

*ipac*

**Site-Level Field Appraisal for Forest  
Co-management: IPAC Bhawal National Park Site**



## **Site-Level Field Appraisal for Forest Co-management: IPAC Bhawal National Park Site**



### **Prepared for: International Resource Group (IRG)**

**Prepared by:**

Masood Siddique  
Shital Kumar Nath  
Md. Abdul Jalil  
Parvez Kamal Pasha  
Md. Touhidur Rahman  
Md. Ahosan Habib  
Primus Pahan

**Submitted to:**

Chief of Party  
Integrated Protected Area Co-management  
Project (IPAC)

**Submitted by: RDRS Bangladesh**

**Submitted on: July'2009**

**Associate: WorldFish Center**

## **Acknowledgement**

Conducting Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) required intensive support of GO and NGO agencies as well as concerned community. Fortunately the team received such support as and when required.

At the beginning the team is expressing heartfelt thanks to Dr. Mohammad Zashim Uddin, Associate Professor, Department of Botany, Dhaka University for his supports in providing different information while preparing this documents.

We are deeply grateful to Mr. Hossain Mohammad Nishat, ACF (Wildlife), Bhawal National Park, for his continuous active supports during our field visits.

Our heartfelt thanks to Mr. Zaheer Iqbal, DCF, RIMS for his active supports in providing necessary maps.

Our heartfelt thanks to all Range and Beat Offices of Bhawal National Park for their proactive supports.

We are grateful to Mr. M. Oliur Rahman and Mr. Md. Abul Hassan Department of Botany, University of Dhaka, Dhaka-1000, Bangladesh as we got valuable information and data from their publication titled “A floral survey on Bhawal National Park, Gazipur, Bangladesh between May 1992 to March 1994”. This study report published in the Bangladesh Journal of Plant Taxonomy. 2 (1&2): 47-79, 1995 (June & December).

Also we extracted information and data from the publication of Mr. D. S. Kabir and Mr. A. Z. Ahmed Environmental Biology Laboratory, School of Environmental Science and Management, Independent University, Bangladesh Plot 14, Baridhara, Dhaka 1212, Bangladesh. The title of the paper is “Wildlife Biodiversity in Bhawal National Park: Management techniques and Draw backs of Wildlife Management and Nature Conservation” which published on Our Nature (2005)3:83-90. We are grateful to both the writers.

Mr. Emilio, Mr. A. Rozario Phd, Conservation Management Planning Specialist and Mr. Abdul Wahab Akonka, Senior Research Officer, Forest Department conducted a survey under Forest Resource Management Project at Dhaka Forest Division that was published in Dhaka Bano Bivag, Atit O Bartoman, Published by Dhaka Forest Division, Bhano Bhavan, Mohakhali, Dhaka -1212, Published in March 2002. While writing this document we extracted information from the said publication. Accordingly our deep gratitude and thanks goes to these writers.

Also we like to quote the publication of Mr. Emilio A. Rosario, Ph.D. on “The Conservation Management Plan of the Protected Areas Other Than Those In the Sundarban Forests In Bangladesh” (Final Report) published by GOB/WB Forest Resources Management Project, Technical Assistance Component, Mandala Agricultural Development Corporation Dhaka, Bangladesh; September, 1997. We used this publication for necessary information and references while preparing this documents.

Our heartfelt thanks to Chairman and Members of the related Union Parishads as well as concerned community of IPAC Bhawal National Park Site for their active participation in designing and documentation of different PRA tools.

At the end, we express our gratefulness to our RDRS’s and WorldFish Center colleagues for all sorts of support that we required during this strenuous time.

## Table of Contents

<b>Cover Page</b>	<b>Page</b> I
<b>Acknowledgement</b>	<b>II -III</b>
<b>Table of Contents</b>	<b>iv-vii</b>
<b>1. Introduction</b>	<b>1-4</b>
1.1 Project Background	1-2
1.2 Information Needs of IPAC Madhupur Site and Logical Basis for Conducting PRA / RRA	2-3
1.3 Purpose of the Report	3
1.4 Outline of the Report	3-4
<b>2. Description of the project site</b>	<b>5-15</b>
2.1 Location	5
2.2 Brief History	5
2.3 Soil type	5
2.4 Temperature and rainfall	5-6
2.5 Declaration	6
2.6 Administration	6
2.7 Infrastructures Facilities / Logistics	6
2.8 Boundary demarcation	6
2.9 Management Zoning	6
2.10 Habitat, Flora and Fauna	6-7
2.11 Ecological Context	7
2.12 Forest types	8
2.13 Habitat types	8
2.14 Habitat quality	8
2.15 River Turag and Chilai, Canals, Beels, and Crops	8
2.16 Socio-economic Context	9
<b>3. Methodology</b>	<b>16-37</b>
<b>3.1 Developing the RRA and PRA: Issues and Methods</b>	16-22
<b>3.2 Preparation of Fieldwork</b>	22-25
3.2.1 Formation of RRA and PRA Field Teams	22
3.2.2 Selection of RRA and PRA Sites	22
3.2.3 Selection of RRA and PRA Transect Route	22-24
3.2.4 PRA Schedule, Spots and PRA Activities	25
<b>3.3 Field Implementation Strategies</b>	26-29
3.3.1. Organization of RRA and PRA field work	26
3.3.2 Household (HH) interview	27
3.3.3 Key informant (KI) interview	27
3.3.4 Group Interview (GI)	27-28
3.3.5 Focus Group Discussion (FGD)	28

3.3.6 Other PRA tools	28
3.3.7 Direct Observation	28
3.3.8 Secondary Information Collection	28
3.3.9. Reflection and Analysis	29
3.3.10 Triangulation and filtering	29
<b>3.4 Limitations of the Fieldwork</b>	<b>29</b>
<b>4. Findings</b>	<b>38-120</b>
<b>4.1 Forest Resources: Status and Trend</b>	<b>38-72</b>
4.1.1 Floral biodiversity	38-66
4.1.2 Faunal biodiversity	67-70
4.1.3 Wetland Resources of the project area	70
<b>4.2 Comparison of present and past livelihood of forest dwellers</b>	<b>73-74</b>
<b>4.3 Ranges and Beats of the Park</b>	<b>74</b>
<b>4.4 Area of IPAC Bhawal National Park</b>	<b>74</b>
<b>4.5 Number of Staff</b>	<b>75</b>
<b>4.6 Temperature and rainfall of Bhawal National Park</b>	<b>75</b>
<b>4. 7 Settlements in and around IPAC Bhawal National Park Site and its level of stakes with the park</b>	<b>75</b>
4.7.1 Settlements	75
4.7.2 Demography	76
4.7.3 Level and role of stake	76
4.7.4 Road network of project area	77
4.7.5 Educational institutions	77
4.7.6 Religious institutions	77
4.7.7 Community facilities	77-78
4.7.8 Credit	78
4.7.9 Leasing and ticketing information	79
4.7.10 Places of interest	79
<b>4.8 Stakeholder Assessment</b>	<b>79-86</b>
4.8.1 Primary Stakeholders (PSH)	79
4.8.2 Secondary Stakeholders (SSH)	79
4.8.3 Institutional Stakeholders (ISH)	80
4.8.3.1 Forest Department (FD)	80
4.8.3.2 Local Community Organizations (CBOs)	80
4.8.4 Brickfield, Sawmill, Furniture's shop, Insecticide's and Hormone shop	84
4.8.5 Industries / factories	84-85
4.8.6 Timber Traders	85
4.8.7 Fuel-wood Traders	85
4. 8.8 Police	85-86
<b>4.9 Dependency of the stakeholders on the forest resources</b>	<b>86-87</b>
<b>4.10 Causes for the decline in forest resources</b>	<b>87-95</b>
4.10.1 General cause	87-91
4.10.2 Seasonal changes in resource extraction	92
4.10.3 Important resource exploitation	92-95
4.10.3.1 Fuel-wood collection	92-93

4.10.3.2 Timber extraction	93-95
4.10.3.3 Cane, bamboo and house building materials collection	95
4.10.3.4 Other Resource Collection	95
<b>4.11 Local Community and Power Structure and Local Governance</b>	<b>96-97</b>
4.11.1 Local decision makers and influential people	96
4.11.2 Local governance	96
4.11.3 Local conflict, conflict resolution, social adhesion and cohesion	97
4.11.3.1 Sources of conflict	97
4.11.3.2 Conflict resolution	97
4.11.3.3 Conflict with FD	97
4.11.3.4 Social cohesion and adhesion	97
<b>4.12 Local Socio-economic Context</b>	<b>98</b>
4.12.1 Demographic Profile	98
4.12.1.1 House-holds (HHs)	98
4.12.1.2 Education	98
<b>4.13 Livelihood analysis</b>	<b>98-99</b>
4.13.1 Occupation	98
4.13.2 Richness-poverty level	98
4.13.3 Unemployment	98
4.13.4 Income and expenditure profile	98
4.13.5 Skill & skill development opportunities	98-99
<b>4.14 Social dynamics (Trend and changes in socio-economics)</b>	<b>99</b>
<b>4.15 Local problems</b>	<b>100</b>
<b>4.16 Local Level Awareness and Behavior</b>	<b>101</b>
<b>4.17 Resource regeneration through plantation practices</b>	<b>101-102</b>
<b>4.18 Seasonal changes in socio-economics of the local people</b>	<b>102</b>
<b>4.19 Gender Issue</b>	<b>103-107</b>
4.19.1 HH decision making	103-104
4.19.2 Outdoor mobility and access to credit and IGA	104-105
4.19.3 Workload of local male and female	105
4.19.4 Daily work load	106
<b>4.20 Law enforcing mechanism</b>	<b>107</b>
<b>4.21 Status and Role of Forest villagers and ethnic community</b>	<b>108</b>
<b>4.22 Background of Social Forestry (SF) in Bangladesh</b>	<b>109</b>
4.22.1 Importance to Introduce Social Forestry in Bangladesh	109
4.22.2 Major component of Social Forestry in Bangladesh	109
4.22.3 Complex land structure implementation of Social Forestry in Bhawal	109
4.22.4 Land ownership and Forest Rights	109
 <b>5. Threats, Issues, Opportunities and Challenges for the IPAC Bhawal National Park Site</b>	 <b>110-116</b>
<b>5.1 Threats to the IPAC Bhawal National Park Site and its Biodiversity</b>	<b>110-112</b>
5.1.1. Clear felling and illegal timber felling	110
5.1.2 Collection of fuel-wood, bamboo and other house building materials	110
5.1.3 Pollution	110
5.1.4 Industrialization	111



5.1.5 FD's production of forestry	111
5.1.6 Hunting	111
5.1.7 Unplanned tourism	111
5.1.8 Proceedings against forest resource users	111
5.1.9 Lose of habitat	112
<b>5.2 Issues of Concern</b>	<b>113</b>
5.2.1 Reduced forest regeneration	113
5.2.2 Unsustainable resource exploitation	113
5.2.3 Local dependence on forest resources	113
5.2.4 Poor forest management by the FD and lack of specific Management Action Plan	113
5.2.5 Local poverty and unemployment	113
5.2.6 Lack of awareness among local people about biodiversity conservation	113
5.2.7 Poor law enforcement for forest protection and role of local police administration	113
5.2.8 Changes in the landscape	113
<b>5.3 Challenges for the Project</b>	<b>114-115</b>
<b>5.4 Opportunities</b>	<b>115-116</b>
 <b>6. Recommendations and Suggestions</b>	 117-120
Administrative	117
Technical Management	117
Some specific suggestions	118
Project activities targeted to local stakeholders	118-120
 <b>Annexure – 1 Pictorial description</b>	 121- 131
 <b>Annexure – 2</b>	 132-137
 <b>Annexure – 3</b>	 138-142
 <b>Notes</b>	 143
 <b>List of Figures</b>	 viii
 <b>List of Tables</b>	 ix-x
 <b>Executive Summary</b>	 xi-xix
 <b>Acronym</b>	 xx-xxi



## List of Figures

SL. No.	Name of Figure	Page No.
Fig. 1.	Map of Dhaka Forest Division showing location of Bhawal National Park	10
Fig. 2.	IPAC Bhawal National Park Site (commanded area in colour)	11
Fig. 3.	IPAC Bhawal National Park Site (Satelite photograph)	12
Fig. 4.	Social Map of Kawaltia Union Parisad, Gazipur Sadar Upazilla	13
Fig. 5.	Social Map of Mirzapur Union Parisad, Gazipur Sadar Upazilla	14
Fig. 6.	Social Map of Prahalledpur Union Parisad, Sreepur Upazilla	15
Fig. 7.	Transect walk of IPAC Bhawal National Park Site	24
Fig. 8.	Flow of RRA / PRA Field Activities (Duration: 3-4 days)	26
Fig. 9.	Social map of Village: Bahadurpur, Bahadurpur Mouza, Mirzapur UP	30
Fig. 10.	Social map of Village: Arishowprashad, Arishowprashad Mouza, Mirzapur UP	31
Fig. 11.	Social map of Village: Purba Shalna, Shalna Mouza, Kawaltia UP	32
Fig. 12.	Social map of Village: Bishyakuribari, Bishyakuribari Mouza, Mirzapur UP	33
Fig. 13.	Social map of Village: Baroipara, Baroipara Mouza, Mirzapur UP	34
Fig. 14.	Social map of Village: Bonkharia Khetapaglar Mazar, Bonkharia Mouza, Prahalledpur UP	35
Fig. 15.	Social map of Village: Kuchiamara, Bonkharia Mouza, Kayaltia UP	36
Fig. 16.	Social map of Village: Uttar Shalna, Uttar Shalna Mouza, Kawaltia UP	37
Fig. 17.	Link of various stakeholders with Timber Traders	85
Fig. 18.	Relative level of dependence of major stakeholder groups on the IPAC Bhawal National Park Site	87
Fig. 19.	Major direct causes for the degradation of IPAC Bhawal National Park Site	88
Fig. 20.	Flow of extracted fuel-wood from IPAC Bhawal National Park Site	93
Fig. 21.	Relative stakes of different villages with illegal felling	94
Fig. 22.	Linkage of various stakeholders with illegal fellers	95
Fig. 23.	The relative level of stake of different institution	96
Fig. 24.	Venn diagram of Conflict resolution	97
Fig. 25.	Venn diagram of Family decision-making	104
Fig. 26.	Daily Workload Chart of Men of IPAC Bhawal National Park Site	106
Fig. 27.	Daily Work Chart of Women of surrounding villages of Bhawal National Park Site	107

## List of Tables

<b>SL. No.</b>	<b>Name of Table</b>	<b>Page No.</b>
Table 1.	Selected RRA Issues for Bhawal National Park, Specific Activities and Tools Used	17
Table 2.	PRA Issues, Specific Activities Performed and Tools Used in IPAC Bhawal National Park Site	19
Table 3.	Team of PRA and RRA of IPAC Bhawal National Park Site	22
Table 4.	List of Transect Schedule at Bhawal National Park Site	23
Table 5.	PRA Schedule, Spots and PRA Activities in Bhawal National Park Site	25
Table 6.	Summary of performed activities in Bhawal National Park Site during PRA & RRA at a glance	26
Table 7.	List of Wildlife Species in Dhaka Forest Division	67
Table 8.	Status and Trend in Changes of Resources in IPAC Bhawal National Park Site Area	71
Table 9.	Time line analysis basis on wildlife and their habitat at Bhawal National Park Site	72
Table 10.	Table 10. Past versus present livelihood pattern at Bhawal National Park Site	73
Table 11.	Table 11. Name of Beats and its location	74
Table 12.	Mouza wise area of Bhawal National Park	74
Table 13.	Monthly maximum and minimum temperature (°C) of Bhawal National Park (average of 10 years)	75
Table 14.	Monthly average rainfall of Bhawal National Park (average of 35 years)	75
Table 15.	List of the name of Districts, Upazillas and Unions of the IPAC Bhawal NP Site	75
Table 16.	Area of the Project and union-wise number of Household, Population (male and female)	75
Table 17.	Information on Unions Having Stakes with IPAC Bhawal National Park Area	76
Table 18.	Union-wise number of High School, Primary School, Registered Primary School, Madrasa, Moktab / Etimkhana and College / University	77
Table 19.	Union-wise Religious Institution (Mosque, Temple, Church)	77
Table 20.	Union-wise Community Clinic, Tube well, Deep Tube well, Hat / Bazar	78
Table 21.	List of NGO and their union-wise activities	78
Table 22.	Stakeholder information of the IPAC Bhawal National Park Project area	81
Table 23.	Union-wise Brickfield, Sawmill, Furniture's shop	84
Table 24.	Resource Wise Dependence of Different Resource Users	86
Table 25.	Pair Wise Ranking for Identifying Main Causes For Forest Destruction	88
Table. 26	Cause and Effect –Ranking (Understanding Underlying Facts for Forest Degradation)	89

<b>SL. No.</b>	<b>Name of Table</b>	<b>Page No.</b>
Table 27.	Cause and Effect (investigating FD's management practice and local situation)	89
Table 28.	Table 28. Information on resource extraction from Bhawal National Park Site	91
Table 29.	Table 29. Seasonal calendar of resources exploitation in Bhawal National Park Site	92
Table 30.	Trend in Changes in Some Socio-Economic Matrices of the Local People	99
Table 31.	Local problem and their causes and possible solutions	100
Table 32.	Pair wise Ranking of Some Local Problems	101
Table 33.	Trend in changes in occupation of people around Bhawal National Park Area	102
Table 34.	Seasonal Changes in Some Socio-Economic Matrices	103
Table 35.	Information on Family Decision-Making (Uttar Salna)	104
Table 36.	Mobility and participation in social events and access to credit and IGA by male and female in Bhawal National Park Area.	105

## Executive Summary

1. Rapid Appraisal through PRA has been conducted to make a comprehensive situational analysis of IPAC Bhawal National Park (BNP) Site during May to mid July 2009, aiming at helping to determine and shape the future activities for improved management within IPAC Project. Specifically, the appraisals focused on identifying major stakeholders, understanding reasons for the forest and associated resources degradation and its underlying facts, identifying the challenges for the project and exploring the opportunities for its improved management. In addition to application of various tools, like trend and seasonal analysis, Venn diagramming, livelihood analysis, ranking, scoring, resource mapping, mobility etc. a series of household and group interviews, and focus group discussions were also conducted.

2. The main purpose of the present study is to present a synthesis of all findings from RRA and PRA exercises conducted by the IPAC Central Cluster Team in IPAC Bhawal National Park (BNP) Site during May to mid of July 2009. The report also details the methodology and tools used and highlight the issues in forest management and biodiversity conservation and identify the challenges for the IPAC Bhawal National Park Site. The report makes suggestions on what and how the project, Department of Forest Department of Environment, and Department of Fisheries, need to do immediately. At last, the report puts forward a set of recommendations for the improved management of the forest as well as wetland of within and surrounding forest.

3. IPAC Bhawal National Park Site situated within two Upazillas namely; Gazipur Sadar and Sreepur under Gazipur District, Dhaka Division. It is only 40 km north of central Dhaka on the eastern side of Dhaka-Mymensingh High Way, offers serenity from the bustle of the city as well as a taste of the vast Sal Forests that once ran nearly uninterrupted from Dhaka onward all the way north to west Bengal. This is a New Indirect IPAC site. It is predominantly a recreational Park. Geographical position of Bhawal National Park Site is between latitude 23°55' to 24°00' north and longitude 90°20' to 90°25' east. IPAC Bhawal National Park Site covers three unions of two upazillas as stated of which 2 from Gazipur Sadar Upazilla, and 1 from Sreepur Upazilla. Unions under Gazipur Sadar are Kawaltia and Mirzapur Union and that of under Sreepur is Prahalladpur Union.

4. Bhawal National Park Site with an area of about 5,022 hectares was declared as protected area through the Bangladesh Wildlife (Preservation) Order 1973 and subsequently enacted and amended in two phases as the Bangladesh Wildlife (Preservation, Amendment) Act 1974. The Bhawal National Park stands as testimony to the value of long-term planning and local participation in conservation. After being, totally cleared during the upheaval of the Liberation War, the Park was established in 1974 and officially gazetted as a Park in 1982. During past thirty years, the forest has re-grown from *Sal* coppies. The high rate of visitor's inflow to the park, particularly in the winter season has given rise to economic opportunities for the local residents. Now the

forest has re-grown and represents the largest forest block within an easy day trip from Dhaka.

5. The Park area presents an undulated configuration and consists of highlands called *Chalas* covered with forest trees intercepted by numerous depressions called *baidis*, which are cultivated with paddy. Actually, most of the *baidis* are private land. The soil of the area is acidic (pH 5.5), yellowish-red, sandy clay loam, mixed with scattered manganiferous iron ore. The newer alluminium is gray. The porosity of the soil is relatively poor and with the onset of the monsoon, the soil melts and becomes very soft. The organic carbon is approximately 0.73%. The temperature ranges from 11.7°C to 34.3 °C. April, which is the hottest month of the area. The monthly maximum and minimum temperature (°C) of the area is 34.3 in the month of April and 11.7 in the month of January respectively. The monthly average rainfall is minimum 3.4 mm in the month of December and maximum 339.0 mm in the month of August.

6. There are 1 ACF Office and Quarter, 03 Beat Offices (one required repairing), 1 Beat Officer's Quarter, 1 Forest Guard's Barrack, 02 Motorcycles, 01 Pickup, and 1 Truck (need to be repaired) for management of the park / forest. There is no Forest Camp, Nursery, Range Officer's Quarter, Fire Extinguisher, Binocular, etc. for the park / forest. Visitors facilities are 06 Rest Houses (4 AC, 1 Non AC and 1 damaged), 13 Cottages (10 useable and 3 unusable), about 25 km. Walking Trail, 03 Artificial Lakes (total length about 6 Km.), 15 Ponds (5 within Core Zone), 2 Observation Towers (1 damaged), and 50 Picnic Spots (within and out side of the forest), 1 Tourist Shop (with a canteen), 1 *Tom Tom* (horse pulled van), Several Tourist Vans, several Engine Boats (within artificial lake), 1 Mini Zoo (with 12 spotted deer and 01 pheasants), etc .

7. Topographically the landscape comprises mainly plain land with some area covered by forest. This site was once a largely dense forest. The type of forest is deciduous with a mixture of evergreen forest. However, evergreen forest area is negligible. The main species of the forest is Shal / Gajari (*Shorea robusta*). Land surrounding the site and few patches outside the forest are intensively cropped. The entire area including the connecting Canals, Streams and Rivers are intensively fished with a diverse variety of gears. According to the local community, there has been massive geo-physical change over last 20 years with rapid and almost complete deforestation of the forest area as well as only river Turag and Chilai followed by a rapid loss of connectivity due to encroachment and increased sedimentation.

8. Total identified plant species number is 202 under 147 genera and 52 families. Gramineae in Monocotyledons and Leguminosae among the Dicotyledons are the most dominant represented by 25 species under each. Except Sal, the other notable floral species of the forest are Haldu, Koroi, Satian, Roina, Kadom, Dewa, Gutum, Ajuki, Neem, Kanchan, Shimul, Kanjal, Joyna, Palash, Sonalu, Gab, Jam, Bot, Ashatta, Jagdumur, Jial, Jiga, Jarul, Shinduri, Bonam, Amra, Chapalish, Amloki, Hortoki, Bohera, Hargaza, Gadila, etc. The herb and shrub species are Shati, Punch, Bashak, Shorpogondha, Ulatcombol, Shotomuli, Paharialu, Ampeng, Thaja, Dudalu, Adurag, Chutki gota, Kat badam, etc. There are many types of bamboo such as Jai bansh, Muli

bansh and various canes like Jali bet, Golla bet. Besides, there are many types' climbers and vines, herbs and shrubs.

**9.** Total identified animal species is 72. Out of these 72 species, 13 are mammal of which noteworthy are Irrawaddy Spuirrel, Jackal, Jungle Cat, Small Mongoose, Rhesus Macaque, Bat (Indian False Vampire), Indian House Mouse, Pipistrel Indian Pigmy, Three striped palm Cevit, Bengal Fox, Five Stripped Palm Squirrel, Hoary Bellied Himalayan Squirrel, Hispid Hare, etc. Identified 14 reptilian species are Monitor Lizard, Gekko, Mabuya, Common Cobra, Bengal Monitor Lizard, Banded Crait, etc. Identified 6 amphibian species are Common Toad, Skipper Frog, Cricket Frog, Bull Frog, Maculated Tree Frog, etc. Within identified 39 species of birds, most common are Red Jungle-fowl, Rufous Woodpecker, Gray-capped Pygmy Woodpecker, Fulvous-breasted Woodpecker, Green Bee-eater, Pied Cuckoo, Asian Koel, Green-billed Malkoha, Lesser Coucal, Greater Coucal, Rose-ringed Parakeet, House Swift, Barn Owl, Spotted Owl, Emerald Dove, Rock Pigeon, Spotted Dove, Cinereous Vulture, Brahminy Kite, Great Cormorant, Cattle Egret, Great Egret, Little Heron, Indian Pitta, Common Iora, House Crow, Black Drongo, Greater Racket-tailed Drongo, Black-hooded Oriole, White-throated Fantail, Rufous-faced Warbler, etc. The Forest Department has recently re-introduced Peacock, Spotted Deer, Python, and Fishing Cats to the area.

**10.** The Park contains low forest type with Sal generally comprising the upper layer of canopy. The lower canopy is still composed of Sal mixed with other medium-sized trees. This forest type comprises the major wildlife habitat in the park. In line with the bio-geographical zoning approach, three habitat types are identified in the Bhawal National Park, namely: low forest, cultivated paddies and grassland, and water body (Artificial lake and natural flood-lands). The low forest habitat includes the entire forest, which generally serves as the main habitat of arboreal animals in the park. The cultivated paddies and grassland habitat type is partly flooded during the monsoon season and generally dry during rest of the year. During the cropping season the vegetation is generally, rice land and some grass species. This habitat harbors some reptile species, ground birds, rats and frogs. The lake and river habitat harbor some introduced fish species, water birds, and amphibians. It is a limited habitat area because the lake is being managed primarily for outdoor recreation in the form of boating. A summary of the various habitat types in terms of area in the Bhawal National Park Site are low forest - 4,472 (ha), Cultivated paddies / grassland - 500 (ha), Lake and riverine - 50 (ha).

**11.** Most of the flood lands of forest areas receive water from the river Turag and Chilai. Turag originated from Old Brahmaputra. River and Chilai is a branch of River Turag. On the way, the River system connects many Canals, lower pockets (Beels) and tributaries that created a rich ecosystem for aquatic vegetation, fish, birds and other aquatic biota. The lower pockets (Beels) contain a few seasonal and perennial Beels rich with aquatic flora and fauna. People surrounding the river basin largely depend on fishing. Boro rice is widely cultivated at the high and medium law lands of Beels in the dry season. The land is fertile and productive. However, there is risk of crop damage due to early flash flood and the community is vulnerable with such situation. The area remains under water at least six months in a year during Jaisthya to Kartik (May-October). This is the main cause

of manifold problems, the people suffers from income hardness. To co-opt such situations the community also involved in many other professions. Farmers use river and Beel water for irrigation. Withdrawal of water by shallow pump causes water scarcity in the river and Beels during dry season. Even some part of river dries up due to extensive irrigation.

**12.** The Bhawal National Park is also a popular tourist spot. Tourists visit the park throughout the year. However, most of the tourists visit mainly during winter season. Subsequently, many people employed themselves through various services related to tourism. A huge number of people are living surrounding area of Bhawal National Park. Similarly, a huge number of people depend on the forest for subsistence. Around 20-25 groups (average number of visitors 600) visit Bhawal National Park each day. Compositions of visitors are 80 percent male and 20 percent female. There are six gates in BNP, where ticketing system available in each gate.

**13.** The IPAC Bhawal National Park Site divided into 02 Ranges namely; Bhawal Range and National Park Range. There are 04 Beats under Bhawal Range namely; Bhabanipur, Baroipara, Rajandrapur West and Beshiyakori. There are 03 Beats under National Park Range namely; Park Beat, Baupara and Bonkhaira. Above all Beats located eight different Mouzas. The total area of the IPAC Bhawal National Park is 5,022 ha of state-owned, FD-acquired, and private-owned lands situated in various Mouzas such as: 1,070 ha in Arishaprashad; 397 ha in Bishayakuri-Bari, 2,684ha in Baraipara, 345 ha in Bankhuria, 137 ha in Uttar Salna, 88 ha in Baupara, 50 ha in Bhahadurpur, and 251 ha in Mohana Bhowanipur.

**14.** A total of 35 Mouzas and 136 villages having varied degree of stakes within three unions were identified. The villages belong to 3 Unions namely; Kawaltia, and Mirzapur of Gazipur Sador Upazilla and Prahalledpur of Sreepur Upazilla of the project area. Total project area is 136.06 Sq. Km. Total Household of 136 villages is 35,490. with population of 266,476 including 137,916 male and 128,560 female. There are three types of stakes depends on their roles. The major type of stake, live in Mirzapur; medium type of stake live in Kawaltia; and Minor type of stake live in Prahalledpur.

**15.** There are 21 Non-Government High and Junior High Schools, 39 Government Primary Schools, 33 Registered Primary Schools, 21 Madrashes and 120 Moktabs / Etimkhana (orphan house) and 01 University in the project area's unions. Inhabitation of the project area consist different types of religious groups with an ethnic group (at Kuchiamara, Barmonpara under Prahalledpur Union), where the Muslims are the majority. The religious institutions within the project area are Mosque 198 Nos., Temple 22 Nos. and Church 01 Nos. There is no church in Kawaltia and Prahalledpur Union. The community facilities within the project area are average in standard comparing to the other part of the Bangladesh. There are 02 Hospitals, 21 Community Clinics, 5,332 Sanitary Latrines, 6807 Tube Wells, 52 Deep Tube Wells, and 17 Hats / Bazars.

**16.** Several NGOs and banks provide micro-credit to local people. About 19 NGOs involved in the project area. Bank loans mainly provided for poverty reduction and integrated rural development through creating opportunity of IGA and as seed money for



agriculture and handicraft. NGOs provide credit mainly for IGA. NGO's IGA programs concentrate on small business, fish culture, poultry, livestock rearing, nursery, etc. Women's are mainly the target beneficiaries for the NGO credit programs. It has been seen that local people also take credit locally from neighbors, relatives and sometimes from *Mohajons* (Money Lender) etc.

**17.** FD took initiatives for ticketing in 1976 but not executed. First leasing started in 2004-05. However, there was no record about lease amount and price of ticket. Lease amount for 2005-06 was 25, 00,000 (twenty-five lac) Taka. and that of 2008-09 was 28,00,000 (twenty eight lac) Taka. Present price of tickets: Taka 10 / Person, Taka 200 / Bus, Taka 100 / Minibus, Taka 60 / Private Car, Taka 20 / Auto-Rickshaw, Taka 5 / Rickshaw or Motor Bike, Taka 5 / Student. Around 20-25 groups (consisting average number of visitors 600) visit Bhawal National Park (BNP) each day. Compositions of visitors are 80 percent male and 20 percent female. There are six gates in BNP, where ticketing system available in each gate. A number of famous places, Organizations, Academic Institutions situated near Bhawal National Park. Visitors can also visit these sites while visiting BNP. These are Joydebpur Rajbari, BARI, BRRI, Rover Scouts Center, BRAC-BCDM, Bangabandhu Agriculture University, etc.

**18.** At least 3 categories 18 different types of stakeholder identified in IPAC Bhawal Site, such as: Primary stakeholder- involved with direct extraction of resources from the wetland or their activities directly affect the wetland. Secondary stakeholders – indirectly linked with the wetland, involved with trading or exert influences on the wetland; Institutional stakeholder- involved with developmental activities and administration of the adjoining areas. About 13 different primary stakeholder types, who directly extract different resources from the forest, were identified. Of them; Fuel-wood collector, Fuel-wood seller, Illegal tree feller, *Moholder*, Encroacher, Bangladesh Air Forces, Bangladesh Arm Forces, Fruit Collector, Ant's egg collector, Vegetable collector, Medicinal plant collector, House building materials collector, Industrialist as primary stakeholder. Out of 18 stakeholders; Sawmill owner and operator, Furniture owners, Brick field owners as secondary stakeholders. Out of 18 stakeholders, Relevant Government Institutions, NGO, are as institutional stakeholders.

**19.** The scenario of a limited portion of the project area consist many Brickfield, Sawmill, Furniture's shops, and Insecticide's & Hormone shop which are highly unfriendly for environment and ecosystem. There are about 28 brickfields in the project area only at Mirzapur Union. These brickfields are also responsible for forest destruction. There are about 66 sawmills in the project area. In addition, there are a number of temporary sawmill found in the forest area. All these sawmill are to some extent involved in illegal tree felling. Most of the sawmills have unauthorized powerl connection and sometimes operated by generator during load shading. There are about 147 furniture shops in the project. Many of them have no valid license for trading of timber. They usually receive sawed timber from sawmills and trade locally. It is alleged that they sometimes receive illegally felled timber from poachers and get sawed and sell it and thus responsible for illegal felling of timber. There are many insecticide and hormone shops in the project

area. Out of this specific shops, most of the local small grocery shop sale insecticides and hormone.

**20.** At present, quick industrialization is one of the major threats for the IPAC Bhawal National Park Site. The PRA / RRA Team have addressed industrial pollution issues of Bhawal National Park Site, where more than 166 major industries are located: 105 at Mirzapur UP, 58 at Kwaltia UP and 03 at Prahalledpur UP. Most of these industries are socially compliant but not environmentally. It is estimated that these industries are discharging huge amount of waste water in surrounding flood lands. In addition, effluent from industries downstream in the Tugar catchments also appears to enter in to the river and being carried upstream by late season tides. Large areas of surface water have a dark black appearance and fuel smell due to high sulfide levels and low or no oxygen in dry season. There are also reports of poor catches and large-scale fish mortality in the water area during dry season.

**21.** There are about 213 timber traders (including sawmill and furniture shop owner) in three unions of the project area, who are involved with timber trading. Many of them have no valid license for the trading of timber. They usually receive sawed timber from sawmills and trade locally. A number of fuel wood traders have been identified that have indirect stakes with the Bhawal Forest; they collect fuel-wood from the local direct collectors. Several trucks of fuel-wood transported everyday from this area and majority of which come from clear felling and substantial fuel-wood also sold locally by the traders. The traders procure fuel-wood from the individual collectors, stack them and sell it to the local consumers, while the others transport it by trucks, van, rickshaw, pickup, etc. The marketing opportunities have increased during the recent times at the local level. The fuel-wood is traded at the rate of Tk. 220 -300 taka per van, which contain about two mounds.

**22.** The major causes for the decline in forest in order of magnitude are as follows: clear felling and illegal timber felling, pollution, industrialization, FD's plantation strategies, fuel-wood collection, collection of house building materials, hunting, bamboo and cane collection, etc. Pair-wise ranking exercises showed that presently clear felling practice is the major cause for the decline in forest biodiversity, followed by illegal timber felling, fuel-wood collection and bamboo collection. Presently, hunting has negligible responsibility, as the activity is very limited. The role of FD's plantation strategies for the forest degradation has not been explored. FD's poor forest patrol, easy negotiation with local FD staff, poor strength of local FD and emergence of increased local influential people are all-contributing to illegal timber felling. Fuel-wood collection has been linked to development of transportation system and marketing opportunities and drop in solvency level.

**23.** A total of 09 different types of resources are extracted from the forest. Of them, timber (includes both legal and illegal extraction), fuel-wood, coppices, dead leafs are extracted in a large scale, cane and building materials in a medium scale, wildlife, fruits, vegetables, etc. in a minor scale, bamboo, medicinal plants in a negligible scale. The main purposes for resource extraction include meeting HH needs, selling for added

income / and or to support and supplement livelihood. Timber felling, fuel-wood and cane & bamboo collection, collection of house building materials, hunting etc. all are causing threats to the forest and its biodiversity through bringing qualitative and quantitative changes in the habitat and the wildlife they support. *Moholder*, local poor people, forest villagers and unemployed laborer are the major categories of resource user.

**24.** Many influential people have control over the local people, their activities and even over local administration. Local Union Parishad is the lower level local government tier that look after local welfare and development. It has also emerged as the main center for conflict resolution. The UP members, who are elected from different areas of the Union, look after their respective areas. The local public representatives are consulted whenever there is a local issue. There is also a new local organization, led by Ward Member of UP, in each ward (village) and deal with all local issue, including welfare, development, dispute and conflict. Police administration at Upazilla level is the local law-enforcing agency and are involved with maintaining local law and order situation. The main sources of conflict among local people are, land dispute, children affairs, livestock grazing, marriage related affairs, family affairs, money lending, local politics, local elections etc. Conflicts are resolved by arbitration by local elites & public representatives (MP, UP Chairman, members). If the local efforts are not fruitful, it may lead to filing cases with Thana-police and ending up in courts. There is a huge conflict between with FD local staff and local people, particularly disputed landowners and with tree feller from various villages. Sometimes there are direct conflicts with tree feller during patrolling, sometimes lead into exchanges of fire and even murder. Many social activities maintain social adhesion and cohesion among the villagers.

**25.** The overall literacy rates of male and female are near to close at project area. In recent years, the number of school going girls is higher than the boys. However, in case of higher studies girls are behind the boys. Overall, females are less educated than the males. Once higher educated people were less in this area but at present, the scenario has changed. The major primary occupation of the project area is agriculture (40-50%) mainly paddy cultivation, followed by service holder (30-40%), daily laborer (20-25%), overseas employment (3-5%) and small businesspersons (2-3%). The PRA / RRA team members have received an idea about richness and poverty level of the project area that are; about 7-10% people of the area are rich, 20-25% is middle class and 40-50% is under middle class and 10-15% is very poor. Unemployment is another severe problem that puts pressure on over exploitation of forest resources. In average, about 15% local surrounding people are unemployed. However, there is a strong seasonal trend in unemployment level in the area. Unemployment is a major concern/problem in the area. According to the local people, the number of unemployed people increases during the dry season.

**26.** Recommendation and suggestion for the project works implement can be mentioned in major sectors are administrative management, technical management, etc. Poor forest management by the Ministry of MoEF and Forest Department has been identified as one of the major reasons for forest degradation. Strengthening and capacity building of FD, along with local concerned authorities' engaged in forest management would have to be a

prior area that IPAC can address. An appropriate, site specific and technically sound management Action Plan should be developed in consultation with local people

**27.** The possible challenges for the project are demarcation of boundary, occupancy right of forest dwellers on land use / forest resources, finalizing the legislative status of Forest, replacement of planted forest by natural forest, transparency and accountability of the concerning authorities, empowerment of Forest Resource User Group; stopping fuel-wood, bamboo and building material collection; reducing local poverty and unemployment: Unless this issue not addressed the illegal use of wetland resources will continue. However, though it may be a difficult job even than project should address this issue with great importance. Reducing use of chemical, fertilizer & insecticides; establishing co-management regimes for biodiversity conservation, etc. Besides these, for better result excavation / re-excavation of degraded Beels and canals, stocking indigenous endangered species, fish sanctuary, proper plantation on embankment of the Turag River and Chilai River and their branches and Fish Act implementation within project area to restore the habitat.

**28.** A large number of people visit the Bhawal National Park. If infrastructures are developed, this will attract more visitors and ecotourism can be planned accordingly. In addition, security of tourist must be ensured. To develop ecotourism activities of the project area can be introduced through IPAC like as development of extension materials, easy transportation facility from Dhaka and Mymensingh, eco-cottage and other living facilities, introduction of eco-guide, forest patrol group, etc.

**29.** A number of wildlife are still inhabitant of Bhawal forest, Due to scarcity of adequate food and shelter, they are in vulnerable condition. In this regards, a rehabilitation scheme should separately be considered for resident monkey and other wildlife of Bhawal Forest. To this end the following activities can be considered; re-establishment of habitat continuity between the fragmented habitats of these wildlife and plantation scheme with food trees suitable for non-human primates such as Bohera, Horitoki, Amloki, etc.

**30.** Fuel-wood, bamboo and collection of some other major building materials should be stopped on a short-term basis, but this may not be as success as long as there are scarcities of its supplies in the area. However, once the stock is recovered it may be possible to exploit the resources based on principle of sustainable use. Therefore, project should strongly considered; establishment of a buffer sustainable resource use zone around the NP with provision for fuel-wood plots, woodlots and other plantations required for house building purposes. Providing resource substitution, promotion of fuel-efficient stoves / oven in the locality, promotion of homestead plantation etc. can be implement.

**31.** Poor resource users, particularly those who are dependent on the forest for their livelihood, should be identified and brought under AIG programs with provision that they give up the unsustainable use of forests / forest resources. The possible AIG opportunities include Nursery, Bamboo and cane based handicrafts, Handicrafts, Poultry, Medicinal plant gardening and nursery, Ape culture, Fish culture etc.

**32.** Attempts should be made to bring the local elites on board with the concept of forest protection. In particular, the project needs to consult local public representatives,

including local Chairmen and Members of Upazila / Union Parishad and MP, and involve them, at least in advisory role. The project should also work with existing local community organizations identified under the appraisals. Awareness raising activities should be carried out on a priority basis in the area to make the people understand how they would get benefit from this project. It is felt that the illegal resource users (illegal tree fellers in particular), get shelter from local authorities hence strong dialogue should be initiated among them involving the higher authority. Awareness campaign groups at local level can be developed by involving Boys Scouts, BNCC, School / College students who will conduct street drama; pot songs on sustainable use of forest / forest resources.

**33.** The Shal forest habitat is a sample of much larger tracts of Shal that once existed here. Identified species of floral and fauna is doubtful. Immediately a comprehensive faunal and floral inventory should be made. Investigations into the threatened categories of flora and fauna should be made on a priority basis and a management scheme for their protection and rehabilitation should be developed.

**34.** Finally, it can be said that, to revive the natural forest resources as well as fisheries resources of Turag River and Chilai River would be the prior challenge for IPAC. These can be achieved by bringing down the rate of dependency of the local people on natural resources. To achieve these challenges, introduction of Alternative Livelihood Activities (AIGA) is very much important. The future action plan of IPAC needs to be centered with this message in thinking.

# Acronyms

<b>Acronym</b>	<b>Detailed name</b>
AC	Air Conditioned
ACF	Assistant Conservator of Forest
ADB	Asian Development Bank
ADRA	Advantage Development And Relief Agency
AIGA	Alternate Income Generating Activities
ASA	Association for Social Advancement
BARI	Bangladesh Agricultural Research Institute
BCDM	BRAC Center for Development and Management
BDR	Bangladesh Rifles
BELA	Bangladesh Environmental Lawyers Association
BNCC	Bangladesh National Cadet Core
BNP	Bhawal National Park
BO	Beat Office / Beat Officer
BRAC	Bangladesh Rural advancement Committee
BRDB	Bangladesh Rural Development Board
BREB	Bangladesh Rural Electrification Board
BRRI	Bangladesh Rice Research Institute
CAP	Center for Advancement Program
CBO	Community based Organization
CBSDP	Charge of Bangladesh Social Development Program
CMC	Co-management Committee
CODEC	Community Development Centre
Dept.	Department
DF	Damien Foundation
DFO	Divisional Forest Officer
DoF	Department of Fisheries / Director of Fisheries
etc.	Etcetera
ETP	Effluent Treatment Plant
FD	Forest Department
FG	Forest Guard
FGD	Focus Group Discussion
Fig.	Figure
FRMP	Forest Resource Management Plan
FSP	Forestry Sector Project
GD	Group Discussion
GI	General Interview
GO	Government Office
GoB	Government of Bangladesh
Govt.	Government
HHs	Households
IGA	Income generating Activities
Int.	Interview
Intr.	International
IPAC	Integrated Protected Area Co-management

IRG	International Resource Group
ISH	Institutional Stake Holder
kg	Kilogram
Km.	Kilometer
KI	Key Informant Interview
LGED	Local Government Engineering Department
MACH	Management of Aquatic Ecosystem through Community Husbandry
Mat.	Material
MCC	Mennonite Central Committee
MoEF	Ministry of Environment And Forestry
MoFL	Ministry of Fishery And Livestock
MP	Member of Parliament
NACOM	Nature Conservation Management
NFE	Non Formal Education
NGO	Non Government Organization
Nos.	Numbers
NP	National Park
NSP	Nishorgo Support Project
NTFP	Non Timber Forest Product
PA	Protected Area
PDB	Power Development Board
PIDIM	A Bengali named, microfinance organization
PRA	Participatory Rural Appraisal
PSH	Primary Stake Holder
RDRS	Rangpur Dinajpur Rural Service
RDS	Rural Development Sangstha
RDSM	Rural Development Social Mobilization
RF	Reserve Forest
RO	Range Office / Range Officer
RRA	Rapid Rural Appraisal
SF	Social Forestry
SFP	Social Forestry Project
SH	Stakeholder
Sq. Km.	Squire Kilometer
SSH	Secondary Stake Holder
SSS	Society for Social Services
UP	Union Parishad / Upzilla Parishad
US	United States
USAID	United States Assistant for International Development



# 1. Introduction

## 1.1 Project Background

The United States (US) Government funding agency United States Assistant for International Development (USAID) financed two separate project namely: MACH (Management of Aquatic Ecosystem through Community Husbandry) and Nishorgo respectively with the GoB agency; The Department of Fisheries and Forest Department. The carryover of these two projects will be main streamed through Integrated Protected Area Co-management (IPAC) project.

This project follows the successful completion of the MACH Project funded by USAID from 1998 – 2008, to support the Department of Fisheries and local stakeholders in the management of Aquatic Ecosystem through Community Husbandry (MACH). IPAC also continues support provided to the Forest Department Nishorgo Program aimed at promotion the co-management of protected areas of forest.

Collaborative management, or co-management, is an approach used by government technical agencies to collaborate with local communities and other stakeholders in the management of designated natural resources like forest ,wetlands etc. To implement a co-management approach, managers engage these local stakeholders through a participatory process that empowers them with a voice and well defined role in decision-making and provides sufficient economic incentives to engage their interest and commitment to the successful achievement of the agreed upon natural resource management objectives.

IPAC is being implemented through the Ministry of Environment and Forest (MoEF), and Ministry of Fisheries and Livestock (MoFL). The primary technical implementing agencies of the Government of Bangladesh are the Forest Department (FD), the Department of Fisheries (DoF) and Department of Environment (DoE).

The principal targeted beneficiaries of IPAC are the men, women and youth of poor rural households living within the landscapes around the targeted protected areas. However, the successful implementation of IPAC will generate benefits for the entire country over the medium and long term.

IPAC is also designed to communicate with and to support the development of a wide range of constituencies with a stake in conservation of natural resources as well as those in a key position of influencing decisions about the use and management of natural resources. This includes political and opinion leaders, religious leaders, university students, journalists, scouts and other youth program participants, tourists and other visitors to protected areas, environmental and conservation organizations as well as corporate leaders and private sector partners.

IPAC project mobilization began in June, 2008, and the project is being launched in November, 2008. IPAC will be implemented over a period of five years, and is schedule to end in June, 2013.

Bangladesh is rich in natural resources especially water and soils. Its freshwater wetlands are among world's most important, harboring hundreds of fish, plants and wildlife and providing a critical habitat for thousands of migratory birds. The productivity of this valuable wetlands has come under increasing pressure as the human population has spiraled, and as forest clearance, drainage for agricultural development and the construction of flood embankments in tandem with over exploitation and pollution has decimated fish stock and other aquatic life, including edible

plants harvested by the poor. The consequences have been devastating for millions of fishing households.

“Saving Bangladesh’s forest for future Generation” is the principal slogan of Forest Department Nishorgo Program. In recent years Bangladesh’s forest have also come under relentless human pressure as its population grows and forest land are converted To Whom It May Concern: agriculture and other land issues. As a result, Bangladesh now has one of the smallest areas and protected and intact forest in the world, and many rural livelihoods that are depended on the continued existence of forests are threatened.

In order to secure these natural resource-based livelihood while improving the socio-economic well-being of rural communities and protection these valuable natural resources and the associated with natural beauty of Bangladesh’s wetlands and forests, USAID/Bangladesh is pleased to extend its support to the government of Bangladesh as well as the people of Bangladesh.

## **1. 2 Information Needs of IPAC Bhawal National Park Site and Logical Basis for Conducting PRA / RRA**

For any project either development or research based, information are required for designing and planning project interventions, setting implementation strategies, evaluation and monitoring of project performance and impacts. Information at the initial stages of the project thus helps the project in carrying out its activities effectively and efficiently.

IPAC Bhawal National Park Site is situated within two Upazillas namely; Gazipur Sadar and Sreepur under Gazipur District, Dhaka Division. It is only 40 km north of central Dhaka on the Mymenshig Road, offers serenity from the bustle of the city as well as a taste of the vast Sal Forests that once ran nearly uninterrupted from Dhaka all the way north to west Bengal. It is predominantly a recreational Park. Geographical position of Bhawal National Park is between latitude 23°55’ to 24°00’ north and longitude 90°20’ to 90°25’ east.

IPAC Bhawal National Park Site covers 3 unions of these two upazillas; 2 from Gazipur Sadar Upazilla, and 1 from Sreepur Upazilla. Unions under Gazipur Sadar are Kawaltia and Mirzapur Union and that of under Sreepur is Prahalladpur Union.

This is a New Indirect IPAC site. For successful implementation of identified interventions in this site, it will concentrate on collection of relevant information by using appropriate methodology. Therefore, it was necessary to carefully scrutinize the information needs and determine its relevance to the project objectives and activities.

The generation of information, in principle, is guided by project objectives and goals. The IPAC Bhawal National Park is particularly concerned with the establishment of co-management mechanism of forest resources in one hand and developing a prescription for the technical management of its resources, on the other hand. Therefore, generation of information is thus centered on the characterization of local community (stakeholders) likely to be involved with the project and local resources that are to be managed.

- **Co-management** -----stakeholders and their activities, socio-economics, behavior, community power structure, their needs and expectations, conflict, challenges etc.
- **Resource management** ---- resources and its status, trend and causes for resource degradation, resource exploitation, threats to local resources and biodiversity

This preliminary assessment of information needs for IPAC Bhawal National Park Site through scooping exercises provided precursors for brainstorming for identifying specific information needs that will be collected through subsequent appraisals. It was thought that at the initial stage of the project a rapid appraisal would be very appropriate in terms of cost effectiveness, usefulness, reliability, and overcoming time constraints.

Rapid Rural Appraisal (RRA) / Participatory Rural Appraisal (PRA) are packages of methods and tools for collection of qualitative information about local people, their life, environment, resources within the landscape, activities and living conditions in a short time. The purpose is to utilize knowledge of the local people in designing and setting implementation strategies of a project / program and / or to monitor and evaluate project performances and impact. It is also considered as a process for involving local people in the project planning and / or implementation and monitoring. In fact, RRA / PRA is thus considered as an integral part in down-top planning process in many development or resource conservation projects.

RRA was carried out as an initial activity in the field with primary focus on stakeholder assessment and also equally intended for generating information that will help to get a sense of range of key issues and challenges that need to be addressed and be better informed on the context (social, economic, ecological) in which the project is likely to intervene.

Built upon the outcome of the RRA, subsequently PRA was planned to collect in depth information on the identified issues and to ensure greater participation of local people in information collection.

### **1.3 Purpose of the Report**

The main purpose of the present report is to present a synthesis of all findings from RRA and PRA exercises conducted by the IPAC central Cluster Team in IPAC Bhawal National Park during January-March, 2009. The report also details the methodology and tools used and highlight the issues in forest management and biodiversity conservation and identify the challenges for the IPAC Bhawal National Park. Finally, the report makes suggestions on what the project, Department of Fisheries, Department of Forest and Department of Environment need to do immediately. Finally, the report puts forward set of recommendations for the improved management of the forest of Bhawal National Park.

### **1.4 Outline of the Report**

The site level appraisal report, at first, provides an executive summary, which summarizes the entire ranges of the findings, methods used, issues and challenges identified during PRA. The report starts with general introduction in **Chapter 1** that includes the background information of the project, information needs of IPAC Bhawal National Park and logical basis for conducting PRA / RRA, the purpose of the report etc.

A brief description of the site is provided with a site map in **Chapter 2**.

**Chapter 3** sets out the methodology of the study that deals with the approach taken for the implementation of the fieldwork of RRA and PRA, study team and study period, objectives and methodology of the study. The chapter also includes study period, setting RRA and PRA issues

and questions, formation of RRA and PRA field teams, selection of RRA and PRA spots, choice of RRA and PRA methods and tools and the limitation of the fieldwork.

Outcomes of the RRA and PRA exercises are described in **chapter 4** which contain major findings and analyses. The findings are mainly presented as situational analysis of the forest resources, stakeholder analysis, resource and resource extraction, trend analysis, socio-economical situation of the surrounding area, seasonal trends in resource extraction, etc. In short, this chapter reflects the status of the forest dynamics with social dynamics.

**Chapter 5** presents issues and challenges for IPAC Bhawal National Park, an extended section based on PRA / RRA outcomes, identifying present issues of concern and challenges for NSP and highlights the opportunities for the project.

The final **Chapter 6** embodies a set of suggestions and recommendations regarding the implementation of the project. At last, a number of necessary references of all documents consulted and photographs are appended as annexure with the report.

## 2. Description of the project site

**2.1 Location:** Bhawal National Park, only 40 km north of central Dhaka on the Dhaka-Mymensingh High Way, offers serenity from the bustle of the city as well as a taste of the vast Sal Forests that once ran nearly uninterrupted from Dhaka onward all the way north to west Bengal. It is predominantly a recreational Park. IPAC Bhawal National Park Site situated in two Upazillas namely; Gazipur Sadar and Sreepur under Gazipur District, Dhaka Division. Geographical location of Bhawal National Park is approximately between latitude 23°55' to 24°00' north and longitude 90°20' to 90°25' east.

IPAC Bhawal National Park Site is bordered by Kaligong and Kapasia Upazilla of Gazipur District on the east, Gaffargaon and Bhaluka Upazilla of Mymensingh District on the north, Shakipur and Kaliakoir Upazilla of Tangail District on the west, Savar Thana, Uttara Thana and Rupganj Thana of Dhaka District on the south.

There are 5 upazillas under Gazipur District, namely: Gazipur Sadar, Sreepur, Kaliakoir, Kapasia, and Kaligonj of which IPAC Bhawal National Park Site is situated within Gazipur Sadar and Sreepur Upazilla. IPAC Bhawal National Park Site covers 3 unions of these two upazillas; 2 from Gazipur Sadar Upazilla, and 1 from Sreepur Upazilla. Unions under Gazipur Sadar are Kawaltia and Mirzapur Union and that of under Sreepur is Prahalladpur Union (Fig.1 - 6).

**2.2 Brief history:** Bhawal National Park Site with an area of about 5,022 hectares was declared as protected area through the Bangladesh Wildlife (Preservation) Order 1973 and subsequently enacted and amended in two phases as the Bangladesh Wildlife (Preservation, Amendment) Act 1974.

The Bhawal National Park stands as testimony to the value of long-term planning and local participation in conservation. After being totally cleared during the upheaval of the Liberation War, the Park was established in 1974 and officially gazetted as a Park in 1982. During past thirty years, the forest has re-grown from Sal coppies. The high rate of visitor's inflow to the park, particularly in the winter season has given rise to economic opportunities for the local residents. Now, the forest has re-grown and represents the largest forest block within an easy day trip of Dhaka.

By synthesizing the previous records; it is found that IPAC Bhawal National Park Site formed during Myosin Period of Tertiary Era which is about 2 to 3 cores of years before.

**2.3 Soil type:** The Park area presents an undulated configuration and consists of highlands called *Chalas* covered with forest trees intercepted by numerous depressions called *bairds* that are cultivated with paddy. Actually, most of the *bairds* are private land.

The soil of the area is acidic (pH 5.5), yellowish-red, sandy clay loam, mixed with scattered manganiferous iron ore. The newer alluminium is gray. The porosity of the soil is relatively poor and with the onset of the monsoon the soil melts and becomes very soft. The organic carbon is approximately 0.73%.

**2.4 Temperature and rainfall:** The temperature ranges from 11.7°C during April, which is the hottest month of the area. The monthly maximum and minimum temperature (°C) of the area is 34.3 in the month of April and 11.7 in the month of January.

The monthly average rainfall is minimum 3.4 mm in the month of December and maximum 339.0 mm in the month of August.

**2.5 Declaration:** Within Bhawal Forest, Bhawal National Park declared as a **National Park** dated 11<sup>th</sup> May 1982 as per Gazette Notification Number 66/318 with 8 Mouzas which containing 12,405.99 acres (5,022 hectares) forest land.

**2.6 Administration:** Wildlife Management and Nature Conservation Division, Dhaka.

**2.7 Infrastructures facilities / logistics:**

- **Management:**
  - 1 ACF Office, no Range Office,
  - 03 Beat Offices (one should be repair),
  - no Forest Camp, and
  - no Nursery.
- **Visitor:**

There are

  - 06 Rest Houses (4 AC, 1 Non AC and 1 damaged),
  - 13 Cottages (10 useable and 3 unusable),
  - Walking Trail (about 25 km.),
  - 03 Artificial Lakes (total length about 6 Km.),
  - 15 Ponds (5 within Core Zone),
  - 2 Observation Towers (1 damaged), and
  - 50 Picnic Spots (within and out side of the forest),
  - 1 Tourist Shop (with a canteen),
  - 1 *Tom Tom* (horse pulled van),
  - Several Tourist Vans, engine boats (within artificial lake) for tourist,
  - 1 Mini Zoo (with 12 spotted deers and 01 pheasants), etc.
- **Staffs facilities:**

There are

  - 1 ACF Quarter,
  - no Range Officer's Quarter,
  - 1 Beat Officer's Quarter, and
  - 01 Forest Guard's Barrack.
- **Vehicles:**

The followings are using patrolling purposes as vehicles for Forest Department Staffs.

  - 02 Motorcycles,
  - 01 Pickup, and
  - 01 Truck (need to be repair)
- **Equipment:** None: considering the tools like Fire Extinguisher, Binocular, etc.

**2.8 Boundary demarcation:** Partially Demarcated

**2.9 Management zoning:** Core Zone demarcated but not Buffer Zone.

**2.10 Habitat, Flora and Fauna:** Topographically the landscape comprises mainly plain land with some area covered by forest. This site was once a largely dense forest. The type of forest is deciduous with a mixture of evergreen forest. However, evergreen forest area is negligible.

**Identified flora:**

The main species of the forest is Shal / Gajari (*Shorea robusta*). Total identified plant species number is 202 species under 147 genera and 52 families. Gramineae in Monocotyledons and Leguminosae among the Dicotyledons are the most dominant represented by 25 species under each. Except Sal, the other notable floral species of the forest are Haldu, Koroï, Satian, Roina, Kadom, Dewa, Gutum, Ajuki, Neem, Kanchan, Shimul, Kanjal, Joyna, Palash, Sonalu, Gab, Jam, Bot, Ashatta, Jagdumur, Jial, Jiga, Jarul, Shinduri, Bonam, Amra, Chapalish, Amloki, Hortoki, Bohera, Hargaza, Gadila, etc. The herb and shrub species are Shati, Punch, Bashak, Shorpogondha, Ulatcombol, Shotomuli, Paharialu, Ampeng, Thaja, Dudalu, Adurag, Chutki gota, Kat badam, etc. There are many types of bamboo such as Jai bansh, Muli bansh and various canes like Jali bet, Golla bet. Besides, there are many types' climbers and vines, herbs and shrubs.

**Identified fauna:**

Total identified animal species is 72. Out of 72 species, 13 mammal species of which noteworthy are Irrawaddy Squirrel, Jackal, Jungle Cat, Small Mongoose, Rhesus Macaque, Bat (Indian False Vampire), Indian House Mouse, Pipistrel Indian Pigmy, Three striped palm Cevit, Bengal Fox, Five Stripped Palm Squirrel, Hoary Bellid Himalayan Squirrel, Hispid Hare, etc.

Identified 14 reptilian species are Monitor Lizard, Gekko, Mabuya, Common Cobra, Bengal Monitor Lizard, Banded Crait, etc.

Identified 6 amphibian species are Common Toad, Skipper Frog, Cricket Frog, Bull Frog, Maculated Tree Frog, etc.

Within identified 39 species, most common birds species are Red Jungle-fowl, Rufous Woodpecker, Gray-capped Pygmy Woodpecker, Fulvous-breasted Woodpecker, Green Bee-eater, Pied Cuckoo, Asian Koel, Green-billed Malkoha, Lesser Coucal, Greater Coucal, Rose-ringed Parakeet, House Swift, Barn Owl, Spotted Owl, Emerald Dove, Rock Pigeon, Spotted Dove, Cinereous Vulture, Brahminy Kite, Great Cormorant, Cattle Egret, Great Egret, Little Heron, Indian Pitta, Common Iora, House Crow, Black Drongo, Greater Racket-tailed Drongo, Black-hooded Oriole, White-throated Fantail, Rufous-faced Warbler, etc.

The Forest Department has recently re-introduced Peacock, Spotted Deer, Python, and Fishing Cats to the area.

Land surrounding the site and few patches outside the forest is intensively cropped. The entire area including the connecting Canals, Streams and Rivers are intensively fished with a diverse variety of gears. According to the local community there has been massive geo-physical change over last 20 years with rapid and almost complete deforestation of the forest area as well as only river Turag and Chilai followed by a rapid loss of connectivity due to encroachment and increased sedimentation.

The Turag & the Chilai River flowing in the western and in the eastern side of the forest respectively.

**2.11 Ecological context:** One of the few remaining patches of Sal forest (original forest has been destroyed; current one is secondary forest, originated from coppice and seedlings) in Bangladesh. Mammals once existed but at nearly present disappeared are – fox, jackal, small Indian civet, wild boar, blacked-naped hare.



**2.12 Forest types:** The Park contains low forest type with Sal generally comprising the upper layer of canopy. The lower canopy is still composed of Sal mixed with other medium-sized trees. This forest type comprises the major wildlife habitat in the park.

**2.13 Habitat types:** In line with the biogeographical zoning approach; three habitat types are identified in the Bhawal National Park, namely: low forest, cultivated paddies and grassland, and water body (man-made lake and natural floodlands). The low forest habitat includes the entire forest which generally serves as the main habitat of arboreal animals in the park.

The cultivated paddies and grassland habitat type is partly flooded during the monsoon season and generally dry during the rest of the year. During the cropping season the vegetation is generally rice land and some grass species. This habitat harbours some reptile species, ground birds, rats and frogs.

The lake and riverine habitat type harbour some introduced fish species, water birds, and amphibians. It is a limited habitat area due to the fact that the lake is managed primarily of outdoor recreation in the form of boating.

A summary of the various habitat types in terms of area in the Bhawal National Park Site is as follows:

<u>Habitat types</u>	<u>Total (ha)</u>
Low forest	4,472
Cultivated paddies / grassland	500
<u>Lake and riverine</u>	<u>50</u>
<b>Total</b>	<b>5,022</b>

**2.14 Habitat quality:** The forest habitat is generally preserved for the folivorous and frugivorous arboreal animals in the park. The forest guards generally control cutting of timber. Nevertheless, unfortunately, the gathering of coppies shoots and grazing of cattle inside the forest habitat are allowed to go on unabated. These activities affect adversely the quality of not only the forest habitat but also the recreational value of the entire park. Because of periodic cultivation and harvesting, ricefields are only for short-period habitation of wild animals in the park. Similarly, because of recreational use, the lake in the Park is a disturbed habitat of water birds.

**2.15 River Turag and Chilai, Canals, Beels, and Crops:** Most of the flood lands of forest areas receive water from the river Turag and Chilai. Turag originated from Old Brahmaputra. River and Chilai is a branch of River Turag. On the way, the River system connects many Canals, lower pockets (Beels) and tributaries that created a rich ecosystem for aquatic vegetation, fish, birds and other aquatic biota. The lower pockets (Beels) contain a few seasonal and perennial Beels rich with aquatic flora and fauna.

People surrounding the river basin largely depend on fishing. Boro rice is widely cultivated at the high and medium low lands of Beels in the dry season. The land is fertile and productive. However, there is risk of crop damage due to early flash flood and the community is vulnerable with such situation. The area remains under water at least six months in a year during Jaisthya to Kartik (May-October). This is the main cause of manifold problems, the people suffers from income hardness. To coopt such situations the community also involved in many other professions.

Farmers use river and Beel water for irrigation. Withdrawal of water by shallow pump causes water scarcity in the river and Beels during dry season. Even some part of river dries up due to extensive irrigation.

**2.16 Socio-economic context:** The Bhawal National Park is also a popular tourist spot. Tourists visit the park throughout the year. However, most of the tourists visit mainly during winter season. Subsequently, many people are employed through various services related to tourism. A huge number of people are living surrounding area of Bhawal National Park. Similarly, a huge number of people depend on the forest for subsistence. Around 20-25 groups (average number of visitors 600) visit Bhawal National Park each day. Compositions of visitors are 80 percent male and 20 percent female. There are 6 gates in BNP, where ticketing system available in each gate.

Fig. 1: Map of Dhaka Forest Division showing location of Bhawal National Park



Fig. 2. IPAC Bhawal National Park Site (commanded area in colour)





Fig. 3: IPAC Bhawal National Park Site (Satellite photograph)



Fig. 4: Social Map of Kawaltia Union Parisad, Gazipur Sadar Upazilla

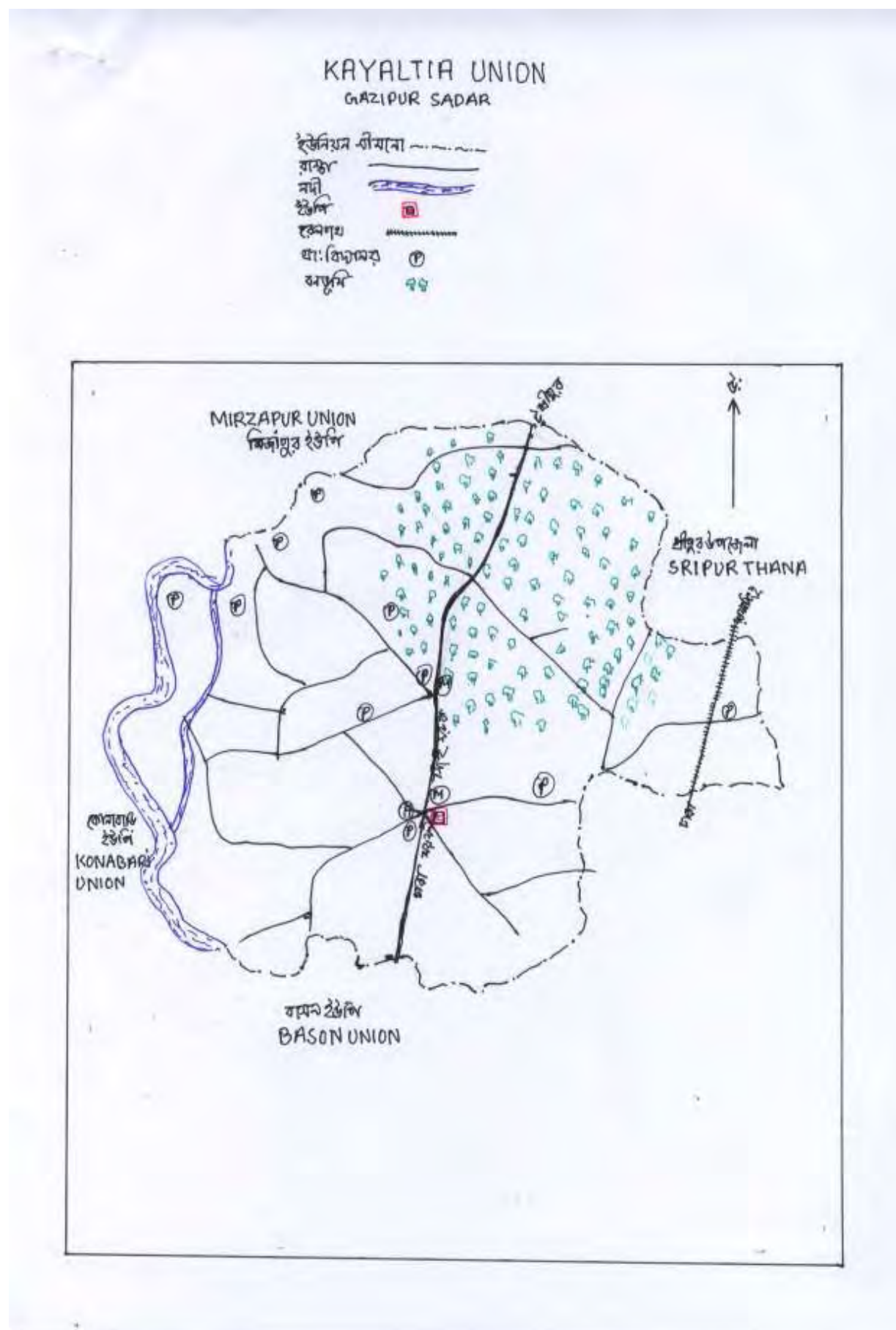
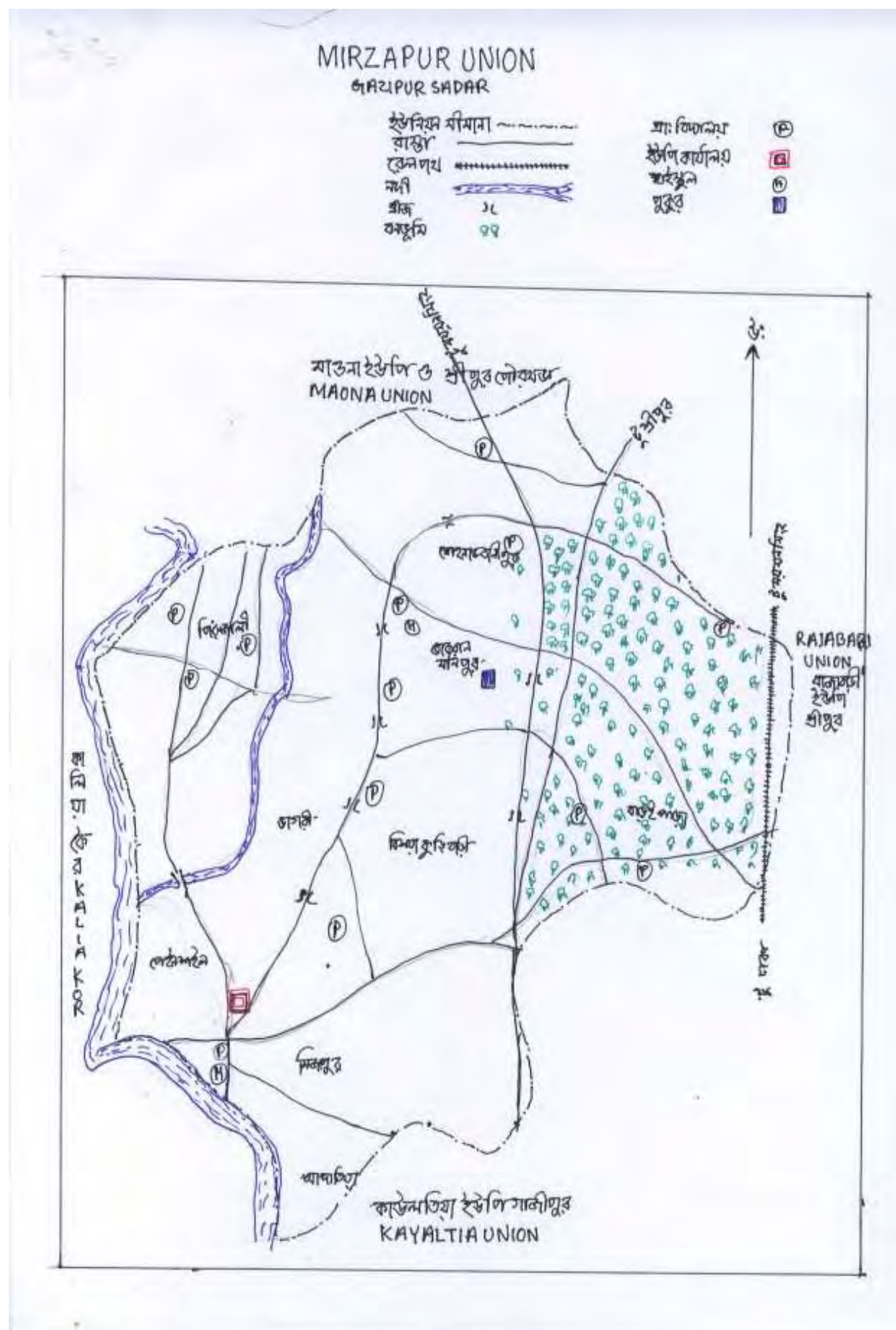




Fig. 5: Social Map of Mirzapur Union Parisad, Gazipur Sadar Upazilla



PRA / RRA Report of IPAC Bhawal National Park Site





### 3. Methodology

As mentioned in the preceding section a two-step rapid appraisal strategy has been conducted. RRA was conducted in the initial stage during the appraisal process, followed by PRA. RRA was carried out as an initial activity in the field with a primary focus on generating information that would help to get a sense of the range of stakeholders, key issues and challenges that need to be addressed and provide information on various context (social, economic, ecological, etc) in which the project will operate. Built upon the outcome of the RRA, a subsequent PRA exercise collected in-depth information on the identified issues and was designed to ensure greater participation of local people in information collection.

The overall purpose of the RRA and PRA was to come up with a comprehensive situational analysis of the IPAC Bhawal National Park Site with a view to understand:

- Who destroys the forest & why?
- How the forest being destroyed?
- What are the underlying driving forces for forest degradation?
- Livelihood and behavior of local people;
- Opportunities for improvement in forest management;
- How IPAC can be involved in the process?

#### 3.1 Developing the RRA and PRA: Issues and Methods

An interactive and consultative planning workshop was organized on 1<sup>st</sup> to 2<sup>nd</sup> May 2009 at IPAC Central Cluster Office, Madhupur to identify, prioritize and finalize the RRA issues and questions. The type and nature of issues, the research team's accessibility and mobility in the area, the behavior of local people and their rapport with the field staff were all taken into consideration in the design of these methods and tools. Specialists and representatives attended the workshop from IPAC team, field implementation partners (RDRS) and local FD staff, who were likely to be involved in the RRA field exercise. This workshop provided an opportunity to prepare a field protocol, decide and agree on approaches, methods and tools to be used and also to make and consolidate team understanding.

The detailed methodology for these activities was embodied in a manual and used in training workshops with the field teams to give instruction in using the research tools and ensure that the methodology remained same across the team and across the sites. A one-day training workshop was organized for the RRA team members on 5<sup>th</sup> May 2009. A similar workshop was also held for PRA on 7<sup>th</sup> May 2009. The purpose was to give the RRA and PRA field team instructions in using various tools. The workshop was held at the IPAC Central Cluster Office, Madhupur, on RRA and PRA, respectively.

The RRA was mainly based on structured and semi-structured household interviews, KI interviews, group interviews and focus group discussions (FGD). A limited number of other RRA tools were also used like trend analysis, seasonal analysis, sketch mapping etc. The issues and activities covered in the RRA are shown in Table 1.

**Table 1. Selected RRA Issues for Bhawal National Park, Specific Activities and Tools Used**

Sl.	RRA Issues	Specific activities	Tools	Participants
1	Stakeholder Assessment	-Identification of settlements, resource users, local institutions and agencies and organization, community organizations etc and their roles and activities	HHs Interview, KI, FGD, GD Sketch mapping & Review Records	Local HHs Local school teacher, Doctor, Upazila level GO/NGO Offices; Community people (villagers, elites etc) Local community people Local people
2	SH Demographic profile	- Settlement wise no. of HHs / population -HH occupation, education, -Dependency on forest resources, land holding	Secondary Info HH Int., KI, GD, FGD, Trend Analysis	Local union parishad; HHs heads/members Community people School/College teachers & local public representatives
3	SH Economic Activities / Livelihood Strategies and Human Capital Development	-HH primary and secondary income sources -HH Richness / poverty Unemployment and its seasonal trend Credit and alternate income generating opportunities -Skill and skill development opportunities -Seasonal workload of male and female	HH Int. GD, KI, FGD, Seasonal Calendar	HHs heads/members Teacher, retired officers, old people Public representative Local elite Community people Forest villagers
4	Gender Issues	-General impression on living standard, education and health status etc. -Participation in decision making (household and PA management) -Women mobility in the area -Access to IGA and credit etc	HH Int., GD ,FGD, KI, Direct observation	HHs heads Women group Community people Local elites RRA team members.
5	Behavior local people of	-Initial response of the local people and FD staff towards the project -Sources of conflict and conflict resolution	FGD, GD HH int.	Local community FD staff HHs heads
6	Local Level Awareness	-Awareness and perceptions about resource degradation and conservation -Willingness for resource conservation -Awareness about the existence of nearby park / game reserve and reserved forest -Knowledge about forest and wildlife preservation acts	HH int., GD, FGD	HHs heads Local community FD staff
7	Resources / resource status	-Trend in changes in major resource bases -Endangered/extinct plant and animals -Causes for the decline in different resources	Trend analysis, HH int., FGD, GD , KI	Local people / FD staff Local HHs heads FD staff Community people Local educated old,

Sl.	RRA Issues	Specific activities	Tools	Participants
8	Resource exploitation	<ul style="list-style-type: none"> <li>-Major forest resources collected, including NTFPs</li> <li>-Reasons and extent of exploitation of different forest resources</li> <li>-Dependency on the forest/forest products</li> <li>-Seasonal trend in resource exploitation</li> <li>-Future risks</li> <li>-Medicinal plant uses and reason for not using these</li> </ul>	HH int., FGD, GD, KI, Trend analysis, seasonal calendar	Local HHs heads Public representatives & FD staff Community people Local educated old, Local elite and FD staff HHs interview and KI
9	Resource regeneration practices	<ul style="list-style-type: none"> <li>-Plantation status in the locality</li> <li>-Problem with natural regeneration in the forest</li> <li>-Plant nursery</li> <li>-General land use pattern in the buffer zone</li> <li>-Major agricultural crop</li> <li>-Seasonal pattern in agriculture</li> </ul>	Secondary Information, FGD, GD, KI, Seasonal calendar	Secondary data from FD staff Community people Local elite, teacher Community people
10	Legal aspects	<ul style="list-style-type: none"> <li>-Access to the forest by locals</li> <li>-Forest villagers and land use agreement</li> <li>-Conflict and negotiation with FD staff</li> <li>-Land encroachment/recovery</li> <li>-Law enforcement mechanisms in the PA</li> <li>-Illegal tree felling and forest cases</li> </ul>	FGD, GD, KI, FGD, KI	FD staff and forest villagers Local community and local govt. members Local elites FD staff, community people Teacher, ex-officers,
11	Power structure	<ul style="list-style-type: none"> <li>-Local influential and their role,</li> <li>-local hierarchy Nature and sources of power and their domain of influence</li> <li>-Conflict and conflict resolution Social cohesion and adhesion</li> </ul>	HH int., FGD, KI, GD,	Local HHs heads Local community and local govt. Local community Local elites
12	Others	<ul style="list-style-type: none"> <li>- Access to areas and settlements,</li> <li>- NGO activities in the locality challenges for conservation</li> <li>Local problems,</li> <li>- Mobility in the area</li> </ul>	HH int., FGD, GD, KI	HHs heads Local community and local govt. Local people & FD staff Local elites

PRA issues and questions were developed by a three-person team of experts on the basis of field experience and outcomes of the RRA exercise. During the PRA, tools like Venn diagramming, resource mapping, seasonal analysis, trend analysis, mobility, livelihood analysis etc., were used in addition to interviews, focus groups and more informal discussions. More than one tool was used to explore any particular issue to allow the research teams to triangulate the information gathered. The issues and activities performed in the PRA are summarized in Table 2.

**Table 2. PRA Issues, Specific Activities Performed and Tools Used in IPAC Bhawal National Park Site**

Sl.	Issues	Specific activities	Tools	Participants
1	Forest Status and dynamics	<ul style="list-style-type: none"> <li>-observation on forest physiography and topography</li> <li>-land use cover, resource exploitation and regeneration areas, animal distribution</li> <li>-changes in forest cover, thickness, vegetation, settlements, animals and availability of resources</li> </ul>	Transect walk, KI Resource mapping Secondary data, FGD, KI Trend analysis	PRA Team Local elite, FD staff and , forest villagers
2	Local governance system; community structure and functions	<ul style="list-style-type: none"> <li>-Decision makers</li> <li>- influential people</li> <li>-Local community organizations and institutions and their linkages</li> <li>-Local conflict and conflict resolution</li> <li>-Social cohesion and adhesion</li> <li>-Collective action</li> <li>-Local problem, cause and possible solution</li> </ul>	Venn diagram FGD & GD and Ranking	As above and local elite
3	Livelihood strategies	Income and expenditure sources, Livestock, Richness and poverty	Wealth ranking HH interview	Women group and local people
4	Gender issue	<ul style="list-style-type: none"> <li>-Role in family decision making</li> <li>-mobility</li> <li>-workload</li> <li>-Education and access</li> </ul>	Decision making chart, Mobility map, Daily and seasonal work Chart, HHs Int. & FGD	Women and local educated people
5	Fuel wood collection	<ul style="list-style-type: none"> <li>-Information on collector</li> <li>-Purpose and driving force for collection</li> <li>-Dependence on the extraction for their livelihood and its extent</li> <li>-Uses and marketing channel of the resource</li> <li>-Level of extraction and seasonality</li> <li>-Conflict with FD or other people over the extraction</li> <li>-Negotiation for carrying out the activity</li> <li>-Alternate source for the collection of the resources</li> <li>-Needs and expectation of the collector</li> <li>-Impact on the forest and future risks for the collector</li> </ul>	FGD & GD, seasonal analysis	Fuel wood collector, community people, local hotel and tea stall owners, local Imam and other religious person

Sl.	Issues	Specific activities	Tools	Participants
6	Illegal felling timber	<ul style="list-style-type: none"> <li>-Information collector</li> <li>-key people behind the activity and network</li> <li>-Purpose and driving force for collection</li> <li>- uses and marketing channels and dependence</li> <li>-What encourages them to take up the activity</li> <li>-Anybody protect them, if they are in problem</li> <li>-Protection by FD or by any other agencies (e.g. Police etc.)</li> <li>-conflict and negotiation with FD or other people</li> <li>-needs and expectation of the feller</li> <li>-impact on the forest and future risks for the illegal feller</li> <li>-Seasonality and trend in timber extraction</li> </ul>	FGD, GD and KI, Seasonal calendar and trend analysis	Illegal timber feller, FD staff and community people, teacher and local elite
7	Collection of trees as building materials	<ul style="list-style-type: none"> <li>-Information on collector</li> <li>-purpose and reasons for collection</li> <li>-uses of the resource and extent of extraction</li> <li>-dependence on the extraction and marketing</li> <li>-conflict and negotiation with FD or other people over the extraction</li> <li>-alternate source for the collection of the resources</li> <li>-needs and expectation of the collector</li> <li>-impact on the forest and future risk for the collector</li> </ul>	FGD, GD, KI	Community people, FD staff, forest villagers, local public representative and elite
8	Bamboo and cane collection	<ul style="list-style-type: none"> <li>-Information on collector</li> <li>-purpose and reasons for collection</li> <li>-uses of the resource and extent of extraction</li> <li>-dependence on the extraction and marketing</li> <li>-conflict and negotiation with FD or other people over the extraction</li> <li>-alternate source for the resources</li> <li>-needs and expectation of the collector</li> <li>-impact on the forest and future risk for the</li> <li>-seasonal changes and trend in abundance</li> </ul>	FGD, GD Seasonal calendar and trend analysis	Bamboo and cane collector, community, people and FD staff Bamboo collector and local people

Sl.	Issues	Specific activities	Tools	Participants
9	Information on Forest villagers & Ethnic Community	-Distribution of forest villager's & ethnic communities settlements -Registered and actual number of forest villagers -Compliances to FD agreement -Present economic activities -Resources exploitation and dependence on forest resources -land encroachment by the forest villagers or by their dependant -relationship and conflict with FD -internal governance system -needs and expectation	FGD Secondary data	Forest villagers, Ethnic Community and FD staff FDs villagers register
10	Pineapple, lemon, papaya, banana, cultivation	-distribution of Lemon yards within and approximation of its number -historical perspective of flourishing the activity in the area -information on cultivator -ownership of land -dependence on the activity -Impact on the forest resources -Conflict with FD	FGD GD GD	Lemon cultivator FD staff Local community

Each PRA tool was used to collect information about more than one issue, as shown below:

**Venn diagramming:** local power structure, local community organizations, local institutions and agencies, local conflict and conflict resolution, family decision making, mobility of women & men, local NGO / CBOs

**Seasonal calendar:** fuel-wood, bamboo and timber collection, unemployment, workload, accessibility to forest, transportation problem, brickfield / sawmill operation, forest patrol, agricultural activities, collection of building materials, hunting, vegetable collection, damaged by wild bore, sun-grass extraction.

**Trend analysis:** forest cover, forest thickness, tall trees, herbs and shrubs, forest use, unemployment, local solvency, land encroachment, settlement / population solvency / income, livelihood expenditure, literacy, unemployment, use of forest for income, use of forest for HH needs, transportation and mobility, homestead plantation, food scarcity, credit and IGA, occupation, damages by wild bore, wildlife, hunting, illegal tree felling, fuel wood collection, bamboo and cane collection, fruit bearing trees in the wild, livestock, turtles and tortoises, agricultural activities, medicinal plants.

**Ranking and scoring:** local problem ranking, wealth ranking, and livelihood analysis

**Transect walk:** Soil, vegetation, land use, elevation, crops, wildlife, human activities etc

**Forest resource mapping:** forest land use cover, resource zones, resource exploitation zones, animal distribution, settlements.

**Mobility:** Various professional group identification with their daily and seasonal movement.

**Road Networking:** Inter district roads, secondary roads within the locality, pacca and semi pacca roads and forest tracks identified by using local maps and physical visits.

## 3.2 Preparation of Fieldwork

### 3.2.1 Formation of RRA and PRA Field Teams

The RRA field teams were formed with representatives from RDRS Bangladesh, Worldfish Center, and FD local staff, having biological and sociological background. The teams make up for the RRA and PRA field exercises are provided in the table 5. During RRA and RRA field teams were formed a common team (Table 3). The teams worked simultaneously in the field of different locations.

**Table 3. Team of PRA and RRA of IPAC Bhawal National Park Site**

Sl. No.	Name	Organization
01	Masood Siddique	IPAC-Worldfish Center
02	Shital Kumar Nath	IPAC-RDRS Bangladesh
03	Md. Abdul Jalil	IPAC-RDRS Bangladesh
04	Parvez Kamal Pasha	IPAC-RDRS Bangladesh
05	Md. Touhidur Rahman	IPAC-RDRS Bangladesh
06	Md. Ahosan Habib	IPAC-RDRS Bangladesh
07	Primus Pahan	IPAC-RDRS Bangladesh

### 3.2.2 Selection of RRA and PRA Sites

On the basis of information provided by local FD and other GO agency staffs and the field implementing NGO (RDRS), various sample locations were selected for the purpose of information collection. These locations are hence called RRA and PRA spots. The selection of locations was based on a number of selection criteria. The selection process was completed during planning workshop. While the number of sites visited during the RRA was limited, the team focused on gaining an overview of issues covering the whole of the Reserve Forest area. However, because of the size and geographical location of the RF, it became clear there would have to be a trade off between the size of the study area and the depth and quality of the information collected. Therefore, a decision was made that the PRA would focus on only issues and stakeholders relating to the management of forest within the Bhawal National Park (NP) area. A list of the selected RRA and PRA spots for IPAC Bhawal National Park Site is given in Tables 4 and 5.

### 3.2.3 Selection of RRA and PRA Transect Route

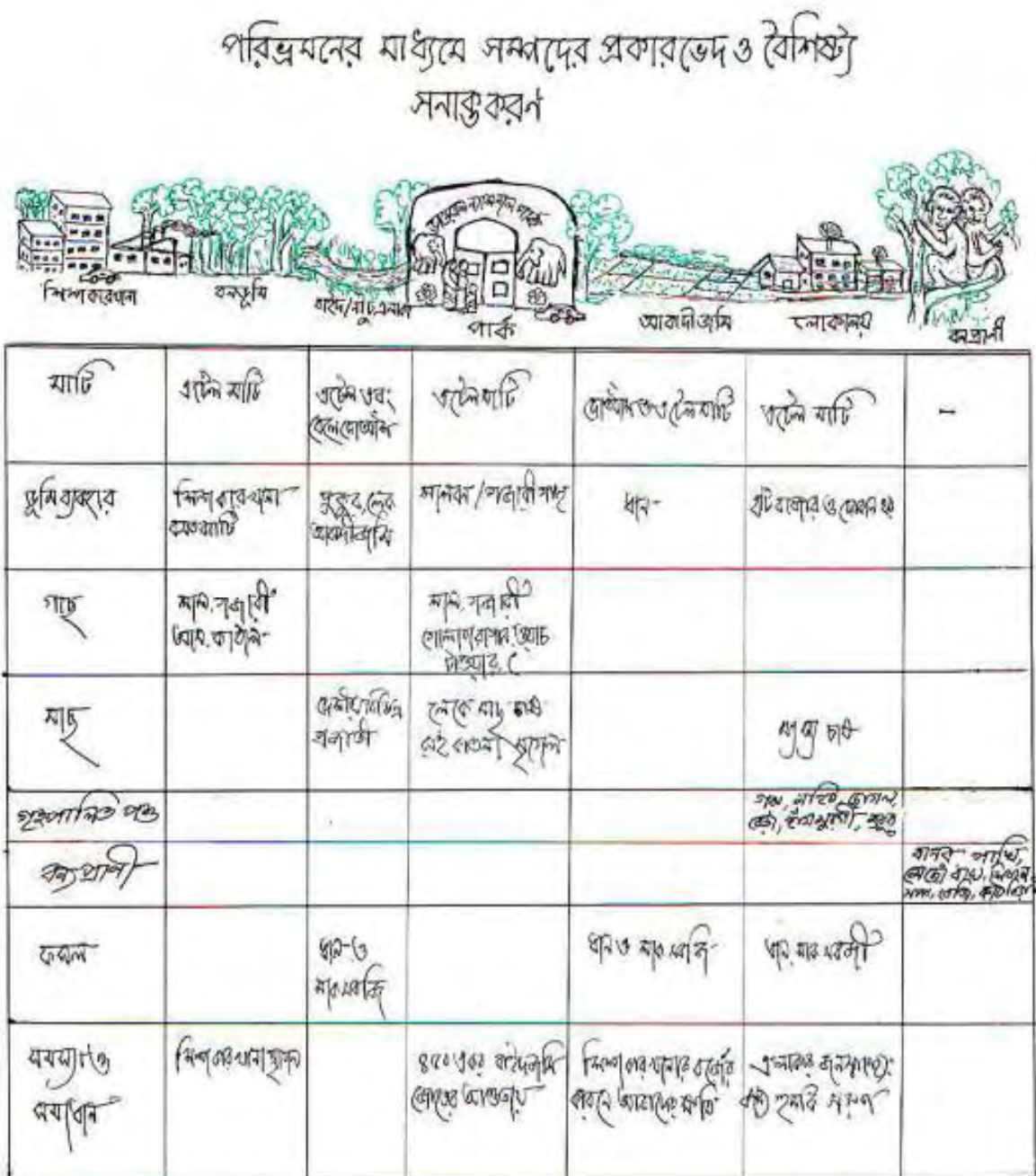
To get a quick physical view of the whole project area four transect conducted from different direction as Table 4 and Fig.9

**Table 4. List of Transect Schedule at Bhawal National Park Site**

Sl. No.	Date	From	To	Route and area coverage
01	16.05.09	Shalna Check Post	Sreepur Upazilla Parisad	Through core zone of the forest south to north through Dhaka-Mymensingh Road. Through this route we found Bhawal ACF Office, Rajendrapur Range Office, Rajendrapur Park Range Office and Sreepur Range Office.
02	17.05.09	Rajendrapur Chow Rasta	Mirzapur Union Parisad	Through forest east to west through Rajendrapur-Mirzapur Road. Through this route we found forest, many industries, Rover Scout Training Academy, etc.
03	18.05.09	Rajendrapur Bus Stand	Prahalledpur Union Parisad	Through forest from west to east. Through forest adjacent village area and patches of forest, cantonment board office and other relevant offices, some NGO offices, etc.
04	19.05.09	Gazipur Town	Bonkoira Beat	Through core zone area of the forest, from south to north-east of the forest. Through this way we met with <i>baidis</i> , several sawmills, several furniture shops, Hat-Bazar, etc.



Fig. 7: Transect walk of IPAC Bhawal National Park Site



### 3.2.4 PRA Schedule, Spots and PRA Activities

A total of 35 Mouzas and 136 villages having varied degree of stakes within three unions have been identified. The villages belong to 3 Unions namely; Kawaltia, Mirzapur of Gazipur Sador Upazilla and Prahalledpur of Sreepur Upazilla of the project area (Table 15). Out of those main PRA spots of the project area listed in Table 5.

**Table 5. PRA Schedule, Spots and PRA Activities in Bhawal National Park Site**

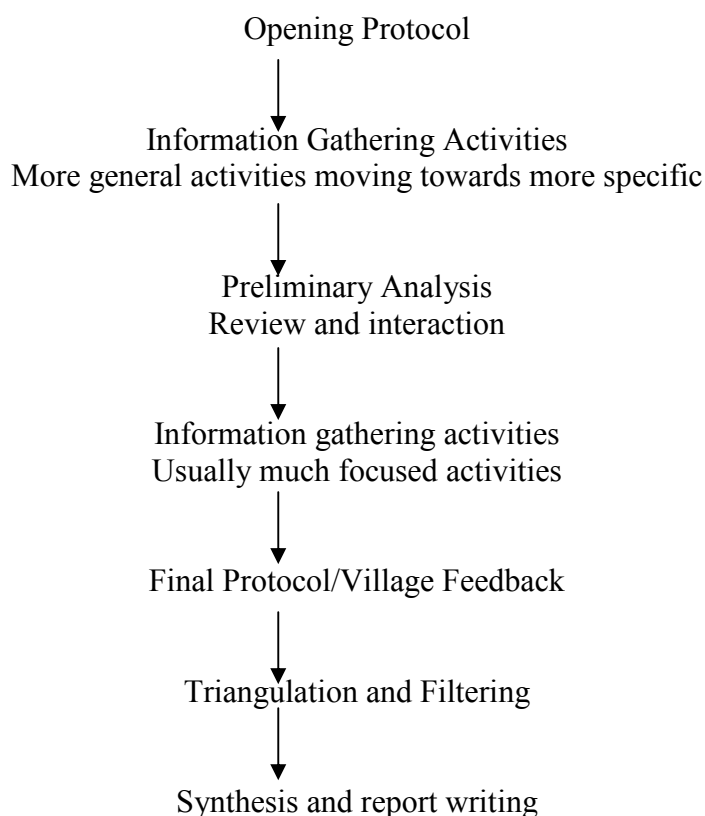
Date	Village/ Location	Performed activities	Remarks
23.05.09	Kawaltia UP	GD(1), HH interview(3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
24.05.09	Mirzapur UP	GD (1), HH interview (3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
30.05.09	Prahalledpur UP	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
09.06.09	Village: Bahadurpur, Bahadurpur Mouza, Mirzapur UP	GD (1), KI (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. KI with local UP member ,Social Mapping with local people
09.06.09	Village: Arishowprashad, Arishowprashad Mouza, Mirzapur UP	FGD (1), KI (1), HH interview (4) Social Mapping	FGD with forest villagers, KI with head man of forest village, HH with female group
13.06.09	Village: Purba Shalna, Shalna Mouza, Kawaltia UP	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping, and FD Staff
14.06.09	Village: Bishyakuribari, Bishyakuribari Mouza, Mirzapur UP	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
16.06.09	Village: Baroipara, Bariopara Mouza, Mirzapur UP	GD(1), HH interview(3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
18.06.09	Village: Bhabanipur Akonda Para, Mohona Bhabanipur Mouza, Mirzapur UP	GD (1), HH interview (3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
21.06.09	Village: Bonkharia Khetapaglar Mazar, Bonkharia Mouza, Prahalledpur UP	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
23.06.09	Village: Kuchiamara, Bonkharia Mouza, Kawaltia UP	GD (1), KI (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. KI with local UP member ,Social Mapping with local people
24.06.09	Village: Uttar Shalna, Uttar Shalna Mouza, Kawaltia UP	FGD (1), KI (1), HH interview (4) Social Mapping	FGD with forest villagers, KI with head man of forest village, HH with female group

### 3.3 Field Implementation Strategies

#### 3.3.1. Organization of RRA and PRA field work

The organization of field exercises involved a series of logical steps. The field teams put their efforts to adhere those steps. The flow of activities is shown in the following flow chart.

**Fig. 8: Flow of RRA / PRA Field Activities** (Duration: 3-4 days)



During RRA exercise, a total of 40 HHs interviews, 2 focus group discussions, 4 group interviews, 4 key informant interviews, were conducted. The other PRA tools were applied during above mentioned interviews and discussions. Similarly, during PRA a total of 56 HH interviews, 12 Group interviews and 7 focus group discussions, 6 key informant interviews were conducted. This is summarized in Table-6.

**Table 6. Summary of performed activities in Bhawal National Park Site during PRA & RRA at a glance**

Appraisal	Village covered	FGD	GD	KI Interview	HH Interview	Transect	Resource and social mapping
RRA	7	2	4	4	40	4	12
PRA	12	7	12	6	56	4	12

The other PRA tools were used either during the above exercise or in separate exercises dedicated for this purpose. Further details on the implementation of the fieldwork methods used are provided below.

### **3.3.2 Household (HH) interview**

- Individual / HH interviews were conducted with random selection of interviewees, typically visiting one household at each stop.
- Both male and female respondents were considered.
- Typical HH interview last for about 1 hr – 1:30 hr
- The interviewees were treated as respondents to a questionnaire, active participants in an unstructured / semi-structured interview. A checklist of issues was used as a basis for questions, not necessarily addressing all questions in each interview and sometimes departing from basic questions to pursue interesting, unexpected or new information, relevant to the project and situation.

### **3.3.3 Key informant (KI) interview**

Key informants are local people who have extensive knowledge on the local environment, situation and events. The purpose of this interview was to utilize them in collecting information from them that would be relevant to the project needs.

- KI interview was by prior appointment. A local guide helped in making appointments with the KI. The interview was taken by paying visit to Key informant HH or by inviting him to the team base
- A preliminary discussion with local FD staff, IPAC field partner staff and interview of local people gave adequate clue for selecting KI. Preferably local school teachers, retired officials, local elites or local public representatives were selected as the KI.
- A typical KI interview lasted for about 1.5 hrs. The entire team took part in the interview taking session
- As with HH interview, a similar checklist of questions used for the purpose of KI interview.

### **3.3.4 Group Interview (GI)**

- The purpose of the planned Group Interviews was to collect some information on the locality and local situation based on the consensus of the local people.
- Interviews were conducted at places, preferably at local tea stalls, road junctions and other local community places, where local people gathered spontaneously. No formal invitation to the local people was made for participating at the group interview.

- Mapping, seasonality, ranking and scoring exercises, whenever possible, were done in such group interviews.
- Typically a group interview lasted for about 1.0 - 1.5 hrs
- At least one group interview was held each day
- This was basically an unstructured interview and a checklist of issues was used as a basis for questions

### **3.3.5 Focus Group Discussion (FGD)**

Focus Group Discussions were carried out with different professional groups, resource user groups, local public and government representatives with a view to collect information on specific areas.

- During PRA, FGDs were principally conducted with different stakeholder groups, mainly with local FD staff, forest villagers, local public representatives etc. other professional groups, like fuel-wood collector, sawmill owner, etc.
- The FGDs were conducted by invitation and a local guide was used to invite the people.
- Senior project personnel /or senior personnel from the partner NGO /and or senior FD Official and/or experts were usually present in the FGD sessions.

### **3.3.6 Other PRA tools**

Other PRA tools were either incorporated into the interview and discussion processes outlined above or carried out through separate exercises dedicated for this purpose. Resource mapping, Venn diagramming, seasonal calendaring, mobility, trend analysis, ranking, scoring, record reviewing etc. were done usually in separate sessions dedicated to these activities. However, sometimes, these exercises were also performed during group, focus group and key informant interviews. The participants were either invited local people or local people instantly gathered at places.

### **3.3.7 Direct observation**

The team while walking through the project area, talked to local people, discussed many things and made observation on the resources, people's behavior and their activities, etc. These observations and informal discussions helped to triangulate collected information and generate new questions for interview or discussions.

### **3.3.8 Secondary information collection**

Some demographic data was collected from the relevant local Union Parishad sources. The secondary information collected from several sources for report preparation.

### **3.3.9. Reflection and analysis**

After each day of fieldwork, the team sat together for about 1 ½ hours for team interactions and triangulation. The activities performed during the session included:

- Reviewed information gathered that day and made summary of the information, triangulated whenever necessary. The person designated for report writing took note of discussions
- Next day's activity planning
- Methodological review

### **3.3.10 Triangulation and filtering**

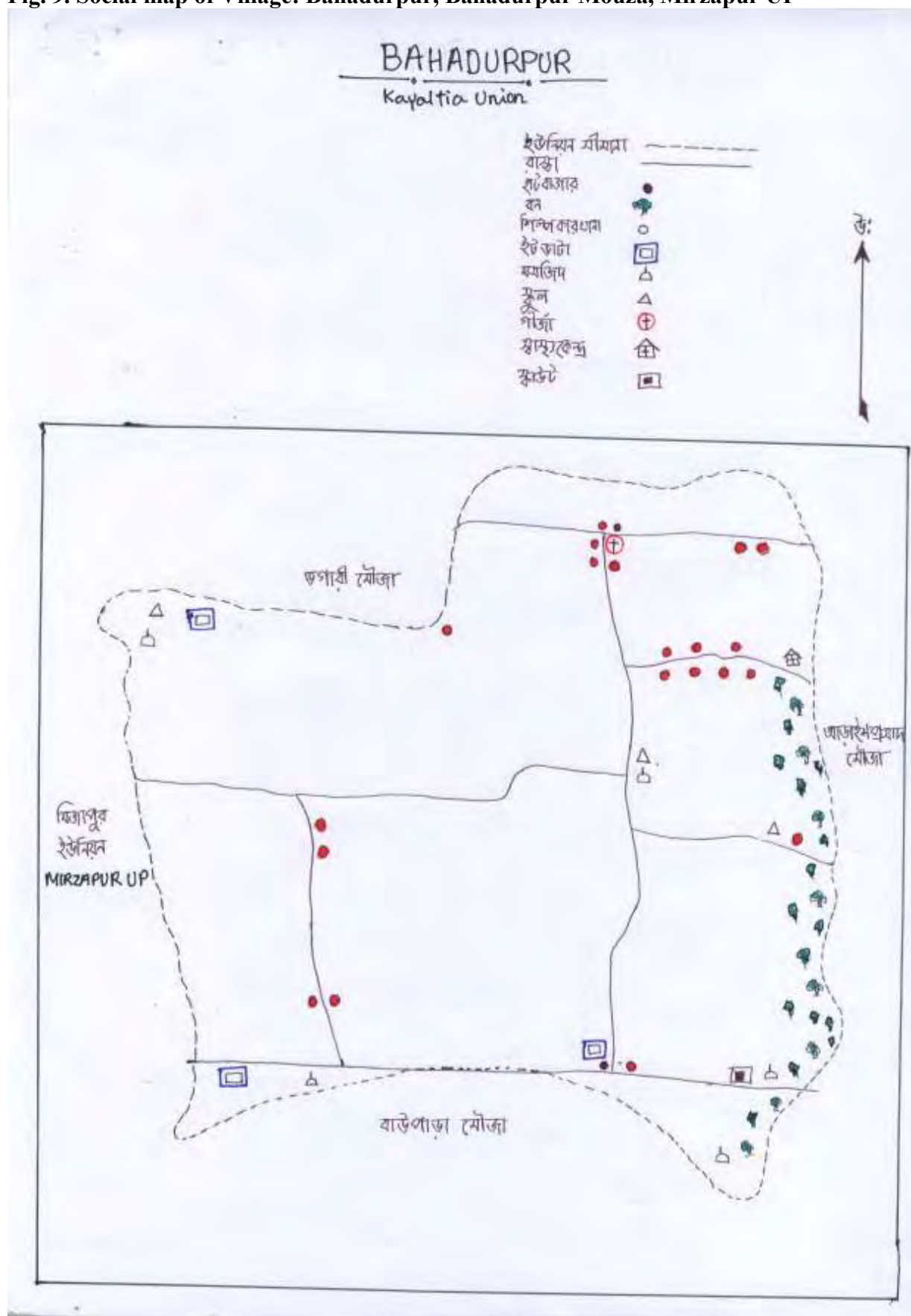
Single information may be collected by using several tools or from several sources. The team cross-checked their results and accepted the most logical analysis. During these feedback sessions and subsequent data analysis, team members were required to use their own judgment to ensure the most reliable analysis of the situation.

## **3.4 Limitations of the Fieldwork**

No remarkable limitations observed in PRA and RRA period. The mentionable limitations were as below:

- The main limitation of the field work was that it took place during the rainy season. This made working conditions difficult, and in particular meant that the traditional PRA approach of participants working together to complete large scale matrices on the ground was impossible, and researchers recorded information in note form and by completing matrices themselves either during the group discussion or afterwards. Therefore this work does not match the usual requirements of a PRA where information is analyzed and owned by the participants. These difficult conditions also meant that accessing the forests to undertake transect walks, was also frequently impossible due to bad weather and impassable tracks.
- logistic support for PRA and RRA was not sufficient
- FD staff and local muscle men in some cases used to keep hidden the real information

Fig. 9. Social map of Village: Bahadurpur, Bahadurpur Mouza, Mirzapur UP





**ARISOPROSAD**  
Kayaltia Union

মৌজা এখানো  
সড়ক  
হাট বাজার  
মন্দির বাড়ানা  
মসজিদ  
জমিদার বাড়ি  
ব্র্যাক পোর্ক  
গ্রাম

জাওয়ান ন্যামানিয়ার  
অপুদি  
FDR O  
স্কুল  
জেলখানা

□  
●  
○  
△  
□  
□  
□

বিক্রোজী মৌজা

উঃ

বায়দুর পুর মৌজা

বনকজিয়া মৌজা

উজুর মলনা মৌজা



[illegible]

Fig. 12. Social map of Village: Bishyakuribari, Bishyakuribari Mouza, Mirzapur UP

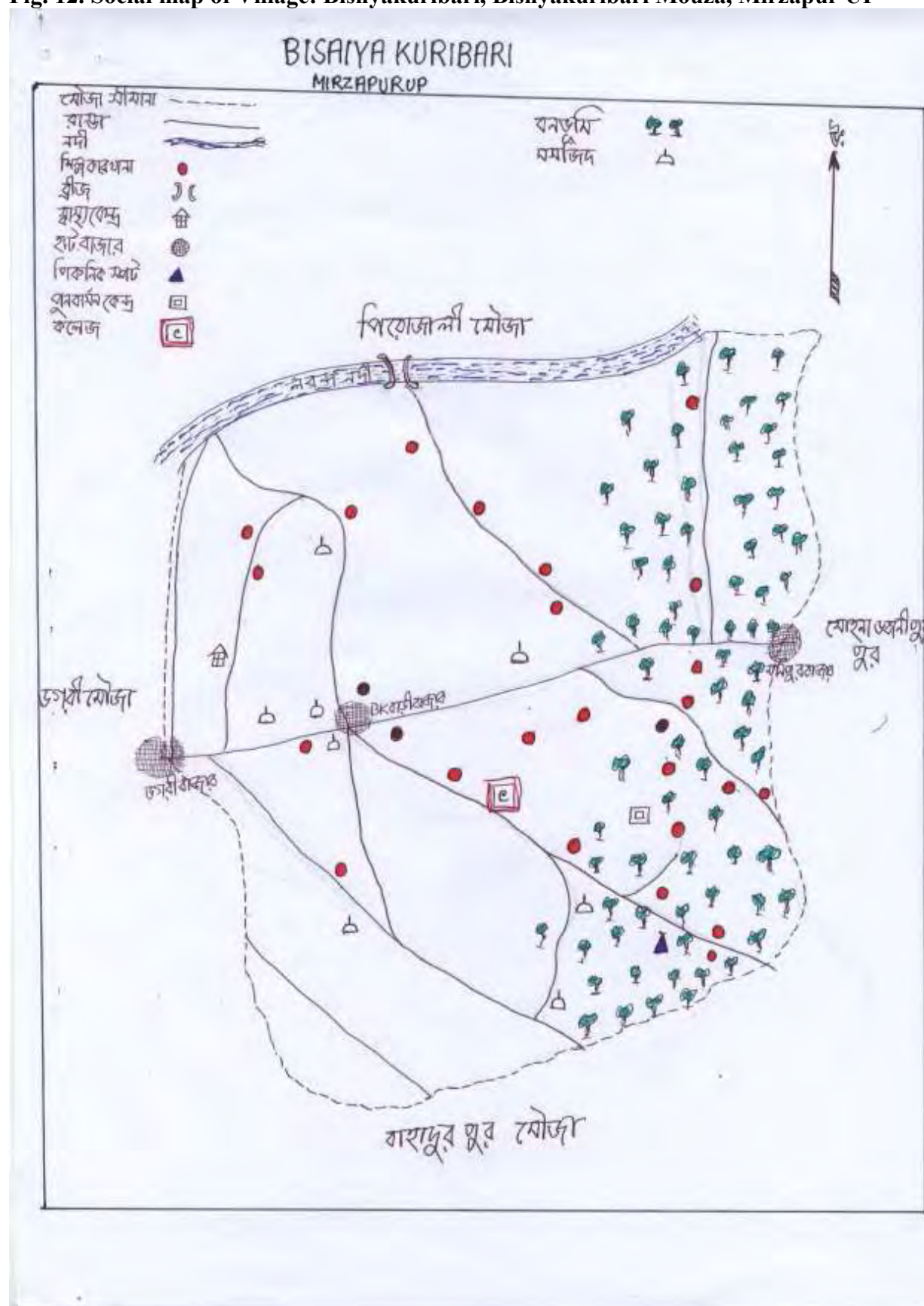
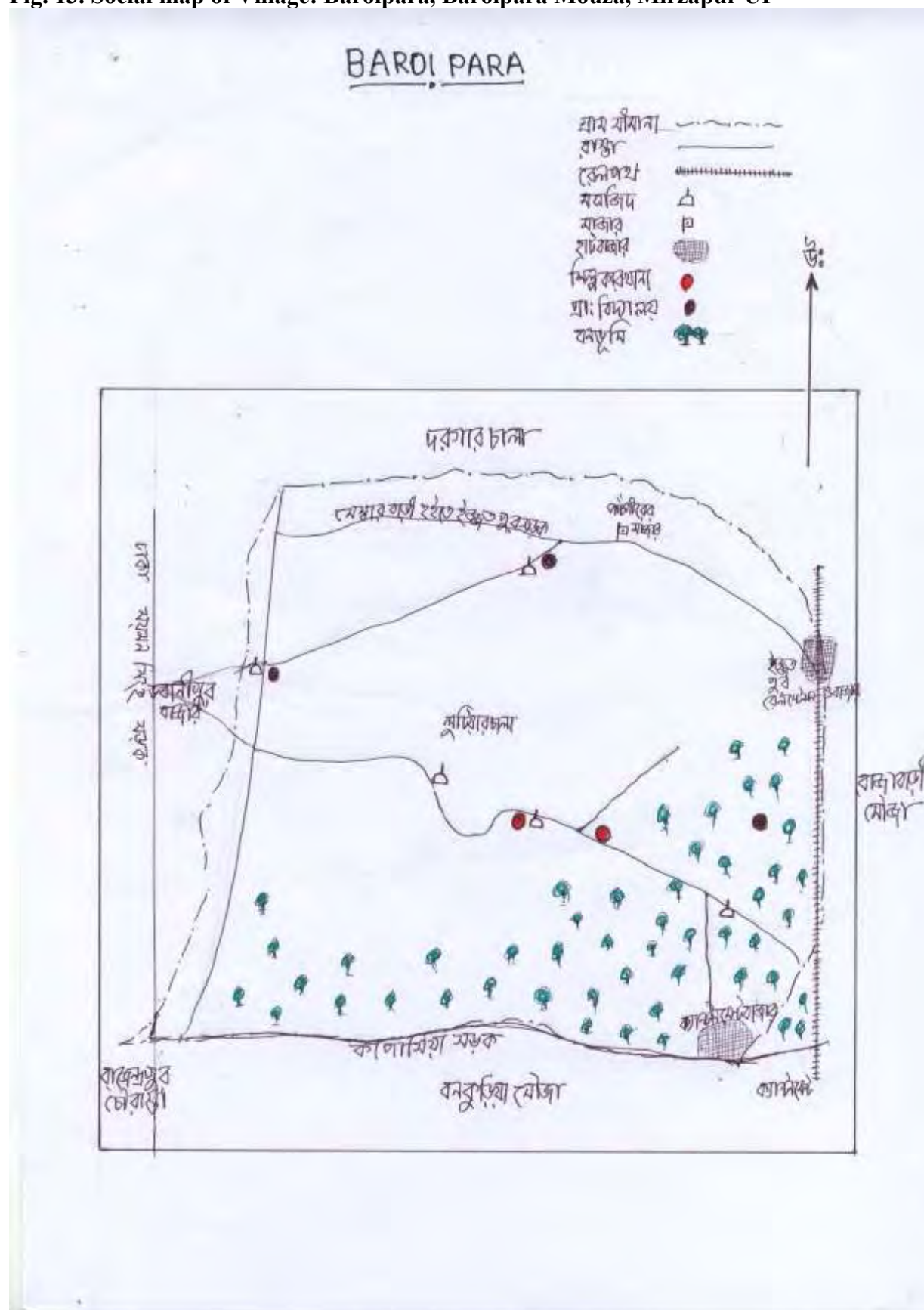


Fig. 13. Social map of Village: Baroipara, Baroipara Mouza, Mirzapur UP





**Fig. 14. Social map of Village: Bonkharia Khetapaglar Mazar, Bonkharia Mouza, Prahalledpur UP**

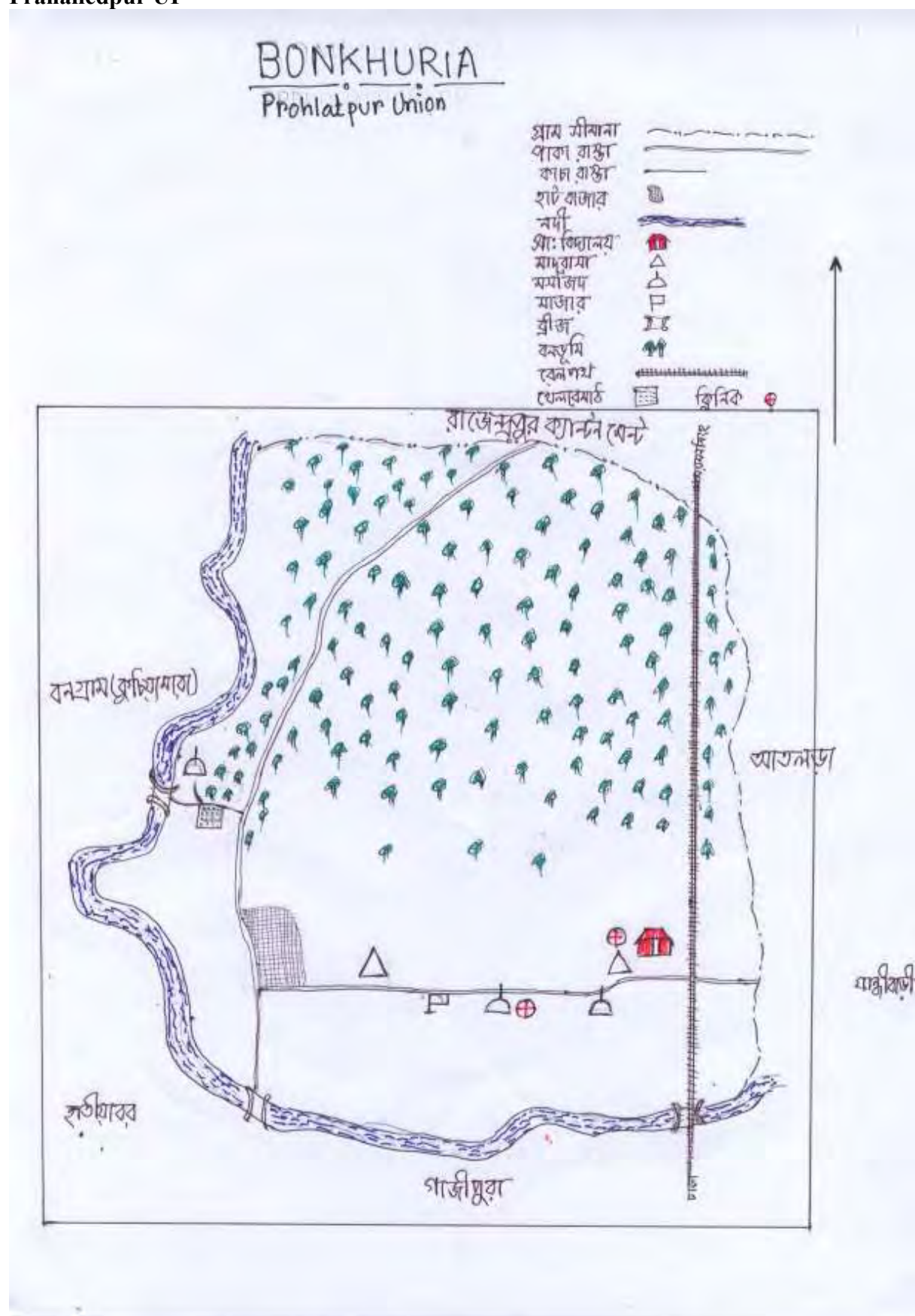


Fig. 15. Social map of Village: Kuchiamara, Bonkharia Mouza, Kawaltia UP

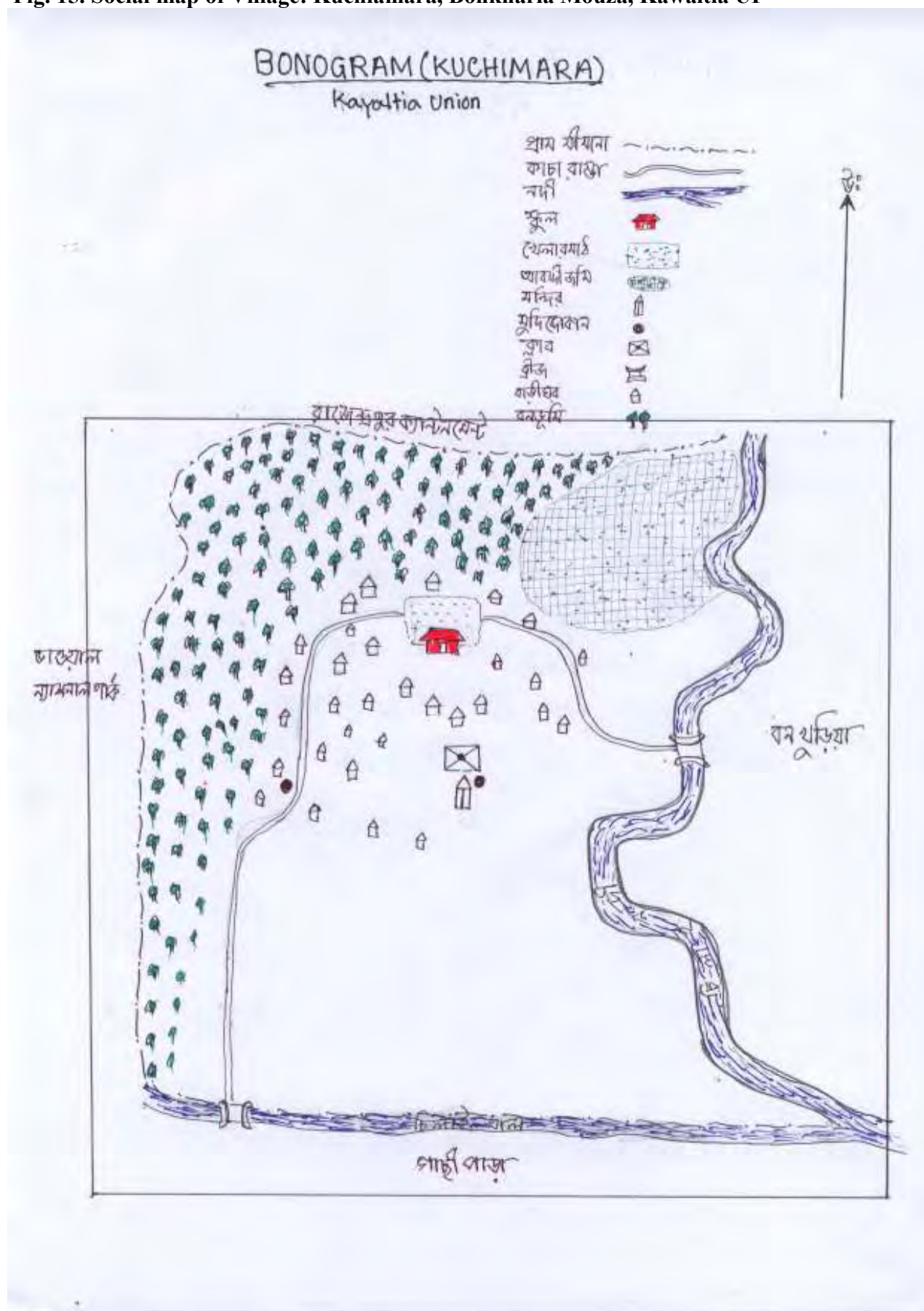
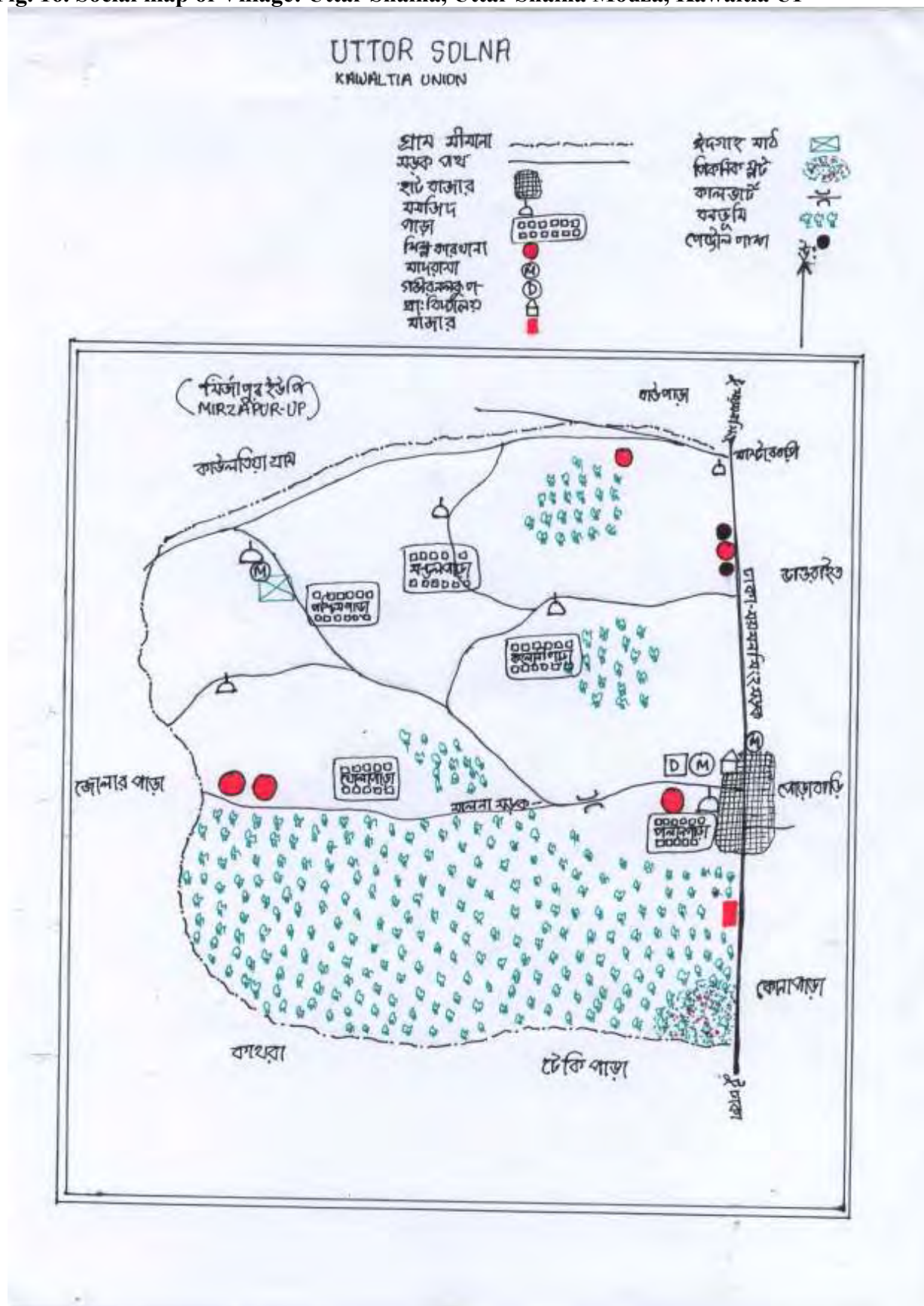


Fig. 16. Social map of Village: Uttar Shalna, Uttar Shalna Mouza, Kawaltia UP





## 4. Findings

### 4.1 Forest Resources: Status and Trend

Sal forests constitute a unique biological diversity, covering vast areas in the centre and east of Bangladesh. They constitute 70- 75% "Sal" trees including several other valuable trees and herbaceous species like the sun grass. Nevertheless, the Asian Development Bank (ADB) has actively promoted the destruction of the "Sal" forests by considering them of low productivity. In this regard, financing projects were granted for tree monoculture plantations using Eucalyptus and rubber among other species. Now a day, the only big patch of Sal forest standing is that of Madhupur. Most of the forestland has been denuded, degraded and occupied by forestry companies or displaced people. Contribution on forest management, resident people and protected area, natural resource management, and structure and diversity of natural and managed Sal forest in the Terai of Nepal have also focus on the wildlife biodiversity. The wildlife at Bhawal National Park was well known for its peacocks, tiger, leopard (black panther also) elephant, clouded leopard, sambar deer, etc. However, the overall situation is that these wild lives have disappeared and few mammals (squirrel, mongoose, jackal, civet, jungle cat, etc.), few reptiles (monitor lizard, snakes) and some indigenous birds remain.

In fact, clear felling, and subsequent long- and short rotational plantation practices have altered most parts of the natural forest. However, in some of the oldest long-rotation plantations, the vegetation cover has taken on the structure of a secondary natural forest with the re-growth of creepers and naturally occurring trees and undergrowth species.

The biodiversity lost in course of time due to increasing settlement, more human invasion, the sound of air force's firing range, free roaming the livestock, forest firing, etc. By the impact of the mentioned factors the forest is shrinking, the wildlife is losing their habitat and food.

#### 4.1.1 Floral biodiversity:

M. Oliur Rahman and Md. Abul Hassan, Department of Botany, University of Dhaka, Dhaka-1000, Bangladesh conducted a floral survey on Bhawal National Park, Gazipur, Bangladesh between May 1992 to March 1994. This study report published in the Bangladesh Journal of Plant Taxonomy. 2 (1&2): 47-79, 1995 (June & December). They identified total floral species are about 202 as shown in the publication are shown in the following list.

#### MONOCOTYLEDONEAE ALISMACEAE

***Sagittaria guayanensis* H.B.K. ssp. *lappula* (D. Don) Bogin, Mem. N.Y. Bot Gard. 9 : 192 (1955).**

An annual, scapigerous herb. Flowers white. Achene elliptic. Fl. & Fr. : June-August. In ponds, canals, beels and low lands.

Representative specimen: Araaisaprasad, 3 viii 1992, No. 151

***S. sagittifolia* L., SP. PL. 2: 993 (1753).**

A scapigerous aquatic herb with long stolons. Flowers white. Achene obliquely obovate. Fl. & Fr: October-December. In shallow water, ditches, beels and low lands.

Representative specimen: Baruipara, 8 iv 1993, No. 478.

## GRAMINEAE

**Alloteropsis cimicina** (L.) Stapf in Prain, Fl. Trop. Afr. 9 : 487 (1919). *Milium cimicinum* L.; *Axonopus cimicinus* (L.) P. Beauv.

A tufted perennial grass. Spikelets ovoid, dorsally compressed. Glume ovate-lanceolate. Grain ovate, flattened. In waste places.

Representative specimen: Araisaprasad, 4 vii 1992, No. 145.

**Arundinella bengalensis** (Spreng.) Druce in Rep. Bot. Exchg. Club. Brit. Isles: 605 (1961). *Panicum bengalense* Spreng., *Arundinella wallichii* Nees ex Steud.

A stout perennial grass. Spikelets densely imbricate. Glumes ovate-lanceolate. Grain narrowly oblong.

In deep forest, near railway lines and edges of paddy fields.

Representative specimen: Bahadurpur, 24 xii 1992, No. 338.

**Axonopus compressus** (Swartz.) P. Beauv., Ess. Agrost. J 2, 154, 167 (1812). *Milium compressum* Swartz.

A tufted, perennial grass. Spikelets oblong to lanceolate-oblong. Glumes membranous. Grain elliptic-oblong, flattened. In low lying, clayey or sandy soil.

Representative specimen: Uttar Salna, 2 ii 1993, No. 436.

**Brachiaria distachya** (L.) Stapf in Prain, Fl. Trop. Afr. 9: 565 (1919). *Panicum distachyum* L.

An annual or perennial grass. Spikelets elliptic-obovate. Glume ovate. Grain enclosed by lemma and palea. In waste lands.

Representative specimen: Araisaprasad, 31 vii 1992, No. 219.

**Centotheca lappacea** (L.) Desv. in Nouv., Bull. Soc. Philom. 2: 189 (1810). *Cenchrus lappaceus* L.

A perennial grass. Spikelets oblong-lanceolate. Glume ovate-oblong. Grain ovoid. Along the roadsides and margin of the forest.

Representative specimen: Araisaprasad, 26 x 1992, No. 271.

**Chloris virgata** Sw., Fl. Ind. Dec. 1 : 203 (1797).

A tufted annual grass. Spikelets 2-flowered. Glumes oblong-lanceolate. Grain fusiform. In shady and sunny conditions.

Representative specimen: Araisaprasad, 16 x 1992, No. 321.

**Cyrtococcum patens** (L.) A. Camus in Bull. Mus. Hist. Nat. Paris 27: 118 (1921). *Panicum patens* L.



A robust perennial grass. Spikclets broadly obovoid. Glumes ovate, elliptic or oblong. Grain oblong.

On sandy soil, in forest.

Representative specimen: Araisaprasad, 26 x 1992, No. 263.

**Digitaria sanguinalis** (L.) Scop., Fl. Carn. ed. 2, 1 :52 (1772). *Panicum sanguinale* L.; *Paspalum sanguinale* (L.) Lamk.

An annual or perennial grass. Spikelets long, crowded. Grain oblong. In moist places, on ditches and channels, in gardens and lowlands.

Representative specimen: Araisaprasad, 31 viii 1992, No. 221.

**Dimeria ornithopoda** Trin., Fund. Agrost. 167, t. 14 (1820).

A slender annual grass. Spikelets linear. Glumes flattened, papyraceous. Grain linear. In moist places of the forest.

Representative specimen: Bisaiyakuribari, 4 I 1994, No. 540

**Echinochloa crusgalli** (L.) P. Beauv., Ess. Agrost. 53, 161 (1812): *Panicum crusgalli* L.

An annual or perennial grass. Spikelets elliptic-ovate. Glume ovate-oblong. Grain broadly elliptic in outline. In marshes, ditches and along the margin of the paddy fields

Representative specimen: Araisaprasad, ~ viii 1992, No. 57.

*Eleusine indica* (L.) Gaertn., Fruct. 1,8 (1789). *Cynosurus indicus* L.

A tufted annual grass. Spikelets densely imbricate. Glumes persistent. Grain oblong. In a variety of habitats.

Representative specimen: Rajendrapur, 15 vi 1993, no. 505.

**Eragrostis gangetica** (Roxb.) Steud., Syn. Pl. Glum. 1 :266 (1854). Prain, Beng. Pl. 2:921 (1903, repr. ed. 1963). *Poa gangetica* Roxb.; *Eragrostis stenophylla* Hochst ex. Miq.

A tufted, perennial grass. Spikelets linear to linear-oblong. Glume ovate-oblong. Grain oblong. In moist places and by the edges of the paddy fields.

Representative specimen: Rajendrapur, 15 vi 1993, No. 504.

**E. unioloides** (Retz.) Nees ex Steud., Syn. Pl. Glum. 1: 264 (1854). *Poa unioloides* Retz.; *Eragrostis amabilis* Wight & Am.

An annual grass. Spikelets ovate or ovate-oblong. Glume lanceolate. Grain obovoid or ellipsoid. In all habitats but preferring mostly the marshy and semi-aquatic situations.

Representative specimen: Baupara, 15 i 1993, No. 382.

**Hemarthria protensa** Steud., Syn. PI. Glum. 1:359 (1854). *Rottboellia iJrotensa* (Steud.) Hack.

An erect to decumbent grass. Sessile spikelets linear-lanceolate. Glume lanceolate. Grain oblong.

Along the edges of ponds, ditches and paddy fields.

Representative specimen: Rajendrapur, ] 5 vi 1993, No. 496.

**Hymenachne pseudo-interrupta** C. Mueller in Bot. 2, 19,333 (1861). *Panicum myuros* Lam.

An annual grass. Spikelets oblong. Glume aristate. Grain ellipsoid-obovoid. On moist soil, near ponds and ditches.

Representative specimen: Bahadurpur, 24 xii 1992, No. 342

**Imperata cylindrica** (L.) P. Beauv., Ess. Agrost: 165 (1812). *Lagurus cylindricus* L.; *Imperata arundinacea* Cyr.

A rhizomatous perennial grass. Spikelets lanceolate. Callus hair white, soft. Glume lanceolate. Grain linear to oblong. Common across plains and in open areas.

Representative specimen: Rajendrapur, 15 vi 1993, No. 507.

**Panicum notatum** Retz., Obs. Bot 4: 18 (1786). *Panicum montanum* Roxb.

A tufted perennial grass. Spikelets ovoid. Glume ovate. Grain ellipsoid. In the forest in shady places.

Representative specimen: Araisaprasad, 30 v 1992, No. 97.

**Panicum paludosum** Roxb., Fl. Ind 1:310 (1820). *Panicum proliferum* Lam.

A perennial grass. Spikelets ovate-lanceolate. Glume orbicular to ovate. Grain oblong. Along the margins of the ponds, ditches and in marshes.

Representative specimen: Araisaprasad, 31 viii 1992, No. 210.

**Paspalidium flavidum** (Retz.) A. Camus in Lecomte, Fl. Gen. del' Indo-Chine 7:419(1992). *Panicum flavidum* Retz.

An annual grass. Spikelets ovate-oblong. Glumes ovate, suborbicular. Grain orbicular. In dry lands, gardens and also in moist places

Representative specimen: Araisaprasad, 26 x 1992 No. 250.

**Paspalum scrobiculatum** L., Mant. 1:29 (1767).

A glabrous, annual grass. Spikelets orbicular or sub-obovoid. Glume orbicular to broadly ovate. Grain biconvex. In damp places, marshes and ditches.

Representative specimen: Araisaprasad, 26 x 1992. No. 249.

**Sacciolepis indica** (L.) A. Chase in Proc. BioI. Soc. Wash. 21:8 (1908). *Aira indica* L. *Panicum indicum* L.

A tufted annual grass. Spikelets densely crowded. Glumes ovate. Grain elliptic-oblong. Common in marshes and on bounds of paddy fields.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 542.

**S. myosuroides** (R.Br.) A. Camus in Lecomte, Fl. Gen. de l' Indo-Chine 7: 460 (1922). *Panicum myosuroides* R. Br.

A slender annual grass. Spikelets narrowly crowded. Glume ovate-oblong. Grain oblong. In damp places both in sunny and shaded habitat in the forest.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 527.

**Setaria glauca** (L.) P. Beauv., Ess. Agrost. 51, 169, 178 (1812). *Panicum glaucum* L.

A tufted annual grass. Spikelets oblong to ovate. Glume rotundate. Grain elliptic-rotundate. In shady places of the forest.

Representative specimen: Araisaprasad, 25 v 1992, No. 65.

**Sporobolus diander** (Retz.) P. Beauv., Ess. Agrost. 26, 147, 178 (1812). *Agrostis diandra* Retz.

A slender annual or perennial grass. Spikelets fusiform. Glumes elliptic-oblong. Grain ovoid. Along the roadsides.

Representative specimen: Uttar Salna, 22 ii 1993, No. 413.

**Vetiveria zizanioides** (L.) Nash in Small, Pl. South-east U.S.:67 (1903). *Phalaris zizanioides* L.; *Andropogon muricatus* Retz.

A rhizomatous, aromatic, perennial grass. Spikelets awnless. Glume coriaceous. Grain oblong. Mostly near ponds, ditches and along the bank of the rivers.

Representative specimen: Araisaprasad, 4 vii 1992, No. 146.

## CYPERACEAE

**Cyperus compressus** L., Sp. Pl. ed. 1:46 (1753).

A tufted annual. Spikelets spicate, linear-oblong. Glumes ovate. Achene obovate. On clay soil, waste places and open grasslands.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 530.

**C. difformis** L., Cent. Pl. 2:6(1756).

A tufted annual. Spikelets linear-oblong. Glumes nearly orbicular. Achene obovate. In marshy places.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 528.

**C. distans** L.f., Suppl. Pl.: 103(1781).

A perennial. Spikelets linear. Glumes oblong-ovoid. Achene elliptic-oblong. In wast places.

Representative specimen: Araisaprasad, 31 viii 1992, No. 208.

**C. iria** L., Sp. Pl. ed. 1: 45 (1753)

An annual, rarely perennial. Spikelets loosely disposed. Glumes obovate-orbicular. Achene obovateellipsoid. In waste places and paddy fields.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 473.

**C. pilosus** Vahl., Enum. Pl. 2:354(1806).

A perennial. Spikelets linear-lanceolate to elliptic. Glumes broadly ovate. Achene obovate to broadly elliptic. On wet soil by the edge of the swamps and paddy fields.

Representative specimen: Araisaprasad, 3 viii 1992, No. 168.

**C. pulcherrima** Willd. Ex. Kunth., Enum. Pl. 2: 35 (1837)

A perennial. Spikelets linear-oblong. Glume ovate. Achene ovate to elliptic. In open moist places.

Representative specimen: Uttar Salna, 22 ii 1993, No. 430.

**C. rotundus** L., Sp. Pl: 45(1753).

A perennial. Spikelets linear or elliptic. Glumes ovate to ovate-elliptic. Achene ellipsoid or ellipticoblong.

Representative specimen: Baupara, 15 i 1993, No. 373.

**C. tenuispica** Steud., Syn. Pl. Glum. 2: II (1955). *Cyperus flavidus* sensu Clarke in Hook. f. Fl. Brit. Ind.

An annual. Spikelets linear-oblong. Glumes ovate-oblong. Achene strongly obovate. On wet soil and in paddy fields.

Representative specimen: Baruipara, 8 i v 1993, No. 468.

*Eleocharis acutangula* (Roxb.) Schult. in Roem. & Schult., Mant. 2:91 (1824). *Scripus acutangulus* Roxb.; *Eleocharis fistulosa* (Poir) Schult.

A perennial. Spikelets cylindrical. Glumes broadly ovate. Achene obovate. On wet soil and in marshy places.

Representative specimen: Araisaprasad, 25 v 1992, No. 51.

**Fimbristylis aestivalis** (Retz.) Vahl, Enum. Pl. 2: 288(1806). *Scirpus aestivalis* Retz.

A tufted annual. Spikelets ovate-lanceolate to elliptic--lanceolate. Glumes pubescent. Achene obovate. On moist soil.

Representative specimen: Uttar Salna, 22 ii 1993, No. 426.

**F. albo-viridis** Clarke in Hook. f., Fl. Brit Ind. 6:638 (1893).

A tufted annual. Spikelets ovate or linear-ovoid. Glumes ovate. Achene obovate. In waste places and paddy fields.

Representative specimen: Araisaprasad, 26 x 1992, No. 252.

**F. bisumbellata** (Forsk.) Bubani, Dodecanth. : 30(1850). *Scirpus bisumbellatus* Forsk.

A tufted annual. Spikelets ellipsoid. Glumes ovate-oblong. Achene obovate. In moist places.

Representative specimen: Rajendrapur, 15 vi 1993, No. 498.

**F. dichotoma** (L.) Vahl, Enum. Pl. 2:287 (1806). *Scirpus dichotomus* L; *Fimbristylis diphylla* (Retz.) Vahl.

A perennial. Spikelets ovoid or ovoid-ellipsoid. Glumes broadly ovate. Achene obovate. In waste places and paddy fields.

Representative specimen: Rajendrapur, 15 vi 1993, No. 501.

**F. dipsacea** (Rottboel) Clarke in Hook. f., Fl. Brit. Ind 6:635 (1893). *Scirpus dipsaceus* Rottboel; *Echinolytrum dipsaceum* (Rottboel) Desr.

A tufted annual. Spikelets ovoid-globose. Glumes oblong or oblong-elliptic. Achene linear-cylindric. On clay soil.

Representative specimen: Rajendrapur, 15 vi 1993, No. 509.

**F. miliacea** (L.) Vahl, Enum. Pl 2: 287 (1806). *Scirpus miliaceus* L.

A tufted perennial. Spikelets oblong. Achene verrucose. On wet soil and in paddy fields.

Representative specimen: Rajendrapur, 15 vi 1993, No. 500.

**F. schoenoides** (Retz.) Vahl, Enum. Pl 2:286(1806). *Scirpus schoenoides* Retz.

A tufted perennial. Spikelets ovoid to ellipsoid. Glumes broadly ovate. Achene obovate-orbicular. In wet places.

Representative specimen: Araisaprasad, 31 viii 1992, No. 213.

**F. squarrosa** Vahl, Enum. Pl. 2:289(1806).

A tufted annual. Spikelets squarrose, ovoid. Glumes 3-nerved. Achene obovate. On wet soil.

Representative specimen: Baruipara, 8 iv 1993, No. 493.

**Fuirena ciliaris** (L.) Roxb., Fl. Ind. ed. 1,1: 184(1820). *Scirpus ciliaris* L; *Fuirena glomerata* Lam.

A pubescent annual. Spikelets ovoid. Glumes obovate-oblong. Achene broadly obovate. In rice fields and marshy places.

Representative specimen: Baupara, 15 i 1993, No. 374.

**Kyllinga nemoralis** (J.R. & G. Forst.) Dandy ex Hutchins. & Dalziel, Fl. W. Trop. Africa 2:486, in key and 487 (1936). *Thryocephalon nemoralis* J. R & G. Forst; *Kyllinga monocephala* Rottb.

A perennial. Spikelets ovate-elliptic. Glumes whitish. Achene oblong or suborbicular. On sandy and heavy soil.

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, No. 456.

**Mariscus sumatrensis** (Retz.) Raynal, Adansonia 15: 110 (1975). *Kyllinga sumatrensis* Retz.; *Mariscus sieberianus* Nees

A perennial. Spikelets linear-lanceolate. Glumes ovate. Achene linear-oblong. On sandy soil and in waste places.

Representative specimen: Rajendrapur, 15 vi 1993, No. 497.

**Pycnus pumilus** (L.) Nees, Linnaea 9: 283 (1835). *Cyperus pumilus* L.; *Pycnus nitens* Nees

A tufted annual. Spikelets linear-oblong. Glumes obovate. Achene obovate-oblong. Both on wet and sandy soil.

Representative specimen: Bahadurpur, 24 xii 1992, No. 337.

**Schoenoplectus juncoides** (Roxb.) Palla, Bot. Jahrb. Syst. 10:229 (1889). *Scirpus erectus* Poir. sensu Clarke in Hook. f., Fl. Brit. Ind.; *Scirpus juncoides* Roxb.

A perennial. Spikelets ovate. Glumes ovate. Achene obovate. In marshy places.

Representative specimen: Bisaiyakuribari, 4 i 1994, No 529.

**Scleria levis** Retz., Obs. : 4( 1786). *Scleria hebecarpa* Nees.

A perennial. Spikelets unisexual. Achene ovoid, pubescent. In shaded places of the forest and on clay soil.

Representative specimen: Baruipara, 8 iv 1993, No. 490

## **XYRIDACEAE**

**Xyris indica** L., Sl. : 42 (1753)

A tufted annual herb. Bracts brown with golden margins, membranous. Fruit a capsule. FI & Fr. : January-December. In marshy areas and rice fields.

Representative specimen: Bisaiyakuribari, 4 I (1753)

**Commelina benghalensis** L., Sp. Pl.: 41 (1753).

A slender herb. Flowers blue. Fruit a capsule, membranous. Fl. & Fr.: February-December. On moist clayey soil, sandy loam and hill slopes.

Representative specimen: Araisaprasad, 16 xi 1992, No. 327.

**C. diffusa** Bunn. f., Fl. Ind. 18, t. 7, fig 2 (1768). *C. Iludiflora* L.

An annual, slender herb. Flowers blue. Anthers versatile. Fruit a capsule, 3 celled. Fl. & Fr.: January-December. On moist clayey soil, edges of water, and in swamps, grasslands and forest.

**C. erecta** L., Sp. Pl. : 41 (1753). *C. kurzii* C. B. Clarke

An erect, branched, perennial herb. Flowers pinkish blue. Anthers oblong. Fruit a capsule, subglobose.

Fl. & Fr.: June-December. On sandy alluvial soil, grass lands and in forest.

Representative specimen: Araisaprasad, 16 xi 1992, No. 324.

**Murdannia nudiflora** (L.) Brenan, Kew Bull. 7 : 189 (1952). *Commelina iludiflora* L.; *Aneilema nudiflorum* (L.) Wall.

An annual diffuse herb. Flowers blue. Fruit a capsule, sub-globose. Fl. & Fr.: June-November. On lawns, fallow lands, moist clayey soil, hill slopes and roadsides.

Representative specimen: Araisaprasad, 31 viii 1992, No. 214.

**M. scapiflora** (Roxb.) Royle, Ilustr. Bot. Himal.: 403, t. 95 (1839). *Commelina scapiflora* Roxb.; *Aneilema scapiflorum* Wight

A perennial herb. Flowers blue. Fruit a capsule, mucronate. Fl. & Fr.: February-July. Common on the floor of forests.

**M. spirata** (L.) Brück in Engl. & Prantl., Nat. Pflanzenfam. ed. 2, 15a: 173 (1930). *Commelina spirata* L.; *Aneilema spiratum* (L.) R. Br.

An annual slender herb. Flowers blue. Fruit a capsule, oblong or subglobose. Fl. & Fr.: January-December. Near marshy areas and paddy fields.

Representative specimen: Araisaprasad, 26 x 1992, No. 245.

**Monochoria vaginalis** (Burm. f.) Presl., Rel. Haenk. 1:128 (1827). *Pontederia vagina* (L.) Burm. f.; *Monochoria vaginalis* var. *plantaginea* (Roxb.) Solms.

A slender, perennial herb. Flowers blue. Fruit a capsule, glandular outside. Fl. & Fr.: May-January.

Common in shallow water and mud.

Representative specimen: Araisaprasad, 31 viii 1992, No. 150

## AMARYLLIDACEAE

**Curculigo orchoides** Gaertn., Fruct. I : 63, 1. 16 (1788).

A slender herb. Perianth yellow. Fruit a berry. Fl. & Fr.: February-August. In shady areas on the floor of the forest.

Representative specimen: Uttar Salna, 22 ii 1993, No. 406.

## DIOSCOREACEAE

*Dioscorea belophylla* Voigt, Hort. Suburb. Calc.: 653 (1844).

A perennial climber. All leaves deeply cordate. Male spikes on leaf-less stems. Fruit a capsule, pendulous. Fl. & Fr.: August-February. Common in deciduous and semi-evergreen forest.

Representative specimen: Araisaprasad, 31 viii 1992, No., 178.

**D. glabra** Roxb., Fl. Ind. 3:803 (1832)

A glabrous climber. Upper leaves shallowly cordate or subtruncate. Fl. & Fr.: September-February.  
Usually in hedges and shrubberies.

Representative specimen: Bankaria, 2 iii 1994, no. 594.

**D. pentaphylla** L., Sp. Pl.: 1032 (1753)

A large, slender climber. Stems twining to the left. Leaves compound. Male spikes in axillary or terminal panicles. Fruit a capsule, oblong. Fl. & Fr.: September-January. In hedges, thickets and deep forest.

Representative specimen: Bankaria, 2 iii 1994, no. 595.

## ZINGIBERACEAE

**Curcuma zedoaria** (Christm.) Roscoe, Trans. Linn. Soc. London 8:354 (1807). *Amomum zedoaria* Christm.

A rhizomatous herb. Coma bracts whitish at first, soon becoming bright rose-pink or crimson. Flowers pale yellow. Fruit a capsule, ovoid. Fl. & Fr. : February-August. In shady areas of secondary forest.

Representative specimen: Baruipara, 8 iv 1993, no. 468.

## ORCHIDACEAE

**Geodorum densiflorum** (Lam.) Schlechter, Fedde. Repert. Beih 4 259 (1929). *Limodorum densiflorum* Lam.; *Geodorum purpureum* R. Br.

A terrestrial orchid. Flowers pink to rose. Pollinia 2, waxy~ Fl. & Fr. : June-September. On exposed slopes, in the crevices of rocks or in shady places of forest.

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, No. 446.



**DICOTYLEDONEAE**  
**PIPERACEAE**

**Peperomia pellucida** (L.) H. B. K., Nov. Gen. et. sp. 1:64 (1815). *Piper pellucidum* L.

An annual herb. Flowers scarcely immersed. Fruit globose-ellipsoidal. Fl. & Fr. : January-December.

In moist, shady places, also on walls.

Representative specimen: Bahadurpur, 24 xii 1992, No. 345.

**URTICACEAE**

**Pilea microphylla** (L.) Liebm. in Vidensk. Selsk. Skr. Ser. 5, 2:296 (1851). *Parietaria microphylla* L.

An annual herb. Flowers in stalked, umbellate clusters. Fruit an achene, ellipsoid. Fl. & Fr.: January-December. In damp places, mostly on the walls of drains and dilapidated walls.

Representative specimen: Araisaprasad, 4 vii 1992, No. 111

**Dendrophthoe falcata** (L.f.) Etling. in Denkschr. Akad. Wissen. Math-Naturw. 32:52 (1872). *Loranthus falcatus* L. f.; *L. longiflorus* Desr.

A parasite with terete branchlets. Flowers orange-yellow, turning pink. Fruit a berry, ovoid-oblong. Fl. & Fr.: October-March. On various trees e.g. *Butea*, *Mangifera*.

Representative specimen: Uttar Salna, 12 xii 1990, Rahman, Huq & Mia 264 I.

**POLYGONACEAE**

**Polygonum minus** Huds. 1, Fl. Angl. ed. 1 : 148 (1762).

An annual herb. Flowers reddish-white. Fruit a nut, orbicular. Fl. & Fr.: December-July. In ditches, river sides and edges of ponds.

Representative specimen: Bahadurpur, 24 xii 1992, No. 336.

**AMARANTHACEAE**

**Achyranthes aspera** L., Sp. Pl. ed. 1:204 (1753).

A perennial herb. Flowers whitish or pale green to red or purple. Fruit a utricle, oblong. Fl. & Fr.:

September-April. By the roadsides and waste places.

Representative specimen: Bahadurpur, 24 xi i 1992, No 350.

**Alternanthera sessilis** (L.) R. Br. ex DC., Cat. Hort Monsp. : 77 (1813). *Gomphrena sessilis* L.

An annual or perennial herb. Spikes white. Fruit a utricle, cordiform. Fl. & Fr.: November-August.  
On wet soil, paddy fields, ditches and by the roadside.

Representative specimen: Barui para, 8 iv 1993, No. 484.

**Amaranthus spinosus**. L., Sp. Pl. ed. 1.: 992 (1753).

An annual herb armed with axillary spines. Flowers green. Fruit a capsule, ovoid-urceolate. Fl. & Fr. : almost throughout the year. In waste places and by the roadsides.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 561.

**A. viridis** L., Sp. Pl. ed. 2.: 1405 (1763).

An annual herb. Petals with green keel. Fruit a utricle, suborbicular. Fl & Fr.: December-June. In open places.

Representative specimen: Bahadurpur, 24 xii 1992, No. 343.

**Portulaca oleracea** L., Sp. Pl.: 445 (1753).

A prostrate annual herb. Flowers yellow. Fruit a capsule, ovoid. Fl & Fr.: January-December. Usually on clayey soil.

Representative specimen: Araisaprasad, 16 xi 1992, No. 300.

**Polycarpon prostratum** (Forsk.) Aschers. & Schweinf., Os terr. Bot. Zeitschr. 39: 128 (1889).  
A! sine prostrata Forskal; Polycarpon loeflingiae (Wight & Arn.) Benth. & Hook. f.

A prostrate herb. Flowers white. Fruit a capsule, ovoid. Fl. & Fr.: February-August. In low lying areas

Representative specimen: Uttar Salna, 22 I 1993, no. 429.

## NYMPHAEACEAE

**Nymphaea nouchali** Burm. f., Fl. Ind. : 120 (1768). N. lotus L. var. pubescens (Willd.) Hooker & Thomson.

A perennial herb. Flowers white, pink or purplish red. Fruit a berry, globose. Fl. & Fr.: January-December. In fresh water tanks, beels and ditches.

Representative specimen: Araisaprasad, 4 vii 1992, No. 110.

## MENISPERMACEAE

**Cocculus hirsutus** (L.) Diels, Engl., Pflanzen. 46:236 (1910). Menispermum hirsutum L. ;  
Cocculus villosus DC.

A climber or straggler. Flowers greenish. Fruit a drupe, laterally compressed. Fl & Fr.: November-April. Usually in hedges, thickets and by the edge of forest.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 544.

**Stephania japonica** (Thunb.) Miers. Ann. Mag. Nat. Hist. Ser. 3, 18: 14 (1866). *Menispermum japonicum* Thunb.

A slender climber. Flowers greenish-yellow. Fruit a drupe, globose-obovoid. Fl. & Fr.: March-October. Common on wayside, thickets, exposed slopes and fences.

Representative specimen: Araisaprasad, 4 vii 1992, No. 113.

## MAGNOLIACEAE

**Michelia champaca** L., Sp. Pl.: 536 (1753).

An evergreen tree. Perianth segment oblong, pale yellow. Fruit a follicle with scarlet seeds. Fl. & Fr.: March-December. Planted.

Representative specimen: Araisaprasad, 4 ii 1992, No. 105

## LEGUMINOSAE SUBFAMILY: PAPILIONOIDEAE.

**Alysicarpus heterophyllus** (Baker) Jafri & Ali, Biologia 12:33 (1966). *A. vaginalis* (L.) DC. var. *heterophyllus* Baker

A herb. Calyx deeply divided. Fruit a pod, tetragonal. Fl. & Fr.: October-May. In the secondary forest.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 555.

**Butea monosperma** (Lam.) Taub., Engl. & Prantl., Pflanzen. 3 (3): 365 (1894). *Erythrina monosperma* Lam.; *Butea frondosa* Koenig ex Roxb.

A deciduous, tomentose tree. Flowers flame-coloured. Fruit a pod, distinctly stalked. Fl. & Fr.: January-April. In open areas.

Representative specimen: Baupara, 15 i 1993, No. 360.

**Crotalaria pallida** Aiton, Hort. Kew. 3: 20 (1789). *C. saltiana* Auct. non Andr.

A glabrescent undershrub. Flowers yellow. Fruit a pod, oblong-cylindrical. Fl. & Fr.: January-July. In open dry land.

Representative specimen: Araisaprasad, 4 vii 1992, No. 109.

**C. spectabilis** Roth, Nov. Pl. Sp.: 34 (1821). *C. sericea* Retz.

A subglabrescent undershrub. Flowers yellow. Fruit a pod, distinctly stalked, linear-oblong. Fl. & Fr.: November-March. In the secondary forest.

Representative specimen: Bankaria, 2 iii 1994, No. 597.

**Desmodium gyroides** DC., Prodr. 2: 326(1825).

A shrub. Flowers violet pink and then bluish lilac. Fruit a pod, copiously, loosely pubescent. Fl. & Fr.: August-January. In the secondary forest.

Representative specimen: Araisapasad, 26 x 1992. No.264.

**D. heterophyllum** (Willd.) DC., Prodr. 2:334 (1825). *Hedysarum heterophyllum* Willd.

A procumbent herb. Flowers pink. Pod oblong, indented on one suture. Fl. & Fr.: June-March. On the floor of secondary forest and also in open areas.

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, No. 443.

**D. motorium** (Houtt.) Merr in J. Am. Arb. 19:345 (1938). *Hedysarum motorium* Houtt.; *Desmodium gyrans* (L.f.) DC.

An undershrub. Flowers pink. Pod slightly falcate, pubescent. Fl. & Fr.: October-May. In the secondary forest.

Representative specimen: Bahadurpur, 24 xii 1992, No. 352.

**D. polycarpum** DC., Prodr. 2:334 (1825).

An undershrub. Flowers purple. Pod ciliate on both edges, densely pubescent when young. Fl. & Fr.: April-December. In the secondary forest, also in waste places.

Representative specimen: Baruipara. 8 iv 1993, No.4 71.

**D. pulchellum** (L.) Benth., Fl. Hongk.: 83 (1861). *Hedysarum pulchellum* L.

A stoutish shrub. Flowers yellow. Pod glabrous, with 1-3 joints. Fl. & Fr.: October-February. In deep forest

Representative specimen: Bankaria, 2 iii 1994, no. 600

**D. triquetrum** (L.) DC., Prodr. 2:326 (1825). *Hedysarum triquetrum* L.

An undershrub with triangular stem. Flowers bluish purple. Pod oblong with 6-8 square joints. Fl. & Fr.: September-February. In the scrub jungles.

Representative specimen: Bankaria, 2 iii 1994, No. 599.

**Flemingia bracteata** (Roxb.) Wight, Ic: Ind. Or., t. 268 (1840). *Hedysarum bracteatum* Roxb.; *Flemingia strobilifera* var. *bracteata* (Roxb.) Baker

An undershrub or shrub. Flowers white streaked with pink, rosy or purple. Pod oblong. Fl. & Fr.: June-March. In the secondary forest.

Representative specimen: Baupara, 15 i 1993, No. 398.

**F. macrophylla** (Willd.) Merr., Philipp. J. Sci. 5: 130 (1910). *Cratalaria macrophylla* Willd.: *Flemingia congesta* Roxb.

A shrub. Flowers pink or flesh-coloured with purple, orange or yellow striae. Pod pubescent, glanddotted. Fl. & Fr.: November-April. In the secondary forest.

Representative specimen: Bahadurpur, 24 xii 1992, No. 356.

**Mucuna pruriens** (L.) DC., Prodr. 2:405 (1825). *Dolichos pruriens* L.; *Mucuna prurita* Wight.

An annual, climbing vine. Flowers purple, lilac or white. Pod linear-oblong, sometimes S-shaped. Fl. & Fr.: January-April. Common in deep forest.

Representative specimen: Bankaria, 2 iii 1994, No.592.

**Pueraria phaseoloides** (Roxb.) Benth., J. Linn. Soc. Bot 9: 125 (1867). *Dolichos phaseoloides* Roxb.

A herbaceous, pubescent vine. Flowers white with purple markings. Pod linear-oblong. Fl. & Fr.:

November-April. In the secondary forest.

Representative specimen: Bankaria, 2 iii 1994, No. 593.

**Spatholobus parviflorus** (Roxb.) Kuntze, Rev. Ges. Pl.: 205( 1891). *Butea parviflora* Roxb.; *Spatholobus roxburghii* Benth.

A liana. Flowers white. Pod broadly linear. Fl. & Fr.: June-November. In the secondary forest.

Representative specimen: Ariisaprasad, 3 vii 1992, No. 176.

**Uraria rofescens** (DC.) Schindler, Fedde Rep. 21: 14 (1925). *Uraria hamosa* Wall. ex W. & A.

An undershrub. Bracts cuspidate, pubescent. Corolla 2-3 times the calyx. Pod pubescent. Fl. & Fr.:

June-December. In deep forest.

Representative specimen: Bahadurpur, 24 xii 1992, No. 353.

## SUBFAMILY : CAESALPINIOIDEAE

**Caesalpinia pulcherrima** (L.) Sw., Sp. Pl. 2: 531 (1799). Poinciana pulcherrima L.

A shrub or small tree. Flowers golden yellow or reddish yellow. Pod obliquely oblong. Fl. & Fr.: January-December. In an open area .

Representative specimen: Araisaprasad, 4 vii 1992, No. 107.

**Cassia siamea** Lam., Enc. I: 648(1783).

A tree. Flowers yellow. Pod linear, nearly straight, compressed. Fl. & Fr.: June-February. In an open area and along the roadsides.

Representative specimen: Araisaprasad, 26 x 1992, No. 282.

**C. sophora** L., Sp. Pl.: 379 (1753).

A glabrous or subglabrous shrub. Flowers yellow. Pod slightly turgid, oblong. Fl. & Fr.: November-February. In waste places and by the roadsides.

Representative specimen: Baupara, 15 i 1993, No. 395.

**C. tora** L., Sp. Pl.: 76 (1753).

An annual woody herb. Flowers golden yellow. Pod flat, compressed. Fl. & Fr.: July-May. In waste places especially in open grounds.

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, No. 451.

## SUBFAMILY: MIMOSOIDEAE

**Acacia auriculiformis** A. Cunn. ex Benth. in Hook, London J. Bot. I :377( 1842).

A tree. Phyllodes elliptic, falcate. Spike(s) I or paired. Flowers yellow. Pod coiled. Fl. & Fr.: December- April. Planted.

Representative specimen: Araisaprasad. 3 viii 1992.No. 173.

**A. intsia** (L.) Willd .i Sp. Pl. 4: 1091 (1806). Mimosa intsia L.

A straggling shrub. Flowers pink or rose. Sutures of pod very prickly. Fl. & Fr.: July-March. Along the roadside, railway embankments and also in the forest. .

Representative specimen: Uttar Salna. 22 ii 1993, No. 428.

**A. mangium** Willd .i Sp. Pl. 4: 1053( 1806).

A medium sized tree. Phyllodes broadly elliptic. Flowers whitish-yellow. Fruit a pod. Fl. & Fr.: November-March. Planted.

Representative specimen: Araisaprasad. 3 viii 1992, No. 192.

**Albizia procera** (Roxb.) Benth. in Hook. & London J. Bot. 3:89(1844). *Mimosa procera* Roxb.

A deciduous tree. Flowers greenish-white. Pod linear-oblong. Fl. & Fr.: September-January. Planted.

Representative specimen: Bahadurpur. 24 xii 1992. No. 351.

**M. pudica** L., Sp. Pl.: 518 (1753)

A prickly woody herb. Flowers pink. Sutures of pod unarmed or with only a few prickles. Fl. & Fr. : January-December. In waste lands and along the roadsides.

Representative specimen: Baruipara, 8 vi 1993. No. 486.

### OXALIDACEAE

**Oxalis corniculata** L., Sp. Pl.: 435 (1753).

A perennial, procumbent herb. Flowers yellow. Fruit a capsule. linear-oblong. Fl. & Fr.: SeptemberrMay. In moist situations.

Representative specimen: Bankaria, 2 ii 1994, no. 584.

### RUTACEAE

**Glycosmis pentaphylla** (Retz.) A.DC., Prodr. 1:538 (1824). *Limonia pentaphylla* Retz.; *Glycosmis arborea* (Roxb.) A.DC.

A small tree. Flowers white. Fruit a berry, LbglObose. Fl. & Fr.: February-April. In secondary thickets.

Representative specimen: Bisaiyakuribari, 4 I 1994, no. 545.

### EUPHORBIACEAE

**Antidesma ghaesembilla** Gaertn., De Fruct. I: 189, t. 39 (1788).

A small tree. Flowers in terminal panicle spikes. Fruit a drupe, subglobose. Fl. & Fr.: March-June In shrubberies.

Representative specimen: Baruipara, 8 iv 1993, No. 472.

**Aporosa dioica** (Roxb.) MueJl-A'rg. in DC., Prodr. 2:472(1832). *Aporosa roxburghii* Baill.

A medium sized tree. Male spikes solitary or clustered. Fruit a capsule, ovoid-oblong. Fl. & Fr.: November-March. In open areas.

Representative specimen: Baupara, 15 i 1993, No. 363.

**Bridelia stipularis** Bl., Bijl.: 597 (1826).

A scandent or subscandent shrub. Flowers often subtended by long stipular bracts. Fruit a drupe, oblong. Fl. & Fr.: March-July. In open areas.

Representative specimen: Rajendrapur, ] 5 vi 1993, No.5] 3.

**Croton bonplandianum** Baill., Adansonia 4:339( 1864). Croton sparijlo1'lls Morong.

A suffruticose annual herb. Flowers whitish. Fruit a schizocarp, glabrous. Fl. & Fr.: Almost throughout the year. Common along roadsides and waste lands.

Representative specimen: Uttar Salna, 22 ii 1993, No. 435.

**C. caudatus** Geisel, Croton. Monogor. : 73 (1807).

A scandent or subscandent shrub. Flowers light yellow. Fruit scabridly rusty-pubescent. Fl. & Fr.: April-August. By the edge of secondary forest, roadsides and railway embankments.

Representative specimen: Araisaprasad, 4 vii 1992, No. 119.

**Euphorbia hirta** L., Sp. Pl: 454 (1753)

An annual erect herb with hairy stem. Cyathia axillary in capitate cymes. Fruit a capsule. Fl. & Fr.: Almost throughout the year.

Representative specimen: Bahadurpur, 24 xii 1992,. No. 341.

**E. thymifolia** L., Sp. Pl.: 454 (1753).

A glabrous prostrate herb. Cyathia usually solitary, axillary, appressed hairy. Capsule: ripening within the cyathium. Fl. &Fr.: December-March. On fallow lands, paddy fields and roadsides.

Representative specimen: Uttar Salna, 22 ii 1993, No. 427.

**Glochidion multiloculare** Muell.-Arg in DC., Prodr. 15:279 (1866).

A shrub or small tree. Flowers in axillary clusters. Fruit a capsule, orbicular. Fl. & Fr.: July-December. In the secondary forest.

Representative specimen: Araisaprasad, 16 xi 1992, No. 319.

**Jatropha gossypifolia** L., Sp. Pl.: 1006 (1753).

A small shrub. Flowers purple or red. Fruit a capsule, ovoid, 3-lobed. Fl. & Fr.: January-July. In Waste lands, shrubberies and along roadsides.

Representative specimen: Baupara, 15 i 1993, No. 390.

**Phyllanthus amarus** Schumacher & Thonn. in Kongl. Danske Vid. Selsk. Skr 4: 195 (1829). P. niruri auct. non L.



An erect annual herb. Flowers solitary. Fruit a capsu)~, oblate, smooth. FI. & Fr.: April-August. In waste lands.

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, no 462.

## RHAMNACEAE

**Zizyphus mauritiana** Lam., Encycl. 3:319 (1789). *Z. jujuba* (L.) Lam.

A tree. Flowers whitish-yellow. Fruit a drupe, globose, oblong or ovoid. FI & Fr.: July-December. In open areas, also self-sown in shrubberies.

Representative specimen: Araisaprasad, 16 xi 1992, No. 317.

**Z. oenoplia** (L) Miller, Gard. Diet. ed. 8,3 (1768). *Rhamnus penoplia* L

A prickly shrub. Flowers greenish-yellow. Drupe globose or obovoid. FI. & Fr.: July-January. In deciduous forests, village thickets and hedges.

Representative specimen: Bankaria, 2 iji 1994, No. 602.

*Z. rugosa* Lam., Encycl. 3:319 (1789)

A large shrub or small tree, often climbing. Petals abt:lll . .LJ' upe globose. FI. & Fr.: June-December. In wet deciduous or semi-evergreen forests and scrub jungles.

Representative specimen: Baruipara, 8 vi 1993, No. 469.

## VITACEAE

**Leea crispa** Royen ex L., Syst. Nat. ed. 12,2:627 (1767).

A shrub. Flowers greenish white. Fruit a berry, depressed globular. FI. & Fr.: March-August. In secondary forest.

Representative specimen: Uttar Salna, 22 ii 1993, No. 409.

## TILIACEAE

**Microcos paniculata** L., Sp. Pl. 1:514(1753). *Gewia microcos* L.

A large shrub or small tree. Flowers light yellow. Fruit a drupe, ellipsoid to obovoid. FI. & Fr.: January-September. In the secondary forest, hedges. and also by the roadsides.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 563.

**Triumfetta rhomboidea** Jacq., Enum. Pl. Carib.: 22 (1760).

A woody herb or small shrub. Flowers orange or yellowish pink. Fruit a capsule, nearly globose. FI. & Fr.: October-May. By the edge of the forest and roadsides.

Representative specimen: Bankaria, 2 iii 1994, No. 567.

## STERCULIACEAE

**Melochia corchorifolia** L., Sp. Pl.: 675 (1753).

A suffrutescent herb. Flowers pinkish. Fruit a capsule, globose, hairy. Fl. & Fr.: July-October. Usually along water courses, bounds of paddy fields and other moist places.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 533.

## DIPTEROCARPACEAE

**Shorea robusta** Roxb. Ex. Gaertn. F., De fruct. 3:48, t. 186 (1805).

A tall, deciduous tree. Flowers pale yellow to cream coloured. Fruit a nut. Fruiting calyx with three outer lobes. Fl. & Fr.: March-August. A dominant tree of deciduous forests.

Representative specimen: Baruipara, 8 iv 1993, No.476.

**Flacourtia indica** (Burm. f.) Merrill, Interpr. Rumph. Herb. Amb.: 377 (1917). *Gmelina indica* Burm. f.

A much branched, thorny shrub. Flowers yellow. Fruit a drupe, globose. Fl. & Fr.: April-September. By the edges of forest.

Representative specimen: Bankaria, 2 iii 1994, no. 587

## LYTHRACEAE

**Ammannia baccifera** L., Sp. Pl.: 120(1753).

An erect, annual herb. Flowers in dense axillary clusters. Petals absent. Fruit a capsule. Fl. & Fr.: January-December. In paddy fields and moist places.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 556.

**Rotala densiflora** (Roemer & Schultes) Koehne, Bot. Jahrb. 1: 164 (1880). *Ammannia del/siflora* Roemer & Schultes

An annual herb. Flowers pink. Fruit a capsule, subglobose. Fl. & Fr.: October-February. In paddy fields and moist places.

Representative specimen: Araisaprasad, 3 viii 1992, no. 163.

## MYRTACEAE

**Eucalyptus camaldulensis** Dehnhardt, Pl. Hort. Camald. ed. 2: 20 (1832).

A tree, typically with smooth grayish-white bark. Fruit a capsule, hemispherical to broadly turbinate. Fl. & Fr.: December-April. Planted.

Representative specimen: Rajendrapur, 15 vi 1993, No. 526.

**E. citriodora** Hook., Mitch. Trap. Aust. : 235 (1848).

A tall tree with smooth scroll-marked bark. Flowers whitish. Fruit urceolate. Fl. & Fr.: November-May. Planted.

Representative specimen: Araisaprasad, 3 viii 1992, No. 182.

**Syzygium fruticosum** (Roxb.) DC., Prodr. 3:260(1828). *Eugenia fruticosa* Roxb.

A large shrub or small tree. Flowers sessile in panicles from old branches, brownish. Fruit a berry, globose. Fl. & Fr.: April-July. In the secondary forest.

*Representative specimen:* Uttar Salna, 22 ii 1993, No. 400.

**S. operculatum** (Roxb.) Niedz. in Pflanzenfam. 31, 7:85 (1893). *Eugenia operculatus* Roxb.

A large tree. Flower buds obovoid. Petals oblong. Berry ellipsoid. Fl. & Fr.: December-May. In the forests.

*Representative specimen:* Uttar Salna, 22 ii 1993, No. 401.

## ME LA S TOM A CEA E

**Melastoma malabathricum** L., Sp. Pl.: 390 (1753).

A medium shrub. Flowers pink to mauve-purple. Fruit a capsule, coriaceous. Fl. & Fr.: May-December. In open area, by the roadsides, thickets and river banks.

*Representative specimen:* Rajendrapur, 15 vi 1993, No. 515.

## ONAGRACEAE

**Ludwigia hyssopifolia** (G. Don.) Excell., Garcia de Orta 5:471 (1957). *Jussiaea hyssopifolia* G. Don.; *Jussiaea linifolia* Vahl

A branched herb. Flowers yellow. Fruit a capsule, subterete. Fl. & Fr.: Almost throughout the year. In paddy fields, near ponds and wet sandy soil.

*Representative specimen:* Araisaprasad, 16xi 1992, No. 328.

**L. perennis** L., Sp. Pl.: 119 (1753). *L. paviflora* Roxb.

An annual herb. Flowers yellow. Capsule thin walled. Fl. & Fr.: January-December. In wet places and paddy fields.

*Representative specimen:* Baupara, 15 i 1993, No. 375.

**L. prostrata** Roxb., Fl Ind. 1:441 (1820).

A branched herb. Flowers yellow. Capsule glabrous, more or less 4-angled. Fl. & Fr.: July-November. On moist soil and in paddy fields.

*Representative specimen:* Araisaprasad, 3 viii 1992, No. 152.

## UMBELLIFERAE

**Centella asiatica** (L.) Urban in Mart, Fl. Bras. 11:287(1879). *Hydrocotyle asiatica* L.

A perennial trailing herb. Flowers white or rose-tinged. Fruit orbicular to ellipsoid. Fl. & Fr.: Almost throughout the year but mostly April-August. Usually in waste lands.

*Representative specimen:* Bankaria, 2 iii 1994, No. 609.

## SAPOTACEAE

**Bassia latifolia** Roxb., Pl. Corom. 1:20, t. 19 (1819).

A large tree. Flowers cream. Fruit a berry, ovoid, tawny-tomentose. Fl. & Fr.: March-July. In open areas.

*Representative specimen:* Araisaprasad, 4 vii 1992, No. 106.

## OLEACEAE

**Jasminum scandens** Vahl, Symb. Bot. 3:2 (1794).

A woody climber. Flowers white. Fruit ellipsoid. Fl. & Fr.: April-August. In the secondary forest and also along the roadsides.

Representative specimen: Rajendrapur, 15 vi 1993, No.514.

## GENTIANACEAE

**Canscora decussata** (Roxb.) Roem & Schult., Mant.: 269 (1827). *Pladera decussata* Roxb.

An erect, annual herb. Flowers white. Fruit a capsule, linear-oblong. Fl. & Fr.: October-May. On the floor of secondary forest in a shady habitat.

Representative specimen : Bankaria, 2 iii 1994, No. 610.

## APOCYNACEAE

**Ichnocarpus frutescens** (L.) R. Br. in Ait., Hort. Kew. ed. 2, 2:69(1811). *Apocynum frutescens* L.

A woody climber. Flowers cream coloured. Fruit a follicle, cylindrical. Fl. & Fr.: August-March. In scrub jungles.

Representative specimen : Uttar Salna, 12 xii 1990, Rahman, Huq & Mia.

## ASCLEPIADACEAE

**Hemidesmus indicus** (L.) R. Br. in Ait., Hort Kew. ed. 2, 2:75(1811). *Periploca indica* L.

A perennial undershrub with aromatic roots. Corolla lobes ovate-lanceolate. Fruit a follicle, terete. Fl. & Fr.: July-December. Mostly in the shady places of the forest.

Representative specimen : Araisaprasad, 16 xi 1992, No. 306.

## CONVOLVULACEAE

**Cuscuta reflexa** Roxb., PI Corom. 2:3, t. 104 (1798).

A twining parasitic herb. Flowers yellowish. Fruit a capsule, globose. Fl. & Fr.: January-June. On a variety of hosts in sunny situations.

Representative specimen : Araisaprasad, 16 xi 1992, No. 318.

**Evolvulus nummularius** L., Sp. Pl. ed. 2: 391 (1762). *Convolvulus nummularius* L.

A perennial, prostrate herb. Flowers white. Fruit a capsule, globose. Fl. & Fr.: January-December. By the edges of the forest, roadside and railway embankments.

Representative specimen : Mahona-Bhabanipur, 14 iii 1993, No. 455.

**Ipomoea fistillosa** Mart, ex Choisy in DC., Prodr. 9:349(1845).

A tall herb or small shrub containing milky juice. Flowers pink or pale purple. Fruit a capsule, ovoid. Fl. & Fr.: January-December. By the roadsides, also near waterbodies.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 559.

**Merremia hederacea** (Burm.f.) Hallier f., Bot. Jahrb. 18:118(1894). *Evolvulus hederaceus* Burm. f. ; *Ipomoea chryseides* Ker-Gawl.

A twiner. Flowers yellow. Fruit a capsule, broadly conical to depressed-globular, Fl. & Fr.: October-January. In the secondary forest, common in hedges and thickets.

Representative specimen: Bahadurpur, 24 xii 1992, No. 347.

**M. hirta** (L.) Merr., Phillip. J. Sc. 7. (Bot): 244 (1912). *Convolvulus hirtus* L.; *Ipomoea linifolia* Bl.

A slender twiner. Flowers whitish or pale-yellow. Capsule 4-valved. Fl. & Fr.: September-November. In the secondary forest.

Representative specimen: Araisaprasad, 16 xi 1992, No. 313.

**M. umbellata** (L.) Hallier f., Bot. Jahrb. 16:552 (1893). *Convolvulus umbellatus* L.

A woody twiner. Flowers white. Capsule 4-valved, splitting from the base. Fl. & Fr.: February-May. Edges of the forest and in village thickets.

Representative specimen: Bankaria, 2 iii 1994, No. 589.

## BORAGINACEAE

**Heliotropium indicum** L., Sp. Pl. : 130 (1753).

An annual erect herb. Flowers blue, violet or rarely white. Fruit ovoid, separating into two nut-like, two-seeded pyrenes. Fl. & Fr.: Almost throughout the year. By the roadsides and waste lands.

Representative specimen: Rajendrapur, 15 vi 1993, No. 519.

## VERBENACEAE

**Clerodendrum indicum** (L.) Kuntze, Rev. Gen. Pl. 2:506 (1891) (*as Clerodendron*). *Siphonanthus indica* L.; *Clerodendrum siphonanthus* R. Br.

A suffrutescent undershrub. Flowers whitish to cream coloured. Fruit a drupe, 4-10 lobed. Fl. & Fr.: November-April. Along the edge of the forest and by the roadsides.

Representative specimen: Bisaiyakuribari, 4 i 1994, No. 552.

**C. viscosum** Vent., Jard. Malam. l:t. 25 (1803). *C. infortunatum* Wild, ex Pers.

A softly tomentose woody herb or shrub. Flowers white to slightly pinkish. Drupe subglobose. Fl. & Fr.: December-June, At the side of railway lines, roads and in shrubberies,

Representative specimen: Mahona-Bhabanipur, 14 iii 1993, No. 450.

**Duranta repens** L., Sp. Pl. ed. 1: 637 (1753). *D. plumieri* Jacq.

shrub or small tree. Flowers blue, lilac, violet or purple. Fruit a drupe, globose. Fl. & Fr.: December-June. In thickets, hedgerows, fencerows and roadsides.

Representative specimen: Baupara, 15 i 1993, No. 364.

**Gmelina arborea** Roxb., Pl. Corom. 3 : 41, t. 246 (1815).

A deciduous tree. Flowers golden-yellow. Fruit a drupe, ovate or obovoid. Fl. & Fr.: October-February. In open areas.

Representative specimen: Baupara, 15 i 1993, No. 386.

**Lantana camara** L., Sp. Pl. ed. 1, 2:627 (1753).

A branching shrub. Corolla opening yellow and turning to rose, rose-pink or pink. Fruit a drupe, fleshy. Fl. & Fr.: Almost throughout the year. By the edge of forest, roadsides and open places.

Representative specimen: Bankaria, 2 iii 1994, No. 579.

## LABIATAE

**Anisomeles indica** (L.) Kuntze., Rev. Gen. : 512(1891). *Nepeta indica* L.; *Anisomeles ovata* R. Br.

An annual or perennial, aromatic undershrub. Flowers pink-violet. Nutlets obovate. Fl. & Fr.: October-July. In the forest, also by the roadsides.  
Representative specimen: Bankaria, 2 iii 1994, No. 590.

**Hyptis suaveolens** Poit., Ann. Mus. Natl. Hist. Nat. 7:472. t. 29. f. 2 (1806).

An aromatic herb. Flowers blue. Nutlets 2. Fl. & Fr.: November-April. Along the roadsides and waste lands.  
Representative specimen: Bankaria, 2 iii 1994, No. 598.

**Leucas lavandulifolia** Sm. in Rees., Cyclop. 20: n 2 (1819). *L. linifolia* (Rottb.) Spreng.

An annual, erect herb. Flowers white. Nutlets oblong. Fl. & Fr.: Almost throughout the year but mainly January-July. Along the roadsides and open areas.  
Representative specimen: Bisaiyakuribari, 4 i 1994, No. 535.

**L. zeylanica** (L.) R. Br. in Ait., Hort. Kew. ed. 2, 3:409(1811). *Phlomis zeylanica* L.; *Leucas involucrata* Benth.

An annual aromatic herb. Flowers white. Nutlets obovoid-oblong. Fl. & Fr.: May-February. By the roadsides and waste lands.  
Representative specimen: Araisaprasad, 31 viii 1992, No. 243.

**Ocimum sanctum** L., Mant. 1:85 (1767)

A softly hairy annual herb. Flowers purplish. Nutlets subglobose or broadly oblong. Fl. & Fr.: Almost throughout the year but mainly October-March. In waste lands.  
Representative specimen: Uttar Salna, 22 ii 1993, No. 420.

## SOLANACEAE

**Nicotiana plumbaginifolia** Viv., Blench. Pl. Hort. Dinegro : 26 (1802).

A slender, annual herb. Flowers white or slightly greenish or pinkish white. Fruit a capsule. Fl. & Fr. : March-December. In moist shady places and in village thickets.  
Representative specimen : Uttar Salna, 22 ii 1993, No. 411.

**Solanum indicum** L., Sp. Pl. : 187 (1753).

An undershrub, stellately woolly. Flowers blue. Fruit a berry, globose. Fl. & Fr. : January-December. In waste places.  
Representative specimen : Bahadurpur, 24 xii 1992, No. 349.

**S. sisymbirifolium** Lam., Illustr. 2:25 (1811).

A viscid and very prickly herb or undershrub. Flowers white to bluish-white. Berry globose. Fl. & Fr.: January-December. In waste lands, fallow lands and roadsides.  
Representative specimen : Bankaria, 2 iii 1994, No. 566.

## SCROPHULARIACEAE

**Adenosma indianum** (Lour.) Merr. in Tr. Am. Philos. S. : n.s. 24 (2) : 351 (1935). *Adenosma capitatum* (Benth.) Hook. f.

A stoutish, annual herb. Flowers blue or violet. Fruit a capsule, ovoid. Fl. & Fr. : August-June. Along the margin of the forest and paddy fields.  
Representative specimen : Bankaria, 2 iii 1994, No. 603.

**Limnophila repens** (Benth.) Benth. in DC., Prodr. 10:387 (1846). *Stemodia repens* Benth.; *Limnophila conferta* Benth.

An ascending herb. Flowers pinkish. Fruit a capsule, ovoid. Fl. & Fr. : October-February. In marshes and paddy fields.  
Representative specimen : Bisaiyakuribari, 4 i 1994, No. 534.

**Lindernia antipoda** (L.) Alston in Trin., Handb. Fl. Ceyl. 6. suppl. : 214 (1931). *Ruellia antipoda* L.; *Bonnaya veronicifolia* (Retz.) Spreng.

An annual herb. Flowers white to purple. Fruit a capsule, linear-cylindrical. Fl. & Fr. : Almost throughout the year. In pasture lands, paddy fields, river banks and clayey soil.  
Representative specimen : Araisaprasad, 25 v 1992, No. 60.

**L. multiflora** (Roxb.) Mukerjee in Jour. Ind. Bot. Soc. 24:131 (1945). *Torenia multiflora* Roxb.; *Vandellia multiflora* (Roxb.) G. Don.

An annual herb. Flowers white to pale white. Capsule ovoid-ellipsoid. Fl. & Fr. : June-January. In paddy fields, fallow lands and moist places.-  
Representative specimen : Araisaprasad, 16 xi 1992, No. 311.

**L. procumbens** (Krock.) Philcox in Taxon 14:30 (1965). *Angaloides procumbens* Krock.; *Vandellia erecta* Benth.

An annual herb. Flowers white, glabrous. Capsule ellipsoid. Fl. & Fr. : September-June. In wet low land, paddy fields and river sides.  
Representative specimen : Araisaprasad, 25 v 1992, No. 61.

**Scoparia dulcis** L., Sp. Pl. : 116 (1753).

An annual herb. Flowers white. Fruit a capsule, subglobose. Fl. & Fr. : Almost throughout the year but mainly August-April. In open areas.  
Representative specimen : Bisaiyakuribari, 4 i 1994, No. 558.

## OROBANCHACEAE

**Aeginetia indica** L., Sp. Pl. : 632 (1753).

A leafless parasitic herb. Flowers purple or violet. Fruit a partially two valved capsule. Fl. & Fr. : July-January. Among the undergrowth of sal forest.  
Representative specimen : Araisaprasad, 31 viii 1992, No. 233.

## ACANTHACEAE

**Adhatoda zeylanica** Medic., Hist. & Commentat. Acad. Elect. Sci. Theod.-Palat. 6:393 (1790). *Justicia adhatoda* L.; *Adhatoda vasica* Nees.

A shrub. Flowers white with pinkish-violet patches in the throat. Fruit a capsule, clavate. Fl. & Fr. : November-May. In hedges, shrubberies and roadsides.  
Representative specimen : Uttar Salna, 22 ii 1993, No. 404.

**Hygrophija auriculata** (Schum.) Heyne in Kew Bull. 16 (2): 172 (1962). *Barleria auriculata* Schum.; *Hygrophila spinosa* T. Anders.

An erect, spinose herb. Flowers blue. Fruit a capsule, linear-oblong. Fl. & Fr. : October-March. By the sides of paddy fields, ditches, canals and in marshes.  
Representative specimen : Uttar Salna, 12 xii 1990, Rahman, Huq & Mia.

**Justicia gendarussa** Bunm. f., Fl. Ind. 10 (1768).

An undershrub. Flowers white with purple streaks and spots inside. Fl. & Fr. : December-May. In open areas, along the roadsides and railway embankments.



Representative specimen : Bankaria, 2 iii 1994, No. 564.

**Nelsonia canescens** (Lam.) Spreng. in L., Syst. Veg. ed. 16, 1:42 (1824). *Justicia canescens* Lam.; *Nelsonia campestris* R. Br.

A trailing or diffuse herb. Flowers purplish, rose or blue. Fruit a capsule, oblong. Fl. & Fr. : October-February. By the roadsides, waste places and near the banks of the ponds.

Representative specimen : Baruipara, 8 vi 1993, No. 488.

**Phaulopsis imbricata** (Forsk.) Sweet, Hort. Brit. : 327 (1827). *Ruellia imbricata* Forsk.; *Phaulopsis parviflora* Wild.

A much branched hairy herb. Flowers white. Fruit a capsule, clavate. Fl. & Fr. : November-March. In open areas and along the roadsides.

Representative specimen : Araisaprasad, 16 xi 1992, No. 331.

**Rungia pectinata** (L.) Nees in DC., Prodr. 11:469 (1847). *Justicia pectinata* L.; *Rungia parviflora* var. *pectinata* (L.) Clarke

A much branched herb. Flowers blue. Fruit a capsule, ovoid. Fl. & Fr. : November-May. In shady places and in the deep forest.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 546.

**Staurogyne polybotrya** (Nees) Kuntze in Rev. Gen. Pl. : 496 (1891). *Ebermaiera polybotrya* Nees

A diffuse herb. Flowers purple. Fruit a capsule, narrow-oblong. Fl. & Fr. : October-March. In the deep forest.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 554.

**Strobilanthes scaber** Nees in Wall., Pl. As. Rar. 3:84 (1832).

A herb. Flowers yellow, hairy within. Fruit a capsule, 4-seeded. Fl. & Fr. : April-September. In the forest, also in open areas.

Representative specimen: Uttar Salna, Momtaz Begum.

## RUBIACEAE

**Borreria articularis** (Linn, f.) Williams, Bull. Herb. Boissier (Ser. 2), 5:956 (1905). *Spermacoce articularis* Linn, f.; *Borreria hispida* (L.) K. Schum.

A procumbent rough, hispid herb. Flowers ashy white or greyish-white. Fruit a capsule, ellipsoid. Fl. & Fr.: August-December. In waste lands, also in moist shady forest area.

Representative specimen : Bahadurpur, 24 xii 1994, No. 591.

**Coffea benghalensis** Heyne ex Roem. & Schult., Syst. Veg. 5 : 200 (1819). *Coffea bengalensis* Roxb., F. Ind. 2 : 194 (1824).

A small shrub. Flowers white. Fruit ovoid-oblong. Fl. & Fr. : February-July. In the forest clearings.

Representative specimen : Bankaria, 2 iii 1994, No. 591.

**Dentella repens** (L.) J. & G. Forster, Char. Gen. 26 : t. 13 (1776). *Oldenlandia repens* L.

A slender, profusely branched annual herb. Flowers white. Fruit a capsule, globose. Fl. & Fr. December-July. In paddy fields and moist soil.

Representative specimen : Rajendrapur, 15 vi 1993, No. 508.

**Ixora undulata** Roxb., Fl. Ind. 1:385 (1820).

A shrub. Flowers white. Fruit globose with 2 plano-convex pyrenes. Fl. & Fr. : March-August. Usually in shrubberies.  
Representative specimen : Bankaria, 2 iii 1994, No. 596.

**Morinda angustifolia** Roxb., Pl. Corom. 3 : 32, t. 237 (1815).

A shrub or small tree. Flowers white. Fruit a drupe, turbinate. Fl. & Fr. : May-September. In the shrubberies, by the edge of the forest and along the roadsides.  
Representative specimen : Araisaprasad, 3 viii 1992, No. 187.

**Randia dumetorum** (Retz.) Poir. in Lam., Encycl. Suppl. 2:829 (1812). *Gardenia dumetorum* Retz.

A shrub, armed with strong horizontal spines. Flowers white turning pale yellow. Fruit a berry, subglobose. Fl. & Fr.: April-October. In secondary forests.  
Representative specimen : Mahona-Bhabanipur, 14 iii 1993, No. 460.

**R. wallichii** Hook, f., Fl. Brit. Ind. 3:113 (1880).

A large unarmed shrub or small tree. Flowers in axillary or leaf-opposed cymes. Berry smooth. Fl. & Fr.: June-December. In the deep forest.  
Representative specimen : Baruipara, 8 iv 1993, No. 473.

## CUCURBITACEAE

**Coccinia grandis** (L.) Voigt, Hort. Suburb. Calcut. : 59 (1845). *Bryonia grandis* L.; *Coccinia cordifolia sensu Cogn.*

A much branched, climbing or prostrate herb. Flowers white. Fruit fusiform-ellipsoid. Fl. & Fr. : May-November. In thickets and hedges.  
Representative specimen : Araisaprasad, 3 viii 1992, No. 177.

**Gymnopetalum cochinchinense** (Lour.) Kurz, J. As. Soc. Beng. 40 : 57 (1871). *Bryonia cochinchinensis* Lour.

A climber. Inflorescence a raceme. Fruit ovoid or ovoid-oblong, shortly villous. Fl. & Fr. : September-February. In waste lands especially on moist soil.  
Representative specimen : Araisaprasad, 16 x 1992, No. 177.

**Melothria indica** Lour., Fl. Cochinch. : 35 (1790).

A slender climber. Flowers white. Fruit ellipsoid, pointed. Fl. & Fr. : June-October. In thickets and hedges.  
Representative specimen : Araisaprasad, 3 viii 1992, No. 179.

## CAMPANULACEAE

**Wahlenbergia marginata** (Thunb.) DC., Mon. Camp. : 143 (1830). *Campanula marginata* Thunb.; *Wahlenbergia gracilis* DC.

A perennial herb. Flowers ashy-blue to lilac. Fruit a capsule, obconical. Fl. & Fr.: December-June. In low land, moist soil and paddy fields.  
Representative specimen : Baupara, 15 i 1993, No. 379.

## COMPOSITAE

**Ageratum conyzoides** L., Sp. Pl. : 839 (1753).

An annual herb. Flowers whitish blue. Fruit a cypsela, narrowly oblong. Fl & Fr. ; September-July. By the roadsides, in secondary forest and also in low land and moist places.

Representative specimen : Baruipara, 8 iv 1993, No. 489.

**Blumea lacera** (Burm. f.) DC. in Wight., Contrb. : 14 (1834). *Conyza lacera* Burm. f.

An annual aromatic herb. Flowers yellow. Cypsela linear to oblong. Fl. & Fr. : November-August. By the roadsides, in open fields and along the margin of the forest.

Representative specimen : Rajendrapur, 15 vi 1993, No. 522.

**B. membranacea** Wall, ex DC., Prodr. 5:440 (1836).

An annual, non-aromatic herb. Flowers yellow. Cypsela linear to oblong. Fl. & Fr. : January-June. In waste places and paddy fields.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 536.

**Blumeopsis flava** (DC.) Gagnep., Bull. Mus. Hist. Nat. Paris 26:76 (1920). *Blumea flava* DC.; *Laggeraflava* (DC.) Clarke

A slender herb. Flowers yellow. Cypsela glabrous, ribbed. Fl. & Fr. : November-February. In deep forest, also in clearings of hill top.

Representative specimen : Bahadurpur, 24 xii 1992, No. 355.

**Centipeda minima** (L.) A. Br. & Aschers., Ind. Sem. Hort. Berol. App. : 6 (1867). *Artemisia minima* L.; *Centipeda orbicularis* Lour.

An annual herb with much radiating branches. Flowers yellowish. Cypsela linear to oblanceolate. Fl. & Fr. : February-August. In fallow lands and cultivated fields.

Representative specimen : Araisaprasad, 25 v 1992, No. 55.

**Chromolaena odorata** (L.) King & Robinson in Phytologia 20:204 (1970). *Eupatorium odoratum* L.

Art erect herb or undershrub. Flowers bluish-white or pinkish-white. Cypsela hairy. Fl. & Fr. : November-June. In open places by the roadsides, on dry exposed slopes and on sandy places.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 548.

**Eclipta alba** (L.) Hassk., Pl. Jav. Rar. : 528 (1848). *Verbesina alba* L.; *Eclipta prostrata* (L.) Mant.

An annual herb. Flowers white. Cypsela compressed, sparsely and minutely pubescent at the tip. Fl. & Fr. : January-December. In damp waste places, paddy fields and by the canals.

Representative specimen : Bahadurpur, 24 xii 1992, No. 340.

**Elephantopus scaber** L., Sp. Pl. : 814 (1753).

An erect perennial herb. Flowers pinkish red or violet. Cypsela oblanceolate. Fl. & Fr. : November-April. In the deep forest.

Representative specimen : Baupara, 15 i 1993, No. 397.

**Gnaphalium luteo-album** L. subsp. affine (D. Don.) Koster, Blumea 4:484 (1941). *G. affine* D. Don.; *G. luteo-album* var. *multiceps* Hook. f.

An erect, annual herb. Flowers golden-yellow. Cypsela oblong-obovoid. Fl. & Fr. : August-May. In moist fallow land and paddy fields.

Representative specimen : Uttar Salna, 22 ii 1993, No. 431.

**G. polycaulon** Pers., Syn. Pl. 2 : 421 (1807). *G. indicum* auct. non. L.

An erect annual herb. Flowers pale yellow. Cypsela oblong with minute glandular hairs. Fl. & Fr. : December-June. On moist soil, fallow land and paddy fields.

Representative specimen : Baruipara, 8 iv 1993, No. 491.

**G. pulvinatum** Delile, Fl. Egypte : 266, t. 44 (1813).

A decumbent woolly, annual herb. Flowers yellow. Cypsela minutely papillose. Fl. & Fr. : August-April. On moist soil and paddy fields.

Representative specimen : Uttar Salna, 22 ii 1993, No. 422.

**Grangea maderaspatana** (L.) Poir., Enc. Suppl. 2:825 (1811). *Artemisia maderaspatana* L.

An annual herb. Flowers yellow. Cypsela with short glands and hairs. Fl. & Fr. : December-June. In paddy fields and fallow lands.

Representative specimen : Rajendrapur, 15 vi 1993, No. 502.

**Mikania cordata** (Burm.) Robinson, Contr. Gray Herb. 104:65 (1934). *Eupatorium cordatum* Burm.; ' *Mikania scandens* auct. non. L.

A perennial herb. Flowers white. Cypsela narrowly oblong, glabrous. Fl. & Fr. : October-March. By the roadsides, on bushy jungles and on the bank of ponds.

Representative specimen : Bisaiyakuribari, 14 i 1994, No. 541.

**Spilanthes calva** DC. in Wight, Contrb. : 19 (1834). 5. acmella auct. non. L.

An annual herb. Flowers yellow. Cypsela narrowly obovate, glabrous but ciliate at the margins. Fl. & Fr.: January-December. In open sunny places, by the roadsides and by the rivers.

Representative specimen : Bisaiyakuribari, 4 i 1994, No. 551.

**Synedrella nodiflora** (L.) Gaertn., Fruct. 2:456, t. 171, f. 7 (1791). *Verbesina nodiflora* L.

An erect branching annual herb. Flowers yellow. Cypsela glabrous. Fl. & Fr. : January-December. Mostly on waste lands, garden lands and in the the village thickets.

Representative specimen : Uttar Salna, 12 xii 1990, Rahman, Huq & Mia 2632.

**Vernonia cinerea** (L.) Less., Linnaea 4 (1):291 (1829). *Conyza cinerea* L.; *Vernonia patula* (Dryand.) Merr.

An erect, annual herb. Flowers purplish or pinkish, sometimes violet-bluish. Cysela oblong, sparsely puberulous. Fl. & Fr.: Almost throughout the year. By the roadsides, in waste places and open fields.

Representative specimen : Araisaprasad, 30 v 1992, No. 89.

Topographically the landscape comprises mainly plain land with some area covered by forest. This site was once a largely dense forest area. The type of forest is deciduous with a mixture of evergreen forest. However, evergreen forest area is negligible. The main species of the forest is Shal / Gajari (*Shorea robusta*). Total identified plant species number is 202 species under 147 genera and 52 families. Gramineae in Monocotyledons and Leguminosae among the Dictyledons are the most dominant represented by 25 species under each. Except Sal, the other floral species of the forest are Haldu, Koroi, Satian, Roina, Kadom, Dewa, Gutum, Ajuki, Neem, Kanchan, Shimul, Kanjal, Joyna, Palash, Sonalu, Gab, Jam, Bot, Ashatta, Jagdumur, Jial, Jiga, Jarul, Shinduri, Bonam, Amra, Chapalish, Amloki, Hortoki, Bohera, Hargaza, Gadila, etc. The herb and shrub species are Shati, Punch, Bashak, Shorpogondha, Ulatcombol, Shotomuli, Paharialu, Ampeng, Thaja, Dudalu, Adurag, Chutki gota, Kat badam, etc. There are many types of bamboo such as Jai bansh, Muli bansh and various canes like Jali bet, Golla bet. Besides, there are many types' climbers and vines, herbs and shrubs.

Among exotic short-rotational trees, Acacia hybrid, Mangium, Malacanna, Eucalyptus, Akashmoni, are common in plantation areas.

#### 4.1.2 Faunal biodiversity

Mr. Emilio, Mr. A. Rozario Phd, Conservation Management Planning Specialist and Mr. Abdul Wahab Akonka, Senior Research Officer, Forest Department conducted a survey under Forest Resource Management Project at Dhaka Forest Division that was published in Dhaka Bano Bivag, Atit O Bartoman, Published by Dhaka Forest Division, Bhano Bhavan, Mohakhali, Dhaka -1212, Published in March 2002. They identified total animal species is 72 (Table 7). Out of these 72 species, 13 are mammal of which noteworthy are Irrawaddy Squirrel, Jackal, Jungle Cat, Small Mongoose, Rhesus Macaque, Bat (Indian False Vampire), Indian House Mouse, Pipistrel Indian Pigmy, Three striped palm Cevit, Bengal Fox, Five Stripped Palm Squirrel, Hoary Bellid Himalayan Squirrel, Hispid Hare, etc.

Identified 14 reptilian species are Monitor Lizard, Gekko, Mabuya, Comon Cobra, Bengal Monitor Lizard, Banded Crait, Crait, etc.

Identified 6 amphibian species are Common Toad, Skipper Frog, Cricket Frog, Bull Frog, Maculated Tree Frog, etc.

Within identified 39 species of birds, most common species are Red Jungle-fowl, Rufous Woodpecker, Gray-capped Pygmy Woodpecker, Fulvous-breasted Woodpecker, Green Bee-eater, Pied Cuckoo, Asian Koel, Green-billed Malkoha, Lesser Coucal, Greater Coucal, Rose-ringed Parakeet, House Swift, Barn Owl, Spotted Owl, Emerald Dove, Rock Pigeon, Spotted Dove, Cinereous Vulture, Brahminy Kite, Great Cormorant, Cattle Egret, Great Egret, Little Heron, Indian Pitta, Common Iora, House Crow, Black Drongo, Greater Racket-tailed Drongo, Black-hooded Oriole, White-throated Fantail, Rufous-faced Warbler, etc.

The Forest Department has recently re-introduced Peacock, Spotted Deer, Python, and Fishing Cats to the area.

**Table 7. List of Wildlife Species in Dhaka Forest Division**

##### **Mammals:**

Sl. No.	Scientific Name	Common Name	Bangla Name
01	<i>Calloscirus pygerythrus</i>	Irrawaddy Squirrel	Kathbirali
02	<i>Canis aureus</i>	Jackal	Khekshial
03	<i>Felis chaus</i>	Jungle-Cat	Bon Biral
04	<i>Herpestes auropunctatus</i>	Small Mongoose	Beji
05	<i>Macaca mulatta</i>	Rhesus Macaque	Banor
06	<i>Megaderma lyra</i>	Bat, Indian False Vampire	Badur
07	<i>Mus musculars</i>	Indian House-mouse	Nengti Indur
08	<i>Pipistrellus mimus</i>	Pipistrel Indian Pigmy	--
09	<i>Funumbalus palma ran</i>	Thrc striped palm squirrel	Dora Khatbirali
10	<i>Vulpes bengalensis</i>	Bengal Fox	Shial
11	<i>Funambalus pennati</i>	Five striped palm squirrel	Dora Khatbirali
12	<i>Callosciurus pygery-thrus</i>	Hoary Bellid Himalayan squirrel	Badami Khatbirali
13	<i>Caprologus hispidus</i>	Hispid Hare	Khorgosh

##### **Reptiles:**

Sl. No.	Scientific Name	Common Name	Bangla Name
14	<i>Calotes versicolor</i>	Monitor Lizard	--
15	<i>Enhydries enhydries</i>	-	--
16	<i>Gekko gekko</i>	Gekko	Takkok
17	<i>Hemidactylus flaviviridis</i>	-	Baro Tiktiki
18	<i>Mabuyacarinata</i>	Mabuya	Anjon
19	<i>Mabuya macularia</i>	-	--
20	<i>Naja naja</i>	Coman Cobra	Ghokra Shap
21	<i>Varanus bengalensis</i>	Bengal monitor lizard	Ghui Shap
22	<i>Xenochrophis ceraogaster</i>	--	--
23	<i>Bungarus fasciatus</i>	Banded crait	Shankini Shap
24	<i>Bungarus caeruleus</i>	Crait	Kweta Shap
25	<i>Ptyas mucosus</i>	-	Daras Shap
26	<i>Natrix piscator</i>	-	Dhora Shap
27	<i>Lycodon aulicus</i>	-	Ghar Ginni Shap

#### Birds:

Sl. No.	Scientific Name	Common Name	Bangla Name
28	<i>Acridotheres tristis</i>	Common Myna	Myna
29	<i>Aegithinia tiphia</i>	Common lora	--
30	<i>Alcedo atthis</i>	Common Kingfisher	Machranga
31	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	--
32	<i>Anthus novaeseelandiae</i>	Australasian Pipit	--
33	<i>Ardeola grayii</i>	Indian Pond-Heron	Kanibok
34	<i>Bubulcus ibis</i>	Cattle Egret	--
35	<i>Columba livia</i>	Rock Pigeon	--
36	<i>Copsychus saularis</i>	Oriental Magpie-Robin	--
37	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike	--
38	<i>Corvus macrorhynchos</i>	Large-billed Crow	--
39	<i>Cypsiurus parvus</i>	Palm Swift	--
40	<i>Dicaeum erythrorhynchos</i>	Pale-billed Flowerpecker	--
41	<i>Dicrurus adsimilis</i>	Black Drongo	--
42	<i>Dicrurus aeneus</i>	Bronzed Drongo	--
43	<i>Dinopium bengalense</i>	Woodpecker, Red-backed	--
44	<i>Egretta garzetta</i>	Little Egret	--
45	<i>Elanus caeruleus</i>	Black-winged Kite	--
46	<i>Estrilda amandava</i>	Red Munia	--
47	<i>Haliastur indus</i>	Brahminy Kite	--
48	<i>Hirundo smithii</i>	Wire-tailed Swallow	--
49	<i>Lanius schach</i>	Long-tailed Shrike	--
50	<i>Lanius tephronotus</i>	Grey-backed Shrike	--
51	<i>Megalaima lineata</i>	Lineated Barbet	--
52	<i>Merops orientalis</i>	Little Green Bee-eater	--
53	<i>Motacilla alba</i>	White Wagtail	--
54	<i>Nectarinia asiatica</i>	Purple Sunbird	--

55	<i>Oriolus xanthornus</i>	Black-hooded Oriole	--
56	<i>Orthotomus satorirus</i>	Tailor Bird	--
57	<i>Passer domesticus</i>	House Sparrow	--
58	<i>Pelargopsis capensis</i>	Stork-billed Kingfisher	Machranga
59	<i>Pecrocotus cinnamomeus</i>	Small Minivet	--
60	<i>Pencrocotus flammeus</i>	Scarlet Minivet	--
61	<i>Prinia atrogularis</i>	Hill Prinia	--
62	<i>Pycnonotus cafer</i>	Red-vented Bulbul	--
63	<i>Streptopelia chinensis</i>	Spotted Dove	--
64	<i>Sturnus contra</i>	Asian Pied Starling	--
65	<i>Turdoides striatus</i>	Jungle Babbler	--
66	<i>Tyto alba</i>	Barn Owl	--

#### Amphibian:

Sl. No.	Scientific Name	Common Name	Bangla Name
67	<i>Bufo melanostictus</i>	Common toad	Kuno Bang
68	<i>Microhyla ornatata</i>	-	--
69	<i>Rana cyanophlycis</i>	Skipper frog	Kola Bang
70	<i>Rana limnocharis</i>	Cricket frog	Kola Bang
71	<i>Rana tigrina</i>	Bull frog	Kola Bang
72	<i>Rhacophorus maculatus</i>	Maculated tree frog	--

**Source:** Dhaka Bano Bhikab, Atit O Bartoman, Published by Dhaka Forest Division, Bhano Bhavan, Mohakhali, Dhaka -1212, Published in March 2002

The natural vegetation is restricted to a limited area and dominated by indigenous tree species, like awal, jam, chaitan, rata, dumri, menda, bot, chapalish, etc. The natural forest is moderately thick with dense underneath vegetation. The rest of the areas are covered by plantations, both long and short rotation plantations. The long rotation plantations are also limited to small areas and dominated by teak, jarul, garjan, mahogoni etc. Most parts of the forest are covered with short rotational plantations. Some of the short rotational plantations are of mixed species; the main species are acacia, eucalyptus, mengium etc. There are some mono-species short rotational plantations. These mainly include melocana, agar, palm etc. Bamboo and cane have been planted in a number of plots.

As can be seen from Fig. 7, the major wildlife species are concentrated in the natural forest areas. The important species are several squirrel, rhesus monkeys, hispid hare, common cobra, several crait, etc. Some major wildlife species are also available in the long rotation plantations. The new plantations of exotic trees are very poor in its wildlife. The monkeys are also found in the peripheral areas of the park. The wildlife comes from the forest in locality due to their food scarcity in the forest as well as while forest is under fire. In winter season some people intentionally or unconsciously lit fire in the dried leafs, ground of the forest which destroy the forest resources. This is a common phenomena and in near future will become the main cause of forest destroy.

Sal forests constitute a unique biological diversity, covering vast areas in the centre and east of Bangladesh. They constitute 70- 75% "Sal" trees including several other valuable trees and herbaceous species like the sun grass. Nevertheless, the Asian Development Bank (ADB) has actively promoted the destruction of the "Sal" forests by considering them of low productivity. In this regard, financing projects were granted for tree monoculture plantations using Eucalyptus and

rubber among other species. Now a day, the only big patch of Sal forest standing is that of Madhupur. Most of the forestland has been denuded, degraded and occupied by forestry companies or displaced people. Contribution on forest management, resident people and protected area, natural resource management, and structure and diversity of natural and managed Sal forest in the Terai of Nepal have also focus on the wildlife biodiversity. The wildlife at Bhawal National Park was well known for its peacocks, tiger, leopard (black panther also) elephant, clouded leopard, sambar deer, etc. However, the overall situation is that these wild lives have disappeared and few mammals (squirrel, mongoose, jackal, civet, jungle cat, etc.), few reptiles (monitor lizard, snakes) and some indigenous birds remain.

#### **4.1.3Wetland Resources of the Project Area**

IPAC Bhawal National Park Site has some wetland resources as follows:

- Turag River: Originated from Old Brahmaputra in the north and flows over Kalikoir and Gazipur Sadar and ended in Burigonga and Balu River in the south. Actually, the river flow mainly western side of the Bhawal National Park. This river tributary has high importance in fish migration for indigenous species. At present the physical condition of this river tributary is very much vulnerable due to encroachment and industrial pollution.
- Small Lake in Bhawal National Park: There are three small artificial lakes inside forest. Total length of these lakes is 6 Kilometer. There is good potential for fish culture in this water body.
- Ponds: There are 15 ponds with in Bhawal National Park including 5 within in Core Zone. These water bodies if possible can be utilized by IPAC as a regular income source for the CMCs.



**Table 8. Status and Trend in Changes of Resources in IPAC Bhawal National Park Site Area**

Issue	Before 1971	10 years back	Present	Reasons of changes	Future Risk
Forest Cover	00000	0000	00	Clear felling in the past and present	High
Forest Thickness	00000	000	00	Clear felling, illegal tree felling, burning and weeding practice for plantation in natural and planted forest areas, fuel-wood collection etc.	High
Tall trees	00000	000	0	Legal feeling in the past and present, timber poaching, etc.	High
Herbs and Shrubs	00000	000	0	Burning and weeding, for new plantation in natural and artificial forest area, fuel-wood collection,	Medium
Wildlife	00000	000	0	Habitat loss, food scarcity, lack of safety, hunting in the past, disturbances by resource collectors	High
Hunting	00000	00	00	Prohibition, and unavailability of game animals and birds	Less
Illegal tree felling	0	000	000000	Greed of some local FD staffs for extra benefit, illegal timbre business of powerful people, local poverty, unemployment	High
Fuel-wood Collection	0	000	00000	Traditional practice of local people for HH consumption, local poverty, unemployment, easy access.	Moderate
Bamboo (natural)	00000	000	00	Natural bamboo stock decreased due to auction and over exploitation	High
Bamboo (planted)		00	0000	Stock increased due to FD's plantation strategy	No risk
Cane		0	00000	Stock increased due to plantation by FD since 1997	No risk
Fruit bearing trees in the wild	00000	000	0	Natural death, felling, fuel-wood collection, absence of fruit trees in new plantations	High
Medicinal plants	00000	000	0	Habitat destruction, clear felling, land clearing in the way of plantation, lemon plantation Fuel-wood collection,	High
Livestock	00	000	0000	For alternative income	No Risk
Agricultural activities	000	0000	0000	Cultivation of various agricultural species, new variety cultivation in the locality	Less
Sun grass	00	00000	00	Over exploitation, claiming land sun-grass bed, grew as result of clear felling for new plantations	Moderate
Vegetable	0000	000	00	Clear felling, plantations of exotic species, ,	Less
Fodder	00000	000	00	As above	Medium
Honey	00000	00	0	Clear felling of trees, decrease in fruit bearing trees, and monoculture with exotic plant species	High

Table 8 shows the changes in forest make up, forest resources and resource related activities with time. Virtually, there has been a major change in forest cover and the cover has decreased by only about 15-20%, compared to pre-liberation period. On the other hand, forest thickness and abundance of tall trees have decreased approximately by 60%. The abundance of herbs and shrubs and sun-grass has also decreased by about 65% due to clearing and claiming land for plantations. Indigenous bamboo now remains only by 8%. Except birds, the abundance of major wildlife has also decreased by more than 60%. The abundance of medicinal plants has also decreased by 60%. Since the forest has been degraded in its plant stock and nature, it has become less suitable for the wildlife as their habitat. The decrease in the abundance of wildlife has probably caused by 60-70%. The abundance of fruit bearing trees has decreased by 75%. The NTFPs, like honey and sun-grass have also decreased significantly. Many wildlife species have been extinct by now from the forest. Among the extinct animals, tiger, elephant, leopard, peacock etc. are notable. Some other wildlife, like fishing cat, python, cobra, vultures and turtles, etc, are threatened. Trend in changes in the resource collection activities is shown in Table 10. Compared to pre-liberation period, activities like illegal timber felling and fuel-wood collection have increased by 60-65%. On the other hand, collection of wild bamboo decreased by about 40%, while that of wild bamboo and honey decreased by about 80% owing to unavailability of these resources. Collection of sun-grass has however increased during 80's due to large scale felling and then slightly declined by now, again due to claiming of sun-grass beds for plantations. Hunting of wildlife has also decreased by more than 80% mainly due to serious decline in the resource. In addition, prohibition of hunting, playing has a role to decrease the rate of hunting.

Another notable incident happened in this forest, which is a High Way; Dhaka-Mymensingh Road constructed middle of the forest from south to north in between 1978 to 1980. This has major harm for the forest protection. Later many other roads constructed based on this road.

Another study of time line analysis basis on wildlife and their habitat done by Mr. D. S. Kabir and Mr. A. Z. Ahmed, Environmental Biology Laboratory, School of Environmental Science and Management, Independent University, Bangladesh Plot 14, Baridhara, Dhaka 1212, Bangladesh. The paper published on Our Nature (2005)3:83-90. Their analyses are as follows.

**Table 9. Time line analysis basis on wildlife and their habitat at Bhawal National Park Site**

Period	Pre-existing wildlife	Number of species	Habitat
British era	Peacocks, tiger, leopard (Black panther also) elephant, clouded leopard, Himalayan black bear, barking deer, gaur, etc	Peacocks: about 1,000 (say) Pantheridae species: Deer: >100 or so Pangolins: 50 or so: >500 Raptors: >50 Bears: 100 Birds: innumerable (in thousands)	Dense forest cover as well as dense under growth for most species that have been mentioned here
Pakistani	Peafowl, jungle fowl, Wild boar, barking deer, clouded leopard, leopard, etc	Peacocks and other birds: about 500 or more (say) Barking deer: 100 or so Cats: around 100	Dense forest but somewhat less than compared to what it was in the past.
Bangladesh (After 1971)	Fox, jackal, small Indian civet, fishing cat, etc and birds such as Jungle Babbler, etc.	Mammals: 100 or so Birds: innumerable	Dense undergrowths and covers of what ever remains

## 4.2 Comparison of present and past livelihood of forest dwellers

Impact of decreasing the forest resources on forest dwellers livelihood has changed tremendously (Table 10). At past time, forest dwellers mostly depend on forest based resources but at present, they are compelled to convert their livelihood dependency on non-forest based income generation activities.

**Table 10. Past versus present livelihood pattern at Bhawal National Park Site**

Past livelihood	Present livelihood
<ul style="list-style-type: none"> <li>Fully depended on forest resources, a very few were engage in agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Forest resource user groups livelihood highly vulnerable. Most of people depend on services in different industry.</li> </ul>
<ul style="list-style-type: none"> <li>Very less or no use of chemicals or insecticides in agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Excessive use of chemical fertilizer, insecticide in vegetable gardening and paddy culture causing harm to forest environment</li> </ul>
<ul style="list-style-type: none"> <li>People used to extract “Bon kachu (wild rum)”, “Bon alu (wild potato)”, “Bon misticumra (wild pumpkin)” etc. as food from forest</li> </ul>	<ul style="list-style-type: none"> <li>Culture of hybrid vegetables significantly increased. Due to unavailability of such resources forest dwellers have buy those from market</li> </ul>
<ul style="list-style-type: none"> <li>Around 100 species of medicinal herbs and shrubs were abundant. For common treatment people depended on herbal physician.</li> </ul>	<ul style="list-style-type: none"> <li>Almost all medicinal herbs and shrubs are nearly extinct. Forest dwellers have to depend on modern treatment but such treatment also scarce for them.</li> </ul>
<ul style="list-style-type: none"> <li>Died and dead brunches were used as fuel wood</li> </ul>	<ul style="list-style-type: none"> <li>Local poor HH still depends on such resources. But due to scarcity most people have to buy fuel wood from market</li> </ul>
<ul style="list-style-type: none"> <li>Forest bamboo and cane were the sources of income for the ethnic women.</li> </ul>	<ul style="list-style-type: none"> <li>As these resources are destroyed, their source of income became limited and expansion of such industry has almost ruined.</li> </ul>
<ul style="list-style-type: none"> <li>Forest dweller used to honey from nature and could earn buy selling those. Some part use as household consumption.</li> </ul>	<ul style="list-style-type: none"> <li>Natural honey nearly extinct.</li> </ul>
<ul style="list-style-type: none"> <li>Grazing area were abundant in the forest and there were no scarcity of cattle feed.</li> </ul>	<ul style="list-style-type: none"> <li>Cattle grazing area and feed highly decreased.</li> </ul>
<ul style="list-style-type: none"> <li>The forest ecosystem was enrich with biodiversity. There was no rubber garden.</li> </ul>	<ul style="list-style-type: none"> <li>Due to decreased in forest area and increased the area of rubber garden, biodiversity destroyed extensively.</li> </ul>
<ul style="list-style-type: none"> <li>Forest dwellers culture was forest based.</li> </ul>	<ul style="list-style-type: none"> <li>Such culture nearly extinct.</li> </ul>
<ul style="list-style-type: none"> <li>Invention of tourist was very less. On average 200 visitors visit the park per day on 1985.</li> </ul>	<ul style="list-style-type: none"> <li>Tourist increases significantly, causing harm to social environmental and cultural livelihood of forest dwellers. At present, on average 600 visitors visit the park each day.</li> </ul>
<ul style="list-style-type: none"> <li>Once there were no industry in this</li> </ul>	<ul style="list-style-type: none"> <li>At present, there are 169 major</li> </ul>

Past livelihood	Present livelihood
area	industries within the 3 Unions (Kawaltia, Mirzapur and Prahalledpur). Besides, there are many small industries like poultry; dairy farms, etc. are common in the forest area.

### 4.3 Ranges and Beats of the Park

The IPAC Bhawal National Park Site divided into 02 Ranges and 07 Beats. The position of the Beats and ranges are shown in the following table (Table 11).

**Table 11. Name of Beats and its location**

Sl. No.	Name of Beat	Name of the position of Union	Under the Upazilla and District	Name of Range
01	Bhabanipur	Mirzapur	Gazipur Sador, Gazipur	Bhawal Range
02	Baroipara	Mirzapur	Gazipur Sador, Gazipur	
03	Rajandrapur West	Mirzapur	Gazipur Sador, Gazipur	
04	Beshiyakori	Mirzapur	Gazipur Sador, Gazipur	
05	Park Beat	Kawaltia	Gazipur Sador, Gazipur	National Park Range
06	Baupara	Kawaltia	Gazipur Sador, Gazipur	
07	Bonkhaira	Prahalledpur	Gazipur Sador, Gazipur	

### 4.4 Area of the IPAC Bhawal National Park

Above all Beats located 8 different Mouzas. The total area of the IPAC Bhawal National Park is 5,022 ha of state-owned, FD-acquired, and privately owned lands situated in various Mouzas such as the following:

**Table 12. Mouza wise area of Bhawal National Park**

Sl. No.	Name of Mouza	Area of the forest in ha
01	Arishaprashad	1,070
02	Bishayakuri-Bari	397
03	Baraipara	2,684
04	Bankhuria	345
05	Uttar Salna	137
06	Baupara	88
07	Bhahadurpur	50
08	Mohana Bhowanipur	251
	<b>Total</b>	<b>5,022</b>

#### 4. 5 Number of staff of the IPAC Bhawal National Park Site

The involving forest of the project area includes:

- 1 DFOs (Divisional Forest Officer);
- 1 ACFs (Assistant Conservator of Forest),
- 2 ROs (Range Officers),
- 06 BOs (Beat Officers),
- 14 FGs (Forest Guards).

#### 4. 6 Temperature and rainfall of Bhawal National Park

The temperature ranges from 11.7 during January to 34.3 during April, which is the hottest month of the area. The monthly maximum and minimum temperature (°C) of the area is given in a Table 13 below.

**Table 13. Monthly maximum and minimum temperature (°C) of Bhawal National Park (average of 10 years)**

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Max. Temp.	25.1	28.5	32.1	34.3	33.7	31.3	31.0	30.8	31.3	30.6	28.7	26.7
Min. Temp.	11.7	14.7	19.7	23.2	24.8	25.7	26.1	26.1	25.9	23.4	17.8	12.0

The average annual rainfall is around 1800 mm, 90% of which occurs in the period May through October. The mean monthly rainfall (mm) of this area is shown in Table 14.

**Table 14. Monthly average rainfall of Bhawal National Park (average of 35 years)**

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Rainfall(mm)	5.6	5.3	46.5	89.9	247.9	328.6	334.0	339.0	235.1	152.3	10.8	3.4

#### 4. 7 Settlements in and Around IPAC Bhawal National Park Site and its Level of Stakes with the park

##### 4.7.1 Settlements

A total of 35 Mouzas and 136 villages having varied degree of stakes within three unions have been identified. The villages belong to 3 Unions namely; Kawaltia, and Mirzapur of Gazipur Sador Upazilla and Prahalledpur of Sreepur Upazilla of the project area (Table 15).

**Table 15. List of the name of Districts, Upazillas and Unions of the IPAC Bhawal NP Site**

District	Upazilla	Union	Number of Mouza	Number of Village
Gazipur	Gazipur Sador	Kawaltia	18	26
		Mirzapur	09	82
	Sreepur	Prahalledpur	08	28
Total			35	136

**Source:** Census 2001, local Statistical Bureau Office, Gazipur Sador and Sreepur Upazilla, Gazipur, Dhaka

### 4.7.2 Demography

A number of 03 Unions having varied degree of stakes with the project have been identified including 35 Mouzas (Table 15). Total project area is 136.06 Sq. Km. Total Household of 136 villages is 35,490 Nos. with population of 266,476 including 137,916 male and 128,560 female (Table 16).

**Table 16. Area of the Project and union-wise number of Household, Population (male and female)**

Name of the Union	Area of the Union in Sq. Km	Household	Population (Male)	Population (Female)	Total Population
Kawaltia	32	17,154	47,220	38,551	85,771
Mirzapur	88.06	12,887	72,703	72,515	145,218
Prahalledpur	16	5,449	17,993	17,494	35,487
<b>Total</b>	<b>136.06</b>	<b>35,490</b>	<b>137,916</b>	<b>128,560</b>	<b>266,476</b>

**Source:** Census 2001, local Statistical Bureau Office, Gazipur Sador Upazilla and Sreepur Upazilla, Gazipur, Dhaka

### 4.7.3 Level and role of stake

Table 17 provides information of the Unions total population, level and role of stake with the forest. There are three types of stakes depends on their roles. The major type of level of stake, live in Mirzapur; medium type of stake live in Kawaltia; and Minor type of stake live in Prahalledpur.

**Table 17. Information on Unions Having Stakes with IPAC Bhawal National Park Area**

Name of the Union	Total Population	Level of stake	Role of stake
Kawaltia	47,220	Medium	Industrial encroachment is comparatively less than Mirzapur Union. People collect fuel-wood and dried leaves, some involve with illegal tree felling.
Mirzapur	72,703	Major	Industrial encroachment is very high in this area. Surrounding people collect fuel-wood and dried leaves, house building materials, vegetables and other NTFPs from the forest.
Prahalledpur	17,993	Minor	Industrial encroachment is comparatively least than other two unions. People are involve fish culture, collect fuel-wood and dried leaves, house building materials, vegetables and other NTFPs from the forest.
<b>Total</b>	<b>266,476</b>		

#### 4.7.4 Road network of project area

The roads within the project area form a frame of network. The Dhaka-Mymensingh High Way penetrates the forest nearly through the middle from south to north. Many sub-roads / connecting roads constructed, based on this high way. Easier accessibility by using these access roads is one of the main causes of forest resource degradation. The illegal forest resource collector can easily move within and around the forest comfortably. (Fig. 2, 4-6).

#### 4.7.5 Educational institutions

There are 21 Non-Government High and Junior High Schools, 39 Government Primary Schools, 33 Registered Primary Schools, 21 Madrasahs and 120 Moktab / Etimkhana (orphan house) and 01 University (Table 18) in the project area's unions.

**Table 18. Union-wise number of High School, Primary School, Registered Primary School, Madrasa, Moktab / Etimkhana and College / University**

Union	Non-Government High and Junior High School	Government Primary School	Registered Primary School	Madrasa (Dhakil, Ebdadia, etc.)	Moktab / Etimkhana	College / University
Kawaltia	06	13	23	13	35	01
Mirzapur	08	19	06	04	83	04
Prahalledpur	07	07	04	04	02	00
<b>Total</b>	<b>21</b>	<b>39</b>	<b>33</b>	<b>21</b>	<b>120</b>	<b>05</b>

#### 4.7.6 Religious institutions

Inhabitation of the project area consist different types of religious groups with an ethnic group (at Kuchiamara, Barmonpara under Prahalledpur Union), where the Muslims are the majority. The religious institutions within the project area are: Mosque 198 Nos., Temple 22 Nos. and Church 01 Nos. (Table 19). There is no church in Kawaltia and Prahalledpur Union.

**Table 19. Union-wise Religious Institution (Mosque, Temple, Church)**

Name of the Union	Mosque	Temple	Church
Kawaltia	35	00	00
Mirzapur	83	05	01
Prahalledpur	80	17	00
<b>Total</b>	<b>198</b>	<b>22</b>	<b>01</b>

#### 4.7.7 Community facilities

The community facilities within the project area are average in standard comparing to the other part of the Bangladesh. There are 02 Hospitals, 21 Community Clinics, 5,332 Sanitary Latrines, 6807 Tube Wells, 52 Deep Tube Wells, and 17 Hats / Bazars (Table 20).

**Table 20. Union-wise Community Clinic, Tube well, Deep Tube well, Hat / Bazar**

Name of the Union	Hospital	Community Clinic	Sanitary Latrine	Tube well	Deep Tube well	Hat / Bazar
Kawaltia	00	06	1,708	2,600	05	04
Mirzapur	01	09	2,655	2,500	37	09
Prahalledpur	01	06	1,069	1,707	10	04
<b>Total</b>	<b>02</b>	<b>21</b>	<b>5,332</b>	<b>6,807</b>	<b>52</b>	<b>17</b>

#### 4.7.8 Credit

Several NGOs and banks provide micro-credit to local people. About 19 NGOs involved in the project area. Bank loans are mainly given for poverty reduction and integrated rural development through creating opportunity of IGA and also as seed money for agriculture and handicraft. NGOs provide credit mainly for IGA. NGO's IGA programs concentrate on small business, fish culture, poultry, livestock rearing, nursery, etc (Table 21). Women's are mainly the target beneficiaries for the NGO credit programs. It was seen that local people also take credit locally from neighbors, relatives and sometimes from Mohajons (Money Lender) etc.

**Table 21. List of NGO and their union-wise activities**

Sl. No.	Name of NGO	Activities	Location of Union
01	ASA	Micro credit for agriculture, small business, poultry and livestock	All Unions
02	Grameen Bank	Micro credit	All Unions
03	Buro Bangladesh	Micro credit	All Unions
04	BRAC	Micro credit, education, health, awareness, poultry & livestock development	All Unions
05	CARITAS	Micro credit, education, health, handicraft, spinning, poultry & livestock, legal support, etc.	All Unions
06	PROSHIKA	Micro credit, Livelihood	All Unions
07	SSS	Micro credit	All Unions
08	PRODOKHAP	Micro credit	All Unions
09	POPI	Micro credit and livelihood	All Unions
10	BASA	Micro credit, Trainings, etc.	All Unions
11	PIDIM	Livestock	All Unions
12	DIP	Microfinance	All Unions
13	SRVE	Health and education	All Unions
14	BARC	Micro credit, Vegetable gardening, etc.	All Unions
15	HETOISI Bangladesh	Micro credit, livelihood	Mirzapur Union
16	TMSS	Micro credit, Several Technical Trainings, etc.	All Unions
17	PMK	Micro credit	Mirzapur Union
18	PLAN International	Health and sanitation	Prahalledpur Union
19	Gramin Shakti	Solar panel	All unions



#### 4.7.9 Leasing and ticketing information

FD took initiatives for ticketing in 1976 but it was not executed. First leasing started in 2004-05. But there was no record about lease amount and price of ticket. Lease amount for 2005-06 was 25,00,000 (twenty five lac) Taka and that of 2008-09 was 28,00,000 (twenty eight lac) Taka.

Present price of tickets:

• per Person	Taka 10
• Bus	Taka 200
• Minibus	Taka 100
• Private car	Taka 60
• Auto-Rickshaw	Taka 20
• Rickshaw / Motor Byke	Taka 5
• Students	Taka 5 (per Head)

Around 20-25 groups (average number of visitors 600) visit Bhawal National Park (BNP) each day. Compositions of visitors are 80 percent male and 20 percent female. There are 6 gates in BNP, where ticketing system available in each gate.

#### 4.7.10 Places of Interest

A number of famous places, Organizations, Academic Institutions situated in the vicinity of Bhawal National Park. Visitors can also visit these sites while visiting BNP. These are: Joydebpur Rajbari, BARI, BRRI, Rover Scouts Center, BRAC-BCDM, Bangabandhu Agriculture University, etc.

### 4. 8 Stakeholder Assessment

At least 3 categories of stakeholder identified in IPAC Bhawal Site, such as

- Primary stakeholder- involved with direct extraction of resources from the wetland or their activities directly affect the wetland
- Secondary stakeholders – indirectly linked with the wetland, involved with trading or exert influences on the wetland
- Institutional stakeholder- involved with developmental activities and administration of the adjoining areas

#### 4.8.1 Primary Stakeholders (PSH)

Table 22 provides information on stakeholder type & category, stakeholder description, their activities, dependency, relative level of stakes, potential strategies for obtaining support or reducing obstacle with the wetland and their impact on the wetland resources. About 13 different primary stakeholder types, who directly extract different resources from the forest, have been identified. Of them; Fuel-wood collector, Fuel-wood seller, Illegal tree feller, Moholder, Encroacher, Bangladesh Air Forces, Bangladesh Arm Forces, Fruit Collector, Ant's egg collector, Vegetable collector, Medicinal plant collector, House building materials collector, Industrialist as primary stakeholder.

#### 4.8.2 Secondary Stakeholders (SSH)

Out of 18 stakeholders; Sawmill owner and operator, Furniture owners, Brick field owners as secondary stakeholders.

### **4.8.3 Institutional Stakeholders (ISH)**

Out of 18 stakeholders; Relevant Government Institutions, NGO, as institutional stakeholders.

#### **4.8.3.1 Forest Department (FD)**

Forest Department (FD) is directly involved with overall management of the forest at the local level. FD has the overall responsibility for management, conservation and development of the Forest Area through planting, harvesting, patrolling and guarding the forest resource. The number of forest staff is inadequate for its management. There is a forest check post on the Tangail - Mymensingh highway at Madhupur Forest Area. Overall, FD plays a positive role in the protection of the RF, a few FD local staff and officials are alleged to be involved indirectly with illegal felling activities. However, the PRA team did not notice this.

#### **4.8.3.2 Local Community Organization (CBOs)**

Several CBOs have stake with the community people, could be identified in the Project Area. These local organizations deal mainly with local problems and welfare, and cultural activities, not any environmental issues.

**Table 22: Stakeholder information of the IPAC Bhawal National Park Project area**

Sl. no.	SH name	SH types	SH description	Role / Description of Activities of SH	Dependency	Level of stake	Potential strategies for obtaining support or reducing obstacle	Remarks
01	Fuel-wood collector	Primary	Local poor people, Forest villagers (mainly men and women)	Collect dead trees, small trees, non-timber trees, tree branches, dead leaves etc. Cut, chop, bundle and carry away as shoulder or head-load, sometimes use van, rickshaws	Many HHs dependent for HH use Many HHs sell for livelihood support, entirely or partly	Major	Alternative income source should be lunched and improve stoves should be set up	Fuel-wood collector sometimes collect vegetable
02	Fuel-wood seller	Primary	Local people, mainly poor people	Collect from forest seasonally and occasionally	Mainly for HH consumption, sell surplus, some people fully dependent on daily selling	Major	Alternative income source should be lunched	Usually it is an intended activity
03	Illegal tree feller	Direct / primary	Adult male from some villages, some laborer for clear felling, un-employed people from forest are mostly poor.	Selectively fell the valued timber trees. Usually enter the forest at night. Reduce forest cover, thus destroy habitat They come from some nearby settlements	Many HHs entirely dependent on this activity. Many depend partly on it for their livelihood	Major	Alternative income source should be lunched	They are mainly organized gangs. They are influenced by timber trader and moholder
04	Moholder (auctioneer for tree felling)	Direct / primary	Some rich and influential people from the outside of the forest area	Legally clear fell forest through winning auction. In addition to timber trees, completely destroy all under storey vegetation. Mix some illegally felled trees.	Not dependent on the activity	Major	Awareness building about nature conservation	Clear felling practice of moholder is detrimental to forest biodiversity FD gets revenue

Sl. no.	SH name	SH types	SH description	Role / Description of Activities of SH	Dependency	Level of stake	Potential strategies for obtaining support or reducing obstacle	Remarks
05	Encroacher	Direct / primary	Local and outside people. Riches people come to this area to set up agricultural land, houses, etc.	Rich-men illegally encroaches the land to build up different types of structures.	Not dependent on the activity	Major	Awareness building about nature conservation	Encroaching practice is detrimental to forest biodiversity
06	Bangladesh Air Forces	Direct / primary	A part of Government Security Forces	Air Forces set up their firing ranges, offices, etc. at Forest Land	Not dependent on the activity	Major	Awareness building about nature conservation	Activities of Air Forces is detrimental to forest biodiversity
07	Bangladesh Arm Forces	Direct / primary	A part of Government Security Forces	Air Forces set up their firing ranges, offices, etc. at Forest Land	Not dependent on the activity	Major	Awareness building about nature conservation	Activities of Air Forces is detrimental to forest biodiversity
08	Fruits collector	Primary	Local poor people	Mainly collect wild fruit.	Not dependent	Negligible	Aware the biodiversity richness	
09	Ant's egg collector	Primary	Local poor people	Mainly collect fish trap	Not dependent	Negligible	Aware the biodiversity richness	
10	Vegetable collector	Direct / primary,	In and out side villagers, poor people, mainly Fuel-wood collector and occasionally the outside villagers	Collect vegetables, like, kachu, Kitchen vegetable etc.	Meet HH needs Also met from homestead gardens	Minor	Homestead gardening will be developed	Forest villagers and most people from outside villagers
11	Medicinal plant collector	Primary	Some local people	Some limited species, not on a large scale	Not dependent	Negligible	Homestead medicinal gardening will be developed	Sometimes, local kabiraj collect it
12	House Building material Collector	Primary / Direct	Forest villagers and surrounding people	Collect various materials as per need for HHs building.	Partially dependent	Major	Introduce alternative materials using practice start	Restricted to a designated area used by forest villagers, but no agreement

Sl. no.	SH name	SH types	SH description	Role / Description of Activities of SH	Dependency	Level of stake	Potential strategies for obtaining support or reducing obstacle	Remarks
13	Industrialist	Primary / Direct	Rich-men illegally encroaches the land to build up different types of structures.	Not dependent on the activity	Major	Awareness building about nature conservation	Encroaching practice is detrimental to forest biodiversity	Local and outside people. Riches people come to this area to set up industry, houses, etc.
14	Sawmill owner and operator	Indirect / Secondary,	Individual / Group	Help in conversion of illegal timber and encourage illegal tree felling and trading	Not dependent	Minor	Awareness	Functioning sawmill's are detrimental to forest biodiversity
15	Furniture owner shop	Indirect / Secondary,	Individual / Group	Have a good link with illegal feller and encourage illegal tree felling by purchasing illegal timber mainly from saw mills	Not dependable	Minor	Awareness	Functioning furniture shop's are detrimental to forest biodiversity
16	Brick field owner	Indirect/ Secondary,	Individual	Use fuel wood and small timber, encourage illegal tree felling having good link with illegal feller	Become established	Minor	Aware the environmental degradation and they should use coil instead of timber	Presently no encroachment is taking place now Once recovered and again taken back
17	Relevant Government Institutions	Institutional	Group	They play positive role	Indirect	Major	Capacity build up	Improve all type of facilities / supports
18	NGOs	Institutional	Group	They play positive role	Indirect	Medium	Capacity build up	They can support the main stakeholder by AIG

#### 4.8.4 Brickfield, Sawmill, Furniture's shop, and Insecticide & Hormone's shop

The scenario of a limited portion of the project area consist many Brickfield, Sawmill, Furniture's shops, and Insecticide's & Hormone shop which are highly unfriendly for environment and ecosystem.

**Brickfield:** There are about 28 brickfields in the project area only at Mirzapur Union (Table 23). These brick-fields are also responsible for forest destruction.

**Sawmill:** There are about 66 sawmills in the project area (Table 23). Also there are a number of temporary sawmill found in the forest area. All these sawmill are to some extent involved in illegal tree felling. Most of the sawmill have unauthorized electrical connection and sometimes operated by generator during load shading.

**Furniture shop:** There are about 147 furniture shops in the project (Table 23). Many of them have no valid license for trading of timber. They usually receive sawed timber from sawmills and trade locally. It is alleged that they sometimes receive illegally felled timber from poachers and get sawed and sell it and thus responsible for illegal felling of timber.

**Insecticides and Hormone shop:** There are a lot of insecticide and hormone shops in the project area. Out of this specific shops, most of the local small grocery shop sale insecticides and hormone.

**Table 23. Union-wise Brickfield, Sawmill, Furniture's shop**

Sl. No.	Name of the union	Brickfield	Sawmill	Furniture shop
01	Kawaltia	00	28	58
02	Mirzapur	28	32	59
03	Prahalledpur	00	06	30
<b>Total</b>		<b>28</b>	<b>66</b>	<b>147</b>

#### 4.8.5 Industries / factories

At present, quick industrialization is one of the major threats for the IPAC Bhawal National Park Site. The PRA / RRA Team have addressed industrial pollution issues of Bhawal National Park Site, where more than 166 major industries are located as per list:

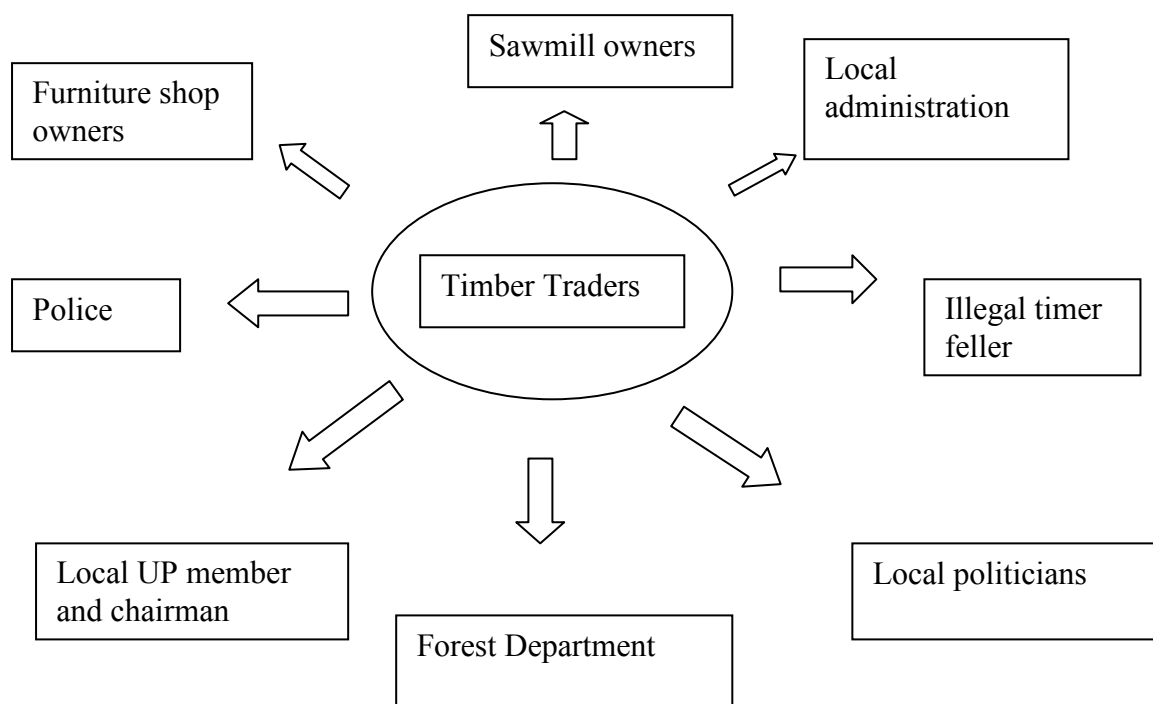
<u>Name of Union</u>	<u>Number of industry / factory</u>
Mirzapur UP	105
Kwaltia UP	58
Prahalledpur UP	03
<b>Total</b>	<b>166</b>

Most of these industries are socially compliant but not environmentally compliant. It is estimated that these industries are discharging huge amount of waste water in surrounding flood lands. In addition, effluent from industries downstream in the Tugar catchment also appears to enter in to the river and being carried upstream by late season tides. Large areas of surface water have a dark black appearance and fuel

smell due to high sulfide levels and low or no oxygen in dry season. There are also reports of poor catches and large scale fish mortality in the water area during dry season.

#### 4.8.6 Timber Traders

There are about 213 timber traders (including sawmill and furniture shop owner) in three unions of the project area (Table 23), who are involved with timber trading. Many of them have no valid license for the trading of timber. They usually receive sawed timber from sawmills and trade locally.



**Fig.17. Link of various stakeholders with Timber Traders**

#### 4. 8.7 Fuel-wood Traders

A number of fuel wood traders have been identified that have indirect stakes with the Bhawal Forest; they collect fuel-wood from the local direct collectors. Several trucks of fuel-wood transported everyday from this area and majority of which come from clear felling and substantial fuel-wood also sold locally by the traders. The traders procure fuel-wood from the individual collectors, stack them and also sell it to the local consumers, while the others transport it by trucks, van, rickshaw, pickup, etc. The marketing opportunities have increased during the recent times at the local level. The fuel-wood is traded at the rate of Tk. 220 -300 taka per van, which contain about 2 mounds.

#### 4. 8.8 Police

Police is main law enforcing institutions that have substantial stake with the forest. They patrol in the area and on the highway to enforce the overall law and order

including forest protection laws. It was reported by local people as well as by the FD staff that sometimes police develop a process of negotiation with the illegal tree fellers and other resource users. Forest cases are initially lodged with the local police stations.

#### 4.9 Dependency of the Stakeholders on the Forest Resources

Traditionally, the local people are used to collect various resources from the Bhawal National Park and other adjacent area. The entire ranges of the stakeholders could be broadly categorized into four groups (Table 24). Local sawmills and furniture shops depend to some extent on the legal and illegal timber from the nearby forests. However, their livelihood is not dependent on the supply of timber from the Bhawal National Park. Similarly, the Moholders, who are involved with clear felling, are not also dependent on the timber from Bhawal National Park. However, the local people who are employed by the *Moholders* and involved with illegal felling are entirely or partially dependent on the forest extraction activity for supporting their livelihood. Forest villagers are entirely dependent for fuel-wood and building materials for meeting HH needs on the forest. It seems that there is no alternate source for its supplies. They also collect vegetables, fruits and hunt some wildlife. But they are not dependent on these resources for their livelihood. The forest villagers are mainly dependent on several types of cultivation in the forest areas for their livelihood support.

**Table 24. Resource Wise Dependence of Different Resource Users**

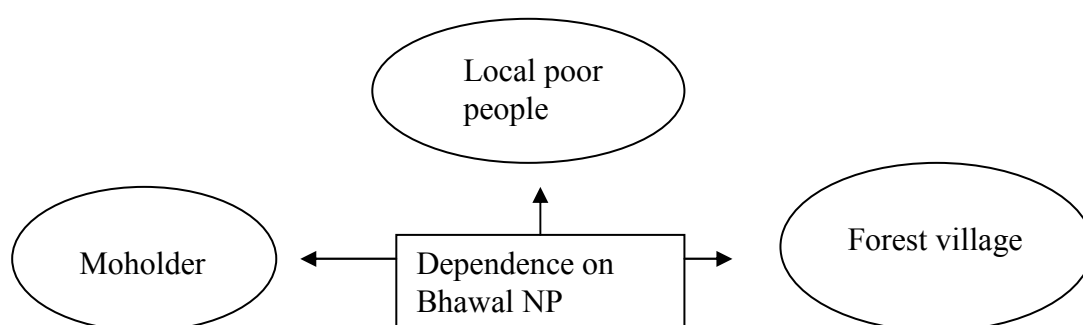
Sl	Name of Resources	Users	Causes	Extent	Dependency of localities	Risk
01	Timber	Moholder, illegal timber feller, Saw mill owner, Furniture Shops, Timber trader	Household use, building materials	High	25 %	High
02	Fuel wood and dead leaves	Local people, a few outside users (restaurant, brickfield)	Mainly commercial use (selling for livelihood) and HHs consumption (small amount)	Medium	50 %	High risks
03	Cane and bamboo	Local users	Basket binder	Less	2 %	Less
04	Medicinal Plants	Local people, a few Kabiraj	As medicine	Less	2 %	Less
05	Herbs	Local People	As vegetables	Very less	3 %	Less
06	Bird	Forest villager, Local People	For meat (wild fowl, Ghughu)	Very less	1 %	High
07	Fruit	Local People	Food	Very Less	2 %	Less
08	Vegetables	Local People	Food	Less	5 %	Less
09	Grass	Local People	For Cattle feeding	Less	5 %	Less



A large number of HHs of the identified villages depends on the extraction of fuel-wood and building materials from the forest. It is the poor who collect these resources, mainly for their HHs consumption and also for selling. The poor people from the neighboring forest area collect fuel-wood and other NTFPs from the forest. Some HHs sell these to earn extra income. Some of them are involved with illegal felling of timber and thus are dependent on their forest extraction activity.

Table 24 shows the dependence of different stakeholder groups on different resources for their HHs needs and supporting their livelihood. Almost, all HHs of forest villages are dependent on the fuel-wood and house building materials, vegetables from the forest for their HH needs. But, they do not collect these for commercial purpose. Many poor people are completely dependent on selling of fuel-wood and many of them sell it for added income. It was revealed from FGD with local people that about 15 % people from the nearby villages completely or partly depend on selling of fuel-wood. Almost all-illegal tree feller sells timber and many of them are completely dependent on it, while others do it for added income.

Fig 18 shows the relative level of dependence of different groups of people on the forest, i.e., the pressure exerted by the stakeholders on the forest. It is apparent from the figure that the local poor people including the ethnic forest villagers are dependent on the forest and at the same time they are the people who causing most harm to the forest. However, the activity of the forest villagers are mostly confined to the area allocated to them for lemon cultivation.

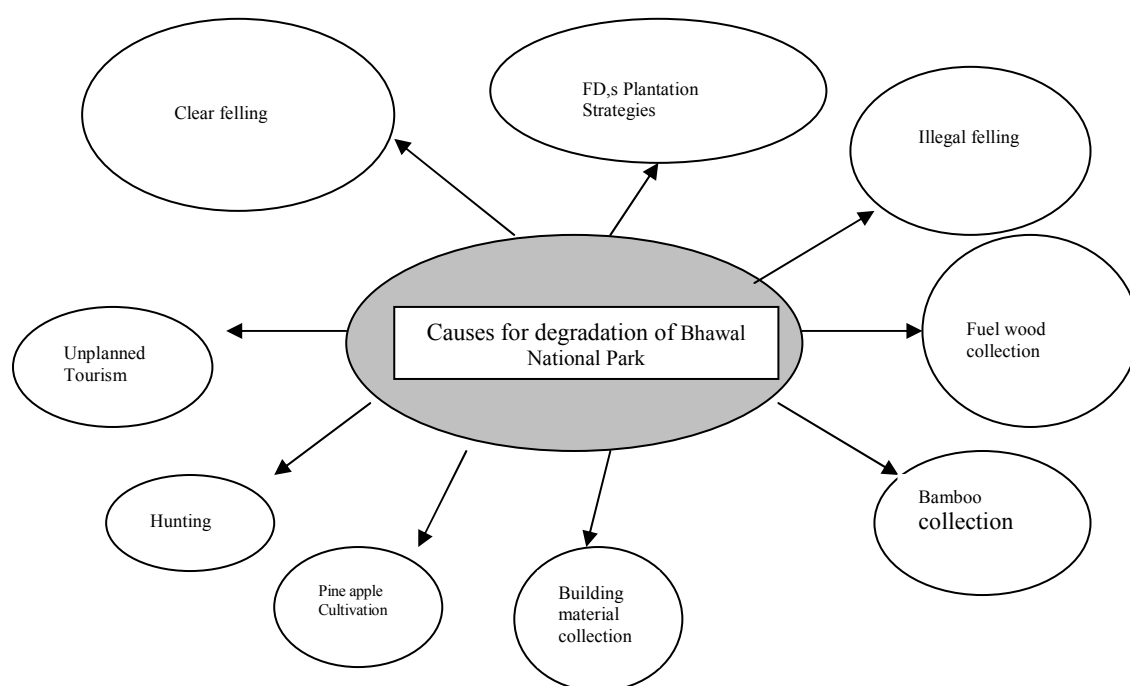


**Fig. 18. Relative level of dependence of major stakeholder groups on the IPAC Bhawal National Park Site**

## 4.10 Causes for the Decline in Forest Resources

### 4.10.1 General cause

Based on the perception of the team developed through discussions with different cross sections of people in the area, a Venn diagram has been constructed on the major causes for the degradation to the forest and its biodiversity and is shown in Fig. 19. The major causes for the decline in forest in order of magnitude are as follows: clear felling and illegal timber felling, FD's plantation strategies, fuel-wood collection, collection of house building materials, hunting, bamboo and cane collection, etc.



**Fig. 19: Major direct causes for the degradation of IPAC Bhawal National Park Site**

Pair-wise ranking (Table 25) exercises showed that presently clear felling practice is the major cause for the decline in forest biodiversity, followed by illegal timber felling, fuel-wood collection and bamboo collection. Presently, hunting has negligible responsibility, as the activity is very limited. The role of FD's plantation strategies for the forest degradation has not been explored.

**Table 25. Pair Wise Ranking for Identifying Main Causes For Forest Destruction**

	<b>Clear felling</b>	<b>Illegal felling</b>	<b>Fuel-wood collection</b>	<b>Cane and bamboo collection</b>	<b>Hunting</b>
Clear Felling	----	Clear felling	Clear felling	Clear felling	Clear felling
Illegal felling	Clear felling	-----	Illegal felling	Illegal felling	Illegal felling
Fuel-wood coll.	Clear felling	Illegal felling	-----	Fuel-wood collection	Fuel-wood collection
Cane and bamboo collection	Clear felling	Illegal felling	Fuel-wood collection.	-----	Bamboo collection
Hunting	Clear felling	Illegal felling	Fuel-wood collection	Bamboo collection	-----
<b>Rank</b>	08	06	04	02	00

In order to investigate the underlying factors responsible for undertaking of these forest degradation activities by the local people cause and effect ranking was done and the outcomes are shown in Table 25 and 26. The exercises revealed that local poverty and unemployment are the main driving factors for the extraction of forest resources, followed by additional income needs and squeezed income opportunities.

Excessive forest cases lodged by the FD and lack of some local resources are also driving the people for increased timber felling and including building materials (Table 25).

**Table 26. Cause and Effect –Ranking (Understanding Underlying Facts for Forest Degradation)**

Name of resource  Identified problems	Timber to sell	Fuel-wood collection	Bamboo & cane sell
Poverty	0000	0000	0
Unemployment	000	000	0
Additional income needed	00	00	00
Lack of house building material			00
Forest cases (in Bhawal National Park)	00		
Income opportunities squeezed	00	0	0

FD's poor forest patrol, easy negotiation with local FD staff, poor strength of local FD and emergence of increased local influential people are all contributing to illegal timber felling. Fuel-wood collection has been linked to development of transportation system and marketing opportunities and drop in solvency level (Table 27).

**Table 27. Cause and Effect (investigating FD's management practice and local situation)**

Practice/Management Practice	Timber to sell	Fuel wood collection	Bamboo and cane collection.
Poor forest patrol	00000	00	00
Easy negotiation	00000	00	0
Poor strength of FD /increased local strength	00000		0
Transportation dev.	000	000	0
Traditional practice	0000	0	0
Increased role of local	0000	0	-
Influential people			

A summary of information collected on resource exploitation from Bhawal National Park Forest are provided in (Table 24). A total of 09 different types of resource are extracted from the forest. Of them, timber (includes both legal and illegal extraction), fuel-wood, coppies dead leafs are extracted in a large scale, cane and building materials in a medium scale, wildlife, fruits, vegetables, etc. in a minor scale, bamboo, medicinal plants in a negligible scale. The main purposes for resource extraction include meeting HH needs, selling for added income / and or to support and supplement livelihood. Timber felling, fuel-wood and cane & bamboo collection, collection of house building materials, hunting etc. all are causing threats to the forest

and its biodiversity through bringing qualitative and quantitative changes in the habitat and the wildlife they support. Moholder, local poor people, forest villagers and unemployed laborer are the major categories of resource user.

**Table 28. Information on resource extraction from Bhawal National Park Site**

Sl. No	Name of resources	Resource collector	Purpose	Extent	Impact	Future Risk	Destination
1	Timber	Moholder, local poor people from adjacent villages, unemployed people from surrounding village	For selling	Large	Reduce selectively large tree and forest thickness, loss of habitat and biodiversity	High	Local timber trader, sawmill, furniture shop, urban areas
2	Fuel-wood	Local poor people, forest Villagers	For HH consumption and selling	Large	Loss of habitat, loss of forest biodiversity,	High	Local HHs, local markets, brickfield, transported to urban areas
3	Wildlife	Forest villagers Occasionally outsider	For consumption As hobby	Little	Stock heavily depleted	High	Local HHs
4	Building materials	Forest villagers Local poor people	Meet HH needs Selling for added income	Medium	Reduce abundance of small trees, loss of habitat, loss of wildlife	Medium	Local HHs Local markets
5	Bamboo & cane	Local people	HH use	Negligible	Little collected as they are not much available	Presently negligible	FD has many cane plantations
6	Fruits	Local people, children and women	Own consumption, few for sale in the locality	Minor	Hamper forest regeneration to a little extent	Little	
7	Vegetables	Mainly forest villagers and local poor people	Collect number of species of vegetables	Minor	No apparent impact	Negligible	
8	Medicinal plants	Few local people, forest villagers	Occasionally collect some selective species	Little	Negligible	Negligible	

## 4.10.2 Seasonal changes in resource extraction

Table 29 shows the trend in forest resource exploitation by month. The exploitation of resources from the forest is season dependent. Most of the timbers are illegally felled during the rainy season as forest patrol is poor during this period. However, legal clear felling takes during the dry season. Fuel-wood is mainly collected during dry season due to easy accessibility and mobility inside the forest during that time. Bamboos extraction mainly takes place in drier months that corresponds to local needs for house building. Medicinal plants, vegetables and some other forest resources are extracted to some extent mainly during rainy season. A little amount of honey is also extracted during summer (Baishakh-Jaistha).

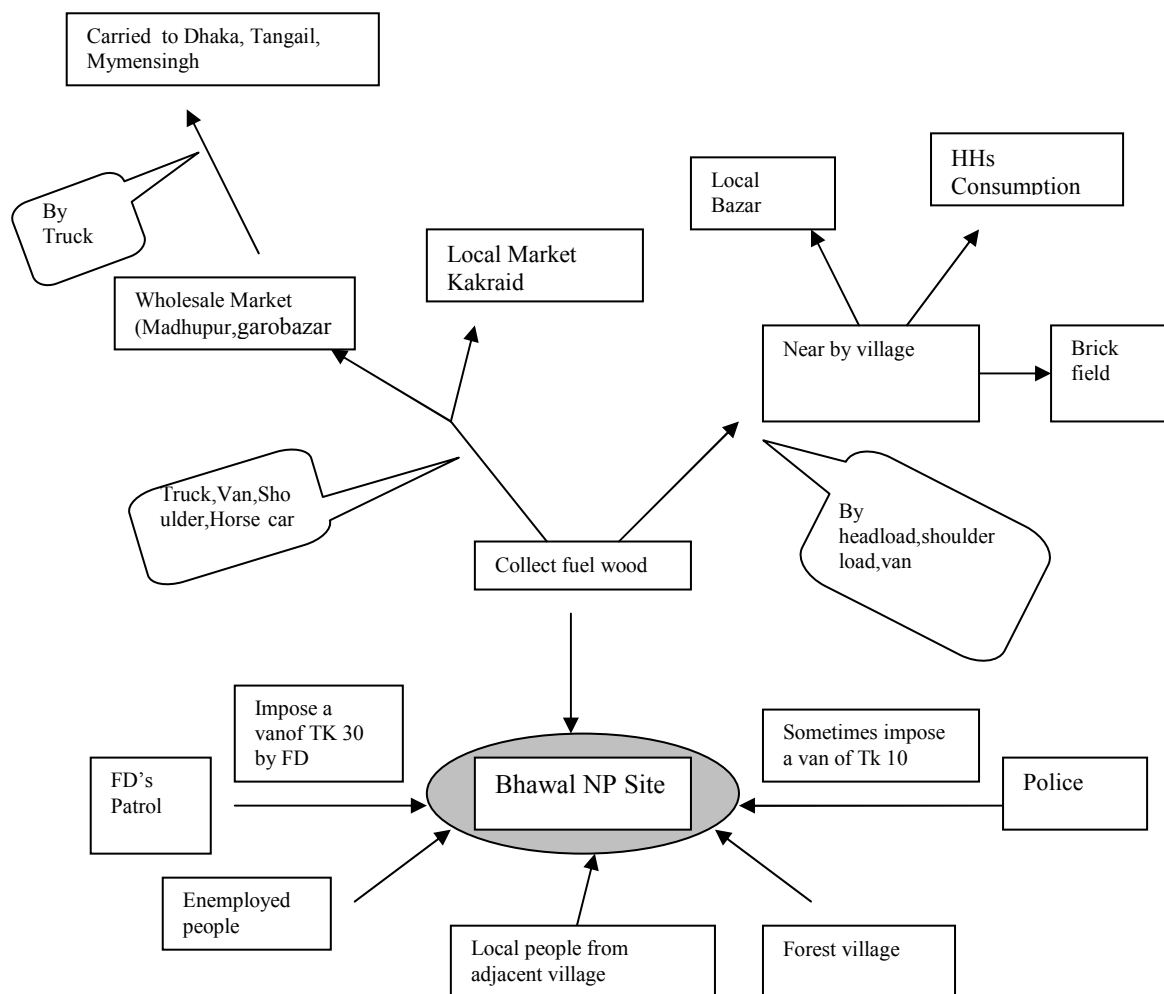
**Table 29. Seasonal calendar of resources exploitation in Bhawal National Park Site**

Name of Resources	Bais-hak	Jaista	Ashar	Shra-bon	Vad-ra	Ashin	Katr-ik	Agrah-ayan	Poush	Magh	Fal-gun	Chait-tra
Timber	00	000	000 00	00	000	000	000	000	00	00	000	000
Fuel Wood	000	000	.....	.....	.....	.....	000	00	000	000	0000	0000
Vegetables	0000	0000	.....	.....	.....	0	0	0	0	0	0	0
Cane, bamboo, building materials	0	0	0	0	0	0	00	0000	0000	000000	00000	00000
Medicinal Plants	00	00	.....	.....	.....	.....	.....	.....	00	00	00	00
Wildlife	0000	000	0	0	0	0	0	0	00	00	00	00

## 4.10.3 Important Resource Exploitation

### 4.10.3.1 Fuel-wood collection

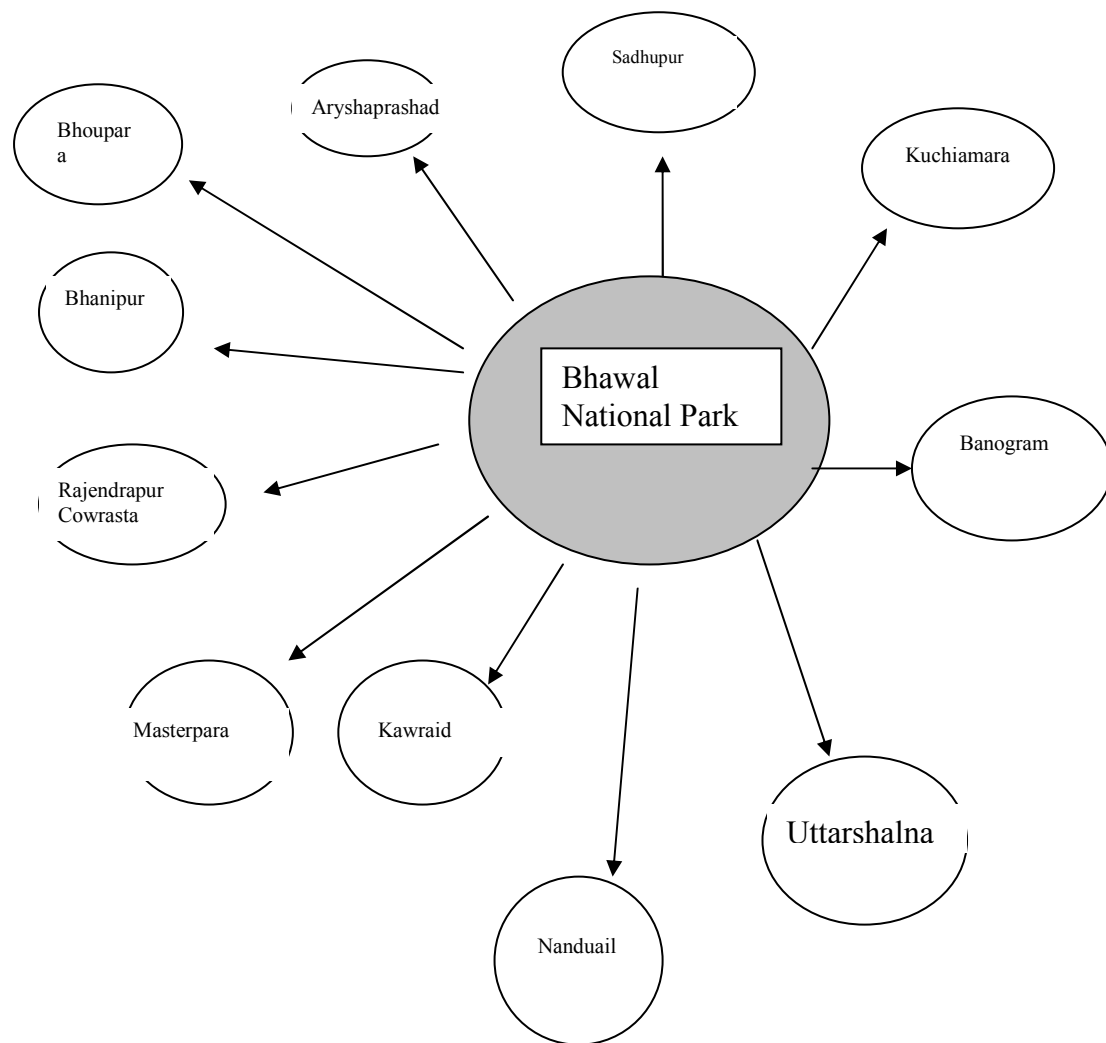
Extensive fuel-wood collection is another practice in the reserve area that poses a threat to the forest biodiversity. This is a major and very visible activity in the Bhawal National Park. It is a year round activity, but major extraction occurs during the dry seasons. Fuel-wood is collected both for household consumption and for commercial purposes. Most of the collectors are adolescent boys and adults; both male and female. Most collectors are poor and supplement their income by selling fuel-wood. Some fuel-wood collectors have substantial linkage with illicit feller and act as informative persons.



**Fig. 20: Flow of extracted fuel-wood from IPAC Bhawal National Park Site**

#### 4.10.3.2 Timber extraction

Although timber is extracted in both illegal and legal way, timber extraction is regarded as the major cause for the destruction of Bhawal National Park. Many people from the surrounding villages of Bhawal National Park are directly involved with the illegal extraction of timber from the forest. The villages of all unions are mainly involved in this activity. In other villages, the number of timber poachers is few. Most of the poachers are poor.

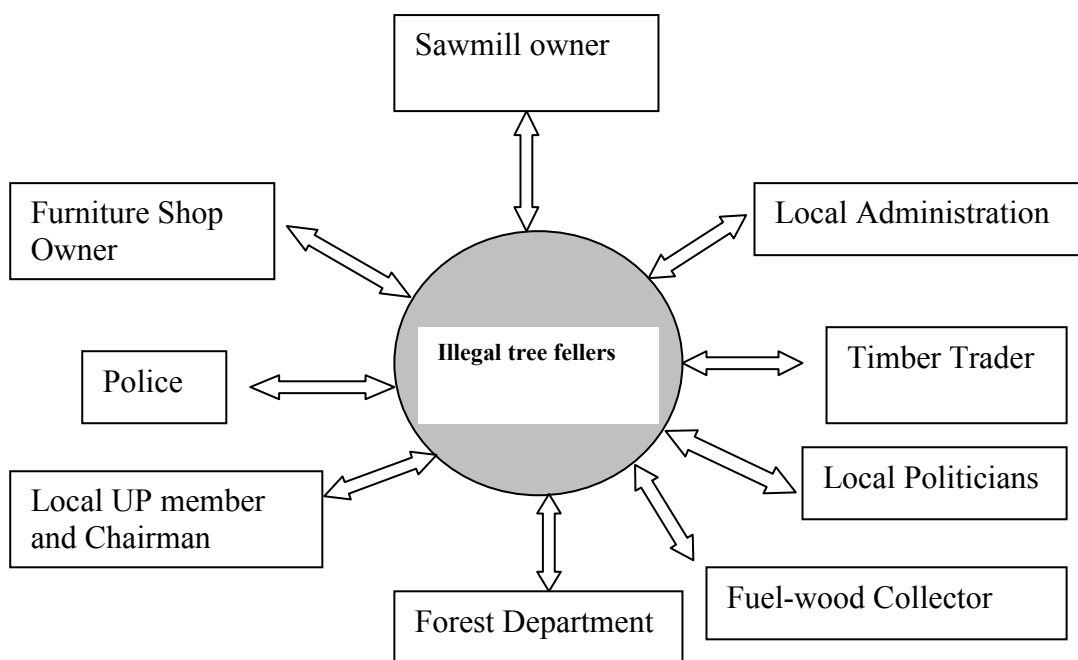


**Fig. 21. Relative stakes of different villages with illegal felling**

Timber is extracted from the Bhawal National Park by two ways. One is legal way by clear felling, through auctioning by FD. FD auctions out different forest coupe / block for clear felling to auctioneers, locally called *Mohalder*. Another is by illegal felling. It is claim by the local people that illegally felled trees are smuggled out along with clear felled trees by the *Mohalder*s. Beside these, various groups of people are involved with illegal felling. Fig.22 shows that the illegal fellers have linkage with different parties, including police, administration, local political leaders, FD etc. Both legal and illegal timbers are sold in the local market such as Sreepur Bazar, Salna Bazar, Joydebpur Bazar, Bhabanipur Bazar, Kalihati Bazar, Mirzapur Bazar, etc. Then it is transported to the various places of the country such as Mymensingh, Dhaka, Tongi, etc. by truck, bus etc

Different law enforcing agencies, such as police and FD check illegally felled trees at different posts. As per local people that the traders manage to pass through the check posts. It appears that local Police play a negative role in this aspect.





**Fig. 22. Linkage of various stakeholders with illegal fellers**

#### **4.10.3.3 Cane, bamboo and house building materials collection**

House building materials are collected at a small scale from this forest, though this forest is situated not far away from the settlements. The forest villagers collect their entire house building materials from the forest, predominantly from their pine apple cultivation areas as they claim. The Bhawal National Park area is also widely used by the surrounding rural population, and people from the identified villages for collection of building materials. However, collection of building materials by them is not much. The building materials collected is mainly small trees, sometimes young trees of valued timber trees. Bamboo is also used as building materials for their houses.

#### **4.10.3.4 Other Resource Collection**

Different resource users also collect various other resources from the Bhawal National Park. Cane also collected at a negligible quantity from the forest. There are people in the adjacent villages of forest who collect vegetables and fruits from the forest. The vegetables collected include bamboo shoots (manthana), bonkachu (bandhugi), ramkala, thankuni, aorai kalai, karam, gantha, muia, palong shak kachu, kachur lati, etc., mainly during rainy season. Very few villagers are involved with this activity. In addition, few people collect seasonal fruit from the forest. The main forest fruits that are collected by people are *Chapalish*, *Kau*, *Kanthal*, cane fruits and banana. The fruit collectors mainly collect these fruits for their own consumption. A few of them probably sell them to their neighbors or to markets for additional income. In addition, there is irregular hunting of jungle fowl and wild boar by the people or HH consumption.

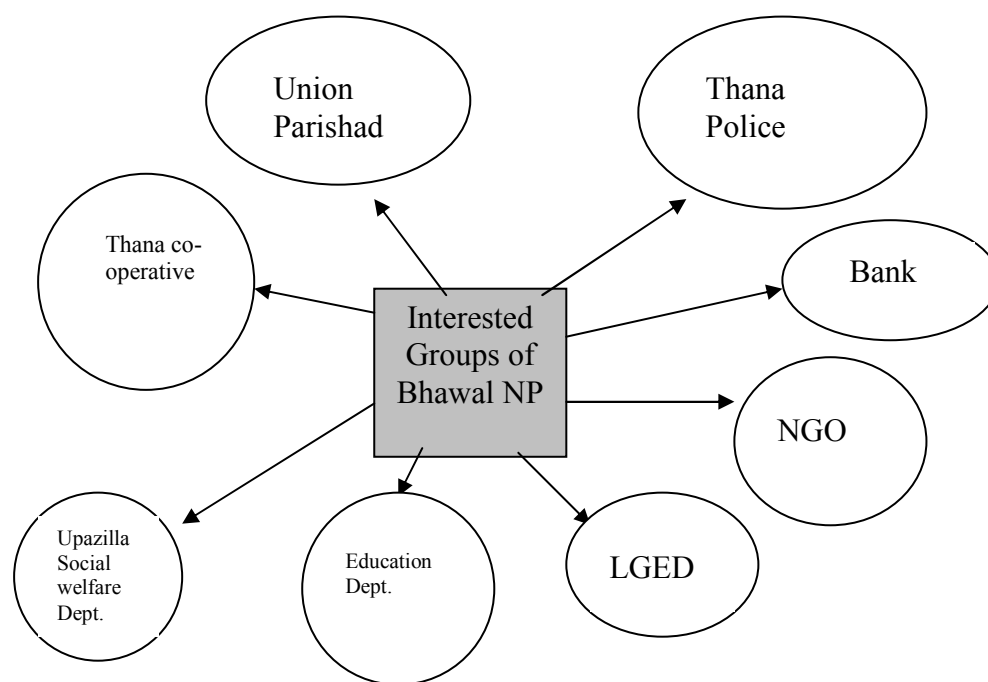
## 4.11 Local Community and Power Structure and Local Governance

### 4.11.1 Local decision makers and influential people

Many influential people have control over the local people, their activities and even over local administration. Some of them have linkages with the illegal tree feller.

### 4.11.2 Local governance

Local Union Parishad is the lower level local government entity and look after local welfare and development. It has also emerged as the main center for conflict resolution. The UP members, who are elected from different areas of the Union, look after their respective areas. The local public representatives are consulted whenever there is a local issue. There is also a new local organization, headed by Ward Member of UP, in each ward (village) and deal with all local issue, including welfare, development, dispute and conflict. Police administration at Upazilla level is the local law enforcing agency and are involved with maintaining local law and order situation. Fig.23 shows the relative involvement of different Government and Non-Government organizations in the locality for local welfare, development and administration.



**Fig. 23. The relative level of stake of different institution**

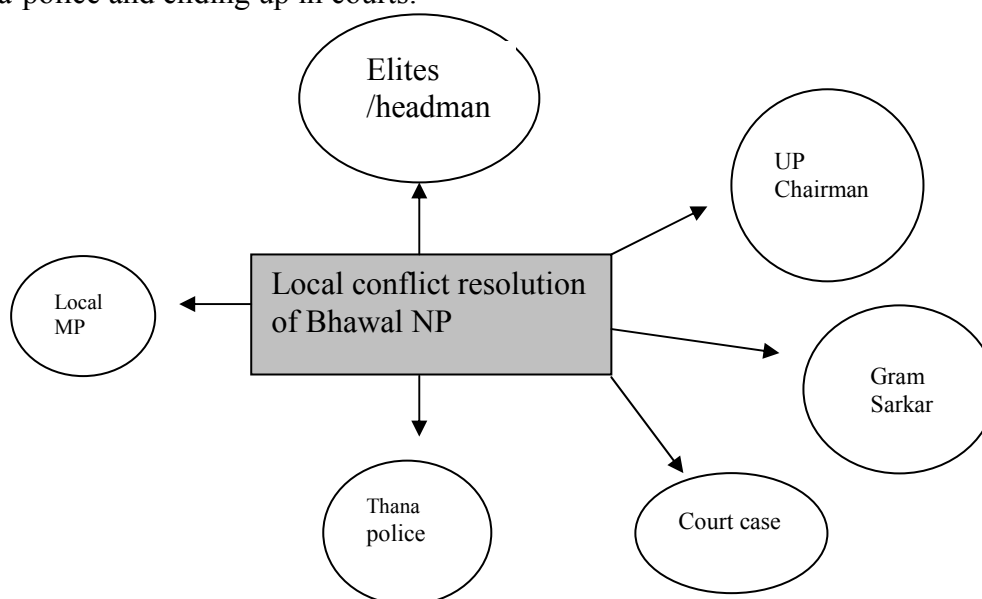
### 4.11.3 Local conflict, conflict resolution, social adhesion and cohesion

#### 4.11.3.1 Sources of conflict

The main sources of conflict among local people are, land dispute, children affairs, livestock grazing, marriage related affairs, family affairs, money lending, local politics, local elections etc.

#### 4.11.3.2 Conflict resolution

Conflicts are resolved by arbitration by local elites & public representatives (MP, UP Chairman, members). If the local efforts are not fruitful it may lead to filing cases with Thana-police and ending up in courts.



**Fig. 24. Venn diagram of Conflict resolution**

#### 4.11.3.3 Conflict with FD

There is a huge conflict between with FD local staff and local people, particularly disputed land owners and with tree feller from various villages. Sometimes there are direct conflicts with tree feller during patrolling, sometimes lead into exchanges of fire and even murder.

#### 4.11.3.4 Social cohesion and adhesion

There are many social activities that maintain social adhesion and cohesion among the villagers. Some of them are Eid-ul-Azha, Eid-ul-Fitre, marriage ceremony, religious functions, Adivashi (local ethnic people Barmon) festival collective action through local community organizations, etc.

## **4.12 Local Socio-economic Context**

### **4.12.1 Demographic Profile**

#### **4.12.1.1 HHs**

In total, there are approximately **35,490** (Table 16) identified households having as major and medium level stakes of the total project area. Of them, only 85 HHs belong to Adivashi (local ethnic people called Barmon) forest village.

#### **4.12.1.2 Education**

The overall literacy rates of male and female are near to close. In recent years, the number of school going girls is higher than the boys. However, in case of higher studies girls are behind the boys. Overall, females are less educated than the males. Once higher educated people were less in this area but at present the scenario has changed.

## **4.13 Livelihood analysis**

### **4.13.1 Occupation**

The major primary occupation of the project area is agriculture (40-50%) mainly paddy cultivation, followed by service holder (30-40%), daily laborer (20-25%), overseas employment (3-5%) and small businesspersons (2-3%).

### **4.13.2 Richness-poverty level**

The PRA / RRA team members have received an idea about richness and poverty level of the project area that are; about 7-10% people of the area are rich, 20-25% is middle class and 40-50% is under middle class and 10-15% is very poor.

### **4.13.3 Unemployment**

Unemployment is another severe problem that puts pressure on over exploitation of forest resources. In the project area, on an average, about 10-15% people are unemployed. Among the villagers, about 5-7% people are unemployed. In average, about 15% local surrounding people are unemployed. However, there is a strong seasonal trend in unemployment level in the area. Unemployment is a major concern/problem in the area. According to the local people, the number of unemployed people increases during the dry season.

### **4.13.4 Income and expenditure profile**

FGD revealed that the major sources of income in order of magnitudes are laborer, followed by agriculture, fuel wood collection, timber poaching, small business, etc. On the other hand, the expenditure profile shows that people spend major part of their income for purchasing food, followed by meeting, cultivation expenses, clothing purpose, less for educational purpose.

### **4.13.5 Skill & skill development opportunities**

Overall in the area, the number of skilled person seems to be very inadequate to undertake alternate income generation activities. Skill development training provided

by the NGOs are very limited and confined to some traditional areas of income generation. Local people have got some skills on poultry, fish culture, like bamboo basket and mat making, etc. There are areas such as bamboo and cane handicrafts preparation, cattle fattening, poultry, dairy, pond aquaculture etc. Potential training and credit support in these areas could play a vital role in income generation of some of the local people and lessen their dependency on forest and at the same time very soft loan would help in undertaking these activities.

#### 4.14 Social dynamics (Trend in changes in socioeconomics)

##### General Dynamics

Table 30 shows the changes in some key socio-economic factors and local activities. Compared to 1970, there has been an increasing population; the expenditure of local people has increased with corresponding decline in solvency. Income of local people in terms of taka has increased, but at the same time livelihood expenditures have increased. Although, literacy rate has increased, unemployment rates have also increased. During this time, use of the wetland for both as HH needs and income has increased. However, local food scarcity has reduced while opportunities for alternate income have increased.

**Table 30. Trend in Changes in Some Socio-Economic Matrices of the Local People**

Issue	Pre-1971	15 years ago	Present	Causes for change
Population	00	000	00000	Population growth,
Solvency	00000	0000	000	Livelihood expenditure increased, lack of added income and unemployment
Pollution	00	0000	000000	Quick industrialization
Livelihood expenditure	00	000	00000	Increased price of goods, use of increased commodity
Literacy	0	000	00000	Awareness raising, educational opportunity increased
Unemployment	0	00	00000	Less cultivated land than pre- 1971, population growth, resource depletion
Use of wetland for income	00	000	00000	Poverty, unemployment
Use of wetland for HH needs	00	000	00000	Poverty, Population growth, easy access and no alternate source
Transportation and mobility	00	000	00000	Development of communication and transport road
Homestead plantation	0	00	0000	For income generation, consumption, awareness HHs
Food scarcity	00000	000	00	Increased opportunity development and employment agricultural
Credit and IGA	-	-	00	Increased GO, NGOs credit and IGA programs
Occupation	0	00	00000	Increment of IGA and business

#### 4.15 Local Problems

Problem ranking exercise (Table 31) was performed to identify and understand the local level problems and its causal factors. The major problems, according to the magnitude, are pollution, poverty, unemployment, road communication, electricity, drinking water, etc.

**Table 31: Local problem and their causes and possible solutions**

<b>Name of Problems</b>	<b>Reason</b>	<b>Solutions</b>
Pollution	Day by day, the area going beyond living of standard due to pollution, mainly industrial pollution. Impact of industrial pollution most of wetland's as well as forest ecosystem have destroyed.	ETP should be establishing in all factories and other environmental factors should be considered.
Poverty	Over population, unemployment, lack of capital to initiate IGA, lack of alternative income generating activities, lack of skills.	Creation of opportunities for new IGA and providing of credit without interest, skill dev. training, more NGO activities
Unemployment	Lack of sufficient work, population pressure, Lack of education,	Creation of opportunities for new IGA and providing of credit without interest, skill dev. training, more NGO activities
Education	There is no sufficient educational institution	Establishment of new technical & NFE schools, awareness, and financial support
Road communication	Road communication is not well in some area, most of the case, become difficult during rainy season	Local government and other concern agencies should give proper attention
Drinking water	Lack of deep tube well and fresh water	Need Government and NGO efforts to provide tub well and technology for safe water.
Electricity	Limited & interrupted electricity supply that hampers public life.	Electricity supply should be smooth and introduce solar energy system.

**Table 32. Pair wise Ranking of Some Local Problems**

Identified problems	Pollution	Poverty	Unemployment	Food security	Income needs	Fuel-wood scarcity	Scarcity of house build. mat
<b>Pollution</b>	.....	Unhealthy environment		Lack of farming land			
<b>Poverty</b>		-----	Poverty	Poverty	Poverty	Poverty	Poverty
<b>Unemployment</b>		Poverty	---	unemployment	Income needs	Unemployment	Unemployment
<b>Food security</b>		poverty	unemployment	-----	Income need	Food security	Food security
<b>Income needs</b>		poverty	Income needs	Income needs	-----	Income needs	Income needs
<b>Scarcity of. H. build mat.</b>		poverty	unemployment	House building materials	Income needs	House building mat.	-----
<b>Total</b>	10	08	03	02	06		01
<b>Rank</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>7</b>	<b>5</b>

#### 4.16 Local Level Awareness and Behavior

Local people know about some of the rules of forest Acts, but most of them do not know the significance of the National Park. About 50% people are aware of the National Park and many people know about some restrictions in the National Park. Compared to male, female are less aware of it. In Bhawal National Park, people are aware about the degradation to forest and forest resources and its adverse impacts. They have a positive attitude towards conservation. However, local people know little about rules, regulations for the use of the reserved forest. Initial response of local people and FD staff towards the project was positive. As per local people, alternate income generation provision for the local poor people would be helpful for the successful implementation of the project. The ethnic community is well behaved and cooperative. Most of the local Bangalees are also good people. However, some of them are rude. Some people expressed their concern that if the program affects the livelihood of local people they will not cooperate and may oppose the program. Initial response of the local people and FD staff towards the project is very positive and villagers are willing to cooperate.

#### 4.17 Resource regeneration through plantation practices

Already there are some Social Forestry have developed on the road side and in some patches of forest. The Social Forestry is mainly maintained by the administration of Local Government. The species of Social Forestry are Mehogoni, Akasmoni, Arjun, Hisol, Karach, etc.

**Table 33. Trend in changes in occupation of people around Bhawal National Park Area**

Sl	Occupation	Before 1971	Before 15 Years	Present
01	Agriculture	00	0000	00000
02	Day Laborer	00	000	0000
03	Business	00	000	00000
04	Fuel wood Collector	00	000	00000
05	Illegal Poacher/tree feller	00	000	00000
06	Service	0	00	0000
07	Timber Trader	0	00	0000
08	Carpenter	0	000	0000
09	Sawmill operation	0	00	0000

### **FDs Plantation / Product forestry by FD**

The plantation policy for the Bhawal National Park forest appears to be concentrated on the production of timber, cane, bamboo and some other forest products, with planning, establishment, management and harvest under the centralized control of the Forest Department. FD records show that plantation in Bhawal National Park Forest started in 2002 under FSP (Forestry Sector Project). Initial plantations included only long-rotation plantation, primarily with teak and conspicuous tree species. FD records shows that about 28 species of trees were used in planting the forest. Intensive plantation of the forest occurred during the period 1983-1990. The later plantations include mainly short-rotation monoculture plantations mostly with exotic and rapid growing species. The most common species for the short-rotation plantation are Acacia, Mengium, Eucalyptus, etc. The FD has also planted cane and bamboo in a substantial area.

**Plantation practice:** Plantation of the forest included clear felling of the original forest, burning of underneath vegetation. Although illegal logging has been stopped in the natural forest, FD continues to clear the mature plantations both inside and in bordering of the reserves. It was expressed from an FGD that the FD's plantation strategy for Bhawal National Park is still guided by the production forestry. Along with the traditional plantation practice with valuable long rotational timber trees, present plantations in Bhawal National Park include Jarul, Chapalish, Garjan, teak, as well as short rotation exotic trees (i.e. Acacia hybrid, Mangium, Moluccana, Euclyptus, Pine, Akashmoni) with mono species. Beside this bamboo and cane have been and being planted in many blocks. Cane is planted as undergrowth which has started from 1997. The FD also continues to cut under short vegetation in the natural forest in order to plant bamboo. Although not quantified, this practice has a significant negative impact on regeneration and forest succession. These practices resulted in the earning of huge amount of government revenue. Changing these practices may be difficult given the amount revenue generated.

**Rose gardening:** Recently 100 species of roses have introduced in 1(one) hector at Bhawal National Park.



## 4.18 Seasonal changes in socio-economics of the local people

Table 34 provides information on monthly changes in some socio-economic parameters and some resource extraction activities. Unemployment is higher during Baishakh-jaistha and during Poush-Magh. Timber felling is more during wet season while fuel-wood collection is more during dry seasons. In summary, except timber felling, most forest resource extraction and related activities take place during dry months. Timber felling is inversely related to forest patrol. While there appears to be no direct link between seasonal unemployment and dependence on the forest resources, this is thought to be a causal factor in dependence.

**Table 34. Seasonal Changes in Some Socio-Economic Matrices**

	Baishak	Jaisthya	Ashar	Shraban	Vadra	Ashyin	Kartik	Agrahayan	Poush	Magh	Falgun	Chaitra
Unemployment	0	0	00	000	00	000	000	0	00	0	000	000
Accessibility to forest	00	00	000	000	0	0	0	00	00	0	00	00
Transportation problem	00	00	000	0000	0000	000	00	0	0	0	0	0
Brickfield/saw mill operation	000	00	.....	.....	.....	.....	.....	000	0000	0000	0000	000
Forest patrol	0000	000	00	00	00	00	000	0000	0000	0000	0000	0000
Agricultural activities	0000	0000	0000	0000	00	0	0	0	00	00	00	000
Timber felling	000	0000	0000	0000	0000	000	000	00	00	00	00	00
Fuel-wood collection	0000	000	00	00	00	00	000	0000	0000	0000	0	0000
Bamboo	00	00	0	0	000	00	00	000	000	000	000	000
Building materials	00	00	0	0	0	0	00	00	000	000	00	00
Hunting	0	0							0	0		
Vegetable collection	000	000	0	0	0	0	00	0	0	0	00	00

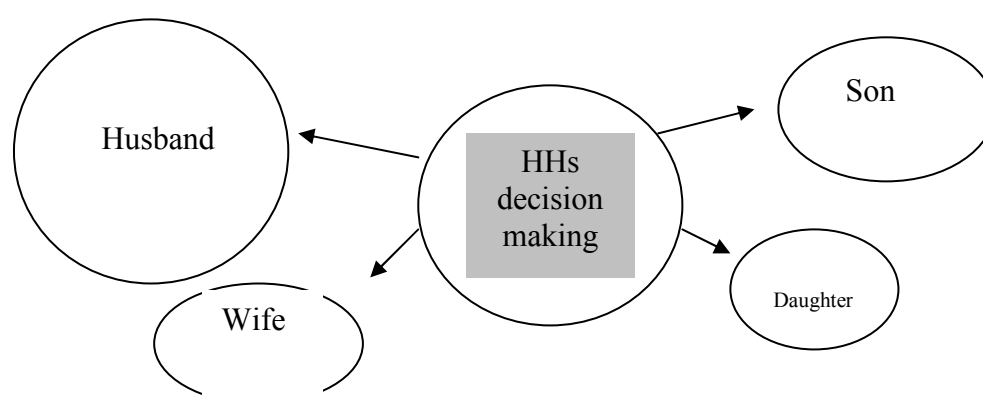
## 4.19 Gender Issue

### 4.19.1 HH decision making

Table 25 and Fig. 21 shows the relative level of influence of different members of the family in decision making. In Bhawal National Park area, the husband takes the major HH decisions, followed by wife and sons. Daughters are rarely consulted in decision making. Women of ethnic community have a major role in many HH decisions making.

**Table 35. Information on Family Decision-Making (Uttar Salna)**

Name of decision	Husband*	Wife	Father	Mother	Elder Brother	Younger Brother	Son	Daughter
Marriage	00000	0000	0000	0000				
Sowing crops	000	00	0000	00				
Land purchase	00000	0000						
Land selling	00	0000		0000				
Treatment	00000	0000						
Education	00000	00000	0000	0000			0	0
Tree selling	000	000	0000	0000				
House making	00000	00000	000	000				
Cattle Purchase	000	0000						
Loan	00000	0000						
Savings	00000	0000						
General expend.	00000	00	000	00				



**Fig. 25. Venn diagram of Family decision-making**

#### 4.19.2 Outdoor mobility and access to credit and IGA

Table 36 shows that the women of the area have moderate mobility. Participation to social events by women is comparatively less than males. But in the cases of IGA & credit, the women have much higher access than the man. The cause behind this is that the credit providing organizations or NGOs prefers female than to male for providing credit. Women are moderately discriminated in case of employment in jobs, business etc. But in the ethnic community, this picture is quite different; women are more involved in earning.

**Table 36. Mobility and participation in social events and access to credit and IGA by male and female in Bhawal National Park Area.**

	<b>Outdoor mobility</b>	<b>Participation in social events</b>	<b>Access to credit</b>	<b>Access to IGA</b>	<b>Education</b>	<b>Employment</b>
Male	00000	0000	0	0	000	00
Female	00	00	00	00	00	0

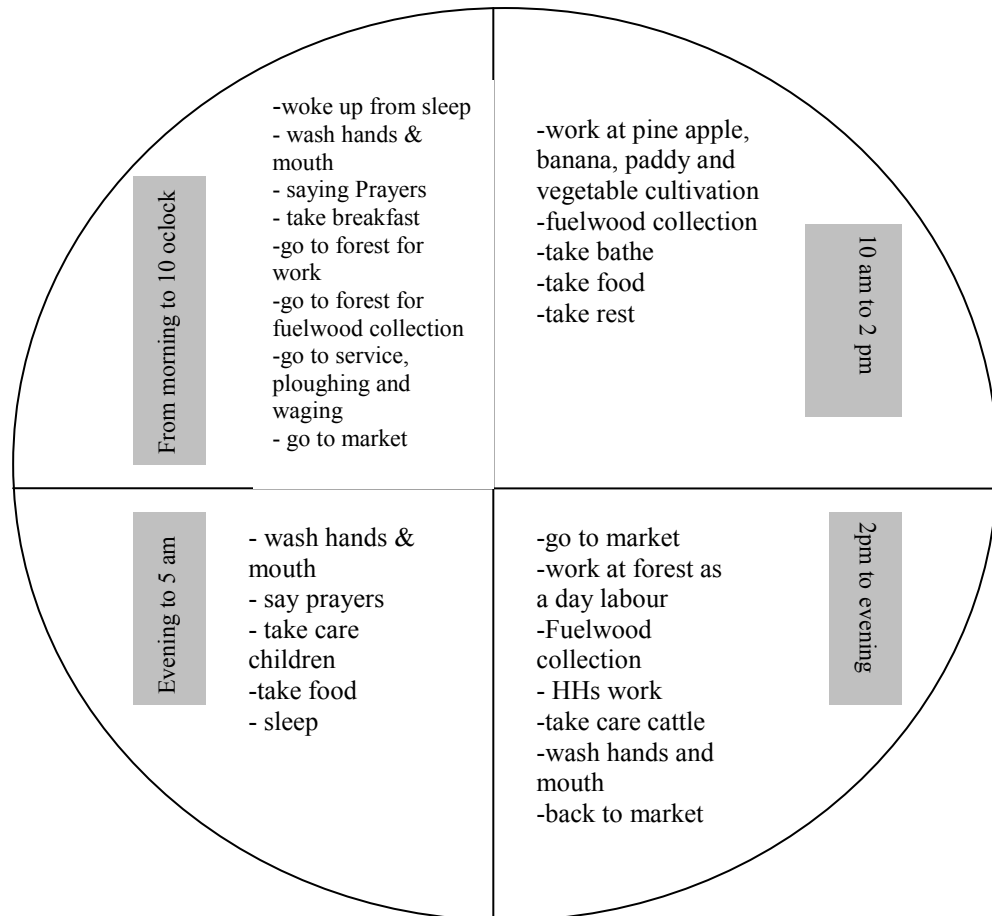
#### **4. 19.3 Workload of local male & female**

Generally, in the Bangalee community, men have more work during Jaistha to Bhadra and again during the winter months. The females have more work during the dry months and the periods that correspond to the local agricultural activities. However, in the Bormon community (having only 85 HHs) the women have more work than men except the month of Agrahayan.

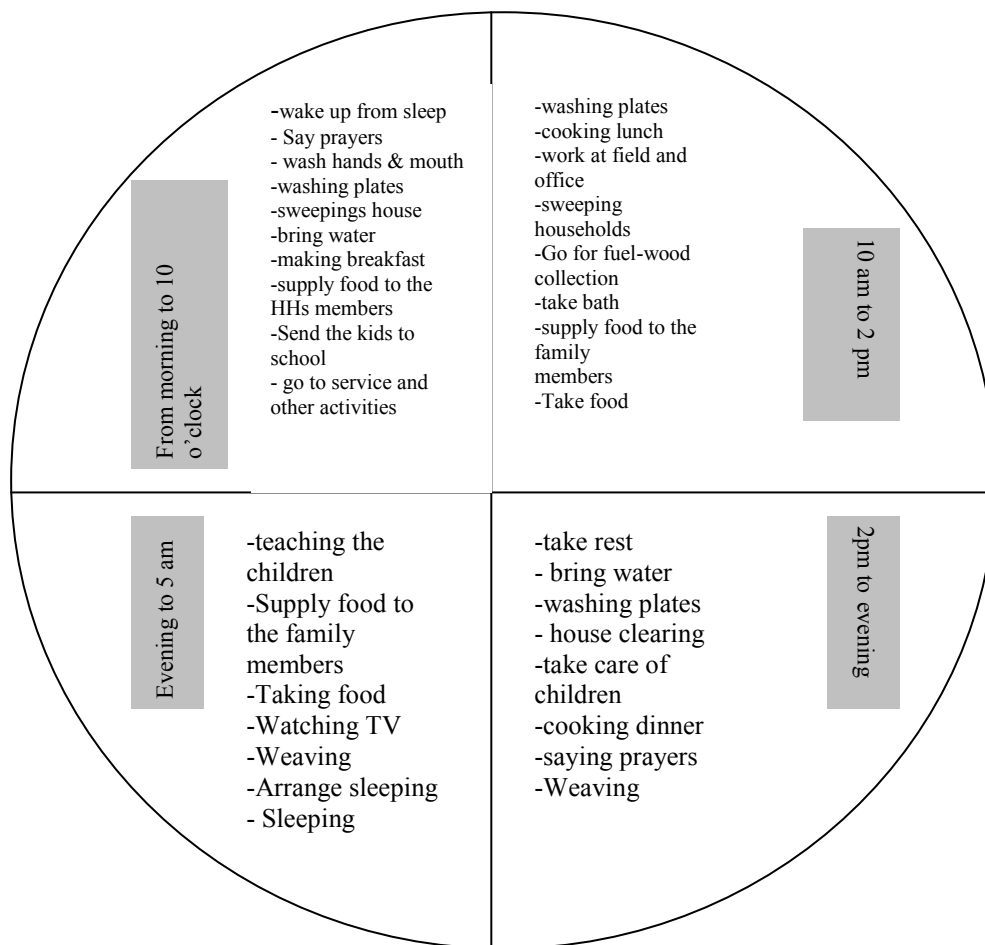
In general, women in the locality have a lower workload than the men excepty Barmon commuity.

#### 4.19.4 Daily work load

Fig. 26 and Fig. 27 show the daily work chart of male and female, respectively, in a Garo family in Bhawal National Park forest village. The females are typically involved with the household work, agriculture and also help in the weaving and outdoor work. The males mainly do the outdoor works related to income generation.



**Fig. 26. Daily Workload Chart of Men of IPAC Bhawal National Park Site**



**Fig. 27. Daily Work Chart of Women of surrounding villages of Bhawal National Park Site**

## 4.20 Law Enforcing Mechanisms

In Bhawal National Park, forest patrol is inadequate and FD staffs are not capable of facing the armed gangs of illegal timber extractor. As revealed from FGD, forest check post at Bhawal National Park does not serve the purpose of checking illegal timber adequately. Sometimes forest cases are filed against innocent villagers and this activity compell them to fell in the cycle. Local police takes lot of interest in enforcing law. However, according to local people, their enthusiasm in forest protection goes against the forest conservation. Local people claim in FGD that police patrols around the forest but not for forest conservation purpose, for their own interest. Often police impose per van of Tk. 10 for each fuel-wood collector and a big amount of money for each trucks with illegal timber. According to the FD and local community they are helpful and cooperative in this aspect.

#### **4.21 Status and Role of Forest villagers and ethnic community**

There are many forest village located very close to the Bhawal National Park inhabited with an small ethnic community called Bormon, they were allowed to settle down within the Bhawal National Park area. The FD mainly maintain cooperative relation for strengthen their forest patrolling with the help of the forest villagers. They have only their homestead land. They cultivate mainly paddy and vegetables in an area around their village, informally allocated to them for the purpose. The maximum villagers depend on forest resources. They collect vegetables; house building materials and fuel-wood from the Bhawal National Park. Overall a little impact on the park by above activities. There have a tendency of encroaching land or establishing new settlements inside the park. But they expect to get some more few new lands for establishing new HHs for their expanding family members, also they have some expectation from the project that IPAC should provide some support to improve their livelihood development strategies.

## **4.22 Background of Social Forestry (SF) in Bangladesh**

### **4.22.1 Importance to Introduce Social Forestry in Bangladesh**

Forestry in Bangladesh has been a continuation of British and Pakistan policy which was commercial in nature, state-centric and devoid of people's participation. On the contrary when the destruction of forest resources became very much visible then policy makers start thinking to compensate this destruction process. And thus the idea of introducing Social Forestry program evolved. SF emerged as an alternative Income generating approach for the forest dwellers. The salient features of SF are:

- Conserve and protect the forest
- Participatory model of management
- Encouraging people's participation
- Equity & efficiency

### **4.22.2 Major component of Social Forestry in Bangladesh**

- woodlot plantation to be established on *Khas* (government owned) land
- Agro-forestry, 3.5 acres of land allocated to each participant household
- strip plantation
- Village nurseries

To materialize it

NGO played crucial role in mobilizing groups, to plant, to select species of trees, land allocation and women's involvement.

### **4.22.3 Complex land structure implementation of Social Forestry in Bhawal**

- FD began SF as ADB-assisted project in 1989-90.
- More woodlot & agro forestry. Shal trees cut for woodlot plantations & agro forestry
- Natural Shal trees were cut to plant fuel trees (e.g., Eucalyptus, Mengium, Acacia)
- Seed selection by FD but implemented under the rhetoric of participatory development
- Removal of forest dwellers right to forest produce
- Threatened livelihood led to resistance; FD officials dual roles as police and promoters of SF

### **4.22.4 Land ownership and Forest Rights**

- Social Forestry Project (SFP) failed to recognize the importance of common land. Did not take into account of traditional customary ownership
- Although SF implied "bottom-up" approach, appears to remain state-oriented.
- FD contradictory roles as both 'protectors' & 'exploiters'
- Participants are 'beneficiaries', not active agents of change
- Not conservation, regeneration, rather afforestation with commercial trees
- In the face of such complex scenario, it is ironical that FSPs in Bangladesh is yet to become "social".

## **5. Threats, Issues, Opportunities and Challenges for the IPAC Bhawal National Park Site**

### **5.1 Threats to the IPAC Bhawal National Park Site and its Biodiversity**

#### **5.1.1. Clear felling and illegal timber felling**

Matured plantations are cleared felled through a process of auction. The auctioneers are usually the local influential and very powerful. They cut everything within their auctioned area. They remove the herbs as well as to facilitate carrying and transportation of logs. It is alleged that some timber illegally felled are also smuggled out along with the clear fell timber. Widespread timber felling in the past caused to the reduction in the forest coverage, but was replanted with short rotational plantation. Timber felling is still widespread within the Forest and selectively large trees are removed. The entire process poses most threat to the Forest.

#### **5.1.2 Collection of fuel-wood, bamboo and other house building materials**

Collection of fuel-wood, bamboo and house building materials are widespread within the Forest and remain as important threat to the biodiversity of the Bhawal Forest Area. The collection of these forest resources removes the indigenous, non-traditional timer and small trees and shrubs. All these contribute to forest degradation and poor abundance of these exploited species.

#### **5.1.3 Pollution**

At present, pollution of water and air are the main threats for the IPAC Bhawal National Park Site. One of the biggest industrial clusters in Bangladesh is located in Gazipur Belt of Dhaka, where there are many textile & dyeing, medicine factories and poultry industry. Beside the project area, there are many brickfields polluting the environment in various ways. These industries use the surrounding wetlands, which flows through the Beel, as a disposal ground for untreated waste, which they reported resulted in poor catches of bad smelling fish. Effluent from industries downstream in the Turag and Bangshi catchments also appears to be entering the river and is carried upstream during low river flows by tidal effect. As a result, water quality has deteriorated to a level which is unsuitable for certain types of aquatic life. In some cases, the low land which receiving the westages of industries have no passing way of westage with any canal or river or so on. These types of waterbody are much polluted and their water is containg very bad smells. And finally, causes of serious diseases of human being.

Pollution also causing harms to forest ecosystem in a several of ways. Polluted water inside the forest when get locked makes the surrounding soil unhigenic both for plants and animals. Wild animals frequently face drinking water scarcity and compelled to drink polluted water. This causes serious health hazards for wildlife.



#### **5.1.4 Industrialization**

At present, quick industrialization is one of the major threats for the IPAC Bhawal National Park Site. The PRA / RRA Team have addressed industrial pollution issues of Bhawal National Park Site, where more than 166 major industries are located (105 in Mirzapur UP, 58 in Kwaitia UP, 03 in Prahalledpur UP). Most of these industries are socially compliant but not environmentally compliant. It is estimated that these industries are discharging huge amount of waste water in surrounding water bodies. In addition, effluent from industries downstream in the Tugar catchment also appears to be entering the river and is carried upstream by late season tides. Large areas of surface water have a dark black appearance and foul smell due to high sulfide levels and low or no oxygen in dry season. There are also reports of poor catches and large fish kills in the area during dry season

#### **5.1.5 FD's production of forestry**

FD aims at increasing the valuable timber trees to get the maximum biomass from the forest. Therefore, plantations are done with short rotational tress of rapid growth. Very often, exotic monoculture plantations are done. They also plant bamboo and also cane as undergrowth. This causes a great threat to the diversity of both plants and animals. Plantation practices include clearing of land and subsequent weeding to facilitate plant growth. These practices also hamper the natural regeneration of the forest and reduce the biodiversity.

#### **5.1.6 Hunting**

Widespread hunting in the past resulted greatly to the reduction in wildlife diversity in the Bhawal Forest. Hunting in Bhawal Forest now comparatively less than previous time, mainly because of unavailability of wildlife. However, some level of hunting is still done. The local ethnic community hunts / traps some wildlife; the important species sought are wild boar, jungle fowl and some species of birds. It is reported that sometimes people from distant places come to the forest for bird hunting. Therefore this poses a threat to the wildlife of the Bhawal as their population is now highly reduced.

#### **5.1.7 Unplanned tourism**

A good number of visitors come to the Bhawal Forest during the winter, mainly for picnic purposes as well as nature observation. Government earn helthy money by leasing the gate money of this park in every year. The visitors enter the forest and walk through the whole forest. They cause disturbances to wildlife because the numbers of visitors are out of carring capacity of the park.

#### **5.1.8 Proceedings against forest resource users**

To protect and conserve forest resources FD suite several proceeding against forest dwellers. This is common scenario. To meet up the expenses of proceedings against them, they are compelled to earn more money by involving them illegal activities such as tree felling, fuel-wood collection, poaching.

### 5.1.9 Lose of habitat

Lose of forest habitat are mainly due to encroachment, tree felling, lit fire in the forest, etc.

- **Encroachment:** Encroachment is one of the main reasons for forest habitat degradation. This occurs by expansion by agricultural lands, development of new settlement, and through establishment of industries. Almost seventy percent of forest habitat due to such practices since last four to five decades.
- **Tree felling:** Tree felling specially the timber wood of felling is very common in IPAC Bhaowal Site. There are some poaches that used to do such practice for their quick and cash earning. They used to sell timbers in neighboring sawmill or furniture shops. However, timber wood becomes already scarce in IPAC Madhupur Site due to such illegal exploitation. Due to loss of tall timber trees birds like vultures, kites, cairns, parrots, already disappeared from the site.
- **Lit fire in the forest:** Lit fire in the forest common phenomenon in the IPAC Bhaowal Site. This usually done by local non-ethnic people to collect fuel-wood easily. Also due to ignorance about conservation of forest resources, people do such practices without thinking of its fetal effect. When fire lit in the forest, all the subsoil insect and other flora and fauna destroyed. At that time, swarming of underneath insects and subsoil fauna occur and destroys in the fire. This intern makes the ecosystem imbalanced. Most of the medicinal herbs and shrubs close to extinct due to such practices.

Combined impacts of above mentioned cause's biodiversity of the area decreasing day by day alarming rate.

## 5.2 Issues of Concern

The following are the major problems that need to be addressed in order to sustainable management of the IPAC Bhawal National Park Site:

**5.2.1 Reduced forest regeneration:** Mainly caused due to fuel-wood collection, clear felling etc. Regeneration is required for bringing back wilderness in forest and it should be major option for the management of the forest.

**5.2.2 Unsustainable resource exploitation:** Mainly included collection of fuel-wood, bamboo, building materials, some species of wildlife etc. and causing depletion in biodiversity. IPAC needs to address this issue.

**5.2.3 Local dependence on forest resources:** Almost all inside HHs and many HHs from nearby settlements depend on fuel-wood, bamboo and other building materials for HHs needs and many HHs depends on it for their livelihood. Use of forest by local people causing harm to bio-diversity. Thus this emerges as an issue of concern for the project.

**5.2.4 Poor forest management by the FD and lack of specific Management Action Plan**

**5.2.5 Local poverty and unemployment:** Local poverty and unemployment have been identified as the driving forces for the illegal forestland use by the local people. Unless the problem is reduced it is unlikely to achieve success in the implementation of the project and therefore draws particular attention for addressing the issue.

**5.2.6 Lack of awareness among local people about biodiversity conservation:** There is serious lack in understanding about benefit of biodiversity conservation and need for sustainable management of forest resources among the local people. It seems that enhance local level awareness would help in the successful implementation the project interventions.

**5.2.7 Poor law enforcement for forest protection and role of local police administration:** Forest patrol is inadequate to check illegal tree felling. Help from the other local law enforcing agencies is not adequate; rather the activity of local police is not conducive to forest protection and encourages the illegal tree feller.

**5.2.8 Changes in the landscape:** Land erosion, land leaser, different types of cultivation with in forest area practice, reduced forest area, siltation of rivers and canals, sedimentation, etc. brought a change in the original landscapes and its associated elements in between past and present.

### 5.3 Challenges for the Project

The possible challenges for the project are:

- **Boundary demarcation:** Beat-wise areas have been mentioned but there is no specific demarcated forest area either published through gazette or declared by Forest Department. There should be clear demarcation as declared by GoB. IPAC can adopt an initiative in this regard.
- **Occupancy right of forest dwellers on land use / forest resources:** Forest Department or any other GO, NGO Agencies in past tried to implement several management practices. But these initiatives face strong protest from the forest dwellers as they were not aware about the merits of such activity. They thought that these activities will not establish their rights on land use and forest resources rather will reduce their right. Before going to implement any management initiatives through CMC awareness raising and motivational activities would have to be introduced to IPAC end.
- **Finalizing the legislative status of Forest:** Specific Forest Rules and Regulation declared in 1928. After that several amendments have been done but those were not sufficient to protect forest resources. These Forest Acts and subsequent rules should be more clear and indicative. IPAC can do advocacy in this regard.
- **Prohibition of indiscriminate use of forest resources:** Illegal tree felling, making fire in the forest, excessive fuel-wood collection, illegal establishment of small industry or structure in the forest land are causing rapid destruction of Bhawal National Park. FD has no declaration of prohibition about such activities. IPAC can provide support to FD to formulate very much specific declaration of prohibition.
- **Plantation under different project:** Several projects supported by donor implemented / forestation without taking consideration of ecosystem acceptability. Instead of doing betterment of the forest, these activities rather caused harm to forest resources.
- **Replacement of planted forest by natural forest:** The planted forest as stated above needs to be replaced by natural forest with indigenous species.
- **Transparency and Accountability:** FD and all concerned GO & NGO Agencies need to ensure Transparency and Accountability in forest resources management activities.
- **Empowerment of Forest Resource User Group:** Forest dwellers whose livelihood depends on forest resources should be organized in a forum (like

CMC, PF) and their voice should be raised and ensured in local as well as policy level decision making.

- **Stopping fuel-wood, bamboo and building material collection:** In the project area's people have a tendency to collect fuel-wood, bamboo and building materials try to collect from forest when they need. Even they don't care the presence of FD staffs.
- **Reducing local poverty and unemployment:** Unless this issue not addressed the illegal use of wetland resources will continue. However, though it may be a difficult job even than project should address this issue with great importance.
- **Revising FD's production forestry policy in favor of biodiversity conservation:** This is a policy issue. However, opinions and recommendation from field would have to be documented and proposed to the higher authority for policy reformation.
- **Reducing use of chemical, fertilizer & insecticides:** People are not aware about the negative impact on using of chemicals and insecticides in the crop fields. They even don't know how these practices causing fatal effect on aquatic biodiversity. IPAC would have to take the challenge to aware local community on these issues
- **Establishing co-management regimes for biodiversity conservation:** Approach for resource management by involving stakeholders at different tiers is new in the country. It will be a huge task for the project to bring the parties, particularly the local community on board and facilitate them to be organized.

## 5.4 Opportunities

- **Positive responsiveness of the local people:** The general people showed interest to the project. This positive attitude of local people can be utilized to ensure their participation in the project and thus will help in establishing co-management.
- **Ecotourism development:** A large number of people visit the Bhawal National Park. Some infrastructures have developed which is more attraction more visitors and ecotourism should be planned accordingly. Also security of tourist. But some of the cottages, watch tower are damaged condition which must be repaired for better management. To develop ecotourism following activities can be introduced through IPAC.

A number of famous places, Organizations, Academic Institutions situated in the vicinity of Bhawal National Park. Visitors can also visit these sites while visiting BNP. These are: Joydebpur Rajbari, BARI, BRRI, Rover Scouts Center, BRAC-BCDM, Bangabandhu Agriculture University, etc.

**Development of extension materials:** This includes colorful posters, booklets, postcards, view cards, CD / DVE on Bhawal National Park, etc.

**Easy Transportation facility from Dhaka and Mymensingh:** FD and Bangladesh Parjaton Corporation can introduce luxury bus service for the tourist. Also private sector can be encouraged here.

**Security of Eco-cottage and other living facilities:** To be ensuring the security in Eco-cottage and othe living facilities. It is an alerming news that, sometime some bad occurances happend with tourists.

**Introduction of tourist vehicle:** There is a very good road linkage within forest with all spots. This route will attract to the tourist open more vehicle can be introduce with guard and guide.

**Handicraft of forest resource:** Bamboo, cane, reed, and other forest materials can be use to made attractive handicraft. This will attract tourist and this kind of activities can be introduced as AIG activities among the forest dwellers.

**Tourist shop:** Real tourist shop can be develop by organizing local people and can be provide credit from banks / NGOs.

**Eco-guide:** A number of Eco-guide groups can be organized with the involvement of local people. This also may inter become a livelihood option for the forest dwellers.

**Forest patrol group:** Local young people can be motivated to serve as forest petrol member. This is a voluntary activity. However heavy sticks, dresses, gumboots, umbrella, tourches, hand-mikes, whistles, can be provided them for their encouragement.

- **Plantations:** There are plenty of opportunities for plantation like on road side, and forest area's *Baids*, etc. This type of plantation will automatically restore the natural habitat.
- **Scope for alternate income generation activities:** There are good scopes to undertake various AIG activities, such as basket making, handicraft making, cultivation, nursery, medicinal plant gardening, medicinal plant nursery, poultry, bee culture, cattle fattening, weaving, fish culture etc. The raw materials for such AIGA are easily available within the locality. This will help to reduce dependency on forest resources uses.
- **Habitat restoration and rehabilitation:** Still there are denuded areas within the forest, created due to clear felling and these areas could be brought under plantations with indigenous and eco-friendly plant species.

Besides these, for better result excavation / re-excavation / improvement of degraded Lake, Beels and canals, stocking indigenous endangered species, Forest Acts and Evironment Acts implementation within project area the habitat can be restored.

## **6. Recommendations and Suggestions**

### **Administrative**

**6.1** Poor forest management by the Ministry of MoEF and Forest Department has been identified as one of the major reasons for forest degradation. Strengthening and capacity building of FD, along with local concern authorities' engaged in forest management would have to be a prior area that IPAC can address. Following supports and activities would be required to achieve this target

- Adequate staffs for the local FD offices. As at this moment there is no chance to set revenue staffs from GoB side, therefore, field worker can be provided from project side. At the same time this issue can be highlighted in PA strategy with importance and advocacy can be given to the concern ministry and departments to increase staffs;
- Capacity building in forest management and community development required for the local FD and related GoB staffs;
- Logistic support for the local concern offices like motor cycle, pickup, truck and other necessary equipments can be provided from project;
- Developing and strengthening linkage among local club or federations and local government;
- Updating and enforcing Forest Acts and Rules;
- Provision for providing incentives to local staff to make the job lucrative
- Steps for improving the moral of local staff and make them dedicated to biodiversity conservation
- Provision for strong monitoring and supervision of local activities by a central cell and the cell will take any necessary participatory decision in consultation on scientific and technical point of view

### **Technical Management**

**6.2** An appropriate, site specific and technically sound management Action Plan should be developed in consultation with local people. The action plan, among others, should have the following provisions:

- a plan of action for re-introduction and rehabilitation of endangered biotic species
- a plan of action for habitat restoration and rehabilitation
- a plan of action for protection and sustainable use of forest resources and biodiversity
- a long-term biodiversity monitoring plan aiming at changes in the biodiversity in the forest; not only targeting to measure the changes impacted due to project activities but also to identify post project situations.

### **Some specific suggestions:**

- i. Clear felling should be stopped by any means to conserve the forest and biodiversity.
- ii. Plantation of exotic species should be carefully assessed with its after effect on other local variety of plants and animals. No long term strategies should be taken for plantation of the forest, rather principal of increasing wilderness by natural regeneration processes should be followed.
- iii. Short-rotational plantations with exotic trees should gradually be replaced with indigenous species for social forestry.
- iv. A number of monkey and languor groups are still inhabitant of Bhaowal forest, Due to scarcity of adequate food and shelter, they are in vulnerable condition. In this regards, a rehabilitation scheme should separately be considered for resident monkey and languor groups of Bhaowal forest. To this end the following activities can be considered:
  - ❖ re-establishment of habitat continuity between the fragmented habitats of these primates
  - ❖ plantation scheme with food trees suitable for non-human primates such as Bohera, Horitoki, Amloki, etc.
- v. Considering local dependence on the forest resources, sustainable use of some resources like vegetables, honey, medicinal plants and other non-timber forest products may be allowed.
- vi. Fuel-wood, bamboo and collection of some other major building materials should be stopped on a short term basis, but this may not be as success as long as there are scarcities of its supplies in the area. However, once the stock is recovered it may be possible to exploit the resources on the basis of principle of sustainable use. Therefore, project should strongly consider the following:
  - ❖ establishment of a buffer sustainable resource use zone around the NP with provision for fuel-wood plots, woodlots and other plantations required for house building purposes
  - ❖ providing resource substitution (for example, commercialization of fuel made of rice, husk and others)
  - ❖ promotion of fuel efficient stoves / oven in the locality
  - ❖ promotion of homestead plantation

### **Project activities targeted to local stakeholders.**

**6.3** Poor resource users, particularly those who are dependent on the forest for their livelihood, should be identified and brought under AIG programs with provision that they give up the unsustainable use of forests / forest resources. The possible AIG opportunities include



- Nursery
- Bamboo and cane based handicrafts
- Handicrafts
- Poultry
- Medicinal plant gardening and nursery
- Ape culture
- Fish culture

**6.4** There are some private medicinal plant plots. Local people produce medicinal plants in the selected plots and sell those to herbal medicine companies. IPAC can take initiative to organize them for strengthening their abilities.

**6.5** Attempts should be made to bring the local elites on board with the concept of forest protection. In particular, the project needs to consult local public representatives, including local Chairmen and Members of Upazila / Union Parishad and MP, and involve them, at least in advisory role. The project should also work with existing local community organizations identified under the appraisals.

**6.6** Awareness raising activities should be carried out on a priority basis in the area to make the people understand how they would get benefit from this project.

**6.7** It is felt that the illegal resource users (illegal tree fellers in particular), get shelter from local authorities hence strong dialogue should be initiated among them involving the higher authority. A similar approach may be taken with local CBOs to ensure the effective involvement of them.

**6.8** Excessive forest cases suited against the local people have led to increased incidences of illegal tree felling. These cases should be reviewed and withdrawn.

**6.9** Planned eco-tourism may be promoted in and around the forest with provision for generating local funds for forest management and welfare of the local people.

**6.10** The project should make an effort to negotiate with local development partners / agencies to extend their social welfare services to the area.

**6.11** As an initial step, the project should concentrate its activity inside the forest villages and later with the other identified villagers having minor / negligible stakes.

**6.12** The project should also initiate dialogue with sawmill, brickfield, furniture shop, factory / industry owners of the locality and motivate them towards the importance of biodiversity conservation. Through motivation also let them be aware and understand about the benefits of project activities.

**6.13** The project should also make provisions for generating a scientific and social knowledge base about the forest resources.

**6.14** Immediately a comprehensive faunal and floral inventory should be made. Investigations into the threatened categories of flora and fauna should be made on a priority basis and a management scheme for their protection and rehabilitation should be developed.

**6.15** Awareness campaign groups at local level can be developed by involving Boys Scouts, BNCC, School / College students who will conduct street drama; pot songs on sustainable use of forest / forest resources.

**6.16** Wetland Resource inside Bhawal Shal Forest: There are 3 potential artificial lakes inside the forest. The total length of these lakes is 6 kilometers. The PRA Team was informed that this lake was renovated when FD was trying to establish as National Park. However, presently this water body is remaining as derelict. It has high potentiality for fish culture. It may be a good source of income for CMC, once it is formed. IPAC can take up these interventions as a prior activity. Besides, there are 15 ponds inside the forest and 5 within core zone. These ponds may also be able to be brought under fish culture, there after would be a good income source for the beneficiaries.

It can be noted that, if these water bodies can be brought under intensive fish culture and it is possible to grow large fish, then game fishing can be introduced. This will be a good income source for CMCs (which may be formed in future).

**Annexure – 1**  
**Pictorial Presentation**



**Main Entrance of Bhawal National Park**



**A watch tower of Bhawal National Park (Functioning)**





**Part of lake inside Bhawal National Park**



**Lake view of Bhawal National Park**





**Signboards of different industries / factories situated within a part of the pheriphery of Bhawal NP. This indicates how the protected areas are being graved and polluted.**



**Land encroachment inside the forest to build industry.**





**Another land encroachment view, inside the forest to build industry.**



**Illegal aquaculture practice in lowland of forest. Here people said dykes / embankments to hold rain water.**





**An industry inside the forest, polluting natural forest creeks.**



Public land commonly called *Baid*, inside forest. Such land owners have common tendency to increase their land area by destroying forest, which is a common phenomenon of Bhawal NP.



**A common senerio of *Chala* (forest land) and *Baid* (low land beside *Chala*) inside Bhawal National Park**



**Herring Bone road inside Bhawal National Park (for visitor's using)**





**A children park inside Bhawal National Park (for visitor's using)**



**Industrial pollutants falling into floodlands within forest area**





**Jackfruit collection: a common scenerio of Bhawal National Park forest area.**



**Partial view of BRAC training center that established inside forest area**





**Land encroachment inside the forest to build industry.**



**A phreasant bird of Bhawal National Park Mini Zoo**





**A herd of spotted deer of Bhawal National Park Mini Zoo**



**A forest trail of Bhawal National Park which is usually avoided by visitors due to snapping threat**





**Shapla Cottage of Bhawal National Park (for visitor using)**



**A wild rhesus monkey of Bhawal National Park**

## Annexure-2

### Checklist of questions of RRA for FGD, KI and HHs interview

#### **a. Checklist of questions for FGD**

##### **I. Stakeholder Assessment**

1. What are the settlements/villages from where the people come to the forest and collect resources? Please indicate its location on the map.
2. What are the different categories of people who collect different resources from the forest?
3. At what extent the local people depend on the resources they collect from the forest for their livelihood, please specify for each category of resource users group?
4. What are the local organizations/institutions which are involved with the development and management of the forest or its control or its resource exploitation/and or degradation? What are the activities of these institutions/organizations?
5. Please indicate how the different resource users and other stakeholder groups interact with each other or inter-linked with each other.

##### **II. Resources and resource status**

6. Which plants and animals have disappeared from the forest in the recent past?
7. Which plants and animals in the forest have been declining very rapidly?
8. What are the causes for the decline of these animals and plants-Venn diagramming
9. What are the major shifts in the abundance of various resources over time? Compare between pre-liberation and present status? ---Trend analysis

##### **III. Power structure and local conflict**

10. What are the sources of conflict among local people?---Venn diagramming
11. Whom do the local people go for conflict resolution?
12. How the local conflicts are resolved?
13. What are the events that bring the local people together?----Venn diagramming

##### **IV. Resource exploitation**

14. What are the various resources that are collected from the forest and who collect what? Please indicate on the format. ---use format
15. Exploitation of which resources is posing threat to its future availability?
16. Please indicate how exploitation of different resources varies with different seasons? ----- Seasonal analysis
17. Which animals and plants are collected more and which are collected less?
18. When there is scarcity of fuel wood in the locality and indicate how it varies with season? --seasonal calendar
19. Do the local people collect medicinal plants from the forest? Are they available now a day?

##### **V. Demographic profile**

20. What are major occupations of the people of the locality? Please rank them.
21. Are there many illiterate people in the locality? Do many people go to High school, college, and universities? Please rank them and indicate on the format

22. Do you think that the occupations of people in the locality have changed over past (30-50 years)?

Please indicate the shift in occupation local people over time?

Format, in which occupation the shifting have occurred (Trend analysis).

#### **VI. Socio-economic activities / livelihood strategies**

23. What are the major activities for earning of the local people and rank them according to their importance?
24. Are there many people who have no land?
25. Are there many people in the locality who have no work to do?
26. Please indicate how the availability of work changes with seasons?
27. What the local people do when there is less or no work for them to do
28. Do many people in the locality take loan from, bank NGO or other organizations and please mention the reasons for taking loans?
29. Do the local people get income generation training from various organizations?

#### **VII. Gender issues**

30. How do the roles of men and women differ in this community?
31. What are the different thing men and women do concerning the forest and forest products?
- a. Does the male and female are equally educated in the locality?
  - b. Who take the decision for HH purchase, undertaking income generation activities etc. - male or female?
  - c. Do the females have access to loan and IGA as the male have?
  - d. Is the female are associated with forest management?
  - e. Please indicate on the format, what daily works are done by the male and what daily works are done by the female?----- Chart

#### **IX. Others**

32. What are major the NGOs operating in the locality? Please indicate their activities on the format?
33. What are major challenges for the conservation of forest resources?

## **b. Checklist of questions for Key Informant (KI) interview**

### **Stakeholders Assessment**

1. What are the organizations/institutions, which carry out any type, work in the forest?
2. What are the villages from where people come to forest for collecting resources? Please tell which villages are more involved and which are less involved?
3. What are the different categories/groups of people who go and collect various resources from the forest?
4. Who are the other people who don not use forest resources but have linkages with resource exploitation and development of the forest?
5. Are there any people who can be important for the conservation of the forest and its resources?

### **Power structure and local conflict**

6. Who are the more influential people in your locality? Tell who more and who are less influential among them
7. What are the sources of conflict among local people?
8. Whom do the local people go for conflict resolution?
9. How the local conflicts are resolved?
10. What are the events that bring the local people together?
11. Have the local people any conflicts with Forest Department? If yes, what are those?

### **Resources and resource status**

12. Which plants and animals have disappeared from the forest in the recent past?
13. Which plants and animals in the forest have been declining very rapidly?
14. What are the causes for the decline of various animals and plants?

### **Resource exploitation and dependency on forest**

15. What are the various resources that are collected from the forest? Which are collected more and which is less?
16. What are the reasons for collection of these resources?
17. Which category / group of resource users are dependent on the collection of these resources?
18. What proportion of HHs benefit from the forest?
19. Collection of which resources likely to pose a threat to those resources / availability in the future?
20. Do people collect and use medicinal plant from the forest?

### **Demographic profile**

21. How many households are living in this community / thana? How many adults?
22. What are the major occupations of the local people?
23. What proportion of local people are illiterate and what proportion of people have read upto school, colleges and above?
24. How have the occupations of people in the locality have changed over past (30-50 years)?

### **Socio-economic activities/livelihood strategies**

25. What are the major activities for earning of the local people?
26. What proportions of local people are very poor (have food shortage), poor, middle class and rich?



27. Are there many unemployed in the locality? What proportion?
28. In which season(s) there is scarcity of work in the locality?
29. From which source the local people take credit?
30. What are the different organizations, which operate credit in the locality?
31. Do many people in the locality take loan from, bank NGO or other organizations?
32. Have the local people skills that can be utilized for undertaking alternate income generation?
33. Is there any work / economic opportunity that require special skill that the local people don't have?

#### **Legal aspects**

34. Can anybody can go to the forest and collect any thing?
35. Is there illegal tree felling? Is it at large scale? Does it affect forest health? Are the feller local or come from outside?
36. What are the main reasons for tree felling?
37. Do you think that the forest department people are protecting the forest resources?
38. Is there any issue of forestland encroachment? What are problem with recovery of these land?

#### **Gender issues**

39. Does the male and female are equally educated in the locality?
40. Who take the decision for HH purchase, undertaking income generation activities etc. - male or female?
41. Do the females have access to loan and alternate income generating activities as the male do have?

#### **Others:**

42. What are the major threats to the forest habitat and its resources ?
43. What would be major challenges for the conservation of biodiversity and restoration of its habitat?

### **C. Checklist of questions for HH interview**

1. Govt. has plans to preserve the forest biodiversity and to improve the socioeconomic condition of the people ---- what do you think (Actually team will gave a statement on the purpose of their visit and on the project)
2. Do you know that the forest is a park/wildlife sanctuary / reserve
3. Do you know what are allowed and not allowed to do in the Park / reserve / sanctuary
4. Do you think that the forest resources should be preserved / conserved ?

#### **Stakeholders**

5. What are the villages from where people come to forest for collecting resources? Please tell which villages more involved and which are less involved?
6. What are the various groups of people who collect different types of resources from the forest?
7. Who are the people who do not use forest resources but are involved with the forest or has control over the forest
8. What are the organizations/institutions which carry out any type of work in the Forest

#### **Resources and resource status**

9. Which plants and animals have disappeared from the forest in the recent past?
10. Which plants and animals in the forest have been declining very rapidly?
11. What are the causes for the decline of these animals and plants?

#### **Resource exploitation and dependency on forest**

12. What sorts of things do you use from this forest?
13. Does your household collect it/them, or do you obtain from someone else?
14. If yes, do you collect those for selling or for consumption?
15. Of those things you get from the forest, which ones won't be available in 5 or 10 years?
16. Do you use medicinal plants from the forest?

#### **Power structure and local conflict**

17. Who are the more influential people in your locality? Tell who are more and who are less influential among them
18. What are the sources of conflict among local people?
19. Whom do you go for conflict resolution?
20. How the local conflicts are resolved?
21. Have you or your neighbors any conflict with forest department? If yes, what are those?

#### **Demographic profile**

22. What is your primary and secondary occupation?
23. How many people in your HH are educated upto School, how many in the colleges and above and how many are illiterate.

#### **Socio-economic activities / livelihood strategies**

24. What is your HH primary and secondary source of income?
25. Do you have land of your own (home stead/agricultural)?
26. Is your HH income adequate to meet your family expenditure or you having

surplus?

27. Have many people in the locality no work?
28. Have you work to do in all seasons? In which season/seasons people of the locality have little / no work
29. What do you do when you have no work opportunities locally?
30. Have you taken loan from, bank NGO or other organizations? Was it easy to get the loan
31. What are the different organizations, which operate credit in the locality?
32. Have you any skill to do a particular work but you don't do? Why don't you do it?

### **Resource regeneration practices**

33. Are there many plant nurseries in the locality?

### **Legal aspects**

34. Can anybody can go to the forest and collect any thing?
35. Do you know that there is tree poaching in the forest? If yes, from where they come (villages)?
36. Do you think that the Forest Department people are protecting the forest resources?

### **Annexure-3**

#### **PRA Issues**

PRA will build upon the RRA findings and is intended for collecting in depth information on the identified issues.

#### **Understanding the forest make up and dynamics**

**Transect map:** Necessary for understanding the present forest physiographic and topography. A few transects across the forest will give an idea on overall make up of the forest. This exercise will also provide the opportunity for learning about the historical trend in changes in the forest make up in different areas of the forest. It will also provide the opportunity to learn many thing about the forest while walk with a key informant.

#### **The transect map should indicate**

- land elevation (high / low)
- land cover/use pattern (trees / bush / grassland / agricultural land / marshy land etc.).
- A similar transect map should be drawn based on the condition of the forest 30-40 years back.
- Should carry GPS to track the transect walk/take coordinate reading at intervals
- Should be accompanied by a key informant and learn about the changes over time in the forest

#### **Trend analysis in forest dynamics:**

Changes with time of the following: forest cover and thickness, abundance of tall trees and herbs and shrubs, settlements, population

**Resource maps (on the forest):** Helps in the understanding the distribution, concentration of different major resources of the forest, resource exploitation and regeneration areas. Also will show

- internal walkways, footpath trails, access roads
- encroached land areas
- settlements
- pressurized areas
- areas for plantation, agricultural and other resource regeneration
- areas for major resource exploitation
- distribution of various resources

#### **Understanding the land encroachment process: Important for IPAC Bhawal National Park Site**

- historical perspective and trend
- who and how
- uses and transformation
- legalization process

- causal factors
- impact on forest

### **Understanding local governance system and community structure and functions**

- decision makers--- influential people
- hierarchy set up
- local community organizations and institutions and their linkages
- local conflict and conflict resolution
- social cohesion and adhesion (which brings them together)
- collective action

### **PRA ISSUES**

#### **Fuel-wood collection/collector**

##### **Information to be collected:**

- who collect (adult, boys or girls / women, poor or rich / employed labor, gang / armed gang, local / outsider if possible mention the settlements from where they come etc.)
- purpose of collection (for selling, HH consumption or both)
- what compels them to extract the resource
- do they depend on the extraction for their livelihood (partially / entirely, supplement income), at what extent and how
- What encourages them to take up the activity
- What are various uses of the resource
- if commercial-where do they sell, who buys, where does it go, who are the traders and where, prices at various levels
- Quantity collected/day/person
- any conflict with FD or other people over the extraction
- any negotiation or arrangement to carry out the activity
- any alternate source for the collection of the resources
- needs and expectation of the collector
- impact on the forest, as the participants see
- Risk for the collectors as the collector see, if the activity is carried out at this rate

#### **Illegal timber felling**

- Information to be collected:
- Who collect (adult, boys or, poor or rich/ employed labor, gang / armed gang, local/outsider etc. if possible mention the settlements from where they come etc.)
- at individual or group level
- Who are behind the activity and indicate the network
- Purpose of collection (for selling, HH consumption or both)
- reasons for the activity
- uses of the resource at various levels
- what compels them to fell the timber

- Do they depend on the activity for their livelihood (partially / entirely, supplement income or for added income), at what extent and how?
- What encourages them to take up the activity?
- Anybody protect them, if they are in problem
- If commercial-where do they sell, who buys, where does it go, where are the traders-indicate the chain
- how the protection is provided by FD or by any other agencies (e.g. Police etc.) and at what stage
- any conflict with FD or other people over illegal felling
- any negotiation or arrangement to carry out the activities
- needs and expectation of the feller
- as seen by the feller, impact on the forest due to the activity on forest and its resources
- Impact on/risk for the collector, if the activity is not allowed
- Seasonality and trend analysis

### **Collection of trees as building materials**

#### **Information to be collected:**

- who collect (adult, boys or girls/ women, poor or rich / employed labor,
- gang / armed gang, local / outsider if possible mention the settlements from where they come etc.)
- carried out at individually or in group
- purpose and reasons for collection (for selling, HH consumption or both)
- uses of the resource
- what compels them to extract the resource
- do they depend on the extraction for their livelihood (partially / entirely, supplement income), at what extent and how
- What encourages them to take up the activity
- if commercial-where do they sell, who buys, where does it go, who are the traders and where, prices at various levels
- any conflict with FD or other people over the extraction
- any negotiation or arrangement to carry out the activity
- any alternate source for the collection of the resources
- needs and expectation of the collector
- impact on the forest, as the participants see
- Risk for the collectors, as the collector see, if the activity is carried out at this rate

### **Bamboo and cane collection**

- Information to be collected:
- Who collect (adult, boys, or girls / women, poor or reach / employed labor, gang / armed gang, local / outsider if possible mention the settlements from where they come etc.)
- Purpose of collection (for selling, HH consumption or both)
- what compels them to extract the resource
- Do they depend on the extraction for their livelihood (partially / entirely, supplement income), at what extent and how

- What encourages them to take up the activity
- What are various uses of the resource
- if commercial-where do they sell, who buys, where does it go, who are the traders and where, prices at various levels
- any conflict with FD or other people over the extraction
- any negotiation or arrangement to carry out the activities
- any alternate source for the collection of the resources
- Needs and expectation
- Impact on the forest, as the participants see
- Risk for the collector, if the activity is carried out at this rate

**Information the Ethnic community:**

- Distribution of ethnic community settlement in and around the forest
- Probable No. of HH in each settlement
- Present economic activities
- Resources (plants and other NTFPs) they extract and reason for extraction (consumption / selling or both)
- dependence on the forest resources and its impact on the forest
- land encroachment by them
- relationship with the local people or agencies
- internal governance system
- conflict with FD or other agencies or other people on there use of the forest
- needs and expectation
- reaction to the project

**Information on Forest villagers:**

- Distribution of forest villager's settlement in and around the forest
- No. registered and approx. present number of HH in each settlement
- Privileges under FD agreement
- compliances to agreement
- Present economic activities
- Resources (plants and other NTFPs) they extract and reason for extraction (consumption/selling or both)
- dependence on the forest resources and its impact on the forest
- settlementalization processes and land encroachment by the forest
- villagers or by their dependant
- relationship and conflict with FD
- Forest villager management / or internal governance system
- needs and expectation
- reaction to the project

**FD's forest management regimes**

- Forest patrol, check post operation etc.
- Activities of other organization in relation to the forest protection
- Any special management efforts for the NP / WS / Reserve etc.
- Forest cases and punishment
- Is the present regime effective in protecting the forest
- Prevailing unlawful extraction and uses
- If not effective, what are the causes for the poor management of the forest ( lack of manpower and logistics/ accessibility and problem in movement / fear of bandits / local people more powerful / little help from the higher

authority / low morale of FD staff / intervention by the local public representative or political elite etc.)

**FD's plantation strategies**

- Area under plantation
- Species planted (information on clear felling etc.)
- Plantation practices
- Nursing and care (thinning etc.)
- Impact on the wilderness

**Information on Brickfield / Brickfield owners**

- Nos. and distribution
- Owners and their influences
- Compliance to forest laws
- Period of operation
- Sources of fuel-wood (from the forest concern or from elsewhere)
- Type of fuel-wood used
- Network of supplies
- Approx. quantity used / year
- Impact on forest

**Information on Sawmill / Sawmill owners**

- Nos. and distribution
- Owners and their influences
- Compliance to forest laws
- Period of operation
- Who brings timber to them
- Sources of timber (from the forest concern or from elsewhere-homestead)
- How distinction is made between timber from the forest and that from villages
- Inspection by FD / or other law enforcing authority
- Network of supplies

**Livestock grazing**

- Identification of grazing areas
- Types and No. of livestock
- Who owns the livestock (ethnic/poor/rich/influential/general people)
- Mention whether seasonal and all time
- Description of damages / impact caused by grazing
- Alternate areas for grazing

**Information on clear felling**

- Area felled
- Name of auctioneers and their influences
- Natural or planted trees felled
- Felling practices (clearing, burning etc.)
- Operation period
- Transportation and marketing of felled trees-network
- Link with illegal feller
- Impact on the forest



## Notes