

# **SOCIO-ECONOMIC PROFILE OF MIGRATORY GRAZIERS AND PARTICIPATORY APPRAISAL OF FORAGE PRODUCTION AND UTILIZATION OF AN ALPINE PASTURE IN NORTH-WEST HIMALAYA**

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## **Introduction**

Indian agriculture is predominantly oriented towards mixed farming in which animal husbandry plays a crucial role throughout the country. In Indian Himalaya (which constitutes about 13% of the geographical area of India), pastures and meadows account for 11.4 m ha of area. In Himalayan states pastures and grasslands are located between 300-4500 m altitudinal zone traversing subtropical, temperate and alpine environment (Singh, 1996). Based on edaphic and microclimatic conditions, the pastures situated in high hills (above 3200 m altitude) can be categorized into sub-alpine and alpine pastures, which remain snow-bound from November to April and are open for grazing to sheep, goats, yaks and horses from May to September.

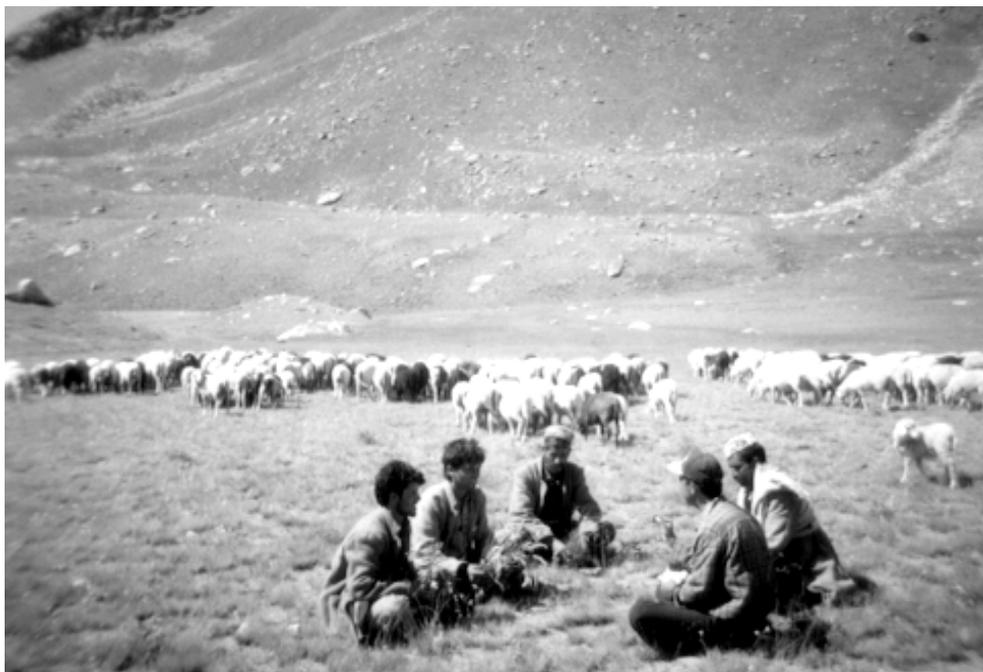
In the hilly regions of Himachal Pradesh (H.P), which spreads over north-western Himalaya from 32° 22' to 33° 12' N-latitude and 75° 47' to 79° 41' E-longitude with an altitudinal variation of 350–7000 m, sedentary, semi-migratory and migratory systems of livestock rearing are followed. In the lower hills (up to 1523 m altitude) livestock rearing is sedentary, while on higher hills (up to 2472 m altitude) it is semi-migratory. *Gaddis* and *Gujjars* are two major tribes in Himachal Pradesh, which follow the year round migratory system of animal rearing. Migratory pastoralism is very common practice among many other nomadic communities in other parts of Himalaya. Pastoralists rely on natural resources found on rangelands for their livelihoods. With time and increasing diversity of occupations, a considerable decline has been recorded in the number of pastoral nomads, but they still constitute a large proportion of Himalayan population. In H.P grasslands/pastures produce far below their potential and their carrying capacity is only 1.05 ACU (Adult Cattle Unit with an average body weight of 350 Kg)/ha/annum (Anonymous, 1995). Overgrazing has resulted in permanent damage to the vegetative cover leading to massive soil erosion and increase in barren land over a period of time in the state. The extremities of climate and poor vegetation have further added to the degradation process at an alarming rate.

Physical isolation has excluded the mountains and their population from development, resulting in political and economic marginalisation. Mountain people suffer from unemployment, poverty, poor health and insufficient sanitation. Pastoral communities are facing tremendous pressure on their livelihoods as a result of the deteriorating resource base and a shift towards intense market oriented agricultural economy, on one hand, and rapidly changing social structures on the other. Understanding of the socio-economic factors affecting production systems in the region is very limited. The current study aims at understanding the socio-economic milieu of nomadic graziers with a focus on forage production and utilization in an alpine ecosystem.

## **Methodology**

The study area, Thanpattan pasture, is located at an altitude of about 3450 m to 4365 m above m.s.l in Lahaul & Spiti (31° 44' 57" to 33° 42' 54" N-latitude and 76° 56' 29" to 78° 41' 34" E-longitude) district of Himachal Pradesh in Indian Himalaya. The exploration was carried out during July-August, 1999 and 2000. This alpine pasture is the largest in the state having an area of about 4300 hectare. The pasture is located approximately 32 Km north of Udaipur, on both sides of Miyar *Nallah* (rivulet), with an area demarcated to allow 16 flocks to graze on left bank and 10 flocks on the other side. The present study concentrated on the left bank. The 16 households owning the flocks were divided into four groups as suggested by the graziers to facilitate the information gathering and each flock belonged to two to three families. PRA methods as standardized by KRIBHCO (Krishak

Bharti Cooperative Limited – an NGO working in India) were used to obtain the relevant information from graziers (Figure 1).



**Figure 1:** Information generation through participatory approach using a focussed PRA

The observations were recorded at following sites.

<b>Location</b>	<b>Altitude (m)</b>	<b>Household sites</b>
Doogi Druni	3560	Tentu, Churu Druni, Devi Druni and Doogi Druni
Gumba	3745	Bhiali, Nikori Nallaha, Gumba and Gharatanu
Bhaisgar	4010	Jampar, Kudnu, Bhaktoth and Bhaisgar
Dali	4235	Khaitibu, Bakroth, Dali and Janpar

A list of the graziers present in the pasture was prepared and stratified into marginal, small, medium and large herders. The criteria for stratification were identified by the graziers themselves and are presented in Table 1. A total number of 38 graziers representing 23 families participated in different exercises. The information was gathered on ovine population, herd size, family size, education level, land holding, lambing (%), kidding (%) and role of women through focussed group discussion (FGD). The tools employed to gather the information on natural grasses, their preference, different categories of households, mapping of migratory route were matrix ranking, well being ranking and participatory mapping, respectively.

The data on herbage production, density and biomass were collected at the four sites mentioned above in participation with the nomads. At each site species density and biomass and herbage production were recorded in a unit area of 1.0 m<sup>2</sup> and 6.0 m<sup>2</sup>, respectively, during 1999 and 2000. This was replicated five times and averaged. *Festuca gigantea* the most dominant and preferred grass species in the pasture was analysed for chemical composition by the method laid down by Association of Official Analytical Chemists (A.O.A.C.), 1990.

## Results

### *Pasture utilization*

The pasture under study is between altitudes of 3450 m to 4365 m above m.s.l in Lahaul & Spiti Distt. of Himachal Pradesh. In 1980 the Government of Himachal Pradesh took over the possession of the pastureland and distributed the land to *Gaddis* according to their previous grazing rights. The Department of Forests of the Government of Himachal Pradesh charges a grazing fee of 20 *paise* per sheep and 40 *paise* per goat (one US \$ is about 47 *Rupees* and one *Rupee* has 100 *paise*). Initially the local Thakur (King) owned the pastureland, whose forefather had distributed the land to

these migratory graziers and had given *pattas* (titles or deeds regulating use and this bestowed only the grazing rights; the ownership of the land, however, remained with the King) and obtained the rent in cash or kind (one or two sheep/goats, known as *tini*) depending upon the size of the flock being grazed. The flocks grazing in the pasture belong to more than one family on both sides of the Miyar Nallah. About 15,000 sheep and goats graze every year for about two months in the pasture. There were 16 flocks on the left flank of Miyar Nallah and 10 flocks on right flank. Each of them has specified area for grazing. Two to three *Gaddi* families manage their flocks together. The families staying together like this were often found to be related to each other. These families generally have two settlements. One settlement is their permanent home, which is situated at lower altitudes on the migratory route, while the other one is situated in the alpine regions. Rotational grazing is practiced in the pasture. The settlement is in a shed whose height is just enough to sit and there is enough space for only two persons to sleep. However 3-5 persons had to sleep there. It was interesting to observe a well-protected grove of about 120 *Betula spp.* trees amidst the alpine grasses whose wood the *Gaddis* say is only used to lit the pyre when some one dies.

On account of being the prime source of forage, grazing fulfills 100% herbage requirement of the migratory flocks. Duration of grazing and intensity of grazing appear to be the key factors in pasture use pattern. Grazing is done at Thanpattan from July to August. *Gaddis*, based upon their experiences allow the grazing for about one month at the lower elevation at Thanpattan and then move up to the adjoining area following a scheme of rotational grazing.



**Figure 2:** Sheep grazing the vegetation of *Festuca*

### General vegetation

The climatic variation, physiography, topography and altitude has greatly influenced the vegetation of the area. It was observed during the exploration that *Festuca gigantea* “Neeru” dominated the pasture at higher altitude (Figure 2), while *Cyperus* “Bagarmuth” dominated the low-lying areas. *Sibbaldia* “Trodu”, *Phleum* “Jawara”, *Artemesia* “Masreen” and *Potentilla* “Muthi” were the other edible species observed.

A perusal of the data presented in Table 2 reveals that *Festuca* was the most dominant species, having 75.8 plants m<sup>-2</sup> with relative density of 31.1% and 100% frequency followed by *Cyperus* and *Sibbaldia*. The lowest density of 1.0 plants m<sup>-2</sup> with a relative density of 0.4% and 50% frequency was observed in *Phleum alpinum*.

### Herbage production

Data pertaining to the herbage production and dry matter accumulation (Table 3) reveal that the highest fresh and dry biomass production was observed in *Festuca* with dry matter accumulation of 0.51 gm per plant. Lowest biomass production and dry matter accumulation was observed in *Phleum* and *Cyperus*. The data presented in table 4 reveal that the average herbage production varied from 262Kg ha<sup>-1</sup> to 329Kg ha<sup>-1</sup> (Fresh weight) at different sites, which corresponds to 87 and 116 Kg ha<sup>-1</sup> dry biomass. Dry matter production has been observed to be only 94Kg ha<sup>-1</sup> under very high grazing pressure (Table 4). The data reveal that the carrying capacity was found to be only 0.31 ACU/ha for the grazing period of two months.

### Nutrient composition

The graziers perceived that *Festuca* is one of the most nutritious grass spp and the chemical analysis substantiated this (Table 5). Dry matter varied from 90-93%. Crude protein varied from 13.9-16.2%, which is quite high.

### Livestock preference for grasses

Matrix ranking was done using a ten point scoring method, where one was the most preferred and 10 being the least preferred species. Palatability, availability and preference by animals were identified to be the key criteria for ranking by the graziers. *Festuca* has been rated as the most preferred species in terms of palatability, its contribution in increasing body weight and milk production (Table 6). According to *Gaddis*, *Festuca* is so nutritious that if a horse starts jumping from one side of an area and grazes on every jump, to the other side, there is an increase in body weight of the horse, by the time it reaches the other end.

### Social and economic profile

The data on socio-economic indicators is presented in Table 7. The size of the family, which is an important socio-economic factor as well as an indicator of overall development revealed that the average family size was 6.8, and varied from 6.3 to 7.7 in different categories. The proportion of males in the families in different categories varied from 19-37%.

The distribution according to education indicates that the majority of the grazer families was illiterate. Average literacy was 26% in the study area. The literacy percentage varied directly with the herd size. The lowest literacy rate of 20% was found in the marginal group and 21% of the families had no literate person. None of the women were found to be literate.

All the households were found to possess some land as an operational farm holding at their native place. It was observed that the area of holding in all the categories was less than one hectare. The data reveal that the size of the land holding increased with the increase in flock size indicating a positive association between land holding and flock size. The marginal group possessed only 0.28 ha average size land holding, while maximum land holding of 0.72 ha was with the large category. Average land holding across all categories was only 0.48 hectare.

The tribal economy of the *Gaddis* is predominantly agro-pastoral. Livestock form the most important possession of the tribal population. The data on number of sheep and goats owned by the sample graziers reveal that the average size of flock was 237, out of which the number of sheep and goat was 128 and 109, respectively. Similarly the average size of flock size on marginal, small,

medium and large holdings was 75, 180, 280 and 413, respectively. It was observed that lambing (found in sheep) and kidding (found in goats only) were less than 30.0% and 2.0%, respectively.

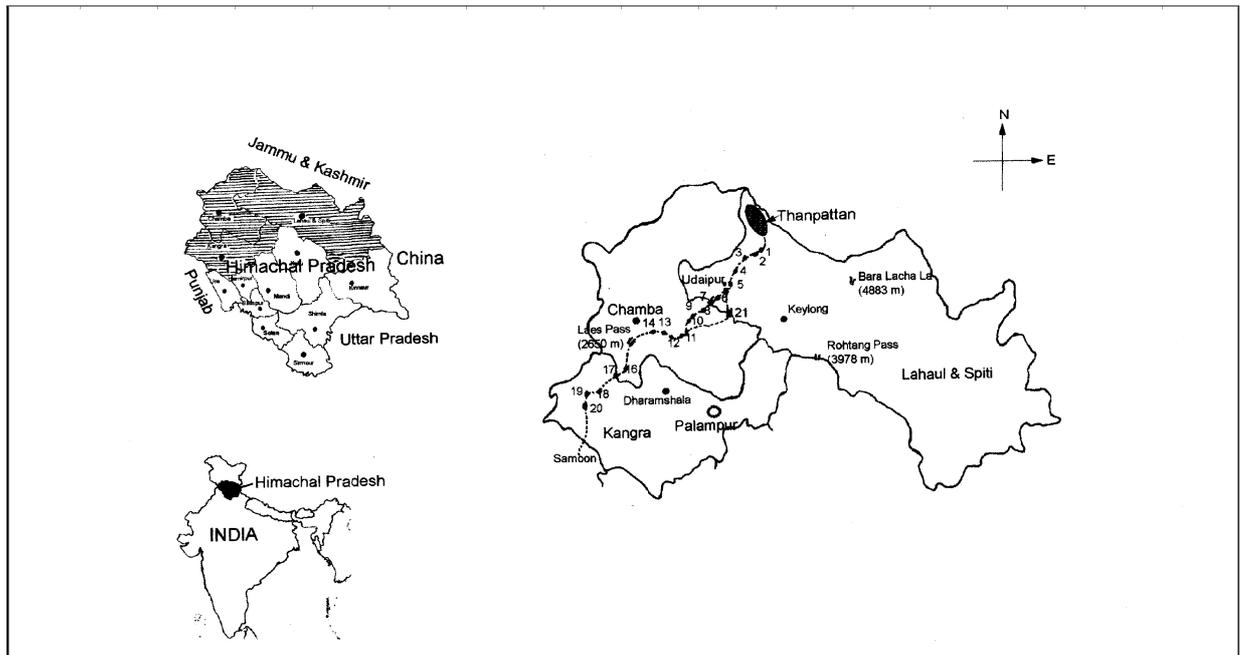
Sale of wool and meat contributes significantly to the family income. Wool production per animal varied from 1.0 to 1.50 Kg/animal/annum in two shearing. The graziers sell about 15% of the animals each year for meat purpose. With the increase in herd size there was a substantial increase in their annual income. The lowest Per Capita farm income of Rs 1657/- per annum was found in the marginal group, while maximum Per Capita income of Rs 8,411/- was observed in large farm size. On an average Per Capita income of the graziers was observed to be about Rs 4483/-.



**Figure 3:** Migratory graziers enroute to Thanpattan

### **Transhumance**

*Gaddis* start their return journey from Thanpattan around 18<sup>th</sup> to 20<sup>th</sup> August. After moving for about 8-10 days they have to cross the Kali Chho Pass, which is at an elevation of about 4803 m above m.s.l. Badagran (Bharmour) is the first village, where *Gaddis* arrive after 6 to 8 days after crossing the Pass. They arrive at Aura around 5<sup>th</sup> September and stay here for about one month. Then they have to cross the Laes Pass (2650 m above m.s.l.) after which they stay at Janera for about 10 to 12 days. From Janera *Gaddis* move to Samoon, where they stay up to March and thereafter they start moving back to Thanpattan (Figure 3). From Samoon to Bharmour the same route is followed and then instead of going via Kali Chho Pass they go via Chhobia Pass, which is at an elevation of 4966 m above m.s.l and to Surgani and thereafter follow the same route.



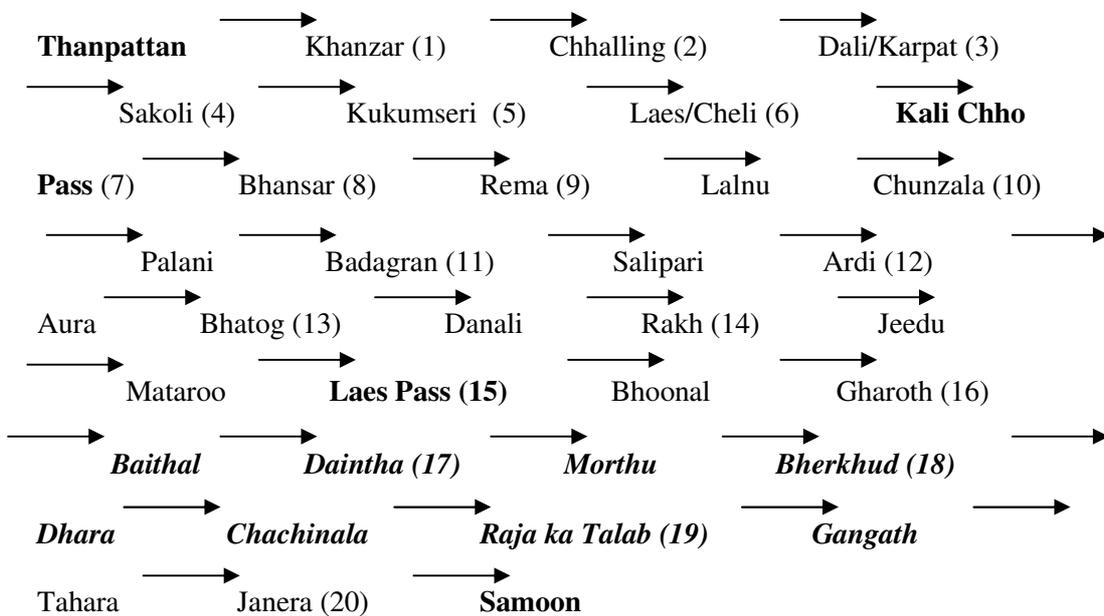
**Figure 4:** Route followed by migratory graziers of Thanpattan

Migratory route.....

1. Khanzar 2. Chhalling 3. Karpat 4. Sakoli 5. Kukumseri 6. Laes/Cheli 7. Kali Chho Pass (4803 m) 8. Bhansar 9. Rema 10. Chunzala 11. Badagran 12. Ardi 13. Bhatog 14. Rakh 15. Laes Pass (2650 m) 16. Gharoth 17. Daintha 18. Bherkhud 19. Raja ka Talab 20. Janera 21. Chhobia pass (4966 m)

**Migration route**

The migratory route has been depicted in Figure 4.



**Discussion**

In the Himalaya there are tribal groups who live by terrace cultivation at lower altitudes and move with their flocks of livestock to higher altitudes in search of pastures during summer (Lal, 1974). The pastoral nomads inhabiting the Himalayan states practice horizontal and vertical migration due to snow cover at high elevation, which compels them to come down during winter and go up during summer and rainy season (Tyagi and Singh, 1988). The *Gaddis* are the most remarkable race

in the hills. In features, manners, dress and dialect they differ essentially from rest of the population. They are of robust frame and survive exposure to all extreme weather conditions owing to the migratory life. The *Gaddi* family is patrilineal and patriarchal with the father heading the family and representing the family in all the social groups. Women play a significant role in the family and have the social status almost equal to men. Until last ten years some of the women used to accompany their flocks, but abduction of a woman a few years ago during migration have stopped them from accompanying their flocks. Sheep and goat farming is a hereditary occupation with these people, where the husbandry practices followed are most primitive. Poor literacy rate and education status and almost non-existent women's education reflected their poor state of living and their capacity to acquire new knowledge and new technologies. The size of the land holding at their native place increased with the increase in flock size indicating a positive association between land holding and flock size. Herders decision to keep a given proportion of goats and sheep may have been a response to edging against risk rather than a driving force to raise profits (Koul, 1998). Poor status of the families is reflected in their poor standard of living and there is a poor response for adoption of new technologies. Despite little leisure to socialize, shepherds have to invest in social networking both among themselves as *Gaddis* and with outsiders to provide insurance against natural and economic risks. Sheep farming has been mainly confined to tribal farmers of Himachal Pradesh. Continuous and uncontrolled grazing has resulted in severe degradation of the productive pastures. The livestock trends suggest selective grazing and overstocking along grazing routes as the main reason for decline in the range health with hazards like soil erosion and weed invasion in Himalaya (Tyagi and Shankar, 1988). Due to the high grazing pressure, palatable grasses and legumes do not get sufficient time for seed setting and dispersal. Meanwhile undesirable plant species, which are not grazed, get conducive conditions to thrive and set seed. This unchecked growth of weeds has led to their dominance in most of the pastures (Shankar and Singh, 1996) The adverse geographical conditions of the alpine areas and small land holdings at their native place have now forced the nomads to evolve new strategies for their survival. The information generated indicated that the average dry matter production of alpine pasture under natural conditions is quite low but the reverse is the case with regard to palatability of herbage mainly because of the typical characteristics of herbage species adapted to such agroclimatic conditions. Variation in the fresh weight and dry herbage production is the result of different species composition.

Due to the climatic conditions prevalent in Himachal Pradesh transhumance is a necessary popular practice. Transhumance is a response to the ecological demands and mutual adjustments between herding to insure against specific seasonal risks and enhance preparedness against general uncertainty at different elevations. This shifting of grazing pressure permits the grasses to regenerate. The most vulnerable areas exposed to the *Gaddi* herders movements are the passes situated at higher levels. These are very difficult places with high wind velocity and sudden thunderstorms. Besides Kalichho and Chobia passes (used by the herders of Thanpattan), other passes like Rohtang (3978 m) Hampta (4270 m) and Kugti (5010 m) are used by the herders of Himachal Pradesh (Koul, 1998).

#### **Problems (enumerated by the *Gaddis*)**

- a) Herbage production in the pasture is constantly decreasing. Since last 20 years, biomass production has decreased by 20-30%.
- b) Edible species are being replaced by noxious weeds and thereby the quality of herbage is deteriorating.
- c) The nomads face a lot of problems while migrating with their animals. They are trapped in snow, rains, piercing cold winds particularly on the higher reaches and on mountain passes resulting in many casualties.
- d) The sheep and goat rearing is a very low remunerative profession
- e) They face conflicts with the villagers on the migratory routes, while migrating their livestock.
- f) With the increasing diversity of occupations the number of pastoral nomads have declined considerably.
- g) Due to the extremities of climate, poor management and constant grazing, these areas have degraded at an alarming rate.

- h) Crossing the high altitude passes is very difficult. Some times due to heavy snowfall at the time of crossing the passes, there is risk of life.
- i) Lot of diseases occurs in animals during migration resulting in heavy casualties.
- j) Lack of communication, medical facilities discourages the younger generation to adopt this profession.
- k) In future if pastures are not protected, properly maintained and *Gaddis* do not get good returns for the byproducts of sheep and goats, most of *Gaddis* are afraid of abandoning this profession.

#### Potential interventions

- a) Steps should be taken to provide financial stability for their traditional livestock rearing practices by creating an effective marketing system.
- b) There is an urgent need for incentive to be given to the graziers of the tribal areas for higher education.
- c) State agencies should take up strategic programmes to develop these pastures/silvipastures along the traditional grazing routes. After development these pastures should be released for use in phases so that simultaneous vegetation recovery takes place.
- d) To create awakening about environmental damages due to misuse of natural endowments by demonstrating alternative scientific land use. Use of these pastures needs to be regulated so that their quality is not further eroded and degraded through overgrazing.
- e) Communication facilities, medical facilities and forage availability be ensured enroute.
- f) Socio-economic survey of pastoral communities should form an integral part of the programme in development and implementation of technologies.

#### Conclusions

It may be concluded that although livestock rearing plays an important role in the economy of hilly regions, the pastoral communities are facing tremendous pressures on their livelihoods as a result of deteriorating resource base and rapidly changing social structures. Poor literacy rate and almost non-existent women's education reflected their poor state of living and their inability to acquire knowledge and new technologies. Herbage production in the pasture is constantly decreasing and noxious weeds are replacing edible grass species. Lack of communication, medical facilities, poor returns etc. discourages the young generation to adopt this profession. Therefore it is imperative to give incentives for their education, provide medical and communication facilities and expose them to the scientific management of their resources. Grassland/pasture management needs to be considered holistically, thus promoting the interaction between grassland, livestock and grazing communities.

**Table 1.** Categories of graziers according to herd size

Category	Herd size	Graziers (%)
Marginal	<100	27
Small	101-200	40
Medium	201-300	20
Large	>300	13

**Table 2.** Density, relative density and frequency of different species

Species	Density (plants <sup>-2</sup> )	Relative density (%)	Frequency (%)
<i>Festuca</i>	75.8	31.1	100.0
<i>Cyperus</i>	61.1	25.0	100.0
<i>Sibbaldia</i>	47.2	19.3	25.0
<i>Potentilla</i>	41.5	17.0	50.0
<i>Artemisia</i>	12.6	5.2	75.0
<i>Polygonum</i>	4.9	2.0	75.0
<i>Phleum</i>	1.0	0.4	50.0

**Table 3.** Fresh and dry biomass of different species

Species	Fresh wt. (Kg ha <sup>-1</sup> )	Dry wt. (kg ha <sup>-1</sup> )	Dry matter accumulation (g plant <sup>-1</sup> )
<i>Festuca</i>	1303.0	385.0	0.51
<i>Cyperus</i>	403.0	37.0	0.06
<i>Sibbaldia</i>	188.0	76.0	0.16
<i>Potentilla</i>	186.0	56.0	0.14
<i>Artemisia</i>	207.0	90.0	0.71
<i>Polygonum</i>	29.0	13.0	0.27
<i>Phleum</i>	2.50	0.50	0.14

**Table 4.** Herbage production and carrying capacity

1. D.M yield (Kg/ha)	94.00
2. Stocking density for the grazing period	
Animal unit/ha	1.67
Sheep/ha	1.00
3. Grazing pressure	
Animal unit/ha	1.67
Sheep/ha	1.00
4. Carrying capacity for the grazing period (ACU/ha)	0.31

**Table 5.** Nutrient composition of *Festuca*

Sites	DM (%)	CP (%)	TA (%)	NDF (%)	EE (%)	ADF (%)
I	93.3	13.9	8.3	60.9	3.6	39.3
II	92.7	16.2	8.5	58.5	2.4	44.6
II	90.2	15.5	6.6	55.7	2.6	44.3
IV	92.3	15.2	7.7	52.8	3.0	40.0

DM – Dry matter; CP – Crude protein; TA- Total ash; NDF- Neutral detergent fibre; EE – Ethyl ester; ADF- Acid detergent fibre

**Table 6.** Matrix scoring for grasses

Criteria	<i>Festuca</i>	<i>Cyperus</i>	<i>Sibbaldia</i>	<i>Phleum</i>	<i>Artemisia</i>	<i>Potentilla</i>
Most preferred	1	2	3	4	5	6
Maximum spread	1	6	2	4	3	5
Milk production	1	4	3	2	6	5
Palatability	1	3	2	6	5	4
Increase in body weight	1	-	-	-	-	-
Preferred by sheep/goat	1	4	3	2	6	5

**Table 7.** Socio-economic profile of the sample graziers

Aspect	Category				Average
	Marginal	Small	Medium	Large	
Family size (No.)	6.0	7.2	7.7	6.3	6.8
Education status Literacy (%)	20	25	28	30	32
Average land holding (ha) at native place	0.21	0.36	0.64	0.72	0.48

Ovine population	75	180	280	413	237
Sheep	47	88	157	220	128
Goats	28	92	123	193	109
Lambing (%)	28.8	27.9	28.3	29.2	28.6
Kidding (%)	1.6	1.2	1.8	1.5	1.5
Average wool (sheep) production/annum/family (Kg)	59	110	196	275	160
Average sale price (wool) (Rs)	2065.00	3850.00	6860.00	9625.00	5600.00
Average annual income from selling the animals (Rs)	7850.00	18,900.00	29,400.00	43,365.00	24,885.00
Total annual income (Rs)	9940.00	22,750.00	36,260.00	52,990.00	30,485.00

## References

- A.O.A.C 1990. Official methods of analysis. Association of Official Analytical Chemists, 15<sup>th</sup> edition, Arlington, Virginia
- Anonymous 1995. Statistical Outline of Himachal Pradesh. Deptt. of Economics and Statistics. Himachal Pradesh, Shimla
- Koul, Minoti Chakravarty 1998. Transhumance and customary pastoral rights in Himachal Pradesh: Claiming the high pastures for *Gaddis*. Mountain Research and Development, Vol 18 No. 1:5-17
- Lal, Permanand 1974. The tribal man in India: A study in the ecology of primitive communities. pp. 281-329. In: M.S. Mani (ed.) Ecology and Biogeography. W. Junk Publishers, The Hague.
- Miller, D.J and Craig, S.R. 1996. Rangeland and Pastoral Development in Hindu-Kush Himalayas. Proc. of a Rangeland Expert Meeting. (November 5-7, 1996), Kathmandu, Nepal.
- Shankar, Vinod and Singh J.P 1996. Grazing Ecology. Tropical Ecology. 37 (1): 67-78
- Singh, Punjab 1986. Status of Himalayan rangelands in India and their sustainable management, pp. 13-22. In Proc. Rangeland and Pastoral Development in Hindu Kush-Himalayas (November 5-7, 1996), Kathmandu, Nepal. (Ed. By Daniel J. Miller and Sienna R. Craig).
- Tyagi, R.K and Shankar Vinod 1988. Pastoralism and grazing systems in the Central Himalayan. pp. 665-668. 3<sup>rd</sup> International Rangeland Congress. Abstract Vol. II. Range management society of India. Indian Grassland and Fodder Research Institute, Jhansi, India.
- Tyagi, R.K. And Singh, P. 1988. Grazing resources and grazing systems in India, pp. 17-34. In P. Singh (ed.), Pasture and Forage Crops Research: A State of Knowledge Report. Range Management Society of India, Indian Grassland and Fodder Research Institute, Jhansi, India.
- Verma, V. 1996. *Gaddis* of Dhauladhar. A transhumant tribe of the Himalayas. Indus Publishing company, New Delhi pp. 149