# Traditional Knowledge and State of Bio-diversity in CHT: Case Study of Khagrachhari

## **Research Report**



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# Traditional Knowledge and State of Bio-diversity in CHT: Case Study of Khagrachhari

This study has been researched and prepared by Mr. Mahfuzullah, Secretary General, Centre for Sustainable Development of Bangladesh. The opinions expressed in the study report, and any errors of fact or interpretation or omission are the responsibility of the author, and do not reflect the agreed policy positions of the publishers.

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## **TABLE OF CONTENTS**

List c	of Tablesi
Prefa	aceii
Exec	utive Summary iii
Chap Introd	oter 1 duction1
	oter 2 this Study
Chap Meth	oter 3 odology4
Chap Findi	oter 4 ngs of the Study5
Chap Peop	oter 5 ole's Perception9
Chap Majo	oter 6 r Findings & Recommendations11
Anne	exures
l.	Uses of the medicinal plants which are available at present12
II.	Fruit trees which have decreased over the last ten years or more
III.	Wood/bamboo/cane which have decreased over the last 10 years or more17
IV.	Availability of traditional varieties of rice
V.	Birds, Rodents and insects and Wild animals presently available/seen by the respondents
BIBI	IOGRAPHY 21

## **LIST OF TABLES**

Number of Households	5
Table 1.2 Distribution of Gender	5
Table 1.3 Level of Education	5
Table 1.4 Status of Child Education	6
Table 1.5 Status of Secondary Occupation	6
Table 1.6 Distribution of Income	7
Table 1.7 Source of Drinking Water	7
Table 1.8 Sanitation Status	8
Table 1.9 Source of Information	8
Table 2.0 Family and Family Members Engaged in Seed Preservation	10

#### **PREFACE**

A number of agreements of the World Trade Organization (WTO) are feared to have adverse impact on the live and livelihood of the agro-economy based societies like ours. While the developed countries argue that these agreements would benefit developing countries by creating the incentive structure necessary for knowledge generation and diffusion, technology transfer and private investment flows, the developing countries apprehend that the proposed arrangements would adversely impact the pursuit of sustainable development strategies.

The most contentious agreements of the WTO include the Trade Related Aspects of Intellectual Property Rights (TRIPs), Agreement on Agriculture (AoA), Agreement on the Application of Sanitary and Phytosanitary Measures (SPS). The main debates about these agreements centre around issues like subsidy, imposition of standards, intellectual property requirements and so on that are believed to make accrual of trade benefits all the more difficult for poor and developing countries. It is believed that the age-old rights of the farmers to protect their traditional knowledge, save, use, exchange and sell seeds, claim benefits for the use of their varieties by commercial seed producers and so on would be rendered meaningless if states do not make a move to enact laws for protecting this vulnerable populace that constitute 60 per cent of the total population. As a note of caution against the threats posed by these agreements, it is often proposed that the biodiversity rich and dependant countries make an assessment of their own resources and proceed to give those resources adequate legal protection against bio-piracy or illegal trade with no equitable benefit sharing.

Against such a backdrop, a regional network called SAWTEE that comprise of leading organizations from south Asia undertook a program with the objectives of enabling all concerned to understand and cope with the processes of transition and equip them with information and tools of advocacy to provide adequate safety nets for the protection of environment and consumer through enhance regional cooperation.:

The program of SAWTEE has received generous support from the Ford Foundation, Delhi and the Action Aid, Nepal. BELA, as an implementing organization of the program being supported by the FF and Action Aid undertook the first research on the state of biodiversity in three villages of the Khargachhari hill districts. The main reason behind moving to the hill areas remained to be the facts that the mountain ecology, though extremely rich in resources, is left largely unprotected and that due to backwardness of the mountain populace, they are unlikely to receive any economic and trading benefits that liberalization may offer though the same may target their resources and knowledge.

This Report makes an attempt to indicate the present state of biodiversity in the resource rich areas of mountains and also to identify the reasons behind the loss of biodiversity that affect the traditional way of living of the farmers. The objective of the regional program would only be achieved if the various researches to be undertaken as part of the program can be complemented by advocacy efforts for adequate and effective legal protection to safeguard the rights of the farmers and protect the rich bio-diversity and traditional knowledge that the country is proud of.

March 2003, Dhaka

**S. Rizwana Hasan** Director (Programs) BELA

#### **EXECUTIVE SUMMARY**

The study was conducted in three remote villages of the hill areas of Bangladesh with the objective to make a primary assessment on the state of biodiversity in the areas and also to trace the dependence of the local people on such biodiversity. The ultimate objective would be to use the findings of the research in advocating for legal protection of natural resources and the traditional knowledge base.

At the initial stage, filed visits were undertaken and based on the information collected through the field visits a questionnaire was prepared. A total of 318 households were interviewed with due attention to various professionals/occupation. Based on the information collected from the local people, five separate lists of medicinal plants, fruit frees, wood, bamboo, canes, traditional varieties of rice, birds, rodents and insects and wild animals currently seen/at the verge of extinction have been prepared. These lists are reflective of the extreme rich bio-diversity of the area that demand appropriate documentation or legal protection for conservation and protection against unlawful use and piracy.

Information gathered from the discussions, workshops and questionnaires suggest that the local people emphasis on preservation of traditional varieties as they find cultivation of new varieties costly, less productive and destructive to environment. They demand revival of traditional method of cultivation like the *jhum* (shifting) believed by them as useful for preserving soil fertility. The local people have also expressed concern over market domination of seed as opposed to the traditional way of preservation by women. They were found dependant on the locally available medicinal plants for primary health care and treatment of diseases.

The Study has recommended adoption of effective measures to check the fast deterioration and change in the natural state of the hill areas. It has suggested on adoption of conservation measures with full participation of local people and in due recognition of their needs, perceptions and ethical values. The introduction of register to document traditional knowledge and bio-diversity with adequate legal protection has been strongly advocated.

#### INTRODUCTION

"The rice variety of the olden days is gone. Now we are to buy *bideshi* (foreign) seeds at a higher price." That was the way Chinadhan Marma of Headman Para village was explaining the changing farming practices of his village. Headman Para is one of the sleepy villages of Khargachhari, one of the three districts of Chittagong Hill Tracts (CHT). Chinadhan has many more regrets. *Snails*, considered to improve eyesight, are no more available. Gone are white and red *shimul* (silk-cotton tree), ingredients of which are essential for maintaining vigour. Even many of the indigenous variety of fishes are gone because of poison (pesticides) applied in rice fields.

That is the way a section of the people of the hills in Bangladesh prefer to describe their perceptions of changing farming practices and biodiversity. There are also other voices. These voices speak of poverty and argue in favour of foreign seeds to have better yields. But Tanchaingya Marma of the same village understands the importance of biodiversity. To him the biggest loss has been in the area of medicinal plants. They were, at one point of time, dependent on different medicinal plants for common diseases like *jaundice*, *rheumatism*, *diarrhoea*, *dog bite*, *headaches*, *partial paralysis of limbs*, *eclampsia*, *malaria*, *epilepsy*, *leprosy* etc. They had even effective arrangements for birth control. But they are not ready to share this information with outsiders. The reason, "lack of trust."

Bangladesh, basically a flat delta, has a limited stretch of hilly areas spread over its the northern and south-eastern region. The important hilly area, known as Chittagong HII Tracts (CHT), is spread over an area of 13,295 square kilometres and contains about 52 percent of the forestlands of the country.

The area is situated between 21° 25' and 23°40' North latitude and 91°55' and 92°45' East longitude. Because of geo-physical location, having close proximity to India and China, some of the academics call it a bridge between South and Southeast Asia. The area is different in some respects from other regions of the Hidukush Himalay (HKH) and other areas of the country in surface and soil conditions.

The area has four main valleys, which are considered the oldest geological formation in Bangladesh. The valleys are *Changi, Maini, Rainkhiang,* and *Sangu* Valley formed by the rivers *Feni, Karnaphuli, Sangu, Matamuhari* and their tributaries. Some of these valleys are up to 80 kilometres long and 10 kilometres wide. The height of the hill ranges varies from a few hundred metres to over 1000 metres.

With a circuitry of rivers and streams, fed by heavy monsoon and washed by frequent floods, the whole territory is a crowded green mass of wild growth containing a variety of plants, creepers and trees. The forests of CHT are broadly of three kinds: tropical evergreen forests; tropical semi-evergreen forests; and tropical moist deciduous forests.

The area has a population of 1.06 million and the literacy rate for both sexes stands at 29.9 percent as against the national average of 32.4 percent. The CHT has two types of visible land tenure, freehold and leasehold. The later is the issue of confrontation between the hill people and the settlers brought in from other areas of the country. The settlers, mostly dirt poor and victims of different natural disasters have been accused of displacing the ethnic nationalities from the land they had been owning for ages.

For a long time the area was almost isolated and the people had no contact with the outside world. The situation began to change as the British colonial masters took control of the area in 1760. Because of topography and climatic conditions the people of CHT fall back upon

agriculture for their livelihood. Only a small percentage of the population is engaged in business, trade, professions and government services. Besides agriculture, they engage in certain types of art and craft work that account for other day-to-day needs of life. They build their own houses, make their own looms, weave their own dresses, make their baskets, and manufacture their household utensils, agricultural implements and beverages.

The CHT has three districts, namely: Rangamati, Khagrachhari, and Bandarban. When the country was divided into 19 districts, the CHT used to be the biggest district. Khagrachhari has an area of 2,700 square kilometres with reserve forests spread over 103 square kilometres and unclassified forests over 1,094 square kilometres. The thanas of the district are *Khagrachhari Sadar, Dighinala, Paanchari, Mahalchari, Matiranga, Manikchari, Ramgarh, and Lakhmichari.* It has 34 unions and 127 *moujas.* The tribes of this district include *Chakma, Marma, and Tripura.* Over hundreds of years local people have developed sustainable development strategies without any external input. The communities are particularly rich in indigenous knowledge related to fermented foods, preparation of beverages. The valleys are highly suitable for agricultural and horticultural activities. The construction of the Kaptai Hydroelectric dam in Rangamati in 1960 was the most serious blow to the life and economy of the local population. The dam uprooted as many as 100,000 people and they were not given proper compensation or rehabilitated.

#### WHY THIS STUDY

The hilly areas of Bangladesh, known as CHT, have independent practices of life and living. The different provisions of WTO would have different impacts in different sectors of economy of Bangladesh. The Agreement on Agriculture (AoA) is intended to establish a fair and market-oriented agricultural trading system. This is, in most cases, an alien idea to the people involved in agriculture. Besides, the Agreement on Trade Related Intellectual Property Rights would have a strong impact on countries like Bangladesh, which are rich in biodiversities. Whether the people of the CHT like it or not, the formation of regional forums for development and co-operation as outlined in the WTO Agreement would have significant impacts on the life and living of the people. The proposed Asian highway linking Bangladesh with Myanmar would run very close to the area and if Bangladesh decides to open trade routes for people of North Eastern states of India the area would be linked to regional trade. The linking of the area to regional trade would change the social dynamics of the area.

The area, being quite close to the Bay of Bengal, would also be subjected to adverse impacts of possible sea rise, especially in conserving its rich biodiversity. There has been no proper evaluation of natural resources in the area except that of water resources. The use of water resources for generating electricity had created one of the worst impacts. Some other studies claim there is gas and oil in the area. These are all issues for concern of the local people. But they are for the present concerned about restoration of land ownership and protecting the roots to which they belong.

Bangladesh Environmental Lawyers Association (BELA), against this backdrop, conducted a study in three villages of the district of Khagrachhari against the backdrop mentioned earlier. The objectives of the study were

- To have an understanding of the livelihood of the ethnic population living in hill environment
- To have an understanding about people's perception of biodiversity situation of the area
- To assess the need and mode of legislative protection of the bio-diversity of the area and related rights of the local people



#### **METHODOLOGY**

The CHT is home to different ethnic minorities through the terrain is almost uniform throughout the area. Information collated from different secondary materials and based on visits show that the ethnic minorities are dependent on resources available in the area for their survival. They have commonalities of farming practices, housing, eating habits and use of medicinal plants for treating diseases. The ethnic minorities have very strong cultural identities of their own and each has independent traits.

Of the population of CHT, the Chakma community has the highest population. Besides, despite having a Peace Treaty the situation in the area is yet to become friendly for people from the plains. Considing the security situation and resource constraints it was decided that the study would be conducted in the Khagrachhari district. The district has people from different ethnic groups and these groups live in independent villages. So, three villages, Headman Para, Kumardhan Para and Kuki Chara, situated within a radius of five kilometres of the district headquarters were selected in consultation with members of the Hill District Council, who were earlier members of the Shantibahini. The villages represented three ethnic communities: Marma, Tripura and Chakma. Considering the average number of households in a village, it was decided to include all the 318 households of the villages in the study.





Based on two field visits, the questionnaire was developed and later tested and necessary corrections were made before final administration. The administration of questionnaire was a difficult task. Though it was in Bangla, the national language, three local data collectors were recruited to facilitate questionnaire administration.

#### FINDINGS OF THE STUDY

The villages covered by the study individually represented three ethnic communities. These are:

**Table 1.1 Number of Households** 

Village	Ethnic population (tribe)	Total number of households
Headman Para	Marma	114
Kumardhan Para	Tripura	101
Kuki Chara	Chakma	103

Of the households covered by the study, only 30 are female -headed and the rest male. This is not an unacceptable situation in the locality. Most of the household heads belong to the age-cohort of 36-57 years. The following table gives the distribution of male and female members of all villages.

**Table 1.2 Distribution of Gender** 

Age	Male	Female
Below 10 years	259	223
11-16 years	132	135
17-35 years	201	251
36-55 years	214	158
56 years +	51	30

Incidentally, in all the villages the number of male population is higher that that of the female population and the difference in number is highest in Kumardhan Para village.

Most of the residents of the area have no access to education. The following table gives the educational status of the household heads of all villages.

Table 1.3 Level of Education

Level of education	Number / Percentage	
No education	154 (48.4%)	
Literate	40 (12.6%)	
Read upto Class V	56 (17.6%)	
Read upto Class VIII	57 (17.9%)	
SSC	7 (2.4%)	
Graduation and above	4 (1.3%)	

The present state of education of children below the age of 16 is also not encouraging. The following table gives the situation of children having access to education.

**Table 1.4 Status of Child Education** 

Ethnic population	Total children	Children <16 years going to school	Children <16 years Not going to school
Marma	256	154 (60.2%)	102 (39.8%)
Tripura	276	96 (34.8%)	180 (65.2%)
Chakma	236	153 (64.8%)	83 (35.2%)
Total	768	403 (52.5%)	365 (47.5%)

Of the male children 43.8 percent do not go to school while the figure for girl child is 51.6 percent. The above table shows that of the ethnic groups under study, the Marma and Chakma children are better placed than the Tripuras. The Chakmas are traditionally better placed in the locality.

Of the heads interviewed, 53.1 percent are farmers, 12.6 percent are jhum cultivators, 14.5 percent are day labourers and 9.7 percent are service holders. The rest have the professions of business, wood collection, manual transport owner, shopkeeper and so on. Besides having a primary occupation, the households have also other occupation which could be termed secondary occupation. The following chart shows the situation of secondary occupation.

Table 1.5 Status of Secondary Occupation

Types of occupation	Male	Female	Total
			(as percentage of total
			house hold
Daily labour	5.6	3.3	5.3
Farmer	7.7	3.3	7.2
Vegetable grower	0.7		0.6
Wood collector	2.1		1.9
Student	1.1		0.9
Service holder	2.5	3.3	2.5
Household work	71.2	90.0	62.6
Business	0.7		0.6
Jum cultivator	3.5		3.1
Wood collection (cooking)	0.7		0.6
Wood & bamboo cutter	0.4		0.3
Wood trader	0.7		0.6
Wood cutter	0.4		0.3
Vegetable & fruits trading	0.4		0.3
Cow rearing	0.4		0.3
Others	2.1		1.9

The following table shows the benefit received most by the surveyed household from different occupation.

**Table 1.6 Distribution of Income** 

Types of Occupation	Percentage
Daily labour	15.5
Farmer	30.5
Vegetable growing	0.3
Service	13.5
Business	24.2
Jam cultivation	11.9
Gardening	1.9
Traditional medicine	0.6
Wood & bamboo cutting	0.6
Wood trading	0.3
Wood cutting	0.3
Others	0.3

About 83.3 percent of the respondents have a monthly income in the range of Taka 1000-3000. About 8.5 percent belong to the income group of less than Taka 1000 a month and 8.2 percent belong to the income group of Taka 3000-5000 a month.

Information provided by the respondents show that they are quite conservative in taking loans either cash or in kind. In Headman Para village about 27.2 percent of the households took loan, while this figure is 44.6 percent and 19.4 percent for Kumardhan Para and Kukichara villages respectively. Of the loan collected by all the households, 38 percent is in kind and the rest cash. These loans are available from relatives, neighbours and members of the community, with interest. The loan in kind includes basically paddy in the range of 40 kg to 800 kg. The micro-credit programme is yet to have a strong coverage in the area as the number of NGOs working in the area is limited. Only about 19.6 percent of the households are member of an NGO.

Water is also a scarce commodity in the area. More than forty percent of the households in the area have to walk on an average a distance between 100 and 500 metres to collect drinking water and the responsibility lies with the women members of the households. The following table gives a picture of the source of drinking water.

**Table 1.7 Source of Drinking Water** 

Source	Dependence (%)
Tubewell	62.6
Hilly spring	2.2
Well	35.2

Sanitation is another problem in the area. The following table shows the types of latrine used by residents for defecation.

**Table 1.8 Sanitation Status** 

Types of latrine	Percentage
Open space	1.3
Bushes close to the house	10.4
Fixed covered place	23.0
Makeshift latrine	57.5
Ring latrine	7.2
Pucca latrine	0.6

The people of all the villages are dependent on words of mouth for information. Access to radio and television is very limited and completely different from national situation. The following table gives the different sources of information for the villagers.

Table 1.9 Source of Information

Sources of information	Percentage of respondents
Words of mouth	39.2
Radio	10.0
Newspaper	05.4
Neighbours	17.0
Village leader	11.4
Television	04.7
Weekly market	01.0
Educated persons in the village	11.5

The information collected also shows a very interesting picture about the exposure of the respondents to the world outside their villages or neighbouring areas. Fifty percent of the respondents have never travelled beyond the periphery of their villages. Only 13.2 percent of the respondents have ever travelled to Dhaka, the capital of their country.

The villagers usually use bamboo, grass, mud and *chan* (a kind of tall grass suitable as a thatching material) as house building material. On an average 43.7 percent of the households use tin as roofing material. They collect bamboo and *chan* grown in nearby forests.

#### PEOPLE'S PERCEPTION

People of the three villages have a common understanding of the biodiversity situation of the area. The older generation is more concerned about the degradation of biodiversity and can better narrate the situation. During the survey the people in the area were able to identify 153 medicinal plants. They identified most of the plants according to their own dialect, deciphering of which is a time consuming task. (For a list of medicinal plants and their corresponding use see Annex 1). These plants grow in the area but while naming plants, shrubs and rice varieties they have also included types, which have been imported into the area. People of the area often use medicinal plants as remedies but they do not have knowledge about the ingredients of these plants. Even the *kabiraj* (practitioners of traditional medicine) is also not very sure about the ingredients, as they have not gone through any formal education and the knowledge has been handed down through generation. Besides, they are also secretive about their knowledge.

Their perception about the presently available or found plants, fishes, birds also point to the general understanding that there has been a general decline in the rich biodiversity of the region. Describing the reasons for causes in the decrease of fruit trees they have identified reasons where human aggression tops the list. The following table shows the reasons for a decline in the fruit trees.

Causes	Percentage of perception (multiple answers)
Lack of land	20.8
Natural process of extinction	60.9
Cutting down for use as fuel wood	8.7
Cutting down for sale	64.3
Cutting down for making furniture	1.4
Not planted any more	1.9
Lack of maintenance	1.0
Cutting down by other people	76.8

The respondents have also identified the fruit trees, the varieties of which have decreased over the last ten years or more (Annex-2). So is the case with wood/bamboo/cane (Annex-3). The respondents have identified the family members engaged in seed preservation.

Table 2.0 Family and Family Members Engaged in Seed Preservation

	No.of family	People engaged in seed			
Crops	engaged in seed	preservation (i	<del> </del>		
	preservation	Male	Family		
Turmeric	104	61.54	38.46		
	(32.7)				
Paddy	235	47.66	52.34		
	(73.9)				
Chili	15	20.00	80.00		
	(4.7)				
Maize	55	76.36	13.64		
	(17.3)				
Ginger	30	56.67	43.33		
	(9.4)				
Brinjal	8	-	100.0		
	(2.5)				
Bean	5	40.0	60.0		
	(1.6)				
Tobacco	10	-	100.0		
	(3.2)				
Mustard	13	69.23	30.77		
	(4.1)				
Mete Alu	4	(80.00)	(20.00)		
	(1.3)	, ,	,		
Marfa	15	40.0	60.0		
	(4.7)				
Teel	43	51.16	48.84		
	(13.2)				
Sugarcane	6	50.0	50.0		
	(1.9)				
Sindra	10	-	100.0		
	(3.2)				
Cotton	38	44.74	55.26		
	(12.0)				
Potato	3	25.0	75.0		
	(0.9)				

To have a broader understanding of the attitudes of the respondents about their livelihood and perception of biodiversity six focus group discussions were organised in the locality. What transpired during the discussions can be summarised as follows:

- New varieties of seed do not give better yields
- Seeds of the high yielding varieties cannot be preserved but we have the techniques preserve the traditional varieties
- Fertility of the land has been affected because of jhum cultivation
- Application of cowdung keeps the soil fertile for three years, but you are to app chemical fertilisers every year
- Production of new varieties of rice involve additional cost
- Earlier women used to conserve seeds, now it comes from the market

#### MAJOR FINDINGS & RECOMMENDATIONS

#### **Major findings**

- The residents of the CHT are basically poor and dependent on agriculture products and forest resources for survival.
- The CHT is rich in medicinal plants and residents use them for cure and prevention of their ailments.
- The crops produced are meant for domestic consumption and sale in the local market. Their experiences of selling products to a wider market is not very encouraging.
- The respondents are not very sure about how to cope with the problem of loss in biodiversity or to conserve biodiversity. Their world is still limited to themselves and they are yet not ready to share their storehouse of knowledge with someone whom they do not know. They are concerned about the decline in biodiversity and ask for involvement of all sections of hill people in preserving the biodiversity.

#### Recommendations

It is quite difficult to make any recommendation for an area like CHT based on a study which only included three communities out of twenty six. Nevertheless, mainstreaming the CHT and its people in the national development efforts would initially require building trust. The people there have a feeling of alienation and they are concerned about their survival. Nevertheless, based on the findings the following recommendations are made:

- Measures to alleviate poverty should be taken in consultation with local population.
- The local population should be encouraged to maintain indigenous agricultural practices and these practices should be recorded.
- Initiative should be taken to develop farmers' organisation
- A clear land and resource tenure should be in place, which would recognise and ensure the age-old rights of the local people.
- People should be made aware of the importance and need for conservation of biodiversity in the region. A register of biodiversity of the area should be immediately developed based on a larger sample.
- Conservation of biodiversity should be based on people's participation and local ethical values.
- There should be measures to stop degradation of watershed.
- Deforestation of the area should be stopped.
- Information on bio-diversity and indigenous knowledge on natural resource management with special reference to livelihood should be documented and legally protected.

Annex I
Uses of the medicinal plants which are available at present

Medicinal Plants	Uses
Thankuni	Arthritis, Indigestion, Dyspepsia, Cough, Malaria, Jaundice, Polio, Ringworm, Dental pain, Diarrhoea, Skin disease, Measles, Indigestion, Running nose/ cough, Dyspepsia of cow/buffalo, Dysentery, White discharge, Swelling of scrotum, Urethral obstruction, Stomach pain, Small pox, Gastritis, High blood pressure, Throat infection
Duthra	Stomach-ache, Dyspepsia, Polio, Ring worm, Dental pain, Measles, Urinary problem, Cough
Pathar kuchi	Stomachache, Dyspepsia, Cough, Malaria, Jaundice, Polio, Dental pain, Measles, Disease of domestic, Dental carriage, Urethral obstruction, Sneezing, Titenus, Burn, Throat infection, Arthritis and Jaundice
Tulshi	Stomach-ache, Dyspepsia, Cough, Malaria, Jaundice, Polio, Ring worm, burn, Dental pain, Diarrhoea, Skin disease, Measles, Indigestion, Dental carriage, Dyspepsia of cow / buffalo, White discharge, Chicken disease, Swelling of scrotum, Urethral obstruction, Stomach pain, Small pox, Tetanus, Headache, Pain, Gastric, Throat infection, Pregnancy and infertility, Arthritis and Jaundice, Cough and cold, Asthma and throat pain, Urinary problem
Nim pata	Cough, Malaria, Jaundice, Measles, Dental carriage, Urinary problem
Gandha trino	Stomach-ache, Arthritis, Dyspepsia, Scrotal swelling, Pain and burn, Cough, Malaria, Jaundice, Polio, Ringworm, Diarrhoea, Skin disease, Ringworm, Measles, Indigestion, Dental carriage, Running nose/cough, Dyspepsia of cow/ buffalo, White discharge, Cancer, Small pox, Severe pain of stomach, Tetanus, Headache, Pain, Gastritis, High blood pressure, Pain, Throat infection, Pregnancy and infertility, Arthritis and Jaundice, Cough and cold
Fona gula	Cough, Arthritis
Gongho lata	Cough, Malaria, Polio, Ringworm, and Dysentery
Dad mordin	Stomach-ache, Arthritis, Dyspepsia, Cough, Jaundice, Polio, Ringworm, Diarrhoea, Indigestion, Dental carriage, Running nose/ cough, White discharge, Swelling of scrotum, Urethral obstruction, Small pox, Tetanus, Headache, Pain, Throat infection, Arthritis and Jaundice
Doksha sangdari	
Jaba pata	Arthritis, Cough, Jaundice, Polio, Ringworm, Dental pain, Running nose/cough, Stomach pain, Tetanus, Headache, Pain, Gastritis
Kath golap	Cough, Malaria
Chanda moyam	Cough, Malaria
Satakaya	Cough, Malaria
Shefali pata	Stomachache, Dyspepsia, Throat infection, Gastritis, Cough, Polio, Child cough, Jaundice, Diarrhoea

Ringworm, Measles, Indigestion, Dental carriage, Cancer,					
Swelling of scrotum, Small pox, Tetanus					
Ringworm, Indigestion, Dental carriage, Stomach pain					
Ringworm, Small pox					
Stomachache, Dyspepsia, Jaundice, Ringworm, Dental pain, Diarrhoea, Skin disease, Ringworm, Measles, Indigestion					
Jaundice, Diarrhoea, Indigestion					
Jaundice, Diarrhoea					
Arthritis, Jaundice, Ringworm, Skin disease, Indigestion, Cancer					
Cough, Skin disease, Indigestion					
Ringworm, Dental pain					
Ringworm, Diarrhoea					
Stomachache, Jaundice, Ringworm, Dental pain, Indigestion,					
Dental carriage					
Ringworm, Indigestion					
Ringworm, Indigestion, Swelling of scrotum, Tetanus					
Arthritis, Ringworm, Skin diseases, Indigestion, Cancer, Swelling					
of scrotum					
Skin diseases, Indigestion, Tetanus					
Cough, Dyspepsia, Acne, Dental pain, Diarrhoea, Skin diseases					
Ringworm, Running nose/cough, Stomach pain					
Ring worm					
Ringworm, Indigestion					
Ringworm					
Cancer					
Sneezing, Burn					
Stomach pain					
Jaundice, Ring worm, Indigestion, Stomach pain					
Stomach pain					
Dyspepsia, Jaundice, Small pox					
Dental carriage, Severe pain of stomach					
Ring worm, Cancer, Tetanus					
Skin diseases, Ring worm, Cancer, Tetanus					
Jaundice, Ringworm					
Urinary problem, Cough, Jaundice					
Dysentery					
Dysentery					
Jaundice					
Stomach pain					
Stomach pain					
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Agali gach	Stomach pain			
Hub buk chara	Stomach pain			
gach				
Tattha manik	Common cold			
Angor pata	Skin diseases			
Bada chur fal	Stomach pain			
gach				
Karuk gach	Stomach pain			
Bok ful gach	Stomach pain, Small pox			
Jalti ba lota	Stomach pain			
Heda baksho sal	Common cold			
Datta long pata	Cough, Tetanus			
Choderabe sak	Small pox			
Surchan	Skin diseases			
Son sabarang	Small pox			
Hettenga	Skin diseases, Small pox			
Komola	Small pox			
Helia	Small pox			
Chandra ketu	Small pox			
Satto moli	Common cold, Skin diseases			
Koni gach/ kala	Neonatal boil			
mom				
Ranga moma	Neonatal boil			
Talcho gacher ul	Neonatal boil			
Harong gach	Common cold			
Sukor amila	Common cold			
Somaso	Common cold			
Jonno her	Common cold			
Akkol sak	Common cold			
Rocto joba ful	Skin diseases			
Dan sabarang	Stomach ache			
Buisaba ful	Stomach ache			
Maytra ve	Small pox			

Annex II

Fruit trees which have decreased over the last ten years or more (according to the perception of the respondents)

Fruit trees	Level of decrease (in percentages)						
	<5	6-15	16-25	26-35	36-50	51-75	
Kathal	45.7	45.7	6.5	2.2	-	-	
Narkel	46.8	41.8	9.5	0.6	1.3	-	
Peara	50.8	40.7	6.8	-	-	1.7	
Anarash	50.0	35.9	9.0	1.3	3.8	-	
Supari	32.5	45.0	20.0	2.5	-	-	
Jambura	38.2	50.0	8.8	-	-	2.9	
Tetul	35.9	46.9	17.2	-	-	-	
Jam	28.6	52.4	14.3	-	4.8	-	
Amm	34.3	37.4	24.2	2.0	1.0	1.0	
Lichu	49.7	37.9	6.5	3.3	2.6	-	
Deshi kala	22.5	33.8	32.4	7.0	4.2	-	
Khajur	51.4	37.1	8.6	2.9	-	-	
Lebu	35.7	42.9	14.3	-	7.1	-	
Boroi	29.3	41.5	26.8	-	2.4	-	
Amra	14.3	21.4	50.0	-	14.3	-	
Ata	50.0	50.0	-	-	-	-	
Bel	12.5	50.0	25.0	12.5	-	-	
Horitaki	35.7	21.4	42.9	-	-	-	
Amloki	-	100.0	-	-	-	-	
Kamranga	-	50.0	-	50.0	-	-	
Bichi kola	-	-	25.0	-	75.0	-	
Chalta	12.5	37.5	50.0	-	-	-	
Jolpai	-	-	-	-	100.0	-	
Bangali kola	-	-	-	100.0	-	-	
Anaj kola	-	-	-	100.0	-	-	
Kamala	100.0	-	-	-	-	-	
Pinna gora		-	-	-	100.0	-	
Gulu/ Ulugach	60.0	20.0	-	20.0	-	-	
Pinna gota	-	-	100.0	-	-	-	

Wood/bamboo/cane which have decreased over the last 10 years or more (according to the perception of the respondents)

Annex III

Wood, bamboo and cane	Level of decrease (in percentages)					
	<5	6-15	16-25	26-35	36-50	51-75
Koroi	36.6	30.7	20.8	5.0	6.9	-
Jam	39.4	40.9	16.7	3.0	-	-
Mahajoni	17.6	52.9	29.4	-	-	-
Shil-koroi	42.6	-	42.9	14.3	-	-
Amm	52.0	36.0	12.0	-	-	-
Fulsum	33.3	16.7	50.0	-	-	-
Muli bash	68.3	19.5	9.8	-	2.4	_
Dulo bash	56.0	34.0	4.0	-	2.4	-
Basher bet	60.0	40.0	-	-	-	-
Bija bash	20.0	56.7	20.0	_	3.3	-
Kochi beth	-	100.0	-	-	-	-
Boroi	50.0	25.0	_	25.0	-	-
Kaloshirish	85.7	14.3	_	-	-	-
Bira bash	-	50.0	50.0	-	-	-
Media bash	50.0	-	50.0	-	-	-
Bet	-	-	100.0	-	-	-
Dadul	-	-	100.0	-	-	-
Bija bash	-	-	100.0	-	-	-
Shimul	30.0	40.0	-	20.0	-	-
Jeta boroi	12.5	75.0	12.5	-	-	-
Chamali	-	-	100.0	-	-	-
Jarul	33.3	58.3	8.3	-	-	-
Sonn	-	100.0	-	-	-	-
Jamrul	-	-	100.0		-	-
Neem	100.0	-	-	_	-	-
Lali	-	50.0	50.0	-	-	-
Sonn	16.7	66.7	-	-	16.7	-
Chacco	28.6	21.4	28.6	-	21.4	-
Boddi	36.1	90.6	13.9	2.8	13.9	2.8
Bon jam	33.3	33.3	-	-	33.3	-
Konok	40.0	20.0	20.0	-	20.0	-
Gabbo bash	-	100.0	-	-	-	-
Acholla	100.0	-	-	-	-	-
Fulchumari	33.3	16.7	16.7	-	16.7	16.7
Goda	100.0	-	-	-		
Kani	-	100.0	-	-	-	-
Bonjam	33.3	33.3	33.3	-	-	-
Kalojam	100.0	-	-	-	-	-

Wood, bamboo and cane	Level of decrease (in percentages)					es)
	<5	6-15	16-25	26-35	36-50	51-75
Gurugotto	50.0	-	-	-	50.0	-
Konok	-	-	100.0	-	-	-
Fitil	100.0	-	-	-	-	-
Gutguti	100.0	-	-	-	-	-
Badna	-	50.0	50.0	-	-	-
Suruj	100.0	-	-	-	-	-
Kodom	-	100.0	-	-	-	-
Batti	-	100.0	-	-	-	-
Godi	50.0	50.0	-	-	-	-

#### Annex IV

# Availability of traditional varieties of rice (as mentioned by respondents)

Rohamen, Butta, Bashabo, Shiladhan, Choroi dhan, Binni, VashaTulshi mala, Compani dhan, Bangabinni, Chorui dhan, Uttorsho binni, Khoi binni, Hori, Binnidhan, Motorkumani, Narikel binni, Balam, Kamrang, Uthkotto binni, Lokapora binni, Shorno chori, Modhuri binni, Bachchapuk, Shornoma chori, Modhumaloti.

#### Annex V

#### Birds presently available / seen by the respondents

Kokil, Ghughu, Kak, Chil, Tia, Tuntuni, Doel, Pecha, Babui, Moina, Shakun, Kaththokra, Sada-bok, Charui, Chatok, Moina, Shyama, Shalik, Bok, Mach ranga, Bou katha kau, Khanjana, Darkak, Pati hash, Sharong, Dahuk, Bunohash, Bulbuli, Badur pakhi, Kabutor, Kakatua, Ful chodni, Sabuj dahuk, Kalo dahuk, Bon morog, Gul chowdury, Dunga, Chati hash, Badur boro jater, Gorba pakhi, Gathi hash, Boruni, Agkok boro, Agkok choto, Ugrik, Hon pakhi, Sair, Biraj, Sotta paik, Dunga, Hon, Egol, Nader kutti, Lal chidera dahuk, Buri paik, Fol dahuk, Lal dahuk, Buri pakhi, Mati dahuk, Athithi pakhi, Chona pakhi, Baj, Sada kak, Choto bok, Pati kak, Raj hash, Finge, Bon kabutor, Gang chil, Son pakhi, Jomir pakhi, Dotooi sipai, Totto raj, Jolkali, Dhonesh, Pati hash, Sharosh.

#### Rodents and insects identified by respondents

Sika edur, Telapoka, Girgity, Ticktiky, Choto samuk, Wee-poka, Pipilika, Kecho, Jonaki, Jol-jok, Stol-jok, Makrosa, Gui-sap, Kakra, Jat-edur, Beji, Ajogar-sap, Gokhrasap, Sona-bang, Kuno-bank, Fula-bang, Mosa (Anufelis), Lomba shamuk, Shamuk, Machi, Tokkhok, Jhenuk, Moumachi, Foring, Kachim, Gash foring, Namnajana, Armajila, Toyatoba, Reshom poka, Achila, Korom poka, Projapati, Jijipoja, Jok, Panir shamuk, Edur, Baga ila shap, Kurkuri bang, Kamo bang, 56 Madho sap, Boro jater edur bajjo edur, Dash, Foring (Gonga +gash), Mosha, Horin jamura shap, Sina jok, Mowmachi jet, Mowmachi bin bin, Tirang batoi, Math shap, Beji, Chamlok, Hokken achila, Ful jamura shap, Gobra, Baja bang, Bolta, Tilhaja faring, Pue foring, Gobor poka, Edur boro & choto jater, Foton puli sap, Kannu, Shatupodi, Moumachi (Gonga), Sona bang + korkori bang, Kalu machi, Hokken, Dragon fly (Urantu machi), Urbela shap, Bow shap, Telapoke (Boro), Tossho poka, Tosha machi, Bicha poka, Shabo podi, Hoken tamak, Totahk, Koida bichi bang, Vimrul lal, Vimrul lal step, 115 Bacha poka, Gonga foring, Mati shap, Lal machi, Shamlo, Boro chopra, Charpoka, Kula badha sap, Sap, Kerang, Chaora samuk, Gol samuk, Samuk choto, Samuk boro, Vadar jok, Arronner samul, Pahari chchop, Dai sap.

#### Wild animals identified by respondents

Bonno sukor, Sojaru, Khak sial, Bon-morog, Kat-birali, Wee-poka, Beji, Bonsukor, Horin, Bon-sial, Bhalluk, Korgosh, Banor, Chita-bag, Bon-biral, Sona-horin, Mete-Bhalluk, Gankallo-banor, Jitol-harin, Gach-balluk, Tubbas-biral, Jat-sial, Chitra harin, Hati, Ulluk, Gokhora shap, Gui sap, Goyal, Rull, Kerang, Bonkukur, Ajgar, Gachu bag, Kula bad shap, Nek sial, Kochop, Bolga harin, Bon kukur, Shurjo horin, Moddho valluk, Bon rui, Ut biral, Jet sial, Gatto biral, Bag, Nakul, Cochop jole thaka, Bon biral sugondi jukto, Kat boirali kalo, Kat birali badami, Jabbo kukur, Parthodur kochop, Sial, Bon biral morog churi kore, Kat birali choto, Jongli sukor, Bora shukor, Gatto birar (gorte paikana kore), Chakloko banor, Bon biral tambush, Ya horin, Bannor chosma, Laga banopr, Didira biral, Pibo khak sial, Kondo bag, Bonno bori sukor, Ud biral, Kochop (Buk gottal), Gach boral, Moi biral, Malmur (Bonrui), Wak biral, Horin jet, Bon biral chedera, Chongra, Bon biral dora keta, Bonbiral tambush (Sugandi), Jongli kochop, Laga banor, Nur, Bon biral mati, Honuman banor, Ban biral (Korte paikhana kore), Mukpora banor, Choto banor.

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