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## Progress Report II

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### **1. Services availed from Tashithang Community Forest.**

87% of the Community Forest Management Group (CFMG) households have availed the services from the CF since after inception in 2011. The most acquired services for domestic use was fuel wood (75% households) and for commercialization, Bamboo was most preferred provisioning services (97% households). Water is not considered as important services availed because the villager does not source in the water from CF.

### **2. Community forest assessment for ecosystem services.**

The highest numerical strength and distribution in a CF is represented by *Schima wallichii* with relative density of 30.33% and relative frequency 18.77%. *Albizia procera* has least relative density with 0.67% showing the weaker competition numerically in the community. The CF has *Shannon-Weiner* diversity index of 3.18 and *Margalf's index* of richness of 4.47. Timber species having highest estimated volume are *Schima wallichii* and *Michelia champaca* with 8608.5 ft.<sup>3</sup> and 1256.9 ft.<sup>3</sup> respectively in the entire CF. Ruankiaer's frequency distribution shows heterogeneous distribution (Disturbed Forest community) of species and no single species is distributed in the entire range of CF, however the distribution is aligning towards homogenous distribution as shown by distribution equation;  $27 > 3 > 0 \neq 1 > 0$

### **3. Stream discharge quantities.**

The field work was carried out in the month of March. A stream discharge quantities for irrigation water was calculated using Velocity Area Method. The volumetric analysis of drinking water was not done because the villager does not depend on drinking water drained out from the CF. The stream discharge quantity for irrigation water is 5.4 ft<sup>3</sup>/Sec.

### **4. Priority ranking of NTFP.**

86% (19/22 households) of CFMG were interviewed for the ranking of NTFP using five parameters; *marketing demand, household benefit, availability, regeneration potential and time consumed* for harvesting. The ranking was obtained based on consolidated scoring of priority legend; High, Medium and Low. The most prioritized NTFP is *Bambusa nutans* (Total score; 4.9 out of 12) followed by *Thysanolaena maxima* and the least prioritized is fuel wood.

**Table.1. Vegetation analysis of tree species of economic importance.**

Si. No.	Species name	R. F (%)	R. D (%)	Abundance	Shannon H'	Margalef's D <sub>mg</sub>	Ruankiaer's frequency distribution
<b>Fodder</b>							
1.	<i>Streaspermum suaveolens</i>	1	7	2.43			
2.	<i>Ficus hispida</i>	2.44	2.67	4.32			
3.	<i>Ficus auriculata</i>	1	1.63	2.43			
4.	<i>Bauhinia variegata</i>	3	4.07	2.91			
<b>Timber species</b>							
1.	<i>Toona ciliata</i>	2	2.4	2	3.18	4.47	27>3>0≠ 1 > 0
2.	<i>Michelia champaca</i>	9.33	5.69	4			
3.	<i>Dubanga grandiflora</i>	2.33	1.63	7			
4.	<i>Tectona grandis</i>	4	2.44	6.48			
5.	<i>Dalbergia sissoo</i>	1.33	3.25	1.62			
6.	<i>Gmelina arborea</i>	1	2.44	1.62			
7.	<i>Tertrames nudiflora</i>	1.67	1.63	4.05			
8.	<i>Albizia lebbeck</i>	1	1.63	2.43			
9.	<i>Albizia odoratissima</i>	0.67	1.63	1.62			
10.	<i>Schima wallichii</i>	30.33	18.70	6.41			

**Table.2. Timber Volume (Measured only timber with sizable girth i.e. circumference >3ft.)**

Si. No.	Species	Volume per acre (Ft. <sup>3</sup> /Acre)	Timber volume in CF(Ft. <sup>3</sup> )
1	<i>Tertrames nudiflora</i>	7.86	1231.1
2	<i>Albizia odoratissima</i>	5.57	872.4
3	<i>Dubanga grandiflora</i>	6.98	1093.8
4	<i>Schima wallichii</i>	54.9	8608.5
5	<i>Michelia champaca</i>	8	1256.9
6	<i>Toona ciliata</i>	3.88	608
7	<i>Gmelia arborea</i>	2.23	349.4

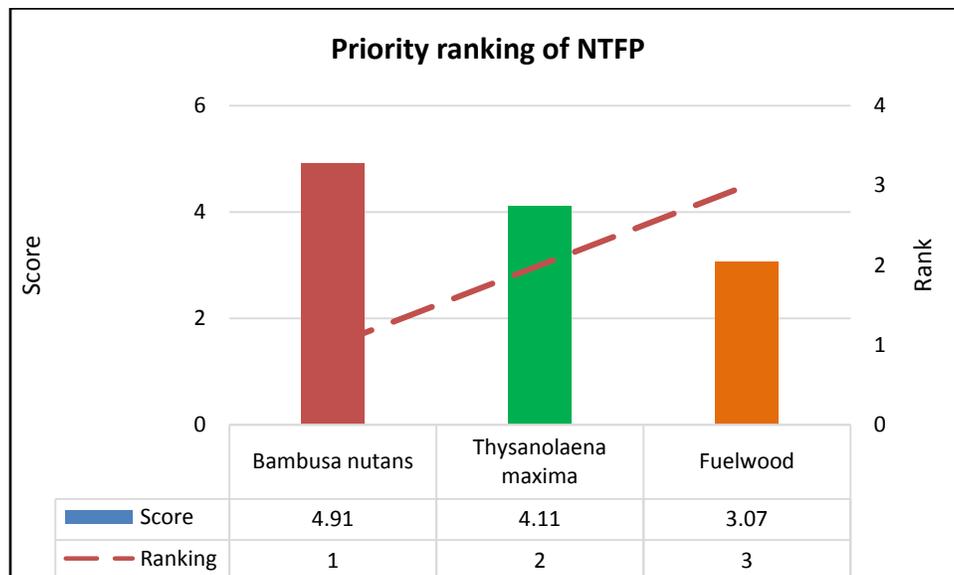
**Table.3. Stream discharge quantities**

Quantity of stream discharge for irrigation						
Length of stream	Width (mean)	Depth (mean)	Area	Time taken (mean)	Velocity (mean)	Water Discharge
164 ft.	3.47ft.	0.64ft.	2.22 ft. <sup>2</sup>	56.6 sec.	2446 ft./sec.	5.4 ft <sup>3</sup> /sec.

Stream location: Latitude: 26 ° 50 ' 28.8 N. Longitude: 90 ° 33 45. 79 E

**Table.4. Priority ranking of NTFP**

NTFP	<i>Bambusa nutans</i>			<i>Thysanolaena maxima</i>			Fuel wood		
<b>Legend</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>Count</b>	39	31	5	22	35	18	16	8	
<b>%</b>	52	41.33	6.66	29.33	46.66	24	21.33	10.66	68
<b>Score</b>	3.12	1.65	0.133	1.76	1.866	0.48	1.28	0.426	1.36
<b>Total score</b>	4.907			4.107			3.067		
<b>Grand total Score 12 (4.907+4.107+3.067)</b>									

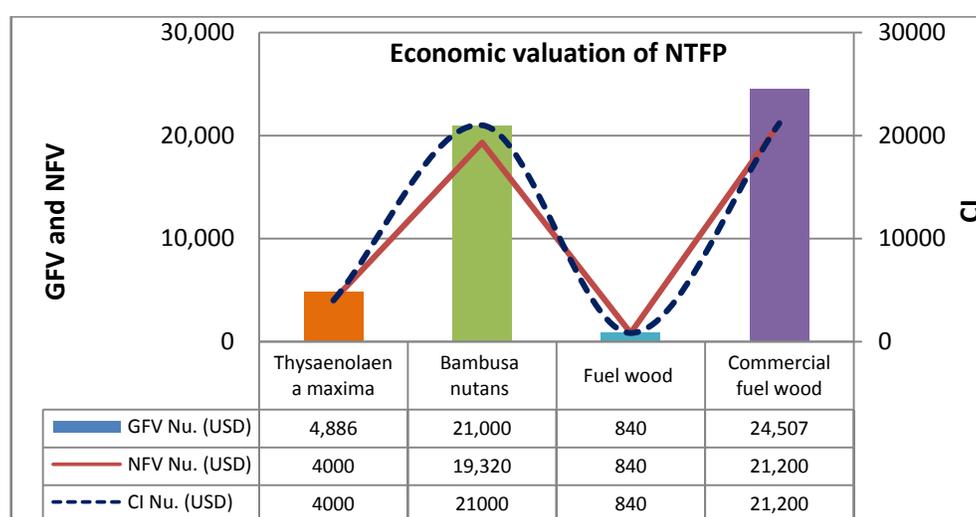


**Graph.1. Priority ranking of NTFP.**

**Table.5. Economic valuation of NTFP**

NWFP	Total quantity harvested	Unit	Price per unit Ngultrum. (USD)	GFV Nu. (USD)	NFV Nu. (USD)	CI Nu. (USD)
<i>Thysanolaena maxima</i>	349	Bundles	19	4,886	4886	4886
<i>Bambusa nutans</i>	1	Truckload	60	21,000	21000	21000
Fuel wood	28	Stumps	30	840	840	840
Commercial fuel wood	1	Truckload	24,507	24,507	21,200	21,200

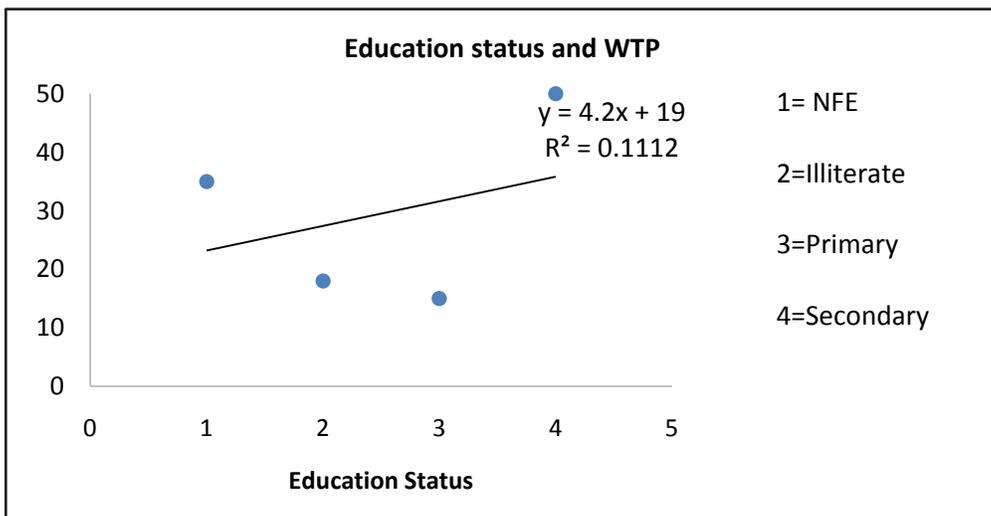
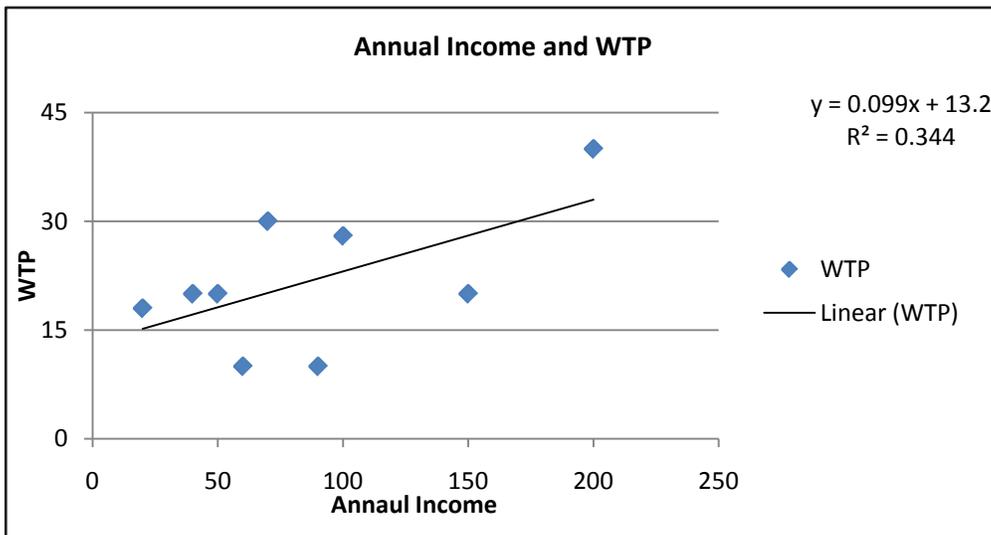
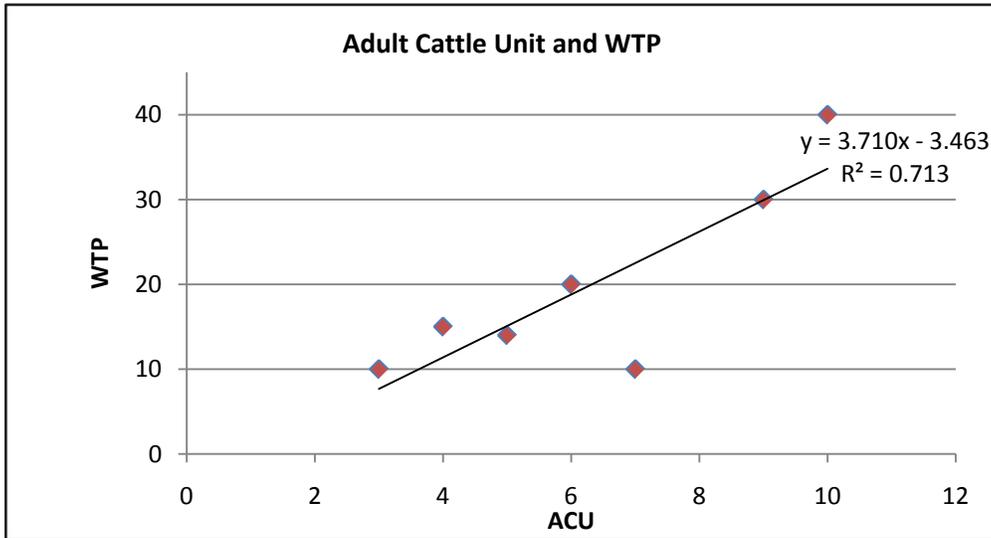
GFV:Gross Financial Value, NFV: Net Financial Value, CI: Cash Income



Graph 2. Economic valuation of NTFP

**Table.6. Economic valuation of Non-Consumptive Use Values**

Economic valuation of non-consumptive use values							
Total households	Total ACU	Total Land holding size	Total Annual Income	Education status	Env.Awareness	Grand Total WTP	Total WTA
15	85	75 acres	1320k	NFE and illiterate	High	<b>2048k</b>	540k
ACU: Adult Cattle Unit, WTP: Willingness to Pay, WTA: Willingness to Accept.							



Graph.3. Correlation of coefficient between variables and WTP

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# Annexure

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## Analytical Characters

Species Name	R. Density	R. Frequency	% Frequency	R. Abundance	H'	Dmg	Raunkiaer's Frequency Dist.
<i>Schima wallichii</i>	30.33%	18.70%	77%	6.41	-0.36	6.65	27>3>0≠1>0 A>B>C ≠ D>E
<i>Amoora wallichii</i>	3.33%	4.88%	20%	2.70	-0.11	13.03	
<i>Szygium formosa</i>	1.33%	3.25%	13%	1.62	-0.06	21.64	
<i>Castanopsis hystrix</i>	6.00%	5.69%	23%	4.16	-0.17	10.38	
<i>Macaranga denticulata</i>	5.67%	4.88%	20%	4.59	-0.16	10.59	
<i>Melia arborea</i>	1.00%	2.44%	10%	1.62	-0.05	27.31	
<i>Mallotus tetracoccus</i>	1.67%	2.44%	10%	2.70	-0.07	18.64	
<i>Ficus auriculata</i>	1.00%	1.63%	7%	2.43	-0.05	27.31	
<i>Ficus hispida</i>	2.67%	2.44%	10%	4.32	-0.10	14.43	
<i>Toona ciliata</i>	2.33%	3.25%	13%	2.83	-0.09	15.42	
<i>Mangifera indica</i>	2.00%	2.44%	10%	3.24	-0.08	16.74	
<i>Streaspermum suaveolens</i>	1.00%	1.63%	7%	2.43	-0.05	27.31	
<i>Cupaniopsis anacardiodes</i>	1.33%	2.44%	10%	2.16	-0.06	21.64	
<i>Rhus Chinensis</i>	0.67%	0.81%	3%	3.24	-0.03	43.28	
<i>Terminalia bellerica</i>	1.67%	3.25%	13%	2.02	-0.07	18.64	
<i>Albizia odoratissima</i>	0.67%	1.63%	7%	1.62	-0.03	43.28	
<i>Albizia procera</i>	0.67%	0.81%	3%	3.24	-0.03	43.28	
<i>Oroxylon indica</i>	4.67%	4.07%	17%	4.53	-0.14	11.37	
<i>Sterculia villosa</i>	1.33%	2.44%	10%	2.16	-0.06	21.64	
<i>Bauhinia pupurea</i>	3.00%	4.07%	17%	2.91	-0.11	13.65	
<i>Acacia meansrii</i>	1.00%	1.63%	7%	2.43	-0.05	27.31	
<i>Tectona grandis</i>	4.00%	2.44%	10%	6.48	-0.13	12.07	
<i>Eurya cavineris</i>	1.00%	1.63%	7%	2.43	-0.05	27.31	
<i>Callicarpus arborea</i>	5.00%	5.69%	23%	3.47	-0.15	11.08	
<i>Albizia lebbeck</i>	1.00%	1.63%	7%	2.43	-0.05	27.31	

<i>Tertrames nudiflora</i>	1.67%	1.63%	7%	4.05	-0.07	18.64
<i>Artocarpous heterophullum</i>	0.67%	1.63%	7%	1.62	-0.03	43.28
<i>Dubanga grandiflora</i>	2.33%	1.63%	7%	5.67	-0.09	15.42
<i>Michelia champaca</i>	9.33%	5.69%	23%	6.48	-0.22	9.00
<i>Ficus coronata</i>	1.00%	1.63%	7%	2.43	-0.05	27.31
<i>Turpinia pomefera</i>	0.67%	1.63%	7%	1.62	-0.03	43.28
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>		<b>100.00</b>	<b>2.77</b>	

### Stream gaging

Quantity discharge of Tashithang CF																
Si.No.	First Interval			Second Interval				Third Interval				Fourth interval				
	Width	Mean	Depth	Mean	Width	Mean	Depth	Mean	Width	Mean	Depth	Mean	Width	Mean	Depth	Mean
1	4.25	3.25	0.67	0.73	4.83	3.15	0.58	0.68	1.25	3.9	0.75	0.68	3.56	3.59	0.57	0.48
2	2.58		0.75		3.17		0.75		7.83		0.83		3		0.5	
3	2.92		0.83		3		0.67		3		0.58		3.8		0.48	
4	2.5		0.67		3.5		0.67		3.83		0.75		4		0.52	
5	4		0.75		1.25		0.75		3.58		0.5		3.6		0.33	
<b>Total</b>	16.25		3.67		15.75		3.42		19.49		3.41		17.96		2.4	

Distance:164ft.

Area:  $0.64 * 3.47 = 2.22$   
square feet

Time Taken:  $(57+55+58) / 3$   
seconds

Velocity of a surface:  
 $164 / 56.6$

Average time taken: 56.6 sec.

= 2.9 ft./sec.

Actual mean depth: 0.64 ft.

Velocity mean: KV surface (k is roughness  
coefficient)

Actual mean width:  
3.47 ft.

$0.85 * 2.9 = 2.46$  ft. / sec.

Total discharge: KV

Surface \* Area

Latitude: 26 ° 50 ' 28.8 N. Longitude: 90  
° 33 45. 79 E

$2.46 * 2.2 = 5.4$  cubic feet per seconds

## Economic Valuation of Non-Consumptive Use Values

Economic valuation of non-consumptive use values												
Hld. No	ACU	WTP	Land holding size	WTP	Annual Income	WTP	Education status	WTP	Env. Awareness	WTP	Total WTP	WTA
1	5	10K	5	20K	100K	30K	NFE	70K	High	90K	220K	20K
2	4	20K	5	100K	20K	5K	illiterate	5K		40K	170K	10K
3	3	10	5	50K	100K	50K	do	50K		50k	210K	50K
4	4	20K	5	10K	40K	20K	do	10K		70K	130K	30K
5	5	15K	5	25K	20K	30K	NFE	15K		55k	140K	40K
6	6	20K	5	10K	70K	40K	do	15K		20K	105K	35K
7	10	40K	5	20K	150K	30K	illiterate	20K		30K	140K	40K
8	9	30K	5	20K	100K	3K	do	15K		35k	103K	10k
9	7	5K	5	25K	200K	40K	do	15K		40K	125K	50K
10	4	10K	5	30K	150K	10K	do	20K		70k	140K	50K
11	5	7K	5	25K	70K	20K	NFE	70K		50K	172K	25K
12	6	20K	5	35K	50K	20K	do	5K		30K	110K	10K
13	5	10K	5	45K	90K	10K	illiterate	50K		10K	125K	50K
14	5	13K	5	20K	60K	10K	do	10K		15K	68K	30K
15	7	15K	5	10K	100K	30K	do	15K		20K	90K	40K
<b>Grand total</b>											<b>2048K</b>	

**Clearing the stream bank for Stream gauging**



**Measuring DBH (Circumference) of *Schima Wallichii* at 1.3 m above the ground.**



**Field Assistants climbing down to find the sample plot**



**Lunch hour break**



**Provisioning services (food) collected from stream (not valued monetarily in the project because most collection happens illegally and documentation of amount collected and price is lacking)**

