Full Length Research Paper

Effect of managing methods of the community forests on the expression of forest products extracted from them in Lalitpur and Dhadhing districts from Nepal

Rasaily Rabina G. and Zuo Ting

Department of Development and Management, College of Humanities and Development, China Agricultural University, Beijing, China.

This study aimed to analyze the effectiveness of community forest to livestock rearing and the income from livestock products for different wealth class households. ANOVA was used to compare the means of quantity of forest products collected from community forest (CF) among different wealth class households. The analysis of the quantity of forest products extracted from community forest for livestock rearing showed that large numbers of rural households acquire benefit from their community forests. Analysis of the forest products collected from various sources for livestock rearing among the different wealth class households shows that the poor households collected more forest products from community forest as compared to other sources. In addition, the study indicates that the quantity of forest products collected for livestock rearing depends on livestock holding among different wealth class households. The extracted forest products from community forest such as poles/timber are used for building animal sheds, ground grass and fodder are directly fed to livestocks, and leaf litter is used as bedding materials, fencing and thatching for livestock. Based on the finding of the study, it can be concluded that, poor households rely more on the community forest than other sources as compared to the rich households.

Key words: Forest products, livestock rearing, Nepal, rural households, wealth class.

INTRODUCTION

Forest is a source of products such as leaf litter, fodder and ground grass which is the major livestock diet. Adequate availability of these products from forests means that livestock are well fed which results healthy animals with high yield in terms of milk, meat and draught power. Cattle, buffaloes and goats play a vital role in converting agricultural residues and forest biomass into useful manure through composting. Subsistence farming is based on a man- cattle- forest relationship (Ahmad et al., 2010). Empirical studies show that the farming communities of Nepal depend on forest resources for their survival and daily livelihood. The farming system of Nepal comprises land (including forests and arable land),

animal enterprises, and farmers (Ahmad et al., 2007). The dependency of the farming system on forest resources has been generating a continuous pressure on forest resources for many generations, leading to the over-exploitation and depletion of invaluable forest resources in Nepal (Ahmad et al., 2010a). Community forestry is a decentralized concept, which has been practiced in Nepal for about 25 years (Dhakal et al., 2005; Ahmad et al., 2008).

Many researchers have reported the exclusive dependency of rural families of Nepal on community forests, national forests and private forests for their daily livelihood (Fardous et al., 2011; Khan et al., 2008). Pandey (1982) reported that the livelihood of medium-income households substantially depends on animal husbandry, and thereby the forest plays a vital role in their livelihood.

---

*Corresponding author. E-mail: zuoting@cau.edu.cn.

Despite this achievement, a number of recent studies indicate that CF development has created limited benefit to poor people and women (Timsina, 2003; Ahmad et al., 2008a). One of the challenges is to promote livestock along with community forestry development. Livestock has been a key role in providing a livelihood and reducing poverty for subsistence farmers in mountain areas (Khan et al., 2007). Livestock business does not only help in securing social and environmental stability but also provides stable employment that is vital for income generation and food security (Dhakal et al., 2005). The restricted period of availability of forage for daily needs from CF has often made it difficult to maintain their livestock. As a result they are forced to violate community rules to supplement the fodder and in some cases they end up paying fines (Dhakal et al., 2005; Ahmad et al., 2008b). Adhikari et al. (2004) reported that poor household's access to forage is reduced following the establishment of CF. Eric (1992) also reports the sole dependency of hill communities of Nepal on private forest trees and community forests for fodders and green grasses. However, this supply may be primarily due to wealthy farmers who afford to keep more number of livestock than rural poor.

In spite of substantial scholarly works that examine the benefits of community forestry in Nepal, researchers in the past ignored the effect/influence of managing methods of the community forests on the expression of forest products extracted from them in Lalitpur and Dhadhing Districts from Nepal. The issues of contribution of CF on livestock rearing based on the wealth classes of forest users and the methods of using forest products collected from CF for livestock rearing. In-depth analysis of household reliance on forests under different wealth classes is crucial for the sustainable management of forest resources. Hill farming is heavily dependent on forest resources as it requires a net transfer of fertility from the forest, through fodder and leaf-litter, to the stall-fed animals.

Therefore, the main objective of this study was to investigate the effectiveness of community forest to livestock rearing for different wealth class households. This study examines the factors determining forest products extraction; differences in the quantity of forest products collected among different wealth classes and further explores the methods of the use of these products in livestock rearing. By analyzing the underlying links among the different wealth classes of forest users, forest products extraction from CF and methods of using these forest products for livestock rearing, this study significantly departs from other studies of community forestry in Nepal.

MATERIALS AND METHODS

This study was carried out in the Lamatar village development committee, Lalitpur and Pida village development committee, Dhading district of Nepal. The community forests were selected based on the criteria: 1) Community Forest User Groups (CFUGs) handed over at least before 5 years 2) CFUGs having the heterogeneous community in respect of household economic status 3) CFUGs having more than 50 households and 4) CFUGs representing the average management performance as per the District Forest Office (DFO) evaluation record. Out of total 756 households, 189 households (25%) were surveyed in six CFUGs of Lalitpur and Dhading district. Table 1 presents the name of the community forest user groups, year of hand over of national forest to the community, area of the community forest, grazing practices, forest products collection time and the household sample size. Selected community forests are diverse in terms of the area covered and location.

In order to collect the required data, households in the study area were first classified into three wealth classes: 1) rich, 2) medium and 3) poor, by the Forest User Groups (FUGs) committee members and some other key informants using their criteria in both the districts as shown in Table 2. Sample size was calculated as of precision 5%, confidence interval 95% (Amini et al., 2012) and selection of 189 households was done by stratified random sampling technique using the list of user groups in different selected CFUGs. Semi structured questionnaire were used to collect the data. Sample consisted of equal proportion of respondents based on gender and households from rich 28%, medium 32% and poor 40% wealth classes. Survey captured demographic and socio economic characteristics of forest users, types and quantity of forest products collected from community forest; income from livestock products such as milk and meat and the methods of using forest products for livestock rearing. This information was analyzed to quantify forest products collected, total livestock holding, dung production and methods of using forest products adopted by the households for livestock rearing.

The livestock holding for all FUGs applied four livestock units where 1 livestock unit (LSU) = 1 buffalo = 1.2 cow/ox = 4 goats (Thapa and Poudel, 2000). Statistical analysis consisting of multiple comparisons of means was done in Statistical Package for Social Science (SPSS) version 13. Incorporated with the analysis of variance and Student's Least Significant Difference (LSD) between different wealth classes and the quantity of forest products collected from CF and total livestock unit among different wealth class households.

RESULTS AND DISCUSSION

Livestock holding

For factor cow, three statistically different groups were identified. First composed of poor wealth class was characterized by a low cow LSU. Second consisted of medium wealth class differed from two others by a mean cow LSU. Third comprising rich wealth class stood out from two previous by a high cow LSU. The averages stretched out from 0.5 to 1.2 cows LSU (Table 3). So, rich wealth class had the highest cow LSU. This finds an explanation through financial means that they have 0.5 to 1.2 cows from poor to rich groups which agree with the findings of Khanal et al. (2009). Similarly, as for factor ox, the averages stretched out from 0.1 to 1 ox (poor to rich groups) and for factor buffalo from 0.6 to 1.9 buffalo (poor to rich groups) respectively. These findings were comparable to similar type study done by Richards et al. (2003), where they stated an increasing number of livestock unit holding represent from poor to rich households.

Table 1. General information about the selected CFUGs for the study.

Distribution	Lalitpur district			Dhading district		
Forest user group	Kafle	Patle	Gomati	Thulo ban	Bageshowari	Amaltari
Forest area (ha)	94	105	60	300	115	34
Total household	65	142	51	343	101	54
Grazing practice	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted
Ground-grass collection	Nov-Feb	Dec-Feb	Nov-Feb	Throughout year	Throughout year	Throughout year
Fodder collection	Nov-Feb	Dec-Feb	Nov-Feb	Throughout year	Throughout year	Throughout year
Leaf litter collection	Nov-Feb	Dec-Feb	Nov-Feb	Throughout year	Throughout year	Throughout year
Fuel wood collection	Nov-Feb	Dec-Feb	Nov-Feb	Nov-Feb	Nov-Feb	Nov-Feb
Pole/timber collection	Nov-Feb	Dec-Feb	Nov-Feb	Decision made by committee	Decision made by committee	Decision made by committee
Forest handover (year)to CFUG	1994	1993	2002	1991	1998	1999
Sample size	17	44	14	78	24	12

Table 2. Criteria used by FUG members to group households (HH) into different wealth class in the study area.

Wealth class	Criteria
Rich	Surplus production from own land; at least one family member engaged in a government job, business or other secure off-farm job with a good cash income; children attend schools/colleges in towns; acquired high percentage of forest products from private forest.
Medium	Sufficient food for 12 months with no surplus for sale; some households with access to off-farm income; send children to schools /colleges in nearby villages; acquired moderate percentage of forest products from private forest.
Poor	Sufficient food only for 6 months; mostly engaged in wage labor in surrounding villages; send children to schools in the village; relatively acquired low percentage of forest products from private forest.

Livestock is a major capital asset in the study sites. Buffaloes and cows are kept mainly for milk and manure production; oxen for draught power and manure; and goats for meat. Livestock plays a critical role in maintaining the fertility of agricultural land and for some households livestock is the only source of cash income in the study area. The sampled households were 53 (28%) from rich wealth class, 61 (32%) from medium wealth class and 75 (40%) poor wealth class. Communities keep cows, ox, buffaloes and goats for milk and meat, draught power, and manure (dung). Table 3 shows the effect of livestock holding on the expression of LSU number per wealth class. The mean livestock holding number by different wealth class households significantly differed ($p < 0.05$) between the cow, ox, and buffalo, whereas there was no significant difference between the goat owned by rich, medium and poor wealth class households. It was due to the reason that the price of cow, ox and buffalo were too high as compared to goat for poor household to afford. This finding was similar to Adhikari and Lovett (2006), stated that wealthiest households own relatively high number of cattle compare to poor households. Buffaloes also require more fodder and since rich households have more access to fodder sources on their own land (tree, grass and crop residues), they can maintain them more easily. Wealthier households also own more oxen because they have more land and need oxen for ploughing. Poor households have proportionately equal number of goats as rich households because goats are regarded to be lower maintenance animals with higher productivity than buffaloes

Table 3. Effect of livestock holding on the expression of LSU number per wealth class.

Wealth class	Sampled households	Number of livestock unit			
		*Cow	*Ox	*Buffalo	*Goat
Rich	53	1.2[a]	1 [a]	1.9[a]	1.3[a]
Medium	61	0.9[b]	0.5[b]	1.5[b]	1.2[a]
Poor	75	0.5[c]	0.1[c]	0.6[c]	1.1[a]

All the buffaloes, cattle and goats owned by the household are converted into livestock unit (LSU) using, 1 LSU= 1 buffalo=1.2 cow= 4 goats= 5 sheep= 2 calves (Thapa and Poudel, 2000). *The mean values of livestock holding under each wealth class followed by different letters (a, b, c) in the same column were significantly different at P=0.05.

Table 4. Annual average quantity of forest products collected from CF for livestock rearing by different wealth classes (per household/year).

Forest product	Wealth class		
	Rich	Medium	Poor
Ground grass (kg)	*1256[a]	1518[ab]	1861[b]
Fuel wood (kg)	*126[a]	223[ab]	293[b]
Leaf litter (kg)	* 370[a]	443[ab]	675[b]
Fodder (kg)	*1108[a]	1180[ab]	1488[b]
Poles/Timber (cubic feet)	*1[a]	2[ab]	3[b]

*The mean values of forest products collected from CF for livestock rearing under each wealth class followed by different letters (a, b) in the same row were significantly different at P = 0.05. Here, the studied factor is forest product gathered from CF. Its variants are Ground grass, Poles/Timber, Leaf litter, fodder, fuel wood.

and cows (Sapkota and Odén, 2008).

Forest products collected from CF

The main forest products collected from CF for livestock rearing were identified as ground grass, fuel wood, fodder, poles/timber and leaf litter (Table 4). Despite the differences in quantity of collection of forest products, all wealth classes rely on forest for livestock rearing. It also showed that the poor households rely significantly on community forests compared to other wealth class households for livestock rearing. This finding was related to report that both low and medium wealth class households collect a higher percentage of fuel wood from community forests (Ahmad et al., 2011). Rich households stated that they meet their fuel wood requirement from private forests for livestock rearing. Forests supply the major share of the feed of these animals in the form of fodder. Fodder includes tree leaves and branches, and as well as crop residues such as rice and millet straw, maize stalks and sheaths. Although some households reported that the use of crop residues to feed their livestock, the quantity were insignificant. The analysis showed that the quantity of poles/timber collected from CF decreases from rich households to poor households. It was due to the reason that wealthier households harvest timber from their private forest as compared to

poor households. Like wise, Makundi and Sathaye (2004) highlighted the importance of private forestry for wealthiest households meeting their timber demands and options of forest resources utilization.

Animal dung production

Animal dung production from livestock decreases from rich households to poor households (Figure 1). There was a high significant difference (p<0.05) between dung production from livestock among rich, medium and poor wealth class households. As the wealthiest households own more buffaloes, cows and ox, it provides larger quantity of animal dung as well as draught power compared to poorer households and there is a general agreement with the reports of (Kalash et al., 2009; Fu et al., 2011). It is also indicated that larger quantity of flow of forest products from various sources to rich wealth class households.

Milk and meat production from livestock

Buffaloes and cows are kept for milk production, and goats for meat production. Analysis showed significant difference (p<0.05) in milk production and sold quantity among rich, medium and poor wealth class households
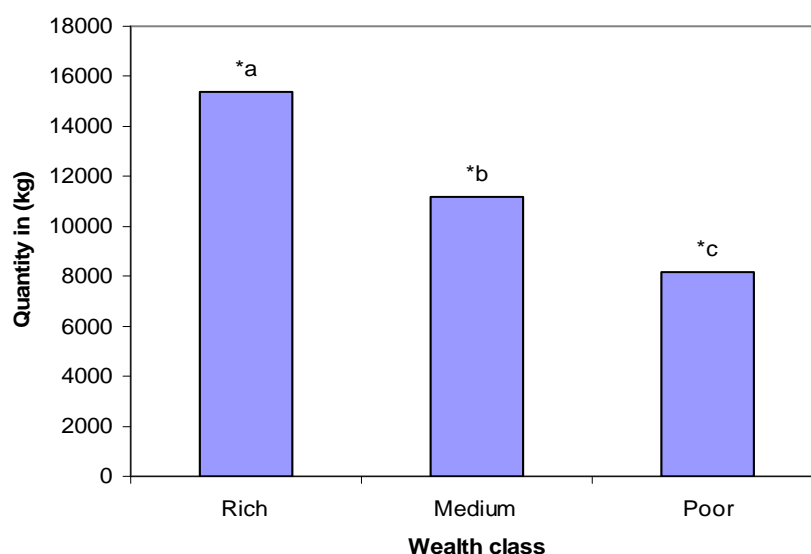
Figure 1. Annual average quantity of dung produced from livestock for each wealth classes. *The mean values of dung produced from livestock under each wealth class followed by different letters (a, b, c) in the chart column were significantly different at P=0.05.

Table 5. Average quantity of milk and meat production and sold quantity for different wealth class.

Wealth class	*Milk (liter/annum)	*Sold (liter/annum)	*Meat (kg/year)	*Sold (kg/year)
Rich	1056[a]	293[a]	30[a]	23[a]
Medium	928[b]	236[b]	29[a]	21[a]
Poor	306[c]	72[c]	28a	20[a]

*The mean values of milk production and sold quantity under each wealth class followed by different letters (a, b, c) in the same column were significantly different at *P=0.05*.

(Table 5). It was due to the reason that the number of livestock holding decreases from rich to poor class households, and there was no significant difference in meat production and sold quantity among different wealth class households. The reason behind this was that there was no significant difference in number of goat holdings among different wealth class households. Our results were in agreement with indications given by Kalash et al. (2009), who noted that number of goat holdings between low, medium and high wealth class were insignificant.

Income from milk and meat sold

Livestock husbandry is still the main source of livelihoods in the study area. The total annual average income from sold milk was higher for rich wealth class households (Table 6). The analysis showed that there was a high significant difference (p<0.05) between income from sold milk among rich, medium and poor wealth class households. The present study paralleled with the

research conducted by Hedge (2006) who assessed the contribution of animal husbandry to different wealth status of farmer's economy through milk production decreases from rich to poor households. As of there was no significant difference between incomes from sold meat with in households of wealth class rich, medium and the poor. The result clearly showed that due to the livestock holding for rich households were higher, which contributes to higher income from livestock products than the poor households in the study area.

Forest products collected from various sources

The contribution from various sources of forest products collected for livestock rearing among different wealth class households is presented in Table 7. There was significant difference (p<0.05) between quantity of forest products collected from private forest (PF) among households in different wealth classes but there was no significant difference in quantity of forest products

Table 6. Annual average incomes from sold milk and meat for different wealth class.

Wealth class	*Milk income (*NRs.*)	*Meat income (NRs)
Rich	5860[a]	4776[a]
Medium	4720[b]	3812[a]
Poor	1440[c]	3538[a]

(NRs= Nepalese Rupees)(1US$ = 75 NRs). *The mean values of income from milk and meat sold under each wealth class followed by different letters (a, b, c) in the same column were significantly different at *P=0.05*.

Table 7. Forest products collection from national and private forest for livestock rearing among different wealth classes (per household/year).

Forest products	Wealth classes		
	Rich	Medium	Poor
Ground grass (kg)			
National forest	0	0	0
Private forest	*1169[a]	948[b]	392[c]
Fodder (kg)			
National forest	0	0	0
Private forest	*597[a]	345[b]	146[c]
Fuel wood (kg)			
National forest	0	0	0
Private forest	*479[a]	242[b]	131[c]
Leaf Litter (kg)			
National forest	0	0	0
Private forest	*302[a]	177[b]	63[c]
Poles/Timber (cubic feet)			
National forest	0	0	0
Private forest	*2.7[a]	1.4[b]	0.5[c]

*The mean values of forest products collected from various sources under each wealth class followed by different letters (a, b, c) in the same row were significantly different at *P=0.05*. Here studied factor is forest product gathered from NF and PF. Its variants are Ground grass, Poles/Timber, Leaf litter, Fodder, Fuel wood.

collected from national forest (NF) between households in different wealth classes. The results showed that the quantity of forest products collected from PF increases from poor to rich wealth class households This finding was related to Maraga et al. (2010) who concluded that the proportion of forest products obtained from private sources as opposed to communal or open access resources decreases wealthiest to the poorest households, suggesting that richer households were better able to meet their forest products needs from their own sources. The collection of forest products from national forests was restricted for public use.

Improvement in livestock rearing after formation of CF

Among the 189 respondents, 91% said that there has

been an improvement in livestock rearing after the formation of community forest (Figure 2). They cited that prior to the initiation of community forest; the forests were under the control of district forest office with open grazing practices through out the year. This resulted in rampant destruction of ground grass, fodder seedlings and saplings by livestock, consequently resulted in reduced availability of forest products for livestock. After the formation of community forest, the forest area was restricted for open grazing practices and applied stall feeding system that lead to increase in plant biomass. In case of poles/timber used for building animal sheds, the poor households lacked access to these products prior to the formation of community forest, as the richer groups mostly controlled it. After the formation of community forest, the distribution of these products was regulated, this has led to access for the poorer households. Forest products were easily available and accessible for the
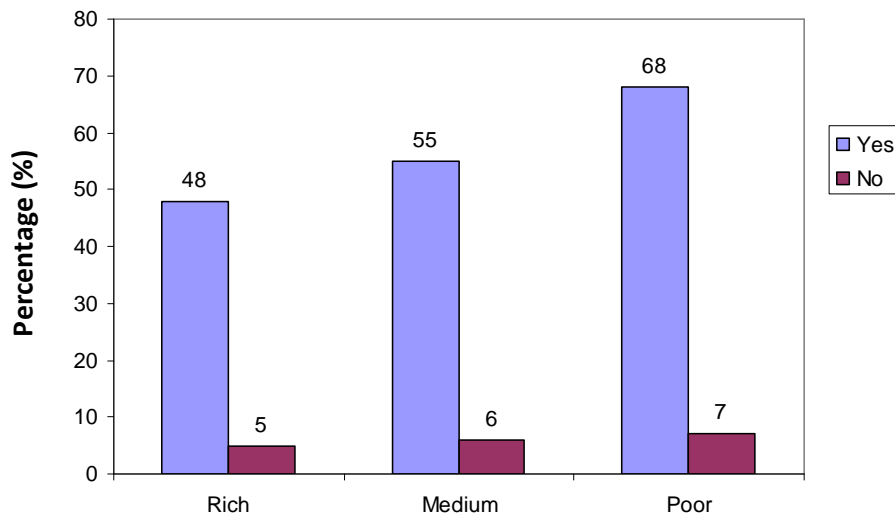
Figure 2. Improvement in livestock rearing after formation of CF (N=189).
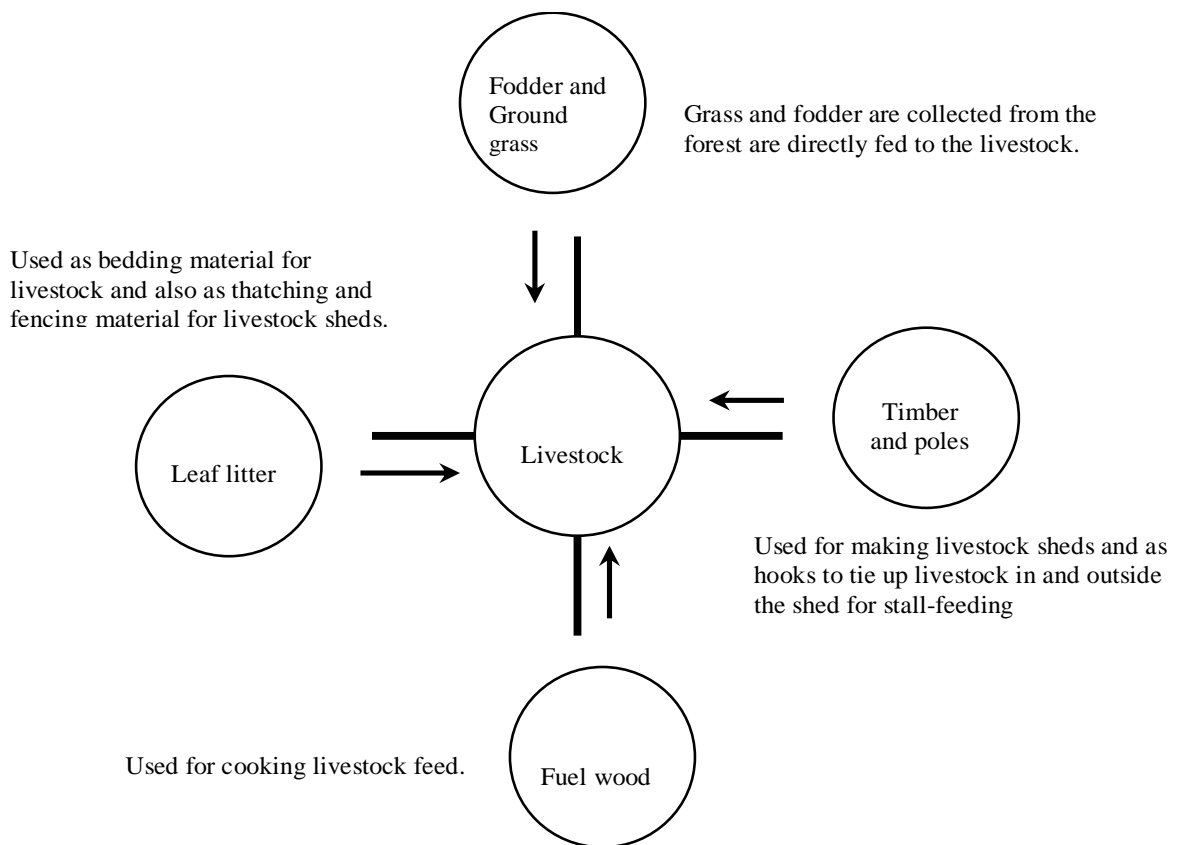

Figure 3. Methods of utilization of forest products for livestock rearing in the study area.

households living nearby forest area, which consequently reduced the availability for the households living far away from the forest area, but after the formation of community forest, collection of forest products was followed according to CFUG operation plan. Findings of the study were supported by Neupane et al. (2004) who reported that there has been a significant increase (33%) in number of households keeping livestock and making

income from them.

Methods adopted for utilization of collected forest products

Livestock husbandry is a vital component of farming system in the study area. A major output of cattle production that goes to farmland is dung as farm yard manure which contributes a major source for maintaining soil fertility in mid-hills of Nepal. Livestock husbandry practices include stall- feeding. Stall-feeding is achieved by providing grass, weed, and herbaceous fodder, tree leaf fodder collected from agricultural lands and community forests (Figure 3).

Leaf litter collected from forests was spread on the floor of animal sheds and also used as bedding material in animal sheds during winter which protects animals from extreme cold. It was also used for thatching and fencing the animal sheds. Fodder and ground grass were directly fed to animals. Similarly, timber and poles was used for making animal sheds and also as hooks to tie up animals. Long poles were used as a support during thatching upon which leaf litter is also spread as it was also used as thatching material. Smaller poles were also used for fencing of animal sheds during winter months and leaf litter used along with poles as fencing material which protects animals from cold wind. Smaller poles/timber was also used as hooks to tie up animals to it. Fuel woods collected from CF were used to cook animal feed (bran).

Conclusion

The study concludes that the effectiveness of community forest for livestock rearing depends upon the wealth class of the households within FUGs is reflected in the way FUGs manage their community forest resources and distribute forest products. As a whole, community forest supplies fodder, fuel wood, leaf litter, ground grass and poles/timber for livestock rearing. Leaf litter is used as bedding materials for stall- feeding and fencing/roofing the livestock shed. Poles/timber is used to build animal shed and hooks to tie up animals. This study showed that the wealth classes of households have a marked relationship with the quantity of forest products collected from private forest. Rich households tend to collect less quantity of forest products from community forest than the poor households, as they fulfill their most demand from privately owned forests for livestock rearing. The poor households rely heavily on community forests for most of the forest products used for livestock rearing.

These findings indicate that the rich and medium wealth class households rely on private forests for many forest products, even though community forest remains a very important source. This high level of dependency of rich and medium wealth class households on community

forest has developed due to an inseparable relationship between community forest and livestock husbandry in the study area.

RECOMMENDATIONS

This study represents a case study with regards to the effectiveness of managing methods of the community forests on the expression of forest products, as the work was restricted to Districts Lalitpur and Dhading of Nepal. The undoubted utility of such survey based on the valuable community forests resource to livestock rearing information being generated, makes it imperative that the same may be extended to the rest of the Districts of Mid Hills as the next step and later for other regions too, for it not only assists the farmers/forest dependent communities but also generate poor wealth class oriented programs to increase their income, more rational management of community forests, alleviates of poverty and consequently, enhances the gross economy at the national level.

REFERENCES

Adhikari B, Falco SD, Lovett J (2004). Household characteristics and forest dependency: Evidence from common property forest management in Nepal. Ecol. Econ., 48(2): 245-257.

Adhikari B, Lovett JC (2006). Transaction costs and community-based natural resource management in Nepal. J. Environ. Manage., 78: 5–15.

Ahmad K, Ejaz A, Khan ZI, Gondal S, Fardous A, Hussain A, Sher M, Valeem EE, Samiullah (2010). Evaluation of Dynamics of Iron and Manganese from Pasture to Buffaloes: A case study at rural livestock farms. Pak. J. Bot., 42(5): 3415-3421.

Ahmad K, Hussain M, Ashraf M, Luqman M, Ashraf MY, Khan ZI (2007). Indigenous vegetation of Soone valley: At the risk of extinction. Pak. J. Bot., 39(3): 679-690.

Ahmad K, Ibrahim M, Khan ZI, Rizwan Y, Ejaz A, Fardous A, Gondal S, Lee DJ, Alyamni M (2011). Effect of Sewage Water on Mineral Nutritive Potential of Six Fodder Species Grown Under Semiarid Conditions. Saudi J. Biol. Sci., 18: 317–321.

Ahmad K, Khan ZI, Ashraf MY, Ashraf M, Valeem EE (2008). Forage evaluation for some trace elements: a case study in the soone valley, Pakistan. Pak. J. Bot., 40(3): 999-1004.

Ahmad K, Khan ZI, Ibrahim M, Ashraf M, Hussain M (2010a). Evaluation of nutritional composition of plant species of Soone Valley, Punjab, Pakistan. J. Plant Nutr., 33: 496-517.

Ahmad K, Khan ZI, Shah ZA, Ibrahim M, Mustafa I, Valeem EE (2008b). Evaluation of available sugars in plant species indigenous to soone valley (Punjab) Pakistan. Pak. J. Bot., 40(5): 1877-1883.

Ahmad K, Khan ZI, Ashraf M, Hussain M, Ibrahim M, Valeem EE (2008a). Status of plant diversity at kufri (soone valley) Punjab, Pakistan and prevailing threats there in. Pak. J. Bot., 40(3): 993-997.

Amini B, Baghchesaraei H, Nasiri A (2012). Estimation of coliform contamination rate and impact of environmental factor on bacterial quality of tube well water supplies in Khorramdarreh County, Iran. Afr. J. Biotechnol., 11(31): 7912-7915.

Dhakal B, Bigsby H, Cullen R (2005). Impacts of community forestry development on livestock based livelihood in Nepal. J. For. Livelihood., 4(2): 43-48.

Eric PR (1992). An investigation of an indigenous knowledge system and management practices for tree fodder resources in the middle hills of central Nepal. PhD dissertation, Michigan State University, USA.

Fardous A, Ahmad K, Gondal S, Khan ZI, Ejaz A, Valeem EE (2011). Assessment of iron, cobalt and manganese in soil and forage: A case study at a rural livestock farm in Sargodha, Pakistan. Pak. J. Bot., 43(3): 1463-1465.

Fu JH, Liu QY, Xu MJ, Shi DS, He XH, Pan Y, Guo RB, Gao, Q, Yi SX, Si HS, Zhu XQ (2011). Seroprevalence of *Mycoplasma bovis* infection in dairy cows in subtropical southern China. Afr. J. Biotechnol., 10(54): 11313-11316.

Hedge NG (2006). Livestock Development for Sustainable Livelihood of Small Farmers. Souvenir of the 39th Annual General Meeting and 48th National Symposium on Energising Rural India. A Challenge to Livestock Industry. Compound Livestock Feed Manufactures Association of India (CLFMA), Manesar, Haryana, pp. 50-63.

Kalash P, Rathore R, Kumar M (2009). Livelihood improvement of farm women through cattle and buffalo rearing in Jhunjhunu District of Rajasthan. Int. J. Rural Stud., 16(12): 1-3.

Khan ZI, Ashraf M, Ahmad K, Mcdowell LR, Valeem EE (2008). Transfer of magnesium from soil and forage to goats grazing in a semiarid region of Pakistan: influence of seasons and sampling periods. Pak. J. Bot., 40(5): 2127-2133.

Khan ZI, Ashraf M, Ahmad K, Mustafa I, Danish M (2007). Evaluation of micro-minerals composition of different grasses in relation to livestock Requirements. Pak. J. Bot., 39(3): 719-728.

Khanal Y, Upadhyaya CP, Sharma RP (2009). Economic valuation of water supply service from two community forests in Palpa District. Banko Janakari, 20(1): 24-29.

Makundi WR, Sathaye JA (2004) GHG mitigation potential and cost in tropical forestry – relative role for agro-forestry. Environ Dev Sustain, 6: 235–260.

Maraga JN, Kidwage JK, Oindo BO (2010). Factors determining community participation in afforestation projects in River Nyando basin, Kenya. Afr. J. Environ. Sci. Technol., 4(12): 853-859.

Neupane KP, Neupane SS, Basyal LN (2004). Contributions to people livelihoods from forestry: Experience from sub-watershed resources management project in Dhading District, Editors: Kanel KR, Mathema P, Kandel BR, Niraula DR, Sharma AR and Gautam M. Twenty-fiver years of community forestry, proceedings of the fourth national workshop on community forestry, 4-6 August 2004, Community Forest Division, Department of Forest, Kathmandu, Nepal, pp. 259-263.

Pandey KK (1982). The livestock-fodder situation and potential fodder resources. Mountain Development Environment SATT, Sahayogi Press, Kathmandu, Nepal, pp. 47-60.

Richards M, Maharjan M, Kanel K (2003). Economics, Poverty and Transparency: Measuring equity in forest user groups. J. For. Liveli, 3(1): 91-106.

Sapkota IP, Odén PC (2008). Household characteristics and dependency on community forests in Terai of Nepal. Int. J. Soc. For., 1(2): 123-144.

Thapa GB, Poudel GS (2000). Evaluation of the livestock carrying capacity of land resources in the hills of Nepal based on total digestive nutrient analysis. Agric. Ecosyst. Environ., 78: 223-235.

Timsina N (2003). Promoting social justice and conserving Montane forest Environments: A case study of Nepal's community forestry programme. Geogr. J., 169(3): 236-243.