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ASSESSMENT OF LIVESTOCK GRAZING, CHOPPING AND LOPPING IN SOME FOREST OF TARAI AND BHAWAR OF KUMAUN HIMALAYA

Bhasker Joshi[a], Suresh Chandra Pant and Sona Joshi[b]
a. R. H. Govt. P.G. College, Kashipur- 244713 (Kumaun University, Nainital), Uttarakhand, India
b. Kumaun Kesari Pt. Badri Dutt Pandey Govt. P. G. College, Bageshwar, District: Bageshwar – 263640
***Corresponding Author's Email: bhaskerjoshiphd@yahoo.com**
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Abstract: The present communication deals with the study of livestock grazing, chopping and lopping in some forests of Tarai and Bhawar area of Kumaun. Maximum and minimum lopping was reported in site IV and site III respectively, maximum chopping was reported in site IV and no chopping was reported in site III however maximum and minimum livestock grazing was reported in site IV and site III respectively.
Keywords: Bhawar; Chopping; Forest; Kumaun Himalaya; Livestock Grazing; Lopping; Tarai
Postal Address: Department of Botany, Surajmal Agarwal Pvt. Kanya Mahavidyalaya, Kichha-263148 Uttarakhand.

INTRODUCTION

Forests are linked with our culture and civilization. India's current forest and tree cover is estimated to be 78.29 million ha, constituting 23.81 per cent of the geographical area of the country (FSI, 2011). Forest cover alone amounts to 69.20 million hectare, against the recorded forest area of 76.95 million ha. Of the total forest cover, 12.06 per cent is very dense forest (more than 70% crown density), 46.35 per cent is moderately dense forest (40% to 70% crown density), and the remaining 41.59 per cent is open forest (10% to 40% crown density). Forest provide us fodder, fuel wood, timber, leaf litter form manuring crop fields, construction, industrial raw material and several non-timber forests products (Ram *et al.,* 2004). Non-timber forest products include canes, gums, resins, tannins, lac, dyes, fibers, medicine, oil, honey, spices and several other produces (Ram *et al.,* 2003).

Due to anthropogenic pressure several changes seen in floral and faunal diversity, habitat, landscape, soil degradation in forests. Rathore (1993) studied resource utilization pattern in Central Himalaya. Rikhari and Palni (1999) investigated affect of forest fire on ground vegetation in Central Himalaya. Silori (2001) studied the affect of anthropogenic pressure in buffer zone of Nanda Devi Biosphere Reserve in Uttarakhand. Silori and Mishra (2001) work out on anthropogenic pressures: livestock grazing in and around the forest corridors of Mudumalai wild life sanctuary and analysed the status and distribution of grazing pressure and socio-economic status of the local inhabitants. Chhetri (2004) studied impact of anthropogenic pressure on Khangchendzonga Biosphere Reserve. Nautiyal *et al.* (2004) studied anthropogenic pressure on Alpine vegetation of Garhwal Himalaya. Kumar and Ram (2005) conducted a detailed study on anthropogenic disturbance and plant biodiversity in certain forests of Central Himalaya of Uttarakhand.

Grazing, deforestation, lopping, chopping and forest fire are major causes of forest degradation and have wide ranging adverse ecological, economic and social impacts. Over the years, forests suffered from serious depletion due to unrelenting demand for timber, fuel wood and fodder. This study deals with detailed information on livestock grazing, chopping and lopping in some forest of Tarai and Bhawar of Kumaun Himalaya adjacent to Kashipur, Uttarakhand.

EXPERIMENTAL

For the present study, some forests of Tarai and Bhawar area of Kumaun adjacent to Kashipur in between 29^{0}14'43.6" N to 29^{0}19'50.5" N and 79^{0}03'22.6 E to 79^{0}04'23.2" E at an elevation of 250 to 265 msl were selected as Jurkha Beat (site I), Gulzarpur Beat (site II), Jogipura Beat (site III) situated in Tarai area and Aampani Beat (site IV) situated in Bhawar area of Kumaun. The selected forest area is 3242.09 ha. Due to direct link to Corbett National Park and a junction of Tarai and Bhabhar, this area is highly rich in flora and fauna. The forest area under the study were 558.38 ha (site I), 674.61 ha (site II) 900.51 ha (site III) but actual forest area was only 5.00 ha because this site suffer from heavy deforestation in past years and soil erosion by flood of river Kosi and Dabka and 1108.59 ha (site IV) {Source: Office of Tarai West Forest Division Ramnagar, Uttarakhand}.

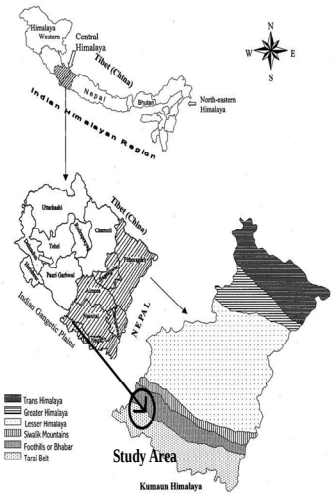

Figure 1: Map of Study area

An anthropogenic pressure and resource utilization site was studied by frequent field visits, from experience of personals of forest department and the local natives. Prior to the ban, pattas (permits) were given to herders for grazing their livestock. Herders followed an agro-pastoralist lifestyle with establishing permanent goths (cattle sheds) in the forests and practicing mostly subsistence agriculture in the villages. In the forest, vegetation in and around the cattle-shed would be cleared to create *kharka* (open space for grazing). In the adjacent areas, trees would be heavily lopped for fodder and cut for firewood and timber. The movement of the herders depended upon availability of fodder, water, livestock type and was seasonal in nature.

RESULTS AND DISCUSSION

Biotic factors play an important role in resource limited habitats due to plant competition (Chapin and Shaver 1985; Tilman, 1988). However, abiotic factors become important in the nutrient poor habitats (Campbell *et al.,* 1991; Grime, 1977 and Keddy, 1989). Deforestation is mainly caused by heavy uncontrolled grazing, commercial logging and local use of trees for firewood, clearance for cultivation, pastures and defective road construction. The over exploitation of land resources has resulted in partial or complete removal of forest cover (Shaheen, 2011). Himalayan forests are very much de-graded due to nomadic activities, sedentary livestock overgrazing, legal as well as illegal tree cutting (Ahmed *et al.*, 1990, 1991, 2006). Perennial and palatable grass species become less dominant due to extensive grazing giving place to annual, less nutritious and less palatable species (Gupta, 1978; Shaheen, 2011) majority of which possess invasive potential.

In Tarai and Bhawar wood have high commercial uses. These include Teak, Sal, Shisham, Eucalyptus, Cutsagaon, Toon and Haldu for timber. Wood is generally used as energy without any treatment or modification except that of cutting into small pieces. Wood can be used in four following forms as a source of energy, for cooking and space heating in rural communities, for cooking and space heating in urban areas, for industrial thermal energy and For mechanical energy in both rural and urban areas. Singh *et al.* (1991) reported that in developing countries as much as 43% of the total energy used is derived from biomass, of the total 3.2 billion cubic meter global consumption of wood. 44% is being used in developed countries and 56% used in developing countries. They indicate that only 20% of total wood used in developing countries is used as firewood, while more than 80% wood harvested in developing countries in used for firewood purposes. In many rural regions fuel wood is the most important energy source (Broadhead *et al.,* 2001) and

many people rely on fuelwood extraction from natural forests for cooking and heating (Anon., 2002). The amount of wood harvested for fuelwood is much more than harvested volumes for industrial and other purposes. Local natives surrounding to forests

Table 1: Monthly variation of Lopping in site I and site II

Month	Site I			Site II		
	Person Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}	Person Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}
April 2007	7±2.23	245.00±78.26	7.35	9±4.58	342.00±174.13	10.26
May	8±2.54	304.00±96.88	9.42	10±4.52	370.00±167.52	11.47
June	6±2.34	240.00±93.80	7.20	6±2.00	210.00±70.00	6.30
July	6±2.91	174.00±84.54	5.39	5±2.12	165.00±70.00	5.11
August	5±2.23	150.00±67.08	4.65	4±2.23	112.00±62.60	3.47
September	4±1.58	128.00±50.59	3.84	6±1.58	150.00±39.52	4.50
October	9±1.58	306.00±53.75	9.48	10±3.39	300.00±101.73	9.30
November	8±1.22	296.00±45.31	8.88	11±2.54	374.00±86.68	11.22
December	10±1.58	360.00±56.92	11.16	13±3.67	494.00±139.62	15.31
January	11±1.58	374.00±53.75	11.59	10±2.23	400.00±89.44	12.40
February	6±1.87	192.00±59.86	5.57	11±2.73	407.00±101.32	11.80
March 2008	5±2.54	150.00±76.48	4.65	10±2.91	350.00±102.04	10.85
Average	**7.08±2.15**	**243.25±84.87**	**7.43±2.65**	**8.75±2.80**	**306.17±119.63**	**9.33±3.65**
		Total	**89.18±2.65**	**Total**		**111.99±3.65**

Table 2: Monthly variation of lopping in site III and site IV

Month	Site III			Site IV		
	Person Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}	Person Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}
April 2007	3±2.00	90.00±60.00	2.70	11±3.53	385.00±123.74	11.55
May	2±1.22	64.00±39.19	1.98	12±2.23	360.00±67.08	11.16
June	0±0.00	0.00±0.00	0.00	8±2.54	256.00±81.58	7.68
July	0±0.00	0.00±0.00	0.00	9±2.73	297.00±90.37	9.21
August	0±0.00	0.00±0.00	0.00	9±3.39	252.00±94.95	7.81
September	1±0.70	34.00±24.04	1.02	7±2.23	189.00±60.37	5.67
October	2±1.58	70.00±55.33	2.17	12±3.16	420.00±110.67	13.02
November	3±1.58	111.00±58.50	3.33	12±3.31	456.00±126.03	13.68
December	2±2.00	78.00±78.00	2.41	15±2.91	555.00±107.87	17.21
January	1±0.70	28.00±19.79	8.68	14±3.39	532.00±128.86	16.49
February	2±1.22	64.00±39.19	1.86	13±2.91	429.00±96.21	12.44
March 2008	1±1.00	34.00±34.00	1.05	12±2.54	432.00±91.78	13.39
Average	**1.42±1.08**	**47.75±37.33**	**2.10±2.35**	**11.17±2.44**	**380.25±113.52**	**11.61±3.52**
Total			**25.20±2.35**		**Total**	**139.31±3.52**

cut down small twigs and some time whole plants for firewood. In the present study sites, lopping is prohibited. 7.08±2.15 to 11.17±2.44 persons enter in forest every day. They cut down and collect small twigs and dried branches of plants. Eucalyptus (*Eucalyptus hybrid*), Rohini (*Mallotus philippenensis*) and Ber (*Zizyphus jujuba*) are used during lopping but Teak (*Tectona grandis*), Lasura (*Cordia myxa*), Gular (*Ficus racemosa,*) shrubs like *Acacia nilotica*, *Callicarpa macrophylla*, and *Solanum verbascifolium* were also collected by villagers. Maximum lopping was

seen during the months of winter and spring season. In late spring and summer season forest suffer from fire and average lopping was observed in this period. It has also been observed that the firewood consumption also differs according to family size and large families have more firewood consumption than those of medium and small families (Bhatt and Sachan, 2004).

Table 3: Monthly variation of Chopping in site I, site II and site IV

Month	Site I			Site II			Site IV		
	Trees Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}	Trees Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}	Trees Every Day	Amount Kg Day^{-1}	Amount Ton Month^{-1}
April 2007	5±2.35	325.00±152.44	9.75	7±2.24	350.00±111.80	10.50	10±2.74	650.00±178.01	19.50
May	7±2.00	490.00±140.00	15.19	9±2.24	450.00±111.80	13.95	11±2.24	748.00±152.05	23.19
June	4±2.00	232.00±116.00	6.96	7±3.08	476.00±209.59	14.28	13±2.24	936.00±161.00	28.08
July	6±2.24	360.00±134.16	11.16	8±2.92	520.00±189.51	16.12	12±2.74	852.00±194.44	26.41
August	7±1.58	427.00±96.45	13.24	6±2.92	450.00±218.66	13.95	11±1.58	825.00±118.59	25.57
September	6±1.58	390.00±102.77	11.70	7±3.74	406.00±217.02	12.18	10±2.24	700.00±156.52	21.00
October	10±3.16	700.00±221.36	21.70	12±4.06	840.00±284.34	26.04	13±3.16	1014.00±246.66	31.23
November	9±1.58	666.00±117.00	19.98	11±5.15	858.00±401.53	25.74	14±2.74	1218.00±238.26	36.54
December	9±1.58	675.00±118.59	20.93	13±3.67	1066.00±301.29	33.05	14±2.55	1190.00±216.71	36.89
January	11±2.00	869.00±158.00	26.94	14±2.74	1078.00±210.87	33.42	15±2.55	1335.00±226.91	41.38
February	7±1.87	483.00±129.09	14.01	9±2.74	549.00±167.06	15.92	9±2.74	630.00±191.70	18.27
March 2008	8±2.45	568.00±173.91	17.61	8±2.55	432.00±137.67	13.39	8±2.92	496.00±180.76	15.38
Average	**9.25±2.63**	**515.42±184.88**	**15.76±5.79**	**9.25±2.63**	**622.91±263.09**	**19.05±8.21**	**11.67±2.19**	**882.83±261.96**	**26.95±8.17**
Total			**189.17±5.79**	**Total**		**228.61±8.21**		**Total**	**323.44±8.17**

In rainy season, minimum lopping was observed. Maximum lopping was observed in Aampani forest while minimum lopping was observed in Jurkha forest. Forests are good source of food, fodder and forage. Local natives surrounding to forests collect forage for their domestic animals from forests. In the present study sites, villagers and vangujjars collect forage from the forest. For this purpose they cut down small leafy twigs of trees having up to 22cm diameter. This process is called chopping (Joshi and Kumar, 2011). Maximum chopping was observed in winter season because during this period minimum vegetation available in ground surface of forest. Minimum chopping was observed in spring and summer season because during this period leaf fall is common in forests and the forests also suffer from forest fire which removes herbaceous vegetation from ground surface of forests. During rainy season, less chopping was observed as compared to winter but more than spring and summer season, because plenty of grasses and other herbaceous species were present in ground surface of forest.

Acacia catechu, *Bauhinia malabarica, Broussonetia papyrifera*, *Ficus racemosa*, *Ficus religiosa, Terminalia balerrica* and *Trewia nudiflora* are mostly affected by chopping. *Dalbergia sissoo*, *Mallotus philippenensis*, *Eucalyptus hybrid*, *Eugenia jambolana* and *Tectona grandis* were not affected by chopping, because leaves of these plants is not preferred by cattle. In present study maximum chopping was observed in site IV, because this forest is mostly covered by small villages. Local natives and vangujjars collect forage from the forest site, while minimum chopping was observed in site I.

Livestock grazing and its impact on Himalaya were studied by Ram *et al.* 1989, Singh 1991, Negi *et al.* 1993, Rawat and Uniyal 1993, Kala *et al.* 1995, Sundriyal 1995 and Kala *et al.* 1997. Kumar and Joshi (1972) and Rawat and

Rodgers (1988) have argued that moderate level of grazing may enhance herbaceous species diversity in alpine meadows.

Table 4: Monthly variation of Grazing in site I

Month	Cows Every Day	Buffalo Every Day	Grazing by Cows Kg Day^{-1}	Grazing by Buffalo Kg Day^{-1}	Net Grazing Kg Day^{-1}	Net Grazing Ton Month^{-1}
April 2007	40±7.87	70±11.48	720.00±141.66	2310.00±378.84	3030.00	90.90
May	45±9.21	62±13.03	810.00±165.78	2046.00±429.99	2856.00	88.54
June	44±3.39	68±13.39	792.00±61.02	2244.00±441.87	3036.00	91.08
July	50±7.68	75±12.76	900.00±138.24	2475.00±421.08	3375.00	104.62
August	51±8.68	70±12.06	918.00±156.24	2310.00±397.98	3228.00	100.06
September	39±6.74	72±14.05	702.00±121.32	2376.00±463.65	3078.00	92.34
October	41±7.61	73±14.26	738.00±136.98	2409.00±470.58	3147.00	97.56
November	42±7.78	65±6.74	756.00±140.04	2145.00±222.42	2901.00	87.03
December	37±7.54	60±3.53	666.00±135.72	1980.00±116.49	2646.00	82.03
January	40±3.53	63±5.29	720.00±63.54	2079.00±174.57	2799.00	86.77
February	37±4.69	59±12.96	666.00±84.42	1947.00±427.68	2613.00	75.77
Mar. 2008	36±4.52	64±16.92	648.00±81.36	2112.00±558.36	2760.00	85.56
Average	**41.83±4.87**	**66.75±5.31**	**753.00±87.79**	**2202.75±175.26**	**2955.75±234.06**	**90.19±7.89**
					Total	**1082.26±7.89**

Table 5: Monthly variation of Grazing in site II

Month	Cows Every Day	Buffalo Every Day	Grazing by Cows Kg Day^{-1}	Grazing by Buffalo Kg Day^{-1}	Net Grazing Kg Day^{-1}	Net Grazing Ton Month^{-1}
April 2007	105±6.00	176±13.76	1575.00±90.00	5280.00±412.80	6855.00	205.65
May	99±5.91	166±14.26	1485.00±88.65	4980.00±427.80	6465.00	200.41
June	102±7.64	198±19.87	1632.00±122.24	5940.00±596.10	7572.00	227.16
July	120±8.27	188±11.11	1920.00±132.32	5640.00±333.30	7560.00	234.36
August	125±7.87	190±8.27	2000.00±125.92	5700.00±248.10	7700.00	238.70
September	101±9.05	200±7.87	1515.00±135.75	6000.00±236.10	7515.00	225.45
October	90±4.30	176±16.29	1440.00±68.80	5280.00±488.70	6720.00	208.32
November	98±4.84	168±7.10	1568.00±77.44	5040.00±213.00	6608.00	198.24
December	91±4.52	156±9.61	1456.00±72.32	4680.00±288.3	6136.00	190.21
January	80±9.35	135±10.00	1280.00±149.60	4050.00±300.00	5330.00	165.23
February	68±8.39	145±5.74	1088.00±134.24	4350.00±172.00	5438.00	157.70
Mar. 2008	75±7.07	148±7.78	1200.00±113.13	4440.00±233.40	5640.00	174.84
Average	**96.17±16.82**	**170.50±21.37**	**1513.25±263.90**	**5115.00±641.32**	**6628.25±858.21**	**202.19±26.69**
					Total	**2426.27±26.69**

Table 6: Monthly variation of Grazing in site III

Month	Cows Every Day	Buffalo Every Day	Grazing by Cows Kg Day^{-1}	Grazing by Buffalo Kg Day^{-1}	Net Grazing Kg Day^{-1}	Net Grazing Ton Month^{-1}
April 2007	28±6.67	42±8.42	504.00±120.06	1344.00±269.44	1848.00	55.44
May	29±6.04	51±8.27	522.00±108.72	1632.00±264.64	2154.00	66.77
June	32±3.16	60±8.86	576.00±56.88	1920.00±283.52	2496.00	74.88
July	36±4.69	60±8.86	648.00±84.42	1920.00±283.52	2568.00	79.61
August	38±6.63	65±8.36	684.00±119.34	2080.00±267.52	2764.00	85.68
September	42±6.48	58±9.87	756.00±116.64	1856.00±315.84	2612.00	78.36
October	32±4.74	59±8.06	576.00±85.32	1888.00±257.92	2464.00	76.38
November	30±4.30	61±9.21	540.00±77.40	1952.00±294.72	2492.00	74.76
December	27±2.82	63±10.19	486.00±50.76	2016.00±326.08	2502.00	77.56
January	20±3.53	60±8.21	360.00±63.54	1920.00±262.72	2280.00	70.68
February	30±5.00	50±8.21	540.00±90.00	1600.00±262.72	2140.00	62.06
Mar. 2008	25±5.38	51±6.89	450.00±96.84	1632.00±220.48	2082.00	64.54
Average	**30.75±5.91**	**56.67±6.69**	**553.50±106.38**	**1813.33±214.15**	**2366.83±265.08**	**72.23±8.57**
					Total	**866.72±8.57**

Table 7: Monthly variation of Grazing in site IV

Month	Cows Every Day	Buffalo Every Day	Grazing by Cows Kg Day^{-1}	Grazing by Buffalo Kg Day^{-1}	Net Grazing Kg Day^{-1}	Net Grazing Ton Month^{-1}
April 2007	125±10.17	207±11.51	2375.00±193.23	6831.00±379.83	9206.00	276.18
May	130±9.05	209±12.94	2470.00±171.95	6897.00±427.02	9367.00	290.38
June	131±9.32	217±10.95	2489.00±177.08	7161.00±361.35	9650.00	289.50
July	140±17.73	225±14.57	2660.00±336.87	7425.00±480.81	10085.00	312.64
August	148±20.84	220±10.97	2812.00±395.96	7260.00±362.01	10072.00	312.23
September	158±14.47	230±10.97	3002.00±274.93	7590.00±362.01	10592.00	317.76
October	130±11.81	200±13.91	2470.00±224.39	6600.00±459.03	9070.00	281.17
November	131±10.58	198±14.61	2489.00±201.02	6534.00±482.13	9023.00	270.69
December	140±3.80	198±8.27	2660.00±72.20	6534.00±272.91	9194.00	285.01
January	128±8.63	211±18.86	2432.00±163.97	6963.00±622.38	9395.00	291.04
February	125±14.73	207±12.08	2375.00±279.87	6831.00±398.64	9206.00	266.97
Mar. 2008	120±12.72	198±13.54	2280.00±241.68	6534.00±446.82	8814.00	273.23
Average	**133.83±10.81**	**210.00±10.97**	**2542.83±205.56**	**6930.00±362.31**	**9472.83±526.89**	**288.90±17.16**
					Total	**3466.80±17.16**

Plates 1: Movement of buffaloes in forest

2: Forest suffering from Flood

3: Collection of vegetation after chopping in forest

4: Collection of fuel wood from forest

The present study sites were extensively used for grazing every year. The grazing period is according to the climatic conditions. The grazing time was found to be longest in the rainy season as compared to winter, spring and summer season. During summer season villagers and vangujjars free their cattle for grazing at 8AM, between at 8AM to 8.30 AM during rainy, 9AM during winters and between 9AM to 10AM during spring. Some time night grazing was seen in months of March and April. In the evening, cattle came back in late hours during summer and early hours during winter and rainy seasons. Cattle spent 7 to 8 hours in grazing sites. Animals spent lot of time in different activities such as resting, walking and other activities.

It is clear by study that the animals graze minimum during summers and maximum during rainy season. Because during summers, the animals remain least active and spent much of their time in resting and other activities. In rainy season, forage production was maximum, so that animals spend their maximum time in grazing because active selection of forage due to plenty of herbage availability. During winters, although the requirement remained more but due to less production animals spent much time in walking and other extra activities as well as the day length is very short so animals got less time for grazing. From late winter and spring season grazing activity was decreased up to summer season because forage production was minimum during these pupils so that much of the time was lost by animals in searching of food material. In the present study maximum grazing was observed in site IV, because this forest is mostly covered by small villages and local natives as well vangujjars collect forage from this site. In site IV, vangujjars have 162 buffalos and they paid 3116.00 rupees to forest department of Ramnagar range for grazing (Source: Forest office of Ramnagar range, Ramnagar, Uttarakhand). While minimum grazing was observed in site I. *Cynodon dactylon* and *Saccharum spontaneum* were mostly grazed by cattle in rainy season. *Saccharum spontaneum* was also used by villagers and vangujjar for the purpose of cottage formation.

CONCLUSION

Indians are forest loving people and they directly and indirectly depend on forest. Due to logging, clear felling, grazing, fire and collections of fuel wood, fodder and non-timber forest products the forest area reduced. Constructions of roads, urban expansion, settled agriculture and pastoralism have caused massive forest destruction in Tarai and Bhawar area. Due to interference of anthropogenic agencies the area of forests has been reduced substantially in recent years, which has caused serious ecological disasters such as soil erosion, loss of fertility and violent floods. By continued exploitation and maltreatment of plants for centuries by man and his domesticated animals the forests climaxes have been largely destroyed, replacing them at places by grasslands, scrubs, savannas and others by swamps, deserts and such biotic or bioedaphic communities. The forest / grazing lands are used as source for fuel, fodder, forage and other material. Nearly 80% of wood in developing countries is consumed for fuel, whereas developed countries use approximately the same proportion for industrial uses. The forests also produce raw material for paper industries. Large numbers of paper industries are present in Tarai and Bhawar areas. Due to anthropogenic activities, the area of forests is degenerated. So this study was purposeful to understand the assessment of lopping, chopping and livestock grazing in forests of Tarai and Bhawar of Kumaun Himalaya.

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