganellia reticulata	Euphorbiaceae	Sikkat	Green
Morus alba	Moraceae	Tuti	Dark red
Punica granatum	Puicaceae	Darim	Golden
Solanum nigrum	Solanaceae	Bhukta	Sky blue
Above Ground Part:			
Cynodon dactylon	Poaceae	Dubhi	Black

Plants and their parts yielding fixers for Binding Colours

Name of the plant	Local name	Part used
Acacia nilotica	Babul	Gum
Aegle marmelos	Bel	Kernal
Brassica campestris	Sarson	Seed extract
Citrus aurantifolia	Kagji nibu	Fruit juice
Commiphora mukul	Guggul	Gum
Ficus bengalensis	Bargad	Latex
Linum usitatissimum	Tisi	Seed extract
Melia azadirachta	Neem	Gum and juice
Musa paradisiacal	Kera	Leaf juice

Less known uses:

Vetiveria zizanoides, which is known as a source of perfumed oil and a potential sand binder provides raw material to the ***sikki cottage industry*** in northern region of Bihar (especially in mithila). The mature peduncles are collected from the flood plains soon after the rainy season is over. The same are stored and used by the women during their leisure time for carving a number of containers used for various household purposes. The women make hundreds of exquisite craft items both of traditional and modern hues by making the hard stalks flexible through water treatment. The circular stalks with diameters ranging.

Innovative tradition in cremation:

Since long wood has been an exclusive choice as the funeral fire wood. But in recent years, however, a gradual emergence of dung cakes as an alternative fuel for cremating dead bodies has been witnessed in Mithila region. This is because of stringent restrictions over cutting of green trees, which have made the firewood more costly.

The new method of cremation, besides being economic, is less cumbersome and could also be held as an environmentally efficient system. To an extent it also saves the further erosion of mango biodiversity for which this region is known.

This stresses the need for setting up more and more of electric crematoria in rural areas in line with extension of cooking gas facility, which has eased the pressure on green plants to a considerable extent.

8. AGRICULTURE:

Bihar has 1006 mm average rainfall. North Bihar has excess rain causing flood whereas South and Central Bihar faces draught like situation every year. The agriculture in Bihar widely depends upon the ground water, tubewells and canals. 90% of farmers in Bihar grow rice cultivation. Rain water is lost due to high runoff and soil moisture is not retained causing agricultural draught. 50% of rice fields are covered under irrigation and the farmers mainly depend upon monsoon. Short, medium and long duration varieties of rice are grown here but there is still a great need to promote short and medium duration varieties. The long duration varieties are affecting the wheat crop.

Agriculture contributes 47.6% to the state domestic product. The pre-dominance of agricultural activity is further evident from the fact that 87.52% of Bihar's population resides in the villages. The agriculture sector provides livelihood for over 80% of its people and important segments of industries derive their raw material from agriculture produce like jute, sugar and small/ village industries such as oil mills, dal mills etc. During the last two decades the productivity in food grains has accelerated in Bihar mainly due to improved varieties of seeds, fertilisers and assured irrigation facilities. Small farmers have been provided government assistance through marketing, credit facilities and extension services. All these measures need to be strengthen fully so as to help agriculture in Bihar to realise its optimum potential.

The topography of Bihar can be easily described as a fertile alluvial plain occupying the Gangetic Valley. The plain extends from the foothills of the Himalayas in the north to a few miles south of the river Ganges as it flows through the State from the west to the east. Rich farmland and lush orchards extend throughout the state. Following are the major crops: paddy, wheat, lentils, sugarcane, jute (hemp, related to the marijuana plant, but a source of tough fibers and "gunny bags"). Also, cane grows wild in the marshes of West Champaran. The principal fruits are: mangoes, banana, jack fruit and litchis. This is one of the very few areas outside China which produces litchi.

The state is divided into three **Agro-Climatic Zones**:

North Bihar Plains: Consisting of West Champaran, East Champaran, Gopalganj, Siwan, Saran, Sitamarhi, Muzaffarpur, Vaishali, Madhubani, Darbhanga and Samastipur.

North Eastern Bihar Plains : Consists of Saharsa, Araria, Madhepura, Kisanganj, Purnea, Katihar, Begusarai and Khagaria.

South Bihar Plains : Consisting of Bhojpur, Patna, Rohtas, Nalanda, Aurangabad, Gaya, Jehanabad, Nawada, Munger and Bhagalpur.

Crops:

Paddy, wheat, lentils, sugarcane, jute (hemp, related to the marijuana plant, but a source of tough fibers and "gunny bags") are the major crops of Bihar. Also, cane grows wild in the marshes of West Champaran, Tea in Kisanganj, Litchi in Muzaffarpur, Mango varities of Bhagalpur and many aquatic crops like Singhara, Makhana etc. in the wetlands of north Bihar. Katarni rice and 'Chuda' of Jagdishpur in Bhagalpur district, Sugar, Molasses, Green Vegetables are always available in abundance in the state.

There is very little industry in the plain region except for the sugar factories that are scattered all over the northern plains, particularly in the western region. Jute is transported to the jute factories located mostly in Calcutta.

Aquatic crop of Flood Zone:

Makhana and Singhara, it is Khubahi-Ramdana cottage industry that provides a source of earning to the marginalized farmers in this state. The lotus, bhent, kesaur, chichorh, kauatuthi, ghenchul etc. are some other aquatic crops mainly grown in and around Darbhanga district. Khubahi cottage industry runs all through the year except during rainy season when the atmospheric humidity puts a major deterrent to the pop making and also to the retention of the pop shape and size. Khubahi provides livelihood to the poor and back ward people mostly belonging to Noniya, Mushar and Mallah castes. Khubahi business has been thriving in the Tal areas of Mokama-Barahiya on the southern side of Ganga.

Rice:

Rice is the major crop of the state. Bihar is a typical eastern state, with highest acreage under rice but lesser yield. The rainfed lowlands, including the flood-prone ecosystem constituting more than 50% of the total acreage, are characterized by dismally poor productivity. Most of the area is covered by traditional systems of cultivation, though scientists claim to have developed high yielding varietal technologies, their adoption has been negligible as farmers prefer their own cultivars which are adapted to the varying conditions prevalent in the region. These cultivars have passed through innumerable selection cycles. High yielding varieties perform better where management is better, but virtually fail when conditions are adverse.

Chaur (lowlying land depression, mostly circular or striped in nature) is a typical land characteristic of Bihar. They are deeper at the center and shallow at the periphery. Farmer plant suitable cultivars according to expected water stagnation. At the periphery of the *Chaur*, short duration varieties, even high yield varieties, are grown, than photosensitive, tall varieties which can withstand 40-100 cm water depth. By looking at the varietal composition in the *Chaur*, the pattern of water can be visualized. Farmers, however, in

low rainfall years, such as 1992 onwards, have changed varietal composition; medium duration varieties, instead of photosensitive tall types, are planted now.

Practically the farmers are not much convinced to grow higher yield varieties possibly because these varieties need (i) high level of management; (ii) necessity for irrigation water; and (iii) input application level, that may not be available to the farmers.

Pulses:

The cultivation of pulses is still confined to marginal or poor land. It is, therefore, the gap between the demand and supply of pulses continues to widen.

Distribution of seed minikits, Field level demonstration, and Training programmes should be promoted among the farmers. Less attention by the govt., surveyors, researchers and the farmers has been towards the production of pulses in the state.

Productivity potential of aquatic bodies and crop rotation between Makhana and wheat:

A novel case of rotational cropping of an aquaphyte makhana (Euryale ferox salisb.) with that of an early variety of the arable crop wheat in the same plot has been reported from the outskirts of Dharbhanga town in North Bihar, India. The plot has the facility of limited supply of domestic sewage from a municipal channel, which could be closed or opened as per the farmer's requirement. Makhana is cultivated as an additional crop in this plot as against the adjoining upland plots which produce a single crop in a year. E. ferox occupies the field during April-August while wheat occupies it during October-March. Wheat + Makhana plot also harbours an additional production of fish, mollusk and crab species.

Horticulture:

Fruits:

Mangoes, Litchis, Banana, Jack fruit, Guava, Citerus and Pine apple etc. are the major fruit crops of Bihar. This is one the very few areas outside China which produces litchi. Export potential of Lichi Mango and Makhana is immense in the state.

Among the horticultural crops mango contributes maximum area and production under total fruit crops grown in Bihar. Litchi attains fourth position in the total fruit area and production.

Litchi (Litchi Chinensis) is the most important sub-tropical fruit of India which originated from China about 3,000 years ago. It is mainly cultivated in the old districts of Muzaffarpur, Champaran and Darbhanga.

Sericulture :

Bihar produces three varieties of silk like Tasar, Eri and Mulbery. Bihar is the largest producer of Tasar silk in India and occupies second position in Eri silk production.

Small organizations run by state govt. for the maintenance development of silk industry before the beginning of **1st five years plan** were:

1. Training Center, Nathnagar, Bhagalpur

2. Tasar seed supply station at Chaibasa (Singhbhoom)
3. Tasar seed supply sub station at Amrapara (Santhal Pragana)
4. Eri seed supply station at Ranchi having five small demonstration centers.

However during the 1st five year plan two new seed supply stations at Daltonganj (Palamau) and at Raghunathpur (Madhubani), three Tasar substations, one Mulbury farm at Roshna (Purnea), one eri seed supply station at Begusarai (Monghyr), and five silk weaving tutional classes are started.

During 2nd five years plan more rapid expansion in silk industry took place. As many as 47 new schemes to open seed supplying stations, sub stations & research stations, demonstration centers, training cum production centers and marketing organizations were started.
During the **3rd five year plan** a number of new schemes were implemented in different phases for the development of silk industry specially for Tasar silk.

Kinds of Silkworms: Different kinds of silkworms of commercial importance belong to the two families namely Bombycidae and Saturniidae of order Lepidoptera of class Insects. About 30 species of insects belong to three families.

Silkworms	**Variety of silk filament obtained from cocoon**
Bombyx mori	Mulbury (Shiny, creamy and white fibres.)
Antharae assama **i. Muga silk moth** **ii. Tasar silk moth**	 Muga (a golden colour allied of Tasar) Tasar (coppery colour)
Philosamia ricini **Attacus ricini** **Eri silkworm**	Eri (a creamy white silk, less shiny than Mulbury silk

Utility of silk: The raw silk is utilized in the manufacturing of dresses, parachute, fishing lines, elastic webs and parachute, sieves for flour mills, insulation coil for telephone, wireless receivers and tyres of racing cars. Cocoon is used as medicine by Hakeems. The raw silk is changed to yarn by machines and this yarn is dyed and used for different purposes. It may be mentioned that artificial silk, rayon and other silk substitutes have captured a section of market and the natural silk industry is facing a tough competition with artificial silk.

Socio-Economic: In India the industry engages about one-lakh men & women; 2800 handlooms are under silk production while the number of Tasar weavers account for about 80,000. Several thousand acres of land are in Mulbury and Castor cultivation.

The famous Bhagalpur silk of Bihar is in considerable demand in USA & other parts of the world. In Nathnagar (Bhagalpur) Mulbury , Eri and Tasar silk worms are reared. A very large Bihar Spun Silk Mill had started at Bhagalpur with collaboration of the Govt. of Japan and Bihar state at an estimated cost of Rs. 1.50 crores having 3000

spindles. It was estimated that this mill would produce annually 55,000 kg. of finished yarn including Tasar yarn. This mill is the only third of its kind in the country. But now remains non functional leaving a huge unemployment left behind. The govt. is also not at all serious about it.

Present status of Sericulture in Bihar & Jharkhand:

Bihar produces the highest quantity of Tasar silk whereas Munga silk is not produced in Bihar. Eri silk is produced in Patna, Ranchi (Jharkhand), Bhagalpur and Muzaffarpur. Mulbury silk is produced in Patna.
Nowadays a research centers has been started in Jharkhand as Central Tasar Research Station, Ranchi (Jharkhand)
Many bacterial and fungal diseases in the silk worms seriously affect sericulture. Advancement in technology and improvement in marketing facilities would brighten the prospect of Sericulture in India.

Environmental impact of Sericulture:

Different types of silk like Mulbury, Tasar, Munga and Eri have different types of specific food plants and out these four Eri silk is obtained from the worm reared on Castor plants which is not perennial. The other type of silk such as Tasar, Munga & Mulbury, the food plants are perennial and they are mostly in the form of forests. These trees are also helpful in purifying the environment in the same way as the caster plants.

Livestock :

Production of Milk, Eggs, Wool and Fish are the important economical factors for Bihar. After the construction of a bridge on the river Ganges near Hazipur and Vikramshila Setu at Bhagalpur in Bihar, the procurement of milk has made a quantum jump. Dairy development specially in the area of Patna and Barauni is quite encouraging for self sustaining efforts on the path of growth.

Unlike other states of India, where agriculture is generally undertaken together with dairying, in Bihar as a traditional caste-based occupation dairying is mostly undertaken by the people of "Yadav" community. Thus, nearly 25 per cent of the farmers only are involved in milk production business.

The cattle are smuggled to the bordering country of Bangla desh through the route of Araria and Kisanganj districts.

Tea Plantation In Kisanganj:

An area specified economic plantation has been introduced in Bihar. Tea cultivation in Bihar dates back to 1862 when it was first started in Ranchi, a plateau region of Chhotanagpur but it could not succeed due to various reasons. After a lapse of 120 years, in 1982, tea cultivation started with only half hectare of land in Sonapur-Panwara village of Pothia block in Kishanganj district. Soil and other agro-climatic parameters studied in course of a survey (1996) conducted by the Tea Board has observed that there is

possibility of growing tea in north-east part of Kishanganj district of Bihar. Studied about the prospect of tea plantation in the adjoining districts namely Araria and Purnea are also being explored. Kishanganj has generally a humid climate with as high as 2,269.49 mm. rainfall.

Diara Land:

'Diara' is a typical land mass specially in the Ganga and Kosi river system lying in a vast strtetch of Bihar and in a part of Jharkhand of the gangetic alluvium. The land contains more soil and is alluvial in nature.

Diara land can be divided in three main categories;

1. **Diara cum 'Bhita'** – This type of land is less affected due to the flood and is totally cultivated. Erosion due to flood is not an occurrence here.
   Cultivated Diara Land: This land is more affected by flood and is more fertile and soil erosion is lesser. There is less 'Kharif' crop is there in the region due to inundation in the flood time.

2. **Main Diara Land**: This type of land is mainly sandy in nature and badly affected due to soil erosion. Variably 10 to 50% of the land is cultivable in the area. Rest is the grassland of 'Kashal' or 'Kush' and 'Jhhaua'. The local people go for some wheat and pulses cultivation whatever they can and others few grow vegetables like cucumbers applying local technique by digging the earth.

Crop of Diara land: rice is less cultivated in the Diara land and if grown by some of the farmers it is not of good quality and so having less commercial value. But the main crop of the area is Maize, Wheat, Barley, Gram, Pea, Arhar, Masur, Moong, Kalai, Khesari, Kurthi, Sugarcane, Methi, Dhania, Mustard and Jute. The recent trend during last five years or so, the farmers have started growing Sunflower but they are not having proper direct access to the industries for its sale.

Plantation of Diara land: The people are now taking no more interest in growing 'Sisam' for the reason of the unidentified epidemic in this species a few years back had destroyed hundreds of thousands of trees al together. There is less Bamboo plantation as compared to the southern side of Ganga. Some Palm and Date Palm have been grown but making liquor in huge quantity out of it is not in practice as it is in the tribal areas. The Bamboo, Palm trees and Seesam are used for house building materials and for some commercial use. 'Kashal' or 'Kush' and 'Jhhaua' are the excellent fodder for the cattles when young and at maturity these are used for amking roof top of their houses. Among the fruits Guava and few plums are there in the area.

Fauna of Diara land: Only natural fishing id there in the Chaur and Dhar and in the river. Rohu and katla are the main species popular among the locals. Wild animals like Blue bull and wild boar are less as we move towards Jharkhand side of Diara land but it is a common occurrence in the Diara land other than the jackals, lizards and monitor. The snakes mainly seen are Cobra, 'Sainkara, Krait, Rat Snake, 'Harhara', and some water snakes like 'Dhorwa'. Frogs and squirrels are some other small animals of the Diara land.

But in the adjoining rivers the Gangetic Dolphin (Platanista gangetica), crocodiles, Gavials(Gavialis gangeticus), turtles, otters (Lutra perspicilata) and hundreds of varieties of migratory and local birds are present. The cattle are every where in good number. The people of Diara use horses for their means of local conveyance. Poultry is not seen much in the economy of the Diara people.

People of Diara land: The people of Diara are mainly belonging to the cast of Gangot, Yadav, Bhumihar, Rajput, Koiri and some of the tribal population of Kharwar. The tribals are mainly the labourers in the area.

Research Activities:

The Agro Economic Research Centre (AERC)for Bihar (& Jharkhand now also) was set up as late as on 30th March, 1996 has done a creditable job within a short span of existence. The Centre has just completed five years of inception with full research activities and during this short span, the Centre has undertaken various studies of national importance. A year wise profile of research activities of Agro Economic Research Centre for Bihar & Jharkhand is given here under :

Research Activities:

No.	Title of Studies	Assignment Year	Sample District/ State	Status
1.	Economics of Export Oriented Horticulture Crop (Litchi) in Bihar	1996-97	Muzaffarpur	Report submitted in September 1997
2.	Production & Utilization Pattern of Milk at the Rural Producers' level in Bihar	1996-97	Muzaffarpur & Samastipur	Report submitted in April 1998
3.	Economics of Pulses Production & Identification of Constraints in Raising their Production in Bihar	1996-97	Godda & Bhagalpur	Report submitted in May 1998
4.	Prospects of value Addition of Forest Produce in Tribal Areas of Bihar	1997-98	Ranchi & Hazaribagh	Report submitted in May 1998
5.	Prospects of Tea Plantation in Kishanganj District of Bihar	1998-99	Kishanganj	Report submitted in October 1998
6.	Socio-Economic Evaluation of the National Integrated Pest management Programme in Bihar	19981999	East Champaran & West Champaran	Report submitted in October 1998
7.	Economic Reforms & Dynamics of Cooperative Movement in Bihar	1998-1999	Patna & Nalnada	Report submitted in October 1999
8.	Production & Utilization Pattern of Milk at the Rural Producers' level : An Analysis Across the States. (A Consolidated Report)	1997-1998	A. P., Bihar, Gujrat, Punjab & West Bengal	Report submitted in January 2000
9.	Prospects of Value Addition of Forest	1997-1998	M. P. and Bihar	Report submitted

	Products in Tribal Areas : An Analysis Across the States. (A Consolidated Report)			in July 2000
10.	Economic Reforms & Dynamics of Cooperative Movement in India (A Consolidated Report)	1998-1999	Assam, Bihar, H. P., Maharashtra & TamilNadu	Report submitted in September 2000
11.	Problems, Potential & Economics of Mushroom Cultivation in Bihar	1999-2000	Ranchi & Hazaribagh	Report submitted in March 2001
12.	Interim Report on Setting up Farm Machinery Institute in Bihar (As a Catalyst for Eastern Region)	2000-2001	Bihar	Report submitted in June 2001
13.	Impact of Minimum Support Prices on Agricultural Economy in Bihar	1999-2000	Rohtas, Purnia & Darbhanga	Draft report submitted in Jan. 2002.
14.	Flow of Credit to small and Marginal Farmers in Bihar	2000-2001	Bhagalpur & Madubani	Draft report submitted in Feb. 2002.
15.	Economics of Pulses Production in Mokama Taal Area of Bihar	2000-2001	Patna & Lakhisarai	Drafting of the report in progress

Government set up in agriculture:

1. Director of Agriculture, Bihar
2. Joint Director of Agriculture at Commissionary level.
3. District Agriculture Officer
4. Sub divisional Agriculture Officer
5. Block Agriculture Officer
6. V.L.W. – Village level Worker

Farm under Bihar Govt.:

1. Seed multiplication farm at district & sub division level. Closed due to the lack of fund & hands. Most of them converted in to Charwaha Vidyalaya.
2. Horticultural Nursery Farm at block level. Somewhere and somewhere closed.

Out of 476 agriculture farms in united Bihar, 142 went in Jharkhand and from rest 334 in Bihar, 207 have been given to the Charwaha Vidyalaya those are non functional instead of giving it to the farmers for seed growing.

Function of Govt. agencies:

The main function of govt. agencies are to:

1. Supply improved seeds to the farmers.
2. provide technical know how to the farmers to the village level.
3. provide plant protection measures to the farmers.
4. provide technical training to the farmars in collaboration with Agriculture college & Krishi Vigyan Kendra (KVK).

But agencies are not functioning properly due to the lack of fund and hands.

Agriculture Colleges and their work:

There is an Agriculture university in Bihar. In this university there are campuses. At Pusa where main campus of the university exists includes all post graduate department of agricultural faculties:-

1. College of Agricultural Engineering.
2. College of Home Sciences.
3. College of Fisheries.
4. P.G. Department of Plant Breeding.
5. P.G.Department of Soil Science & Chemistry.
6. P.G.Department of Agricultural statistics.
7. P.G.Department of Agronomy.
8. P.G.Department of Entomology
9. P.G.Department of Plant Pathology
10. Cattle & Dairy Farm at Pusa
11. Tirhut College of Agriculture, Dholi

Sabour (Bhagalpur) Campus:

1. Bihar Agricultural College, Sabour
2. P.G.Department of Horticulture (vegetable and floriculture)
3. P.G.Department of Horticulture (Fruit and fruit technology)
4. Department of Food Science
5. College farm, sabour

Poultry farm and Dairy farm have been closed due to lack of funds.

Patna Campus:

1. Bihar Veterinary College & Cattle Research Institute at Sheikhpure, Patna
2. Regional Agricultural Research Institute at Madhepura & Agwanpur
3. Banana Research Centre at Hazipur
4. Makhana Research Center at Madhubani, Darbhanga
5. Litchi Research Sub Center at Muzaffarpur
6. Irrigation Research Center at Bikramganj, Arrah

Research work is not performing well due to the lack of funds.
Most of the state research (agriculture & veterinary) works postpone due to lack of fund and hands.
I.C.A.R. projects and schemes are functioning well. Total funds are provided by I.C.A.R. (Indian Council of Agricultural Research)
Research and teaching works are affected due to lack of teaching staff, scientists, workers and funds.

KVK (Krishi Vigyan Kendra)

K.V.K. are being stablished in all the districts of Bihar by I.C.A.R. (Central Govt.) in collaboration with agricultural universities.

Functions of KVK:

1. Training of farmers regarding improved seeds, improved implementation of new agricultural technologies, plant protection measures.
2. Production of new improved seeds, new crops like medicinal crops, fiber crops, floriculture, flower cultivation, processing and marketing.
3. Training regarding Bee keeping, Goat keeping, Pigery, Poultry, Dairy, handling of Tractor, Agricultural implements etc.
4. Demonstration of new varieties, hybrid varieties, paddy transplanter, harvester, thresher etc.
5. Training regarding fruit preservation (Jam, jelly, squash, aachar etc.)

Macromode Traning Programme:

It is a central govt. scheme executed through District Agricultural Officers (D.A.O.). fund is provided by I.C.A.R.. Agricultural scientists and specialists of Agriculture colleges & KVK are generally engaged in training programmes. Seeds, Imlements and Tractors are also provided on subsidiary rate to the farmers.

Major Irrigation Projects in Bihar

Projects completed during pre plan period:

1. Sone Canals
2. Tribeni Canals

Projects completed to the end of VIII plan:

3. Sakri Lower valley
4. Lilajan
5. Lower Morhar
6. Upper Morhar
7. Khajia Weir
8. Lower Kiul Valley
9. Badua Reservoir
10. Kohira Dam
11. Kamla Irrigation
12. Chandan Reservoir (in Jharkhand)
13. Kosi Barrage and Eastern Canal
14. Rajpur Canal
15. Uderstilan
16. Sone High Level Canal

Ongoing projects:

17. Western Kosi Canal
18. Baghmati
19. Durgawati Reservoir
20. Barnar
21. Bateshwarsthan Pump PH-1

22. Upper Kiul Reservoir
23. Kosi Eastern Canal PH-II
24. Gandak PH-II

Bansagar (is with M.P. & U.P.)

9. CENTRAL SPONSERED SCHEMES FOR RURAL DEVELOPMENT:

Many schemes are often launched by the central govt. but it is wide open fact that to get the real benefit of it one has to struggle very hard and accept malpractices of the system. In between, a major share of the benefit is distributed at various points.

SWARANJAYANTI GRAM SWAROJGAR YOJNA

This programme was launched in April,1999. This is a holistic programme covering all aspects of self employment such as organisation of the poor into self help groups, training, credit, technology, infrastructure and marketing.

JAWAHAR GRAM SAMRIDHI YOJNA

The critical importance of rural infrastructure in the development of village economy is well known. A number of steps have been initiated by the Central as well as the State Governments for building the rural infrastructure. The public works programme have also contributed significantly in this direction.

INDIRA AWAS YOJANA

IAY is the flagship rural housing scheme which is being implemented by the Government of India with an aim of providing shelter to the poor below poverty line. The Government of India has decided that allocation of funds under IAY (Indira Awas Yojna)will be on the basis of poverty ratio and housing shortage.

CREDIT CUM SUBSIDY SCHEME FOR RURAL HOUSING

There were a large number of households in the rural areas which could not be covered under the IAY, as either they do not fall into the range of eligibility or due to the limits imposed by the available budget. On the other hand due to limited repayment capacity, these rural households cannot take benefit of fully loan based schemes offered by some of the housing finance institutions. The need of this majority can be met through a scheme which is part credit and part subsidy based.

DRDA ADMINISTRATION

District Rural Development Agency(DRDA) has traditionally been the principal organ at the District level to oversee the implementation of the anti-poverty programmes of the Ministry of Rural Development. Created originally for implementation of Integrated Rural Development Programme(IRDP), the DRDAs were subsequently entrusted with a number of programmes, both of the Central and State Governments. Since inception, the

administrative costs of the DRDA (District Rural Development Agency) were met by setting aside a part of the allocations for each programme. Of late, the number of programmes had increased and several programmes have been restructured with a view to making them more effective. While an indicative staffing structure was provided to the DRDAs, experience showed that there was no uniformity in the staffing structure. It is in this context that a new centrally sponsored scheme-DRDA (District Rural Development Agency) Administration has been introduced from 1st April, 1999 based on the recommendations of an inter-ministerial committee known as Shankar Committee. The new scheme replaces the earlier practice of allocating percentage of programme funds to the administrative costs.

DROUGHT PRONE AREAS PROGRAMME

The Drought Prone Areas Programme(DPAP) aims at mitigating the adverse effects of drought on the production of crops and livestock and productivity of land, water and human resources. It strives to encourage restoration of ecological balance and seeks to improve the economic and social conditions of the poor and the disadvantaged sections of the rural community.

Member of Parliament Local Area development Schemes (MPLADS)

Community Development

Basic Minimum Service etc.

10. FLORA:

Introduction:

The rich vegetation and floristic diversity of the State have attracted the attention of a number of explorers and botanists in the past (Hooker, 1848; Anderson, 1863). The flora of Bihar is mainly known through the work of Haines (1921-25) who published Botany of Bihar and Orissa in three volumes. Recently, Botanical Survey of India has published an analysis of the Flora of Bihar (including Jharkhand) (Singh *et al*., 2001) based on published data and collections available in the Central National herbarium, Howrah.

Present status of biodiversity

The vegetation of the state is mainly tropophilous. A few pockets exhibit vegetation of xerophilous nature. The extreme north-western regions like Champaran is the main natural forest of the State. The gangetic plain hardly possess any natural forest patch. But plantation of plants like shisham, Acacia, Eucalyptus has been done by the Forest Department. North Bihar is dominated by welands which are utilized for aquatic crops like makhana etc. Litchi cultivation is mainly done in Muzaffapur region whereas banana is cultivated on large scale in Hajipur and Naugachhia regions. Mango cultivation is done throughout state mainly in north And northeastern parts of the State.

There are about 250 species which are rare in the State. Some of them are *Abrus pulchellus, Alysicarpus pubescens, A. hamosus, Crotalria acicularis, Derris cuneifolia, Rhynchosia cana, Tacca leontopetaloides, Orobanche cernua, Brachiaria kurzii,*

Cynodon arcuatus, Leea alata, Drosera indica. Orchids are mainly represented by Zeuxine strateumatica, Vanda testacea and *V. tessellata*. Some of the weedy species which have been introduced in the flora include *Alternanthera paronychioides, A. philoxeroides, A. pungens, A. tenella, Chromolaena odorata, Euphorbia heliscopia, Parthenium hysterophorus, Rumex ambrosioides and Solanum viarum, Peperomia pellucida, Rumex*

THREATENED PLANTS OF BIHAR:

The state of Bihar exhibits reasonably diverse climate and topography with comparatively rich flora and fauna. In India particularly in Bihar, the forests and natural vegetation are depleting day by day due to rapid destruction of forests and other biotic factors. In recent time technological advancement in agriculture is brought about through the increased production of new high yielding verities of crops and left cultivation of old crops. In this way crops germplasms are being vanish. These germplasms may be utilized in future for genetic improvement. These should be conserve because each species or variety of plants represents a unique type of germplasm or a gene pool with special characteristics and values. To conserve the primitive type of cultivars, land races, ecotypes, and folk varieties of indigenous agriculture, etc. there is no conservation center in Bihar. NBPGR regional station, Ranchi is working in this line but it in Jharkhand State. As we know, many crops plants including rice have been improved using genetic resource from old gene pool of the cultivated species. It is high time that the significance of the plant. Genetic resources for human welfare should be realized and their conservation through establish ex-situ conservation center is imperative and need of the hour. In Bihar State, there are urgent needs an ex-situ conservation center of crops.

Makhana, Gorgon nut and Fox nut (Euryale ferox) – a potential source of wetland management - Gorgon nut or Fox nut commonly known as Makhana (Euryale ferox Salibs) of the family Nymphaeaceae is an unique, highly nutritious, fully non cereal food, which is extensively grown in stagnant water of wetlands and beautiful purple color solitary flowers is cultivated mainly in the state of Bihar, West Bengal and Assam.

Bihar state accounts for over 80% of makhana production of the country. Madhubani, Darbhanga, Sitamarhi, Saharsa, Katihar, Purnia, Samastipur, Supaul, Kishanganj and Araria districts are major producers of makhana. The fruit has a high nutritional value. It may be grown throughout Bihar and other state also with some agro-technological development. For this, Indian Council of Agricultural Research, New Delhi has been established a National Research Center for Makhana in the year 2002. Out put of the center is still awaited.

Bamboos in Bihar - India has very rich diversity of Bamboos. There are 130 indigenous and exotic species under 23 genera found naturally or under cultivation. Out of the above 20 species and 4 genera are naturally growing or cultivated in the state of Bihar. Most common species are Bambusa balcoa, B. nutans, Dendrocalamus strictus and endemic species is Dendrocalamus sericeus, which needs ex-situ conservation.

Botanic Garden - Botanical Garden in India have active role in plants conservation specially endemic and threatened plants that may be indigenous or exotics. It also play good role towards awareness, improvement and cultivation regarding conservation and resource utilization. According to "*Directory of Botanic Gardens and Parks of India* " (Chakravarty and Mukhopadhyay, 1990) there is no Government garden working in Bihar state towards conservation except two University Botanic Garden: (a) Botanical Garden post graduate Department of Botany, T. M. Bhagalpur Univ., Bhagalpur-7, and (b) Magadh Univ. Botanical Garden, Bodh Gaya. These two are running without any financial support from state govt. For conservation of wild plant genetic resources specially rare and endangered plants these two Botanical Gardens have done so many works and continuously working in this direction. So, prime importance should be given to these gardens and funds should be allocated on regular basis.

The T. M. Bhagalpur Univ. Botanical Garden was established in the year 1970. The garden has made to impart teaching and training to Post Graduate Students of the Univ. The Garden has beautiful landscape and suitable climate for germplasm conservation in the region. Beside the collection of 14000 herbarium, the garden has a living collection of more than 1600 species both indigenous and exotics.

The garden has to its credit in good collection of threatened and endemic plant species like Frerea indica, Drosera indica, Commiphora roxburgii var: Serratifolia, Euphorbia caducifolia, Euryale ferox, Stemona tuberosa, Rouvolfia serpentina, etc.

PLANT SPECIES at ECO PARK, IOC, BARAUNI

1. Acacia farneesiana		T - Bilayati Babool
2. Acacia nilotica		T - Babool
3. Acalypha hispida		SH
4. Acalypha spp.		SH
5. Aegle marmelos	2	T- csy
6. Agave americana		Tamua
7. Aglonema spp.		
8. Albizzia lebbek	180	T- f'kjh"k
9. Allamenda cathertica		CL -
10. Alpinia galanga		SH - Taro
11. Alternanthera philoxeroides		Marginal Aquatic
12. Alternanthera sessilis		Marginal Aquatic
13. Anthocephalus cadamba	12	T- dnECk
14. Araucaria columnaris / exceisa	28	T- fØlel Vªah
15. Areca catachu	24	T- lqlkkjh
16. Azadirachta indica	182	T- uhe

17. Asperagus spp.		CL - Shatawar
18. Bamboosa balcoa	85	ckaaaaal
19. Bamboosa gigantia.	525	T- EkksVk ckaaaaal
20. Bamboosa stricta	112	T- GkBh ckaaal
21. Bauhinia acuminata		SH
22. Bauhinia purpurea		
23. Bauhinia variegata	452	T- dpukj
24. Bombax malabarica		
25. Bougainvillea spp.	136	T- CkskxuchfG;k
26. Bryenia rhamnoides		SH -
27. Butea frandosa	1	T- lkGk'k
28. Calliandra heamatocephala		
29. Cassia artimisiodes (? Auriculata)	3	T- dkfl;k
30. Cassia biflora		
31. Cassia fistula	2	T- veGrkl
32. Casurina equisitaefolia	51	T- >kSvk
33. Cestrum diurnum	10	T- jkr dh jkuh
34. Cestrum nocturnum		
35. Citrus aurantium	2	T- uhacw
36. Citrus sp.		
37. Cocos nucifera	94	T - Ukkfj;G
38. Codiaeum variegatum		Karotan
39. Dalbergia sissoo	82	T- 'kh'ke
40. Delonix regia		
41. Dendrocalamus giganteus		
42. Dracaena terminalis		SH-
43. Eravatamia coronaria		SH
44. Eucalyptus citrodora	35	T- lQsnk
45. Eugenia jambolana	15	T- tkequ
46. Ficus bengalensis	5	T- cjxn
47. Ficus elastica	23	T- jcj
48. Ficus glomeruta	15	T- xwGj
49. Ficus infectoria	3	T- lkkdM+
50. Ficus nitida	45	T- Pkednkj gjk
51. Ficus religiosa	25	T- ihiG
52. Furcarea gigantia	41	T- lseG
53. Gravillea robusta		

54. Grewia asiatica	12	T- QkGlk
55. Heliconia sp.		
56. Gmelina arborea	4	T-gamhar
57. Hibiscus rosasinensis.	38	T- xqGgj
58. Hibiscus spp.		SH- vM+gqG
59. Hydrilla verticilata		Aquatic
60. Imperata cylendrica		Aquatic
61. Ipomea aquatica		Aquatic
62. Ipomea carnea		Aquatic
63. Ixora spp.	31	T- :fDe.kh
64. Jacaranda mimosaefolia	3	T- UkhGk xqGeksgj
65. Jasminum grandiflorum		Cl- pesGh
66. Jasminum pubescens		Cl- pesGh
67. Jatropha podagrica		SH
68. Juniperus chinensis.	50	T/SH- twuhisjl
69. Lagerstromia indica	25	T- Lkkou] Qkjl
70. Lemna sp.		Aquatic
71. Leucaena leucocephala		T-SUBABOOL
72. Lagerstroemia sp.		T
73. Litchi chinensis	32	T- Ghph
74. Mangifera indica	78	T- vke
75. Melia azedarach	7	T- lqccwG
76. Mimusops elengi	26	T- ekSGJh
77. Morus alba	1	T- ‘kgrwr
78. Murraya exotica	27	T- Ek/kqdkfeuh
79. Musa paradisica	8	T- dsGk
80. Nyctanthus artabortristes	10	**T- gjflaxkj**
81. Ochna squarrosa	2	T- dud pEik
82. Pterocarpus sp.		T- Chandan
83. Passiflora foetida		CL
84. Paspalum paspaloides		Aquatic
85. Phyla nudiflora		Aquatic
86. Phyllanthus sp.		T- bhui vakoGk
87. Polyanthia longifolia	545	T- Mªwfiax v’kksd
88. Prunus amygdalus	24	T- cknke
89. Psidium gujava	33	T- ve:n
90. Pterospermum acerifolia	7	T- eqpdaqn

91. Clematis sp.		**Climber**
92. Quisqualis indica		
93. Ravenala madascariensis	5	T- [ktwjia[kh
94. Roystonea regia		Plam
95. Saccarum sp.		Aquatic
96. Syzygium cumini		
97. T. occidentalis		
98. Tectona grandis	40	T- lkxoku
99. Terminalia arjuna	132	T- vtZqu
100. Terminalia catappa		
101. Thuja orientalis	281	T/SH- eksjia[kh
102. Toona ciliata		
103. Typha angustata		Aquatic
104. Ziziphus jujuba	12	T- csj
105. Chrysalidocarpus lutescens		Plam
106. Cyperus sp.		
107. Livistonia chinensis		Plam
108. Bixa orellena		SH
109. Canna indica		
110. Clerodendrum inerme		SH
111. Holmskioldea sanguinea		CL
112. Cinnamomum zeylanicum		T
113. Coleus sp.		
114. Cordia myxa		T
115. Clitoria ternatia		CL
116. Dienffenbachia picta		
117. Dienffenbachia sp.		
118. Gardenia jasminoideas		
119. Ixora parviflora		
120. Mussaenda phillipica		
121. Serissa foetida		
122. Dahlia pinnata		
123. Cosmos bipinnatus		
124. Calendula officinalis		
125. Aster amellus		
126. Careopsis tinctoria		
127. Ageratum conyzoides		
128. Gerbera jamessonii		

129. Tegetes erecta		
130. Zinnia elegans		
131. Phlox drummondii		
132. Ipomea batatas		
133. Ipomea muricata		
134. Brunfelsia americana		
135. Dendrothema sp.		
136. Lavandula sp.		
137. Dracaena deremensis		
138. Dracaena godseffiana		
139. Embelica officinalis		
140. Euphorbia pulcherrima		
141. Euphorbia tirucalli		
142. Euphorbia thymifolia		
143. Hygrorhiza aristata		
144. Ixora parviflora		
145. Jasminium humile		
146. Jatropha panduraefolia		
147. Michelia champaca		
148. Derris indica		
149. Muehlenbackia platyclados		
150. Oxalis corymbosa		
151. Gurga pinnata		
152. Nolina longifolia		
153. Phoenix acaulis		
154. P. sylvestris		
155. Pathos aureus		
156. Philodendron sp.		
157. Polianthus tuberosa		
158. Pinus sp.		
159. Putranjiva roxburghii		
160. Padillanthus tithymaloides		
161. Pilea codersii		
162. Portulaca grandiflora		
163. Portulaca sp.		
164. Pyrostegia venusta		
165. Punica granatum		
166. Russelia sp.		
167. Yucca aloifolia		

168. Villisneria spiralis		
169. Tinospora cordifolia		
170. Vernonia elaengifolia		
171. Kaemferia sp.		
172. Maranta sp.		
173. Nasturtium sp.		
174. Nerium sp.		
175. Rosa indica		
T- Tree, SH- Shrub, Cl- Climbers, AQ- Aquatic		

11. FAUNAL BIODIVERSITY:

Our more than two decades study on the survey, faunistic composition and community structure of aquatic animals ranging from zooplankton, macro invertebrates, fishes, birds colonizing riverine and lacustrine environments of eastern Bihar indicates that the aquatic biodiversity of riverine ecosystem (Ganges, Kosi and Gandak) gradually followed a declining trend in taxonomic diversity, abundance, population size as well as in distribution (Sharma et. Al. 1982; Roy et. Al. 1988; Singh and Roy, 1989; Roy, 2003).
The aquatic biodiversity have been increasingly threatened by habitat alteration and fragmentation due to construction of barrages, highways, road network, dams, over harvesting, indiscriminate killing of brood and juvenile fishes, pollution and introduction of alien species. The rivers like Ganges and Kosi have highest contribution of the sediment to the Sunderban estuary. The land use changes, prolific agriculture and .construction of 'Rajendra Pul' between Mokama and Barauni, 'Vikramshila Setu' between Bhagalpur and Naugachhia and 'Farakka Barrage" between New Farakka and Maldah over river Ganges have significant impact on the local biodiversity of the region. Many species that were abundant earlier become common and their population size decreased considerably both quantitatively and qualitatively. It was observed that the deteriorating limnobiotic profiles of the water bodies are not only upsetting the physiological and behavioral rhythm of the higher animal taxa viz. fishes, birds and mammals through their feeding, breeding, migratory behaviour and productivity (Kannan et. Al. 1993). The other factors appear for depletion of biodiversity in this region are excessive human interference like massive deforestation, over grazing by livestock, population pressure, siltation and eutrophication which pose a threat on the fragile geology of the area, increasing the frequency and incidence of floods annually causing heavy loss to the local people and their property.

In eastern Bihar, Diara ecosystem has been created by the change of the course of river Ganges. The erosion and deposition is a perpetual feature of river Ganges in this region. This feature alarms destabilizing the biodiversity inhabiting the area. The dominance of grass *Saccharum spontaneum* in the region for checking natural soil erosion and binding soil has been destroyed by the local people, posing a great threat on the general ecology of the area.

Molluscs:
The fresh water mollusks are the natural diet for fishes and aquatic vertebrates. They play an important role in cleaning the water, jewellary industry and are thefood resource to the poor people.
Faunistic composition of molluscs has been studied by Sharma et. al. (1980). Viviparous bengalensis, Lymnea sp., Planorbis sp., Lamllidens marginalis, are the most abundant molluscs in lacustrine environment. However, their population is sparsely recorded in riverine systems. Paressiya sp. is the most common in Kosi region now exploited for button and lime industries by local people. Lymnea sp. and Planorbis sp. are vectors of fluke parasites transmitting diseases in the cattle of local people of the region.

List of Molluscs:

Sr. No.	Scientific Names
1.	Viviparous bengalensis f. annandalei (Kobelt)
2.	Viviparous bengalensis f. typica (Lamarck)
3.	Viviparous variatus (Frauenfeld)
4.	Lymnaea (Pseudosuccinea) acuminata f. rufescens Gray
5.	Lymnaea (Pseudosuccinea) acuminata f. gracilion Von
6.	Lymnaea (Pseudosuccinea) lutecola f. ovalis Gray
7.	Lymnaea (Pseudosuccinea) acuminata f. typica (Lanmark)
8.	Achatina (Lissachatina) fulica; fulica Bowdich
9.	Melanoides lineatus (Gray)
10.	Melanoides tuberculatus (Muller)
11.	Digoniostoma ceraneopoma (Benson)
12.	Atocinma orcula var. Producta (Nevill)
13.	Indoplanorbis exustus (Deshayes)
14.	Gyraulus convexiusculus (Hutton)
15.	Segmentina calathus (Benson)
16.	Pila globosa
17.	Corbicula sriatella (Deshayes)
18.	Corbicula bensoni (Deshayes)
19.	Novaculina gangetica (Benson)
20.	Unio marginalis

Annelids:

Brachiodrilus sp., Dero sp. are the common Oligochaets of the region while Hirundinaria sp. and Placobdella sp. found in appreciable quantity in ponds of the region. Tubifex tubifex and Limnodrilus hoffmeisteri represents 80% of the total bottom dwelling macro invertebrates. These annelids indicate a high degree of organic enrichment in river Ganges and other water bodies. A polychaete Nephtys has been identified in river Ganges which is also a good indicator of organic pollution.

Insects:

71 species of insect biodiversity belonging to orders Ephemeroptera, Odonata, Plaeoptera, Hemoptera, Coleoptera, Diptera and Trichoptera have been surveyed and encountered in lacustrine and riverine ecosystems from Barauni to Farakka. The abundance of these insects in these aquatic environments have been found to be correlated with the seasonal growth of angiospermic vascular plants. Reckless changes in agricultural practices, use of chemical fertilizers and pesticides in agriculture, by improvement in land drainage, adoption of monoculture, industrialization, construction of highways, mining operations without following the “digging and filling principles”, stone quarrying operations, Brick Kila operations, establishment of industrial complexes etc. in totality have caused the loss of numerous aquatic habitat whereas new reservoirs with vast quantities of chalk, clay, stone chips and gravels have been created. Thus the old aquatic habitat have been destroyed and new ones have been established. So,

comprehensive studies have been made on the changes in the aquatic insects habitat. On the other hand reclamation schemes and improved drainage have greatly reduced the number of swamps, marshes, chaurs and a variety of wetlands. This region is considered as a most species rich biotop and zoogeographically diversified region of the Indian sub continent. A careful survey of the region will be undertaken to make sure that nothing of biological interest would be destroyed by operation because such life supports systems are necessary for sustenance of higher biodiversity.

BIODIVERSITY OF GANGA BASIN OF BIHAR:

Although a great deal of work has been done on the floral and faunal diversity of river Ganga, earlier reports only included the fish diversity. But since the middle of 20^{th} century, works on floral diversity has also been reported. A detailed account of faunal resources was published by ZSI around 1991.

Bilgrami and Munshi 1980 and again in 1984 published two important reports which includes information on the physico chemical nature of the water and soil of river Ganga between Barauni to Farakka and Patna to Farakka respectively. Together these reports include 8 species of bacteria 129 species of fungi, 118 species of macrophytes, 175 species of algae, 50 of zooplankton, 33 of invertebrates, 89 species of fishes and about 30 species of other vertebrates.

All the biota of river Ganga is continuously facing the stress due to discharge the effluents from the industries such as McDowell distillery and Bata Shoe Factory at Mokama, run off from the agricultural land from the catchments containing chemical fertilizers and pesticides, domestic sewage, cattle bathing and other human activities.
Ganga near Ghogha and kahalgaon gets further polluted by the discharges of Jagdishpur Distillary and NTPC, Kahalgaon. Fishing of even juvenile fishes using nets with smaller mesh size has adversely affected the fish population of river Ganga. Polythene and plastic bags used by the people in different holy or religious occasions further degrading the water. A huge quantity of poly bags are being thrown in the river specially during big festivals like Chhath. Besides these, emersion of idols of Goddesses Durga, Kali and Saraswati adds to the process of siltation. Due to the above factors, the water quality of river Ganga has further degraded. A general survey of the fish market of Bhagalpur and its surroundings suggests that there is sharp decline in fish landing from river Ganga. The shortage is partly balanced by landing of carp fishes from Andhra Pradesh. However, the local fishes are always preferred as compared to the fishes imported from Andhra Pradesh.

An eel like air breething fish *Amphipnous (=Monopterus) cuchia* once abundant in the swamps of N. Bihar has become extremely rare and is being considered as threatened. So is the case with *Chaca chaca* from the swamps of N. Bihar. To save cuchia from extinction, eel culture practices may be given priority in the rural areas.

Table 9. List of fish species recorded from the Bihar & Jharkhand Gangetic Plains.

Sl. No.	NAME	LOCAL NAME	STATUS
1.	Ailia coila (Hamilton-Buchanan)	Banspatta	MC, HC
2.	Amblypharyngodon microlepis (Bleeker)	Dhawai	R
3.	Amblypharyngodon mola (Hamilton-Buchanan)	Dhawai	R
4.	Amphipnous (Monopterus) cuchia	Bamsar, Kuchia	VVR
5.	Anabas testudineus (Bloch)	Koi	C
6.	Anguilla bengalensis	Bamach	R
7.	Aorichthys aor (Hamilton-Buchanan)	Tengara	C, HC
8.	Aorichthys seenghala (Sykes)	Tengara	MC, .HC
9.	Aspidoparia morar (Hamilton-Buchanan)	Harda	C, LC
10.	Badis badis (Hamilton-Buchanan)	Pathra/Sunha	R, NC
11.	Bagarius bagarius (Hamilton-Buchanan)	Bagari/Goonch	R. LC
12.	Barilius bendelisis (Hamilton-Buchanan)	Dhawai/Angura	VR, LC
13.	Botia dario (Hamilton-Buchanan)	Baghwa/Baghawa	R, NC
14.	Botio lohachata	Baghi	
15.	Catla catla (Hamilton-Buchanan)	Mirka/Bahakur	MC, HC
16.	Chagunius chagunio		
17.	Chanda baculis (Hamilton-Buchanan)	Chanda/	R
18.	Chanda nama (Hamilton-Buchanan)	Chanda	R, LC
19.	Chanda ranga (Hamilton-Buchanan)	Chani/Chanda	R, LC
20.	Channa gachua	Chenga	C
21.	Channa marulius (Hamilton-Buchanan)	Pumurl	R, NC
22.	Channa punctatus (Bloch)	Girai	C, LC
23.	Channa striatus (Bloch)	Sauri, Saura, Morrel	R, HC
24.	Chela atpar		
25.	Chela laubuca (Hamilton-Buchanan)	Chelowa/Dannhrah	C, LC
26.	Cirrhinus mrigala (Hamilton-Buchanan)	Mirka/Nainee	MC, HC
27.	Cirrhinus reba (Hamilton-Buchanan)	Rewah	R, MC
28.	Clarias batrachus (Linnaeus)	Magur	VR, HC
29.	Clupisoma garua (Hamilton-Buchanan)	Garua/Bachawa	C, LC
30.	Colisa fasciatus (Schneider)	Khosti	C, LC
31.	Crosochellus latius latius	Gahuma	
32.	Danio dangila (Hamilton-Buchanan)		R, NC
33.	Danio devario (Hamilton-Buchanan)	Dhawai/Patukari	R, NC
34.	Erethistes pussilus Muller & Troschl	Jeenkata/Tinkantia	C, LC
35.	Esomus danricus (Hamilton-Buchanan)	Dhawai/Dendu	R, NC
36.	Eutropiichthys vacha (Hamilton-Buchanan)	Bachwa/Buchawa	C, MC
37.	Garra gotyla gotyla (Gray)	Mirka/Siltoka	R, LC
38.	Glossogobius giuris (Hamilton)	Bulla, Bullamachh	C, LC
39.	Glyptothorax telchitta		R
40.	Gonialosa manmina (Hamilton-Buchanan)	Suhia	R, NC
41.	Gudusia chapra (Hamilton-Buchanan)	Chopri/Suiya	MC
42.	Hara hara (Hamilton-Buchanan)	Panhi/Tinkantiya	R, NC
43.	Heteropneustes fossilis (Bloch)	Singhi	R, HC

Sl. No.	NAME	LOCAL NAME	STATUS
44.	**Hypolophus sephen**	Saukchi	
45.	Jhonius coitor	Bholwa, Bhola, Pathachatti	
46.	Jhonius gangeticus	Bholwa, Bhola	
47.	Labeo bata (Hamilton-Buchanan)	Bata	C, MC
48.	Labeo calbasu (Hamilton-Buchanan)	Calbasu	C, HC
49.	Labeo gonius (Hamilton-Buchanan)	Kursa	R, MC
50.	Labeo rohita (Hamilton-Buchanan)	Rohu	MC, HC
51.	Lepidocephalus guntea (Hamilton-Buchanan)	Guhma	R, NC
52.	Macrognathus aculeatum (Hamilton-Buchanan)	Patgainchi/Bami	MC,C
53.	Macrognathus aral	Gainchi	MC,R
54.	Mastacembelus armatus (Lacepede)	Gainchi/Baam	C, LC
55.	Mastacembelus pancalus	Gainchi	C,MC
56.	Mystus cavasius (Hamilton-Buchanan)	Tengra	MC, LC
57.	Mystus menoda (Hamilton-Buchanan)	Belauli	R
58.	Mystus tengra	Soni Palwa	C,MC
59.	Mystus vittatus (Bloch)	Jengra	MC
60.	Nandus nandus (Hamilton-Buchanan)	Bheda/Vaadhul	R, HC
61.	Nemacheilus botia		R,NC
62.	Notopterus chitala (Hamilton-Buchanan)	Moi/Chital	C, HC
63.	Notopterus notopterus (Pallas)	Moi/Patra	MC
64.	Ompok bimaculatus (Bloch)	Papta/Jalkapoor	C, HC
65.	Ompok pabo (Hamilton-Buchanan)	Tambulivapapta	C, HC
66.	Osteobrama cotio cotio	Pithari, Gurda	
67.	Oxygaster gora Rahman	Dariaichalo	R, LC
68.	Pangasius pangasius	Pangas	
69.	Pseudambassis ranga	Chanda	
70.	Pseudeutropius atherinoides	Patasi, Tinkatia	
71.	Puntius chola (Hamilton-Buchanan)	Pothia/Siddhari	R
72.	Puntius conchonius (Hamilton-Buchanan)	Pothia/Kharauli-pothe	C, MC
73.	Puntius sarana sarana (Hamilton-Buchanan)	Pothi	MC
74.	Puntius sophore (Hamilton-Buchanan)	Pothia	MC
75.	Puntius ticto (Hamilton-Buchanan)	Pothia	MC
76.	Rhinomugil corsula (Hamilton-Buchanan)	Ansuari	C, HC
77.	Rita rita (Hamilton-Buchanan)	Belgagra/Rita	C, HC
78.	Salmostoma bacaila	Chelwa	
79.	Securicula gora	Hastha	
80.	Setipinna brevifilis	Phasia	R,MC
81.	Setipinna phasa (Hamilton-Buchanan)	Phansa	C, LC
82.	Sicamugil cascasia (Hamilton-Buchanan)	Mullet	R, MC
83.	Silonia silondia (Hamilton-Buchanan)	Silan/Silond	C, LC
84.	Sisor rhabdophorus		
85.	Somileptes gongota		
86.	Tenualosa ilisha (Hamilton-Buchanan)	Hilsa	R, HC
87.	Tetraodon cutcutia Hamilton-Buchanan	Fokcha/Petfulni	R, NC
88.	Tor tor (Hamilton-Buchanan)	Mahseer	VR, HC
89.	Wallago attu (Schneider)	Boari/Paran/Wallah	MC
90.	Xenentodon cancila (Hamilton-Buchanan)	Kaua/Kankle/Thona	C, NC

There are some other species also found in Bihar in addition.

MC=Most Common, C=Common, R=Rare, VR=Very rare, HC=High Commercial Value, MC=Moderately Commercial, LC=Low Commercial, NC=Non Commercial

Aquatic insects:

Genere / Species	* mark showing Relative abundance		
	Abundant	**Common**	**Rare**
A.Order- Coleopetra Family- Dytiscidae			
Cybister confuses Sharp			*
Cybister regulosus Retd.			*
Cybister limbatus Fabr.			*
Cybister tripunctatus asciaticus Sharp			*
Laccophilus chinensis inefficiens Boh.			*
L. parvulusAube	*		
L. anticatus Sharp	*		
Hyphoporous sp.			*
Hyphydrus indicus Sharp			*
Hydrocoptus subvittatus Mot		*	
Canthydrus laetabilis Walk	*		
Canthydrus sp.	*		
Eretes sticticus L.		*	
Sandracottus festivus Illinger			*
Guignotus pradhani Vazirani		*	
Hydaticus vittatus		*	
Family- Hydrophilidae			
Sternolophus rufipes Fabr.	*		
Amphiops sp.	*		
Helochares anchoralis Sharp.		*	
Berosus pulchellus M'Leay		*	
B. indicus Mots		*	
Regimbartia attenuata Fabr.	*		
Hydrophilus olivaceous Fabr.	*		
H. indicus Bedel	*		
Enochrus sp.		*	
Hydraena sp.		*	
Laccobius sp.			*
Family-Gyrinidae			
Orectocheilus gangeticus Wied.	*		
Dineutes spinosus Fabr.		*	
Family- Haliplidae			
Haliplus pulchellus Fabr.	*		

Haliplus		*	
B. Order- Hemiptera **Family- Corixidae**			
Corixa hieroglyphica Duf		*	
C. promontoria Dist.	*		
Micronecta merope Dist.	*		
M. proba Dist.		*	
M. scutellaris Stal.	*		
M. striata Dist.		*	
Family- Notonectidae			
Anisops sardea Herr-Schaff	*		
A. breddini Kirk.		*	
Enithares sp.			*
Family- Pleidae			
Plea frontalis Fieb.	*		
P. sp.	*		
Family-Gerridae			
Geris fossarum Fabr.	*		
G. spinole Leth. Et. Sevn.	*		
Family-Mesovellidae			
Mesovelia sp.			*
Family-Hydrometridae			
Hydrometra vittata Stal		*	
Family- Nepidae			
Ranatra filiformis Fabr.	*		
R. elongata Fabr.	*		
Laccotrephes griseus Guer.	*		
L. rubber Linn.		*	
Family-Belostomatidae			
Diplonynchus annulatum Fabr.	*		
Sphaerrodema rusticum Fabr.		*	
Belostoma indicum Lep. Et. Serv.			*
C. Order- Odonata **Suborder- Anisoptera** **Family-Gomphidae**			
Mesogomphus lineatus Selys	*		
Family-Libellulidae			
Cordulegaeter sp.		*	
Suborder-Zygoptera **Family-Coenagriidae**			
Ischnura delicata Hagen	*		
I. senegalensis Rambur	*		
Rhodischnura nursei Moton		*	
Agrioonemis sp.			*

D. Order- Diptera **Family- Chironomidae**			
Chironomus sp.	*		
Monopelopia sp.	*		
Conchapelopia sp.		*	
Clinotanypus sp.	*		
Family-Culicidae			
Anopheles sp.	*		
Culex sp.	*		
E. Order- Ephemeroptera **Family-Baetidae**			
Baetis sp.	*		
Cloeon sp.	*		
Ephemerella sp.	*		

Animals in aquatic and adjoining area:

Sr. No.	Scientific Name	Common Name
	Mammals:	
	Platanista gangetica	River Dolphin (Sons)
	Lutra perspicillata	Otter
	Canis aura	Jackal
	Boaalaphus tragocamalus	Nilgai, Blue Bull
	Sus scrofa	Wild Boar
	Reptiles:	
	Gavialis gangeticus	Gharial
	Kachuga tentoria	Indian Tent Turtle
	Lissemys punctata	Indian Flapshell Turtle
	Aspideretes gangeticus	Indian Softshell Turtle
	Aspideretes hurum	Indian Peacock Shoftshell Turtle
	Varanus bengalensis	Common Indian Monitor
	unidentified	Water Snakes

Aquatic flora and fauna of North Bihar:

North Bihar is rich in its water area. Bowl shaped physiography coupled with a moderate to high rainfall causes water-logging of an immense scale. The lotic system forms a fine network of rivers which are notorious for changing their courses over millennia. This has resulted into the formation of hundreds of ox-bow lakes and land depression (CHAURS) which form the life line of the region. Besides, thousands of big and small ponds cater to the needs of irrigation and are also used for rearing fishes which form a significant component of the dietary preference in this area. An obvious advantage with the prolonged water logging is in the form of recharging of ground water and the region escapes the deficiencies of surface and ground water as witnessed in other parts of the country.

The region is known for its rich aquatic biodiversity. Earlier the quantum of fish production through capture fisheries was sufficient to feed the dependent human population. Fishes in dried forms used to be exported in the past from this region to distant places. Speedy rise in human population has brought about a considerable decline in the per capita fish availability. As per 2001 census, the population in the area has crossed 1000-1200 individuals per sq. kms. The region suffers from the acute problem of protein-energy malnutrition. Impact of floods on the regional economy could be gauged from 3.1% out migration of its population which is the highest in the country.

Flood plain wetlands are a repository of aquatic biota. Trapa natan var. bispinosa, known for its high biological value is grown on an extensive scale. several other species including Nelumbo nucifera, Nymphaea spp., Scripus articulatus, etc. are utilized as subsidiary food items. Leaves of Ipomoea aquatica, Alternanthera spp. etc. are also utilized as valuable greens. These wetlands also harbour the growth of significant biofertilizers like Azolla sp. and Aeschynomene sp. The latter with prominent stem nodulations could be seen growing abundantly in the flooded paddy fields.

A significant number of aesthetic items are carved from aquaphyte species belonging to Aeschynomene, Vetiveria, Cyperus, Typha, Phragmites etc. Amongst the animal biota freshwater gastropods, crabs and prawns are variously utilized as source of protein and energy and are used as diets by the poor sections of society.

Large no. of shallow and stagnant water bodies are utilized for cultivation of Makhana (Euryale ferox salisb.) which is a rooted floating microphyte belonging to family Nymphaeaceae (Euryalaceae). This aquaphyte is grown as a crop in the non-calcareous water pockets of Kosi-Kamla-Mahananda belt.

Makhana ponds are ideally suited for growing only the air-breathing fishes. Experiments performed earlier on integrated cultivation of Makhana with air-breathing fishes have yielded encouraging results.

Increasing stress on enhanced fish production has urged the fish farmers initiate experiments on integrated aquaculture with both air-breathing and carp fishes.

The debris of the Makhana crop as well as weeds lying at the bottom from the food of the detritivorous fishes. Makhana ponds harbour a rich population of insects which also serve as natural fish feeds and bring about a biological control of its pests.

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Other aquatic products --- Used for Edible purpose

Andhrathadi village has all the potentials of being developed as a potentials tourist site. Besides Makahna, these wetlands produced a no. of other plant products utilized as food. The most significant one is Singhra (Trapa natans). Other products are – Khubahi-Ramdana (Scir pus articulatus), Bhent (Nymphaea spp.), Kamalgatta (Nelumbo sp.) which are used in seed formation. Those utilized as the underground forms include the lotus rhizome, Kesaur, Saruk, Chichorh, Karahar etc. Leaves of Karmi saag (Ipomoea aquatica) and Sarhanchi (Alternanthera spp.) are utilized mostly as greens.

Shell fisheries and button industry of Bihar:

In North Bihar, the Ganga drainage system comprises several perennial rivers such as Sikrahna, Kamla, Balan, Gandak, Kraih, Burhi Gandak, Kosi and Mahananda.

These rivers often change their courses resulting in formation of different types of aquatic system like Oxbow lakes, beels, wetlands, ponds and swamps. These aquatic systems are highly productive for the natural growth and propagation of molluscan fauna. Out of 19 species of molluscs reported so far from this area, only 6 species of Parreysia favidens, P. favidens var. Pinax, marcens, deltae and lamellidens corrianus constitute the commercial shell fisheries of this area. They cater the requirements of raw materials for MOP of button industry. The MOP of button industries is more than 100 years old and these are primarily concentrated at Mehsi (East Champaran) of North Bihar.

But is a matter of grave concern that population of Bivalves in the area is depleting at an alarming rate. This is mainly due to the indiscriminate exploitation of both juveniles and adult molluscs of the area, without any consideration of conservation of its population.

Mammals :

	Name	**Zoological Name**	**Hindi name**
1.	The Gangetic Dolphine	Platanista Gangetica	Sus
2.	The Indian Wild Boar	Sus Scrofa Linnaeus	Suar
3.	Spotted Deer	Axis axis	Chital
4.	The Hog Deer	Axis porcinus	Para
5.	The Sambar	Cervus Unicolor Kerr	Sambar
6.	The Swamp Deer	Cervus Duvauceli Cuvier	Barasingha
7.	The Nilgai	Boselaphus Tragocamelus	Nilgai
8.	The Fourhorned Antilope	Tetracerus Quadricornis	Chowsingha
9.	The Black Buck	Antilope Cervicapra	Mriga
10.	Indian Gazelle	Gazella gazella	Chinkara
11.	The Wild Buffalo	Bubalus bubalis	Arna(M);Arni (F)
12.	Indian Biason	Bos garus	Gaur
13.	The Indian Elephant	Elephas maximus Linnnaeus	Hasti, Gaja
14.	The Indian Hare	Lepus nigricollis	Khargosh
15.	The common House Rat	Rattus rattus	chuha
16.	The long tailed tree mouse	Vandeleuria oleracea	
17.	The white tailed wood rat	Rattus blanfordi	
18.	The Indian bush rat	Golunda ellioti Gray	
19.	Field mice	Mus booduga	
20.	Metads	Millardia meltada	
21.	Mole rats	Bandicota bengalensis	
22.	Antilope rats	Tatera indica	
23.	Five Stripped Squirrel	Funambulus pennanti	Gilheri
24.	Three Stripped Squirell	Funambulus palmerum	
25.	Common yellow Bat	Scotophilus heathi	
26.	Tickell’s Bat	Hesperoptenus tickelli	
27.	Indian Pipistrelle	Pipistrellus coromandra	

28.	Indian False Vampire	Megaderma lyra	
29.	Short Nosed Fruit Bat	Cynopterus sphinx	
30.	Ground Shrews	Suncus murinus	Chuchunder
31.	Tree Shrews	Anathana ellioti	
32.	The ratel	Mellivora capensis	Bejoo
33.	The smooth Indian otter	Lutra perspicillata	Ud bilao
34.	The Sloth Bear	Melursus ursinus	Bhalu
35.	Indian wild dog	Cuon alpinus	Dhole, jungli kutta
36.	The Indian fox	Vulpes bengalensis	Lomri
37.	The jackal	Canis aureus	Gidhar
38.	The wolf	Canis lupus	Bheriya
39.	The stripped Hyena	Hyaena hyaena	Lakkar baghar
40.	The small Indian mongoose	Herpestes auropunctatus	
41.	The common mongoose	Herpestes edwardsi	Newal
42.	Toddy cat	Paradoxurus hermaphroditus	Lakati
43.	The small Indian civet	Viverricula indica	Kasturi
44.	The jungle cat	Felis chaus	Jangli billi
45.	The leopard cat	Felis bengalensis	Chita billi
46.	The leopard	Panthera pardus	Tendwa
47.	The tiger	Panthera tigris	Bagh
48.	Hanuman monkey	Presbytis entellus	Langur
49.	The rhesus macaque	Macaca mulatta	Bandar

12. FOREST:

After the division of the state the percentage of forest has reduced to 6.8% from 26%. Bihar occupies an area of 94,163 sq. km. and out of it the Notified forest area is only 6473 sq. km. i.e. 6.87%. Mainly these forest are existing in 11 districts of West Champaran, Kaimur, Rohtas, Aurangabad, Gaya, Jahanabad, Nawada, Nalanda, Jamui, Banka and Munger.

In rest of the districts there is no notified forest existing. In such districts some plantations have been done on non forest land i.e. Roadside, Canals, Dams etc. under social forestry programme.

The other forest regions of Bihar are Sasaram, Bhabhua and Rajgir forests which have heavily degraded and now represent scrubby scanty forest patches and wasteland is increasing. This is affecting the local environment and climate. Similar is the factor prevailing in the Banka, Katoria region in Bihar.

The forest areas of Bihar are getting heavily disturbed due to criminal activities by local and organized sectors like MCC, Naxalites, People War Group, Party Unity, Ranvir Sena, some timber and Kattha Mafias etc.

The forest is bordering jharkhand is another example where these activities have made the condition measurable. No one usually dares to enter the forest for executing

administration responsibilities or for the study the status of the forest. The Gautam Buddha Sanctuary of which the Danua range has now gone in the Jharkahnd state but Bhalua range in Bihar still has a good forest but inaccessible practically for crime reasons. The other pockets of forested areas are lying in Sherghati, Immamganj, Banke Bazar and some parts of Aurangabad in Gaya and some are there in the district of Nawada adjascent to Gaya. Initially above mentioned areas were known for excellent Sal forest and Kattha (Khair).Now still sal seems to be there but Kattha trees have been extremely exploited and almost wiped off.

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Out of 6473 sq. km. of declared forest area, Protected forest is 692.89 sq. km. i.e. 10.70% Reserve forest is 5778.89 sq. km. i.e. 89.20% and Non classified forest s 1.12 sq. km.

Part of Valmiki Tiger project is declared as the National Park. Other than this 11 wildlife sanctuaries are there and one Jaivik Udyan at Patna. National parks and sanctuaries constitute 50.7% of the forest land of the state.

Survey of Indian Forest Institute, Dehradun in May 2003 reveals that:

1. In this digital survey the areas of even a hectare and more than 23.5 meter wide have been included that of forested and plantation areas. In the northern parts of Bihar there are linear plantation and that is why these have not been included in the map.
2. According to this from the total geographical area of the country of 32,87,263, there is only 7,68,436 sq. km. is the notified area i.e. 23.88%. there is 6,078 sq. km. area as notified forest area i.e. 6.45% of the total geographic area of Bihar. Thus there is only 0.8% area as notified forest in comparison of the countrywide.
3. By the institute, for the first time the data are available about the plantation outside the forest area. This is a matter of pride for the state that traditional plantation is encouraging. In the country there are only 11 trees per hectare, in Bihar it is 14.8 trees per hectare. The plantation area of India is 2.48% outside the forest, but in Bihar it is 3.92%. in Jharkhand it is only 9 trees per hectare.
4. In this survey an increase of 6% in the green cover has been observed in the country but in Bihar it is 18.7%.
5. This survey reveals that including forests and plantation, the percentage of green cover in Bihar is 10% as against the notified forest area i.e. 6.45% of the total geographic area of Bihar.

Challenges before the State:

According to the Indian Forest act, 1988, it is recommended that to maintain the ecological balance 33% green cover is required in the country. The govt. of India has set an objective to increase the forest area upto 25% in tenth five years plan till 2007 and to reach the 33% during eleventh five year plan till 2012.

According to the present report, the real forest area in Bihar is 6.07% out of the total notified area of 6.87% and 50% of it is in good health. If the protected areas are developed in the dense forest, and plantation trend is maintained the forest cover of Bihar would feature as well forested in the national scenario.

Forested area:

	Assessment 1999 in sq. km.(forested)			Assessment 2001 in sq. km (forested)			
	Dense	Open	Total	Dense	Open	Total	Diff.
Bihar	**2,223**	**2,607**	**4,830**	**3,372**	**2,348**	**5,720**	**890**
Jharkhand	11,051	10,593	21,644	11,787	10,850	22,637	993
India	382,229	255,064	637,293	416,809	258,729	675,538	38,245

Forested and plantation Area:

	Total area	**Notified area**		**Forested area**		**Forested & Plantation area**	
		Area	**%**	**Area**	**%**	**Area**	**%**
Bihar	**94,163**	**6,473**	**6.87**	**5,720**	**6.07**	**9,413**	**10.00**
Jharkhand	79,714	23,605	29.61	22,637	28.4	25,331	31.78
India	3,287,263	786,436	23.38	675,538	20.55	757,010	23.03

The sub Himalayan foothills of Someshwar and Dun ranges in Champaran constitute a belt of moist deciduous forests. These also consist of scrub, grass and reeds. Here the rainfall is above 1600 mm and thus promotes luxuriant Sal forests in the favoured areas. The hot and dry summer gives the deciduous forests. The most important trees are Shorea Robusta (Sal), Shisham, Cedrela Toona, Khair, and Semal.are the characteristics of this forest. This type of forest had also occurred in Saharasa and Purnia districts.

Highlight	
Geographical Area :	94,163 Sq.Km.
Notified Forest Area :	6764.14 Sq.Km.
Forest Area to Geographic Area :	7.10%
Protected Area :	15
National Park :	1
Botanical Garden :	1
Sanctuaries :	11
Closed Area :	2
Area of Protected Area :	3320 Sq. Km.
% Protected Area to Total Forest Area :	49.09 %

Protected Forest Area in Bihar

Name of Park / Sanctuary	Place /District	National Park / Sanctuary
1. Valmiki National Park	West Champaran	National Park
2. Sanjay Gandhi Botanical Garden	Patna	Botanical Garden
3. Valmiki Sanctuary	West Champaran	Sanctuary
4. Bhimbandh Sanctuary	Monghyr	Sanctuary
5. Rajgir Sanctuary	Nalanda	Sanctuary
6. Kaimur Sanctuary	Rohtas	Sanctuary
7. Gautambudha Sanctuary	Gaya	Sanctuary
8. Udaypur (Saraiya Man) Sanctuary	West Champaran	Sanctuary
9. Nagi Dam Bird Sanctuary	Jamui	Sanctuary
10. Nakti Dam Bird Sanctuary	Jamui	Sanctuary
11.Vikramshila Gangetic Dolphin	Bhagalpur	Sanctuary
12. Kanwar Jheel Bird Sanctuary	Begusarai	Sanctuary
13. Gogabil Pakshi Vihar	Katihar	Closed Area
14. Kusheshwarsthan	Darbhanga	Sanctuary
15. Barela S.A.Z.S Sanctuary	Vaishali	Sanctuary

District Wise Forest Coverage of Bihar (Including Road/Canal side plantation)

District	**Forest Area (in Sq. Km.)**	**District**	**Forest Area (in Sq. Km.)**
Arraria	13.05	Madhubani	
Aurangabad	538.63	Munger,Lakhisarai,Shekpura	653.19
Begusarai	40.20	Muzaffarpur	42.62
Bhagalpur,Banka	453.88	Nalanda	46.40
Bhojpur,Buxar	36.46	Nawada	697.43
Champaran(East)	0.70	Patna	21.56
Champaran(West)	917.45	Purnia	77.60
Darbhanga	56.80	Rohtas,Kaimur	1,797.62
Gaya, Jehanabad	322.42	Saharsa	60.40
Gopalganj	47.22	Samastipur	46.62
Jamui	673.31	Saran	44.88
Katihar		Sitamarhi,Sheohar	46.12
Khagaria	50.10	Siwan	50.72

Kishanganj	36.40	Supaul	
Madhepura	38.16	Vaishali	50.70

Reserves and other natural habitats:

Many natuaral habitats having good potentialitty for birds have been recommended by the State Coordinator, Bihar & Jharkhand of Indian Bird Conservation Network (IBCN) for the inclusion in the list of Important Bird Areas (IBAs) of Asia being prepared (for India) by BNHS. 13 sites of Bihar namely Kawar Lake Bird Sanctuary, Kusheshwarsthan Pakshi Vihar, Gogabil Pakshi Vihar, Nagi & Nakti Bird Sanctuaries, Valmikinagar Tiger Reserve, Saraiya Man Bird Sanctuary and Vikramshila Dolphin Bird and the unprotected areas like Jagatpur Jheel, Eco Park of IOC, Barauni, Mokama Tal area and Kursela. The chaurs of North Bihar are being worked out for their final recommendations.

The **Vikramshila Gangetic Dolphin Sanctuary** is the only fresh water dolphin sanctuary in india established on 22nd August 1990 in a stretch of 60 km. in Ganga river from Sultanganj to Kahalgaon in Bhagalpur district. But even the fishermen were not aware of this status. They were even not noing that killing of River Dolphin is a great offence till 1992 May when first initiative was taken by the members of Mandar Nature Club (MNC), Bhagalpur who caught a fisherman taking the dolphin on a rikshaw to sell it in the fish market. The matter was highlighted through media and at present a great awareness has been raised and international agencies are attracted towards the study and conservation of thwe spwecies and its habitat. For many years the MNC team had worked in this sanctuary under the leadership of Dr. R.K.Sinha of Patna University and now many agencies and NGOs have developed the interest including the Forest dept. for the protection of river dolphin in the sanctuary. At present it is estimated that some 133 dolphins are inhabiting in the sanctuary area. The forest dept. has been equipped to take care. But the problem of using fine nylon nets in the river for fishing is posing a great threat to the river dolphin locally known as ‘Sons’. The species is blind and takes its movement through eco sound but the fine nylon nets are not producing this sound become the cause of the dolphin trapped in these nets. The fine nets also extract the small fishes that lead to the scarcity of food for the dolphins. During June to august fishing is banned in the sanctuary area of river Ganga because in this season fishes lay eggs and small fishes come up as ‘Jeera’ but the fishermen extract and sell them in the market. This practice is well organized and has taken a shape of the fishing mafias. For this purpose the offenders also hire the fishermen from West Bengal. (June 2002). However, less than 24 cm net is prohibited for fishing in the area. There always remains a conflict between the fishermen and the workers on this issue. The forest dept. has taken some initiatives to resolve the issue as they have proposed schools, hand pumps and roads in the areas of fishermen community other than developing some ponds costing rupees 61,500 each. These ponds have been developed in Bahadurpur, Maniarpur and Jichho. (July 2003).

Bhimbandh Wildlife Sanctuary:

An area of 681.90 sq. km. with a core area of 183.87 sq. km. in Kharagpur, Malaypur, Lakhisarai and Dharhara ranges had been notified as a reserve forest on 26th May 1976. The survey of earlier times says that it was a dense Sal forest here. The hot springs of Bhimbandh are the points of attraction for the visitors.

Terrestrial flora:

The forest of Bhimbandh comprises of mainly forests of different density.

Moist peninsular low level Sal – the common associates of it are:

1. Terminalia tomentosa – Top canopy
2. Terminalia arjuna - Top canopy
3. Syzygium dumini - Top canopy
4. Pterocarpus marsupium - Top canopy
5. Adina cardifolia - Top canopy
6. Buchnania latifolia – Middle canopy
7. Madhuca indica - Middle canopy
8. Croton oblongifolius - Middle canopy
9. Woodfordia floribunda - Middle canopy
10. Holarrhena antidysenterica - Middle canopy
11. Oasearia tomentosa – Ground flora
12. Flemengia chapper - Ground flora
13. Indigofera spp. - Ground flora
14. Millletia auriculates – Climbers
15. Smilex protifera – climbers
16. Bauhinia vahlii - Climbers

Dry peninsular Sal – The associates of it are:

1. Terminalia tomentosa – Top canopy
2. terminalia belerica - Top canopy
3. Diospyros melanoxylon - Top canopy
4. Buchnania lanzen - Top canopy
5. Pterocarpus marsupium - Top canopy
6. Anogeissus latifolia - Top canopy
7. Zizyphus xylopyra – Under growth
8. Gardenia spp. - Under growth
9. Wendloendia spp. - Under growth
10. Wrightia tomentosa - Under growth
11. Woodfordia fruticosa - Under growth
12. Clerodendron viscosum - Under growth
13. Croton oblongifolis - Under growth
14. Combretum decandrum – Creepers
15. Bauhinia vahlii – Creepers
16. Milletia auriculata – Creepers
17. Butea superba – Creepers
18. Smilex spp. – Creepers
19. Butea parviflora – Creepers
20. Acacia spp.

Northern dry mixed deciduous forests with Bamboo as under storey

1. Diospurus melanboxylon – Top canopy
2. Buchnania lanzen - Top canopy
3. Anogeissus latifolia - Top canopy
4. Terminalia tomentosa - Top canopy
5. Lagerstroemia parvifolia - Top canopy
6. Boswellia serrata - Top canopy
7. Pterocarpus marsupium - Top canopy
8. Acacia vatechu - Top canopy
9. Sal – few patches
10. Bamboos –as under storey
11. Holarrhena antidysenterica – Under growth
12. Carissa spinarum - Under growth
13. Alangium salvifolium - Under growth
14. Flacourtea indica - Under growth
15. Randia dumetorum - Under growth
16. Bauhinia vahlii – Creepers
17. Acacia canescense – Creepers
18. Sabai grass

Edaphic sub types

Boswellia (Salai) forests

1. Boswellia serrata (Salai) – Top canopy
2. Pterocarpus marsupium – Top canopy
3. Buchnania latifolia – Top canopy
4. Aegel marmelos - Top canopy
5. Anogeissus latifolia – Top canopy
6. Diospyros melanoxylon – Top canopy
7. Sterculia urens – Top canopy
8. Gardenia spp. – Under growth
9. Woodfordia floribunda – Under growth
10. Nyctanthes arbortristis – Under growth
11. Holarrhena antidysenterica – Under growth
12. Acacia canescense – Under growth

Aegel forests

Scrub forests – found in the eroded areas and in plains

Euphorbia forests – even Sal forests have been degraded due to this

Aquatic:-

There are very few sources of still water and so not much aquatic vegetation is there. Some are found in the dry river beds:

1. Tamaric dioca
2. Saccharum spomtaneum

Sub terrestrial:
Roots, rhizomes and tubers are used by Wild boars, Porcupine and even monkeys. Roots of Salmalia malabarica and rhizomes of Bamboo are liked by the herbivores.

Fauna :
Tigers were found in this forest and in the forest of Kharagpur in the beginning of the century but as now there are no tigers in the area. Sometimes one or two might be crossing the forest but it is not much in evidence.

Sr. No.	Common Name	Scientific Name
Mammals		
1.	Leopard	Panthera pardus
2.	Jungle Cat	Felis chaua
3.	Small Indian Civet	Viverricula indica
4.	Common Palm Civet	Pacadoxurus hermaphroditus
5.	Common Mongoose	Herpestes edeardei
6.	Small Indian Mongoose	Herpestes auropuctatus
7.	Striped Hyena	Hyaena hyaena
8.	Wolf	Canis lupus
9.	Jackal	Canis aureus
10.	Indian Fox	Vulpes bengalensis
11.	Wild Dog	Cuon alpinus
12.	Sloath Bear	Malursus uranius
13.	Honey Badger	Mellivora capensis
14.	Indian Giant Squirrel	Ratfa indica
15.	Three stripped Palm Squirrel	Funambulus palmarum
16.	Indian Porcupine	Huatrix indica
17.	Indian Hare	Lapus nigri collies
18.	Four horned Antelope	Tetracarus quadricornis
19.	Nilgai (Blue Bull)	Boaalaphus tragocamalus
20.	Sambhar	Carvus unicolor
21.	Cheetal (Spotted Deer)	Axis axis
22.	Barking Deer	Muntiacus muntjak
23.	Mouse Deer	Traqulus mominna
24.	Indian Wild Boar	Sus acrofa
25.	Rhesus Macaque	Macaca mulatta
26.	Common Langur	Presbytis antellus
27.	Fulvous Fruit Bat	Rousethus leschenaulti
28.	Short nosed Fruit Bat	Cynopterus sphinx

Reptiles		
1.	Crocodile (short)	
2.	Banded Krait	Bangarus fasciatus
3.	Common Krait	Bangaras coeruleus
4.	Indian Cobra	Naja naja
5.	King Kobra	Naja hahhab
6.	Rat Snake	Ptyas mucosus
7.	Russel Viper	Vipera ruselli
8.	Indian Python	Python molurus
Lizards		
1.	Rock Lizard	Agama buberculatus
2.	Monitor Lizard	Varanus monitor
3.	Chameleon	Chameleon spp.
Birds		
1.	Red jungle Fowl (Jungli Murgi)	Gallus gallus
2.	Common Sandgrouse (Bhat Teetar)	Pterocles exutus
3.	Common Peafowl (Mor)	Pavo cristatus
4.	Common Green pigeon (Harial)	Treron phoenicoptera
5.	Painted Sandgrouse (Bhat Ban)	Pterocles indicus
6.	Black Partridge (Kala Teetar)	Francolinus francolinus
7.	Grey Partridge (Safed Teetar)	Francolinus pondicerienus
8.	Black breasted Quail (Chanak)	Coturnix coromandelica
9.	Common (Grey Quail (Bater)	Coturnix coturnix
10.	Jngle Bush Quail (Lowwa)	Perdicula asiatica
11.	Red Spurfowl (Chhoti jungli murgi)	Galloperdix spadicea
12.	Painted snipe (Raj Chaha)	Rostratula bengalensis
13.	Spotted Dove (Padoki)	Streptopelia chinensis
14.	Ring Dove (Panduk)	Streptopelis decaocto
15.	Little brown Dove (Chhota fakhta)	Streptopelia senegalensis
16.	Jungle Crow (Jungli Kowwa)	Corvus macrorhynchos
17.	House Crow (Kowwa)	Corvus splendens
18.	Koel (Koel)	Eudynamys scolopacea
19.	Barned Owl	Tyto Alba
20.	Brown Fish Owl (Oollu)	Bubo zeylonensis
21.	Indian Great Horned Owl (Ghughu)	Bubo bubo
22.	House Sparrow	Passer domesticus
23.	Common Indian Nightjar (Chhipak)	Caprimulgus asiaticus
24.	Black Vulture (Raj Giddha)	Torogs calvus
25.	White backed vulture (Giddha)	Gyps benghalensis
26.	Small blue Kingfisher (Shareefan)	Alcedo atthis
27.	Pied Kingfisher (Karona)	Ceryle rudis

28.	White breasted Kingfisher (Kourilla)	Halcyon smyrnensis
29.	Black headed Cuckoo Shrike (Jungli Kasya)	Coracina melanoptera
30.	Large Cuckoo Shrike (Kasya)	Coracina novaehollandiae
31.	Small Green Bee eater (Patringa)	Merops orientalis
32.	Blue tailed Bee eater (Bada Patringa)	Merops phillipinus
33.	Chestnut headed Bee eater (Lalsir Patringa)	Merops leschenaulti
34.	Common Grey Hornbill (Dhanesh)	Tockus birostris
35.	Rufous Woodpecker (Kathforwa)	Micropternus brachyurus
36.	Golden backed Woodpecker (Kathforwa)	Dinopium benghalens
37.	Blue Rock pigeon (Kabutar)	Columbia livia
38.	Crow Pheasant (Mahoka)	Centropus sinensis
39.	Common Hawk Cuckoo (Papiha)	Cuculus varius vahi
40.	Hill Myna (Pahari Myna)	Gracula religiosa
41.	Grey headed Myna (Pawai)	Sturnus malabaricus
42.	Bank Myna (Ganga / Barad Myna)	Acredotheres ginginiasus
43.	Indian Myna (Desi Myna)	Acredotheres tristis
44.	Black headed Myna (Brahmini Myna)	Sturnus pagodarum
45.	Green Bulbul (Harewa)	Chloropsis aurifrens
46.	Gold mantled Chloropsis (Harewa)	Chloropsis cochinchinensis
47.	Red vented Bulbul (Bulbul)	Pycnonotus cafer
48.	Red whiskered Bulbul (Pahari Bulbul)	Pycnonotus jocosus
49.	Jungle Myna (Jungli Myna)	Acredotheres fuscus
50.	Large Indian Parakeet (Heeraman Tota)	Psittacula eupatria
51.	Rose ringed Parakeet (Tota)	Psittacula krameri
52.	Crimson breasted Barbet (Chhota Basant)	Megalaima haemacephala
53.	Blue throated Barbet (Nilkanth Basant)	Megalaima asiatica
54.	Blossom headed Parakeet (Tuiya Tota)	Psittacula cyanocephala
55.	Blue Jay (Nilkanth)	Coracias bengalensis
56.	Blue winged Parakeet (Madangour Tota)	Psitticula columboides
57.	Common Pariah Kite (Cheel)	Milvus migrans

Bhimbandh Wildlife Sanctuary is now in scratch. Sometime back the leopard and deer had been killed here. The occasional hunters from use to enter the forest for hunting the wild animals including birds in the forest with their proper arrangements till a few years back. Now the naxal problem started here and the forest has no longer remained safe for the hunters, visitors and the forest employees. Blasts for mining in and around the forest area is also responsible for the depletion of wild life in the forest.

Sanjay Gandhi Biological Park at Patna is popularly known as the Zoo of Patna is spread in an area of 153 acres as protected forest with 300 odd species of plants, 43 species of animals in protection and 53 in the wild. The main objective of the zoo is to promote breeding of rare species, research, education and awareness. There was a peculiar example of a mother leopard who gave birth to two cubs but eaten them.

Valmikinagar:

Valmikinagar Project Tiger probably was known for Champa Van and so the name came on existence 'Champaran" that might have been known earlier as 'Champa Aranya'. At present the Champa trees are very less in the area. It is the Sal forest predominantly and the specific flora of much used for commerce is 'Bent'.
The forest is situated in the North western point of Bihar and meets the international boundary of Nepal where it continues in Royal Chitwan Nation Park of Nepal whereas within the national boundary the forest bordrs the stste of Uttar Pradesh. Almost the whole forest represents the Tarai habitat composed of alluvial beds, swampy areas, wetlands, grassland along with some hills and valleys. The soil is more or less sandy and very fertile. Kotrahia and Rohua nala are the important water channels for carrying the water of river Gandaki (Narayani). Many areas of the forest are almost inaccessible due to marshy land and the inhibitation within the forest is very less in comparison of other forest areas of Bihar and Jharkhand.

Flora: Predominantly the Valmjkinagar forest area is Sal domonent and wa spopularly known for Bent. Khair is another important plant species of the forest which is heavily exploited for commercial purposes by Kattha mafias. The forest department has made the plantation of Teak and Bamboo to increase the forest area.

Fauna: However the forest is known for the tigers but seems to be the ample food for large carnivores like tigers and leopards i.e. Spoted Deer, other deers and antelopes, Blue bulls, Boars and Bears etc. Blue bulls, Boars and Bears are the key species of prey for the tigers and leopards. There seems to be unique assemblage of birds and insects specially what is not common in other forest covers of Bihar due to a Tarai habitat and little different climate. Construction of the railway bridge and forest loss changed the habitat in Madanpur area and the area become swampy and grassland developed. For this reason a few of the Rhinoceros have migrated from Nepal and staying for a couple of years. (The similar migration of 6 Rhinoceros has taken place and bred here in the tarai forest of Pilibhit (U.P.), a reserve forest spread in about 700 sq. km. from where this animal had vanished some 100 years ago. But the care should be taken to save these Rhinos from the poachers. Source Newspaper).
Tribals: The two races of tribals are living inside the forest and are moderate in number. They are Tharu and Dhangad. Dhangad claim themselves to be the Uraon tribes but this might not be the established fact. They have been cooperative to the forest department in their impementation of programmes and day to day activities. They have sacred gooves in their villages. Their traditional religious value to Sal trees protect the forest but due to poverty and no other source of their livelihood their dependency is solely on the forest resources. A few years back they had been refused to collect NTFPs and so their socio economic condition had become measurable. They had registered their protest to the forest officials but not were under resentment.

Saraiya Man – ECO - PEOPLE

In the West Champaran district of Bihar lies Sariyaman, a horse shoe shaped lake with a spread of 9 sq. kms. formed by a shift in the course of the river Narayani. Manjharia is on the bank of the lake, with 250 refugee families from Bangladesh,

primarily of the Das and Namasudra communities who were resettled in what was scrubland with scattered paddy fields. They remain totally dependent on locally produced biomass for all of their requirements; the one school shed in the village being the only brick, cement and asbestos structure.

The village is surrounded on three sides by the lake, and on the fourth by the forest. This permits them to raise three crops of paddy, that is supplemented by fish from the lake for their food. The naturally growing bamboo is excellent construction material, and the elephant grass serves to thatch the roofs. They stall feed the cattle on grass collected from the lake shore and use the dung and straw as fuel. So they have no need of fuel wood. They neither poach on the wild animals, nor encroach on the forests for cultivation.

As a result, large flocks of waterfowl take refuge in the lake adjoining Manjharia. Their only problem is the damage that wild pigs and cheetal inflict on their crops. They are also concerned with the overfishing and poaching of wildlife by other villagers on the bank of Sariyaman.

Salim Ali Zubba Sahni Baraila Bird Sanctuary in the district of Hazipur notified in 1997 in an area of 490 acres in the lake is crying for attention. In past time over 100 bird species were commonly seen in the area but now except some common bird species very few in number are present. Large scale fishing and extreme human interference affects the ecology of the lake. There is a heavy agriculture around the lake specially tobacco crops and the fertilizers, pesticides and insecticides used are running off inside the lake. Trapping of birds is unabated here.

13. PROBLEMS:

The state of Bihar is densely populated by agrarian communities exerting ever-growing demands for agricultural lands. Their needs of fuel wood has been mainly responsible for depletion of plant cover forest and turning of vast tract of land into waste land. Reclamation of wastelands and wetlands for human uses has left animal life vulnerable or declining with no end in the sight. Gradually many ‘chours’ and wetlands, a vital water bird staying area, might have been converted to agriculture due to silting and on name of development. It is generally observed that where human compete with wild life the wildlife often loses. A worrying ecological conditions are more obvious near some of the famous wetlands of Bihar, where on going conflicts between cultivators, fisherman communities and Govt. agencies have resulted in decline in natural productivity of wetlands and destruction of wild habitat.

With changing socio-cultural scenario, which earlier provided wild species of flora and fauna, a new profession has emerged with amazing rapidity near the wetlands and villages having substantial water body during winter. For people residing near by these wetlands, today poaching of birds specially has become an alternative source of income and selling of firewood from forest.

NATURAL CALAMITIES:

Flood:

"North Bihar floats on water but there is no water when needed". This is the curse of Bihar. Heavy rain in the catchment area of Nepal causes heavy flood in Bihar. This may be attributed to the deforestation in the forests of Nepal. The districts of N. Bihar like Khagaria, Gopalganj, Saran, Darbhanga, Madhubani, Sitamarhi, Sheohar and Samastipur are a few districts affected badly due to the flood in Kosi, Baghmati, Gandak, Burhi Gandak and Adhwara group of rivers every year. The other many districts in the central Bihar are affected by Sone and Ganga and its tributaries. Flood causes a great threat of erosion due to which villages are swept away along with the agriculture land. Nearly 15 million people in 8000 villages are affected due to flood in the state every year. Flood not only affects causing erosion but carries silt and sand and chokes the canals affecting irrigation system. It delays the paddy transplantation in N. Bihar. The railway lines and road bridges are washed off due to heavy flood with intense current in the state disturbs communication, conveyance and other development works in the state.

Bihar has its own stakes in the national share of agony inflicted by natural disasters. While major earthquake visited the region in 1934 and 1988, the floods visited the region almost every year. This causes heavy damage to the human and bovine lives. The economy of the region gets badly shattered. Out of total population affected by flood in India 56% of them lives in Bihar. Out of 38 districts 30 of them are flood affected. 76% area of North Bihar and 73% of the entire state is flood prone.

Floods, however, have become synonymous with the state where the tributaries of Ganga both on north and south plains form a fine network of lotic channels. N**orth Bihar** is the most affected region where Kosi , the erstwhile "sorrow of Bihar" (and its tributaries like Kamla – Balan and Bagmati) and Mahanada inflict a severe loss to the life and property in the eastern part. The western part is ravaged by the Ghaghra, the Gandak and also by the Burhi Gandak rivers. Of all the rivers, the Kosi has been notorious, for changing its course. This river has shifted 112 kms westward from its past position in Purnea in 1731 to its present position at Nirmali in 1958 when it was embanked after independence under a highly ambitious plan of controlling floods and give a halt to the downward march of the shattered economy of the region.

A new phenomenon, which has assumed menacing proportions in recent years is prolonged water logging outside the embankments and also in large numbers of Chaurs spread over the entire north and south Bihar. 8 lakh hac. are chronically waterlogged. Altogether 4,20,400 ha. of land is facing the problems of floods and water logging in the Kosi Command Area.

Records available for Gandak Command Area speak of a total of 7.5 lakhs ha. area are facing this problem. Such a situation prevails in other river basins as well. The area of Kusheshwarsthan near Darbhanga remain waterlogged throughout the year

due to the meeting point of Kosi, kamla Balan and Kareh rivers and non-completion of the western Kosi embankment.

After the construction of Farakka Barrage bed of the Ganges is rising due to continuous deposition of silt, which is one of the main cause for devastating floods in the Gangetic basin (primarily in eastern Bihar) in recent years.

Tributaries draining in the Ganges from southern plains are the Son, the Punpun, the Kiuel, the Badua, the Chandan and the Gumani. Southern part of Gangetic plain is also facing the flood hazard primarily due to the backflow of river water. Diverse forms of water bodies acting as "detention shelters" to the flood waters like *Chaurs, mauns, ponds and Diaras.* Approximately 1,03,400 ha. area are remains inundated on the southern side of the Ganges for 3 to 5 months with more than 3 meters of back waters in the Mokama Tal area from Fatuha to Barahiya.

The Kosi- Changing course- Periodic changes in course marks a feature of rivers in north Bihar the Koshi, for example, has moved westward cumulatively by 210 kms in the past 250 years, taking more than 12 distinct routs during the period. The river, which used to flow near Purnea in the 18 th century, now flows east of Saharsa. (Center for Science and Environment, N. Delhi)

Submerged District of Bihar- Khagaria district of Bihar has unique distinction to be known as the submerged district of Bihar. Burhi Gandak, Bagmati, Kareh, Kamla and Kali Kosi merge with Ganges in this district. About 7000 families had been displaced due to large scale erosion of river bank in flood-affected area in past 16 years.(Hidustan, Patna, 15 Sep.,2003)

Resource management

The recurring flood problem cannot be tackled in the state unless there is a mechanism to control the discharge of water originating in Nepal and Tibet as the structures and embankments constructed to protect people and their property from scourge of flood by now become obsolete and were insufficient

For the first time in post independence Bihar, particularly after the construction of Koshi embankments in 1954-59, a concerted political demand for the Barahkshetra high dam has come up which is believed to be the only solution to the recurrent floods in North Bihar.

These inundated areas, however, could be utilized for raising crops like deep-water rice, Makhana (Euryale ferox), Singhra (Trapa natans), Khobi (Scripus articulatus) as the botanical wealth and several other aquatic plant species as well as fish, mollusks, crabs, prawn etc as the animal wealth . Farmers should be prevailed upon to intensify integrated aquacultures by introducing advanced methods of Pisciculture and other available avenues in aquatic horticulture.

A full fledge cottage industry runs on aquatic products including the species of Nelumbo, Nymphaea, Ottelia and some Cyperus and Scirpus species. Various types of ritual and domestic items are manufactured from Aeschynomene sp. Inflorescence of Typha are utilized as stuffing material in pillows. Its leaves, alongwith those of Cyperus sp. Are used in mats. Stem of Phragmites karka is utilized for making brooms and flutes. Cottage industries thriving on mollusk shells also have a luxuriant business. There is need to augment all these industries. This would lead to optimal utilization of all the available natural resources in the flood plains of Bihar.

Natural calamities and animals:

Reports are increasing of the incidences of **Nilgai** (Blue Bull) and **Wild Boars** etc. being drowned or wiped away by flood water and killed by the people specially in the diara land (Gangetic alluvial plain). Some religious Hindu people oppose the killing of Nilgai on such occasion. Many Nilgai and Wild boars have been seen floating in flood water in Sept'03 last year too in the area of Kahalgaon in river Ganga. Due to flood the habitat of wild animals is destroyed and they stray towards the villages and township and killed. Such incidences are reported from the districts of Munger and Bhagalpur recently.

Survey:

Whatever data of biodiversity segments coming, barring a few are too old to be believed to be existant at present or have been collected by unskilled agencies and methods. Almost all fields of biodiversity need a fresh and authentic survey.

Not many study and survey activities are being promoted by the Central and State agencies at present. Many information are scattered, not highlighted and stored in the pockets here and there.

Lack of resource persons:

There are very few skilled and interested individuals and organizations active for making survey of the biodiversity in different fields.

Neglegences of the state Govt.:

What we can say more when even the environment and forest minister says that the forest officers have caused more damage to the forests of the state.

There is a beautiful 'Debkhal Jheel' in the district of Samastipur in N. Bihar in Ujiarpur block west of the railway station and east of NH-28. The lake spread in 575 beegha is perinneal. There is a Fishermen Cooperative Society giving a revenue of Rs. 36,000 to the govt. About 400 years back it was a dense forest. 18 crore rupees had been sanctioned For developing the lake and tourism and 12 lakh for a bridge construction here but the fund had returned unutilized. Return of fund allocated for the developmental programmes is not an uncommon thing in Bihar. The reason may be the setting of commission (share) to the middle man did not materialize or lack of working culture or the diversion of fund to other works. Similar is the case with 'Kawar Lake Bird Sanctuary' where a fund of

about 29 lakh given by the central govt. is lying with the govt. of Bihar but reaching to the site.

The maintenance and development of **ponds** are proven devices and solutions for many ecological issues and problems. The negligence on this part severely affected the eco system of ours. One such example is there in Nathnagar in Bhagalpur district where 28 ponds under the control of fisheries dept. have become shallow and unsuitable for fish culture. The ponds earlier producing 50 quintals of fishes are now producing only 20 quintals of fishes. Encroachment, garbage dumping, deposition of pesticides and insecticides from surrounding agricultural fields and enormous growth of Eichhornia are destroying the ponds and thus affecting the economy of the fishermen too. The plants like Lotus have lost and the fishes are getting diseased.

There are 1450 saw mills as legal against **3900 saw mills running illegally** in Bihar.

The **census** by Forest dept. is believed to be an authentic record. But one careless example of census has been seen at Bhimbandh Sanctuary, Mungar where an NGO was associated in this programme organized by the forest dept. the members had never seen these animals in wild and when asked the different features of even bigger cats, they were not in a position to reply. But the result has been published as the presence of 11 tigers, 39 leopards, 113 hyena and 89 wolf in the sanctuary. In correlation with the presence of these numbers of carnivores, the herbivores supposed to be 5 times more than the total population of the carnivores in the forest for their sustenance The improper census of flora and fauna to fulfill the formalities is a common thing with the forest dept. barring few exceptions where the forest officers and other employees are really expert with excellence.

The two divisions, which are to be closed are Wildlife Division, Gaya and Departmental works division, Munger for reducing flab in the department.

SUPREME COURT ISSUES NOTICES TO GOVERNMENT REGARDING VALMIKI TIGER RESERVE (VTR): Reason --- staff of VTA had not been paid salaries for over a year.

Pollution:

Pollution in attitude:
A severe pollution in the attitude of the govt. is developing and not only this, the people also being the victims of it specially the youth of our society in this materialistic phase of time.

Plastic – High court has banned on the use of plastic of less than 20 microns and govt. also has issued instructions but it is not being implemented at all anywhere in the state while plastic is being one of the major pollutant for human health, degrading edible

items, destroying fertile land and hazardous for animals that swallow it along with the food in the garbage.

Sound:
On the directives of Supreme court, Bihar govt. had taken a initiative to reduce sound pollution but this seems to be non implanted at all practically.
The state govt. had planned to check-
The types of horns used by vehicles.
Even the loudspeakers on temples and mosques.
Use of generators etc.
It has divided the different zones where maximum sound intensity has been fixed by the central govt.

		At Day	**At Night**
1.	Residential Zone -	55 decibels	45 decibels
2.	Industrial Zone -	75 decibels	70 decibels
3.	Commercial Zone -	65 decibels	55 decibels
4.	Silent Zones - (Teaching and Hospital zones)	50 decibels	40 decibels

A survey reveals that in the capital of Bihar, Patna the sound pollution is 30% more than the set standards. In August 2002 the Supreme Court had asked a blue print from the state govt. on the status of sound pollution.

Slaughter Houses within the densely populated urban area are badly affecting the health of the people. In Bhagalpur such a slaughter is existing since last 40 years. The stinging environment, slum development spreads the disease in the area. No insecticides are being sprayed here for hygiene. Worst of it is that since about last 10 years, the vultures have vanished from here. It were seen earlier in hundreds.

Poaching:

Poaching of tigers is prevailing in the state for smuggling not only the skin but also for its bones that is used in South Asian countries in making wines. Special care should be taken in the area of Valmikinagar forest where its boundary meets Nepal and the forest continues in Royal Chitwan National Park of Nepal.

The sale of local and migratory water birds on NH 33 at Bihpur in Naugachhia in the district of Bhagalpur, heavy poaching and trade of birds at Kusheswarsthan Bird Sanctuasry and all across the state is posing a serious threat to the avian population.
The traditional hunters have yet not left their old habit and hunting of Green Pigeon (Harial) in Banka and deers and boars in Bhimbandh has swept away a large number of species of wild animals and birds from the area.

There was a report of hunting 2 wild boars in Kajra forest in Munger district and it is blamed that the I.G., BMP had hunted these animals on 3rd November 2001 in the evening.

Illegal **tree felling** in connivance with forest employees are very often reported from the protected areas of Kajra, Abhaypur, Piri Bazar in Munger . Some specific trees are found in this forest preferred for making "Latto" and "Belan".

These are the few incidences highlighted but the such occurrences are many fold more and not being reported.

Zoos:

Increasing population of few of the species in **zoo** is also a matter of concern for the authorities requiring more fund and hands for management specially the large animals like Hippo in the Sanjay Gandhi Jaivik Udyan at Patna..

Another problem with the zoo authorities is to provide care and space to the animals seized from the circuses. Some animals like Lions and Tigers were brought in Patna Biological park in July 2003 but they were not provided care and maintenance and space. The animals are kept in the wheel cart cage and during rain covered with plastic sheets. Tigers, Lions, Leopards, Bear and Monkeys are banned to be used in the circus but there is no proper plan to keep them after the seizure.

Legal problems affecting destruction:

The green banks in some cities such as **'Sunderban'** in Bhagalpur where the forest dept. has its all establishment is conserved within the city as a 'gene pool' or 'carbon sink'. But the planned connivance of the revenue dept,. and the builders and promoters has posed a great threat on to it as being sold for constructing multistoried complexes. The area is known to have are plant species of plants of different values since decades. Such other habitats the Sandy's compound and Jai Prakash Udyan are also in a very bad shape. The Botanical Garden of P.G.Dept. of Botany in the University area is another treasure to preserve rare flora . The university area as such is an excellent natural habitat of gardens, orchards and ponds. Such areas make the life comfortable for the urban people and keep the environment healthy.

The **Sanjay Gandhi Jaivik Udyan** is another beautiful example in Patna for the health of the city and its people.

It was proposed to **acquire the land of Sanjay Gandhi Jaivik Udyan** of Patna to increase the length of runway of Patna Airport, the Udyan has struggled to save its 3,675 trees that had been marked to be destroyed for this reason.

Transpoert:

Roads are one of the major factors responsible for causing hindrance in survey, study, vigilance and care of biodiversity and affect the scope of developing tourism and eco-**tourism** in the state.

Weeds:

The spread of ***Parthenium histophorus*** **(Gajar Ghass)** throughout the state is a major problem of causing loss in biodiversity. It competes the agricultural and indigenous flora.

The problem probably started since the severe draught in the state in 1970s. The plant is even not liked by the cattle and its roots secrete chemicals that is harmful for the fertility of the soil. A single plant produces 45,000 seeds four times a year and it should be destroyed on priority before flowering.

Fish mafia:
During June to August fishing is banned in the rivers because this is the spawning period of most of the fishes specially the major carps. The fish spawn (eggs) and fry (locally known as 'Jeera') is being extracted by the fishermen and sold in the market. This collection contains fish seed of mixed species and there is a high chance of mortality during its transportation. Due to this practice the fish population is decreasing in the rivers, affecting the economy of the fishermen. This practice is well organized and has taken a shape of the fishing mafias. For phis purpose the offenders also hire the fishermen from West Bengal. (June 2002). However, less than 24 cm net is prohibited for fishing in the area.

Industries:
The plywood industries are promoting another threat by smuggling of wood from the state.

Institutions:
The Post Graduate Dept. of environmental Sciences at A.N.College, Patna was the only of its kind the state. But at present the set up is the victim of improper management, less facilities etc. the Dept. has 48 seats and it was proposed to increase the fee up to Rs. 6000 per student in a year.

Criminal Activities:

The **criminal** activities in Bihar as well as Jharkhand are a great threat to the voluntary workers, researchers as well as to the govt. officials.
The murder of **Sarita and Maheshkant** in Shabdo village of Gaya district had been murdered this year this year and the murder of the DFO of Sasaram **Mr. Sanjay Singh** by the miscreants at Shahabad in the district of Rohtas.on 15th Feb. 2002 are few of the examples. In this incidence 2 extremists of Jharkhand and 3 female extremists from U.P. and Bihar had been allegedly involved.

THREAT TO GANGA

1. Deforestation in the catchments area **causing** landslides and blockades of its tributaries.
2. Diversion of Ganga water for irrigation and other purposes decreased the volume of the water and in many places during the lean period, the seems like a dirty nullah.
3. Construction of big dams in the hill catchments.
4. Promotion of luxury tourism
5. Due to pollution Ganga (industries like – leather, sugar, opium near Ghazipur, distilleries, oil refinery near Barauni discharge their effluents; cremation of

bodies on the banks as well as flow of untreated sewage water are also a major source pollution) has become a carrier of deadly diseases like cholera, viral hepatitis, amoebic dysentery, polio, typhoid and para-typhoid.

6. The establishment of a nuclear power plant at Narora may cause nuclearization of Ganga basin.
7. Siltation of the riverbed of the Ganga due construction of Farakka Barrage has increased the intensity of devastation caused by the floods in Bihar plains.

Industries:

The industries like Bata Soe Factory, McDowell at Mokama, NTPC at Kahalgaon and Jagdishpur Distillary at Bhagalpur are not not maintaining their pollution control measures and discharging the chemicals in the Ganaga river and in the cultivating lands in the surrounding. This is affecting the aquatic life in the river, loss of fertility of the land and hazards to the human health and cattle.

The factors causing decline in aquatic biodiversity of eastern Bihar are enumerated below:

1. the loss of biodiversity in terms of phytoplankton, zooplankton, macro invertebrates and other life support systems in ponds, lakes, rivers, swamps and chaurs are detrimental in making fishes and birds taxa in categories of endangered, vulnerable and rare. Almost all larger animals are included under these categories recently.
2. Heavy industrialization (Bata Shoe Factory, McDowell Distillary, Mokama, Thermal Power Plant, Barauni Oil Refinery, Barauni, Natonal Thermal Power Corporation, Kahalgaon, Brick Kila Operations, Ghogha, Stone Quarry operations, Mirzachowki and Maharajpur, China Clay industries, Rajmahal, National Thermal Power Corporation, Farakka, runoff from the Eastern Coal fields Ltd., Lalmatia (Godda) apart with the human settlements all along the downstream areas of river Ganges further deteriorated the water quality and add solid, liquid and chemical wastes into its water which finally affects the biodiversity existing therein.
3. This region is famous for agriculture in the country. The wheat, maize, oil seeds, pulses, sugarcane etc. are the main crops of the area. Prolific agricultural operations in Indo Gangetic basin coupled with use of fertilizers and pestcides are also important factors in the decline of aquatic biodiversity.
4. Eutrophication and siltation of riverine systems (Ganges, Kosi and Gandak), enhancing incidences of flood at alarming rate annually.
5. Construction of barrages, dams and reservoirs on the rivers of eastern Bihar shattering the migratory routes of the fishes. This type of cause is the sole factor for threatening the population of Indian species, Hilsa ilisha in river Ganges.
6. The recent introduction of alien species of fishes such as Thai Mangur (Clarius gariepinus); Tilapia mossambica; Common Carp (Cyprinus carpio), Grass Carp (Ctenopharyngodon idella), Silver Carp (Hypophthalmichthys molitrix) in piscicultural ponds posed great threat to local endemic fish diversity. The introduction of Thai Mangur has resulted into total disappearance of the local stock of Clarias batrachus Linnaeus, the endemic mangur of the region. Several of

the endemic air-breathing fishes such as Heteropneustes fossilis (Singhi), Mastocembelus armatus (Bami), M. pancalus and major carps such as Labeo labeo (Rohu), Cirrhinus mrigala and Labeo bata are under acute biotic stress. The alien species are more competitive which eliminate the species through competition and over exploitation of resources. (Roy, 2004).

Agricuture:

Practical problems of the farmers:

1. Scarcity of improved seeds.
2. Lack of technical knowledge regarding seeds, methods of cultivation, implements, insects & pesticides, plant disease etc.
3. Lac of storage facilities and storage techniques.
4. Lack of cold storages.
5. Lack of proper marketing facilities for flowers and medicinal plants specially.
6. Lack of banking facilities, agricultural loans
7. Lack of irrigation facilities
8. Only in Bhabhua area canals from Sone river are comparatively in a better condition otherwise the coverage of canals for irrigation is very poor. In Kosi belt the canals are choked due to siltation problem but in the area of Champaran from Gandak river the coverage through canals for irrigation is little better.
9. Problem of theft
10. Shortage of electricity power supply
11. Lack of communication & transportation etc.
12. Higher input cost
13. Low output
14. Unavailability of fertilizers at the time of sowing specially phosphate, potash and nitrogen.
15. Problem of middle man
16. Jute and silk industries have been failed specially in Katihar area for political reasons led to affect the jute farmers.
17. Management of Tal area where water is logged during rainy season is neglected i.e. Mokama Tal.
18. In the area of Kharagpur and Jamalpur in Munger district fire for Mahua collection and other factors involved have destroyed the grasslands and thus affected the Sheep farming.
19. The useful trees and their products have reduced or become rare e.g. Cotton, Kusum (that is having good heart care property and used in Saffola refine oil)
20. Sugarcane farmers have been discouraged as not many sugar mills have been established for its consumption. Most of the sugarcane crop is consumed for making ‘Gud’ at small scale.
21. In the sandy alluvial beds of diara land people have started cultivating Sunflower crop but there is lack of processing and filtration facilities in the state.
22. Crop rotation technique is not properly used by the farmers due to lack of knowledge.
23. Flood delays paddy transplantation in N. Bihar and forces the replantation that costs them more and at that time there becomes the shortage of seedling availability.

24. The **sugar mills** at Hasanpur in N. Bihar and other parts of Bihar are sick and affects the Sugarcane growing farmers.
25. Only Centarl Govt. schemes seems to be functioning in the state like Maromod otherwise the whole system is almost non functional practically.

The marketing board and FCI has gone in the hands of the middlemen depriving the farmers from getting appropriate return of their crops.

Problems of Litchi Production, Marketing & Export :

Middleman. seasonality in production, bulkiness and high perishability, lack of growers' association, system of pre-harvest contract, inadequate storage facilities absence of grading and standardisation, in course of the study. Moreover, the lack of motivation has also been one of the factors which affects most the production of quality fruits for export purposes.

Dairy involves high cost to start with. So, it becomes a difficult task for the milk producers.

Pest Management:

Non-availability of pesticides at proper time, unavailability of bio-control agents are the problems faced by the farmers. They are also not well educated about the judicious use of the pesticides. Many farmers are rightly of the opinion that the pesticides use had direct effect on labourers, human beings and food crops as these were found in close contact with them. However, they did not perceive any effect of pesticides use as pollution of water, air, and animal.

Problems of Diara land:

Flood, erosion, irrigation and crime is the main problems in the Diara land. The is badly affected by intense flood severe draught as when water comes in huge quantity it is not retained for long. Ultimately the farmers got to be dependant on the irrigation through pumping. Due to the oscillation of river course and heavy erosion in the area the cultivable land emerges and drowned alternatively raises the dispute of ownership. The third category of Diara land specially is the hide of the criminals and the local land holders are at their mercy. The area being inaccessible creates the problem for the administration. These criminals are not belonging to the organized groups but are based on casts.

Threat to the floral Biodiversity

1. Due to presence of a number of rivers in the state, Bihar is prone to floods. Every year a large area is inundated resulting in the loss of plant diversity.
2. Due to preference of hybrid varieties over indigenous varieties, survival of a number of indigenous varieties like katarani rice is threatened.

Conservation of Aquatic Biota-

There has been considerable decline in the diverse group of fish populations.

Causes – 1. Hindrance in the natural water flow due to embankments on almost all major rivers.

2.Stress on carp fishes,

3.Stress on makhana cultivation

Fishes suffering depletion in wetlands of North Bihar

Zoological Name	Common name	Nature
Hilsa ilisa	Hilsa	Riverine
Mystus bleekeri	Tengra	Pond
Glossogobius giurris	Bulla	Pond
Nundus nundus	Dhalwa	Pond
Oxygaster bacaila	Chelwa	Pond/riverine
Channa punctatus	Garai	Pond
Channa marulius/Channa striatus	Saura	Pond
Mastocembalus armatus	Gainchi	Pond
Colisa fasciatus	Khesra	Pond
Channa gachua	Chenga	Pond
Puntius muzaffarpurensis/Puntius sarana	Pothia	Pond

Some other locally known fishes which are gradually getting out of sight include Suhi, Bhunna, Bhunni, Bhaura, Kursa, Belauni, Basarahi, Gulata, Derhwa, Kauwa, bami etc.

Makhana cultivation have been instrumental in gradual depletion of lotus population

Same in the case with the Gangetic Dolphin which has become rare even in the Ganga river after which it is named. Obstruction in its free movement by the Farakka barrage coupled with excessive exploitation of fishes (as a component of their food chain) have been the factors responsible for this decline.

The region also harbours a sprawling cottage industries for making buttons from Gastropod shells. Disturbance with natural habitat has brought a considerable decline in the shell availability and the entrepreneurs have to take the recourse of importing marine shells.

Inland water bodies are vital the prosperity of north Bihar. There is need to explore all possible ways for raising the aquatic productivity in this area.

(V. Jha, S. B. Shashi & T. Singh)

Madhubani district is the epicenter of the globally acclaimed Mithila culture which is often held synonymous with Pokhari(ponds) Maachh(fishes) and Makhan (gorgon nut). These three components profoundly influence the regional life style. The land abounds in the big and small water pockets created by geomorphological and anthropogenic factors. These are known as chaurs (land depression), mauns (ox-bow lake), dabar(swamps), Khatta(ditches) etc. For millennia, the rivers like Kosi, kamla- Balan and their tributaries are known to change their courses. The dead and abandoned courses form the stagnant

channels which are also utilized for cultivation of fish, deep water rice, Makhana and other aquatic fruits.

Makhana is extensively grown in majority of the ponds in this district. Botanically known as Euryale Ferox Salisb. , it belongs to the waterlily family Nymphaeaceae.

Andharatharhi pools in this district have been famous for their multisplendoured lotus varieties vernacularly known as satadalkamal, sahastradalkamal etc. there is need to take up steps for the conservation of endangered lotus varieties in this district. More stress on the Makhana and fish cultivation also has played a negative role in the gradual shrinkage of lotus coverage, while pink variety is still available, white lotus has become sporadic. Reports available speak of its confinement to Laukahi area on the Indo- Nepal border from where it is supplied to the nearby markets on festive occasions.

Floods are responsible for creating fresh aquatic pools. New water logged areas on the both the outer sides of embankments on rivers in the district have added to the owes of the farmers. 2002 floods have once again proved troublesome in creating several new water logged sites of perennial nature.

Waterbodies in the district harbour a vast magnitude of water hyacinths dominated by kechuli (Eichornia crassipes). This floating aquaphyte propagates at a very fast rate and provides shelter to the mosquitoes as casual organisms of several vector borne diseases in human beings. It is particularly instrumental for mass mortality of cattle with no option other than feeding rather exclusively upon its fronds in areas which remain engulfed for months together. Mollusc eggs attached with the hyacinth fronds are the vectors of cattle diseases like schistosomiasis, liverfluke etc.

Bhimbandh Wildlife Sanctuary is now in scratch. Sometime back the leopard and deer had been killed here. The occasional hunters from use to enter the forest for hunting the wild animals including birds in the forest with their proper arrangements till a few years back. Now the naxal problem started here and the forest has no longer remained safe for the hunters, visitors and the forest employees. Blasts for mining in and around the forest area is also responsible for the depletion of wild life in the forest.

Valmikinagar: Many areas of the forest are almost inaccessible due to marshy land and the inhibitation within the forest is very less in comparison of other forest areas of Bihar and Jharkhand. Khair is another important plant species of the forest which is heavily exploited for commercial purposes by Kattha mafias. Construction of the railway bridge and forest loss changed the habitat in Madanpur area and the area become swampy and grassland developed.

Many years back a railway bridge had been constructed to connect Bagha of Bihar and Chhitauni in U.P. the railways had denied to release water from that area resulting in the change of habitat from Sal dominant forest and some agricultural land to the inundated swampy area. Few species of trees like Jamun and Munj survived under this condition. A few thousand ha of area was degraded due to this reason from the forest.

U.P. Govt. has made embankment bordering this forest and Bihar govt. made this near Nepal border to save villages and forest in the region of Nepal. This has led to increase in flood and damage to the forest every year.

The overall inhabitation inside the forest is less but some areas are being encroached by the people and not only this, due to the shifting of Ganadaki river course some area has also been encroached by Nepal on the right side of the river. There is heavy encroachment by the people on forest land in the Madanpur area and the reason is attributed to the politicians who back them.
Apart of some local criminal activities inside the forest area, the Maoists from Nepal have also started taking privilege to spread their activities here.
As many areas of the forest are not easily accessible and having poor means of communication, the it is not easy to exploit the forest for the miscreants and on the other hand it is also difficult for the govt. officials to track them.
There was the mining activity in the Thari region on Pandai river for boulders but these mining activities have been checked by the forest department.

Salim Ali Zubba Sahni Baraila Bird Sanctuary in the district of Hazipur notified in 1997 in an area of 490 acres in the lake is crying for attention. In past time over 100 bird species were commonly seen in the area but now except some common bird species very few in number are present. Large scale fishing and extreme human interference affects the ecology of the lake. There is a heavy agriculture around the lake specially tobacco crops and the fertilizers, pesticides and insecticides used are running off inside the lake. Trapping of birds is unabated here.

14. ISSUES:

Straying incidences of animals:

Jackal: Even the Jackals have started attacking on human life and the reported incidences are in the months of October and November. In Nathnagar (Dist. Bhagalpur) in Nov'02 during midnight 11 people were injured out of which 9 had been admitted to the hospital. Again in the same area the incidences occurred in Nov'03. the similar incidences have happened in Araria district also in Oct'02.
Monkeys (Langur) have also time to time creating terror of biting people in many areas.
Elephants: Straying of elephants from the forests and reaching in not only the villages but the cities are giving alarming signal about the ratio of degrading forest in the state and in the surrounding states. Specially since last five years or so the incidences are coming frequently in notice.
Since last 5-6 years the gerd of about 14 elephants every year is appearing in the district of Banka and near the township itself which is a densely populous area. It is roaming in Chandan, Katoria and other places in the district. An elephant was killed by electric wires too and seeing the crowd around them they after loosing their nerves hahe damaged many human life and property. Recently in Sept'03 and at present in April'04 also these

elephants are here in the area but no proper methodology is being used to send them back.

Tigers- It is surprising to note that in the densely populated areas of Jagdishpur, Rajaun and Amarpur where there is no suitable habitat of tigers, during last about a decade three tigers have been killed. One each in the year 1990 (Jagdishpur just about 15 km. from Bhagalpur city), 2001 (Subhka, Rajaun about 27 km. from Bhagalpur city) and 2002 (Amarpur about 25 km. from Bhagalpur city). These areas are lying south to Bhagalpur and all these incidences took place in the month of January.

Leopards- A leopard had been killed in early 1990s in Kahalgaon (about 32 km. east of Bhagalpur)

Bear- The bear had attacked many people in Banka town when it was being stressed by the crowd following the animal. The injured people were admitted in Bhagalpur Medical College & Hospita.

Hyena are often seen on the road near Banka.

Wild Boars - After flood the wild boars from Kosi diara migrate to the upper land and damage the maize crops, eat up sowed seeds and harm man and cattle causing injuries as being encountered. This has increased after the flood of 1998 in the area. (July'02)

Blue bull (Nilgai) – The Nilgai are also in some area of diara land held responsible to damage the crops of the farmers. But these animals are sought religious by Hindus.

I had discussed the matter with the CF about other options under such circumstances of strayed animals who are being killed ultimately. There could be few possible reasons behind it. The habitat and corridor is vanishing and high degree disturbances are prevailing inside the forest. The Tribal – Hunt is one of the major reasons for the wild animals become stray from the forest.

Dr. D.S.Srivastava of Nature Conservation Society at Daltonganj, told me that the herd of elephant disturbs in the area of Banka belongs to the area of Palamau. They must have developed the taste for grains and household stocks. May be, but then why they don't stay in the same area for long? I think it is the matter of their habitat destruction. I wonder, when everybody knows the annual migration time of these elephants to a distant village area, why don't they try to follow them at appropriate time and try to change their direction? Will it cost more than the budget by which Jharkhand Govt. thinks to give compensation of rupees one lakh on the killing of a human by an elephant?

I asked the Conservator of the Forest that for so many years the wild animals regularly invade into the same area of Banka District, the tigers have been killed and elephants other than the bear and all. Many people have lost their lives. Every time they plan big things and plan again after another incidence. Why don't they buy and maintain tranquilising gun and a cage vehicle in each of its division? Till date it is available at Patna only. Impossible to fight the situation at site. Perhaps he didn't know what he is assuring to me that within a week or two it will be available at least in Banka division. Let us all wait for a major incidence.

The tiger killing has left many questions behind. Many compulsions are there for everyone. What resources and armed force are available with the Forest Dept.? They are

expected to deal with such situations but the department says they don't have enough fund even to pay the salary for their staff. They got to depend upon the police department for dealing any offence. The police make it a courtesy and play their own game to save their skin. However, the lack of positive attitude also cannot be denied. What the police and the administration can do under such circumstances where the mass of people is violent. It is hard to convince the mob that law does not permit them to shoot an animal protected under the Wildlife Protection Act. Even the DFO or the CF cannot convince them that the permission to shoot such animal can be obtained from the CCF (wildlife) only. Would the people wait till the permission comes when several lives are at risk? Yes, in this advanced era of faster communication it is possible within no time. But why the officers don't use it? Should the police shoot an animal violating the law? Should they not shoot the animal and invite the possibility of a massacre among the violent public or allow to sacrifice many human lives? When the govt. officials feel handicapped what role an NGO can play? Should it jump into a well without a rope? Should it go alone to the court by risking life from the criminal elements, risking not finding any witness, harassment on all fronts including that of by the police and no financial and other support? And finally, this is a great question mark on our all conservation efforts being made to protect a tiger or any such animals.

Sonepur Mela in Hazipur is the biggest 'Animal Fare' in Asia held approximately in every year. The animals in thousand are brought here for sale like horse, cow, oxen, goat and many wild species too. Approximately 150 elephants are brought here for sale every year. Last year the forest dept. had made some plan to check on the sale of wild animals, specially the elephants in the fare. They has announced the last date of declaring the ownership of elephants as July 2003.

Traditional Animal sacrifices and Tribal Hunt:
Sacrificing the animals in different rituals is a tradition in the state like Goat, Buffalo, Sheep, Pigeon and cock during worship specially in Durga Puja and for some 'Tantra Siddhi'. Even human life is sacrificed by superstitious people for 'Tantra Siddhi' sometimes. This shows the lack of education among the people.

TRIBAL HUNT IN KHARAGPUR HILLS

The wildlife Protection Act, 1972 prohibits any sort of hunting or killing of wild animals. As such tribal hunt is known as "Dison Sendra" organized every year from 'Baishakh' (April) to first fortnight of 'Jeth' (May), unlike the one day Dalma hunt, also stands prohibited under the law. But it continues to be organized every year.

The Kharagpur hunt is obviously a tribal tradition. The Santhalis are the expert hunters. The Santhal Pargana have jhummed most of their own hills and killed the animals found there. Every year they gather in the forests of Kharagpur hills for hunting. It is obligatory for all able bodied man above the age of twelve to join in the hunt. If any one is found unwilling to join and ploughing hid field then his yoke and ploughs and other implements will be destroyed. The unwilling person will not be entitled to claim any damage for such losses.

As stated above the tribal hunt in Kharagpur hills lasts for more than a month. This hunt undones what has been achieved during the preceding year. As such this tribal hunt is one of the most destructive factors operating in this sanctuary. This hunt is a part of tribal tradition and culture. As with the advancement of modernity and education in the tribal society, the old order is giving birth to numerous new traditions. Therefore, the Santhals of Santhal Paraganas and Kharagpur hills should be enlightened and educated on the disappearance of wildlife and consequent imbalance in nature causing untold miseries not only to tribals but to the society as a whole. this requires extensive education of the locall population on the benefits that accrue as a result of preservation and growth of both flora and fauna. This may be done by posters, slides, slogans, pictures and film shows etc. and by organizing group discussions in villages situated in and around the sanctuary. The constant publicity against hunting and provision of compensation for any damage caused by wild animals may deter the Santhals from tribal hunt. The publicity and propaganda against tribal hunt should continue year after year till this menace disappears completely from the minds of the tribals.

Environment Assessment (EIA) in Mokama tal area:

The establishment of 3x660MW Barh Super Thermal Power Plant, of M/s National Thermal power Corporation Limited at Barh near Mokama had been a major issue for the state regarding the great threat of biodiversity in the unique Tal area. Mr. Bittu sahgal and many environmentalists including Bombay Natuarl History Society did not agree with the Environment Assessment (EIA) Interim Report by Ghosh Bose & Associates Pvt. Ltd. March 2000. The following points were noticed In section 1.2 Page 3 & 4 it is stated that the primary concerns include the absence of ecologically sensitive/ protected areas within or proximate to the areas selected:

The EIA report and the official response from the Barh Thermal Project authorities, states that "the area does not fall on the route of birds migrating from other countries nor there are any established habitat of theses birds in the area" However the area allotted for both the construction of the plant i.e. Bhar and the 2000 acres of the ash disposal area in the Tal area (pg. 5 of EIA report) are both ecologically sensitive areas and lie within an Internationally Important Bird Area (IBA) as identified by Bombay Natural History Society. This area comprises of Fatuha, Bakhtiyarpur, Barh, More, Mokemh, Barahiya, & Singhaul tals.

The site qualifies for Important Bird Area (IBA) site in Asia for the criteria listed below:

A1. Globally threatened species:

A4. Congregations of birds

.

The EIA report lists only 39 species of birds, BNHS has a preliminary checklist of 149 species, surveying the area further will most certainly add to the number of species in this list. The assessment of other wildlife in the area is also questionable and does not seem to be have carried out by experts.

The list of Reptiles Amphibians and mammals are ridden with mistakes and include several species from Schedule one and two of the wildlife protection Act. For eg. Dhaman & Rat Snake have been listed as separate species while they belong to the same species and the scientific names.

Industries:
Thermal power generation will impact biodiversity of the both state as well as adjoining areas adversely. It poses a bigger risk to biodiversity than all other anthropogenic interferences put together have done so far.

15. EFFORTS:

Efforts by the forest Department:

The state forest department had proposed to form a **special task force (STF)** in 2002 to fight against mafias employing well equipped 250 STF members to protect the only left over forests in patches in the state in Gaya, Kaimur, Betiah, Bhagalpur areas and its adjoining districts. At present the forest dept. is depending upon the Police to execute their plan for enforcing legal actions. The 25% posts are vacant in the department. The dept. has also proposed the Plant Conservation Act with a provision not to allow even the private forest property without seeking permission. **In this Act a suggestion is there to plant two trees if one tree is cut.** The dept. had mooted 29 crores for the purpose but have been sanctioned only 8 crores of rupees.

Bihar govt. had decided to fulfill 300 posts of trained forest guards which are lying vacant to fight with th criminals, mafias, smugglers and extremists with sophisticated weapons after the murder of Mr. Sanjay Singh the DFO of Sasaram. The dept. has also decided to provide additional security by the police to the forest guards.

The forest dept. has initiated the plans to develop management plans of the protected areas, eco development and promote eco-tourism in the protected areas.

But this is not a new thing to make such plans and then talking of many reasons for non-implementation. Even the preparation of NBSAP was assigned to the Forest Dept. of Bihar a couple of years ago but yet there is something to come up and ultimately the TPCG and Administrative faculties requested Mr. Arvind Mishra, Mandar Nature Club to do whatever can be done within a very short period of a couple of months. For a year or so the TPCG, National coordinator had tried his hard to handover the fund and assignment given to the forest dept. of Bihar to Mandar Nature Club, Bhagalpur but they did not agree. Ultimately they had organized a meeting at Patna on 22nd and 23rd January this year inviting some expertise from different fields. The report is yet to be finalized and sent.

The forest dept. had publicized to declare holding of wildlife articles by private owners to check smuggling of wildlife articles in Oct. 2003.

The secretary, Fisheries and Veterinary of Govt. of Bihar has given the responsibility to the Police dept. to catch stray dogs and maintain casterisation, vaccination and take other care for well keeping etc.

The state govt. had decided to establish 'Eco Clubs' in 100 middle schools in each district. They will be termed as "Rashtriya Harit Vahini". There will be a State Steering Committee, District Execution and hearing Committee headed by the D.M. and different govt. dept. will be involved involved in this process.

Efforts by Non Govt. Agencies and others :

NEAC (National Environmental Awareness Campaign) by the ministry of govt. of India seemed to be effective in generating interest and support to the NGOs in the state and the govt. is getting excellent support instead with investing smaller funds distributed for wider coverage.
BNHS has spread a network in the state through its direct members and through the Indian Bird Conservation Network programmes. It is conducting so many activities in the state like Bird banding Camps etc. and providing advisory and cosultancy when needed.

SACON also involves the people and supports for participating in the national activities.
WTI (Wildlife Trust of India) has been supporting some survey and activities in the state with specific interest. The survey of biodiversity in the only PTR in Bihar and efforts to check on the wildlife in the state are a few examples.

Danapur cantonment: The army personnel of Danapur Cantonment has put all efforts to save the breeding habitat of thousands of Open Bill Storks in their area.

The army men of Paharpur camp in Gaya have done massive plantation in the area.

The IOC management of **Barauni refinery** though involved in such a business that is not environment friendly but they are putting an effort that is encouraging. They have established an Eco Park in their security zone in an area of 75 acres and have developed two ponds from the treated affluent water surrounded by undisturbed vegetation. The site has become a good bird habitat for their roosting and breeding.

Society for Conservation of Flora & Fauna, Patna has been associated in different environmental activities in the capital of the state including the survey and conservation of Open Bill Stork colony at danapur Cantonment.

The UNESCO Club of Darbhanga has been exerting best of it specially to protect and develop Kusheshwarsthan Bird sanctuary in Darbhanga is worth mentioning. Dr. S.K.Verma, the key members of this organization is dedicated in this effort. The work of its another member Dr. V.N.Jha is excellent specially on the wetland diversity of north Bihar and many other aspects relatedto the social and traditional issues.

The efforts of **Dr. R.K.Sinha** popularly known as the **Dolphin Man** and his team of patna university are excellent in studying the riverine ecology in depth and specially the Gangetic Dolphin. He has made a base for studying the River Dolphin in the state for the followers. Mandar Nature Club had also been associated with his team many a times. The work is later on being carried as a follow up by Vikramsila Biodiversity Education and Research Center at Bhagalpur.

Dr. B.K.Sinha, a urologist at Patna is one of the silent wildlifer having vast experience of wildlife not only in the state but even outside the country.

Taru Mitra at Patna has been doing wonderful work and preparing a vast group of environmentalists for future by developing strong network of school students in the state and outside the state.

Gandhi Peace Foundation is involved in various social activities at different levels having an excellent rural penetration.

Mandar Nature Club (MNC), Bhagalpur one of the best environmental NGO known in the state of Bihar and Jharkhand was established in the year 1990. It started the activities with children education and public awareness through many activities including plantation programmes, entered in to serious environmental activities by raising movement against issues, mass mobilization, study, survey and publication particularly in the field of protected area development, coordinating with organizations at national level and spreading a network within the state and developing its own library to help workers in the field of environment. It has the credit of reviving the study of ornithology in the states, discovery of animal fossils, protection of plant fossils, participating in national and international events for highlighting the issues of the states and supporting govt. agencies and organizations in carrying out their biodiversity conservation programmes.

Agriculture:

The State is looking for investment in areas like drugs and pharmaceuticals, agro-based industries like food processing. Development and processing for meat and poultry products, fisheries (prawn culture) and sugar industry.

Realising the excellent agro-climate condition of Bihar the state with central assistance has undertaken to develop a growth centre for an agro-park near Chapra. Infrastructure facilities like green house, drip irrigation, cold storage, packaging, transportation and power plant will be developed at the planned agro-park.

With the assistance of World Bank under National State Project, 3 districts of Bihar - Kishanganj, Purnea and Araria will have mulberry silk centres. The multi faceted development of silk industry, having tremendous export potential has resulted in self-employment to over 50,000 people.

Flora: On going efforts

1. Conservation and propagation of rare and threatened plants collected from Purnea, and Katihar is being done.
2. Germplasm of kheksha (Momordica dioica) and parwal (Trichosanthes dioica) are being maintained in the Botanical Garden of TM Bhagalpur University.

Medicinal plants like *Rauvolfia serpentina, R. tetraphylla, Oroxylum indicum* (sona chhal), *Adhatoda zeylanica* (vasaka), *Withania somnifera* (ashgandh), *Asparagus racemosus* (satavar) collected from different parts of Bihar are being maintained in the Botanical garden.

16. GAP:

The report is being prepared under high constraints of time and resources within a period of one month's time practically. The data collection has been done hastily. The study reports could not be explored from all the corner of the state.

There is a gap in the vision of the decision makers as regards the protection and development of biodiversity of the state.

The greater part of the state is unexplored and data deficient for every field of biodiversity.

The data available are either too old or are the results of unskilled survey.

The inter departmental cooperation within the govt. is another problem in coducting any multidisciplinary programmes smoothly.

Many individuals and institutions could not be contacted due to paucity of time and resources.

Many information are scattered in small pockets and could not be collected.

There is a gap in inter departmental and inter organizational cooperation that affects the study and collection of various data from the field.

Flora:

1. There is need for a comprehensive flora of Bihar State in order to have fuller picture of the flora in different parts of the State.
2. Floristic studies have been done in some districts of Bihar viz., Bhagalpur, Munger, Khagaria, Saharsa, West Champaran, Saran, Ara, Buxur, Darbhanga, Gaya, Nalanda, Patna, Jehanabad but only two floras have been published: Bhagalpur (Varma, 1981) and Patna (Singh, 1986) so far. There is a need for publication of the work already done.
3. Status of wetlands in Bihar is little known. Since Bihar has a large number of welands, their mapping and conservation of biodiversity is needed.

17. SUGGESTIONS:

The human based development process demands not only to restore and enhance the natural habitat but also to stabilize the population and their basic demands as natural resources.

The task of maintenance of identified wetlands, wild life sanctuaries and parks be given to a separate wild life agency, by bifurcating the jurisdiction of forest department. But this separate division should be made with extreme care and sufficient staff to take care of the division unlike in the state of Jharkhand where this type of set up seems unworkable for monitoring as the DFO and even the Range officers are sitting as far as about 400 kms from the working site.

The **wastelands** rapidly increasing in the state should be given immediate attention to restore the forest cover and for maintaining the ecology in the state.

There is need to establish an environmental information system, especially in the villages. The information agency can help the user in many ways. For illiterate and unskilled users the agency can have regional centers at a walkable distance, where villagers can meet directly and obtain information. The center can publicize information through radio, TV and magazines in regional languages and dialects.

There is an urgent need to develop a corps of volunteers, resource persons and specific communities with proper training to study and conserve biodiversity.

It is high time to undertake a comprehensive survey of the status of Biodiversity. It will certainly help to identify areas of stress, endangered species and emerging threats and conflicts between human needs and survival of the natural resources.

More Dolphin sanctuaries:

There is a need to declare some more areas like some places in the district of Araria, which borders both, Nepal and the state of West Bengal to protect the endangered River Dolphin species. Dolphines sre found here in the Panar, Bhalua and Lohandra rivers and their tributaries. According to Dr. Sudan Sahay, Their number has increased in the last few years. While there were only nine Dolphins in the rivers here in 1993, presently their number is said to 23 including infants.

Management of Industries:

<u>Recommendations for</u> Thermal power Plants:

Short term (5-7 years)

1. The monitoring of wet and dry acidic deposition and its impact on soils;
2. The monitoring of aquatic and vegetation environment;
3. The concept of green lung should be popularized;
4. Bio indicators for air pollutants;
5. Training bystander population;

Medium term (15years)

1. Energy and environment policy
2. Carbon and sulphur tax
3. Emission standard

4. Clean fuels
5. Emission control
6. Combined cycle plants
7. Demand side management
8. Pollution prevention boards
9. Reducing losses
10. Renewables

Long term:

Transition from carbon-based energy to a hydrogen based energy system.

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14. Clean fuels
15. Emission control
16. Combined cycle plants
17. Demand side management
18. Pollution prevention boards
19. Reducing losses
20. Renewables

Long term:

Transition from carbon-based energy to a hydrogen based energy system.

The "CLEAN GANGA" movement launched in the early eighties in Varanasi focused attention on pollution of the Ganga. In 1985 the Government of India established the Ganga Authority to implement a time bound program to free the Ganga from the pollution. The main thrust is upon engineering work.

The plan has also associated universities for research and mass education but seems to be inadequately effective to mee tits objective..

A STRATEGY FOR THE FUTURE

1. There is need to create appropriate technological solution to the environmental problems
2. Construction of big Dams and irrigation system has created problems of salinity and water logging, besides flooding the best lands. We should learn lessons from the USSR (Former), where big dams have created so many problems including that of food scarcity. So, in no case these projects should be built.

3. Deforestation activities should be effectively checked.
4. Efforts should be made to check industrial effluents as well as untreated sewage entering into river through proper legislation.

The ultimate and permanent solution lies with the masses.

Agriculture:

1. Agricultural development work should be treated on priority basis.
2. Fund should be provided for agricultural research and extension
3. All vacant posts of Agriculture Colleges and Universities should be filled.
4. Improved seeds should be produced in Bihar itself.
5. There should be secured and sufficient irrigation facilities with proper electric power supply for irrigation.
6. Farmers should be encouraged for Fish farming, Bee keeping, Goat farming, dairy and Poultry etc. Bee keeping is more in practice in the district of Muzaffarpur where Litchi production is a speciality.
7. Medicinal plants and flower cultivation should be promoted.
8. Kisan Mela and Kisan training should be organized at large scale in all three seasons (rabi, Kharif & Summer) at block levels.
9. Plantation should be increased to hold water for soil.
10. Tal areas should be given proper attention for better agriculture. Water pools may be formed for recharging so that the surrounding areas can get irrigation facilities.
11. Embankments and Bunds should be made in the undulating areas to stop water running away.
12. Looking on to the high runoff of rainwater and soil moisture retaining capacity for shorter period, raising the nursery early within June itself may result in less dependency on the rain in September.
13. Tubewells should be installed on war footing to improve agriculture. There is a need for scientific conservation of canal water. Traditional water harvesting systems like ponds and tanks should be rejuvenated. Water harvesting system should be developed properly for the storage of rain water and increasing ground water recharge.
14. Short and medium duration rice varieties should be promoted.
15. Crop management practices should be improved to meet the challenge of draught.
    Short duration, dwarf and draught tolerant varieties of rice should be promoted.
    Raising the height of Bunds around rice cultivation area by 30% can increase 99% conservation of rainwater.
16. Weed control measures should be taken in the agricultural fields. This may be done by the use of insecticides at proper time. Other solutions to control weeds should be sought.
17. There should be a balanced use of fertilizers. Use of phosphate, nitrogen and potash is required for the maturity, growth and draught tolerance of the plants

other than urea. There should be no shortage of these fertilizers at the time of need. During the period of water stress less nitrogenous fertilizers should be used.

18. Search for appropriate varieties is required.
19. Farmers should transplant whatever variety is available to them immediately.
20. Some of the fields should be brought under rice cultivation by sowing seeds directly instead of waiting for seedlings to come.
21. In low lying area where irrigation is available 'Boro' rice can be grown. Sowing the seeds in October, transplantation in February and cultivation in May gives high yield.
22. The farmers should plan a good 'Rabi' (winter) crop as wheat, pulses, lentil, oil seeds crop loke mustard and 'Tori' and 'Rye' as well as tubers & spices particularly in the upland.if 'Kharif' is not viable due to flood and other reasons.
23. Maize sowed in October gives 2.5 times more yield than Kharif (rainy season) crop of maize.
24. Motivation, awareness, scientific motivation towards modern technology for better Rabi crops rather than largely depending upon Kharif.
25. Arrangements for procurement and distribution of seeds of appropriate varieties of Rabi crop.
26. Adequate availability of fertilizers and insecticides should be there in time.
27. Training for developing knowledge and skill for the pattern of farming is required.
28. Nutrients and pest management training is required for sustainability and eco friendly conditions.
29. North Bihar floats on water but there is no water when needed in winter and summer. So, the water shed management is very much required in this area.

To develop Litchi Crop:

1. Scientifically managed nurseries, To educate the litchi growers for the maintenance of orchard, Proper and timely supply of necessary chemicals and spraying equipments be made available.

2. Financial assistance should be made available to orchardists in time so that they could procure fertilisers, pesticides and irrigational tools for producing high quality of litchi.

3. The Government should assure farmers about purchase of all type of fruits. The processing units for manufacturing squash, juice, etc. should be established.

4. The facilities like pre-cooling & sulphonation chamber and refrigerated van should also be extended to all exporters.

5. The air transport facility should be improvised or established

Dairy:

Services should be provided in a satisfactory manner, like feeding, timely medical treatment, vaccination and non-supply of green fodder, etc.

The road network should be developed at village levels to establish a direct link between the producers and ultimate consumers.

The productivity among the lactating animals was found higher among the crossbreed cow than the indigenous cows. So, the breed of cattle should be improved.

The milk producers should be educated for the technical care and nutrition of their cattle.

Tea Plantation:

Tea plantation needs to be exempted from the provision of existing Bihar Land Ceiling Act. The lands falling under categories SC/ST , gfovernment and Bhudan may be given on lease to the tea planters. Establishing tea manufacturing and processing units in the district would promote the tea plantation in the state. Tea nurseries in the area be encouraged.

Pest Management:

It is suggested that proper steps be taken for producing bio-control agents by setting up such laboratories in the state itself.

It is suggested that the government should take proper steps to create awareness regarding the ill-effects of pesticides and propagate the adoption of alternative method of pest control.

Suggestions for Diara land:

1. Cooperative farming should be promoted for better irrigation. At present, 3"-4" wide and 80' -100' deep boring is used by the farmers that is not sufficient. In community farming 6"-8" wide and 150' deep boring can easily be established.

2. The system of temporary check dams is prevailing in the area (Panchayat wise) but it is not maintained by the govt. The effort by the govt. in this regard will protect the crop of the farmers during flood.

Aquatic Biota:

There is a need to devise a proper wetland management strategy aimed at utilization of the hyacinth biomass for generation of compost biogas etc. Pigs also feed upon this hyacinth rather voraciously but remain relatively unharmed on account of their physiological adaptation. The district has all the potentials for enhanced pig rearing under integrated piggery-cum-duckery-cum-pisciculture exercise.

A recent technology developed in Britain to extract a protein rich curd from the leaves of this hyacinth could be made available to the farmers in the inaccessible flood areas for extracting emergency rations. Leaves could also be turned into suitable fodder by proper ensilaging.

In view of high population pressure very much prone to disturb their equilibrium it is essential for the district administration to take of these ponds. For want of proper

upkeep most of them are on way to dereliction. Ponds were well managed under ownership of the erstwhile Darbhanga raj.

There is need to raise the water storage capacities of the ponds. This could be achieved through incorporation of pond excavation work under the rural employment scheme. This will help strengthen both irrigation as well as aquacultural potential of these water bodies.

Wetland rice varieties and rhizomatous plants attract migratory birds during winter season which in turn, make the water bodies more fertile with their excreta.

Wetlands products: A solution to protein energy malnutrition

Along with fishes, Molluscs, crab, prawn etc. as the wetland animal products, plant products also serve as a promising source of protein, carbohydrates and minerals. No proper significance is attached to them on account of free availability. People should be properly educated about the nutritional significance of wetland products. It is high time primary health care system took due notice of these water plants.

Shell Fisheries:

1. Studies should be under taken on the Eco- Biology of the commercially important species of bivalves.
2. Survey should be conducted for spotting new prospecting collection centers.
3. Proper conservation practices should be enunciated. Limitation of harvesting period of bivalves taking care of their reproductive phase; juvenile harvesting should be stopped.
4. Easy process of lease water areas is to be introduced
5. Improvisation of collection methods
6. Transportation facilities are to be improved, and
7. Culture centers should be established.

Valmikinagar:

There should be embankments on the western side of the forest to check erosion of forest.

The soil in Madanpur area is very fertile and excellent in regenerating the forest. Encroachment should immediately be handled to protect this important part of the forest.

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2.In land water resource of north Bihar – an environmental appraisal
3.Madhubani Wetlands – A Repository of Phytoaquatic Wealth
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5.Gastropod-Macrophyte (Euryale ferox) association in the ponds
6. BOTANICAL ROSERIES AND NON FLOWER GARLENDS IN ETHNIC LIFE OF MITHILA REGION (NORTH BIHAR)
7.WOMEN IN KHUBANI- RAMDANA COTTAGE INDUSTRY
8.EXPLOITATION OF SHELL FISHERIES IN THE GANGA RIVER DRAINAGE SYSTEM DUE TO MOTHER PEARL BUTTON INDUSTRY OF BIHAR AND ITS CONSERVATION
9.CERTAIN SCIENTIFIC OBSERVATIONS AS DEPICTED IN INDIAN PHILOSOPHICAL PRINCIPLES
10.Indigenous colours used in the paintings of North Bihar (especially in Mithila Region)

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Personal Interviews with:

1. **Sri Parashuram Ram, IFS, C. F., Bhagalpur**
2. **Dr. S.N.Khetan, a farmer and Chairman, District Board, Bhagalpur and**
3. **Many others at grass root levels**

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