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#### Our Cover

A typical village in Kavre district showing houses of the community forest user groups practicing terrace farming. People have been practicing agroforestry in their farmlands to fulfill their multiple demands. By Rahul Karki

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# Rapid Private Forests Survey in Kavre and Sindhupalchok Districts of Nepal

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# PRIVATE FOREST IN NEPAL: AN OVERVIEW

## Background

In hill agriculture of Nepal private forests are important component to sustain production and farm income. Assorted species of trees and shrubs are grown on terrace risers, farm edges, and scattered as intercrops on privately owned land (Cedamon et.al. 2017, Pandit et al, 2013). The Master Plan for the Forest Sector (1989 – 2010) has recognized the importance of these trees planted on private lands and their development and management (HMGN 1989). Based on this, Forest Act 1993 and Forest Regulation 1995 have the legal provision for private forests (HMGN 1993, HMGN 1995). According to Forest Act 1993, *private forest* means a forest planted, nurtured or conserved on private land owned by an individual pursuant to prevailing laws. Some of the private lands planted with exotic fodder trees and grass species are recent forms of private forestry (Neupane et al. 2002; Pandit; 2018). Trees and shrubs have naturally regrown on private land where cultivation of agricultural crops has been abandoned for some years. The Food and Agriculture Organization (FAO) (2018) estimated that the land abandonment across Nepal is 44 percent. This is even more in some areas of Gandaki province reaching 64 percent in Lamjung district (EnLiFT 2015) to 68 percent in Kaski district (FAO 2018). The main reason for such land abandonment is mainly because of low labor availability due to youth outmigration (Cedamon et al. 2017; Shrestha and Pandit 2017). The increasing land abandonment brings opportunities for low labor input land uses such as forestry and agroforestry that could provide economic benefits to land owners and other farmers as well brings ecological benefits from reforestation of abandoned lands.

## Scope for Private Forestry

Nepal remains an agrarian economy with agriculture being the largest contributor to GDP (35%) in 2016 (GoN 2016). Over 60% of the population is engaged in agricultural lands, which has the necessary multiplier effect to reduce poverty (Pandit 2018). Private forestry has now gained renewed interest in the context of increasing need for enhancing farm-based livelihoods and employment opportunities. As the markets for timber and non-timber forest products grow, rural communities in Nepal can gain cash income through private forest products value chain. This is the reason why the government of Nepal declared to expand private forestry in Nepal. Recently, the government of Nepal has started plantation campaign targeting planting of 50 million trees including one-third of fruit trees on both public and private lands throughout Nepal [personal communication with Ministry of Forest and Environment (MoFE)] and also government declared to expand one million ha of private lands into private forests in Terai and Inner Terai of Nepal (MoFE 2018). Trees grown either on abandoned/underutilized or on cultivated terraces could be an integral component of local

economies because they are sources of timber, animal feed and food and for cash earnings where farmers have access to market centres (Neupane and Thapa 2001; FAO 2010; Duguma 2013; Cedamon et al. 2017). This can be proved from the fact that more than two-thirds of the timber comes from private lands (GoN 2018). Despite this, Nepal imported 11,593 cubic metre of timber from 9 different countries in fiscal year 2017/2018 (MoFE, 2018). As a whole, more than 20,000 saw mills and furniture companies are in existence and more than 200,000 youths are employed in this business (GON 2016). Government record shows that of the total 321, 866 cubic meters of timber supplied during 2015/16, 83 % was supplied through private forestry source (Amatya and Lamsal, 2017). This indicates the importance of private forest for running these furniture companies and thereby increasing income of farmers. Despite these benefits, progress of private forest development in Nepal is not encouraging. Research on silvicultural management in private forests are very limited. Lopping trial of *Leucaena leucocephala* was conducted at Majhigaon of Sindhupalchok district in 1993 for maximizing production of both agricultural crops and its biomass. Trees were cut in three heights (80 cm; 120 cm and control). The results showed that 120 cm cutting height gave the highest yield of both crop and fodder (New ERA, 1993). The Department of forests and Soil Conservation (2017) report shows that out of 75 districts, only 62 districts have records of private forests and their registration. Only 3,753 private individuals have registered 2,902 ha of their forests as PFs at their respective district forest offices (CFD 2017). The production from these forests could have been substantially enhanced if these forests are managed well and policy issues are resolved (Pandit et al. 2014). The only way to enhance the productivity of the existing PFs and to increase benefits to hill farmers could be from active and equitable management of these forests. For this reason, we need to investigate what silvicultural regimes will deliver the optimum livelihoods benefits to farmers on private and underutilized land.

At the EnLiFT2 Project inception meeting held on Dec 3, 2018, a rapid private forest owners' survey was identified as the first activity to be carried out in the project sites. The objectives of this activity were:

- To identify the number of farmers growing private forest on their agricultural lands
- To investigate the estimated volume of timber that could be harvested from private forestry and link them to timber value chain
- To identify the interested private forest owners interested to participate in EnLiFT2 plantation trials and silvicultural trials of existing forests.

## METHODOLOGY USED FOR PF OWNERS SURVEY

The rapid survey of private forests was conducted in areas covered by 27 community forest user groups in six clusters/municipalities of Sindhupalchok and Kavrepalanchowk districts in December 2018 to June 2019 (Figure 1). The six clusters are Chautara Sangachok Gadi Municipality, Lisankhu Pakhar Rural Municipality and Sunkoshi Rural Municipality in Sindhupalchok district and Bhumlu Rural Municipality, Banepa Municipality and Bethanchok Rural Municipality in Kavre District.

Firstly the list of private tree growers (at least growing 10-20 trees per HH) was obtained from one of the CFUG committee leaders, chairperson or secretary of all (27) potential CFUGs (Table 1) consistent of the study conducted by Cedamon et. al. (2007) for reliability testing of village based tree inventory.

Secondly, in each of the CFUG areas, informal discussions were held with at least one of the executive members of community forest and key persons who were knowledgeable about the private forests in their village. They were asked to present their estimate on the number of households among forest users have private forests. Following this, we categorized the number of private forest owners into four different levels; “A” (> 100 trees), “B” (50-100 trees), “C” (25-50 trees) & “D” (20-25 trees). At least one private forest owner from each category

was selected for detailed forest data collection. The sampled PF owners’ farms were visited and biophysical information was obtained.

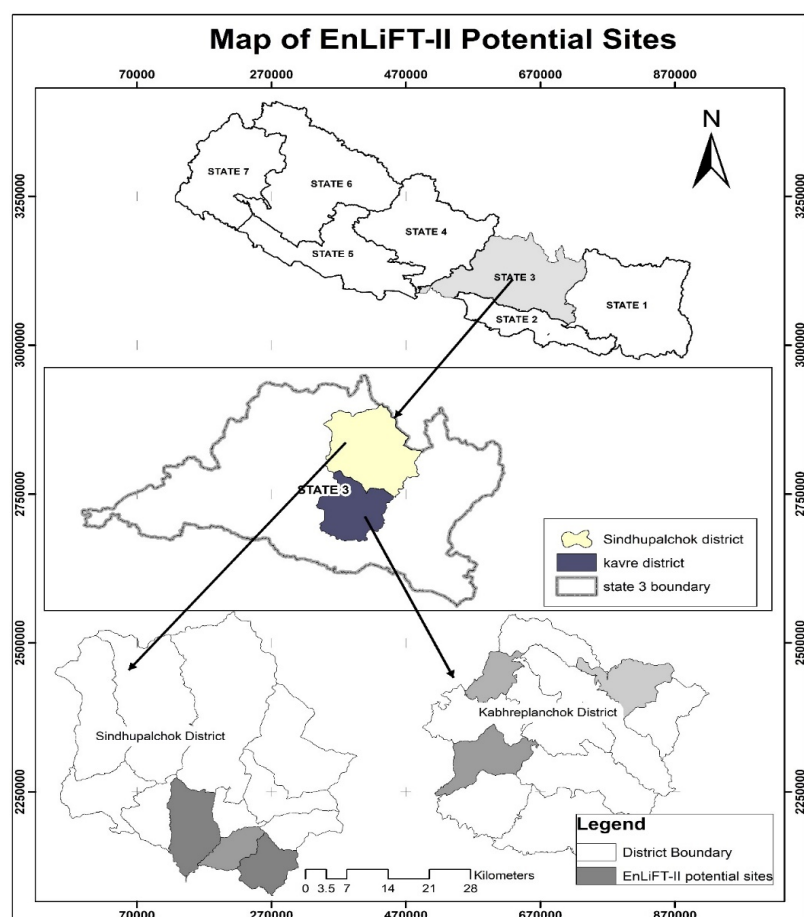


Figure 1 : Map of project sites

The biophysical data mainly included; dominant species, diameter class, age class, stand height, spatial arrangements of the tree, area of private forest, current land use with trees, land use before tree, problems in harvesting and marketing of trees and GPS locations of private forests for each of the small clusters (3 to 7 members) of tree growers.

Thirdly, at least four trees from each of the four age classes (1-5 yrs, 6-10 yrs, 11-15 yrs & above) were identified, and DBH and height were recorded. Finally, the total volume of standing trees was calculated using the formula: Volume=Basal area\*height\*form factor. In case of *Pinus* species, 0.49 form factor was used to calculate the volume of all the standing trees; whereas for *Alnus nepalensis* 0.50 form factor was used as there is no form factor calculated for all individual species (Tenzin et al. 2017). The diameter and height was measured by diameter tape and ocular with stick respectively. The age of the tree was determined through the estimate of the respective farmer who participated during the survey.

During the survey, we identified the potential sites for the establishment of trial plots on existing PFs and new plantation trial plots in private forests.

## RESULTS AND DISCUSSION

### Private Forests in Kavre and Sindhupalchok Districts

Development of plantation in barren hills of public lands in Kavre and Sindhupalchok districts was initiated after the Nepal -Australian Forestry project in 1976. Nepal Australia Community Resource Management and Livelihood Project (NACRMLP) reports that a total of 23,404 hectares of plantations have been established in Sindhupalchowk and Kavrepalanchowk Districts since the late 1970s, and they were mostly dominated by Pine species (Hunt et al., 2001). Since these species have the ability to tolerate drought and moisture stress, and because they were most suitable for the degraded soil conditions. From the mid-1970s, the idea of community forestry began to snowball and its effect was spilled over to private forests. However, the private land plantation especially with fodder trees and grasses was activated when the Nepal Agroforestry Foundation (NAF) started working with NACRMLP in 1995 (NAF, 2013).

Until FY 2074/75 BS, there were altogether 61 registered private forests in Sindhupalchok and 38 forests in Kavre district and cover an area 36.73 ha and 36.61 ha, respectively. For the first time, registration of private forest was initiated in 2043/09/22 BS in Sindhupalchok and 2061/10/25 BS in Kavre district. Among the registered private forests (38) in Kavre, nine PFs are from three clusters (DFO Kavre 2018). Dominant species of these forests include: chilaune (*Schima wallichii*), Utis (*Alnus nepalensis*), Pate salla (*Pinus patula*), Khote salla (*Pinus*

roxburghii), Sal (*Shorea robusta*) and Gobre salla (*Pinus wallichiana*). Similarly, more than half of PFs were found registered in three clusters of Sindhupalchok district.

A total of 1982 trees from 173 (8.7%) PFs were sampled from a total of 1996 private forests (229176 trees) in six clusters (Table 1 and Annex 1). The total volume that can be harvested from all sampled private forest is 95485 m<sup>3</sup>.

**Table 1: Sample Private Forests and number of trees and volume of timber in six clusters**

Name of Cluster	Name of CFUG	Dominant species	No of PF owners	Sample PF	No of trees	Total volume (m <sup>3</sup> )
Banepa	Dhunge Pakha, Hile Jaljale, Bhagwan thumki, Basuki and Kalika	<i>Schima wallichii</i> <i>Alnus nepalensis</i>	350	33	24885	10078
Chaubas	Fagarkhola, Lakuri, Dharapani, Chappani	<i>Pinus patula</i> , <i>Alnus nepalensis</i>	239	21	34637	12934
Dhungkharka	Kalapani, Gelkhola, Bethanchok Narayanstan, Janajagriti, Narayanstan	<i>Alnus nepalensis</i> , <i>Pinus wallichiana</i>	454	44	61921	19220
Chautara	Lampate, Banje-Kapase, Sansari, Srichhap, Tagare	<i>Schima wallichii</i> , <i>Choerospondias axillaris</i>	425	27	38343	16080
Lisankhu Pakhar	Bhajyang, Bodle, Tamche, Lamchaour, Deupokhari	<i>Alnus nepalensis</i> , <i>Schima wallichii</i> , <i>Pinus patula</i>	258	35	51968	29363
Sunkoshi	Deurali, Jagare	<i>Schima wallichii</i>	270	13	17422	7810
Total			1996	173	229176	95485

### Chautara cluster

Chautara is located in the southern part of Sindhupalchok district and covers an area of around 50 square kilometers (Figure 2). The average elevation is 1,600 metres above sea level.

Chautara is in the Deciduous Monsoon Forest Zone, one of five vegetation zones defined for Nepal ([http://www.visitnepal.com/fairsteps/flora\\_fauna.htm](http://www.visitnepal.com/fairsteps/flora_fauna.htm)). The dominant tree species in this zone are Quercus, Pinus, Shorea robusta, *Schima-castanopsis*, *Alnus nepalensis* with coniferous trees at higher altitude. Total available timber volume in this cluster is 16,080 m<sup>3</sup> (Table 2).

Development of private forests in Chautara cluster is quiet encouraging. Out of 61 registered private forests in Sindhupalchok district, 26 registered private forests which cover around 21 ha (DFO Sindhupalchok 2018). As shown in Table 2, we visited five community forests (Lampate, Banje-Kapase, Sansari Danda, Shreechhap and Tagare) as a potential site for PF survey in this cluster. From these five community forests, we collected biophysical information of 27 private forest owners. In this cluster we found *Schima wallichii*, *Pinus patula* and *Choerospondias axillaris* as dominant species in private forest. Banje Kapase CFUG has been identified a suitable site in Chautara cluster for establishment of research trials of *Choerospondias axillaris*.

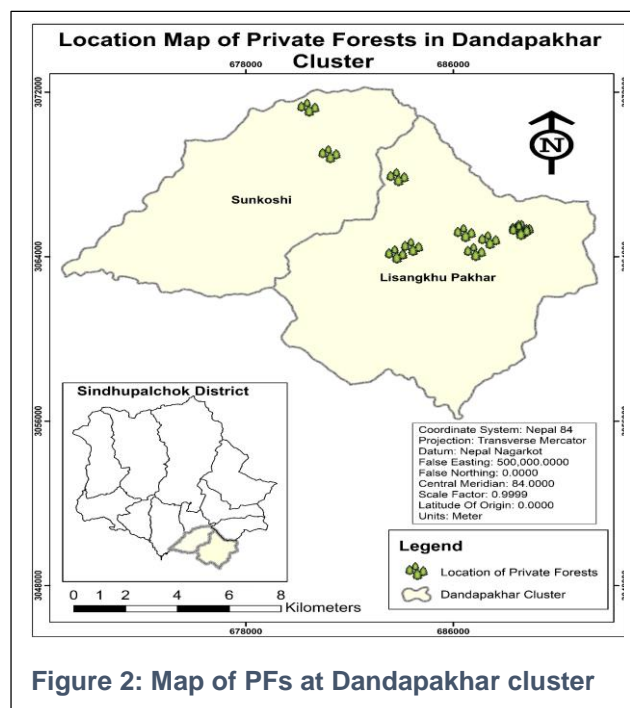
**Table 2: Biophysical information of private forests of Chautara Cluster**

Characteristics	Unit/ age class	Lampate CF	Banje Kapase	Sansari	Shreechhap	Tagare	Total
No of PF HHs	NO	130	15	68	162	50	425
Dominant spp	Type	Schima wallichhi	Choerospondias axillaris	Schima wallichhi & Pinus patula	Schima wallichhi	Schima wallichhi	
Mean girth (cm) by age class	year 6-10	52	37	61	55	18	45
	Year 11-15	70	70	72	79	32	65
	Year > 15	82	119	90	98	88	95
Mean ht (M) by age class	year 6-10	16	12	17	16	4	13
	Year 11-15	20	19	20	21	8	18
	Year > 15	21	27	23	24	17	22
Total number of trees	Year up to 5	5782	246	3180	15449	25	24682
	year 6-10	4275	191	2251	10603	50	17370
	Year 11-15	3299	192	1800	8627	66	13984
	Year > 15	1262	97	883	4703	44	6989
Total volume (m <sup>3</sup> )	year 6-10	849	12	550	2081	0	3492
	Year 11-15	1311	71	703	4567	2	6654
	Year > 15	703	145	648	4415	23	5934
Total volume (m <sup>3</sup> )		2863	228	1901	11063	25	16080

## Dandapakhar Cluster

Lisangkhu Pakhar rural municipality and Sunkoshi rural municipality collectively formed a Dandapakhar cluster. The total coverage area of Lisangkhu Pakhar rural municipality and Sunkoshi rural municipality is 98.61 Km<sup>2</sup> and 72.84 Km<sup>2</sup> respectively. According to the Census 2068 B.S. (2011 A.D.), the total population of Lisangkhu Pakhar rural municipality is 15155 and Sunkoshi rural municipality is 16713. There are only three registered private forests in this cluster which occupies area of 4 ha (DFO Sindhupalchok). In this survey, we collected biophysical information of 48 (35

HHs from Lisangkhu Pakhar & 13 HH from Sunkoshi) households within six different community forest including two CF (Jhagare & Deurali) from Sunkoshi rural municipality and four CF (Bhanjang, Bolde, Tamche, Lamachaur and Deupokhari) from Lisangkhu Pakhar rural municipality. Recently, Thokarpa village within Sunkoshi Rural Municipality of this district was declared as the Community Forestry Learning Center by the government of Nepal. *Schima wallichii* (Chilaune), *Pinus patula* (Patesalla) and *Alnus nepalensis* (Utis) are the major dominant species in this cluster. From research point of view, Dandapakhar Cluster is one of the best sites for research trial plot establishment of Chilaune (*Schima wallichii*), Utis (*Alnus nepalensis*) and Pate salla (*Pinus patula*). The total available timber volume of the trees is 37173m<sup>3</sup> whereas the timber volume that can be obtained from trees more than 15 years is 14,476 m<sup>3</sup> (Table 3) of which nearly one fourth of the timber can be harvested for sale. This is a good site for multi-storey agroforestry plantation as there is plenty of space in between Schima trees and abandoned lands around where we can initiate multi-storey interaction study.



**Table 3: Biophysical information of private forests of Dandapakhar Cluster**

Characteristics	Unit/ age	Bhanjyang	Bodle	Tamche	Lamachaur	Deupokhari	Deurali	Jhagare	Total
No of PF HHs	NO	30	58	30	70	70	125	145	528
Dominant spp	Type	Alnus nepalensis P. patula	Alnus nepalensis, P. patula	P. patula	Schima wallichhi	Pinus. patula	Schima wallichhi	Schima wallichhi	
Mean girth (cm) by age class	year 6-10	70	71	44	44	65	44	59	57
	Year 11-15	94	86	64	68	82	62	71	75
	Year > 15	111	103	109	87	107	91	110	103
Mean ht (M) by age class	year 6-10	19	19	14	14	18	14	17	16
	Year 11-15	24	22	18	19	21	18	20	20
	Year > 15	26	25	23	22	25	22	26	24
Total number of trees	Year up to 5	2748	10250	2574	8736	11900	2462	8646	47316
	year 6-10	2515	6913	1756	6048	8324	1706	5987	33249
	Year 11-15	1737	5766	1429	4928	6724	1429	4881	26894
	Year > 15	625	3115	778	2688	3499	758	2661	14124
Total volume (m3)	year 6-10	981	2721	192	606	2814	181	1394	8889
	Year 11-15	1458	3795	476	1719	4006	396	1958	13808
	Year > 15	800	3237	618	1839	4101	563	3318	14476
Total volume ( m3)		3239	9753	1286	4164	10921	1140	6670	37173

## Banepa Cluster

Banepa, a municipality and historical town is a valley situated at about 1463 meters above mean sea level. It is located in central Nepal which is about 25 kilometres east from Kathmandu. There are 14 wards in Banepa municipality which occupies around 54.49 km<sup>2</sup> of land (CBS, 2017). Survey of private forest in Banepa cluster was done in five different community forests (Dhunge Pakha, Hile Jaljale (ka) and Kha, Bhagawan Thumki, Basuki and Kalika). The extent of private forests in this cluster is relatively lower: 350 private forests. The reason being the closest city of Kathmandu valley. Dominant species of this area are *Alnus nepalensis* and *Schima wallichii*. A total of 33 private land

owners' survey was conducted. Total volume of timber from this cluster is 10078 m<sup>3</sup>. Harvestable volume of timber above 15 years age is 3380 m<sup>3</sup> (Table 4).

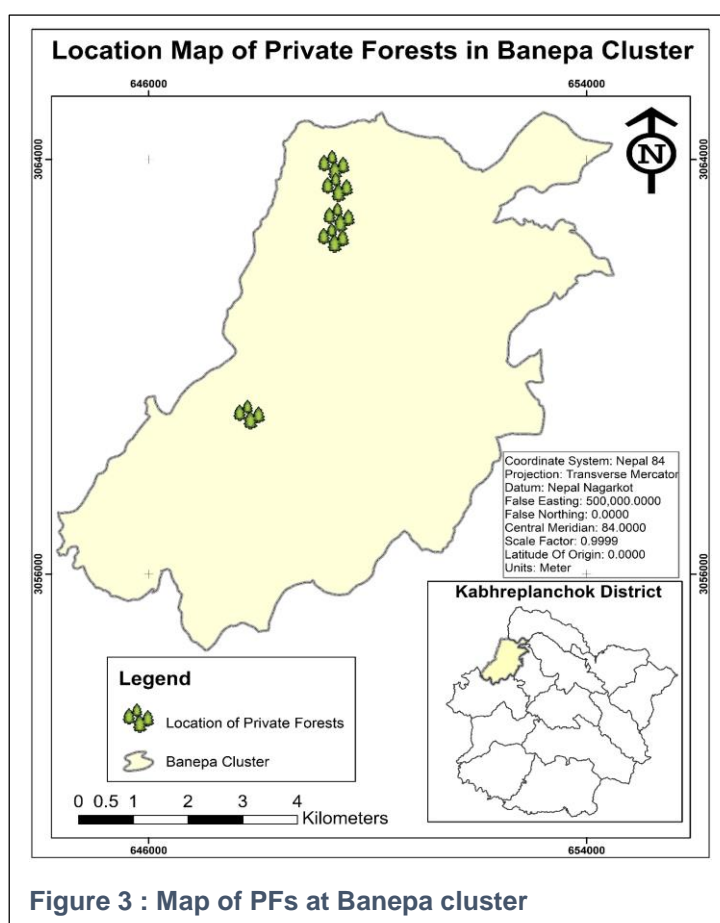


Figure 3 : Map of PFs at Banepa cluster

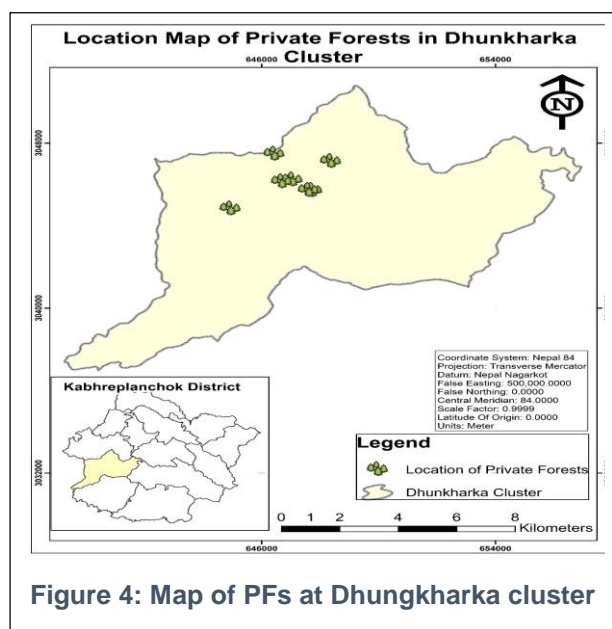
Table 4: Biophysical information of private forests of Banepa cluster

Characteristics	Unit/ age	Dhunge Pakha	Hile Jaljale (KA)	Hile Jaljale (KHA)	Bhagawan Thumki	Basuki	Kalika	Total
No of PF HHs	NO	85	15	20	120	80	30	350
Dominant spp	Type	Schima wallichhi	Cinamomum tamala	Schima wallichhi	Schima wallichhi	Schima	Schima	
Mean girth (cm) by age class	year 6-10	43	61	61	65	71	58	60
	Year 11-15	64	78	71	65	70	75	71
	Year > 15	80	94	84	89	98	86	89
Mean girth (cm) by age class	year 6-10	13	18	18	18	20	17	17
	Year 11-15	18	21	20	18	19	21	20

Mean ht (M) by age class	Year > 15	21	23	22	22.6	24	22	22
Total number of trees	Year up to 5	2192	646	1586	4649	5120	1854	16047
	year 6-10	1489	547	1099	3238	3565	1295	11233
	Year 11-15	1214	550	895	2592	2855	1031	9137
	Year > 15	675	115	488	1300	1438	499	4515
Total volume (m <sup>3</sup> )	year 6-10	146	144	267	1071	1425	420	3473
	Year 11-15	362	239	327	807	1041	449	3225
	Year > 15	361	98	279	941	1325	376	3380
Total volume ( m <sup>3</sup> )		869	481	873	2819	3791	1245	10078

## Dhungkharka cluster

Bethanchwok, rural municipality in Kavrepalanchok District is situated in the Bagmati Zone of central Nepal about 50km south east of Kathmandu. This survey was conducted in the buffer zone of five different community forests, namely Kalapani, Gelkhola, Janagagriti, Narayansthan and Bethanchok Narayansthan CFUGs. In this cluster, the forest comprises of Sub-tropical to temperate type. The major dominant forest species in this area are *Alnus nepalensis* (Utis), *Schima wallichii* (Chilaune), *Pinus roxburghii*, *Pinus patula*, & *Pinus wallichiana* (Salla), *Prunus cerasoides* (Painyu), (*Rhodendron arboretum* (Laligurans), *Quercus semicarpifolia* (Khasru) and *Castanopsis indica* (Katus). Total available volume of timber from this cluster is 19220 m<sup>3</sup>. Similarly, trees above 15 years age will have more than 7926 m<sup>3</sup> of which half of the timber can be harvested.



**Table 5: Biophysical information of private forests of Dhunikharka cluster**

Characteristics	Unit/age	Kalapani	Gel Khola	Janajagriti	Narayansthan	Bethan chowk	Total
No of PF HHs	NO	150	10	100	102	92	454
Dominant spp	Type	<i>Alnus nepalensis and Pinus wallichiana</i>	<i>Alnus nepalensis</i>	<i>Alnus nepalensis</i>	<i>Alnus nepalensis and Pinus wallichiana</i>	<i>Alnus nepalensis</i>	
Mean girth (cm) by age class	year 6-10	45	64	44	43	51	49
	Year 11-15	72	77	64	81	79	74
	Year > 15	89	98	83	103	97	94
Mean ht (M) by age class	year 6-10	15	18	14	13	15	15
	Year 11-15	21	21	20	21	21	21
	Year > 15	25	24	23	25	24	24
Total number of trees	Year up to 5	6076	292	2875	16572	3900	29715
	year 6-10	4275	198	4189	11543	2767	22972
	Year 11-15	3403	157	3292	9241	2209	18302
	Year > 15	1659	80	1278	4646	1073	8736
Total volume (m <sup>3</sup> )	year 6-10	540	60	414	1099	467	2580
	Year 11-15	1447	77	1044	5006	1140	8714
	Year > 15	1293	74	808	4788	963	7926
Total volume (m <sup>3</sup> )		3280	211	2266	10893	2570	19220

## Chaubas Cluster

Chaubas, currently Bhumlu rural municipality is located in Kabhrepalanchok district, in Province no 3 of central Nepal, about 75 Kilometres northeast of Kathmandu. At the time of the 2011 Nepal census it had a population of total 19298. The area covered by this municipality is 91.5 km<sup>2</sup> (<https://www.citypopulation.de/php/nepal-mun-admin.php?adm2id=2403>):

The vegetation of this area ranges from sub-tropical forest to temperate coniferous forest. The most common tree species are *Pinus patula* and *Pinus wallichiana* promoted by earlier Nepal Australia Community Forest Project. Other important species include *Rhododendron arboreum*, *Alnus nepalensis* and *Schima wallichii*.

This survey was conducted in areas of Fagarkhola, Lankuri, Dharapani and Chanp pani community forests as potential sites for private forestry. From this cluster, a total of 20 private forests were surveyed from Fagarkhola CF, Lankuri CF, Dharapani CF and Chap pani CF. *Pinus patula* and *Alnus nepalensis* are the Major dominant species in these private forests. This is the first largest cluster in terms of availability of timber above 15 years age (Table 6). This cluster has a total of 12,934 m<sup>3</sup> available, of which above 15 years timber volume is 5036 m<sup>3</sup>. This volume of timber is largely from pine forest (Table 6).

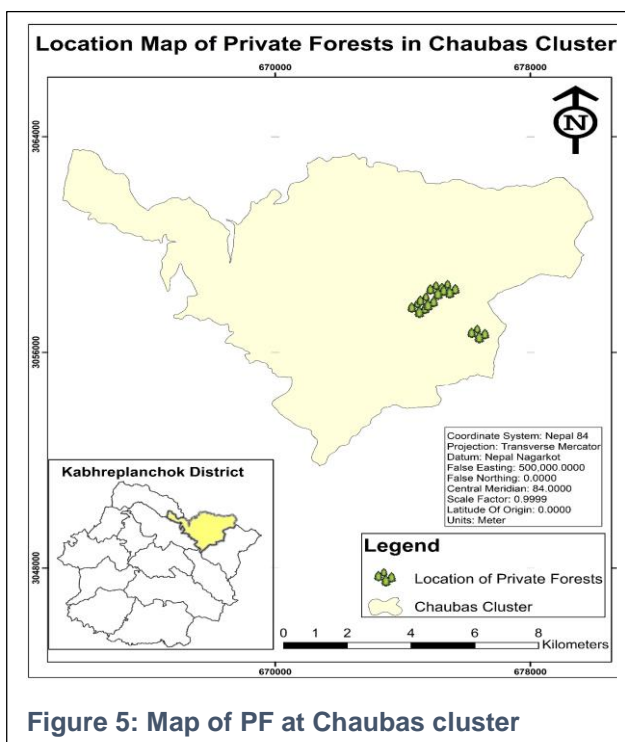


Figure 5: Map of PF at Chaubas cluster

**Table 6: Biophysical information of private forests of Chaubas cluster**

Characteristics	Unit/ age	Fagar khola	Lankuri	Dhara pani	Chhap Pani	Total
No of PF HHs	NO	40	60	43	96	239
Dominant spp	Type	<i>Alnus nepalensis</i> & <i>Pinus Patula</i>	<i>Alnus neplaensis</i> & <i>Pinus Patula</i>	<i>Pinus patula</i>	<i>Pinus patula</i>	
Mean girth (cm) by age class	year 6-10	44	39	60	62	51
	Year 11-15	73	75	87	75	76
	Year > 15	108	109	102	84	101
Mean ht (M) by age class	year 6-10	14	12	17	18	15
	Year 11-15	20	20	23	20	21
	Year > 15	25	26	25	24	25
Total number of trees	Year up to 5	4642	3987	9018	10717	28364
	year 6-10	3214	2835	3382	6341	15772
	Year 11-15	2619	2287	2767	5274	12947
	Year > 15	1429	1249	1137	2103	5918
Total volume (m <sup>3</sup> )	year 6-10	350	200	824	977	2351
	Year 11-15	1137	1032	1888	1490	5547
	Year > 15	1673	1520	1146	697	5036
Total volume (m <sup>3</sup> )		3160	2752	3858	3164	12934

## POTENTIAL SITES FOR ESTABLISHMENT OF RESEARCH TRIAL PLOTS IN PRIVATE FORESTS

During the preliminary survey, 52 potential private forests owners were identified for PF management trial, of which more than half (28 farmers) were selected for private fodder tree plantation trial and six were selected for planting *Cinnamomum tamala* and *Michelia champaca* trees on under-utilized land (Table 7). The selection of trial plots was based on the site, species, accessibility, age gradation and interest of the private forest owners. Some of the potential trial plots are listed below:

### 1. **Multi age mixed pine and broad**

**leaf (Utis) forest trial:** The four farmers at Bhanjyang CF of Dandapakhar cluster (Table 7) are interested for both mixed pine and broad leaf (utis) management of existing private forests and new plantation trial on underutilized land (UUL). Underutilized land before PF (photo 1) belong to these farmers, which they want to develop for commercial



Figure 6: Suitable site for mixed pine and utis trial

plantation. Farmers' choice for commercial trial is *Texus baccata* and *Cinnamomum tamala*. *Juglans regia* (Walnut) and *Zanthoxylum piperitum* (timur) are also preferred by farmers in this area. Next to underutilized land are the private forests of mixed trees of four to six farmers at Bhanjyang CF.

**Table 7: Sites for establishment of Research trial plots**

Private forest owners	Name of CF	Address	Research suitable for
1. Dilmaya/Tilak Shrestha	Bhanjang	Lisangkhu Pakhar 4 (Sindhupalchok)	Mixed Pine and broad leaf (Utis) & new plantation trial
2. Uttam Shrestha	Bhanjang	Lisangkhu Pakhar 4 (Sindhupalchok)	Mixed Pine and broad leaf (Utis) & new plantation trial
3. Thakur Shrestha	Bhanjang	Lisangkhu Pakhar 4 (Sindhupalchok)	Mixed Pine and broad leaf (Utis) & new plantation trial
4. Ramesh Shrestha	Bhanjang	Lisangkhu Pakhar 4 (Sindhupalchok)	Mixed Pine and broad leaf (Utis) & new plantation trial
5. Kul Bikram Thapa	Lamachaur CF	Lisangkhu Pakhar Sindhupalchok	Multi aged Schima wallichhi trial
6. Anju Thapa/ Khatra Kumari Thapa	Lamachaur CF	Lisangkhu Pakhar Sindhupalchok	Multi aged Schima trial/ Multi aged Alnus nepalensis trial
7. Raj Kumari Thapa	Lamachaur CF	Lisangkhu Pakhar Sindhupalchok	Multi aged Schima wallichhi trial
8. Sashi Sakya	Bodle CF	Lisangkhu Pakhar Sindhupalchok	New plantation trial- Alnus nelalenis and pine
9. Khop Prasad Gautam	Dharapani	Bhumlu, Chaubas, Kavre	Pinus Patula trial age between 6 to 12 years
10. Jhamka Pd Chaulagain	Dharapani	Bhumlu, Chaubas, Kavre	Pinus patula trial age between 6 to 12 years
11. Hom Nath Chaulagain and brothers	Dharapani	Bhumlu, Chaubas, Kavre	Pinus patula trial of pole sized tree
12. Guman Dhoj Kunwar	Dharapani	Bhumlu, Chaubas, Kavre	Pinus patula trial age between 2 to 3 years
13. Ghammar Bdr Bharati	Banje Kapase	Chautara-8, Sindhupalchok	Old age Choerospondias axillaris (Lapsi) tree trial
14. Shambhu Dangal	Banje Kapase	Chautara-8, Sindhupalchok	Old age Choerospondias axillaris (Lapsi) tree trial
15. Ram Krishna/ Parbati Shrestha	Kalapani	Dhungkharka, Kavre	Multi aged Alnus nepalensis (Utis) trial
16. Narayan Shrestha	Kalapani	Dhungkharka, Kavre	Multi aged Alnus nepalensis (Utis) trial
17. Krishna Hari Shrestha	Kalapani	Dhungkharka, Kavre	Multi aged Alnus nepalensis (Utis) trial
18. Shyam Krishna Timilsina	Bethanchok Narayansthan	Dhungkharka, Kavre	Multi aged Alnus nepalensis (Utis) trial

**Table 7 Cont.**

Private forest owners	Name of CF	Address	Research suitable for
19. Mr. Sudarsan Giri	Hile Jaljale-Kha	Banepa-2, Kavre	Multi aged <i>Alnus nepalensis</i> (Utis) trial
20. Mr. Hira Mani Ghimire	Hile Jaljale Ka	Banepa-2, Kavre	Cinnamon lopping trial
21. Bed Prasad Timilsina	Jan Jagriti	Dhungkharka, Kavre	New Plantation trial- Loath salla
22. Tika Dutta Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
23. Punya Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
24. Punyawati Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
25. Kedar Nath Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
26. Laxmi Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
27. Gopal Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
28. Chet Bahadur Parajuli	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
29. Mina Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
30. Rita Sapkota	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
31. Santa Bahadur Tamang	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
32. Krishna Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
33. Lok Nath Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
34. Yam Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
35. Tanka Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
36. Baikuntha Aryal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial

**Table 7 Cont.**

Private forest owners	Name of CF	Address	Research suitable for
37. Hom Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
38. Jeeban Krishna Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
39. Bal Krishna Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
40. Bhakta Kumari Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
41. Bhes Khatri	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial / Agroforestry in UUL
42. Parbati Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial / Agroforestry in UUL
43. Sunita Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
44. Sumitra Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
45. Maiya Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial / Agroforestry in UUL
46. Saru Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
47. Urmila Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
48. Sita Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
49. Dadi Ram Ramtel	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial / Agroforestry in UUL
50. Rudra Prasad Nepal (Manged by Shivaram Nepal)	Tagare	Dadhuwa, Sindhupalchowk	Agroforestry in UUL
51. Yadav Prasad Nepal	Tagare	Dadhuwa, Sindhupalchowk	Fodder trial
52. Badri Nepal	Tagare	Dadhuwa, Sindhupalchowk	Agroforestry in UUL

2. **Multi aged *Schima/ Alnus* and *Michelia* forest garden:** The second group of farmers (SN 5 to 7 in Table 7) are members of Lamachaur CFUG. They have more than two ha of *Schima* forests on their private lands. *Schima* trees were naturally grown and are in huge number exceeding 1000 trees (photo 2) of different age classes per farm.



**Figure 7: Suitable site for multi-aged *Schima/ Alnus* plantation**

There are other five to ten farmers having large number of *Schima* trees of different age classes. Trees are not managed for long time almost two decades. Farmers are interested to participate in the *Schima* tree management trial for maximized production and getting more benefits through participation in *Schima* timber value chain. Under the *Schima* forest, Cinnamon trees are planted. Similarly, for the comparison, nearby *Alnus nepalensis* plot will be taken; moreover, in underutilized land, *Michelia chamapaca* (Champ) will be planted to compare the productivity of Tejpat (*Cinnamomum tamala*) and Alaichi (*Elettaria cardamomum*) under different dominant tree species. The elevation range of this area is 1300 to 1500 masl. This area is accessible from the Sub-divisional Forest Office at Dandapakhar.

3. ***Pinus patula* trees thinning on private forest:** In Chaubas, Bhumlu cluster, private forest covered with trees of 15 years age will be used as demonstration of *Pinus patula* thinning trial. Similarly, nearby saplings of *Pinus patula* with age of 2 to 3 years will be used as demonstration site for thinning of saplings. The farmers are very enthusiastic about this trial.



**Figure 8: Suitable site for *Pinus patula* thinning on private forest**

4. **Older aged *Choerospondias axillaris* (Lapsi ) trial (farmer SN 13 to 14 in Table 7):** In Chautara, Sindhpalchowk, *Choerospondias axillaris* fruits of forest gardens are at retardation phase. There are many farmers (at least 10) who are having lapsi trees at Baje Kapase and Sanischare CFUGs area (Photo 4). We will take the measurement of the site characteristics of the lapsi trees and record the quality and quantity of lapsi fruits based on site characteristics.



**Figure 9: Suitable site for *Choerospondias axillaris* trial**

5. **Multi-age *Alnus nepalensis* (Utis) trees thinning trial:** Farmer serial no 15 to 19 have suitable site for multiple age class (photo 5) *Alnus* tree management. This is the biggest group of farmers who are having sufficient number of utis tree for trial. They are from two clusters (Dhungkharka and Banepa). The elevation of these area ranges from 1800 to 2200 masl.



Figure 10: Suitable site for *Alnus nepalensis* thinning trial

6. **Fodder trial, and planting of *Michelia champaca* and *Cinnamomum tamala* on UUL:** Having an elevation of around 1300 meters, Dadhuwa (Sangachokgadi Ward No. 14), Sindhupalchowk is recognized as the suitable site for fodder tree plantation. The farmers are interested in the plantation in their terrace risers as well as in underutilized lands. Similarly, in the lower belt of Dandagaon village of Daduwa, six trials for multi-story crops including *Michelia champaca* and *Cinnamomum tamala* is planned to be established. A total of 31 farmers including six above were identified for fodder trial on terrace risers. Fodder seeds direct sowing trial started beginning of May 2019. However, because of prolong drought, seeds have not yet germinated (June 18, 2019).

## CONCLUSION

This paper concludes that 95485 m<sup>3</sup> volume of timbers can be harvested from all sampled private forests in Sindhupalchowk and Kavrepalanchowk districts. However, even after having a large track of agricultural abandoned lands in both the districts, farmers are not able to utilize them properly due to labor unavailability and appropriate knowledge regarding the various agroforestry and silvicultural practices that could have been applied in these forests. With this rapid survey, various agroforestry practices and silviculture regimes that can be applied to the private forests; therefore, leading towards fruitful outcome from these trials and demonstrations in the selected demonstration sites in future.

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Annex 1: Cluster wise trees and volume M<sup>3</sup> in sample Private forest Owners' farms

Name of Cluster	Name of CFUG	No of PF owners	Sample PF	Dominant species in Sample PF	no. of sampled tree in different age class			Vol. of sampled tree in different age class (m3)			No of sample tree	vol. of sample tree (m3)	Total no. of sample tree	Total vol. of sample tree (m3)	Total No of trees in cluster	Total vol. of tree in cluster (m3)
					6 to 10	11 to 15	> 15	6 to 10	11 to 15	> 15						
Banepa	Dhunge Pakha, Hile Jaljale, Bhagwan thumki, Basuki and Kalika	350	33	<i>Schima wallichhi</i>	145	48	18	10.38	29.27	45.25	211	84.90	264	106.34	24885	10078.35
					27	21	5	1.89	6.02	13.54	53	21.44				
Chaubas	Fagarkhola, Lakuri, Dharapani, Chappani	239	21	<i>Pinus patula</i>	244	81	40	14.66	41.14	79.00	364	134.80	396	147.16	34637	12933.96
					16	13	3	1.09	3.47	7.80	32	12.36				
Dhung kharka	Kalapani, Gelkhola, Bethanchok Narayanstan, Janajagriti, Narayanstan	454	44	<i>Alnus nepalensis</i>	208	163	37	10.81	34.45	77.52	407	122.78	528	164.07	61921	19221.54
					81	27	13	4.49	12.60	24.20	121	41.29				
Chautara	Lampate, Banje-Kapase, Sansari, Srichhap, Tagare	425	27	<i>Schima wallichhi</i>	173	57	22	12.58	35.49	54.88	251	102.95	270	113.4	38343	16081.24
					11	5	3	0.35	2.00	8.08	19	10.43				
Lisankhu Pakhar	Bhajyang, Bodle, Tamche, Lamchaour, Deupokhari	258	35	<i>Alnus nepalensis</i>	129	101	23	12.43	39.59	89.10	252	141.12	420	238.49	51968	29360.15
					60	20	8	5.95	16.80	25.97	87	49				
				<i>Pinus patula</i>	54	18	9	5.29	14.85	28.51	81	48.65				
Sunkoshi	Deurali, Jagare	270	13	<i>Pinus patula</i>	72	23	9	5.70	16.07	24.84	104	46.61	104.00	46.61	17422	7808.53
<b>Total</b>		<b>1996</b>	<b>173</b>								<b>1982</b>	<b>816.05</b>	<b>1982</b>	<b>816.05</b>	<b>229176</b>	<b>95483.8</b>