Baseline Survey Report

Name of the project

Restoration of Hilly Bio-diversity through Community Based Bio-resource Management at Dighinala, Khagrachari

Implementing entity

ANANDO, Khagrachari

Partner NGO of Arannayk Foundation

Prepared by

Prof. Dr. Mohammed Jashimuddin,

Institute of Forestry and Environmental Sciences,

University of Chittagong, Chittagong 4331, Bangladesh.

Email: mjashimuddin2001@yahoo.co.uk

Introduction:

This report describes the baseline survey result designed to establish the initial conditions of the project **"Restoration of Hilly Bio-diversity through Community Based Bio-resource Management at Dighinala"** implemented by **Anando**, Khagrachari, partner NGO of Arannayk Foundation. Forests and forest lands play a pivotal life-supporting role in the lives of tribal community across the Chittagong Hill Tracts (CHTs). They provide them all with many benefits including their livelihoods, vital ecosystem services, raw materials, fuel and goods for trading. Yet these benefits are being seriously eroded by the mounting momentum of deforestation, enormous tempt of power holders, livelihood pressure of the poor on forests and homestead resources, unplanned jhum or shifting cultivation, haphazard accommodative establishment of indigenous community people and resettlement of the Bengali community in the plains, hills and valleys. The survey was designed to observe the socio-economic conditions of the local indigenous people and current status of the biodiversity resources especially timber, fuel, medicinal plants, wildlife and their uses in and around Voirofa para and Ghona para in Dighinala, Khagrachari. The project initially assumed that food insecurity including declining access to land, forest products and income from agricultural products is the most important constraints for livelihood security in Chittagong Hill Tracts (CHTs). This situation arises due to mounting momentum of deforestation, enormous tempt of power holders, livelihood pressure of the poor on forests and homestead resources, unplanned jhum or shifting cultivation, haphazard accommodative establishment of indigenous community people and resettlement of the Bengali community in the plains, hills and valleys. The majority of the indigenous people in CHTs have low incomes and most of the trade and commerce are controlled by outsiders and political elites linked to national political parties. Once jhum or swidden (shifting) cultivation was highly productive and jhum technology had been helpful to sustain life and livelihood of the hill people. The indigenous people in CHTs were once self sufficient to meet their demand for food, clothes and shelter. But now the situation has changed due to population pressure, over exploitation of natural resources, shortening of the fallow period from 15-20 years to 3-4 years for jhum, political unrest etc. and the indigenous people are facing food insecurity that in a sense destroying the biodiversity and the natural resource base of the CHTs. In this connection the proposed base line survey tried to gather information on the current status of the homesteads and owned or leased hilly lands to which the local people depend for their food, timber, fuel and medicinal products and income. The survey also tried to appraise the biodiversity of the homesteads and the hills.

Objectives of the baseline survey:

- To assess the socioeconomic conditions of the people living in the study area.
- To identify the biodiversity available in the homesteads and hilly areas of the study area.
- To identify the lost/endangered biodiversity from homesteads and hilly areas.

Methodology of the baseline survey:

The baseline survey was conducted at the homesteads and hilly areas of the proposed project area of Anando in **Dighinala** Upazilla of Khagrachari Hill District, a hill forest zone with semi-evergreen and sub-tropical forest types, to assess the forest resources, households' economic status, their dependence on forest resources and gender role in agro-forestry practices. The proposed project includes two communities of **Voirofa para** and **Ghona para** of **Dighinala Upazilla**. The baseline survey was conducted through a homestead and forest survey in the hills and plains maintained by the households of the target communities with a pre-structured questionnaire in the study area. A total of 20 households were surveyed randomly from two villages/paras, namely, **Voirofa para (n= 10) and Ghona para (n= 10)** villages from where project participants will be selected by Anando. The head of each selected household was interviewed to gather required information. The forest adjacent each household was also surveyed. The collected data were analyzed and presented in the result section.

Description of the study area:

The proposed project will be working in 2 no. Merung union of Dihinala upazilla consisting of 82 villages or paras. Two communities or paras namely **Voirofa para** and **Ghona para** was initially selected for the project. Both of these are resettled villages, meaning these communities were resettled here after the Peach Agreement in 1997 between the Government of Bangladesh and the CHT Jana Sanghati Samity (JSS). A total of 14 families in Voirofa para and 17 families in Ghona para have resettled here since the Peach Agreement. However during the long insurgency period the people used to live here have moved to India and these places have become abandoned for long time and the forest resources of these areas were extracted indiscriminately by illicit felling, JSS activists and other influential persons. During the insurgency period the forest resources including the wildlife resources were destructed through out the Chittagong Hill Tracts (CHTs) and there was no exception for both Voirofa para and Ghona para. However since the resettlement, the returned tribal families were allotted 2.25 acres (per family) of hilly land to establish their homesteads and produce livelihood from the land. As such they have developed their homesteads with a space for living and most of the land for tree plantation and producing agricultural products along the hill slopes. Some of them have engaged themselves in shifting cultivation occupying more vacant spaces near their homesteads. They still collect fruits (mainly banana), fuel wood and sometimes timber for their own use and earn extra income from the nearby forests (Photos 1 & 2). Chittagong Hill Tracts Development Board (CHTDB) has established rubber plantation in these areas and community people are now engaged in rubber latex collection and selling and earning considerable income from these. The plantation is still young and it will sustain for long time. So if these communities can be developed as biodiversity conservation sites than people of these communities will be benefited by protecting the sites and getting income from fruits and timber at maturity while they can earn extra income from rubber latex.

(a)

(b)

(c)

(d)

(e)

(f)

Photo 1: Photos showing the study area in Voirofa para [(a) Respondent interview; (b) Status of tree plantation on hilly lands; (c) Typical homesteads with fruit trees; (d) Jhum on the hill slopes; (e) Fuel wood collection and (f) Removal of timber from the forest].

(a)

(b)

(c)

(d)

(e)

(f)

Photo 2: Photos showing the study area in Ghona para [(a) Typical homesteads with hills and agricultural lands; (b) Jhum on the hill slopes; (c) Collection and carrying of rubber latex from

the forests; (d) Collection and carrying of banana from the forests for selling; (e) Vacant hills showing the scope of tree plantation and (f) Respondent interview].

Results:

Homesteads survey

Respondents' age, sex, occupation and education level

The result of the survey shows that the average age of the respondent is 45 years and they are most responsible person of the community. Among the respondents most of them are male (95%) and the rest are female (5%) (Table 1). Educational status of the respondents' show that most of the respondents are illiterate (65%) followed by S.S.C. (15%), primary (10%) and secondary (10%) level education (Table 1). It is found that most of the families (80%) are engaged in farming including jhum/shifting cultivation on hill slopes, agriculture on the valleys and plains and tree farming on hills and in and around homesteads followed by business (10%), service (5%) and other category (5%) including daily labourer and rubber latex collection as primary occupation. However, some of them (25%) are also involved in secondary occupation that includes farming (5%), service (5%) and other category (15%) (Table 2).

Table 1: Distribution of respondent households by respondents' age, sex and educational level (Note: M= male; F= Female; Pri.= Primary; Secon.= Secondary) (values in the parentheses denote percentages).

Para name	Age	Sex			Educational status					
					Illiterate	Literate				
		M	F	Total		Pri.	Secon.	S.S.C.	Sub-total	Total
Voirofa para (n=10)	46.5	9 (90)	1 (10)	10 (100)	7 (70)	2 (20)	1 (10)	-	3 (30)	10 (100)
Ghona para (n=10)	43.7	10 (100)	-	10 (100)	6 (60)	-	1 (10)	3 (30)	4 (40)	10 (100)
Total (n=20)	**45.1**	**19 (95)**	**1 (5)**	**20 (100)**	**13 (65)**	**2 (10)**	**2 (10)**	**3 (15)**	**7 (35)**	**20 (100)**

Table 2: Distribution of respondent households by occupation (values in the parentheses denote percentages) (Note: Farm.= Agriculture, poultry and tree farming; Busi.= Business).

Para name	Primary occupation					Secondary occupation				
	Farm.	Busi.	Service	Other	Total	Farm.	Busi.	Service	Other	Total
Voirofa para (n=10)	9 (90)	1 (10)	-	-	10 (100)	-	-	1 (10)	3 (30)	4 (40)
Ghona para (n=10)	7 (70)	1 (10)	1 (10)	1 (10)	10 (100)	1 (10)	-	-	-	1 (10)
Total (n=20)	**16 (80)**	**2 (10)**	**1 (5)**	**1 (5)**	**20 (100)**	**1 (5)**	**-**	**1 (5)**	**3 (15)**	**5 (25)**

Family size, sex and earning member

Average family size in the study area is 5.05 of which 3.0 (59%) are male and the rest 2.05 (41%) are female (Table 3). However, average family size is found higher in Voirofa para (5.4) compared to Ghona para (4.7). Among the family members almost half of them were found in the younger age category of 0-20 years (50%). On average each family has 1.55 (31% of the total family size) earning members of which 1.00 are male (20% of the total family size) and 0.55 are female (11% of the total family size) (Table 3). This result shows that both male and female are earning members of the family meaning women are more or less involved in income generating or livelihood activities. But women are usually deprived of their labour compared to male. If women work as daily labourer they get less wage compared to the male member of the community.

Table 3: Distribution of respondent households by family size, sex and total earning members (values in the parentheses denote percentages) (Note: M= Male; F= Female; T= Total).

Para name	Family size (Age class)								Earning members (% of total family size)
	Sex	<10	10-20	20-30	30-40	40-50	>50	Total	
Voirofa para (n=10)	M	1.3 (24)	0.60 (11)	0.40 (7)	0.30 (6)	0.40 (7)	0.20 (4)	3.2 (59)	0.9 (17)
	F	0. 6 (11)	0.30 (6)	0.40 (7)	0.60 (11)	0.20 (4)	0.10 (2)	2.2 (41)	0.8 (15)
	T	**1.9 (35)**	**0.9 (17)**	**0.8 (15)**	**0.9 (17)**	**0.6 (11)**	**0.3 (6)**	**5.4 (100)**	**1.7 (31)**
Ghona para (n=10)	M	0.90 (19)	0.40 (9)	0.70 (15)	0.10 (2)	0.40 (9)	0.30 (6)	2.8 (60)	1.10 (23)
	F	0.40 (9)	0.50 (11)	0.30 (6)	0.20 (4)	0.20 (4)	0.30 (6)	1.9 (40)	0.30 (6)
	T	**1.30 (28)**	**0.90 (19)**	**1.00 (21)**	**0.30 (6)**	**0.60 (13)**	**0.60 (13)**	**4.7 (100)**	**1.40 (30)**
Total (n=20)	M	1.10 (22)	0.50 (10)	0.55 (11)	0.20 (4)	0.40 (8)	0.25 (5)	3.00 (59)	1.00 (20)
	F	0.50 (10)	0.40 (8)	0.35 (7)	0.40 (8)	0.20 (4)	0.20 (4)	2.05 (41)	0.55 (11)
	T	**1.60 (32)**	**0.90 (18)**	**0.90 (18)**	**0.60 (12)**	**0.60 (12)**	**0.45 (9)**	**5.05 (100)**	**1.55 (31)**

Land resources

Land resources occupied by each family in the study area are 387.4 decimals of which most of the lands (92%) are used for tree plantation and the rest 8% area is used for homesteads and agricultural purposes (Table 4, Photos 1 & 2). Hilly lands are usually used for jhum or tree plantation and valleys or plains are used for agriculture. In Ghona para each family occupy more land (539.3 decimals) compared to Voirofa para (235.5 decimals) (Table 4). However, in both the villages total land resources occupied by each family are higher than the allotted land area of 225 decimals by the Chittagong Hill Tracts Development Board (CHTDB).

Table 4: Distribution of respondent households by land resources (in decimals) (values in the parentheses denote percentages).

Para name	Homestead					Agri-land	Tree areas	Total tree areas	Total
	Dwelling unit (a)	Trees (b)	Yard (c)	Ponds (d)	Total (e=a+b+c+d)	(f)	(g)	(h=b+g)	(i=e+f+g)
Voirofa para (n=10)	4.7 (2.00)	19.5 (8.28)	0.8 (0.34)	-	25 (10.62)	16 (6.79)	194.5 (82.59)	214 (91)	235.5 (100)
Ghona para (n=10)	24.1 (4.47)	14.7 (2.73)	0.4 (0.07)	0.1 (0.02)	39.3 (7.29)	15 (2.78)	485 (89.93)	499.7 (93)	539.3 (100)
Total (n=20)	**14.4 (3.72)**	**17.1 (4.41)**	**0.6 (0.15)**	**0.05 (0.01)**	**32.15 (8.30)**	**15.5 (4.00)**	**339.75 (87.70)**	**356.85 (92)**	**387.4 (100)**

Family income

Analysis of the family income by the respondent households' show that average family income in the study area is 60905 Taka/year of which maximum amount of the income (81%) comes from farming including 24% income from agricultural or jhum products (paddy, vegetables, spices etc.), 46% income from tree products (fruits and timber or fuel wood) and 12% income from others (farm labour) followed by service (12%) and business (7%). The community people of Voirofa para were found totally dependent (100%) on agro-forestry activities or farm income for their livelihood while the people of Ghona para were found less dependent (67%) on agro-forestry activities compared to Voirofa para. However, average family income was found higher in Ghona para (69100 Taka/year) compared to Voirofa para (52710 Taka/year) which is due to alternative income source (Table 5). If the people are more engaged in other alternative income generating (IGAs) activities their total family income will be higher.

Table 5: Distribution of households' family income (Taka/year) in the study area (values in the parentheses denote percentage of total income)

Para name	Farm products					Business	Service	Total income
	Agri.	Fruit	Timber/fuel	Others	Sub-total			
Voirofa para (n=10)	14800 (28.08)	14000 (26.56)	15800 (29.98)	8110 (15.39)	52710 (100)	-	-	52710 (100)
Ghona para (n=10)	14100 (20.41)	20500 (29.67)	5500 (7.96)	6000 (8.68)	46100 (66.71)	8400 (12.16)	14600 (21.13)	69100 (100)
Total (n=20)	**14450 (**23.73**)**	**17250 (**28.32**)**	**10650 (**17.49**)**	**7055 (**11.58**)**	**49405 (**81.12**)**	**4200 (**6.90**)**	**7300 (**11.99**)**	**60905 (100)**

Plant diversity

Table 6 list the plant species and Table 7 shows the plant diversity measures present in the homesteads of the study area. A total of 45 different plant species were identified in the homesteads and hills of the study area (Tables 6 & 7). Table 6 lists the plant species present in the study area with their local and scientific names. Usually the community people are more dependent on crops and tree products that are grown in and around the homesteads and hilly areas occupied or owned by them. Among plant diversity different timber, fruit and medicinal species are found growing. It is evident that **Segun** (100%), **Gamar** (100%), **Am** (100%), **Khantal** (100%), **Peara** (90%) and **Supari** (90%) were found dominating in the homesteads and hills of Voirofa para and on the other hand **Segun** (100%), **Gamar** (100%), **Am** (90%), **Khantal** (90%), **Supari** (90%) and **Banana** (80%) were found dominating in the homesteads and hills of Ghona para (Table 7). Species density was found higher for **Banana** (580), **Gamar** (575), **Segun** (566), **Mahagoni** (400), **Garjon** (103), **Koroi** (102), **Jarul** (102) and **Rubber** (100) in Voirofa para. More or less same result was also observed in Ghona para regarding the species density with higher species density for **Banana** (563), **Segun** (352), **Gamar** (187), **Rubber** (155), **Champa ful** (100) and **Mahagoni** (65) (Table 7). In total species density was found higher for Voirofa para (3161 per household or 1342 per acre) compared to Ghona para (1778 per household or 330 per acre). It is interesting to note here that although the households in Ghona para occupied more land areas compared to Voirofa para (Table 4) but species density are much smaller than Voirofa para. This means in Ghona para there are more scope for tree planting compared to Voirofa para. In case relative density highest percentage was also observed for **Banana** (18.35%), **Gamar** (18.19%), **Segun** (17.90%), **Mahagoni** (12.65%), **Garjon** (3.24%), **Koroi** (3.22%), **Jarul** (3.21%) and **Rubber** (3.16%) in Voirofa para and more or less similar result was observed in Ghona para with higher relative density for **Banana** (31.65%), **Segun** (19.77%), **Gamar** (10.52%), **Rubber** (8.72%), **Champa ful** (5.63%) and **Mahagoni** (3.66%). It is interesting to see that the species density and relative density is higher for **Banana, Segun, Gamar and Rubber** compared to other plant species in the study area (Table 7) as the local people are planting this species at greater numbers to get economic benefits in and around their homesteads and hills.

Table 6: List of plant species present in the study area.

Sl. No.	Species name/ Local name	Scientific name
1	Achargula	*Microcos paniculata*
2	Akondho	*Calotropis procera*
3	Am	*Mangifera indica*
4	Amloki	*Phyllanthus emblica*
5	Amra	*Spondias pinnata*
6	Bamboo	*Bambusa vulgaris*
7	Banana	*Musa sapientum*
8	Bel	*Aegle marmelos*
9	Bhadi	*Gariga pinnata*
10	Bohera	*Terminalia bellerica*
11	Boroi	*Zizyphus mauritiana*
12	Champa ful	*Michelia champaca*
13	Dhakijam	*Sygygium indicum*

Table 6 continued……

14	Dharmara	*Stereospermum personatum*
15	Dumur	*Ficus semicordata*
16	Fuljhumari	*Anogeissus acuminata*
17	Gamar	*Gmelina arborea*
18	Garjon	*Dipterocarpus turbinatus*
19	Gutguttya	*Bursera serrata*
20	Hona gula	*Pajanelia longifolia*
21	Jaganna gula	*Ficus racemosa*
22	Jalpai	*Elaeocarpus floribundus*
23	Jam	*Syzygium cumini*
24	Jambura	*Citrus grandis*
25	Jarul	*Lagerstroemia speciosa*
26	Kamranga	*Schima wallichii*
27	Kanthal	*Artoca rpus heterophyllus*
28	Komola	*Citrus sinensis*
29	Koroi	*Albizia procera*
30	Lebu	*Citrus spp.*
31	Litchi	*Litchi chinensis*
32	Mahagoni	*Swietenia mahagoni*
33	Malta	*Citrus spp.*
34	Medha	*Litsea monopetala*
35	Narikel	*Cocos nucifera*

36	Neem	*Azadirachta indica*
37	Painna gula	*Flacourtia jangomas*
38	Papaya	*Carica* papaya
39	Payara (Guava)	*Psidium guajava*
40	Pitali	*Trewia nudiflora*
41	Rubber	*Heveabrasiliensis*
42	Segun	*Tectona grandis*
43	Supari	*Areca catechu*
44	Telsur	*Hopea odorata*
45	Tula	*Bombax ceiba*

Table 7: Analysis of the plant diversity present in the study area (Note: Nos.= Number of trees/culms; HH= Households; SD= Species density; RD= Relative density).

Sl. No.	Species name	Voirofa para (n=10)				Ghona para (n=10)			
		Frequency		SD	RD (%)	Frequency		SD	RD (%)
		Nos.	HH (%)			Nos.	HH (%)		
1	Achargula	6	20	3.00	0.09	-	-	-	-
2	Akondho	-	-	-	-	4	20	2.00	0.11
3	**Am**	**365**	**100**	36.50	1.15	**233**	**90**	25.89	1.46
4	Amloki	14	50	2.80	0.09	42	40	10.50	0.59
5	Amra	-	-	-	-	2	10	2.00	0.11

Table 7 continued…….

6	Bamboo	60	10	60.00	1.90	255	60	42.50	2.39
7	**Banana**	2900	50	**580.00**	**18.35**	**4500**	**80**	**562.50**	**31.65**
8	Bel	6	20	3.00	0.09	67	50	13.40	0.75
9	Bhadi	5	10	5.00	0.16	4	10	4.00	0.23
10	Bohera	-	-	-	-	4	10	4.00	0.23
11	Boroi	17	60	2.83	0.09	7	30	2.33	0.13
12	**Champa ful**	220	30	73.33	2.32	100	10	**100.00**	**5.63**
13	Dhakijam	16	20	8.00	0.25	-	-	-	-
14	Dharmara	35	20	17.50	0.55	21	30	7.00	0.39
15	Dumur	18	30	6.00	0.19	23	20	11.50	0.65
16	Fuljhumari	43	40	10.75	0.34	33	30	11.00	0.62
17	**Gamar**	**5750**	**100**	**575.00**	**18.19**	**1870**	**100**	**187.00**	**10.52**
18	**Garjon**	410	40	**102.50**	**3.24**	55	40	13.75	0.77
19	Gutguttya	261	30	87.00	2.75	89	50	17.80	1.00
20	Hona gula	20	40	5.00	0.16	13	20	6.50	0.37
21	Jaganna gula	25	20	12.50	0.40	-	-	-	-

22	Jalpai	21	20	10.50	0.33	-	-	-	-
23	Jam	17	50	3.40	0.11	33	70	4.71	0.27
24	Jambura	22	50	4.40	0.14	16	60	2.67	0.15
25	**Jarul**	203	20	**101.50**	**3.21**	25	10	25.00	1.41
26	Kamranga	-	-	-	-	1	10	1.00	0.06
27	**Kanthal**	**855**	**100**	85.50	2.70	**249**	**90**	27.67	1.56
28	Komola	143	50	28.60	0.90	149	70	21.29	1.20
29	**Koroi**	610	60	**101.67**	**3.22**	88	70	12.57	0.71
30	Lebu	3	20	1.50	0.05	6	20	3.00	0.17
31	Litchi	302	70	43.14	1.36	109	60	18.17	1.02
32	**Mahagoni**	1200	30	**400.00**	**12.65**	130	20	**65.00**	**3.66**
33	Malta	-	-	-	-	5	10	5.00	0.28
34	Medha	10	20	5.00	0.16	-	-	-	-
35	Narikel	87	70	12.43	0.39	50	80	6.25	0.35
36	Neem	4	20	2.00	0.06	2	10	2.00	0.11
37	Painna gula	7	20	3.50	0.11	5	10	5.00	0.28
38	Papaya	130	60	21.67	0.69	54	40	13.50	0.76
39	**Payara (Guava)**	**239**	**90**	26.56	0.84	100	70	14.29	0.80
40	Pitali	1	10	1.00	0.03	4	10	4.00	0.23
41	**Rubber**	200	20	**100.00**	**3.16**	310	20	**155.00**	**8.72**
42	**Segun**	**5660**	**100**	**566.00**	**17.90**	**3515**	**100**	**351.50**	**19.77**
43	**Supari**	**399**	**90**	44.33	1.40	**128**	**90**	14.22	0.80
44	Telsur	2	10	2.00	0.06	-	-	-	-
45	Tula	12	20	6.00	0.19	2	10	2.00	0.11
Total		**20298**	**-**	**3161.41**	**100**	**12303**	**-**	**1777.50**	**100**

However, plenty of herbs and shrubs were also found to grow in and around the homesteads which were very difficult to identify and were not the part of the baseline survey. Most of the households (93%) responded that the plant species were planted by themselves and only few (7%) responded that the plant species are occurring naturally (Table 8). Among the agricultural crops the households responded that they also grow **vegetables** (100%), **turmeric** (55%) and **zinger** (40%), paddy (20%), and pineapple (10%) (Table 9).

Table 8: Distribution of respondent households by mode of occurrence (%) of seedlings/trees.

Para name	**Mode of occurrence (%)**	
	Planted	**Natural**
Voirofa para (n=10)	97.1	2.9
Ghona para (n=10)	89.5	10.5
Total (n=20)	93.3	6.7

Table 9: Distribution of respondent households by agricultural crops planted (Note: HH%= Percentage households responded).

Para name→ Crop name↓	Voirofa para (n=10)		Ghona para (n=10)		Total (n=20)	
	Frequency	HH%	Frequency	HH%	Frequency	HH%
Pineapple (Anaros)	2	20	-	-	2	10
Zinger	**6**	**60**	**2**	**20**	**8**	**40**
Turmeric	**7**	**70**	**4**	**40**	**11**	**55**
Paddy	3	30	1	10	4	20
Vegetables	**10**	**100**	**10**	**100**	**20**	**100**

Collection of forest resources

The respondent households were asked to know the type and quantity of forest resources they usually collect from the neighbouring forests. It is observed that respondent households usually collect fuel wood. Each family in the study area was found to collect 172 mounds of fuel wood per year from their own source (100%) travelling a distance of 768 metres and spending about 199 minutes a day on average (Table 10).

Table 10: Distribution of respondent households by the collection of forest resources.

Para name	Fuel wood (Mound/family)	Source		Distance (Meters)	Time (Minutes/day)
		Own (%)	Other (%)		
Voirofa para (n=10)	150	100	-	765	134
Ghona para (n=10)	194	100	-	770	263
Total (n=20)	**172**	**100**	**-**	**768**	**199**

Lost Species

The homestead survey tried to find out the species that are lost from the homesteads and hilly regions of the study area. The respondent households were asked to identify the name(s) of the lost species from their homesteads and hilly lands. It is found that a total of 16 tree species were identified by the respondents of the study area that were lost from the locality (Table 11). Among the lost species **Chapalish** (55%), **Garjon** (50%), **Telsur** (50%), **Civit** (45%) and **Jaganna gula** (35%) are the mostly answered plant species that are lost from the study area (Table 11).

Table 11: Frequency distribution of respondents' perception about lost species in the study area (Note: HH= Number of households responded)**.**

Sl. No.	Species name	Scientific name	Voirofa para (n=10)		Ghona para (n=10)		Total (n=20)	
			HH	%	HH	%	HH	%
1	Achar gula	*Microcos paniculata*	1	10	-	-	1	5
2	Bon chatian	*Alstonia macrophylla*	1	10	3	30	4	20
3	Champa ful	*Michelia champaca*	1	10	1	10	2	10
4	**Chapalish**	***Artocarpus chaplasha***	**4**	**40**	**7**	**70**	**11**	**55**
5	**Civit**	***Swintonia floribunda***	**5**	**50**	**4**	**40**	**9**	**45**
6	Gab	*Dispyros peregrina*	1	10	1	10	2	10
7	**Garjon**	***Dipterocarpus turbinatus***	**5**	**50**	**5**	**50**	**10**	**50**
8	Gutguttya	*Bursera serrata*	3	30	2	20	5	25
9	Hona gula	*Pajanelia longifolia*	1	10	1	10	2	10
10	**Jaganna gula**	***Ficus racemosa***	**2**	**20**	**5**	**50**	**7**	**35**
11	Jarul	*Lagerstroemia speciosa*	1	10	2	20	3	15
12	Kao gula	*Garcinia cowa*	1	10	2	20	3	15
13	Koroi	*Albizia* spp.	-	-	2	20	2	10
14	Medha	*Litsea monopetala*	1	10	1	10	2	10
15	**Telsur**	**Hopea odorata**	**5**	**50**	**5**	**50**	**10**	**50**
16	Tentul	*Tamarindus indica*	2	20	-	-	2	10

Causes of and problems faced due to loss of species

The respondents were also asked to identify the causes of and problems faced due to loss of plant species from the study area. It is found that population pressure (75%) and jhum/shifting cultivation (75%) are identified as the major causes of biodiversity loss followed by fuel wood collection (35%), lack of awareness (10%), lack of alternate income (10%) and illicit felling (10%) in the study area (Table 12). The entire respondent (100%) mentioned that they face difficulty due to biodiversity loss. The respondent households were also identified a lot of problems they are facing due to biodiversity loss from the study area. Some of the mentionable problems identified by majority of the respondents are scarcity of drinking water (75%), increasing temperature (70%), increased soil erosion (45%) and less rain fall (40%) (Table 12). Planting indigenous species (90%), creating alternative income source (50%) and government help (45%) are some of the recommendations by the respondent households for biodiversity conservation in the study area (Table 12).

Table 12: Frequency distribution of respondent households by the reason (s) and difficulty faced for biodiversity loss and recommendation for biodiversity conservation in the study area (values in the parentheses denote percentages)**.**

Variables	Voirofa para (n=10)	Ghona para (n=10)	Total (n=20)
Reasons for biodiversity loss from the homestead or forest			
Population pressure	**8 (80)**	**7 (70)**	**15 (75)**
Jhum cultivation	**7 (70)**	**8 (80)**	**15 (75)**
Lack of awareness	1 (10)	1 (10)	2 (10)
Illicit felling	1 (10)	1 (10)	2 (10)
Collection of fuel wood for Brickfield	4 (40)	3 (30)	7 (35)
Lack alternate income	-	2 (10)	2 (10)
Face any difficulty due to biodiversity loss			
Yes	**10 (100)**	**10 (100)**	**20 (100)**
No	-	-	-
Type (s) of difficulties due to biodiversity loss			
Less rain fall	4 (40)	4 (40)	8 (40)
Increasing temperature	**7 (70)**	**7 (70)**	**14 (70)**
Increased soil erosion in the hilly areas	5 (50)	4 (40)	9 (45)
Scarcity of drinking water	**7 (70)**	**8 (80)**	**15 (75)**
Recommendation (s) for biodiversity conservation			
Government help needed	**6 (60)**	**3 (30)**	**9 (45)**
Stop Jhum cultivation	1 (10)	-	1 (5)
Planting indigenous species	**8 (80)**	**10 (10)**	**18 (90)**
Stop felling trees	1 (10)	2 (20)	3 (15)
Creating alternate income source	**6 (60)**	**4 (40)**	**10 (50)**

Table 13: Frequency distribution of respondent households by their considerations and problem of technical knowledge in planting tree species (values in the parentheses denote percentages)**.**

Variables	Para name		Total (n=20)
	Voirofa para (n=10)	Ghona para (n=10)	
Respondents' consideration for planting trees in the homestead			
All types all species	**8 (80)**	**8 (80)**	**16 (80)**
Species which are needed for family uses	-	1 (10)	1 (5)
All indigenous species	**-**	**10 (100)**	**10 (50)**
Species which have more economic value	**10 (100)**	**10 (100)**	**20 (100)**
Do you face any problem of technical knowledge for planting trees?			

Yes	-	3 (30)	3 (15)
No	**10 (100)**	**7 (70)**	**17 (85)**
Total	10 (100)	10 (100)	20 (100)
Type of problem of technical knowledge for planting trees?			
How to plant species	-	2 (20)	2 (10)
How to identify the good species	-	1 (10)	1 (5)
Received any training for biodiversity conservation			
Yes	**7 (70)**	**8 (80)**	**15 (75)**
No	3 (30)	2 (20)	5 (25)
Total	10 (100)	10 (100)	20 (100)

Recommendation for biodiversity conservation

The respondent households were asked to know their perception about how to overcome the loss of biodiversity from the study area. It is evident that all of the households responded (100%) to plant species which have more economic value followed by all types of species (80%) and all indigenous species (50%) (Table 13). All the respondents (100%) opined that they do not face any problem of technical knowledge for planting trees and most of them (75%) have received training for biodiversity conservation or how to plant trees. However, very few mentioned that they face problem of technical knowledge related to how to plant a specific species (10%) and how to select or identify good species (5%) (Table 13). The responded households were also asked to choose species to plant in their homesteads and hilly areas. It is found that **Gamar** (70%), **Komola** (55%), **Litchi** (50%), **Segun** (50%), **Champa** (35%), and **Garjon** (30%) are the mostly preferred species by the respondent households to plant in the study area (Table 14).

Table 14: Frequency distribution of respondent households by the choice of species to plant in the study area (values in the parentheses denote percentages).

Sl. No.	Preferred species name	Para name		Total (n=20)
		Voirofa para (n=10)	Ghona para (n=10)	
1	Am	2 (20)	2 (20)	4 (20)
2	Bel	2 (20)	2 (20)	4 (20)
3	**Champa**	**2 (20)**	**5 (50)**	**7 (35)**
4	**Gamar**	**7 (70)**	**7 (70)**	**14 (70)**
5	**Garjon**	**3 (30)**	**3 (30)**	**6 (30)**
6	**Komola**	**4 (40)**	**7 (70)**	**11 (55)**
7	**Litchi**	**3 (30)**	**7 (70)**	**10 (50)**
8	Mahagoni	3 (30)	1 (10)	4 (20)
9	Neem	1 (10)	-	1 (5)
10	**Segun**	**5 (50)**	**5 (50)**	**10 (50)**

Distribution of labour in homestead agro-forestry activities

The household survey also tried to identify the labour involvement in homestead agro-forestry activities especially on women involvement. Table 15 shows the different agro-forestry activities in the homesteads with the labour involvement based on sex. It is found that male member(s) of the household are performing most of the activities (79%) where as female performs only 21% of the total agro-forestry activities in the study area (Table 15). In is evident that most of the agro-forestry works including planning, choice of species, seedling collection, planting, nursing, harvesting and selling of the products are performed at by male member(s) of the respondent households (Table 15).

Table 15: Distribution of labour (%) in homestead agro-forestry activities.

Agro-forestry activities	Para name						Total (n=20)		
	Voirofa para (n=10)			Ghona para (n=10)					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Planning	80	20	100	80	20	100	80	20	100
Choice of species	100	-	100	100	-	100	100	-	100
Seedling collection	80	20	100	80	20	100	80	20	100
Planting	80	20	100	80	20	100	80	20	100
Nursing	75	25	100	75	25	100	75	25	100
Fertilizer application	100	-	100	100	-	100	100	-	100
Weeding	50	50	100	50	50	100	50	50	100
Harvesting	67	33	100	63	37	100	65	35	100
Trees	100	-	100	100	-	100	100	-	100
Fruits	50	50	100	50	50	100	50	50	100
Vegetable	50	50	100	40	60	100	45	55	100
Proccssing	50	50	100	50	50	100	50	50	100
Selling	100	-	100	100	-	100	100	-	100
Total	**79**	**21**	**100**	**79**	**21**	**100**	**79**	**21**	**100**

Social/Development organizations working in the study area

The study also tried to find out the organisations working in the study area for social and/or other development. No NGO was found to work in the study area as people have got negative attitudes towards the NGOs providing loan to them. However, only Krishi Bank was found to work and provide loan to only 10% households in the study area (Table 16).

Table 16: Distribution of NGOs activity in the study area (values in the parentheses denote percentages).

NGOs	Para name		Total (n=20)	Activity
	Voirofa para (n=10)	Ghona para (n=10)		
Krishi Bank	1 (10)	1(10)	2 (10)	Loan

Conclusion:

Finally, it can be said that the people of the study area are mainly dependent on agro-forestry (with 81% of total family income) products they get from their homesteads and hills (Table 5, Photos 1 & 2). However, the people of Voirofa para (with 100% of total family income) are totally dependent on agro-forestry activities whereas the people of Ghona para are less dependent (with 67% of total family income) compared to Voirofa para (Table 5). **Segun** (100%), **Gamar** (100%), **Am** (100%), **Khantal** (100%), **Peara** (90%) and **Supari** (90%) were found dominating in the homesteads and hills of Voirofa para and on the other hand **Segun** (100%), **Gamar** (100%), **Am** (90%), **Khantal** (90%), **Supari** (90%) and **Banana** (80%) were found dominating in the homesteads and hills of Ghona para (Table 7). In total species density was found higher for Voirofa para (3161 per household or 1342 per acre) compared to Ghona para (1778 per household or 330 per acre). It is interesting to note here that although the households in Ghona para occupied more land areas compared to Voirofa para (Table 4) but species density are much smaller than Voirofa para. This means in Ghona para there are more scope for tree planting compared to Voirofa para. Among the lost species **Chapalish** (55%), **Garjon** (50%), Telsur (50%), **Civit** (45%) and **Jaganna gula** (35%) are the mostly answered plant species that are lost from the study area (Table 11). Population pressure (75%) and jhum/shifting cultivation (75%) are identified as the major causes of biodiversity loss followed by fuel wood collection (35%), lack of awareness (10%), lack of alternate income (10%) and illicit felling (10%) in the study area (Table 12). Some of the mentionable problems identified by majority of the respondents are scarcity of drinking water (75%), increasing temperature (70%), increased soil erosion (45%) and less rain fall (40%) (Table 12). Planting indigenous species (90%), creating alternative income source (50%) and government help (45%) are some of the recommendations by the respondent households for biodiversity conservation in the study area (Table 12). It is evident that all of the households responded (100%) to plant species which have more economic value followed by all types of species (80%) and all indigenous species (50%) (Table 13). All the respondents (100%) opined that they do not face any problem of technical knowledge for planting trees and most of them (75%) have received training for biodiversity conservation or how to plant trees. However, very few mentioned that they face problem of technical knowledge related to how to plant a specific species (10%) and how to select or identify good species (5%) (Table 13). **Gamar** (70%), **Komola** (55%), **Litchi** (50%) and **Segun** (50%) are the mostly preferred species by the respondent households to plant in the study area (Table 14). It is found that male member(s) of the household are performing most of the activities (79%) where as female performs only 21% of the total agro-forestry activities in the

study area (Table 15). In is evident that most of the agro-forestry works including planning, choice of species, seedling collection, planting, nursing, harvesting and selling of the products are performed by male member(s) of the respondent households (Table 15). The people of the study area are now interested to plant and restore their homestead biodiversity with all those species specially the indigenous one which will enrich biodiversity and be useful for their family purposes and can earn extra income for the family. It is interesting to note here that **Jaganna gula** and **Jial bhadi** are found growing near the streams and the community people believes that these species can retain water and keep the stream alive. So these species should be conserved and planted along the streams to produce more water in the streams for the tribal community which will act as source of water for them. The forests are also rich in wildlife biodiversity including wild boar/boar, deer, common birds, snakes, lizards, bon murag, owl (Pecha), etc. However, it was home of some important wildlife like, tiger, rhinoceros in the past. If this project can successfully implement their activities in the study area it will bring a positive impact on the biodiversity of the region and help people earn extra money from producing plant resources that will enrich the biodiversity of the region including the wildlife resources and certainly improve the environmental quality of the locality.