Project Update: May 2016

Overview of Project progress
Presented here are the project updates for the period from January to April 2016. During the second quarter of project duration following activities were done.

1.   Estimating the availability of phyto-resources in the study villages
As mentioned in previous progress report, data was collected on availability of tree fodder (biomass) in agro-forestry systems of six villages (Table 1). Data were analysed and results are presented as follows:

Data analysis: A correction factor was calculated for the visually estimated data of phytomass. For this, fodder was estimated on a tree/ branch which was then cut and weighed. Both the values were noted and 10 such replications were made in each head-load category for different species. A linear regression equation was plotted as given in figure 1 and correction factor was calculated as given in eq. 1.
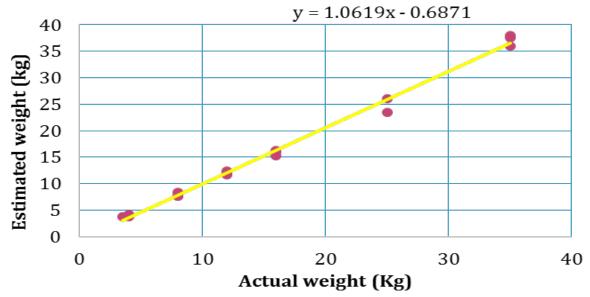

Figure 1. Plotting of Linear regression equation between estimated and actual biomass on fodder tree species in agro-forestry systems

The actual biomass was calculated from following equation,

$$\text{Actual biomass} = \frac{(\text{Estimated biomass} + 0.6871)}{1.0619} \qquad \text{eq. 1}$$

Results: The results show that availability of tree fodder in terms of biomass (kg/ha) and density of fodder trees (numbers/ ha) in the agroforestry systems (AFS) across the villages differed with respect to elevation and forest characters in the surroundings forests. Kotma had highest fodder biomass in the AFS followed by Thapondi settlement in Raulenk village. In Kotma, many families have migrated out or abandoned agricultural fields due to landslides. The surrounding

sanctuary forest is Chir Pine dominated forest which provides no fodder for village cattle. As a result, fodder species have been planted in the abandoned fields also. In Thapondi (a settlement of Raulenk), the houses are closer to riverine forest (primarily *Alnus* dominated patches on landslide affected slopes) and are father from Banj oak forest that is closer to ridges (> 2 km from here). Therefore, people have worked towards enhancing the availability of fodder in AFS. Both, Chaumansi and Jaal Malla had least biomass availability and density in the AFS. Both the villages have access to forest fodder (both tree and grass fodder) in closer vicinity. Also, at higher elevation only few fodder tree species grow well which limits the choice of fodder for AFS.

Results of the species-wise available green biomass in villages like Kaviltha, Kotma, Buruwa and Raulenk show that the cultivated species had higher biomass in AFS while Chaumansi and Jaal Malla with better fodder availability in forest, had higher biomass of *Quercus leucotrichophora* or Banj which is a naturally occurring species. In all of the villages, Banj individuals were those which were left along the field boundaries while clearing the forest (or were in fields on recently encroached forest land) and rarely any planted individuals were seen.

These results will be clubbed with results of work done in previous project (both agro-forestry and forest biomass availability). Results of biomass in AFS of these villages are similar to previous work where biomass availability co-related with elevation and vegetation characters of nearby forest and will strengthen our findings.

Plate 1: Chir pine forest above Kotma; these forests do not provide fodder to villagers for which they have to travel farther

Table 1. Village-wise results of tree fodder availability in agro-forestry system (HEV: High elevation village, MEV: Mid-elevation village, LEV: Low elevation village; multi-purpose tree species includes fodder, fruit and timber trees)

Village Name	Location of village wrt KWS	Elevation category*	Neighbouring forest type	Numbers of Multi-purpose tree species in AFS	Numbers of Fodder tree species in AFS	Total fodder biomass (Kg/ha)	Density of fodder trees/ha	Density of saplings/ ha
Chaumansi	Inside	HEV (1913-2225 m amsl)	Oak- *Rhododendron* mixed forest Grassy slopes	11	7	881.22	61	27.33
Jaal Malla	Along the Sanctuary boundary	HEV (1761-2069 m amsl)	Oak- *Rhododendron* mixed forest Grassy slopes	14	8	710.41	48.33	13.61
Raulek	Along the Sanctuary boundary	MEV (1553-1686 m amsl)	Chir pine (*Pinus roxburghii)* forest Oak- *Rhododendron* mixed forest Grassy slopes	25	15	913.24	63.47	66.11
Thapondi settlement	> 2 km from Sanctuary forest	LEV (1342-1484 m amsl)	*Alnus* mixed forest	17	10	2009.78	133.33	150.67
Buruwa	Along the Sanctuary boundary	MEV (1444-1680 m amsl)	Oak- *Rhododendron* mixed forest *Alnus* mixed forest	25	13	1577.93	124.82	77.01
Kotma	Along the Sanctuary boundary	MEV (1424-1713 m amsl)	Chir pine (*Pinus roxburghii)* forest	29	15	2740.67	252.28	200.35
Kaviltha	Along the Sanctuary boundary	MEV (1526-1650 m amsl)	Chir pine (*Pinus roxburghii)* forest	23	13	1857.13	149.82	136.14

Table 2: Green biomass of fodder tree species encountered in the agro-forestry system of study villages

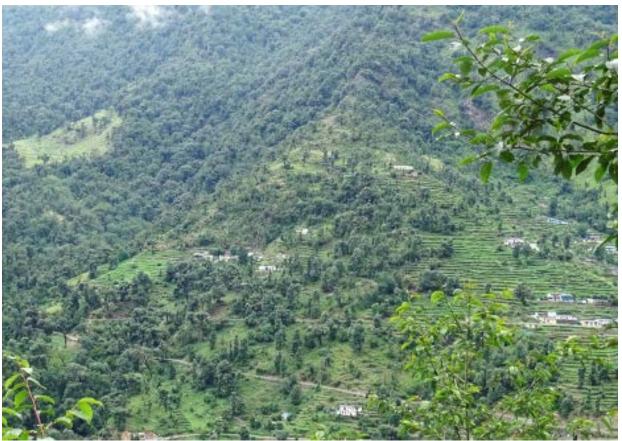| Species	Kaviltha	Kotma	Buruwa	Chaumansi	Jaal Malla	Raulenk	Thapondi
Bauhinia variegata	-	1.97	-	-	-	21.31	8.18
Celtis australis	**226.66**	306.62	173.62	0.00	17.65	**308.27**	**664.87**
Debregeasia hypoleuca	64.09	140.09	58.88	5.67	**53.49**	62.38	70.96
Engelhardtia spicata	104.73	5.93	-	-	-	11.11	-
Ficus palmata	107.37	5.93	41.35	-	-	0.00	0.00
Ficus roxburghii	**265.65**	226.33	**506.36**	5.67	23.14	**144.00**	**614.01**
Ficus semicordata	1.97	-	2.38	-	-	-	23.88
Ficus sp.	-	0.00	-	-	-	-	-
Ficus subincisa	**477.45**	**777.80**	**271.25**	258.05	-	**229.93**	291.32
Ficus nemoralis	89.86	219.06	**184.44**	-	**166.75**	59.24	-
Grewia optiva	116.96	**315.87**	104.34	-	-	-	8.18
Litsea monopetala	273.58	92.50	74.68	-	5.88	31.51	**320.20**
Lyonia ovalifolia	5.93	15.19	-	**49.93**	29.94	0.00	-
Morus alba	4.61	8.58	32.69	-	17.39	13.20	-
Quercus floribunda	-	-	-	0.00	-	-	-
Quercus glauca	-	-	-	-	-	20.53	-
Quercus leucotrichophora	118.28	**616.23**	120.36	**561.91**	**396.16**	7.97	8.18
Quercus sp.	-	-	7.57	-	-	3.79	-
Symplocos chinensis	-	-	-	-	-	0.00	-
Symplocos sp.	-	8.58	-	-	-	-	-
Total	1857.13	2740.67	1577.93	881.22	710.41	913.24	2009.78

Plate 2: *Quercus* spp. dominated forests above Chaumansi; these forests provide good fodder to villagers and they do not have to travel far

2.   Assessing community participation in conservation of forests and natural resources
This was assessed for 15 villages in the study area and results for individual villages are being analysed through purposive sampling (as mentioned in previous updates). Results of initial analyses are as follows.

Gram sabha receives funds from block development office for various development works in the village, one of which could be plantation on wasteland and making check-dams to prevent erosion, however, not much money was spent on such activities in studied villages. Gram Panchayat look after the community forest and civil land with fodder plants in villages. Such land is closed for most part of the year and members of GP decide the days of resource collection. Most of these lands are characterized by dominance of grass species such as *Chrysopogon* sp., *Themeda* sp., *Apluda* sp., and *Pennisetum* sp. Member households get 5 - 50 head loads per household per year from these forests which amounts to fodder worth INR 1500 – 15,000. In some of the villages, these forests are opened for grazing also during winter months. Anyone who does not abide by the rules, has to pay a fine between INR 21 to 500. In villages which are situated inside the KWS, Updhi is done on land which is part of sanctuary but is closed for resource collection during late summer and monsoon.

Though the 'Van panchayat' were established during the British era in Uttarakhand, only two of the studied gram sabha *viz.,* Kalimath and Bhatwari (Bhatwari and Sansari villages) had registered 'Van panchayat'. Other villages like Raulek and Khonu had '*Bala Van panchayat'* who were trying to register these. The Sarpanch of Kalimath Van panchayat mentioned that though the panchayat was registered since 1950s, the budget allocated for the upkeep of forest is very limited. They had been asking for money for past few years for check dams but to no avail and a large part of forest which had Banj got washed away during 2013 floods. Third type of institutions were MMD (Women Welfare Groups or *Mahila Mangal Dal*) which are local groups of village women. In most of the villages these were registered with Block development office and while others were in the process of registration. The primary job of MMD was to organise women for activities such as cleaning of resource use trails in forest and forest streams, chasing away the macaques and Himalayan langurs who damage crops and convincing women to not extract resources from panchayat land during prohibited period and not to cut green branches. In villages with strong and committed GP and MMD, community forests were better conserved with less lopping signs and a recovery period of 2-5 years for the trees. However, it meant that these villages either collected the resources from Sanctuary forest or were depended on agro-forestry systems. Forest department (FD) gave saplings for plantation on village land but many interviewed Sarpanchs complained that after plantation FD staff never come back to look after the plantation. They demanded a watchman for upkeep of such plantation but understood the limited resources with FD. In some of the villages the Self Help Promoting Agencies gave saplings of fodder species such as *Bauhinia* sp., *Grewia* sp., and Napier grass to the member households which will improve the fodder availability within the AFS in long run within the villages. Few NGOs such as Himothan society are also working in the area with GPs to improving availability of fodder and fuel wood with the villages to reduce the pressure on forests.

3. Income enhancement activities and meetings with members of Self-Help Group

A meeting was held with the women and few of the products which were discussed in previous meeting were prepared (pickles, *Malta* squash and green salt). Of these, green salt (a mix of table salt and locally available herbs and spices) was chosen as the product for marketing. Women agreed upon that putting few hours in such activities will improve household's income. The prepared salt was brought to Dehradun and will be sold as an experiment and reviews will be taken.

4. Plantation activities

The idea of planting multi-purpose tree species in agro-forestry system was discussed with villagers who suggested few species that they preferred (Ficus spp., Celtis sp., Bauhinia sp.). It was decided that interested households will plant the saplings on their land and each will be responsible for these.

Plate 3. Women preparing green salt with locally available products

Future goals: In coming weeks, team is planning to study the forest conservation practices in a village named Makku in the fringes of Kedarnath Wildlife Sanctuary. The village presents among the best examples of community led conservation of forests and natural resources in the state of Uttarakhand. The plantation activity will be started at the onset of Monsoon (near end of June 2016).