

# Study on Utilization of Lowland Bamboo in Benishangul Gumuz Region, Ethiopia

Prepared by

**INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN  
(INBAR)**

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## ACRONYMS

BG	Benishangul Gumuz
BGRS	Benishangul Gumuz Regional State
BoARD	Bureau of Agriculture and Rural Development
CPAR	Canadian Physicians Aid and Relief
CSA	Central Statistical Agency
DA	Department of Agriculture
DW	Deep well
ECBP	Engineering Capacity Building Program
FEMSEDA	Federal Medium and Small Enterprises Development Agency
FHI	Food for Hungry International
FTF	Forest Task Force
HDW	Hand-dug well
IFAD	International Fund for Agriculture and Development
INBAR	International Network for Bamboo and Rattan
IRC	International Rescue Committee
KD	Knock down
MASL	Meters above sea level
NGO	Non-Government Organization
ReMSEDA	Regional Micro and Small Enterprise Development Agency
SW	Shallow water

## I. INTRODUCTION

The Benishangul-Gumuz Region has a population of approximately 594,000 who live in 20 Woredas under three administration zones, and is one of the poorest and most food-insecure regions in Ethiopia. The incidence of poverty in the region is 54% (MOFED, 2004) and 93.2% of the population depend on shifting-cultivation agriculture for income. Additional livelihood options include livestock rearing, gathering wild foods, fishing, honey production, traditional gold mining, hunting, handicrafts, and charcoal-making. The annual income per household from both agriculture and off-farm activities ranges from Birr 169 (\$20) to Birr 1499 (\$173).

Poor agricultural practices, limited rainfall, minimal alternative livelihood opportunities and conflict have hampered development in the region. The Benishangul-Gumuz regional government has given high priority to food security, and prepared a Food Security Strategy and Program with the assistance of CIDA. The Program aims to ensure food security at the household level in seven priority Woredas encompassing 25,021 households (150,128 people), and one aim of the program is to increase household incomes via on and off-farm activities. The region has vast bamboo resources which could provide the raw materials for income-generating businesses. Bamboo has been shown to be an excellent source of off-farm income in many developing countries and could be equally effective here.

Benishangul-Gumuz has 440, 000 hectares of Shimal bamboo (*Oxytenanthera abyssinica*) which at present is mainly used for subsistence uses such as housing, fencing, kitchen utensils, and agricultural implements and shoots for food. Some people earn a small income by selling bamboo poles to people in Awassa for use in traditional houses, and by selling small pieces of poles as fuelwood. Adding value to bamboo poles on a commercial basis was limited to residents of the ZOA refugee camp who, after training by the Federal Medium and Small Enterprises Development Agency (FeMSEDA) in Addis Ababa, produced furniture and handicrafts for sale to visitors. The Land and Sea Development acquired a large lease of bamboo land in the region. The company started processing some bamboo but temporarily stopped for unknown reason.

Recognizing the bamboo potentials of the region, the International Network for Bamboo and Rattan (INBAR) then entered in a consortium with 6 Canadian non-government organizations (Save the Children Canada as lead organization, Oxfam Canada, CHF, Canadian Physicians for Aid & Relief, Food for the Hungry International, World Vision Ethiopia) for the implementation of the Benishangul-Gumuz Food Security and Economic Growth Programme. The five-year initiative will seek to enhance food security at the household level by strengthening partnerships amongst all stakeholders working in the region. INBAR is expected to bring its expertise in the sustainable management of the bamboo resources to expand the livelihood benefits derived from this vital endowment in Benishangul-Gumuz.

A study on the potentials of bamboo in Benishangul-Gumuz was then conducted to identify the bamboo related interventions to be included in the Project Implementation Plan for the Benishangul-Gumuz Food Security and Economic Growth Programme.

## **A. Objectives of the Study**

Specifically, the study aims to:

1. Validate bamboo resources in the 7 woredas;
2. Ascertain baseline;
3. Identify potential players/stakeholders and their capabilities and their preparedness and commitment to participate in the project;
4. Identify the woreda/s where bamboo project be implemented in consultation with officials, based on availability of bamboo, manpower, other materials, infrastructure, support services, policies, market;
5. Identify needs of enterprise; and
6. Develop/identify potential marketable product/s.

## **B. Delimitation of the Study**

The study is delimited to the seven (7) woredas of BG regional state covered by the project, namely: Belojiganfof, Debate, Guba, Kurmuk, Mandura, Sherkole and Sirba Abay.

## **C. Methodology**

Interviews were conducted with key persons in the community, with NGOs and government agencies.

An ocular survey of the bamboo natural stands was conducted. Bamboo resource inventory was done through random sampling. Samples of *Oxytenanthera abyssinica* were gathered and tested in the laboratory of the Forest Products Research and Development Institute of the Philippines for physical and mechanical properties.

A value chain workshop was conducted with CHF and ECBP/GTZ with the participation of key regional and woreda officials and NGOs like the Chamber of Commerce and World Vision.

Secondary data were gathered from existing documents and literatures about Benishangul Gumuz Regional State and Ethiopia in general, contents of these were analyzed and became part of the report.

Technology and product development utilizing *Oxytenanthera abyssinica* were done. Due to limited abyssinica bamboo materials that were taken to the Philippines for laboratory testing and prototyping, some of the samples were made out of rattan to simulate Ethiopian bamboo.

From the development of these samples, process sheets were made followed by a cost sheet using Industrialized Handicrafts (INHAND) productivity formula for analysis and allotment of budgets for the project, and finally cash projections of how the workers become co-owners of the project

A workbook comprising of: 1) 2 process sheets for the pre-processing operations; 2) 3 process sheets for the processing operations; 3) 3 cost sheets; 4) 1 cash projection; 5) timeline and 6) return on investment (ROI) was prepared.

## II. FINDINGS

### A. BAMBOO RESOURCES

#### 1. *Bamboo Resource Inventory*

The *Oxytenanthera abyssinica*, the lowland bamboo, is found in most of the Benishangul Gumuz regional state. Ethiopia as a whole has about 1 million hectares of bamboo from which 850,000 hectares are lowland and 350,000 hectares are highland bamboo (LUSO, 1997). BG regional state has about 300,823 hectares of bamboo according to LUSO (1997).

The BGRS is still covered by natural vegetation classified into 8 types, namely: dense forest, riverine forest, broad-leaved deciduous wood lands, acacia woodland, bush land, shrub lands, boswellia wood land and bamboo thickets. There are more than 55 indigenous tree species in the region.

Bamboo in the region grows between 1000 and 1800 MASL and on poor soil in dry vegetation formation. It tolerates poor rocky soil, in erratic annual rainfall even down to about 600 mm and in high temperature of above 35°C.

Land and Sea Development Ltd. was granted more than 300,000 has. of bamboo land (this needs confirmation).

The Random Bamboo Resource Inventory(See Annex A) that was conducted in Afafir, Bambasi Woreda, on Feb. 21, 2010 gave the following results/findings:

- The bamboo specie in the area is *Oxytenanthera Abyssinica* (lowland bamboo).
- From an area of 100 square meters, there are 217 clumps; the average distance per clump is 8 x 7 meters.
- The average number of culms per clump is 72.3 (65 culms in clump 1, 59 culms in clump 2 and 93 culms in clump 3).
- The average length of the culms is 7.5 m.
- The average diameter of the bottom part of the culms is 6 centimeters and the average thickness is 2.5 centimeters.
- On the other hand, the average diameter of the top part of the culms is 2.2 centimeters and the average thickness is .8 centimeter.
- The size of the culms at 250 centimeters length is 2.9 centimeter diameter x 1 centimeter thickness.
- The average number of internodes is 23 with an average length of 32 centimeters per internode.
- The average number of shoots per year is 22.

- House construction, fence, and fuel are the uses of bamboo in the area.
- The bamboo stands are located in public lands (communal lands).
- Bamboo harvesting is done during dry months, from November to April. Generally, permission has to be granted from the Kebele head before the cutting of bamboos.
- The gate-farm selling price of bamboo is Birr 0.5 per pole.
- **Other observations / information**
  - There has been a gregarious flowering of bamboo although in some areas it was noted that there is natural regeneration. However, forest fire seemed unabated that some bamboo areas are affected.
  - A 96-kilometer road from Assosa to Sudan border is under construction by a Korean Company funded by Saudi Arabia. The road traverses a bamboo forest.
  - Bamboo flowering took place 27 years ago.
  - It takes 7-10 years for bamboo to mature after the flowering.
  - Bamboo seeds can be gathered as it is an opportunity for livelihood and for expansion of bamboo plantation in the country.
  - Bamboo is now regenerating and looks promising if forest is not put on fire.

*Conducting the bamboo resource inventory*

## 2. Properties of *Oxytenanthera Abyssinica* Bamboo (laboratory testing)

Samples of *O. abyssinica* were tested on April 5-15, 2010 by the Physical and Mechanical Properties Section, Forest Products Research and Development Institute (FPRDI) of the Philippines to ascertain their physical and mechanical properties. Three samples were submitted for testing with ages 1 year, 2 years and 3 years. The FPRDI devised Minimum Strength and Related Property Limits to Grouping Philippine Timber Species was used for comparison (please refer to Table 1)

TABLE 1: MINIMUM STRENGTH **and** RELATED PROPERTY LIMITS FOR GROUPING PHILIPPINE TIMBER SPECIES

PROPERTY	CLASS OF TIMBER					
	C1		C2	C3	C4	C5
	Moisture Condition	High	Moderately High	Medium	Moderately Low	Low
<b>Static Bending</b>						
Modulus of Rupture (MPa)	Green	78.43	61.76	49.02	39.22	30.88
	12%	126	98	78.4	61.8	49.0
Modulus of elasticity (GPa)	Green	12.74	9.80	7.55	5.88	4.57
	12%	15.7	11.8	9.31	7.16	5.49
<b>Compression Parallel to Grain</b>						
Maximum crushing strength (MPa)	Green	39.22	29.90	23.03	18.14	13.72
	12%	63.7	49.0	37.7	29.8	22.6
<b>Compression Perpendicular to Grain</b>						
Stress at proportional limit (MPa)	Green	8.82	5.49	3.48	2.21	1.37
	12%	13.2	8.82	5.69	3.68	2.40
<b>Shear Parallel to Grain (MPa)</b>	Green	9.80	7.84	6.18	4.90	3.92
	12%	13.7	10.8	8.33	6.37	4.90
<b>Relative Density</b>	Green	0.67	0.54	0.45	0.37	0.30
	12%	0.71	0.58	0.48	0.39	0.32

### Classification of Volumetric Shrinkage (%)

High – 16.1 and above,      Moderately High – 13.3-16.0,      Medium – 10.6-13.2

Moderately Low – 7.9-10.5, Low – 7.8 and below

The table below presents the result of the laboratory test regarding the physical and mechanical properties of the lowland bamboo of Benishangul Gumuz Region:

TABLE 2: DATA TEST RESULTS of SAMPLES of OXYTENANTHERA ABYSSINICA BAMBOO

AGE/HEIGHT LEVEL	TYPE OF TEST (As Received)											
	PHYSICAL PROPERTIES					MECHANICAL PROPERTIES						
	MC (%)	RD	SHRINKAGE (%)			STATIC BENDING			COMPRESSION//g		SHEAR//g	
			CWT (%)	CWW (%)	VOL. (%)	FSEL (MPa)	MOR (MPa)	MOE (GPa)	Max. C. S. (MPa)		(MPa)	
								Nodal	Inter N	Nodal	Inter N	
1-Year Old												
Butt	14.17	0.638	6.24	4.63	10.58	25.00	68.62	10.50	39.00	33.20	6.251	6.839
Middle	17.08	0.642	22.04	3.11	24.42	-	-	-	26.73	47.12	-	6.825
Top	22.50	0.514	2.48	1.58	4.02	-	-	-	36.29	39.78	-	3.582
<b>Average</b>	<b>17.92</b>	<b>0.598</b>	<b>10.25</b>	<b>3.11</b>	<b>13.01</b>	<b>25.00</b>	<b>68.62</b>	<b>10.50</b>	<b>34.01</b>	<b>40.03</b>	<b>6.251</b>	<b>5.749</b>
2-Years Old												
Butt	41.94	0.483	3.74	3.72	7.32	25.12	63.87	9.07	-	38.85	7.930	6.445
Middle	37.90	0.591	1.71	1.72	3.43	30.27	66.09	11.30	46.17	-	8.351	8.766
Top	94.17	0.356	-	-	-	-	-	-	40.18	40.53	-	7.749
<b>Average</b>	<b>58.00</b>	<b>0.477</b>	<b>2.72</b>	<b>2.74</b>	<b>5.38</b>	<b>27.69</b>	<b>64.98</b>	<b>10.18</b>	<b>43.17</b>	<b>39.69</b>	<b>8.141</b>	<b>7.654</b>
3-Years Old												
Butt	13.49	0.806	2.81	3.22	5.94	38.64	86.47	12.05	44.74	46.14	8.714	7.336
Middle	13.66	0.794	3.79	3.49	7.15	37.11	77.73	11.75	38.71	46.05	9.811	5.524
Top	14.85	0.809	2.32	1.33	3.63	37.14	80.09	12.52	41.29	52.32	8.742	11.337
<b>Average</b>	<b>14.00</b>	<b>0.803</b>	<b>2.98</b>	<b>2.68</b>	<b>5.57</b>	<b>37.63</b>	<b>81.43</b>	<b>12.10</b>	<b>41.58</b>	<b>48.17</b>	<b>9.089</b>	<b>8.066</b>

<sup>1/5</sup>Based on oven-dry weight and volume of samples at test

Based on Strength Classification of Philippine Timber Species devised by FPRDI, the 1-year old bamboo belongs to Class 3 (Medium Strength); 2-year old (Class 2 –Moderately High Strength) and 3-year old (Class 1-High Strength).

The strength of bamboo increases as age increases. According to literature, at age three the bamboo can be harvested and be used for its possible ends. The results showed that the one year old can be used for medium construction like furniture and the three year old for heavy construction because of its strength classification which is based on wood.

Statistical analysis showed that age is significant for relative density, fiber stress at proportional limit, modulus of rupture and shear at nodal portion. It means that age matters on the strength of bamboo. The height level (butt, middle & top) is not significant maybe due to limited representative samples (DOST, FPRDI, Philippines).

*O. abyssinica* bamboo is sympodial or clump type with 1 clump consisting of 100 culms. Major part of the culm is solid. It has a total biomass of 19,000 kg/ha in over dry weight with an annual increment of 10,000 kg/ha. About 4,000 culms per hectare are harvested each year. For 300,823 hectares of bamboo forest in Benishangul Gumuz, 1,203,292,000 culms are harvested every year (*Overview of Bamboo Status in Benishangul Gumuz by Tesfaye Hunde, INBAR/East Africa Regional Office, Bamboo Biomass Energy Project National Coordinator; Feb. 2010*).

*Oxytenanthera abyssinica* (lowland bamboo)      *Arundinaria alpina* (highland bamboo)

### **3. Resource Mapping**

Bamboo is declining because of gregarious flowering and management problem. Farmers set bamboo forest on fire for livestock grazing. Nevertheless, the government works on the improvement of bamboo management and establishment of nursery sites.

The major lowland bamboo areas in the Regional State are found in Assosa, Bambasi, Begi, Demi, Dibate, Guba, Kamashi, Pawe and Sherkole (Table 3)

TABLE 3: MAJOR LOWLAND BAMBOO AREAS IN THE BENISHANGUL GUMUZ REGION, LOCATION, TYPE AND AREA

<b>Bamboo Area</b>	<b>Location</b>	<b>Type</b>	<b>Area in hectare</b>
Assosa	20 - 50 km East	Natural	77,947
Bambesi	10 - 50 .km East	Natural	64,245
Begi	20 - 50 km to southwest	Natural	21,509
Demi	75 km northeast of Nedjo	Natural	27,612
Dibate	75 km southwest of Chagni	Natural	14,200
Guba	50 km to south	Natural	7,757
Kamashi	40 km east of Nedjo	Natural	33,723
Pawe	10 – 50 km east of Mabuk	Natural	53,830
Sherkole	Gemed, 34 km away from woreda	Natural	-

Other data gathered on the location of bamboo in the woredas and kebeles, the number of clumps per hectare and the distance from the center are hereby presented in the Table below.

TABLE 4: LOCATION **of** BAMBOO, TYPE **of** BAMBOO, NUMBER **of** CLUMPS, AREA **and** DISTANCE **from the** CENTER

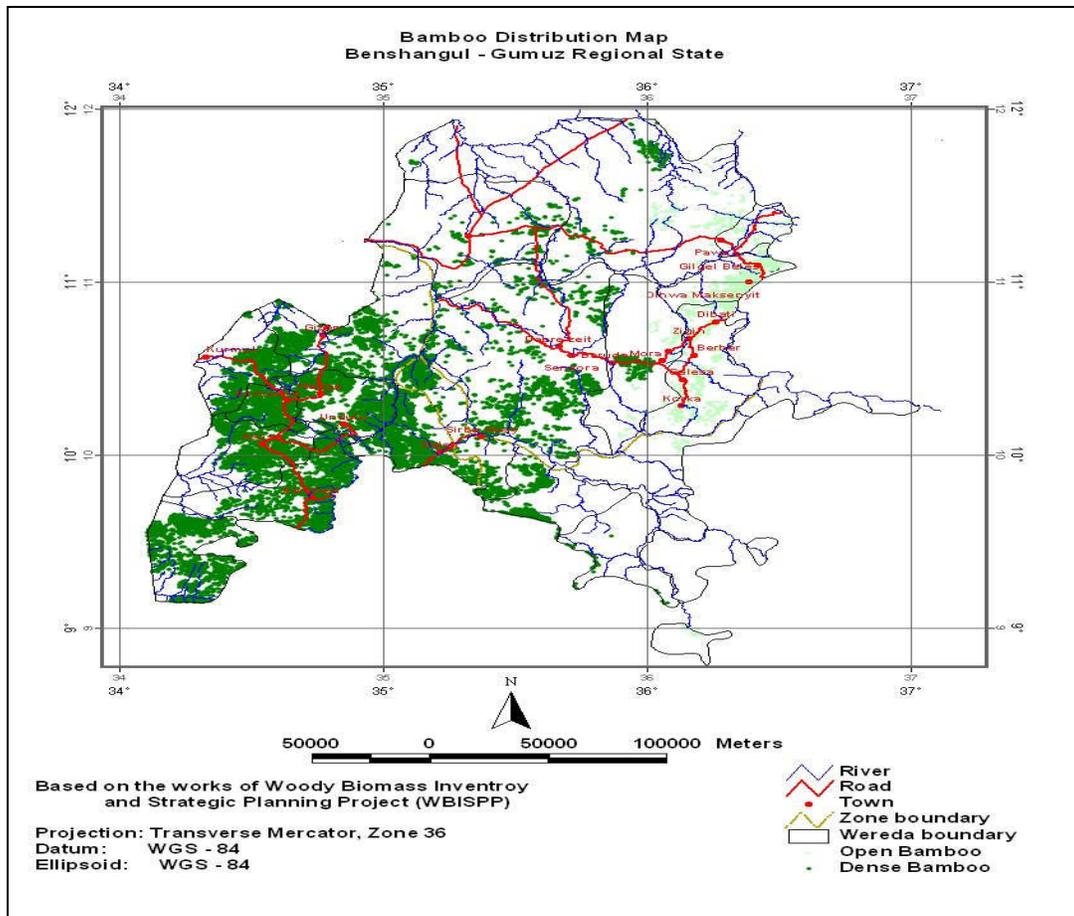
<b>Name of Woreda</b>	<b>Kebeles</b>	<b>Type of bamboo</b>	<b>No. of bamboo clumps</b>	<b>Quantity / hectare</b>	<b>Distance from the center</b>
Mandura	Kuter – 2	Oxytenanthera abyssenica	4950	300-5000	15 km.
	Dubanza bagana		4990	1000-1500	15 km.
	Duha makegnet		4800	5000	10 km.
	Wadit		4000	5000	15 km.
Belo Jeganfoy	Soge		6000-10000	5000	15 km.
	Say dalecha		4000	4000	15 km.
	Sene		3000	6000	15 km.
Guba	Ised		550	6000	30 km.
	Babizenda		700	8000	40 km.
	Bashate		600	1200	5 km.
Debate	Muzen		1000	1500	21 km.
	Albasa		1500-2000	1400	42 km.
	Angtok		2000-3000	1500	45 km.
Kurmuk	Horahazab		1000	3000	15 km.
	Durhode		1500	2500	20 km.
	Salima		2500	1500	10 km.
Sirbabay	15			25 km.	
	Nafirbeni			30 m.	

(NOTE : As of this writing, the figures may vary due to the gregarious flowering of bamboo)

### Gregarious flowering of bamboo

The figure below shows the bamboo distribution in the region.

FIGURE 1: BAMBOO DISTRIBUTION IN THE BENISHANGUL GUMUZ REGION



## 4. Bamboo in the WOREDAS

### a. Sherkole

*Oxytenanthera abyssinnica* is the bamboo species found in Sherkole Woreda. All bamboo in the area flowered but it used to grow in abundance particularly in the 23 kebeles, namely: Belmio, Sherkole, Tenza Groje, Halmo, Gremed Mits mijinale, Amormo, Asheshe, Tumet

Oube, Obe eshe, Febejo, Agats Asheshe, Mekazem, Jadesse, Fabeje, Obe Jarbegu, Kolohu, Abele Guentsa, Abenele, Elethazel Jasuhale, Giza Ataria, Humbe Sheede and Ashesheko. Regeneration now occurs in 5 kebeles: Ashesheko, Obe Farbezer, Gize Azaria, Gemed Sherkole and Halmo Bebe.

The ocular survey that was conducted in Feb. 2010 reveals that bamboo is found in Gemed about 34 kilometers away from the Woreda. People carry them by foot, 20 poles per bundle per person. It takes them 30 minutes to cut the 20 poles.

The distance from Assosa to Sherkole is 96 kilometers which takes 2 hour-ride by car and 3 hours by bus with a fare of Birr 28 for one way trip.

Bamboo is used for house construction, fence and fuel. Normally, ax is used for cutting bamboo. Harvesting is usually done during dry months, from November to April, with 5 persons harvesting every other day. These are sold at Sherkole Woreda at Birr 2 per pole and in Sudan at Birr 5 per pole.

#### **Carrying bamboo poles by foot**

##### **b. Sirba Abay**

*Oxytenanthera Abyssinica* is the bamboo specie found in Sirba Abay. Bamboo is found in Fappo and Gosu. Flowering of bamboo in Fappo happened in 2009 and it shifts from one mountain to the other.

Usually people go on foot to get bamboo. Mandi (where commerce takes place with market 2 days a week) to Sirba Abay is 80 kilometers away with a transportation cost of Birr 20, while Mandi to Assosa is 152 kilometers with Birr 25 for transport cost. Room rental in Sirba Abay is Birr 20; a meal costs Birr 20 (with meat) and Birr 8-10 (without meat).

Bamboo is used for house construction, fence, fuel and food (bamboo shoots). One culm of bamboo costs Birr 1 for a 3 cm x 4-6 meter, solid (1 cm thickness top). Harvesting is done during dry season, from November to April.

#### **Traditional uses of bamboo: for house construction, fence and fuel**

##### **c. Kurmuk**

Kurmuk has both the highland (*Arundinaria alpina*) and the lowland (*Oxytenanthera abyssinica*) bamboos. It is found everywhere in the Woreda particularly in Gembi (Bashir kebele), Asubela, Salima, Akendeyu and Delashe, about 10 to 40 kilometers away from the villages. Lorries are used for transporting the poles.

Bamboos are used to build cottages, houses, fences, firewall, hats, furniture and firewood. Some poles are smuggled to Sudan. The cost per culm is Birr 1.50 to 2. Traditional knowledge of harvesting bamboo is applied; only poles that are of age and big are cut.

Among the uses of bamboo: building cottages and house furniture

#### **d. Mandura**

Mandura also has the lowland bamboo which flowered since 2009. Only a number of culms are left standing. It used to grow in almost everywhere in the woreda. It covers 3 to 5 hectares in each kebele located at 1 to 2 walking hours from the community. Lorries are used to transport the poles.

Bamboo is used for making traditional furniture, basketry, house construction, firewood and fence. The cost per culm is Birr 1 to 2. It is harvested according to age and during dry season (Nov. to April).

In Mandura, the issues on environment / natural resource protection are deforestation due to fuel consumption, charcoal and timber as income-generating activities, farm expansion (hillside farming), and mountain burning (good grass will grow after burning for pasture for animals). There is also drying of some perennial water sources like springs and rivers.

Bamboo is diminishing; no conservation work so far. People think that bamboo will regenerate when burned.

Wildfire is caused by humans for farming and animal hunting. Animals run towards the river when there is fire and they become easy prey to hunters.

There is no communal grazing land for animals. Free grazing is the usual practice. There is lack of forage grass in the forest for animals.

Some local efforts to address the issues / concerns on the environment are:

- Area closure by the community.
- Biodiversity program (afforest wanza and bamboo) in collaboration with Moreda Office in 4 sites covering 8 hectares in Adeda KA.
- Gumuz Tree for Health and Wealth Program – raising tree seedlings for Gelgel Belese Zuria KA at Aguda got.
- Local Investment Guarantee (NGO) provides budget for Assosa Zone and Mandura for natural resources protection. The Woreda environment office establishes nursery site, seedling raising, store, and fencing using the budget.
- Forest Task Force (FTF) is present in 13 kebeles. FTF is responsible in teaching and punishing those that would cause forest destruction (bringing them to elders who would advise them).

The indigenous tree species found in the forest include wanza, mecha, girare, gambelo, gravillia, jacaranda, spatodera, sholla, dogma and bamboo.



**Burning of bamboo lands**

**e. Dibate**

Only the lowland bamboo is found in Debate which occupies about 15 hectares per kebele at a distance of 10 to 20 kilometers away from the houses. According to the people who were interviewed, there is a place named Chelia that has good potential for bamboo. Lorries are used to transport the poles but in the kebeles where there are no roads (like Anstolk), the people carry them on foot.

Bamboos are used for building houses, fence and for food (shoots). The cost per culm is Birr 1.50 to 2.



*Bamboo regeneration in some areas*

**f. Guba**

Lowland bamboo is found in Guba Woreda. It is found around the kebeles about 5 to 40 kilometers away from the center occupying 5,000 to 8,000 hectares per kebele. In Ised kebele, the bamboo area used to be 10,000 to 12,000 hectares, now only 6,000 hectares.

Lorry is the popular mode of transporting the poles. Among the usage of bamboo are: house construction, building fences, for firewood and for food especially when drought is hard. Each culm costs Birr 0.50 to 1. The poles are harvested according to age and the type of project where bamboo is needed.

Harvesting bamboo

### **g. Belo Jiganfoy**

Both the highland and the lowland bamboo could be found in Belo Jiganfoy occupying 4,000 to 15,000 hectares per kebele about 15 to 50 kilometers away from the villages.

The poles are harvested during dry weather. Clean harvest is the usual practice.

Lorry is used to transport the poles.

Bamboo is used for building houses and fences. Each pole costs Birr 0.50 to 2.

Mode of transporting bamboo poles and other products

## **B. Power, Water, Communication and Their Cost**

### **1. Power**

Most of the woredas in Benishangul Gumuz have no access to hydroelectric power. But in the kebele of some woredas, hydroelectric power is under construction. According to officials, there is a possibility of hydroelectric power access in the near future, within 15 to 18 months. Table 3 shows the electric power rates in Assosa.

TABLE 5: ELECTRIC POWER RATES IN ASSOSA

<b>Kilowatt</b>	<b>Domestic Rate</b>	<b>Commercial Rate</b>
1 – 50 KW	Birr 0.2730 / KW	Birr 0.6088 / KW
	Tariff = Birr 0.10 / KW	Tariff = Birr 0.20 / KW
Over 50 KW	Birr 0.3564 / KW	Birr 0.60943 / KW
	Tariff = Birr 0.10 / KW	Tariff = Birr 0.20 / KW

### **a. Sherkole**

The National Power Grid is the main source of power.

### **b. Sirba Abay**

Electricity comes from the hydropower plant from Mandi. A household that uses 4-5 hours of electricity, 5 bulbs of 5 KW some with refrigerator, radio and TV, pays Birr 7-8/month. Connection costs Birr 1,000.

### **c. Kurmuk**

Kurmuk is enjoying electricity. It follows the ELPA rules of power costing: Birr 0.27 for 2-50 KW usage, Birr 0.35 for 50-75 KW usage, and Birr 0.49 for above 75 KW usages.

#### **d. Mandura**

Mandura is not covered with electric power.

#### **e. Dibate**

There is 24-hour electric power at the Woreda level. There is no electricity in the kebeles.

#### **f. Guba**

There is no electricity in Guba.

#### **g. Belo Jiganfoy**

Soge kebele is enjoying 24-hour hydroelectric power. For the rest of the kebeles, there is no electricity.

## **2. Water**

There are two big rivers in the region, namely Abay (Blue Nile) and Beles, but these are far from the kebeles, about 18 kilometers away.

There are 3 schemes for water source being used in the 7 woredas: hand-dug wells (HDW), shallow water (SW), DSP and deep well (DW). All of the woredas employ the HDW scheme with Dibate having the most number (71) followed by Belo Jeganfoy (36), Mandura (19) and Sirba Abay (10). Guba, Kurmuk and Sherkole have the least number. All of the woredas are using the SW scheme except Sirba Abay. Only Dibate (35), Belo Jeganjoy (12) and Mandura (4) are using the DSP scheme. Only Guba and Mandura use the DW scheme (2 each). All in all there are 159 hand-dug wells, 63 shallow wells, 51 DSPs and 4 deep wells.

In every kebele there are 2 to 5 water pumps. Cost of water is very minimal, about Birr 0.18 /cubic meter.

TABLE 6: WATER SCHEMES USED IN THE SEVEN WOREDAS **and** QUANTITY **per** WOREDA

<b>Woreda</b>	<b>Water Scheme Used</b>			
	<b>HDW</b>	<b>SW</b>	<b>DSP</b>	<b>DW</b>
Guba	8	8	-	2
Mandura	19	4	4	2
Dibate	71	12	35	-
Kurmuk	8	9	-	-
Sherkole	7	5	-	-
Sirba Abay	10	-	-	-
Belo Jeganfoy	36	25	12	-
<b>TOTAL</b>	<b>159</b>	<b>63</b>	<b>51</b>	<b>4</b>

Source: Data Info 2001 E.C. (2008-2009)

In Assosa, water costs Birr 4.25/cu.m.

**a. Sherkole**

Water source is shallow water pump constructed at the cost of Birr 105,000 with the use of drilling machine, and manual pump. Most kebeles have water pump, the deepest is 40 meters. However, during winter, some kebeles go to the river and dig into the sand for their water.

**b. Sirba Abay**

Source of water is water pump, 15 meter-deep, Birr 70,000 for installation cost. The other water source is the river.

**c. Kurmuk**

Water pumps are the main sources of water in Kurmuk Woreda. Another water source in Horashab kebele is the sand dam while in Durhoda kebele, it is the small river about 15 kilometers away.

**d. Mandura**

Mandura has several sources of water: water pumps, hand pumps, developed spring, Levit River and Ikanza River (all season river).

**e. Debate**

The rivers (both big and small) are the sources of water in Debate. These are Duma, Didia, Bekata and Sahe Rivers.

**f. Guba**

Water pumps, hand pumps, tap water, Big River (Beles) and small river (during rainy and winter time only) are the sources of water in Guba Woreda.

**g. Belo Jiganfoy**

The rivers (Soga River and Fuwater River) are the main sources of drinking water, about 2 kilometers away from the center of the woreda. No treatment is done with the water. There are also water pumps.

**3. Communication**

In Sherkole, telephone services are still being asked from the region. Mobile phones are used that are connected to Assosa or Sudan.

There is a mobile service for the kebeles and 1 government radio communication line and telegram service in Sirba Abay.

Kurmuk has wireless telephones while Mandura has mobile phones.

Debate has no phone; Guba has mobile phones, Woreda Post and under cover wire phone; while Belo Jiganfoy has wireless telephones.

With the data gathered on the communication system in the 7 target woredas of the project, only 6 kebeles have access to mobile phones, 2 kebeles have fixed phone, 1 woreda

(Mandura) and 1 kebel (Ised) have post office while only 3 kebeles (Saydalecha, Horhazab and Salima) have wireless telephones (Table 5).

TABLE 7: WOREDAS and KEBELES with MOBILE PHONE, FIXED PHONE, POST OFFICE and WIRELESS TELEPHONE

Name of Woreda	Kebeles	With mobile phone	With fixed phone	With post office	With wireless telephone
Mandura	Kuter 2	√	x	At woreda	X
	Duhana bagana	√	X		x
	Duha maxegnet	√	x	x	X
Belo Jiganfoy	Wudit	x	x	x	X
	Soge	x	√	x	X
	Saydalecha	x	x	x	√
Guba	Sene	x	x	x	X
	Babizenda	x	x	x	X
	Bashata	√	x	x	X
Kurmuk	Ised	√	√	√	X
	Horhazab	x	x	x	√
	Durhode	x	x	x	X
Dibate	Salima	x	x	x	√
	Muzen	x	x	x	X
	Albasa	√	x	x	X
Sirbabay	Angtok	x	x	x	X
	Kabale 15	x	x	x	X
	Nafirbenay	x	x	x	x
Sherkole					

### C. POPULATION & MAIN SOURCES OF INCOME

Benishangul Gumuz Region has 670,847 total population (CSA, 2007) representing 0.9% of Ethiopia's total population of 73,918,505, and occupying a total area of 50,381 hectares. Of the region's total population, 50.7% (340,368) are male and 49.3% (330,469) are female; 13.5% (97,965) live in the urban while 86.5% (572,882) are in the rural.

With the three zones (Metekel, Assosa, Kemashi) and two special woredas (Mao Komo and Pawe) that compose the Region, Metekel Zone has the biggest population (273,349; 40.7%) while Pawe Special Woreda has the lowest (37,711; 5.6%).

BG Region is composed of 90 ethnic groups (CSA 2007), 85.4% (572,882) are located in the rural areas while 14.6% (97,965) are in the urban. Berta, Amhara and Gumuz peoples hold the majority of the population (68.3%). Berta ethnic groups are living in Assosa Zone while Gumuz inhabits Metekel and Kamashi Zones. Oromo and Shinasha are the fourth and the fifth largest ethnic groups in the region, about 21% of the population. Shinasha, Mao and Komo, about 10.5% of the region's total population, are found in Metekel Zone and Tongo Special Woreda respectively. However, there are also different non-indigenous ethnic groups living in the region.

### *The indigenous peoples of BG Region*

With regard to languages, Arutani and Gumuz languages are the most widely spoken languages and considered as mother tongues. Arutani is a language that is spoken by Berta people in most parts of Assosa Zone. Oromigna and Amharic languages are the second widely spoken languages. Amharic language serves as the working language of the region.

Throughout Ethiopia, more than 90 ethnic groups were listed in the 2007 census. Out of these, 10 ethnic groups have a population of one million and above. In 1994, Central Statistical Agency (CSA) only listed seven ethnic groups that had population of one million and above.

Muslim/Islam, Orthodox Christians, Protestants, Traditional believers and Catholics are the different religions in the region. Eighty five percent (85%) of these are in the rural areas while only 15% are in the urban. Both Muslims (45%) and Orthodox Christians (33%) constitute the majority of religion while Catholics are the least (0.6%).

The 7 target woredas for the project have 112 kebeles occupying total area of 14,872 hectares (29.5% of the region's total area), with population of 179,313 which is 27% of the total population of Benishangul Gumuz Region (see table below). Dibate has the largest population (54,180) while Kurmuk has the smallest (13,579).

TABLE 8: POPULATION **and** NUMBER **of** KEBELES **per** WOREDA

<b>Woreda</b>	<b>Population</b>	<b>Male</b>	<b>Female</b>	<b>No. of kebeles</b>
Dibate	54,180	27,112	27,068	15
Mandura	36,568	19,063	17,505	17
Belo Jiganfoy	24,993	13,165	11,828	12
Sherkole	19,992	9,931	10,061	19
Sirba Abay	15,100	7,703	7,397	16
Guba	14,901	7,485	7,416	16
Kurmuk	13,579	6,958	6,621	17
<b>TOTAL</b>	<b>179,313</b>	<b>91,417</b>	<b>87,896</b>	<b>112</b>

Source: CSA, 2007

#### **1. Sherkole**

Sherkole has 19 kebeles with a population of 19,992 occupying 3,216 hectare-area.

Agriculture and gold pocket mining are the main sources of income. Their farm harvest is 5-10 sacks (called quintal) of sorghum, which they sell at Birr 300-400 giving them an income of Birr 4,000-5,000 per harvest season.

#### **Market day**

## **2. Sirba Abay**

Sirba Abay has 16 kebeles with 1,314 hectares of area and a population of 15,100.

Agriculture and gold mining are the major sources of income.

Agriculture is a work done by the family. The main products are maize/sorghum (65%) and noug. Harvest is 20 sacks of maize/sorghum per year (equivalent to 100 kgs.). These give them an income of Birr 3,200.

Gold mining is done in group, but still family based. The people earn an average of Birr 7,200 per year from mining. Gold traders go to the Woreda to pick up the gold if these are not sold at Mandi during market day (Saturday).

Eighty percent (80%) of the community are involved in gold mining but agriculture is still a priority.

Gold pocket mining

## **3. Kurmuk**

Kurmuk is composed of 17 kebeles with 13,579 population, the least among the 7 woredas.

Agriculture (70%) and gold mining (30%) are the main sources of income. The people earn an average income of Birr 8,000 to 10,000 from agriculture and Birr 2,000 to 3,000 from gold mining.

## **4. Mandura**

Mandura Woreda has a total population of 36,568; 52% (19,063) are male while 48% (17,505) are female (CSA 2007). It is composed of 17 kebeles occupying an area of 1,036 hectares.

Agriculture and pasturing of animals are the main sources of income. The average income of families ranges from Birr 5,000 to 6,000.

Products that are brought to the market

## **5. Dibate**

Dibate occupies an area of 2,277 hectares, with 15 kebeles and a population of 2,277. Agriculture and animal husbandry are the main sources of income yielding them an average income of Birr 5,500 to 6,000.

## **6. Guba**

Guba has an area of 3,942 hectares (largest among the 7 woredas), with 16 kebeles and 14,901 population. Agriculture and animal husbandry are the dominant sources of income. Average income is Birr 8,400.

## 7. Belo Jiganfoy

Belo Jiganfoy has 24,993 total populations. It consists of 12 kebeles and occupies an area of 1,653 hectares (CSA, 2007). The main income source is agriculture providing them an average income of Birr 7,000 to 10,000.

### D. Training Facilities in the Woreda/Region including Courses and Terms

As per secondary data gathered, there are training centers in every woreda located in the capital (center), however the other kebeles are 20 to 40 kilometers away from the center.

For Agriculture Development Centers, there are 77 offices of the Department of Agriculture with almost 50% of these concentrated in Mandura (20 offices) and Dibate (15 offices). There are 29 Farmers Training Centers with Belo Jiganfoy getting the most number (9).

TABLE 9: NUMBER of AGRICULTURE DEVELOPMENT CENTERS per WOREDA

Woreda	Agricultural Development Center	
	No. of DA Office	No. of FTC
1. Guba	10	1
2. Mandura	20	6
3. Dibate	15	5
4. Kurmuk	7	2
5. Sherkole	8	2
6. Sirba Abay	7	4
7. Belo Jeganfoy	10	9
<b>TOTAL</b>	<b>77</b>	<b>29</b>

Training is provided by the Rural Agricultural Development Agency under BoARD which is located in Assosa. It has machines for metal fabrication.

The baseline survey conducted in the woredas (February - May 2010) reveals that there are no training centers in all of the 7 target woredas except Mandura that has one but this is closed.

Also, there are no machine shops except Sirba Abay that has radio and motorbike repair shops, and 2 skilled carpenters.

### E. Labor cost (minimum wage)

Labor cost in the 7 woredas ranges from Birr 10 to 50 per day with Bole Jiganfoy as the lowest (Birr 10-20) and Sherkole as the highest (Birr 40-50).

TABLE 10: LABOUR COST per WOREDA

<b>Woreda</b>	<b>Labor cost (per day)</b>
Sherkole	Birr 40-50
Debate	Birr 25-30
Guba	Birr 25
Mandura	Birr 20
Sirba Abay	Birr 20
Kurmuk	Birr 18-20
Bole Jiganfoy	Birr 10-20

## **F. Labor laws and practices**

Most of the time agriculture activity is done in group but still family-based. All the members of the family contribute in the farming process. During off-farm season, the women stay at home while the men go out to enjoy seeing friends which cause additional cost to the family.

School dropouts support their family during farming season and after this they go to the town for entertainment. During dry season, almost all families stay idle.

Labor relations are usually based on an agreement.

## **G. GOVERNMENT (Regional and Woreda) PLANS**

### ***1. Investment plans and policies***

According to the ReMSEDA Manager of Amhara Region, Tesfaye Getachew Temach, bamboo would be included in the Tana-Beles Growth Corridor (North Gondar, South Gondar, Esat and West Gojam, Ami), in the Tana Beles Integrated Water Resources Project. Watershed development is a sub-component and bamboo is being considered as one of the resources for livelihood development. Guba and part of Mandura are included in the Tana-Beles Growth Corridor.

Mandura has schools construction, water system development and health center construction. Investments in Kurmuk, Bole Jiganfoy and Guba are in agriculture sector.

In terms of investments, regional policies are followed.

### ***2. Infrastructure development plans***

Mandura is next to Assosa in terms of infrastructure (electricity, water, communication), training centers and its accessibility to PAWE Agricultural Research Institute.

Hydro-electric power and mobile phone system are under construction in Kurmuk.

In Belo Jiganfoy, hydro-electric power, mobile phone network and all weather road are under construction.

Road is under construction in Guba; electricity will also be installed in the area in the near future.

In Sherkole, roads and telephone are still being asked from the region.

There is an ongoing road construction in Sirba Abaya. Mobile phone service and electricity for the kebeles are also among the infrastructures being put up.

Dibate has mobile phone service and gravel road construction.

### ***3. Housing – requirements and procurement systems, location***

There is no housing plan in all of the 7 target woredas.

### ***4. School buildings and furniture – requirements and procurement systems***

Sherkole has 15 primary schools and 2 secondary schools. There are 30 to 40 pupils per class.

Sirba Abay has 12 primary schools and 1 secondary school with 70 children per classroom. Furniture comes from the region. In remotest kebele, bamboo bench is used, free labor and free materials. Some youth go to college.

In the 3 kebeles of Kurmuk (Horashab, Durhodie and Salima), there are 16 elementary schools and 4 high schools. School furniture is supplied by the Education Bureau. Also NGOs provide furniture bought from Assosa based on school performance.

School furniture in Dibate is supplied by the region. In Mandura, it is supplied by the Bureau of Education and the Zone.

In Guba, school furniture is supplied also by the Region; however, there is shortage of furniture. The wood-metal combined furniture costs Birr 600.

Education was in a very low condition ten years ago. In the past ten years, the number of elementary schools rose from 280 to 312 and the number of students went up from 99,314 to 131,672. This shows that education coverage is increasing.

According to Ato Kebede of Education, the demand for elementary schools building and consequently school desks is beyond their capacity of provision. All school furniture are supplied by the Education Bureau with the help of NGOs like International Rescue Committee (IRC), Canadian Physicians Aid and Relief (CPAR), World Vision and Mishishuga, a local NGO.

### ***5. Landownership – systems and requirements***

The government at the federal level owns the land; hence, this would also apply to the BG regional state. Getting a land for investment or business is possible and easy from the region. Also, there is a five-year tax relief period.

In Sherkole, the people can use the land but they cannot own nor sell it.

In Sirba Abay, everyone can have land with permit from the Woreda administration but they are not allowed to sell. They pay Birr 25 to 85 for tax based on the area of the land.

In Bole Jiganfoy, government policy on land is under study.

In Kurmuk, 2.5 hectares is given to everybody for agriculture use. For outsiders, land is acquired through the Regional Bureau and Investment Office.

### **6. Forestry rules and regulations**

Licenses are issued by BoARD for use of wood, Bureau of Trade and Industry for business permits.

There is no nursery in Sherkole but this can be discussed with Woreda administration. Labor cost would be Birr 35-40 per day. Plastic bag (16 cm x 15 cm) costs Birr 50/kg at 800 pcs./kg. An initiative is being undertaken to educate community not to change into other land use because they believe that bamboo will regenerate.

In Sirba Abay, a permission has to be acquired from Bureau of Agriculture and a royalty pay of Birr 0.10 to 0.20 per culm (bamboo pole) is given for Woreda revenue. Bureau of Agriculture conducts education on protection of bamboo.

There are forestry rules and regulations on bamboo but these are generally not applied or followed.

## **H. ENTERPRISES**

There are two companies found in Sherkole: National Gum Processing and Marketing Enterprises and Weyegita Trading PLC. The National Gum Processing and Marketing Enterprises transport 7 to 8 tons of gum (resin) per year to Addis Ababa and pays a royalty of Birr 12/sack/100 kg.

There are only small eateries seen in Sherkole.

In Sirba Abay, no company is found in the area, however there is gold trading, tailoring and dress shops, video shops, radio repair shop, motorbike repair shop and 2 skilled carpenters.

No enterprise found in the rest of the woredas.

## **I. MICRO-FINANCING (institutions and their services)**

In Sherkole, there is a "Government Microfinance For All" program that provides loan with 12% interest for Birr 2,500 and below, 1 year to pay and guaranteed by a group of 5.

In Sirba Abay, people can access loan from the Government Micro-financing Program with 12% interest per annum for Birr 2,200 loan for 1 person for agricultural inputs, payable in 1

year, with fixed asset as collateral. If the loanee is a government employee, the office guarantees for the loan, usually a housing loan.

Dibate has micro-finance facility only at the woreda level.

Mandura has a micro-finance service only at the woreda level with 4% interest rate, guarantee required.

Belo Jiganfoy also has micro-finance facility with 12% interest.

Guba also has micro-finance program for the whole woreda with 12.5% interest; members guarantee one another.

## **J. NGOs and their services**

The International Rescue Committee (IRC) and ADP are present in Kurmuk. IRC is involved in health and agriculture, while ADP is on water.

The Canadian Physicians Aid and Relief (CPAR) works on education, agriculture and water only at woreda level in Dibate.

The Camboni Sisters, OXFAM and Mishishigawa Luka (local NGO) operate in Mandura.

The Food for Hungry International – Japan (FHI) is famous in Bole Jiganfoy providing school furniture, uniforms, books and other school supplies. COOPI – Italy (like a cooperative) also operates in Bole Jiganfoy.

CVM works against HIV in Guba; also provides training and school uniforms. The local NGO, Mishushuga, also is present in Guba.

## **K. OTHERS**

### ***1. Machines and tools available, cost***

There are 9 metal shops in Assosa. For labor, a metal shop worker earns Birr 60 a day while the owner/supervisor received Birr 200 a day. For power cost, the metal shop pays Birr 100 per month. License/permit is acquired from Bureau of Trade and Industry, renewal fee is Birr 200 per year. Annual income tax is Birr 700.

### ***2. Importation requirements, distance to nearest port***

Dijbute is the only available seaport for Ethiopia. NGOs are exempted from import duties.

## **L. VALUE CHAIN PLANNING**

In the Value Chain Planning in February 23-24, 2010 co-facilitated by INBAR, CHF and ECBP/GTZ (Annex C), the following concerns/issues/problems were initially presented on the first day:

- What to do to make food available?
- Forest fire
- Flowering of bamboo
- 400,000 hectares of bamboo land awarded to investors, only available is bamboo in Metekel Zone
- Lack of environmental policy
- Need for mitigation policy
- Limited information on bamboo potentials
- Lack of bamboo technology
- Need to expand bamboo plantation
- Need for training on bamboo management

For the Benishangul Gumuz Bamboo Value Chain, the product chosen is FURNITURE, low technology but high quality products (school furniture).



*Some high quality bamboo products*

**The VISION for 5 years is:** 50% of public institutions, school/university furniture is produced from locally produced bamboo furniture and also fulfilling local furniture demands, and thereby increasing employment and livelihood from this sector.

The PLAN includes the following:

<b>Constraints</b>	<b>Strategies / Activities</b>	<b>Agency Responsible</b>
1. Lack of resource mapping	Mapping of resources <ul style="list-style-type: none"> <li>- Quantity</li> <li>- Quality</li> <li>- accessibility</li> </ul>	EPLAUA
2. Supply of bamboo <ul style="list-style-type: none"> <li>- Flowering</li> <li>- Forest fire</li> <li>- Market linkage</li> <li>- Transport cost</li> </ul>	<ul style="list-style-type: none"> <li>• Education / training</li> <li>• Policy</li> <li>• Charcoal making</li> <li>• Formation of SMEs, cooperatives</li> <li>• Market linkage</li> </ul>	BoARD INBAR BOTI/CPA
3. Lack of skills, tools, designs	<ul style="list-style-type: none"> <li>• Identification of skill gap</li> <li>• Training</li> <li>• Needs gap assessment</li> <li>• Fabrication of tools appropriate to Ethiopian bamboo</li> </ul>	REMSEDA / FEMSEDA TVET ECBP INBAR Rural Technology Promotion Center
4. Lack of awareness	<ul style="list-style-type: none"> <li>• Awareness raising on environment/resource</li> </ul>	EPA

	<ul style="list-style-type: none"> <li>protection</li> <li>• *Regional prioritization of Bamboo policy / promotion (passing of law on use of bamboo, school furniture, forest fire, land use, public institutions bidding on furniture)</li> <li>• Market promotion – public institutions</li> </ul>	BoARD Regional Adviser BoARD ROTI OXFAM Public institutions
5. Lack of business orientation of service providers	Training cum Production	INBAR Chamber of Commerce
6. Lack of initial capital of producers	Provision of micro-finance – innovative tools Capacity development of financial institutions	OXFAM ECBP Chamber of Commerce
7. Lack of use of by-products	Training / awareness on bamboo charcoal	INBAR REPC World Vision Chamber of Commerce
	***Cooperation from BOTI / BoC Clarification of procurement system in public institutions (MSEs)	BoFED BOTI

#### Bamboo Value Chain Discussion / Planning

#### Price of Culms

In the rural area, in the woredas, the price per culm is Birr 1. In the urban area particularly in Assosa, the price is Birr 2; while in Sudan, Birr 5.

### III. ANALYSIS

#### A. Bamboo Resources

There are two bamboo species found in the 7 woredas: *Arundinaria alpina* or highland bamboo and *Oxytenanthera abyssinica* or lowland bamboo. Lowland bamboo is found in all of the 7 woredas while highland bamboo is found in Bole Jiganfoy and Kurmuk woredas.

The study that was conducted by IntechDev Systems in Manila, Philippines in May 2010 on the appropriate use of lowland bamboo from Ethiopia reveals that the bamboo species is both appropriate for structural components and lends itself to bending. A panel board was produced by laminating half rounded poles side by side to create a durable panel displaying 2 sides. The outer side shows the natural rounded bamboo and the inner side shows the split smooth finish surface looking very much like wood. The panels may be used for furniture and housing components. The technology is appropriate for the area where it is to be produced.



*Ethiopian bamboo product development*

Kurmuk, Bole Jiganfoy and Sherkole have the largest bamboo area ranging from 10,000 to 15,000 hectares per kebele. There is gregarious flowering of bamboo in Mandura, Sherkole and Sirba Abay which started in 2009. Regeneration now occurs in 5 kebeles of Sherkole (Ashesheko, Obe Farbezu, Gize Azaria, Gemed Sherkole, Halmo Bebe). In Sirba Abay, flowering shifts from one mountain to the other.

There is forest fire where flowering took place. Likewise, there are unmanaged bamboo stands.

Dr. I.V. Ramanuja Rao, Programme Director of the Livelihood and Economic Development Programme of the International Network for Bamboo and Rattan (INBAR) discussed lengthily the enormous opportunities that the bamboo seeds can provide not just to Ethiopia but also other countries (Email to Tesfaye Hunde, May 4, 2010):

*"The collection of lowland bamboo seeds from Benishangul Gumuz is something that should be done immediately before the rains and will be very*

*useful for the IFAD project in Ethiopia and also for the other countries in the IFAD grant and India, too. The collection, proper storage, local planting and distribution of bamboo seeds need to be considered as a matter of utmost importance that could benefit many people, not only in Benishangul Gumuz and Ethiopia but in other countries as well. Let us do this now and do it right. With the grazing pressures (young bamboo leaves are loved by livestock including chicken), we will see a severe reduction of the present bamboo growing area that will impact the poor rural communities of Benishangul Gumuz. This has happened elsewhere, in Zambia, in India, and in many countries. We should learn from their experiences. Gregarious or mass-flowering is the only time in its life cycle that bamboo is vulnerable as a resource. Otherwise, even recurrent fire does not kill it; the rhizome remains alive and new shoots pop up with the next rain.*

*Bamboo seeds should be stored under low to very low humidity. They are stored even as low as 4°C to 20°C. Let us use existing cold storage facilities including freezers and set up facilities that take storage temperature to below 4°C and even lower in a desiccated or dehumidified state. Blue silica gel can be used along with the seeds in sealed containers. The lower the temperature and drier, the longer they stay. Bamboo seeds rapidly lose viability so everyday there are losses, hence this is really a matter of utmost urgency.*

*Initially, get the seeds into aerated bags like those made of jute or other natural fiber (not plastic) and under cover from rain would be important while the cold storage is set up or the seeds taken elsewhere where these exist. The making of the bags themselves from some local natural fiber could be a livelihood opportunity. Once the seeds are all used up, the seed cold storage centers can be used for farm produce. Capitalize upon the supply chain set up due to the bamboo flowering and seeding.*

*The collection and sale of seeds could be an immediate source of income for many rural people, also the subsequent raising of nurseries and plantations.*

*BG can actually even collect the wildlings (seedlings that have germinated). This was done in Mozambique with very good results. Only one protected wildling (seedling) per existing clump is needed to restock the area.*

*The bamboo seeds from BG from this flowering can establish plantations that can address the charcoal needs of Ethiopia. This should be done even under the EU charcoal project. The bamboo can address construction needs and much more. This would have tremendous implications for tree deforestation, watershed protection, water recharge and soil erosion prevention and control.*

*This is a once in a lifetime opportunity. The bamboo seeds can sow a future of prosperity.”*

### *Bamboo seeds*

*"The bamboo seeds from BG from this flowering can establish plantations that can address the charcoal needs of Ethiopia" (Dr. I.V. Rao).*

In some kebeles (Horashab in Kurmuk, Muezen in Debate, Babizend and Beshata in Guba), bamboo is found everywhere while in most kebeles, these are found 15 to 50 kilometers away from the villages.

People use Lorries to transport the bamboo to the villages while in Sherkole and Sirba Abay, the people carry them by foot for 4 hours. Each person can only carry 1 bundle (20 poles).

All of the woredas harvest bamboo during dry months, November to April. In Sherkole, 5 persons harvest bamboo every other day. The poles are bought to Sherkole Woreda for sale at Birr 2 per culm and to Sudan at Birr 5 per culm.

In Kurmuk, traditional knowledge is applied in harvesting bamboo; only bamboo that are of age (mature) and big are harvested. Clear harvest is applied in Belo Jiganfoy. In Guba, bamboo is harvested according to age and the type of project where bamboo will be used. Axe is usually used in harvesting.

In the 7 woredas, the usage of bamboo includes house/huts construction, fence, firewood, firewall, traditional furniture, basketry, food (bamboo shoots) especially when drought is hard (in Guba).

The cost of bamboo culm ranges from Birr 0.50 to Birr 5. It is the cheapest in Bole Jiganfoy and Guba (Birr 0.50 to 1) while highest when this is sold in Sudan at Birr 5 (from Sherkole and Kurmuk).

Except Dibate that relies only on the rivers for water source, all of the woredas have water pumps, the deepest is 40 meters. Mandura and Guba also use hand pumps. All 7 woredas have the rivers as water sources. Only in Mandura that spring water is utilized as water source. Some kebeles in Sherkole dig into the sand along the river bank during winter for water.

Kurmuk, Sherkole and Sirba Abay have electric power. Sherkole gets its power from the National Power Grid while Sirba Abay gets it from the hydro power from Mandi. There is 24-hour electric power at the Woreda level in Debate while the rest of the kebeles have no electricity. Soge kebele of Guba has 24-hour hydro-electric power while the rest of the kebeles in the woreda have no electricity.

Kurmuk follows the ELPA rules of power costing: Birr 0.27 per 2.50 KW, Birr 0.35 per 50-75 KW, Birr 0.49 above 75 KW. In Sirba Abay, the power cost is Birr 7 to 8 per month for 4 to

5 hours usage (5 bulbs of 5 KW, some with refrigerator, radio, TV), Birr 1,000 for connection.

Regarding communication service, mobile phone service is available in Mandura, Guba and Sherkole; wireless phone in Kurmuk and Bole Jiganfoy; 1 government radio communication line and telegram in Sirba Abay; and Woreda Post and an undercover wire phone in Guba. There is no communication service in Debate.

## **B. Human Resources**

The 7 target woredas have 112 kebeles with population of 179,313 which is 27% of the total population of Benishangul Gumuz Region. Debate has the largest population (54,180) while Kurmuk has the smallest (13,579).

Agriculture is main source of income for the 7 woredas. Gold pocket mining is the secondary source of income in Kurmuk, Sherkole and Sirba Abay; animal husbandry in Dibate and Guba; and pasturing of animals in Mandura. Bole Jiganfoy has only agriculture as income source.

Average income of the 7 woredas ranges from Birr 5,833 to Birr 71,700.

TABLE 11: AVERAGE INCOME **per** WOREDA

<b>Woreda</b>	<b>Average Income</b>
Bole Jiganfoy	71,700
Sirba Abay	71,200
Kurmuk	13,567
Guba	8,400
Sherkole	7,000
Mandura	4,663
Debate	5,833

All of the woredas have no training center except in Mandura that has one but is closed. Kurmuk has no data on this.

Labor cost ranges from Birr 10 to 50 per day with Sherkole having the highest rate (Birr 40-50/day) and Bole Jiganfoy the lowest (Birr 10-20/day).

Labor practice is agreement-based in all of the 7 woredas. By individual, group and family are the modes of working; however, predominant practice is by family. Kurmuk and Mandura have a cooperative to assist them.

## **C. Government Services (regional and woreda)**

### ***1. Investment plans and policies***

Investment plans of government are in agriculture (Kurmuk, Bole Jiganfoy and Guba), schools construction, water system development and health center construction in Mandura.

### ***2. Infrastructure development plans***

In Kurmuk and Bole Jiganfoy, hydro-electric power, wireless phone and mobile phone services are under construction. There is no electricity in Mandura. Electricity will soon reach Beshata kebele of Guba.

There is all-weather road in 1 kebele in Bole Jiganfoy (Sene); a gravel road in Muzen kebele in Debate. Road is under construction in Ised, Guba.

### ***3. Housing***

There is no housing plan for all the 7 woredas.

### ***4. School buildings and furniture***

There is a preparatory school in Bole Jiganfoy; kindergarten schools in Debate, Bole Jiganfoy and Mandura; primary schools in Sherkole and Sirba Abaya; elementary schools in Debate, Mandura, Bole Jiganfoy, Kurmuk and Guba; secondary schools in Sirba Abay, Sherkole, Kurmuk, Bole Jiganfoy and Mandura. In Sirba Abay, some go to College. In Sherkole, 30 to 40 students compose a class (secondary) while in Sirba Abay, 70.

School furniture is supplied by the Education Bureau in Kurmuk and Mandura (Kuter 2 kebele); by NGOs in Horashab kebele in Kurmuk; by the regional government in Debate, Guba and Sirba Abay; and by the Zone in Mandura. There is no data on this in Sherkole and Bole Jiganfoy.

### ***5. Land ownership***

All lands in the region are owned by the government. The people can use the land but cannot own and sell the land. Permit from the Woreda government has to be acquired for the use of the land in Sirba Abay. Likewise, the payment of Birr 25-85 based on the area is needed.

In Kurmuk, 2.5 hectares are made available to everybody within the woreda for agriculture. For outsiders, this is available through the Regional Bureau and the Investment Office.

In Bole Jiganfoy, government policy on land is under study.

## **6. Forestry rules and regulations**

In cutting bamboo, permission from the Bureau of Agriculture has to be acquired and a royalty payment of Birr 0.10 to 0.20 per culm is given for Woreda revenue.

The Bureau of Agriculture conducts education on the protection of bamboo in Sirba Abay and in Sherkole for the communities not to change into other land use because after the flowering, bamboo will regenerate.

The possibility of establishing bamboo nurseries in Sherkole can be discussed with the Woreda Administration. Labor costs Birr 35-40 per day; plastic bag (16 cm x 15 cm) costs Birr 50 per kilogram (800 pieces per kilogram).

Generally, there are forestry rules governing the use of bamboo but these are not followed.

## **D. Enterprises**

Except for Sherkole and Sirba Abay, all the other woredas have no existing enterprise. Sherkole has small eateries while Sirba Abay has gold trading, tailoring and dress shops, and video shops.

## **E. Micro-financing**

Except for Kurmuk that has no data, all the woredas have micro-financing facility mainly coming from the government but such service is concentrated only at the Woreda level (nothing on the kebele level). Interest rate ranges from 12% to 12.5% per annum, payable in 1 year; however, it is interesting to note that Mandura gets only 4% interest rate for its micro-finance service facility. Guarantors are needed either individual or group (5 members); if government employee (in Sirba Abay), the office guarantees (usually housing loan). Fixed assets are used as collaterals.

## **F. Non-Government Organizations (NGOs)**

Nine NGOs operate in the 7 target woredas, 8 of these are international NGOs while only 1 is local. Their area of service are health, agriculture, water, education, trainings and provision of school furniture, uniforms, books and other school supplies.

TABLE 12: NON-GOVERNMENT ORGANIZATIONS PRESENT IN THE SEVEN WOREDAS AND THEIR SERVICES

<b>NGO</b>	<b>Service /project</b>	<b>Area of operation</b>
International Rescue Committee (IRC)	Health, agriculture	Kurmuk
ADP	Water	Kurmuk
Canadian Physicians Aid and Relief (CPAR)	Education, agriculture and water	Dibate
Camboni Sisters		Mandura
OXFAM		Mandura
Mishishigawa Luka (local NGO)		Mandura
Food for Hungry International – Japan (FHI)	Provides school furniture, uniforms, books and other school supplies	Bole Jiganfoy
COOPI (Italy)	Like a cooperative	Bole Jiganfoy
CVM	Addressing HIV problems, provides school uniforms and trainings	Guba
Mishishigawa		Guba

No NGO operates in Sherkole and Sirba Abay.

### **G. Others**

All the woredas have no machine shop except Sirba Abay that has radio and motorbike repair shops and 2 skilled carpenters.

### **H. BENISHANGUL GUMUZ BAMBOO AS HALF ROUND PANEL**

A workbook which comprises of tools used to analyze a project using the INHAND system developed by Medilen Singh was prepared.

The work book (Annex E) comprises of :

- 2 process sheets for the preprocessing operations; scale of 1800 poles daily and 3600 poles daily

- 3 process sheets for the processing operations; scale of 150,240 and 300 panels a day ; Panels are 1.2 x 2.4 in measurement but we may do .60 x 2.4 in the first year of operation on the scale of 150 shts daily of 1.2 x 2.4 panels
- 3 cost sheets using production volumes of 150, 240 and 300 boards a day.
- 1 cash projection which shows how the project is given a seed capital of Birr 6 million which is used to buy equipment and fund working capital for :
  - a. preprocessing operation of 1800 poles daily for 11 months of the 1<sup>st</sup> year;
  - b. processing center operating at 150 panel daily for 11 months of the 1<sup>st</sup> year (or 2<sup>nd</sup> year)
  - c. preprocessing scaling up to 3600 poles daily in the 2<sup>nd</sup> year using surplus from the first year of operations;
  - d. processing center scaling up to 240 panels daily for the 2<sup>nd</sup> year also using surplus from the first year of operations;
  - e. processing center scaling up to 300 panels daily on the 3<sup>rd</sup> year of operations and investing to build its own factory building using surplus from the 2<sup>nd</sup> year of operations. It also shares surplus with its participants – labor and mgmt – for them to reinvest half, back into the factory, for them to become owners of the business.
  - f. The company/cooperative invests one million five hundred Birr in a new company on the 4<sup>th</sup> year of operation to expand into furniture. It continues to distribute surplus from the 3<sup>rd</sup> year of operations to management and labor for them to reinvest half back into the company to increase their share holdings.
  - g. INBAR is allotted the monies earmarked for marketing and R&D to allow it to perform that function well to sustain the growth of the company/cooperative. As the sales volumes increase yearly so does the allotment for INBAR to sustain the project and train the people properly:
    - a. Yr 1 Birr 819,000
    - b. Yr 2 Birr 1,406,592
    - c. Yr 3 Birr 1,638,252
    - d. Yr 4 Birr 1,638,252
    - e. Yr 5 Birr 1,638,252 + allotment from new furniture company

- h. Training money comes from the share of capital, management and labor in the first year. Subsequent years allotment comes only from the capital share as the allotment for management and labor is distributed to them and use half to reinvest in the company to become shareholders. Continuous training and development of the workforce is extremely important for the company to grow and make the workers think like investors.
- a 2 year time line for the implementation of the project. It is important to follow this timeline to see the making of investors by year 2 and 5 and expansion into a new business by year 4.
- Cash flow, cash projections and ROI (return on investment)

Based on the process sheet for 300 panels per shift of a 1.2 meters x 2.4 meters of a half round panel board, the total labor (harvesting, curing and semi-processing) and material cost of a 4.8 cm x 5 meters culm is Birr. 2.06. One hundred thirty four (134) persons are needed to harvest and undertake the semi-processing of the materials. On the other hand, sixty six (66) persons are required in the processing center. The total labor and material cost for one panel is Birr 85.51. Using the productivity formula below, the selling price of a panel would be Birr 213.75.

PRODUCTIVITY FORMULA (used in the cash flow and cash projections)

Labor and Material	- 40 %
Administration	- 5 %
Overhead	- 10 %
Tools & Jigs	- 5 %
Research & Development	- 5%
Marketing	- 5 %
Intra-capital	- 10%
Cost of Money	- 2 %
Profit	- 18 %
Labor (6%)	
Management (6%)	
Capital (6%)	

A look into the cash projections reveals that with a start of Birr 6000000 with a total of Birr 4,095,630 invested on capital expenditure on the first year of operation, on the 2nd year Birr 483956 will be invested in the company/cooperative (depending on the form of organization that will be formed among the players) by the people ( half of their sharing) , 3rd year Birr 982952 ( half of their sharing); 4th year Birr 982952 again plus Birr 1500000 into a new company/cooperative or it can be to the original company/cooperative and the 5th year is another Birr 982952 plus Birr1500000. The total in 5 years is Birr 6792812 and that is when they fully own the project and INBAR can be relieved and would have by that time taught them how to do marketing and R&D.

Another page of the cash projection shows how on the 2nd year of operations if 150 panels a day remains to be produced and not invested in any thing else on the 2nd year, at the end of the 2nd year there will be 6million + Birr in surplus upon which decision will need to be arrived at. Expansion by the 2nd year is shown so more people are trained and get to work bringing them to the level on the fourth year to expand to other enterprises.

(Please refer to Annex E : Ethiopia Workbook)

## **IV. RECOMMENDATIONS**

Based on the above analysis, the following are recommended as courses of action:

### On natural resource and environment:

- 1) The immediate collection, proper storage, local planting and distribution of bamboo seeds (as recommended by Dr. I.V. Rao);
- 2) Review or adoption/ promulgation of policy on land use (no conversion of bamboo land as it may affect climate change and no source of materials for livelihood) - region wide;
- 3) Establishment of bamboo nursery and plantation;
- 4) Validation of bamboo resources through an inventory using GPRS

### On market-led development:

- 1) Establishment of a panel factory with rejects turned into bamboo charcoal/briquettes
- 2) Adopt the Ethiopia Workbook (Annex E)
- 3) Production of school furniture and other furniture by private enterprises.

### Institutional support and financing:

- 1) Trainings will be provided to government officials from ReMSEDA, Trade and Industry, Agriculture and Rural Development Education and Non-Government Organizations (NGOs) so they initially manage the projects and eventually turn over management to the production group from the community.
- 2) Existing credit facilities will be availed of in group.

Due to the gregarious flowering of bamboo in Sherkole and Sirba Abay, these two woredas are chosen as the areas for immediate collection, proper storage, local planting and distribution of bamboo seeds, as well as training on nursery, plantation and management. Sherkole will be the pilot site for nursery establishment and plantation.

For the bamboo factory, Kurmuk is the best area considering that it is one of the 3 woredas that have the largest area for bamboo (along with Belo Jiganfoy and Sherkole), has the basic facilities (water, electricity, communication) needed for a factory, and other infrastructure facilities. Also, Kurmuk is near Sudan, another market opportunity for the bamboo products. An alternative site is Sherkole.

### **Factory to be set up in Kurmuk**

It is recommended that a factory be set up in Kurmuk to produce from 150 to 300 bamboo panels a day to keep cost down and train the participants in the area on Industrialized-Handicraft. The production will be set up in two places. Harvesting, straightening and curing

of poles should take place in the area of existing bamboo stands (also making charcoal of the rejects); while splitting, sizing, lamination and finishing are done in a factory situated in an area where electricity, transportation and communication are accessible. It is in this factory where the majority of capital expenditures will be made from the project's fund.

The panel output of the factory will be sold to entrepreneurs or government centers in the area especially where basic wood working machines already exist for panels to be converted into school desks, furniture and cabinetry, and KD (knock down) housing components without much added investment.

### ***Harvest area***

Bamboo management (harvesting) involves the following process: bundle and transport to cluster points > segregation > cutting > straightening of poles > curing by smoking > grading and bundling > delivery to panel factory and finished product factories. Rejects are turned into charcoal.

The activities involved are:

- Sighting cluster points in bamboo stand area;
- Selection of manpower to be trained;
- Placing of equipment;
- Training for harvesting and management of bamboo stands including firewalls;
- Segregation of poles for charcoal and panel use;
- Training for straightening poles;
- Building of smoke room and training for curing;
- Training for charcoal making; and
- Entrepreneurship training.

### ***Panel Factory***

The process involved is: receiving > splitting > sizing > planning > lamination > finishing sanding > finishing > bundling > delivery. Wastes are turned into charcoal.

The activities involved are:

- Sight area for factory – negotiate, lay-out, purchase/install equipment;
- Select personnel to be trained;
- Train personnel for total operations;

- Determine type of organization and process documentation;
- Set up systems;
- Trial run;
- Secure market;
- Entrepreneurship training; and
- Supervise production for one year to assure quality and on time delivery.

### ***Finished Products Factory***

The panels are cut into smaller sizes and shaped into school desk table tops and seats. Structural components are shaped from round bamboo poles. Panels are formed into KD housing components and into cabinetry.

The activities are:

- Partner with capable entrepreneurs or government agencies in the area to produce finished products;
- Produce prototypes based on samples or drawings by the consultant;
- Cost out prototypes and use them to secure market;
- Layout production systems and train total system;
- Secure other equipment if needed;
- Supervise production for the first 6 months to assure quality and on time delivery

## Log frame

A logical framework for bamboo development in Benishangul Gumuz is shown below:

**Table 13: LOGICAL FRAMEWORK FOR BAMBOO DEVELOPMENT IN BENISHANGUL GUMUZ REGION**

INTERMEDIATE OUTCOME	IMMEDIATE OUTCOMES	OUTPUTS RELATED TO OUTCOMES	ACTIVITIES LINKED TO OUTPUTS	PROPOSED INDICATORS
<p>SUSTAINED ECONOMIC GROWTH:</p> <p>Increased and sustained income within the community (especially among female members) to alleviate poverty</p>	<p>1. Flowering bamboo resource are well-managed so that this becomes a livelihood opportunity for people at the same time protects the bamboo land/area from further conversion</p>	1.1 Livelihood generated from the aerated bags that will be produced (from jute materials) for the bamboo seeds, and sale of bamboo seeds and seedlings	1) Immediate collection, proper storage, local planting and distribution of bamboo seeds	<p>Number of bags of bamboo seeds collected</p> <p>Number of bamboo seedlings produced and sold</p>
		1.2 Pilot bamboo nursery establishment	2) Training on bamboo nursery establishment and plantation management	<p>Number of seedlings produced in the nursery</p> <p>Number of hectares planted with bamboo</p> <p>Number of people trained for nursery establishment and plantation management</p>
		1.3 Pilot bamboo plantation		
		1.4 Adoption of land policy for non-conversion of bamboo land (as it may affect climate change and livelihood base of the communities)	3) Policy review & promulgation of land use	<p>Copy of promulgated policy on land use;</p> <p>Assessment report on the effects of this policy in terms of bamboo land protection</p>
	<p>2. Community enterprises and production centers are established where some people emerge as entrepreneurs, creating jobs, investing and earning from the enterprises</p>	2.1 A bamboo factory is set up producing 150 to 600 panels a day;	<p>1) Setting up of bamboo factory and training people in the area of Industrialized-Handicrafts (training cum production) for community members, NGOs and government personnel</p> <ul style="list-style-type: none"> <li>▪ Develop training designs on harvesting, fabrication of machines, tools and jigs, productivity, process costing, scheduling and management and fund management;</li> <li>▪ Conduct the trainings;</li> <li>▪ Set up 2 production centers:</li> </ul>	<p>Physical structure of the bamboo factory;</p> <p>Number of machines and jigs designed and fabricated;</p> <p>Actual size of workshop;</p> <p>Number of training participants;</p> <p>Number of trainees developed as entrepreneurs</p> <p>List of government and private entrepreneurs handholding community trainees to become</p>
		2.2. Government/private entrepreneurs handholding community trainees who would eventually become producers/owners		

			<p>1) for harvesting, straightening and curing of poles, charcoal making for the rejects – preferably where the bamboo stands are; 2) for splitting, sizing, lamination and finishing where there is electricity, and where transportation and communication are accessible</p> <ul style="list-style-type: none"> <li>▪ Train personnel for total operations</li> <li>▪ Determine type of organization and process documentation</li> <li>▪ Set up systems</li> <li>▪ Trial run</li> <li>▪ Secure market</li> <li>▪ Conduct entrepreneurship training</li> <li>▪ Supervise production for 1 year to assure quality and on time delivery.</li> </ul>	<p>producers and entrepreneurs</p> <p>Number of people who can manage production</p> <p>Number of people who can operate and manage machines;</p> <p>Number of people who will manage funds</p> <p>Number of school furniture shops established</p> <p>Number of furniture enterprises established</p> <p>On-time delivery of required bamboo culms</p> <p>Processing centers/factory co-managed and co-owned among players</p>
		2.3 Finished school desks, housing components, table tops, seats, cabinetry and other furniture;	<p>2) Linkage with institutional markets;</p> <p>Support on acquisition of credit;</p> <p>Improvement of production systems and facilities.</p>	<p>List of institutional markets established</p> <p>Credit facilities acquired</p> <p>Description of improved production systems</p> <p>List of facilities acquired and improved</p> <p>Number of school desks, housing components and other furniture produced from the factory</p>

## **V. SUMMARY AND CONCLUSION**

The study shows that both the lowland (*Oxytenanthera abyssinica*) bamboo and the highland (*Arundinaria alpina*) bamboo are found in the 7 target woredas, with Kurmuk, Bole Jiganfoy and Sherkole having the largest bamboo area.

The laboratory test that was conducted to the samples of the Ethiopian lowland bamboo to determine its physical and mechanical properties reveal that the one-year old has medium strength, two-year old has moderately high strength and three-year old has high strength. The one-year old can be used for medium construction like furniture and the three-year old for heavy construction.

The technology and product development using the samples reveals that the lowland bamboo from Ethiopia lends itself to bending and is appropriate for structural components for both furniture and housing.

With the good bamboo test results and return on investment, two factories are recommended: one for pre-processing and another one for (final) processing. It is projected that harvesting and pre-processing center will employ 134 persons while in the processing center, 66 persons will be required for labor. Several trainings will be conducted on basic operation, on productivity, and enterprise development, until such time that the players will own and manage the factories like a business. Kurmuk (with Sherkole as alternative) is recommended to be the site of these factories due to the accessibility to infrastructure facilities like water, electricity, transportation and communication.

The gregarious flowering of bamboo in Mandura, Sherkole and Sirba Abay that started in 2005 can be an opportunity for income generation like: collection and selling of seeds and wildlings, establishment of nurseries and plantations. Sherkole and Sirba Abay have been identified as possible sites for these nurseries and plantations.

The government through institutional market policies as well as construction and furniture enterprises are envisioned to be the initial potential market for the panels while the bamboo school furniture can be sold to NGOs like UNICEF, World Vision as well as the Bureau of Education.

The potentials for the Ethiopian bamboo to spur economic growth in Benishangul Gumuz Region is great. The vast opportunities that it offers will surely contribute in bringing about food security in the region.

This remains a big challenge to ALL.

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19. INBAR Concept Note, "Innovative Pilot Project to sustainably improve income generation and poverty alleviation in Benishangul Gumuz through the development of the bamboo sector"

**Annex 1: Bamboo Resource Inventory**

PLACE : Afafir, Binare, Bambasi Woreda, B-G

DATE : \_Feb. 21, 2010

PERSON RESPONSIBLE : \_Kebele Gutta, Carmelita B. Bersalona

SPECIES NAME	No. of Clumps	Ave. No. of Culms/ Clump	Ave. Length of Culm	BOTTOM		TOP		Size at 250 cm	Ave. No. of Internodes	Ave. Length of Internodes	Ave. No. of shoots per Year	USES	Land Ownership	
				Ave. Diameter	Ave. Thickness	Ave. Diam.	Ave. Thickness						Private	Public
Oxytenathera abyssinica	217 clumps in	clump 1 =65	4.9 m	3.4 cm	solid	2 cm	.7 cm	2.9 cm Dia x 1 cm Th	13	32 cm	8	house construction		communal
	100 m. x 100 m.	clump 2=59									22	fence		
	average distance	clump 3 =93									36	fuel		
	8 m. x 7 m.													
			7.5 m	6 cm	2.5 cm	2.2 cm	.8 cm	2.9 cm Dia x 1 cm Th	23	32 cm				

**ADDITIONAL QUESTIONS :**

Indigenous Practices on Bamboo Harvesting : harvest during dry months , Nov. - April

Need permission to cut from Kebele head

Indigenous Practices on bamboo Plantation :

Bamboo Related Trainings Undertaken :

Selling Price (please specify specie/kind of bamboo :

1. Farm level - Birr 0.5

2. Market

OTHER OBSERVATIONS ( e.g. bamboo flowering and where bamboos are best grown)

1. bamboo flowered 27 years ago

2. it took 7 years for bamboo to mature

3. there is a river nearby

**Annex 2: Cash Flow, process sheet, timeline, ROI, Cash flow, Cash Projection**

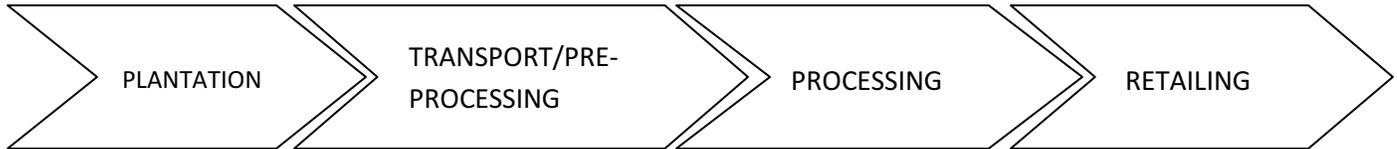
See separate worksheet (Ethiopia workbook 1-1) on the same CD for:

- Cash flow
- Process sheet
- Time line
  - R O I
- Cash flow
- Cash Projection

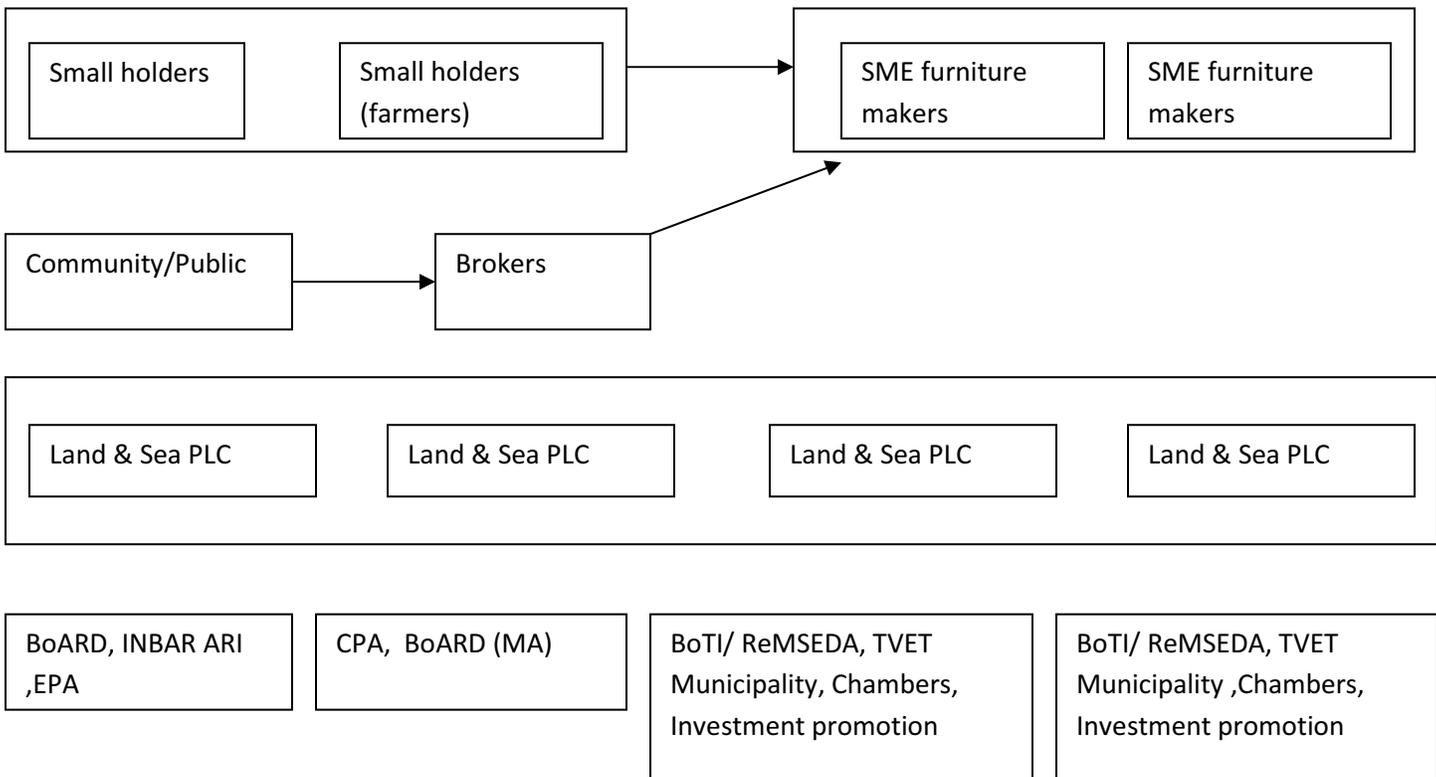


**Annex 3: Benshangul Gumuz Bamboo Value chain**

PRODUCT : Furniture : **low technology** but high quality products (school furniture)



- ACTIVITIES
- plantation management
  - cutting/sizing/forming
  - inputs
  - harvesting
  - post harvest treatment
  - assembly
  - promotion
  - marketing



#### **Annex 4: Focal Persons**

##### **Regional Focal Persons :**

- |                           |                     |
|---------------------------|---------------------|
| 1. Ato Bekele Gutta       | BoARD               |
| 2. Ato Hiskias Pamteu     | BoFED               |
| 3. W/ro Yeshiwork Assefa  | EPLAUA              |
| 4. Ato Tlahun Abera       | BoEd                |
| 5. Ato Kidanemariam Abera | Chamber of Commerce |

##### **WOREDA Focal Persons**

- |                      |            |
|----------------------|------------|
| 1. Alebachew Behane  | Kormuk     |
| 2. Abdul Wahab Maruf | Sherkole   |
| 3. Mengistu Chalte   | Sirba Abay |
| 4. Toni Ayele        | Menge      |