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Need for Carrying Out National Forest Inventory in Nepal

National Forest Inventory (NFI) is carried out for assessing and updating the forest resource status to plan and support the sustainable management of the forest resources of the country. It generates information on national forestry characteristics such as volume, biomass, diameter distribution, growth, yield, and quality of forest resources. Other parameters included in NFI are land use structure and forest ownership, forest types and categories, forest health, biodiversity status, social, economical and environmental values of the forests.

In particular, **forest information generated through NFI is widely used for strategic and high level planning of** forestry sector. Being a signatory of multi-lateral environmental agreements, organizations and processes, the country is obliged to provide forestry related statistics and information periodically. For example, Food and Agriculture Organization of the United Nations (FAO) conducts Global Forest Resource Assessment every five years and also to other organizations to which Nepal needs to report forestry related statistics.

The Department of Forest Research and Survey (DFRS), under the Ministry of Forests and Soil Conservation, is a responsible government agency for conducting Forest Resource Assessment (FRA) at district and national level. In this context, DFRS has been carrying NFI for planning forest resource management. The first NFI was accomplished in the 1960s mainly focusing on merchantable and non merchantable timber volume whereas the second NFI, conducted after 30 years in the 1990s, covered volume, biomass, diameter distribution of the tree species and presence of NTFPs.

Efforts have been made to carry out next NFI covering environmental dimensions of the forestry sector using Airborne Laser Scanning technology for measuring the forestry characteristics. These efforts on NFI are in line with the Three Year Interim Plan (2007/08 - 09/10),

government's policy and programmes of the Fiscal Year 2008/09 and the Master Plan for Forestry Sector of Nepal (1989). The Proposed NFI should support the national efforts to access the environmental benefits of forestry sector in monetary terms from the international mechanism such as Reducing Emissions through Deforestation and Forest Degradation.

The NFI program needs adequate expertise in the concerned field to accomplish the work with high efficiency and accuracy. This could be possible only by strengthening capacity of the concerned staff members of the department. NFI programme also needs to include parameters like soil, under-storey vegetation, tree crown conditions, coarse woody debris, and lichen community of the forest composite. As some countries have already initiated efforts to include such parameters in their NFI, we could also work in connection with the global standards so that there will be consistencies in information sharing and update.

Carbon sequestration potential of *Alnus nepalensis* in the mid hill of Nepal: A case study from Kaski district

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This study was carried out to analyze the carbon content in different parts of *Alnus nepalensis*, and to assess the effect of aspect and altitude in the carbon storage in *Alnus nepalensis* as well as to quantify the total carbon sequestration (stock) in *Alnus nepalensis* forest in the mid-hills of Kaski District. The inventory for estimating above and below ground biomass of forest was carried out using stratified random sampling technique. The carbon content in different parts of *Alnus nepalensis* was quantified using combustion method in the laboratory. For determining the soil carbon content, six soil profiles from each aspect were excavated and soil samples were taken from soil profile up to 1 m depth for deep soil and up to bedrock for shallow soils at the interval of 20 cm. Mean carbon content in stem, branches, leaves and bark of *Alnus nepalensis* were found to be 40.52%, 33%, 9.56% and 16.4%, respectively. Total biomass carbon sequestered in northern aspect was 30.20 t/ha while for southern aspect it was 39.00 t/ha. In both the aspects higher carbon sequestration was observed at an elevation range of 1200-1300m i.e. 34.8 t/ha and 45.6 t/ha in northern and southern aspects, respectively. Soil carbon sequestration in northern and southern aspects was found to be 113.4 t/ha and 169.30 t/ha, respectively. The total carbon sequestration potential of *Alnus nepalensis* forest was estimated to be 186.05 t/ha.

Key words: *Alnus nepalensis*, altitude, aspect, carbon sequestration, mid hills

Drastic climate change and the escalating trend of the global warming have been triggered by human activities leading to elevated atmospheric carbon and greenhouse gas levels. Such change is unlikely to have occurred through natural forces alone. The biggest factor of present concern is the increase in CO_2 levels due to emissions from fossil fuel combustion, followed by aerosols (particulate matter in the atmosphere) which exert a cooling effect and cement manufacture. Other factors, including land use, ozone depletion, animal agriculture, deforestation and land use change also impact climate.

To control global warming there are many options such as the mitigative option- sequestration of CO_2 and reduction of emission; the adaptive option – adjustment in ways that reduce the negative impacts of temperature changes on the environment; and indirect policies - like controlling population growth or changing technologies. Among the options, forestry is one of the most cost-effective mitigating options (IPCC, 1995). Forests cover more than one third of the world's land area and constitute the major terrestrial carbon pool (Mellillo et al, 1990; Roberntz et al, 1999). Carbon (C) storage in forest ecosystems involves numerous components including biomass C and soil C.

Thus, in addition to various goods and services being provided to human beings, forests act as a natural storage for carbon at the global scale, contributing approximately 80% of terrestrial aboveground, and 40% of terrestrial belowground carbon storage (Kirschbaum, 1996). Overall, forest ecosystems store 20–100 times more C per unit area than croplands and hence play a critical role in reducing ambient CO_2 levels, by sequestering atmospheric C in the growth of woody biomass through the process of photosynthesis and thereby increasing the soil organic carbon (SOC) content (Brown and Pearce, 1994).

The main reason for forestry being of high interest is the flexibility provided by increased stocks of C in forests under the uncertainty regarding the impact of global warming (Solberg, 1997). Recognizing the importance of forest and soil in mitigating the greenhouse effect, an agreement was reached under the Kyoto Protocol (KP) to include forest and soil C

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sequestration in the list of acceptable offsets (UNFCCC, 1997). KP under the UNFCC links the environment with economy by establishing a global Carbon market. To implement KP, Clean Development Mechanism (CDM) is only flexible way that allows developing countries to participate in the emerging global climate market. The CDM allows industrialized counties to meet their emission reduction targets through projects in developing countries like Nepal, which contributes little to global warming. CDM has dual objectives of sustainable development and emission reduction (Sharma et al, 2004).

It is assumed that fast growing trees like *Alnus nepalensis* fix the atmospheric carbon in above and below ground biomass more rapidly compared to slow growing species. However, the actual carbon sequestration potentiality of *Alnus nepalensis* has not so far been assessed in mid hills of Nepal. The mid-hills of Nepal consist of large forest tracts of *Alnus nepalensis* at different elevations and aspects, which requires assessment of total carbon sequestration potential of such forest. Therefore, this study aims to establish the base line information for carbon sequestration potential of *Alnus nepalensis* forest at different elevation ranges and aspects.

Materials and methods

Study area

The study was carried out in Kaski district which is located on the western part of Nepal. It lies between the 83° 40' to 84° 12' latitude and 28° 6' to 28° 36' longitude and is at 200 km distance west of the capital. The elevation varies from 450 m to 7969 m from mean sea level. Due to variation in landscape and altitude, the climate and natural vegetation of the district varies with a great influence of the monsoon. Range of rainfall varies from minimum 3038 mm to 3353.3 mm. Similarly, temperature is maximum in April up to 33° C and minimum in January up to 5.6° C.

Sampling

Three sample plots of 20 m by 25 m were laid randomly in each site at different elevation ranging from (1000-1600 m) and two aspects (north and south) for collecting data. The quadrates of size 10m x 10m for poles, nested quadrates of size 1m x1m for regeneration, grass and herb were laid out, and measurement of individual trees/poles lying within the plots were taken.

Biophysical measurements:

Measurement of diameter at breast height (dbh) within each plot was the main biophysical measure. D-tape was used for measuring dbh.

Estimation of carbon content in different parts of *Alnus nepalensis*

Four samples of each stem, branch and leaf were collected during field visit. The samples were oven dried at 75 degree centigrade for 72 hours. Then, it was heated in muffle furnace at 400 ^{0}C for half an hour. The organic carbon contain of the samples was determined using following relations (Negi et al, 2003)

Carbon% = 100 - {ash weight + molecular weight of O_2 (53.3) in $C_6H_{12}O_6$} ..... (i)

Estimation of aboveground biomass

For estimating, the oven dry biomass of the tree components following biomass model was used

$\ln (W) = a + b*\ln (d)$ ..... (ii)

Where, W= is above ground oven dry biomass of tree (kg),

d = is the diameter at breast height (cm), and

a, b = are parameters estimated by MoFSC (1996) (see Table1).

Under growth biomass:

All under storey bushes, grasses and herbaceous layers within the nested quadrate were clipped and weighed. Clipped samples were sun dried for 3- 5 days. In addition, leaf litters and twigs within the quadrate were collected separately and sun dried and weighed.

Root biomass

It is also necessary to calculate the root biomass as roots play an important role in the carbon cycle as they transfer considerable amounts of C to ground,

Table 1: The estimated values of parameters (a and b) for the tree species

Species Parts	Alnus nepalensis		Schima wallichi		Castonopsis indica	
	a	b	a	b	a	b
Stem	-2.95	2.48	-2.78	2.23	-1.78	1.99
Branch	-4.44	2.36	-3.43	1.59	-2.14	1.40
Leaves	-4.77	2.23	-2.90	1.61	-1.63	1.45

where it may be stored for a relatively long period. However, the measurement of root biomass directly in the field is not a simple task. It requires a lot of time as well as experience, and therefore used the equation that has already been established.

For broad leaf vegetation,
Belowground biomass = 30% of aboveground biomass ..... (iii)
(Adopted from: Nepal, 2006)

Estimation of net carbon content

Carbon percent obtained from the equation (i) was used for the computing carbon content in stem, branches and leaves, which is 40.52%, 33% and 9.56% respectively.

While the carbon content for the understorey biomass was assumed 43% of dry biomass (Maclaren-Ford Robertson, 2001). The equations used for above and below ground biomass organic carbon are:

- Total above ground biomass organic carbon = {(total stem biomass * 40.52%) + (total branches biomass * 33%) + (total leaves biomass * 9.56%) + (total twig and litter biomass * 43%)} ..... (iv)
- Total below ground organic carbon = (total root biomass of tree) * 40.52% + total soil organic carbon ..... (v)

Soil Sampling

Soil samples were taken from soil profile up to 1m depth for deep soil and up to the bed rock for shallow soils at five different levels (0-20cm, 20-40cm, 40-60cm, 60-80cm, 80-100cm). A profile was dug at least six places in each aspect and soil samples was collected at above stated intervals and transported to laboratory for analysis.

Bulk density (BD):

Soil cores of 4 cm in diameter and 10 cm long was used for collecting the bulk density data of each soil layer. The weight of soil samples were measured after oven drying 24 hours at constant temperature of 105 ^{0}C in the laboratory.

BD = (Oven dry weight of soil) / (Volume of the soil) ..... (vi)

BD expressed in gm/cm^3

Soil organic carbon (SOC):

The Walkey-Black method (Jackson, 1958) was applied to measure the soil organic carbon percent. Total soil organic carbon was calculated using the formula given below. (Chabbra et.al, 2002):
SOC = Organic carbon content%*soil bulk density (kg/m^3)*thickness of horizon (m)

Further, it was expressed in t/ha

Results and discussion

Carbon content in different parts of *Alnus nepalensis*

Carbon content was found higher in the stem part i.e 40.52% and low in the leaves i.e 9.56%. Similarly, carbon content in the branches and barks were 33% and 16.41% respectively (Table 2). Carbon content was found higher in stem due to the higher density compared to leaves.

Table 2: Carbon content in different parts of *Alnus nepalensis*.

Name of parts	Sample No.	Mean Carbon %	SE Mean
Under stem	8	40.52	0.84
Leaves	4	9.56	0.38
Branches	4	33.00	0.40
Barks	4	16.41	2.85

Note SE: Standard Error

Estimation of biomass of tree:

The biomass of *Alnus nepalensis* varies with elevation range and aspects. In Northern aspect, higher biomass was found at the elevation range 1200-1300 m i.e. 4.596 t/plot while lower at the elevation range 1000-1100 m i.e. 2.604 t/plot. Similarly, higher biomass was found at the elevation range 1200-1300m i.e. 5.980t/plot while lower at the elevation range 1400-1500 m i.e 4.490 t/plot in Southern aspect. Thus, Southern aspect has 1.29 times higher biomass compared to Northern aspect. Difference in biomass at different elevation was due to the moisture content, soil property, temperature, duration of sunlight available and steepness of slope. Biomass was higher on Southern aspect than Northern aspect (Table 3 and 4) because the duration of sunlight is higher in Southern aspect, which directly promotes more photosynthesis than the Northern aspect. Therefore, the net primary productivity was found higher in Southern aspect forest. In both the aspect biomass was found in increasing order up to middle elevation range and than gradual decrease because with the increase in altitude the SOC and temperature decreases.

Table 3: Aboveground biomass in Northern aspect

Elevation Range	Mean(t/plot)	SE mean	Minimum	Maximum	Range	No. of plots
1000-1100	2.604	0.121	2.162	3.038	0.875	6
1100-1200	3.917	0.710	2.338	7.150	4.810	6
1200-1300	4.596	0.453	3.566	6.100	2.534.	6
1300-1400	4.396	0.863	2.814	8.407	5.593	6
1400-1500	4.330	0.253	3.357	5.040	1.682	6
1500-1600	4.288	0.854	2.152	8.151	5.998	6
Mean above ground biomass 4.022 t/plot						

Table 4: Aboveground biomass in Southern aspect

Elevation Range	Mean (t/plot)	SE mean	Minimum	Maximum	Range	No. of plots
1000-1100	4.514	0.573	3.040	6.542	3.502	6
1100-1200	5.408	1.387	1.660	9.756	8.096	6
1200-1300	5.980	1.273	2.761	1.046	7.702	6
1300-1400	5.640	0.719	3.467	8.435	4.967	6
1400-1600	4.490	0.684	2.576	6.636	4.059	6
1500-1600	4.808	0.860	3.084	8.990	5.902	6
Mean above ground biomass: 5.140 t/plot						

Note: t = ton, SE = standard error

Above ground carbon sequestration

It was found that above ground carbon sequestration was higher in Southern aspect than in Northern aspect (Table 5 and 6). The above ground carbon sequestration in Northern aspect and Southern aspect forests including *Alnus nepalensis*, *Castonopsis indica* and *Schima wallich*i was found 30.20 t/ha and 39.00 t/ha respectively. Similarly, in both the aspect higher carbon sequestered was observed at the middle range elevations (Fig 1). With the increase in the elevation, the carbon sequestration potential was found to decrease because temperature decreases as altitude increases.

During photosynthesis, carbon from the atmospheric CO_2 incorporates into products of organic compounds. All the organic compounds containing carbon are stored in different plant tissues as food. Thus, carbon appears as a part of plant biomass. The total aboveground organic carbon includes carbon on the aboveground tree biomass (eg. branch, stem), litter fall, twigs and biomass of undergrowth (Gautam, 2002).

Table 5: Above ground carbon sequestration in Northern aspect

Elevation Range	CS by				Total above ground CS	
	Stem	Branch	Leaves	Undrestorey	(t/plot)	(t/ha)
1000-1100	0.862	0.105	0.015	0.00012	0.982	19.64
1100-1200	1.310	0.150	0.022	0.00013	1.482	29.64
1200-1300	1.535	0.180	0.025	0.00014	1.740	34.80
1300-1400	1.474	0.172	0.023	0.00014	1.670	33.50
1400-1500	1.377	0.171	0.024	0.00015	1.572	31.40
1500-1600	1.431	0.168	0.023	0.00015	1.623	32.46
Mean above ground Carbon Sequestration: 30.20 t/ha						

Table 6: Above ground carbon sequestration in Southern aspect

Elevation Range	CS by				Total above ground CS	
	Stem	Branch	Leaves	Understorey	(t/plot)	(t/ha)
1000-1100	1.539	0.182	0.016	0.000144	1.737	34.74
1100-1200	1.815	0.207	0.028	0.000164	2.051	41.22
1200-1300	2.009	0.234	0.030	0.000173	2.273	45.46
1300-1400	1.890	0.221	0.290	0.000180	2.140	42.98
1400-1500	1.497	0.180	0.024	0.000183	1.701	34.02
1500-1600	1.610	0.190	0.025	0.000181	1.825	36.50
Mean above Carbon Sequestration: 39.00 t/ha						

Note: t = metric ton, CS = Carbon Sequestration

Higher carbon sequestration may be attributed by the fact that Southern aspect has higher biomass compared to Northern aspect. In Southern aspect duration of sunlight is longer compare to Northern aspect, which directly affects the photosynthesis. Therefore, the net primary productivity was found higher in southern aspect forest. In both aspects, higher carbon sequestration was in elevation range 1200-1300 m due to the dense biomass of the forest. It was found the lowest carbon sequestration in the southern aspect at the elevation range 1400-1500 m due to steepness of slope, which has affected the soil depth hence the root development. And in Northern aspect lower carbon sequestration was found at the elevation range 1000-1100 m, which lies near the river, and soil condition at that site was poor due to stoniness in the soil.

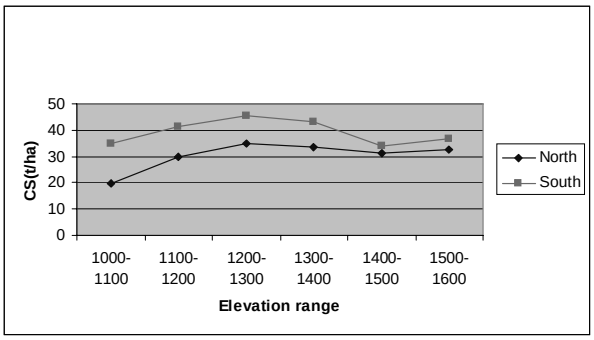

Figure1: Above ground carbon sequestration in *Alnus nepalensis*

Root carbon sequestration

Root carbon sequestration in the two aspects is shown in Table 7. The carbon content was calculated after calculating the root biomass assuming root biomass is 30 % of above ground biomass and the carbon content of roots is to be 40.52 % (table 2) of the calculated biomass. The total root carbon sequestration of *Alnus nepalensis* including the *Castonopsis indica and Schima wallichi* species for the Northern and Southern aspects of the forests was 8.191 t/ha and 12.500 t/ha, respectively. Similarly the higher root carbon sequestration was found at the elevation range 1200-1300 m i.e. 11.170 t/ha and 14.530 t/ha in both Northern and Southern aspect respectively. The higher value of root carbon sequestration in the Southern aspect forest at the elevation range1200-1300 m may be attributed to the higher above ground biomass and dense vegetation in the forest.

Soil Carbon sequestration:

Bulk density (Bd)

The range of bulk density in *Alnus nepalensis* forest based on the entire profile (0-100m) depths is shown in (Table 8). There was large variation in the Bd with respect to depth in the forest soils. There was a gradual increase in the Bd with the increase in the soil depth in both aspect The minimum Bd i.e 1.131 gm/cm^3 was found at the top soil while maximum 1.473 gm/cm^3 at the depth of 80-100cm in northern aspect. Similarly, in southern aspect minimum bulk density was found at top soil i.e. 1.007 gm/cm^3 and maximum at the depth of 80 – 100 cm i.e. 1.277 gm/cm^3.

The Bd depends on several factors such as compaction, consolidation and amount of SOC present in the soil but it is highly correlated to the organic carbon content (Morisada et al, 2004, Leifeld et al, 2004).

Table 7: Root carbon sequestration

Elevation Range	North			South		
	Root biomass(t/ha)	CS (t/plot)	CS (t/ha)	Root biomass(t/ha)	CS (t/plot)	CS (t/ha)
1000-1100	0.781	0.316	6.330	1.354	0.549	10.974
1100-1200	1.175	0.476	9.520	1.623	0.657	13.150
1200-1300	1.380	0.558	11.170	1.794	0.727	14.53
1300-1400	1.319	0.534	10.690	1.692	0.685	13.714
1400-1500	1.300	0.526	10.535	1.347	0.546	10.918
1500-1600	1.286	0.521	10.424	1.442	0.584	11.700
Mean root carbon sequestration		8.191 t/ha		12.500 t/ha		

Note: t = metric ton, CS = Carbon Sequestration

Table 8: Aspect wise bulk density at different depths

Depth	Northern aspect		Southern aspect	
	Mean (g/cm^3)	SE Mean	Mean (g/cm^3)	SE Mean
0-20	1.131	0.083	1.007	0.068
20-40	1.219	0.969	1.101	0.126
40-60	1.353	1.124	1.117	0.051
60-80	1.473	0.000	1.277	0.361

Note: SE = Standard Error

Table 9: Carbon stock in different soil profile depths of two aspect forests

Depth	Northern			Southern		
	N	Mean(kg/sq.m)	SE Mean	N	Mean(kg/sq.m)	SE Mean
0-20	6	3.67	0.97	6	4.33	0.67
20-40	6	2.77	0.69	6	3.61	0.51
40-60	6	1.85	0.42	6	3.58	0.84
60-80	1	1.65	0.00	2	3.07	0.27
80-100	1	1.40	0.00	2	2.34	0.30

Soil organic carbon

The soil organic carbon in forest soil depends upon the forest type, climate, moisture, temperature and types of soil.

Table 9 shows the depth wise distribution of SOC stock in the forests. Multiple comparison of means revealed that the SOC was higher at the upper layers in both the forest. Maximum SOC value 4.33 kg/sq.m was found at top layer while miminum 2.34 kg/sq.m was found at the lower depth in Southern aspect. In Northern aspect 3.67 kg/sq.m and 1.40 kg/sq.m was found at top and bottom layers. Thus, it was found that there was effect of soil depth and aspect on SOC.

The mean value of the sum of soil carbon sequestration in all layers along the soil profile is shown in Table 10. The carbon sequestration in the soil from the top layer of 0-20cm to 80-100cm depth for Northern aspect forest was found to be 11.34 kg/m2 and that of Southern aspect forest was 16.93 kg/m2 .Total SOC in Northern and Southern aspect forest was found to be 113.40 t/ha and 169.30 t/ha respectively. The actual soil organic carbon sequestration by *Alnus nepalensis* could not be analyzed due to lack of base line data of soil organic carbon in the study site. Therefore, the total soil organic carbon content is considered as the soil carbon sequestration.

Table 10: Soil Carbon sequestration in the two aspect forests

Aspect	Sum CS in all layers (kg/sq.m)	Tons/ha
Northern	11.34	113.40
Southern	16.93	169.30

Total carbon sequestration by *Alnus nepalensis*

The total carbon sequestration in the *Alnus nepalensis* forests is shown in Table 11. The total carbon sequestration was the sum of aboveground, root and soil carbon. Total carbon sequestration in *Alnus nepalensis* forest was found to be 151.80 t/ha in Northern aspect while 220.30 t/ha in Southern aspect. Mean carbon sequestration in *Alnus nepalensis* forest in both aspect was found to be 186.05 t/ha. Pinus and *Alnus nepalensis* are the fast growing soft wood so data was compared with Pinus. Above ground carbon sequestration and root carbon sequestration was found higher in *Alnus nepalensis* than in Pinus forest study of which was done in past by Nepal, 2006 at Palpa district. However, the carbon sequestration in soil was found lower compared to Pinus sps, which is attributed by the fact that *Alnus nepalensis* found in less fertile soil. It rapidly colonizes the gravelly land exposed by landslides and old cultivated land (Jacksons, 1994)

Carbon sequestration potential of *Alnus nepalensis* forest was found 76 percent in soil, while 19 percent in aboveground biomass and 5 percent in underground biomass. (Fig 2)

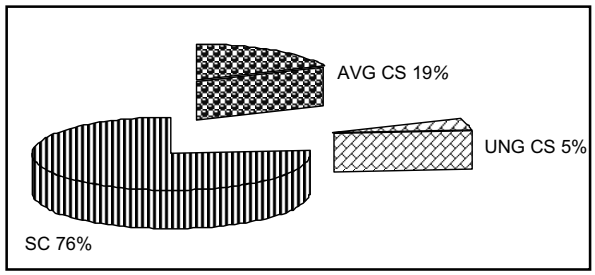

Fig 2: Carbon Sequestration in *Alnus nepalensis* forest

Table 11: Total carbon sequestration in *Alnus nepalensis* forest

SN	Carbon sequestration in	CS in northern aspect (t/ha)	CS in southern aspect (t/ha)
1	Above ground	30.20	39.00
2	Root carbon	8.19	12.00
3	Soil carbon	113.40	169.30
Total		151.80	220.30
Mean carbon sequestration by *Alnus nepalensis* forest of both aspect		186.05 t/ha	

Note: AVG CS = Above ground carbon sequestration,
UNG CS = Under ground carbon sequestration, SC = Soil carbon

Conclusion

- The above ground carbon sequestration in *Alnus nepalensis* forest in southern aspect was found 1.29 times higher than northern aspect of the same forest.
- The below ground carbon sequestration for southern aspect was found 1.49 times higher than northern aspect of the forest.
- Soil carbon sequestration was found 3 times as higher as total biomass carbon sequestration in *Alnus nepalensis*
- Carbon sequestration potential was found higher in both aspects of middle altitude as compared to lower and higher altitude.
- Bulk density increases while SOC decreases with the depth of the soil in both aspects.

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Improving the livelihoods of the poor and marginalized in Nepal through leasehold forestry and livestock program: A review of institutional constraints and opportunities

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The study looks at the opportunities and constraints of the contributions made by forest institutions to improve the livelihoods of the poorest, through an analysis of the Leasehold Forestry (LF) programme in Nepal – a forestry programme that aims to help alleviate poverty of forest dependent communities by leasing degraded land to the poorest. Data and analysis were primarily based from review of literature, consultations with key informants, field visits, and complemented by the authors' direct involvement in the implementation of LF programme. Although intended to improve the lives of the poorest, the LF programme could negatively affect the poorest when it excludes them or when it causes their displacement from the land that the poorest depend for their livelihoods. Such negative impacts of LF program can be attributed to its improper implementation and design. To improve its effectiveness and impact, awareness campaigns should be improved using diverse modes of communication, more line agencies should be involved in the implementation by transferring the implementation responsibility to a district-level project coordination committee, and some programme provisions should be changed in favour of the poor.

Key words: Forest institutions, leasehold forestry, poverty alleviation, Nepal

An increasingly popular school of thought on improving the livelihoods of the poor is to increase their access to the resources or "assets" they needed to make a living, by reforming institutions governing access, more favorable for the poor. This school of thought has been apparent in the trend of national forest policies of developing countries towards community-based forest management, which in principle, gives forest communities greater access rights to forest resources. However, despite changes in forest policies, it is a fact that many forest communities still have difficulty accessing forest resources. Notwithstanding the complexity of improving the livelihoods of poor forest communities, such difficulty underscores the constraints in implementing new, and presumably, more favorable institutions.

In Nepal, the shift in national forestry policy towards greater access for forest users has resulted in the institutionalization of various Community based Forest Management (CBFM) programmes. One of these programmes is the Leasehold Forestry Programme (LFP) which aims to improve the livelihoods of the poorest, by offering them access rights over degraded forest land. Although various studies have demonstrated the positive impacts of the LFP, other studies have also pointed out many of its limitations. One such limitation is in its ineffective implementation (Thoms *et al.* 2006).

This paper looks at the implementation aspect of institutional reform for the case of the LFP in Nepal. This study aims to develop a better understanding of the processes in the formation and make up of forestry institutions as well as the constraints on their effective implementation. In doing so, this study describes the existing forest institutions in Nepal, focusing on the LFP, in particular; identifies institutional constraints for its effective implementation; and recommends measures to improve the LFP or other similar forestry programmes in favor of the poorest. This study was conducted primarily through a review of related literature; consultations with key informants involved in the LFP; field visits to leasehold and community forest user groups; and from the authors' experiences working with Leasehold Forestry User Groups (LFUGs).

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Materials and methods

The study was carried out through a desk study of a number of published and unpublished literature on community forestry, leasehold forestry and other related subjects in Nepal; supplemented with consultation of the stakeholders; and the Collaboration/Conflict, Legitimacy, Interest and Power (CLIP) analysis.

The review of forestry and livelihoods related key literatures focused on the critical analysis of the current situation and how different programs and approaches were addressing it. Besides, various journal articles were also reviewed. Workshop proceedings were important sources of information for analyzing recent research and development highlights in the forestry sector of Nepal, and over viewing what is happening in forestry sector now? who is doing what? and what are the good practices and lessons learnt? Program and project related papers, the review reports and technical papers were also relevant to the analysis. The documents of various projects and programmes were useful in analyzing the approaches and strategies for inclusion, governance and sustainable resource management in community forestry.

Consultations were made with government staffs, I/NGOs personnel and the CFUGs working in community forestry and leasehold forestry in Nepal. This was done through series of meetings with relevant stakeholders including government line agencies. A number of consultation meetings were organized both at individual and organizational levels during the preliminary stage of the study. The main objective of this consultation was to collect relevant literature, inform them about the study as well as to gauge their perceptions about the research problem. Furthermore, a brief questionnaire was used to capture the perceptions of different stakeholders in understanding the current socio-structural context and their suggestions for improvement.

One-day stakeholder meeting was organized whe major stakeholders of CF and LF were invited. The workshop venue was used to carry out CLIP analysis[3]. CLIP tool was used in this study in order to ascertain various opportunities and constraints as perceived by 'key stakeholders' in the forestry sector. The CLIP workshop included representation from CFUGs, LFUGs, researchers as well as partners and other stakeholders from government agencies.

Result and discussion

The leasehold forestry programme

The LFP is one of the community-based forest management (CBFM) programmes being implemented by the Government of Nepal. It was first initiated in 1993 through the implementation of the first leasehold forestry project called the Hills Leasehold Forestry and Forage Development Project (HLFFDP). This was introduced primarily due to the widespread discrimination of the poorest, observed within the CFUGs, formed in the earlier CF programme and the necessity to mainstream the poor and marginalized groups into the overall national development.

Basically, LF is similar to CBFM programmes wherein forest users are organized into Forest User Groups (FUGs) and are awarded with rights and responsibilities to manage a patch of forest. The LFUGs have the same organizational structure and institution-making process as CFUGs. They prepare an Operational Plan (OP) with substantial assistance from the forest rangers. The LFP, however, tries to target the poorest members of the forest community and hands over degraded 'forests' through a 40-year leasehold agreement. As the LFP specifically targets the poorest of the poor[4], the groups are smaller in size, with around 5 to 15 members in one Leasehold Forest User Group (LFUG). Due to the livestock promotion component, LFP involves the Department of Livestock (DoLS) and other local service providers besides Department of Forest (DoF) in its implementation.

Impacts

The programme demonstrated success in achieving its objective of improving the livelihoods of its targeted poorest. Studies show that it (i) increased the assets of the poor, especially their livestock holdings (ii) improved the productivity of women and their participation in group activities and decision-making; and (iii) increased school attendance

[3] Collaboration/Conflict, Legitimacy, Interest and Power (CLIP) is a social analysis tool used in understanding the dynamics of stakeholders, their interest, power and legitimacy

[4] The poorest are to be identified based on the National Planning Commission (NPC)'s poverty threshold criteria which are based on type of dwelling, land/asset holding and food security.

and improved nutrition of the member-households especially of their children (Ohler 2003; HLFFDP 2003). The evidences of positive impacts provided a strong rationale for International Fund for Agriculture Development (IFAD) and the Government of Nepal to continue to support the approach of the programme, creating the Leasehold Forestry and Livestock Programme (LFLP) which would continue to implement the strategies of the HLFFDP and extending it further to 26 more districts.

Despite its achievements, several studies have also revealed constraints in the programme. Although the programme intends to target the poorest communities, many studies have demonstrated that in reality many of such households were left out and as a result, were further impoverished (Grinten and Dhakal 1997; Schuler 1997; Joshi *et al* 2000; Dhakal and Yadav 2000; Bhattarai *et al* 2003; Baral and Thapa 2003). The programme also resulted in conflict between LFUG and non-LFUGs, usually due to conflict over rights to the land being handed over and conflict over who are supposed to be included within the LFUGs (see for example Bhattarai, *et al* 2003; LI-BIRD 2004).[5]

Considering its further extension and expansion into a national programme, the obvious direction for improvement is to further increase its positive impacts while minimizing or eliminating its negative impacts. These require an analysis of the causes of its negative consequences and constraints.

Issues and constraints

There are various issues and constraints about the LFP that are cited in the literature. Given our focus on institutional constraints, we may limit the issues about the constraints on its implementation, and less on its provisions or design. We may present these issues at different levels of implementation i.e. at the community, programme and implementation, and policy level.

Constraints at community level

A primary issue at the community level is about equity, particularly the exclusion of the poorest in the programmes and eventually from the benefits generated from it; in some cases, the displacement of the poorest, in case of communities involved in shifting cultivation, as a consequence of this programme. Various reasons were offered to explain the exclusion of the poorest. One of these is the lack of awareness of the LF programme. The evaluation report of LFLP shows that not all the poor households received prior information about the selection of LFUG members. In many cases, these were reinforced by the remote geographical location of the poorest and poor infrastructure which limits the flow of information and mobility of the people (LFLP, 2005). As a result, there are evidences where some middle class and even richer households are included in the LFUGs (see Baral and Thapa 2003 and Bhattarai, 2003). These studies support the earlier study by Grinten and Dhakal (1997) which revealed that many leaseholder households are large land-holding farming families. In addition, some of the Leasehold Forest (LF) members have dropped out as they could not fulfill some requirements of LF membership such as regular attendance in meetings and other leasehold forestry activities which are required to maintain membership (LI-BIRD, 2004).

Implementation constraints

Obviously, the exclusion of the poorest is the opposite of what the programme intended to do and do not follow the design of the leasehold forestry implementation process. Many of the negative impacts of the programme can thus be attributed to its weaknesses in its implementation, particularly, the lack of capacity of its main implementing agency and weakness in monitoring implementation to conform to the appropriate process of implementation as designed.

Lack of capacity of DFOs

Although a multi-partner programme, the LF is still primarily being implemented by the DoF through its District Forest Office (DFOs), who are also implementing other CBFM programmes. Definitely for the DFOs and their forest rangers, the implementation of another programme would mean additional work. With no additional multidisciplinary staff besides forestry added to implement the LFP, the DFO and their staff would have to juggle their time and resources to accommodate the LFP, often resulting in shortcuts in the processes; and consequently, to lesser quality output. In addition, rangers often manage to provide training to groups

[5] The Programme is also criticized for low impact (i.e. very few people benefited) considering the investment made of around US$ 17 million implemented within seven years (see Yadav and Dhakal 2000).

even without much experience and expertise in the subject matter. Partly the problem lies in the limitation of both human and financial resources.

Lack of monitoring and weaknesses in evaluation

In principle, the LFP process of handing over forests to the poorest tries to minimize exclusion of the poorest as it is for this reason that this programme was introduced in the first place. However, as was demonstrated above, in many cases, forest handovers and the selection of recipients were not done as was designed or intended. Much of these constraints can be attributed to how programme implementation is monitored and outputs evaluated. Although participatory monitoring and evaluation was mentioned as one of the features of the programme, in reality, this is hardly done. Outputs are measured at the end of the project mostly based on quantity (e.g. number of households organized; area of degraded forests covered; number of training provided) rather than on quality (i.e. number of households getting off the poverty line; sustainability of livelihood projects implemented, and of LFUG groups). Communities often complain that the visit of rangers will be negligible immediately after the first year of implementation (LI-BIRD, 2004). Because of the emphasis on quantity outputs, line agencies often do not follow the ideal processes of implementation. Instead, they do some 'shortcut' methods such as not consulting the whole community in the identification of degraded land or in identifying the poorest, which could then later result to conflicts and unfair community forest institution through the LFP[6].

Design constraints

The constraints in the effective implementation of the programme can also be further attributed to its design.

Lack of capacity of User groups

Many of the constraints earlier mentioned can be attributed to the fact that the people being targeted and organized are the poorest. Being poor, they cannot afford to invest their time and resources to activities other than those that will give them immediate returns. They also lack the power to prevent other people from claiming their rights like the ones being provided through the LF programme. They are often illiterate, living remotely, or indebted to the better off households in their neighborhood[7]. These groups (particularly the genuinely poorest) need more than just two years of institutional and technical support but apparently, the project implementation is designed for such a short period of capacity building.

The lack of capacity of the LFUGs can also be attributed to their very small membership composition. The current leasehold groups range from 5-15 households, which are very small compared to CFUGs or other farmers group. This is a disadvantage when accessing external support since NGOs and other civil society organization look for a sizable community groups for collaboration and work. For example, there would be a problem registering LFUGs with the District Agriculture Development Office (DADO) and other district line agencies which require larger membership for them to provide support services.

Limited livelihood options under LF

Under the LFP, the cultivation of cereal crops is prohibited; only grasses, fodder, and trees are allowed. For a poor farmer who cultivates vegetables or cereal crops on a 'degraded' land, converting the land as a leasehold forest would mean that he/she will no longer be allowed to cultivate them. Growing grasses or trees would not be rational because it would take months or even years before they are harvested. On the other hand, once the land being cultivated by these poor farmers are identified as degraded land, they would have not much choice but to yield since they do not have ownership rights over these lands because according to law, these are government-owned land[8].

Opportunities for interventions: a stakeholder analysis

In identifying opportunities for interventions, it is important to have a better understanding of the LF institutions – the various interests in shaping them and their power to influence reform. In this regard,

[6] For more discussion and empirical studies on this subject see Thoms *et al.* 2003; Bhattarai *et al.* 2003

[7] If the degraded forests is open to any interested lessee/s (not excluding the better off households), implementation would have been faster (although it may no longer be a pro-poor endeavor).

[8] An example for this case is the Chepang communities that were reluctant to join the programme due to this policy which prohibits them from growing of agricultural crops in the sloping land. Since these communities do not have any other alternative land for growing the crops, they feel insecure about joining the LF programme (LI-BIRD, 2004).

analysis of the stakeholders in LF was conducted through an analytical tool called CLIP[9] analysis. This tool enables a better understanding of the relationship among the various stakeholders particularly, those who are bound to be in conflict or to collaborate.

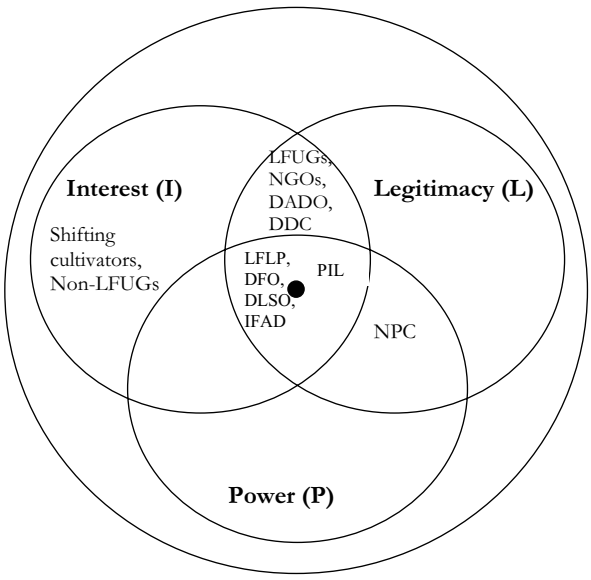
Based on the general commonality in their interest and mandate on forestry, an initial list of LF stakeholders include the *government* through the Ministry of Forests and Soil Conservation (MoFSC), with its various departments such as the DoF - the primary government agency that oversees forest in Nepal, *forest users* including LFUG and non-LFUG members, donors including IFAD, and the social mobilizers including local Non-Governmental Organizations (NGOs). Most of these groupings could still, however, be further categorized into sub-groups based on their differences in interest on the forest resources being handed over or over other benefits from the programme, their legitimacy to influence leasehold forestry institutions based on existing law, and their overall power to effect reform on leasehold forestry institutions.

Within the government, the interests, legitimacy and power of the central office is often different from the implementing line agencies. At the central office, the LF is managed by a separate office: the LFLP office. The LFLP office is obligated to coordinate the implementation of the programme under the DoF. It has the power mostly on the implementation of the programme as well as partly on the policy or design of the programme. Within this group is also included the National Planning Commission (NPC) that is responsible for preparing the national poverty reduction strategy paper for Nepal, which is then used as a basis in the design of poverty reduction programmes such as the LF. At the implementation level, the programme is mainly being implemented by the DFO and District Livestock Office. Altogether, these three government offices (i.e. LFLP central office, DFO, DLSO) have the mandate to implement the programme and therefore have the legitimacy. They benefit from the implementation of the programme and therefore have high interest in LF. And they have the power to reform or not to reform the existing LF institutions. Aside from them, there are also other government agencies that may have interest or legitimacy to get involved in the LF programme but currently lack the power to get involved and influence the implementation. These include the DADO which has the mandate to implement agricultural related activities and the District Development Committee (DDC) which is the local government body at the district level authorized to manage district resources (including forest resources) through the *Local Self-Governance Act of 1998*.

The forest users could also be further categorized into different stakeholders. Foremost of these would be the LFUG members as they are the recipients of the programme. Another sub-group would be those who were left out particularly the shifting cultivators who often have claims over the degraded lands but have high probability of not being included, and the rest of the community members who would not be members of the LFUGs, or non-LFUG members.

The list of LF stakeholders could then include the LFLP office, DFO, DLSO, DADO, DDC, NPC, LFUGs, shifting cultivators, non-LFUG members, IFAD, and the various local NGO contracted as social mobilizers. These stakeholders and their relationship based on the analysis of their legitimacy, interest, and power can be illustrated in Figure 1 below.

Fig. 1: LF Stakeholder analysis



From the above analysis, and as partially illustrated in Figure 1, some important observations about the relationship of the stakeholders are: a) forest communities in general have high interest in LF but lack the legitimacy and power to influence LF institutions to their favor; b) although LFUGs have

[9] Refer to http://www.sas-pm.com/ for details about the tool

high interest and legitimacy to influence LF policies, they lack power to do so. This is true for other line agencies such as the DDC and DADO, and even the NGOs involved in social mobilization process; and c) among the government line agencies, the highest stake, legitimacy and power over LF institutions is mostly concentrated with the DoF through the LFLP at the central office and the DFOs at the districts. The NPC also has the legitimacy and power to influence the design of the programme, but its interest in intervening with LF institutions is limited. Other stakeholders that have high interest, legitimacy, and power to change LF institutions are IFAD and DLSO. This shows that most of the interventions towards institutional reforms can mostly be done by the government policy-makers and implementers.

Discussion and direction for interventions

Given the various institutional constraints at different levels and the analysis of the roles of the various stakeholders, various areas can be identified for interventions to improve the implementation and impact of the LFP.

Community level

The dominant issue under at the community-level is exclusion of the poorest with the forest rangers not following the process of selection of the poorest and degraded land. Intervention should be done to find out whether the process is strictly followed at the community level or not.

One way to do this is to improve the awareness of the communities towards LFP. To do this, innovative means of information dissemination need to be considered. This may include placing posters (about the process of handover) in places frequented by the poorest, and use of local radio to reach out those at remote locations. It was also mentioned that LFUGs do not have constitution that states these rights and responsibilities. In a way, this is due to the reality of preparing a constitution (which for LFUGs would need heavy external assistance just like the preparation of their OPs). On the other hand, LFUGs are being organized into inter-groups and cooperatives which necessitate their preparation of their constitution and by-laws. Intervention should target improving the awareness of LFUG members of their rights and responsibilities, including support for the formation of inter-groups and common-interest associations. Community awareness campaign may also target not just the recipients but also the wealthier and the privileged groups in the community, with the aim of changing their attitude to be more favorable for the poorest.

Programme implementation level

Both DFOs and DLSOs – the primary implementing agencies of the programme - are limited in their capacity partly by their number of staff but especially their sectoral mandate, resulting in their limited collaboration with other line agencies. Programme implementation then needs to involve other government line agencies in the implementation of the programme such as the DADO, District Soil Conservation Office, and the DDC.

A district-level project coordination committee should be formed to manage or supervise the implementation of the LFP. This committee shall be under the chairmanship of the DDC chairperson. Following the *Local Self-Governance Act of 1998* which provides the DDC greater jurisdiction over forest resources, the DDCs have the mandate to implement government programmes at the district level and to coordinate various sectoral activities from various government departments. The DFO could be the secretary of the DDC while other district line agencies including representatives from NGOs and user groups shall be members. This reorganization in the implementation of the programme is needed because the poorest have diverse needs (such as food and nutrition, education, health, income, etc.) and they need integrated and varying interventions to address these needs

This recommended reorganization in the implementation of the LF programme surely would need clarification on the roles of the line agencies involved, or that shall be involved. A very important issue that would need to be resolved (as this would be the main source of controversy) would be the distribution of programme and project funds (i.e. what are the incentives for getting involved in the programme?). Definitely, the DFO will oppose reducing their share of the budget while all other will want their share. Since this is a controversial issue, further discussion involving the various stakeholders is recommended. On the other hand, we suppose that this re-organization would take some processes and time to be resolved. Furthermore there exists a number of complications in coordination not just

among the line agencies but between them and other stakeholders such as the donor agency (IFAD), national coordinating body (i.e. LFLP), and LFUGs. A way forward is to conduct a pilot project that would implement the programme with the proposed organizational structure to see how this recommendation can actually be realized.

Programme design level

Although many of the constraints discussed can be attributed to the design of the programme (e.g. limitations in land quality, cultivable crops, land area, membership composition), it is a fact that changing such design or provisions have their own rationale or purpose (e.g. to improve forest cover). Changing legal provisions is not easy either because of the lengthy process of policy-making or because such provisions are often controversial. Changing the provisions of the LFP has to start by facilitating a dialogue among the concerned stakeholders to discuss and compromise that ideally will satisfy the interests of the stakeholders, and particularly the poor. The smaller leasehold groups of the same locality or VDC (5-15 members) including other existing groups of discipline should be federated to a coordination committee so that it can minimize duplication and facilitate wise use of resources. These dialogues may be initiated by those representing the interest of the poorest such as the civil society organizations including the organization of forest users (eg. FECOFUN, NEFUG); or could better be initiated by IFAD using its power to influence actions of the respective government agencies.

Conclusion

Institutional reform not only require changes in the rules or policy provisions but especially support to make sure that such changes are implemented properly. Implementation of changes by the concerned forestry institutions has, however, become complex by the presence of various conflicting interests over forest resources. These interests are needed to be understood in order to understand how such institutions are shaped and how they can be made more favorable for the interest of the poor. Furthermore, implementation of changes is made difficult by the lack of capacity of implementing agencies; for forest institutions and poverty alleviation programs, by the sectoral nature of government implementing agencies. Institutional reform needs to be complemented by capacity building support. In the case of forestry programs with integrated approaches to livelihoods improvement, capacity building may mean implementing the programme alongside other sectoral agencies.

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Challenges for service providers in community forestry governance: A case study of a community forest users group in Parbat, Nepal

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This study was carried out in Bhodkhore Community Forest Users Group in Parbat district, Nepal with the overall objective to develop a clearer understanding of the challenges for service providers while working towards improving the Community Forestry governance. The primary data were collected through personal interviews, group discussions, key informant interviews and direct observations using a series of questionnaires and check lists. Similarly, the secondary data were gathered from reports and records from Community Forestry User Group and service providers, and from relevant scientific literature. The data were analyzed using qualitative and quantitative tools. The results show that the existing challenges for service providers mainly include financial resource management, time management and inadequate technical support for forest management.

Key words: Community Forestry, Governance, Service Providers, Challenges

The introduction of Community Forestry (CF) programme in Nepal is a courageous, innovative and promising step towards participatory forest management and this has been well recognized throughout the world as a successful people centred programme (Gurung, 2007). The District Forest Office (DFO), which works under the Department of Forest (DoF), is the responsible authority to hand over national forests as community forests to local communities and to provide them necessary services for the better management of their forests. However, it alone is not able to fully provide the supports needed. Community Forestry User Groups (CFUGs) are not fully capable of managing their forest on their own. Thus, they have to depend on external organizations/institutions (Ghimire, 2005). Many of the Non-governmental Organizations (NGOs) and Civil Society Organizations (CSOs) which grew rapidly after 1990 with the change in political conditions in the country (Edwards, 2001), are now involved in the promotion of CF programme (Timsina, 2003).

The support services provided by the government and other organizations have remained inadequate compared to the increasing demand of CFUGs. As a result, several second–generation issues have emerged in CF all around the country; one such issue is good governance in CFUG (Bhatta and Gentle, 2004). These emerging issues have made providing adequate support services to CFUGs more challenging for the Service Providers (SPs). One of the major challenges in CF of Nepal is to ensure poor people's meaningful involvement in its process, their access, rights and benefits for livelihoods (Pokharel and Niraula, 2004). Acharya (2002) reports the following challenges that Nepal's CF is presently facing: redefining policy objectives from basic needs to poverty alleviation; mechanisms ensuring benefits and access in decision-making for disadvantaged groups; shift to active forest management; restructuring of DFO to deliver quality extension services; and reviewing CF process and practices to maintain people's participation.

The Fourth CF workshop identified the following major challenges concerning CF governance: ensuring inclusion at every level of CF governance; unclear role of all stakeholders in policy-making; one-way flow of information; and lack of appropriate mentality for promoting good governance (DoF, 2004). DFO, Parbat (2006) has mentioned the following major issues which led to the challenges for SPs to work in CFUGs: low representation of

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women and *Dalit* (the lower caste people which are also socially deprived) in community forest users group's committee (CFUGC) as well as passive participation of their representatives in decision-making; ineffective implementation of operation plan (OP) and constitution; difficulty to amend OP and CFUG's constitution on time; and passiveness of CFUG to submit audit reports on time. In this study, the challenges for service providers while working towards improving the situation of Community Forestry governance in Bhodkhore CFUG are identified. In addition, these challenges are also analyzed from the users' and service providers' perspectives.

Materials and methods

Study site

Bhodkhore CFUG of Parbat district was selected as the study site considering the following criteria: legal tenure, direct involvement of SPs, and CFUG's heterogeneity. In this district, CF is considered as a successful programme and 45% of the total forest has been handed over to 299 CFUGs by the mid-2006, and consequently 24,908 households have benefited from this programme. The SPs selected for this study are those which have been involved in Bhodkhore CFUG and conducting their activities including CF management and they are DFO, Federation of Community Forest Users, Nepal (FECOFUN), and National Educational and Social Development Organization (NESDO). A brief introduction of each of the SPs is presented in Table 1.

The Bhodkhore CF covers 57 ha of land, is basically a pole stage, predominantly natural Sal *(Shorea robusta)* forest. It was traditionally managed under the *talukdari* (a *talukdar* was responsible for it and for controlling forest management) system of land revenue collection. In 1957, the forest was nationalized and the *talukdar* was no longer able to resist the state's decision. As a result, the forest was accessible to all and used up without controls. Such unrestricted access degraded the forest to a greater extent. Only after the event of a large landslide in 1977, the villagers realized the importance of forest cover and agreed to protect this forest through indigenous forest management system. In April 1993, the forest was officially handed over to the CFUG with its constitution and OP. At present, the CFUG has an executive committee so-called CFUGC of 11 members including six women and five men who represent Brahmin (6 members), Newar (1 member), Chhetri (2 members) and *Dalit* (2 members). As mentioned in its constitution, the CFUGC is reformulated every two years and bears the responsibility to implement the OP and constitution.

Data collection and analysis

Primary data was collected through personal interviews, group discussions and direct observations. Secondary data was obtained from OP and constitution, minutes and other records of the CFUG and records from the SPs. Related documents and reports, and relevant scientific articles were also reviewed in detail. During the field study conducted in 2006, 49 out of 115 households were selected and

Table 1: Service Providers in Bhodkhore CFUG

Description	Service Providers		
	DFO	**FECOFUN**	**NESDO**
Location	District headquarter, Kushma		
Establishment	2042 B.S.	2054 B.S	2052 B.S
Staff	1-DFO, 1-AFO, 11-Rangers and 40-Forest Guards, no female staff	3-regular staff (2 male, 1 female) and 25-facilitators (10 male, 15 female)	1-Programme coordinator and 16- animators (10 male, 6 female)
Working area and CFUGs	Parbat district including 320 CFUGs	Parbat district, 265 CFUGs	Parbat district,145 CFUGs
Major activities	CFUGs formation and forest handover; constitution and OP preparation/amendment; trainings/workshops/tours conduction; technical support for annual plan preparation; facilitating CFUG's fund investment; and coordination with other organizations to provide support for CFUG, etc.	Advocacy; conflict management; constitution and OP preparation/amendment ; good governance; social mobilization; leadership and skill development; and fund mobilization, etc.	Support to hold committee meetings on regular basis; facilitate committee meetings and GAs, facilitate participatory annual plan formulation; and facilitate CFUG's fund mobilization, record keeping and accounting; etc.

one person from each household was interviewed. Stratified random sampling was adopted to select respondents from the CFUG. The total respondents interviewed from SPs were 12 (6 were from DFO, 4 from FECOFUN and 2 from NESDO). Purposive sampling was adopted for selecting respondents from SPs. Separate sets of questionnaires including both closed and open-ended questions were used for respondents from SPs and CFUG.

Additional method of data collection included key informants interviews and separate discussions held with each homogeneous group (consisting of 7 to 10 people) in the CFUG and with the representative group from each SP. Checklists were used to track discussions on given issues. One of the authors (A. Paudel) also observed a general assembly (GA) and a CFUGC's meeting during the field study. Nine key informants from CFUG and SPs were selected and interviewed using the open-ended questions.

Pre-testing of tools and questionnaires was done in neighbouring CFUG to find out any ambiguities and inadequacies in the interview schedule. Furthermore, the data collected by different methods and from different sources was cross-checked through triangulation to improve the reliability of the results. Both qualitative and quantitative tools are used for data analysis. Information from group discussions and open-ended questions is transcribed and presented in tabular and textual forms where appropriate. Data from closed-ended questions was analysed using Microsoft Excel and the result is presented in the form of column diagrams.

Results

All the respondents from CFUG and SPs were asked about the challenges that SPs have been facing while working towards improving the situation of CF governance. Out of the total 61 respondents (comprising 49 from users and 12 from service providers) about 70% of them expressed one or more challenges whereas rest of them either were unaware or could not see any challenges for SPs. Responses of similar concern are grouped under 9 different topics. These challenges and the total respondents' number for each of them are presented in Table 2.

Making CFUG and CFUGC more accountable

SPs had to organize some specific programmes to make illiterate users aware of their roles and responsibilities. Moreover, they had to motivate some users who were aware but had not performed well being skeptical of getting any benefit from CF. Some users were of the opinion that the committee has to be more responsible for forest development activities than the general members, and they would join such activities only if they were invited. Such a perception of the users created an uneven sense of ownership among themselves. SPs had difficulties in making these users aware of their equal rights in benefits from forest and their responsibility in forest management activities. In addition, monitoring and evaluation of executive committee's performance by the CFUG is still weak that has provided the committee an opportunity to hide the unwanted results of its activities. Therefore, these conditions have created a challenge for SPs in making CFUG and its committee more accountable.

Financial resource management

When SPs organized supportive programmes related to CF management, especially poor users could not attend all of them. The reason behind this is that poor users can't spend days in receiving the service at the expense of their work on which they depend for their daily diet and SPs also can't provide them both the free-of-service together with the allowance.

Table 2: Challenges for SPs while working towards improving the situation of CF governance

S.N.	Challenges for SPs	Total Respondents No.
1	Making CFUG and CFUGC more accountable	13
2	Financial resource management	36
3	Time management	34
4	Developing good working environment	17
5	Leadership development in target group	18
6	Convincing rich users for effective launching of poor-focused programmes	23
7	Providing adequate technical support in forest management	25
8	Working with women and *Dalit*	18
9	Making fund management more transparent	22
10	No challenges	9
11	I do not know	10

(Source: Field study 2006), (N=61)

Moreover, CFUG itself can't provide allowance to participants in such programmes as it does not have sufficient funds. Thus, the financial resource management has been a challenge for SPs.

Time management

Majority of the users are farmers who mainly work during the daytime. Other users (service holders) are busy during the daytime in weekdays. When SPs visited the CFUG during the day in weekdays, few users were available. Therefore, arranging time suitable to all users and SPs has been a difficult task the SPs.

Developing good working environment in CFUG

SPs' activities were duplicated sometimes because of the lack of good coordination among them. Moreover, few members of the CFUG did not support some of their programmes, thereby creating difficulty in launching them. This worsened the working environment for SPs in the year 2061 B.S. and thus developing good working environment in CFUG was a challenge. LI-BIRD (2003) mentioned in its district level review report the lack of coordination, communication and linkage between and among the SPs in Parbat district.

Leadership development in target group

Usually, the elite group in the community have been dominating in decision-making (Paudel, 2003). In this CFUG too, elites had in the past captured the leadership positions in CFUGC and thus dominated in decision-making process. As a result, target group had to remain passive during the discussions in assemblies and meetings, and there was clearly a lack of two-way communication. Therefore, developing leadership skills for these socially deprived groups and bringing them in decision-making forum (CFUGC) was a challenge for SPs. Still today, elites are influential in decision-making process especially in emergency meetings.

Convincing rich users for effective launching of poor-focused programmes

To launch any programmes in CFUG, an approval is needed from GA. When SPs tried to launch poor-focused programmes, they found rich users pretending to be ignorant. This situation created difficulty for SPs and thus effective launching of such programmes in CFUG had been one of their challenges. In addition, they also faced difficulties when facilitating to identify poor users through well being ranking.

Providing adequate technical support in forest management

CF programme is moving towards sustainable management from its conservation motive. For this, CFUG needs scientific knowledge and skills of forest management that can be provided by forest technicians only. SPs, with limited number of forestry professionals and broader working area, have difficulties in providing enough technical support to CFUG. Therefore, providing adequate technical support to forest management has been a challenge for SPs.

Working with women and Dalit

Because of discriminative social structure in terms of caste and gender, there is a lack of freedom for lower caste people compared to upper caste and they have higher chances of being dominated in decision-making (Paudel, 2003). In this CFUG, SPs had to take permission from men before talking with women from their family. In addition, women also did not feel easy to talk with people, especially males whom they are not accustomed to. Moreover, upper caste people looked down on SPs if they worked with *Dalit* people. The latter also felt uneasy to be hospitable for upper caste people and work together with them. In fact, these situations still persist but to a lesser degree. Thus, working with women and *Dalit* has been a challenge for SPs.

Making fund management more transparent

Most of the users were not interested to be informed about the CFUG's fund management which easily caused difficulty for SPs to create interest in them. In addition, record keeping system was not in a good shape. Thus, SPs had to facilitate CFUG to improve record keeping system. Moreover, they had to facilitate the discussions on the details of income and expenditure in some GAs. Therefore, making CFUG's fund management more transparent was a difficult task for SPs in the past years, which has been easier nowadays.

Response to each of these challenges from both SPs' and users' perspectives is graphically presented in Figure 3.1.

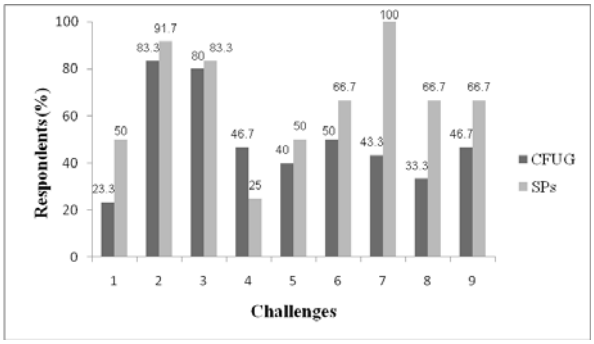

Fig. 3.1: Challenges for SPs in their own and users' perspectives (Source: Field study 2006), (N=42 of which CFUG=30 and SP=12)

Fig. 3.1 shows that most of the respondents (> 80 %) from both the CFUG and SPs comprehend financial resource and time management as challenges for SPs (challenges 2 and 3). SPs have found it challenging to provide adequate technical support in forest management (challenge 7), and nearly half of the respondents from CFUG affirm this difficulty. Two-thirds of the respondents perceived challenges for convincing rich users for effective launching of poor-focused programmes, working with women and *Dalit* and making fund management more transparent (challenges 6, 8 and 9, respectively). Half of them comprehend as challenges for making CFUG/C more accountable and developing leadership in target group (challenges 1 and 5, respectively). From users' perspectives, all others except 2 and 3 are reported by less than half of the respondents as challenges for SPs.

Discussion

Despite some achievements and contribution of CF, there are many unresolved issues and challenges in all areas of capital as well as governance (Timsina, 2002). Providing adequate technical support in forest management, financial resource and time management are still the major challenges for SPs in this CFUG. SPs have difficulties providing both the free service and the allowance for poor users who do not attend SPs' programmes at the expense of their daily work. With the increasing number of CFUGs in the district in recent years, the available financial resources of DFO has become insufficient to provide increasing and varied types of support as demanded by the CFUGs (Kanel and Kandel, 2004). FECOFUN has also limited financial resources of its own (Timsina, 2002). Moreover, CFUG itself can't provide allowance to participants in such programmes as they do not have sufficient fund. Thus, financial resource management is one of the major challenges for SPs to work in this CFUG.

Acharya (2002) reports that shift to active forest management from the existing passive management system have been one of the major challenges in Nepal's CF. Pokharel (2007) has reported that lack of technical knowledge and some policy implementation constraints have resulted in relatively 'passive' managements of forest. In this CFUG, SPs have found challenging to provide adequate technical support to CFUG for active management of forest. The limited capacity of the DoF for generating positions to support CFUGs has become a key constraint for the implementation and consolidation of CF (Springate-Baginski et al., 2003).

Managing the time suitable to all users and SPs has been a difficult task for the SPs. During weekdays, SPs cannot assemble most of the users (both farmers and service holders). Ghimire (2005) reports that most of the NGOs have the scarcity of regular staff to work in CF, thus users have to wait for a long time to get services from them. The poorest cannot afford to participate and take leadership responsibility because they are not compensated for their time (Pokharel and Niraula, 2004). Poor and lower caste users do not fully participate in community development activities because of their daily household, agricultural work and other livelihood requirements (Uprety, 2005). Kafle (2005) also highlighted the lack of proper management of time in meetings and assemblies in his study area. According to Paudel (2003), most of the poor and *Dalit* in CFUGs of Parbat district were not able to attain all meetings and GAs of their CFUGs and also not able to participate in programmes organized by external organizations mainly due to time constraint. This has not only lowered the overall leadership quality of the committees but also led to a degradation of forest condition. Thus, to ensure poor people's meaningful involvement in CF process is one of the major challenges in CF of Nepal (Pokharel and Niraula, 2004).

Convincing people to mobilize local resources for the benefit of the poor, *Dalit* and marginalized groups is difficult, and transfer of power from elites to the marginalized and poorer people is really a challenging task in CF (Maharjan et al., 2004). This could be due to that rich users are usually not the primary beneficiaries of poor-focussed programmes and thus they show less interest in launching them. However, in this CFUG difficulties in convincing rich users for effective launching of poor-focused programmes and developing good working environment have been

reduced to a greater extent. Making CFUG/C more accountable and fund management more transparent, leadership development in target group, and working with women and *Dalit* still exist as challenges but to a lesser degree. Kanel (2004) supports this view stating that making CFUG and its committee more accountable and responsive to all users including poor, women and disadvantaged groups is one of the major challenges in CF.

Conclusion

Since their involvement, SPs have been facing several challenges while working towards improving the situation of CF governance. Some of them have been successfully overcome; some still exist but to a lesser extent and the some are still intensive. Developing good working environment in CFUG and convincing rich users for effective launching of poor-focused programmes have been successfully overcome now. Making CFUG and CFUGC more accountable; leadership development in target group; working with women and *Dalit*; and making fund management more transparent still exist as challenges but to a lesser degree. Financial resource management, time management and providing adequate technical support in forest management are still the major challenges for SPs.

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Community forest management practices in far-western lowlands of Nepal

B. Shrestha[1]

Wider discussions are held as to the contribution of community forestry program in Nepal to improve the forest condition and meeting the forest product requirements. This paper presents findings from a study of six Community Forest User Groups in far-western lowlands of Kailali and Kanchanpur in Nepal. The groups with natural and plantation forests have varied experiences in forest conservation and distribution of products. Some groups are resourceful in terms of availability of forest products from the natural forests. Others with plantation forests are product scarce from their own and depend on government managed forest and other sources to meet their demands. The role of concerned government authorities and federation of groups would be instrumental to analyse demand and supply, and make provisions for distribution of forest products within and outside groups and district.

Key words: Community forest management, forest products, distribution, far-western low land

Decentralization in the management of natural resources has proliferated in discourses, policies and practices since past three decades. This is with the recognition of the roles of natural resources such as forest, water, land, pasture, etc. in the livelihoods of the local people, poverty reduction and the creation of environmental services such as soil and watershed conservation, conservation of biological diversity and carbon sequestration. Emphasis is being laid on participatory approach to common property resource (CPR) management, which entrusts local resource users with the rights and responsibilities to management the CPR (Timsina and Ojha 2004). Thus, CPR is considered to be the most viable option for both ecological and economic sustainability of the commons. With this consideration, governments in more than 50 countries are pursuing community forest/ry (CF) initiatives that provide some sort of local users control over the resources (Agrawal 2001).

Wider discussions are held as to the contribution of CF program in Nepal to improve the forest condition and meeting the forest product requirements. It is interesting to note that firewood is the main source of cooking fuel in Nepal, as almost seven tenth of total households use firewood as their primary source of cooking fuel (HMGN 2004, HMGN 1996). Master plan for forestry sector and three year interim plan have also given due consideration to resource use, poverty reduction and rural development through CF program (HMGN 1988, GN 2007b). These initiatives have been possible due to government's progressive policies towards CF program and recognition of Community Forest User Group (CFUG) as an independent and self-governing local organization. More than 14,000 CFUGs are managing 1.2 million hectares of CF, which comprises around 20 per cent of total forest area of Nepal, and benefiting more than 1.6 million households, which constitute around 35 per cent of total population of Nepal (GN 2007a). As of early 2005 in far-western development region of Nepal, around 140 thousand hectares of forests, 13 per cent of total forest area in the region and 27 per cent of the total potential community forest area and 7 per cent of the total area of the region, were handed over to around 1984 CFUGs (Chhetri and Pandey 1992, HMGN 2005). As of mid-2007 in far-western lowlands (Kailali and Kanchanpur districts), also referred to as *Terai*, a total of 23,236 hectares of forest, which covers 9 per cent of total forest area, was handed over to 224 CFUGs (DFO 2007a, DFO 2007b and DoF 2005).

Despite increasing recognition of CF program, there is a growing concern facing development planners and the academia whether CF program has been successful in improving the livelihoods of the poor and marginalised people and equity aspects (Bhattarai and Ojha 2001, Adhikari 2002, Bhatta 2002a and 2002b, Ojha et al. 2002, Malla et al. 2003, Sharma

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2005). Bhatta (2002a), Bhatta (2002b) and Sharma (2005) have noted that larger tracts of forests have been handed over to the CFUGs comprising fewer households while a large number of households are included in smaller patches of community forests, leading into a situation where material benefits are not accruing sufficiently to a large number of forest user households while a few households are using forests indiscriminately. These facts necessitate understanding different CF management practices. Besides, studies have shown that forest management systems are widely distributed throughout Nepal. However, most of the studies are confined to central and western Nepal, thereby leaving a knowledge gap from other parts of the country (Fisher 1991, Chhetri and Pandey 1992). Therefore, studies from various parts are also needed to understand CF management typologies and develop appropriate policies and legal frameworks.

In this context, a study was undertaken to understand contexts and different practices of CF management in far-western lowlands of Nepal. This paper examines the historical background of the CF management, socioeconomic condition, forest condition, demand and supply of forest products and distribution of forest products. The issues raised in the study will have implications to policy discourse to devise policy, legal and institutional frameworks for different types of CF management schemes.

Materials and methods

A study of six CFUGs in far-western lowlands of Kailali and Kanchanpur of Nepal was undertaken in December 2007 to January 2008. The CFUGs that had completed five years from the date of CF hand over by district forest authority to respective groups, were selected for the study. These CFUGs are listed in Table 1.

Checklists were prepared before the field visits to the CFUGs in order to elicit information in line with the objectives of the study. Interactions were held with the executive committee members and general users. Transact walks were undertaken along the forest tracts to observe the forest condition. The CFUG documents such as Forest Operational Plan (FOP), constitution and financial and forest product distribution records were reviewed.

The information collected during interaction, visit and reviews were tabulated in the excel software to analyse the content of study in the CFUGs. The data collected from the field was analysed using statistical tools such as average and per cent to summarise data, which were describe in the text.

Results and discussion

History of community forest management

Kailali and Kanchanpur are parts of *Naya Muluk*[2]. Prior to 1860, those districts were the parts of India. The districts were covered with dense forest and home to local tribes such as *Tharu*[3] (DFCC 2008a and 2008b). At the time of *Rana* regime[4] and after the eradication of Malaria during early 1960s, the districts experienced massive flow of people. Several groups of people migrated to those districts, including government employees privileged with land offerings from the government, families having linkages with the royal families, people in search of cultivable land and better life opportunities, people immigrating from India and Myanmar. As a result,

Table 1: Name, location and date of handover

SN	Name of CFUG	District	VDC/ Municipality (MP)-Ward	Date of handover
1	Adarsha	Kailali	Dhangadhi MP-3	2002
2	Gyanjyoti (women)	Kailali	Dhangadhi MP-3	2000
3	Baijanath	Kanchanpur	Jhalari-4	2001
4	Baitada	Kanchanpur	Daiji-4	1997
5	Nawadurga	Kanchanpur	Krishnapur-4	2001
6	Sayapatri	Kanchanpur	Krishnapur-6	2001

Source: Adarsha CFUG (2002), Baijanath CFUG (2008), Baitada CFUG (2003), Gyanjyoti CFUG (2005), Nawadurga CFUG (2004) and Sayapatri CFUG (2004).

[2] The *Naya Muluk* (literally new country) areas, present Kanchanpur, Kailali, Bardia and Banke districts annexed by the British under the Anglo-Nepalese Treaty of Peace (Sugauli Treaty) in 1815 AD. In 1860, the *Naya Muluk* areas were restored to the *Ranas* by the British as a reward for *Rana* support in putting down the First War of Indian Independence in 1859 (ActionAid Nepal 2005).

[3] An ethnic group of the *Terai* plains in Nepal. They were virtually the sole inhabitants of the *Terai*. The *Tharu* are present in contiguous areas across the border in India also (ActionAid Nepal 2005). *Tharu* population constitutes 35.9 per cent in far-western *Terai* and 6.75 per cent in Nepal (GN 2008).

[4] *Rana* regime ruled Nepal from 1846 to 1950. It was the time when *Rana* rulers had distributed one-third of the forest to various *Rana* families and others in the form of *birta* and *jagir* tenure (Chapagain et al. 1999).

huge patches of forests were cleared for establishing settlements and arable lands.

The government established the resettlement company in Kanchanpur in 1963 which started to resettle people by clearing forests. The forests were further cleared in resettling the landless, the flood victims and the political victims. The political movements in 1979 and 1989 also resulted in illegal felling and encroachment. The freed Kamaiyas (bonded labour) and people displaced from wildlife reserves had also settled into the forest around the CF. Besides, *Tharu* and seasonal migrants from the hills used to shift their livestock during winter season. Gradually, the migrants from other parts of the country increased (Nawadurga 2004 and Sapayatri 2004). With the increasing population pressure the CFUG were not able to meet the demand of forest products. The users had difficult time to conserve forest from local encroachers, illegal collectors and landless households who had illegally settled into forest. Later, the community members formed the group for conservation, control of illegal activities and utilising the forest products.

In the given historical setting, the CFUGs with natural and plantation forests have varied experiences in forest management including conservation, distribution and utilisation of forest products. Some CFUGs have long been conserving and utilising the forest products from the natural forests. They had experienced heavy felling of trees in the nearby government managed natural forests adjoining to Churia range in Kanchanpur and forests that the communities had been protecting since long time ago. The forests that the communities had been conserving were later handed over to the respective community without adequate participation of the communities to prepare constitution and operational plan, perhaps due to lack of adequate attention by the concerned authorities. This tendency could have serious implications to forest conservation and utilisation of products.

The communities of CFUGs in Kailali undertook plantation in bare lands along east of Mohana river, bordering between Kailali and Kanchapur, during late 1990s and promoted regeneration to meet their current and future requirements of the forest products. They had to rely on forest products from Laljhadi forest block in Kanchanpur along west of Mohana river and Dudhuwa National Park fringe in Indian boarder side south of Nepal, to meet their requirements. The users were worried due to sweeping away of parts of their CF by flash flood in Mohana river from time to time. Irrespective of natural threats such as flood, they have conserved their best to cover the bare forests for present and future utilisation.

Socio-economic condition

The number of households in CFUGs varies widely from five hundred to less than 80 (Table 2). The annual growth in number of households ranges from

Table 2: Household and population distribution

Name of CFUG	Kailali		Kanchanpur			
Indicator (year)	Adarsha	Gyanjyoti (women)	Baijanath	Baitada	Nawadurga	Sayapatri
Number of household	81 (2001), 161 (2007)	77 (2007)	118 (2001), 232 (2007)	343 (1997), 415 (2003), 500 (2007)	295 (2001), 380 (2004)	127 (2001), 218 (2004)
Number of household growth per year (per cent)	16		16	3-5	10	24
Caste/ethnic distribution (per cent)						
Dalit[5]	36	0	7	20	16	17
Janajati[6]	0	86	43	5	5	50
Others	64	14	50	75	79	33
Population (year)	885 (2007)	562 (2007)	600 (2001)	2000 (1997)	2676 (2004)	2021 (2004)
Men (year)	55 (2002)	49 (2007)			51 (2004)	50 (2004)
Women	45	51			49	50
Average household size	5.5	7.3			7.0	9.3

[5] The term *Dalit* refers to "Pani *Nachalne*" (untouchable) group or caste from whom water is not accepted in Hindu social structure (Dahal et al. 2002).

[6] Nationality (*Janajati*) is that community which has its own mother tongue and traditional culture and yet do not fall under the conventional four fold *Varna* of Hindu or Hindu hierarchical caste structure (National Committee for Development of Nationalities 1996 cited in Dahal 2001).

24 to three per cent. The groups closer to motorable roads and local towns have high flow of people from outside leading to increased number of households.

The CFUGs are composed of users from different caste/ ethnic groups. The proportion of *Dalit* households ranges from around one third of total households to none. Similarly, the proportion of *Janajati* households ranges from more than eight tenth to none. *Janajati* includes mainly *Tharu* people. The proportion of other caste/ ethnic groups ranges from around two third to one sixth. The population size varies widely from more than two thousand six hundred to six hundred. The proportion of men ranges from 55 to 49 per cent. The average household ranges from more than nine to five persons. Mostly, *Tharu* live in extended family giving rise to high average household size.

The CFUGs are composed of users that have diverse well-being status. Some user households are relatively well-off, others are of medium status and rest are poorest of the poor. The CFUGs have different practices to identify poor. Some CFUGs have documented the detailed profile of users (name, address, land holding, and livestock holding) and others have conducted participatory well-being ranking to identify poor, medium and well-off users. For example, in a CFUG with plantation forest the proportions of well-off, medium and poor households are around three tenth, half and one fifth of the total households.

The executive committee (EC) of a CFUG plays an important role in the decision making process. The size of EC reflects the population the CFUG has covered and the volume of responsibilities the EC members bear in the group. The composition of an EC shows how it has represented different segments of the community. The size of EC ranges from 17 to 11 persons (Table 3).

The proportional representation by caste/ ethnicity reveals that representation of *Dalits* ranges from 27 per cent of total EC members to none. Similarly, the representation of *Janajatis* ranges from around 65 per cent to nill. The representation of other caste/ ethnic groups than *Dalits* and *Janajatis* ranges from cent per cent to 36 per cent. Some CFUGs are not very sensitive to proportional representation of different segments of the community. There is high domination of men in the EC membership. The proportion of men members ranges from more than nine tenth to less than three tenth and that of women ranges from cent per cent in the exclusively women group to nine per cent. Poor representation of different caste/ ethnic groups and women in the EC of CFUGs could be due to less empowerment and leadership capability, and also domination of other caste/ethnic groups in decision making processes. The disproportional representation in the decision making positions could have implications to sustainable forest management.

Forest Condition

There is wide variation in CF area available with CFUGs ranging between over five hundred hectares to 10 hectares. The average forest size per household ranges between more than one hectare to less than one fifth of it (Table 4). Population pressure on the forest ranges from more than 50 to less than three persons per hectare CF. Most of the CFUGs have forest area per household less than the average for Kailali (0.38) and Kanchanpur (0.4 hectare) as reported in DFCC (2008a) and DFCC (2008b) and national average as reported by GN (2007a).

Table 3: Number of executive committee members

Name of CFUG Indicator (year)	Kailali		Kanchanpur			
	Adarsha	Gyanjyoti (women)	Baijanath	Baitada	Nawadurga	Sayapatri
Number of EC member	11 (2007)	11 (2007)	17 (2007)	17 (2007)	15 (2004)	11 (2004)
Caste/ ethnic distribution per cent						
Dalit	27	0	12	12	0	15
Janajati	0	64	29	0	0	46
Others	73	36	59	88	100	39
Gender distribution per cent						
Men	27	0	82	65	73	91
Women	73	100	18	35	27	9

Table 4: Community forest area and type

Name of CFUG Indicator (year)	Kailali		Kanchanpur			
	Adarsha	Gyanjyoti (women)	Baijanath	Baitada	Nawadurga	Sayapatri
CF area (ha)	46 (2007)	13 (2005)	227 (2007)	505 (2003)	134 (2004)	40 (2004)
Average CF area per household (ha)	0.3	0.19	0.97	1.2	0.35	0.33
Population per hectare CF	19	43	2.6	4	20	51
Proportion of forest by type						
Natural forest area (per cent)	9	31	100	100	80	90
Plantation forest area (per cent)	91	69			20	10
Proportion of forest by use						
Conservation area (per cent)		69	13	12		21
Effective area (per cent)		31	87	88		79
Number of block (block area in ha)	2 (13.85-9.5)	2 (8.98-3.98)	2 (128.25-89)	5 (198-32.75)	2 (81.5-52.25)	2 (66.5- 7)

The proportion of natural forest ranges from cent per cent to less than one tenth. The proportion of effective forest patches ranges between almost nine tenth and one third of total CF area. Accordingly, conservation area ranges between nearly seven tenth to more than one tenth. The number of blocks in a CF ranges between 5 to 2 (all but one). The area of a block ranges between around two hundred hectares and around four hectares.

Some CFUGs have only natural forests and others have plantation forest patches. In the pursuit of community forest management practices, large tracts of natural forests along Churia belt in Kanchanpur were handed over to the adjoining communities for conservation and utilisation of forest products. The small patches of bare lands along Mohana river in Kailali were handed over to the adjoining communities for plantation, conservation and use of forest products. Noticeably, the CFUGs with natural forest have relatively more CF area per household and those having all or higher proportion of plantation forests have less per household forest area.

Sal (*Shorea robusta*) is the predominant species in natural forests as observed by DFCC (2008a) and DFCC (2008b). Other species include Khayar (*Acacia catachu*), Sissoo/ Sisam (*Dalbergia sissoo*) Simal (*Bombax ceiba*), Jamun (*Syzygium cumini*) and Haldu (*Adina cordifolia*). In some CFUGs trees are as old as 100 years. Plantation forest has tree and non-tree species such as Eucalyptus (*Eucalyptus* spp.), Bakaino (*Melia azadirach*), Badahar (*Artocarpus lakoocha*), Tanki (*Bauhinia purpurea*), Amala (*Phyllanthus emblica*), Bamboo (*Dendrocalamus* spp.), Mango, Rattan, and Kurilo (*Asparagus racemosus*). Besides, there is good regeneration of some species such as Sissoo (*Dalbergia sissoo*) and Khayar (*Acacia catechu*).

The users undertake forest management measures for conservation and use of forest products. They harvest grasses during late monsoon in September and undertake silvicultural operations (thinning, singling, prunning and clearing) during December/ January. Tree species such as Sal and Khayar have well regenerated in those CFUGs. Some CFUGs have fenced parts of natural forest for conservation and planted non-timber forest products (NTFPs) for income generation. It helps control open grazing, maintains biodiversity and helps grow timber and non-timber species. Some CFUGs have reduced the quota of firewood collection per household. The reduced mobility of people and carts to collect firewood from the forest also helps conserve regeneration of new plants due to less trampling effect. However, open grazing has been the major threats to regeneration of plant species in natural forests. This improper care could be because the communities having natural forests might not have developed ownership over the resources that they are endowed with.

Demand and supply of forest products

The CFUGs have increasing demand of forest products with the increasing number of households, human population, livestock population and consumption of forest products for household requirements. Some CFUGs have calculated the demand and supply of forest products in their FOPs (Table 5). There is wide variation in annual allowable cut (AAC) of forest products estimated by CFUGs with natural and plantation forests. AAC for timber ranges between 60 Cft to less than one fourth of a Cft, firewood from around four to less than one fifth of a tonne, and grass from around four to one quarter of a ton.

Table 5: Annual average demand and supply of forest products

Name of CFUG	Kailali		Kanchanpur			
	Adarsha	Gyanjyoti (women)	Baijanath	Baitada	Nawadurga	Sayapatri
Demand per household						
Timber (Cft)	5		28			
Pole (number)	2					
Firewood (ton)	2.1		1.8			
Grass (ton)	13.7		3			
Annual allowable cut per household per year						
Timber (Cft)	4.5	0.4	33.1	59.7	4.9	1.4
Pole (number)						
Firewood (ton)	0.02	0.07	3.7	0.46	0.09	0.08
Grass (ton)			3.5	0.24		

In the CFUGs with natural forests demand is less than AAC. CFUGs with plantation forests have less availability of forest products from their own indicating that demand exceeds the AAC. Annual average demand of timber per household varies between 28 to 5 cubic feet (Cft); 2 poles; firewood from 2.1 to 1.8 tons, fodder grass from 13.7 to 3 tons. These figures are more or less consistent with average figures of Kanchanpur, reported by DFCC (2008b), as timber (7.8 Cft), pole (2.1 numbers), firewood (51.8 Bhari[7]) and grass (68.4 Bhari). Of them, the demand of grass is considerably higher than the district average of Kanchanpur. This could be due to relatively more number of livestock held in those CFUGs. The above facts reveal that substantial differences are observed in grass/ forage. This could be because users in some CFUGs have practiced stall feeding of cattle, buffalo and goats that require more grass to feed.

Of the total demand, some CFUGs with natural forests, have estimated to supply all products from their CF and others having plantation forest have planned to partly supply from their CF and partly from private and other sources. This is varying with the scenario of Kanchanpur, in which DFCC (2008b) reports that government forest is the prime source of grass, followed by own source and CF.

There is variation in availability of forest products to a CFUG. Some CFUGs holding natural forests have ample supply of forest products from their own forests. Members of some other CFUGs owning natural and plantation forests in Kanchanpur are the users in other CFUGs with natural forests. In a CFUG of such type, around one fifth users have access to forest products from 2 CFUGs with national forests at the rate of more than 2 hectares per household. Similarly, in other two CFUGs around half of users in some CFUGs have access to forest products from 1.2 to 1.5 hectares per household. Other CFUGs that have plantation forests depend mostly on purchase of forest products from government managed forests, and illegal collection form nearby government managed forest block. This has increased dependency on other forests including government managed forest. This situation could result into the situation, as observed by Sharma (2005), that the larger tracts of the community forests are handed over to the CFUGs comprising fewer households while a large number of households have are included in the smaller community forests.

Distribution of Forest Products

The CFUGs harvest forest products to distribute outside and within the groups to raise income and meet the forest product requirements. In an interval of 2/3 years, the CFUGs with natural forest harvest timber and firewood for distributing to outsiders. Distribution of forest products outside or within the group is determined by the availability of forest products and objectives of harvesting. The CFUGs have varying levels of income ranging from more than 2.3 million rupees in a CFUG with natural forest to less than 20 thousand in a CFUG with plantation forest.

The CFUGs with natural forest generate income mostly from the distribution of forest products to the outsiders. The share of income from distribution of forest products outside the group occupies more than nine tenth. Accordingly, the share of income from distribution within the group covers less than

[7] 1 Bhari = 30 kg firewood/ fodder / forage, according to discussion with CFUGs.

one tenth. Relatively, very low proportion of income generated from the distribution of forest products within the group is due to less quantity sold to the users and relatively lower price of forest products charged to the users, almost one quarter of the price for the outsiders.

The CFUGs distribute forest products to outsiders including neighbour CFUGs and traders. They fix rates for neighbours higher than the users. They distribute forest products to the traders through competitive bidding process at the government rate (see HMGN 2003a). Timber forms an important forest product for distribution. It occupies almost cent per cent of the forest products distributed outside and from seven tenth to half of it in case of distribution within the group. So, it forms an important forest product to generating income.

In case of distribution within the group, some CFUGs with natural forests set fixed quota per household for collection of firewood from the forest specify the collection period for few days in a year. The period is fixed during winter season (December-January). During that time, the users do not require to request the CGUG in written. The users who own or can manage oxen/ buffaloes driven cart (*Dallap* in local language) to transport firewood from the forest to their home yards collect during those open days. Others who cannot manage the *Dallap* collect of forest products after those open days. Renting a *Dallap* costs around Rs. 400 per day. The collection afterwards requires the request to the CFUG in written. Then, the CFUG verifies the request to confirm whether the applicant/ user has already collected the given quota of firewood and approves the request, if found unrepeated. The CFUGs have maintained the records of users that have collected the forest products. This allows them to check or verify whether the users have already collected as per quota allowed to each user. This also helps to regulate the distribution of forest products to the users.

Sal trees are felled down mainly for high quality timber for construction works and furniture. Besides, species such as Asna (*Terminalia tomentosa*), Rohini/ Sindure (*Mallotus phillipinensis*) and Jamun (*Syzygium cumini*) are used as low quality timber for activities such as construction of livestock shed and fencing. The rate of Sal ranges between Rs. 70 to 60 per Cft. and Sissoo around Rs. 60. The low quality timber costs Rs. 30 to 25. A pole costs from Rs. 8 to 2 per running feet. A low quality pole costs Rs. 10 per pole. Firewood costs Rs. 40 to 30 per ton for those who collect firewood in bulk in a cart. The CFUGs fix some charge Rs. 100 per ton for those users who cannot afford or do not need cartful of firewood and wish to carry loads of firewood on their back from the forest to their homes. CFUGs allow the poor, who are unable to pay for firewood, to collect dried twigs from the forest year round free of cost. However, the CFUG warns such collectors not to use axe and other big weapons to harvest such forest products. They can use only the sickle. If those collectors are found using axes and other types of weapons, the forest watchmen seize such weapons from the collectors to penalise them.

Although the CFUGs allow the poor to collect dried twigs on their head, they are not much sensitive to equitable distribution of forest products such as fixing different rates of forest products particularly focusing to poor and marginal users. Even, the rate fixed for collecting firewood on their back is too high considering the volume of collection (Rs. 100 versus 40 as discussed above).

Some CFUGs even tried to address the concerns of poor. However, it is very difficult to implement the provisions made to improve the livelihoods of the poor. A CFUG had a difficult experience on it. Some years back, the CFUG decided to purchase the firewood that the poor collect from the forest. It was intended to raise the income of poor, as for some poor households the collection and distribution of forest products has been the main source of income. Accordingly, some poor households started to collect and deposit near the CFUG building premise. Later, other users than poor also started to collect from the forest and nearby places and deposit in the same place and asking for the money in the CFUG. At that time, it was very difficult to administer who were poor. It was not possible for the CFUG to purchase all whatever and was collected and whoever collected and deposited. The entire intention of improving the livelihoods of poor from distribution of forest products was deviated giving rise to abandoning that pro-poor scheme.

Conclusion

The findings from the study of six community forest user groups reveal that the community members have long been involved in forest conservation, distribution and utilisation of forest products to meeting their household requirements. The groups are endowed with different by type of forests, namely

natural and plantation forests, resulting in different practices. Some groups are resourceful in terms of availability of forest products from the natural forests. Others with plantation forests are product scarce from their own and depend on government managed forest and other sources to meet their demands.

The CFUGs that have natural forests are relatively in the better-off position in terms of forest area available per user household, income generation from distribution of forest products outside and with in the groups. The CFUGs that have plantation forests have relatively less forest area per household resulting in high population pressure on forest. Thus, the CF area per household is an important indicator to assess the users' access to forest and products. In addition, the forest should be assessed by its type, whether natural, plantation or conserved to ensure the availability of products to the users to meet the current and future demands to avoid the situation that the larger tracts of the community forests have been handed over to the CFUGs comprising fewer households while a large number of households have been included in the smaller community forests. Thus, the concerned authorities need to analyse the forest area per user household specifically for different types of forest before natural and plantation forests are handed over to the communities.

Analysis of demand and supply of forest products in CFUGs and their networking will help meet the demand of various segments of the CFUG and also neighbouring communities and distance users. The CFUGs need to calculate the annual demand and supply of forest products and incorporate it into their FOPs and prepare their annual plans accordingly. This could enhance conservation and sustainable use of forest resources. The concerned authority, district forest authority and federation of CFUGs could play important roles to administer the demand and supply within the groups and district and also outside the district in coordination with the concerned authorities. The demand of a CFUG could be linked to the supply from a neighbouring CFUG in the process that district forest authority approves the harvesting procedure of forest products in a CFUG. External interventions to provide alternatives to forest product requirements such as biogas and improved cooking system would be an advantage for the communities that are resource scarce. Promotion of NTFPs in both natural and plantation forests would help conserve forest, generate income and develop ownership among the users for sustainable forest management.

Intra-group equity is another important dimension of equitable distribution of forest products to users of diverse well-being status. The CFUGs need to organise discussions at different clusters representing various segments of the community to analyse their demand of forest products and supply from CFUG and alternative sources. The CFUGs and concerned authorities need to emphasise the distribution of forest products from the rights of users from different segments rather than simply distributing the products as demand arises. The CFUGs need to undertake participatory well-being to identify the poor in the group. Accordingly, the rate and quantity of forest product distribution need to be fixed. This facilitates the poor and marginal users to get their share and make use of them to improve their livelihoods. This allows enriching their ownership over the common resource for sustainable management.

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Monitoring of *Gyps* species vulture in Nawalparasi district, Nepal

P. Subedi[1]

Critically endangered White-rumped vulture (WRV), *Gyps bengalensis* and Slender-billed vulture (SBV), *Gyps tenuirostris* monitoring was conducted in Nawalparasi district in the winter of 2005 following Postupalsky criterion. The objectives of this study were to identify and monitor nest localities, behaviour and to explore information about the vultures. A total of 48 *Gyps* vulture nest was located at six colonies. Of these nests, 18 were found to be active nets, six nests belonged to SBV and 12 nests belonged to WRV. Hundred percent nestling successes were observed in the study area. Restricted pesticides i.e. BHC and DDT were found used in this area. Diclofenac was the commonly used veterinary drug in the treatment of livestock. Carcasses disposal practice was found favorable to the vulture's survival. *Gyps* vulture richness found in this area is due to the availability of food i.e. floating carcass along the edge of the Narayani river and suitable habitat for roosting and nesting. The majority of the respondents had found favorable attitude towards vulture conservation. Further studies on *Gyps* vulture to identify the breeding status, head droppings behavior as well as conservation awareness program for local people and school children are recommended for long-term survival of these lords of the sky in the study area.

Key words: Gyps vulture, monitoring, diclofenac, pesticides

Vultures are the largest flying raptors in Nepal. Vultures along with hawks, kite, baza, buzzard, eagle, harrier, and osprey represent the avian family Accipitridae. These birds of prey are a major component of order Falconiformes. Out of the nine species of vultures are found in South Asia, eight species (Table 1) are reported in Nepal. Two species, White-rumped vulture (WRV), *Gyps bengalensis,* and Slender-billed vulture (SBV), *Gyps tenuirostris,* were formerly distributed in many parts of Nepal (e.g. Grimmett *et. al.* 2000, Inskipp and Inskipp 1991) and the Indian vulture (INV) or the Long-billed Vulture *Gyps indicus* may occur in Nepal but there is no confirmed record yet (Giri and Baral 2001) are now listed as Critically Endangered on the IUCN RED List (BirdLife International 2006).

Globally, WRV and SBV (here after both referred as *Gyps* vulture) are found in Nepal, India, Bangladesh, Myanmar, Cambodia and Laos. Additionally, WRV also occurs in Pakistan, Bhutan and Thailand and has been extinct from southern China (Birdlife International 2000).

The WRV was once described as the most common species of vulture found in Indian Sub-continent (Oaks *et al.* 2004, BirdLife International 2000, Grimmett *et al.* 1998, Inskipp and Inskipp 1991, Ali and Ripley 1989, Fleming *et al.* 1976 and Ali and Ripley 1968). This vulture retained strongholds in India and Pakistan and disappeared from most of Southeast Asia in the early 20th Century. A bulk population decline of more than 95% of this species was first noted at Keoladeo National Park, India in the 1990's. Since then, the catastrophic declines, also involving INV and SBV (split into two sub-species viz: *Gyps indicus* and *Gyps tenuirostris*-Rasmussen and Parry 2001) have been continuously reported across the subcontinent (Quoted in Oaks *et al.* 2004). Current evidence suggests that populations of these species continue to fall very rapidly (Gilbert 2004).

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Table 1: Status of Vultures Reported in Nepal

S.N.	Scientific Name	English Name	Nepali Name	Status			
				BirdLife/ IUCN	CITES Appendix	Nepal	Breeding
1	*Gyps bengalensis*	White-rumped vulture	Dangar giddha	Critically endangered	II	Nationally threatened	Resident
2	*Gyps tenuirostris*	Slender-billed vulture	Sano khairo giddha	Critically endangered	II	Nationally threatened	Resident
3	*Gyps himalayensis*	Himalayan Griffon	Himali giddha	Common	II	-	Resident
4	*Gyps Gyps fulvus*	Eurasian Griffon	Khairo giddha	Common	II	-	Passage migrant, rare, winter visitor
5	*Aegypinus monachus*	Cinereous vulture	Raj giddha	Near threatened	II	Nationally threatened	Winter visitor
6	*Sarcogyps calvus*	Red headed vulture	Sun giddha	Critically endangered	II	Nationally threatened	Resident
7	*Neophron percnopterus*	Egyptian vulture	Seto giddha	Endangered	II	-	Resident
8	*Gypaetus barbtus*	Lammergeier	Hadphor	Common	II	-	Resident

Source: Grimmett et al. 2000 , BirdLife International/IUCN 2006, CITES 2008, Baral H.S. and Inskipp C. 2004.

Once both commonest and resident before 1990's in Nepal, the *Gyps* vultures have been declining alarmingly. The rate of decline was reported as more than 95% within last 15 years; however, the current rate of annual decline is nearly 40% (Baral 2006). It was also reported that besides these two vultures, the remaining other six species of vultures are also declining gradually in Nepal (Baral and Gautam 2007).

The vulture study conducted at different times and places in Nepal such as Kathmandu valley (Giri 1996 and Panthi 1996), Chitwan National park (Giri and Baral 2001), a visit in lowland Nepal (Inskipp and Inskipp 2001), Inaruwa of eastern Nepal (Giri and Baral 2001), Koshi Tappu wildlife reserve (Baral *et al.* 2002), Sukla Phanta wildlife reserve and Nawalparasi forest (Giri and G.C. 2002), Rampur valley (Gautam and Baral 2004) illustrated that both *Gyps* vultures have been declining drastically throughout Nepal. This decline is along the same magnitude as those observed in Pakistan (Baral *et al.* 2003).

Oaks *et al.* (2004) concluded that residues of veterinary drug 'Diclofenac' are responsible for the WRV declines in the Indian Sub-continent. Various factors, including poisoning and the use of pesticides, reduction in food availability and nesting habitat, abnormally high rates of nesting failure, adult/ juvenile/nestling mortality, diseases, nest predators, hunting, environmental contamination, calcium deficiency, aircraft strikes, and electric lines shock have been reported as possible causes for high *Gyps* vulture mortality and subsequent population decline (Birdlife International 2000, BirdLife International 2006). Some of these problems may have also been found to occur in Nawalparasi district.

In the recent years, the international, regional and national conservation bodies have expressed crucial concern over the widespread and rapid decline of *Gyps* vulture. Much stress has been imposed on the identification and/or location of the remaining breeding colonies as well as population of each vulture species as quickly as possible (BirdLife International 2006). Based on important breeding population of WRV, forests of Nawalparasi are declared as Important Bird Area by BirdLife International and Bird Conservation Nepal (Baral and Inskipp 2005). There is still much work to be done to prevent the extinction of greatly affected two species of vulture in Nepal. No extensive vulture studies, except short thoroughfare visits, have previously been conducted in Nawalparasi district of Nepal to asses vulture population dynamics and ecology. In view of these circumstances, a *Gyps* vulture monitoring was conducted in west of Daunne hill of Nawalparasi district during the breeding season in 2005. The objectives of this study were to identify and monitor *Gyps* vulture nest localities and behavior, and to understand the local peoples' perceptions about Gyps vulture. The understandings of this study are expected to prove a cornerstone for future conservation, research and long term survival of these magnificent lords of the sky.

Materials and methods

Study Area

Nawalparasi district (27° 21'-27° 47' N and 83° 36'-84° 35' E) lies in the southern central part of Nepal (Fig 1). Topographically, the district divided in to three regions: Mahabharat hills, Churia hills and the *Terai* (lowland plain). A ridge of *Daunne* hills has divided the district into two separate plain area viz *Bhitrimadesh* in the east and *Terai* in the west. The study was conducted in the lowland western part of Nawalparasi district *i.e.* west of *Daunne* hill and covered the area of Makar, Panchanagar, Ramnagar, Sunwal and Amrout Village Development Committees.

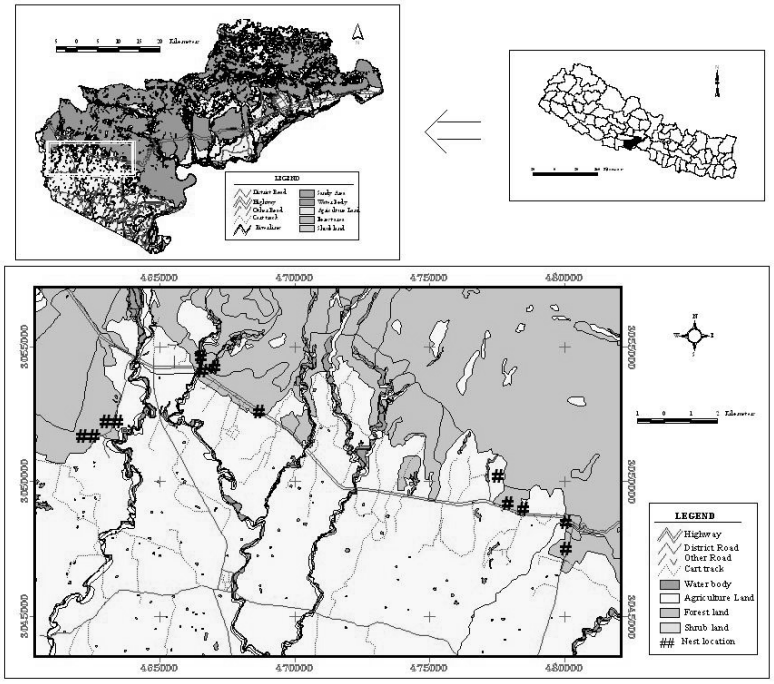

Fig. 1: Location of study area.

The district experiences tropical, subtropical and mild temperate types of climate. May and June are the hottest months and December and February are coldest months. The annual rainfall is 150 mm/year (MFSC 1995). The elevation ranges from 91 to1936 meters above the mean sea level (DDC, 2006). According to the altitudinal variation the average maximum temperature is 28.9 Degree Celsius. A total of 5,62,088 inhabitants are residing in the district (CBS 2002).

The dominant forest vegetation species commonly found in the district are *Shorea robusta*, *Terminalia tomentosa*, *Dalbergia sissoo*, *Bombax ceiba*, *Syzigium cumini*, *Terminalia chebula*, *Terminalia belerica* etc. Permanent river and seasonal streams drain out from north to the south (DDC 2006).

Methodology

Potential *Gyps* vultures' nest locations were identified using existing networks of roads and foot/trails from February 25 to March 1, 2005 as well as using secondary information. Postupalsky (1974) criterion was followed for assessing the reproductive success of *Gyps* vulture. After locating the potential nest colony, nest monitoring and nest activity were recorded from ground level once weekly from March 2 to June 8, 2005. Vulture nests were mostly observed from 6.00 am to 11.00 pm using 20*20CF Nikon Binoculars. All observed nests were recorded and marked using a hand held Global Position System (12XL Navigator Garmin). Each vulture's nest was given the separate number to avoid confusion among nests. Other information i.e. nesting tree species, active and abandoned (non active) nest, nest location in the tree, nesting vulture species, fresh chicks activity and sign of illness (neck drooping of vulture), were also recorded. A sample questionnaire survey was carried out through randomly selected households in the vicinity of vulture colonies to understand inhabitants' perception about vulture population, carcass disposal practices, livestock holdings and veterinary practice, pesticide and fertilizer use and forest resource use. Information on locally practiced pesticides and veterinary drugs was also collected through informal talk with shopkeepers and government officials. Study area map was prepared using topographical map of 1:25000 scales (HMG/N Survey Department 1996) and using GPS field data.

Results and discussion

Location and distribution of nest

Vultures were found to be more abundant in the west compared to the east of Nepal (Inskipp and Inskipp 2001) and still hold some population of both WRV and SBV (Baral *et al.* 2002a). This study has explored the forty-eight numbers of *Gyps* vulture's nests that were found widely distributed in the study area. Out of the 48 nests; 5, 11, 3, 6, 8, and 15 nests were found in Bardghat, Chisapani, Badera, Sunwal, Hadahiya and Basahiya colonies, respectively (Fig 2). Out of 48 nests, 18 were found active and 30 were found

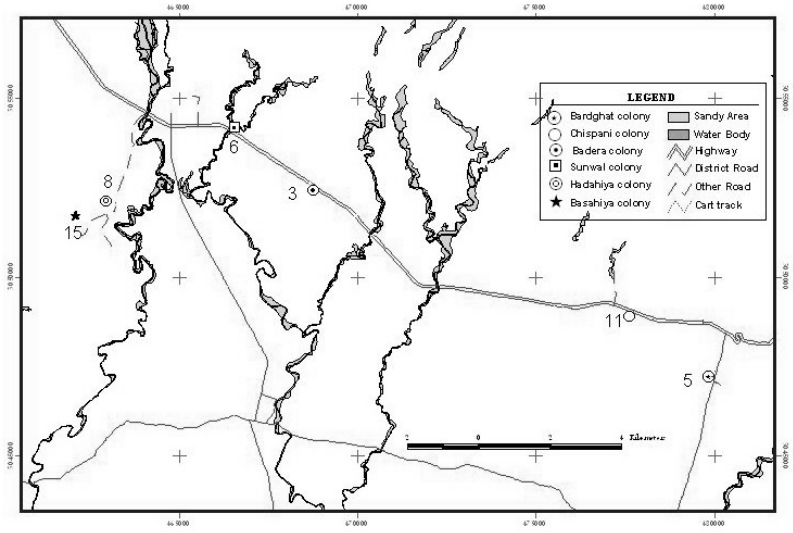

Fig 2: Distribution of minimum number of *Gyps* vulture nest in the study areas.

abandoned. Among the 18 active nests, 6 nests belonged to SBV and 12 nests belonged to WRV (Table 2). This study explored six nests of SBV in western Nawalparasi that was a surprising and unexpected result amid continuous vulture decline circumstance.

The abundance of vultures in this area can be accounted partly due to the availability of food (floating carcasses) along the approximately 75 Kilometer long watershed and edges of Narayani River and large plain area of *Terai* and *Bhitrimadesh*, and partly to the availability of suitable habitats for nesting, roosting and perching.

Nest abandonment

About 63% nest abandonment was observed in the study area (Table 2) though no clear causes have been traced for the high rate of abandonment. The time of nest desertion cannot be clearly explained because of late starts of monitoring activities. The high rate of nest abandonment could be due to the heavy strong wind that blew down some portion of nest during egg hatching, the change of old nesting colony by vulture its self, high number of frustration nest, high mortality rate of breeding vulture during nest building and prior or during egg lying, failure of egg during incubation and nestling mortality. The nest position and nest size on tree showed that some of the nests were being used for more than 3 years. Villagers around vulture colony also confirmed this assessment. The vulture might have shifted and built the nest colony in nearby areas. Unfortunately, these probable areas could not be scanned thoroughly because of adverse security condition inside the forest at that time.

Nestling success and nest deserted time of fledgling

The earlier researchers reported 28% to 59% breeding success of *WRV* in different parts of country (Giri and Baral 2001, Gautam and Baral 2004). During the observation, entire eighteen active nests were observed with chicks and those chicks fledged successfully in May and June. This study explicitly concludes that nestling success was found to be 100% same as the Myagdi and Syangja colonies in Rampur valley (Gautam and Baral 2004). Literatures and previous studies have not reported such high number of SBV nests (= 6) and fledged chick successfully till date in Nepal. This result indicated that this area is listed as one of the major potential SBV's site in Nepal. All parameters (viz. nest building activity prior to egg laying, egg laying and incubation, chick brooding and nestling period) of the breeding process of this study cannot be compared to other studies because this study maintained the data only after hatchlings completed since February 25, 2005.

Table 2: Total, Active, Abandoned and Successful nest

S.N.	Colony	Total nests	Active		Abandoned	Nestling Success
			WRV	SBV		
1	Bardghat	5	2	-	3	2
2	Chisapani	11	1	1	9	2
3	Badera	3	1	-	2	1
4	Sunwal	6	-	-	6	-
5	Hadhiya	8	2	2	4	4
6	Basahiya	15	6	3	6	9
	Total	**48**	**12**	**6**	**30**	**18**

Nest deserting period of fledgling were found to vary moderately. In Hadahiya and Basahiya colonies, 7 fledglings were found to desert their nest in between May 23 to 30; and remaining 6 fledglings in between May 30 to June 5, 2005. While in the Bardghat, Chisapani and Badera colonies, 3 and 2 fledglings were found to desert in between May 11-18 and May 18-5, 2005 respectively.

Chick behavior and parental care

Until the chick reached the fledgling stage, at least one of the parent's vultures was regularly found to care the chick sitting on tree. The parents showed little activities in the early morning however, the late morning witnessed the frequent activities from those parents like standing, sitting, perching, preening and flying out of and to the nest, and sometime lining of the nests. The parents were sometimes found brooding the chick in the nest. When the chick became capable of standing and playing, the parent either stood on the nest or perched on the nearby branch to attend the chick. The chick stood and played with their parents in the nest. By the end of April, most of chicks were seen to reach the fledgling stage. The fledglings were frequently seen preening, standing and sitting on the branch and top of the tree, and shaking the tree they stood on was the most common and frequent activity during nest visiting time.

Nesting tree species and nest height

Vulture normally prefers nesting site at the edge of forest, open grassland with scattered trees, or in *Bombax ceiba* and lightly wooded old forest. Generally, WRV nest were found in colonies in treetops as well as rocky cliff at 2 -10 meters high. However, SBV nest only reported in trees usually large ones, at a height of 7-14 meter (BirdLife International 2006). The *Bombax ceiba* is found to be the most commonly used tree species to built nest. Besides this, both *Gyps* vulture are known to nest in a variety of trees *viz Shores robusta*, *Ficus religiosa*, *F. bengalensis, Albizzia* species, *Mangifera indica*, *Tamarindus indica*, *Dalbergia sissoo*, *Azadirachta indica*, *Eugenia* species, *Terminalia arjuna* (BirdLife International 2006 Grimmett et al. 2000 and Ali and Ripley 1987). In Nawalparasi, Gyps vulture nests were reported on branches and trees tops in all colonies. More than 96 % of vulture nests were found to locate on *Terminalia tomentosa* and 4% on *Shorea robusta*. It is believed that *Gyps* vultures prefer *Terminalia* species because of easiness to break small leafy twigs tugging at it with bill, assisted by vigorous wing flapping to build the nest (Ali and Ripley 1968).

The maximum nest height was found at 45 meter on *Terminalia* tree and the lowest at 16 meter on *Shorea* tree from the ground level and found abandoned. The average height of nest on the tree was found to be 31.5 meter. The chick fledged successfully from the highest active nest was noted at 37 meter in Hadahiya colony. On the basis of the available literatures and research reports, this nest height measured at this study could be the highest nest record in Nepal.

Neck dropping behaviour and reported dead vulture

The neck drooping of both *Gyps* vulture was observed from the beginning of study till June. Through 14 times visit, on an average 5 neck dropper's vultures were noted from the six colonies as shown in figure 3. Neck dropping was also noted in breeding vulture. Abnormally high rate of head (neck) dropping in *Gyps* species are reported in Nepal and the populations of WRV have declined catastrophically in lowland Nepal (Baral *et al.* 2004).

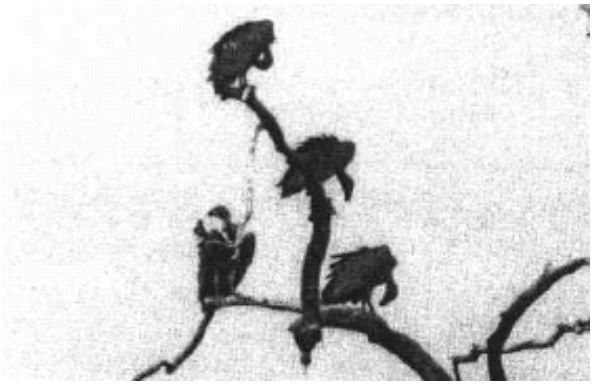

Fig. 3: Indian white-backed vultures showing neck drooping syndrome adopted from Cunningham *et.al.* 2003.

Prakash (1999) reported that once a vulture was seen to be sick, it invariably died within approximately 30 days of exhibiting sign of neck drooping syndrome. Sick birds continue to feed and fly, but both the degree of lethargy and the periods of neck drooping behavior progressively increase. If this annual trend continues, we cannot imagine the existence of this lord of the sky. Neck dropping to some extent may be a normal behavior in Nepal (Giri and Baral 2001). Some of the wild population of the *Gyps* vulture in west of Narayani river might have increased immunity power to this syndrome. All together five WRV and one SBV with rotting body with spreading feathers

were noted in different locations. This study could not collect fresh vulture specimen to perform postmortem and hence it could not explicitly furnish the causes of head dropping and the neck droppers' conditions and causes of death. It is presumed that breeding *Gyps* vulture with chick did not die in the time of study because of hundred percent nestling successes. Reported dead vultures might be sub adult and immature ones.

Logging concession and its effect on vulture habitat

About one decade ago, *Bombax ceiba* - the main roosting and nesting tree species of vultures, was heavily logged from the cultivated area. At that time, more than 70 vultures were regularly seen on roosting in one *Bombax* tree in Bardghat area (*pers comm*. Indra Prasad Sapkota). Logging concession seriously limits nesting habitat of vulture that would be negative consequences on breeding success (Gautam and Baral 2004). Recognizing the negative impact of logging on vulture habitat, the government of Nepal (GoN) declared to ban the logging concession of *Bombax ceiba*, *Terminalia arjuna*, *Shorea robusta, Adina cordifolia, Acacia catechu* and *Michelia champaca* on February 2, 1992. This provision was paralyzed and resulted in continuous destruction of vulture habitats (preferred tree species) even after the enactment of Forest Regulation (1993). Birders, naturalist and government officials of Nepal seriously raised this issue; the GoN again decided to ban the logging of *Bombax* tree but not *Terminalia* on September 1998. Unfortunately, the GoN relaxed the prohibition of *Bombax ceiba* logging concession since November 5, 2007 and this has resulted in the heavy destruction of vulture roosting and nesting habitat.

The concerned authorities that grants logging concessions should at least confirm whether the trees to be logged are being used for vulture's roosting and/or nesting. There is an earnest need to appeal GoN and concerned bodies to make provisions to ban the *Terminalia* and *Bombax* species logging concession, if not at least ban logging of the nesting and roosting trees immediately. Unless the interventions to safeguard the vulture habitats are implemented forthwith the existence of the vulture is in great jeopardy.

Social response

A total of 40 individuals (2 female and 38 male and aged 21 to 60 years) were interviewed and found literate, being involved in agriculture in the study area. Sixty percent of the respondents had migrated from mountain districts and other parts of the same district; and the rest (40%) were local inhabitants. The influx of people to this area started during 1960s after successful malaria eradication program. Other cause of migration to these areas perhaps might be the lack of fertile lands in hilly and mountains districts. The people in the area are heavily depended on forest resources to fulfill the basic needs for their livelihoods. This creates high pressure on autonomous vulture habitat. Basic needs of local people should be addressed through other conservation endeavors to ensure the sustainability of resources and vulture habitat.

Livestock holdings, carcass disposal practice and Veterinary treatment

A total of 356 livestock head were reported to be reared by the respondents. The average livestock unit (LU) was about 3.83 per household in the study area. Thirty-two livestock were reported to have died during the 5-year period in the study area. Seventy-five percent of the total death was due to diseases, 12.5% due to old age, and 12.5% due to accidents. One third of the diseased livestock was reported to die after treatment. When domestic animals die, 70% of the households' throw the carcasses in open fields (such as stream bank, forest area and/or communal land), 20% of them buried and 10% of them call skin tanner. Generally, it was reported that when livestock die due to diseases were always buried to prevent the potential spread of disease to their remaining livestock and human but not certainly to prevent vultures' death due to Diclofenac poisoning. They preferred to throw out carcass in open field in case of natural death of animals. This local practice was reported favorable to the vulture welfare.

Veterinary facilities were found available within 3 kilometer distance from the settlement. Out of 31 Agrovet shops in the district, 18 are located in the study area (DDC 2006). Seven of eighteen shops provided the veterinary drugs and pesticides the name upon the request of researcher but they refused to provide the sold amount. Other shops denied providing any information regarding this. Eighty percent of the respondents called veterinarian (Doctor and JTA) to treat the livestock illness. Commonly available and practiced veterinary drugs in the local market are presented in Table 4.

Besides other veterinary drug, Diclofenac is the easily available medicine to treat the livestock in the study area (*pers. comm.* Shovakar Gyawali). Almost all shopkeepers sell the Diclofenac as per requirement of the customers though, they were unaware about the side effects of the Diclofenac to the vulture. The wild WRV might have exposed to Diclofenac through contaminated water sources but the very low water concentration is unlikely to cause toxicity (Okas et al. 2004). The actual quantity consumed and/or injected to the animal could not be made available.

Use of fertilizer and pesticides

Both synthetic (Urea, Potash and DAP) and organic fertilizers (compost, cattle dung) as well as chemical pesticides were found use by farmers in agriculture cultivation. Majority of the respondents (65%) used both organic and synthetic fertilizers as per their personal judgment. Small proportion (10%) of the respondents used only organic manure in their farms; while 20 % respondents used only synthetic fertilizer in their farm annually.

High proportion (70%) of respondents were frequently found using pesticides in their agricultural land to protect the crop from the harmful insects/ pests. Out of 306 types of pesticides (Nepal's Pesticides Act 1991), 25 are commonly used in the study area and 12 of them are prohibited by this Act. Commonly used pesticides in the study area are given in Table 4. Some of prohibited pesticides viz. BHC and DDT are reported to be used in the study area. Use of pesticides like Forate, Malathion and Fenvalerate has been increasing enormously (Giri and Baral 2001). Actual quantity of pesticides being used/ consumed in the study area could not be obtained because of reluctance of shopkeepers to provide the actual data on their sales. Hence, this study could not reach the conclusion on this aspect. Respondents were found unaware of the prohibited pesticides and their side effects to the living beings.

Conservation Attitudes

Conservation attitude of the people was assessed by presenting 18 dichotomous (agree or disagree) statements to line up the people's opinion to conserve the *Gyps* vulture. The overwhelming majority of the respondents demonstrated favorable attitude towards vulture conservation. Hundred percent respondents showed willingness and interest to contribute financially (ranging from Rs.1 to 50 per year) to support vultures conservation activities such as habitat conservation, extension education, establishment of conservation NGOs and awareness program. All respondents were found to support of community forest. Majority of respondent (55%) affirmed that the veterinary drugs, pesticides and chemical fertilizer as the cause of vulture decline. Eighty five percent of them also expressed serious concern over vulture conservation for our future generation, religious purposes, and stability of the ecosystem.

Conclusion

Encouragingly, the highest number (48) and widely distributed *Gyps* vultures' nests were reported in the study area. Entire active nests (18) were observed with chicks fledged successfully. This study explicitly concluded that western part of Nawalparasi district, particularly west of *Daune* hills, is found to be one of the good strongholds of *Gyps* vulture. If any actions to conserve the vulture habitat are not taken on time, the existence of the vulture will be at stake and we will have to face irreparable loss.

Further studies on *Gyps* vulture focusing on breeding status, nest distribution and nest desertion, head droppings, is imperative to lineup other unidentified and unexplored information in this area. Conservation awareness program among the local inhabitants and local school children focusing vulture present status, threats and its role in the environment

Table 4: Commonly used pesticides and veterinary drugs in the study area.

S.N.	Veterinary drugs	S.N.	Pesticides		
1	Diclofenac	1	Indosulfan	2	Indosolphan
2	Gentamycine	3	Methyle parathion	4	Dichlorvus
3	Oxytetracycline	5	Segar	6	Cypermetheran
4	Ampillicine	7	Malathion	8	Micropower
5	Vita B complex +Vitamins+Mera	9	Zinc phosphide	10	Aluminium phosphide
6	Introflaxacin	11	Cypermethrine	12	Mencozeb
7	Anthalmantic	13	BHC		

Source: District Agriculture Service Office and District Livestock Office, Nawalparasi

need to be conducted to promote the long term survival of this species at this site.

Acknowledgement

This study was supported by the Bird Conservation Nepal. I acknowledge the District forest Office Nawalparasi; Livelihood for Forestry Program- Area Office Butwal; The Peregrine Fund-USA; Oriental Bird Club-UK for their cooperation and former article support. My special thanks go to Ms Carol Inskipp for her encouragement and suggestions and document support. Local people of the study area deserve my sincere appreciation for their help and cooperation.

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Conflict management strategy adopted in community forestry of Nepal: a study of four community forests in midwestern region

G.R. Acharya[1], Y. Yasmi[2]

This study focuses on two types of conflicts in Community Forest User Group (CFUG): conflict between User Group Committee (UGC) and user, conflict among users. Users were found impaired from the UGC decisions and their pattern of benefit sharing. Conflict also existed among users. Major strategies adopted to manage conflict were found to be either avoiding or forcing; but avoiding is the most widely used strategy. Moreover compromising and accommodating were found less frequently compared to forcing and collaborating that were rarely used. This study challenges the common perception that community forestry of Nepal is successful in managing its conflict. The findings of this study do not support this claim because collaborating strategy has rarely been used in Community Forest (CF) conflict management. In contrast, this study shows that avoiding and forcing were more commonly used. The greater application of avoiding and forcing strategy in conflict management indicates that CF is still lagging in realizing the best possible option of collaborating. This finding also challenges the effectiveness of the existing conflict management mechanism in CF. This study also suggests collaborating strategy as a better option for managing conflict. On the other hand, this study also reveals that CF is not benefiting the poor of the community. Though, many scholars trumpet CF as a successful programme in Nepal, this study points out that CF has not yet been able to manage its conflicts in a more constructive way. The study also pinpoints short comings of existing conflict management strategies that could be addressed to improve its performance in the days to come.

Key words: Benefit sharing, community forestry, conflict, strategy

Community forestry is the main strategy in Nepal's forestry sector policy (Nightingale, 2003; Chhetri, 2006; Acharya, 2002b, Acharya, 2007b). There is a close linkage between forestry and rural people in Nepal where people from rural area mostly depend on the forest resource to meet their fuel wood, fodder and timber need. Over 95% of the Nepali populace directly depends on the forests for their need of timber and non-timber forest products (Gautam, 2006). This high forestry dependency among people makes country's forest sector always an important issue for the successful implementation of CF in Nepal (Bhattarai, 2006).

CF is claimed by many as one of the most successful programmes in Nepal (Pokharel, 2001; Pandit and Thapa, 2004; Gilmour and Fisher, 1991; Chhetri, 2006). It has become effective in addressing livelihood of the community and conservation issues together and received attention as a successful forest resource management model (Pokharel, 2001; Agrawal and Ostrom 2001; Chakraborty 2001) both nationally and internationally.

Despite the success in the implementation of CF, there are number of conflict related challenges. CF is not free from discussion and debate (Banjade et.al. 2006, Acharya, 2007a Chakraborty, 2001). It has been a potential area for natural resource related conflict. It is true that CF is one of the successful programmes in Nepal (Pokharel, 2001; Fisher, 1995) but different findings point out that there is an existence of different types of conflicts in the CF (Rana, 2004; Shrestha, 1996; Joshi, Undated, Uprety, 2006). CF needs effective management (Pandit and Thapa, 2004; Pokharel et.al. 2006) to manage these conflicts. "Conflict is common in the use and management of these natural resources. Therefore management of

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conflict is crucial to improve the performance of natural resources management and to achieve sustainable use of natural resources" (Uprety, 2001).

Materials and methods

Theoretical study

Conflict has always been a part of human life (Yasmi, 2007; Uprety, 2006; Martin, 2005; Takacs, 2001; Hill, 1982) and it has been defined in different ways. Some scholars perceive conflict as a potential for both positive and negative outcome with creative or destructive manifestations (Abu-Nimer, 2001; Miall et.al.1999; Swaminathan, 1999; Van De Vliert et.al., 1999; Ayling and Kelly, 1997; Chan and Yu, 1985; Hill, 1982). Similarly others claim it as mostly negative with certain context (Banjade and Timsina, 2005; Upreti, 2004).

Blake and Mouton's managerial grid has strong influence on the conflict management study (Song et.al., 2006; Dyer and Song, 1998) and is a leading thesis on conflict management (Kabanoff, 1987; Pheng and Lee, 1997; Pruitt and Rubin, 1986; Thomas, 1977; Rahim, 1983; Shockley-Zalabak, 1988; Van de Vliert & Prein, 1989: as cited in Van de vliert and Kabanoff, 1990). According to McQueen (2005), the Managerial Grid also addresses improved decision making and problem solving; manages meetings; manages time; builds better team; gets the best answer instead of being simply adequate; and manages change effectively among others. Blake and Mouton's managerial grid is empirically proven (Holt and DeVore, 2005; Pheng and Lee, 1997; van de Vliert and Euwema, 1994; Rahim 1983; Thomas 1977).

(Adapted from Van De Vliert and Kabanoff, 1990)

Fig. 1: Blake and Mouton's Managerial grid

Collaborating

It is also known as **problem solving**. Work accomplishment is from committed people; interdependence through a "common stake" in organization purpose leads to relationship of trust and respect (Blake and Mouton, 1968).

Compromising

Adequate organization performance is possible through balancing the necessity to get out work with maintaining morale of people at a satisfactory level (Blake and Mouton, 1968).

Avoiding

It is also known as **withdrawing**. Exertion of minimum effort to get required work done is appropriate to sustain organization membership (Blake and Mouton, 1968).

Accommodating

It is also known as **smoothing**. Thoughtful attention to needs of people for satisfying relationships leads to a comfortable friendly organization atmosphere and work tempo (Blake and Mouton, 1968).

Forcing

It is also known as **competing.** Individualistic choose forcing as a conflict style (Holt and DeVore, 2005).

Data Collection

Primary Data was collected through Semi Structured Interview (SSI), Focus Group Discussion (FGD), Expert's Consultation and Observation. Informal interview was also carried out to get more information. Empirical research was carried out in four CFs of Dang district where two CFs were relatively larger in size and other two were smaller. A number of interview also varied according to the size of CF. In large CFs, 30 interviews were conducted. Similarly 20 interviews were taken in each small CF. Altogether 100 respondents were selected randomly for SSI. The idea of saturation of interview is the point at which no new information or themes are obtained in data (Guest et.al. 2006). The unit of the research was mostly the individual; and in case of existing or former UGC personnel they were represented as member of institution rather than just an individual. Secondary data were collected from CF records in the study area, Central Bureau of Statistics (CBS), DFO and ranger's office in the area and other line agencies and libraries.