

Rearing practices of migratory sheep and goats in Himachal Pradesh: A case study of *Gaddi* tribe

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ABSTRACT: The economy of *Gaddi* tribes is mainly agro-pastoral and animal husbandry is the main occupation. Sheep and goats rearing is the major profession of *Gaddi* tribe in Himachal Pradesh who lead a very hard life. The number of sheep and goats reared per household was about 120 and 49. The sheep and goats were grazed for 7 to 8 hrs day⁻¹ on common forest/pasture lands during different seasons. Maximum number of graziers stayed at higher hills for four months. The proportion of males migrated with sheep and goats were higher than females. Foot and mouth disease (FMD) was largely observed in plains. Both infection and mortality were more in plains as compared to migration to hills. The major components of rearing cost were labourer's charges followed by expenses incurred on medicines and shearing. There was no expenditure on fodder as the entire flock was grazed on common (forest/pasture) lands in hills and plains. Income from sheep as well as goats was more in plains as compared to hills because of lack of market facilities in higher hills.

Key words: *Gaddi* tribe, grazing pattern, migratory grazier, morbidity and mortality.

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1. INTRODUCTION

Pastoralism is very old economic and social system in the world. The pastoral industry has been relatively stable over the past 100 years and has persisted despite a variable climate, uncertain markets and variable prices (Ash and Smith 2003). Pastoralists derive their basic food needs and income from pastoralist activities viz., rearing of livestock. *Gaddi* (a tribe) is one such community in Himachal Pradesh among pastoralists, which rear ovine/caprines. This community, by and large, continuously moves throughout the year to graze sheep and goats. These graziers travel from temperate/alpine to sub-tropical hill areas during winter and from sub-tropical to temperate/alpine during summer in search of fodder (Verma, 1996). The economy of these tribes is mainly agro-pastoral and animal husbandry is the main occupation. These pastoral tribes are concentrated in high hill regions and lead a hard life. The importance of *Gaddi* tribes in development and preservation of unique breeds of sheep and goats cannot be undermined (Dev *et al.*, 2003). In this paper an attempt has been made to study rearing practices and income generated from sheep and goats to *Gaddi* community and suggests various strategies for improving their conditions.

2. MATERIALS AND METHODS

Multi-stage stratified random sampling technique was employed to select the sample for this study. In the first stage of sampling three districts viz., Chamba, Kangra and Sirmour were purposively selected because of more *Gaddi* tribes concentration (stationary or migratory). In the second stage of sampling, one tehsil having higher concentration of these migratory communities was selected from each district. In the third stage of sampling 5-6 villages were randomly selected from each tehsil and finally 87 respondents were selected from different villages using proportional allocation technique. The respondents were further classified as marginal rearers, (having £ 200 animals) and small rearers (having more than 200 animals). The total sample consists of 49 marginal and 38 small respondents. In order to meet the objectives of the study both primary and secondary data were collected.

Analytical frame work

To meet out the objectives of the present study, both tabular and mathematical techniques were employed for analysis and interpretation of data.

Cost and returns

Cost: The operating cost - include cost of fodder, concentrate, salt, medicine, grazing charges, human labours and other payments.

Returns: The Gross returns were obtained from the value of the production of different livestock products *i.e.* milk, wool, meat and manures etc.

Gross return = Production of livestock products x prevailing price of the respective products

Morbidity and Mortality

The morbidity refers to the state of being diseased or unhealthy within a population and mortality is the term used for the number of livestock died within a population. The morbidity and mortality were calculated by using the following formulae.

$$M_b = \frac{n_d}{N} \times 100 \quad M_t = \frac{n_t}{N} \times 100$$

Where, M_b = Morbidity,

M_t = Mortality

N = Total number of sheep/goats

n_t = mortality of number of sheep/goats

n_d = number of youngstock infected

3. RESULTS AND DISCUSSION

Livestock population and composition

The rearing of sheep and goats is the main occupation of the *Gaddi* community, who migrate from one place to another. The livestock inventory of households has been presented in Table 1. Ovine/caprine rearing was the most common profession as number of sheep and goats per household was about 120 and 49, respectively. Sampled households did not keep buffaloes because of cold climate in the region. The *Gaddi* community was rearing higher number of local cows (0.63 household⁻¹) than improved cows (0.23 household⁻¹). The number of cows (Crossbred+ Local) on overall situation was 0.86. By and large similar pattern was noted for marginal and small households. Some of the households also kept horses/mules for carrying luggage during their migration. Dev *et al.* (2009) have observed in a study of an alpine area that sheep ranked highest (74.62%), followed by

cattle (12.07%), other animals (7.42%) and goats (5.89%)

Table 1. Livestock inventory of sampled *Gaddi* households (Number farm⁻¹)

Particulars	Marginal		Small		Overall	
	Crossbred	Local	Crossbred	Local	Crossbred	Local
Cows	0.20	0.57	0.26	0.71	0.23	0.63
Bullocks	-	0.49	-	0.95	-	0.69
Young stock	-	0.10	-	0.39	-	0.23
Sheep (Adult)	-	63.37	-	192.89	-	119.94
Lamb	-	5.37	-	8.11	-	6.56
Goats (Adult)	-	51.33	-	124.34	-	48.74
Kids	-	3.33	-	6.00	-	4.49
Horses/mules	-	0.43	-	1.61	-	0.94

Grazing Practices

Needless to mention that the type, size and extent of livestock rearing on a farm heavily depend upon availability of fodder (dry and green), crop by-products, weed flora, and grazing sources like owned pasture, *ghasni*, common lands and forest. Grazing and stall feeding pattern of animals is presented in Table 2. *Gaddi* grazed their migrating sheep and goats throughout the year in hills during summer and in plains during winter. However, cows and bullocks were reared by stall feeding and grazing following the semi migratory pattern depending upon seasons. So, in cows and bullocks both (stall feeding and grazing) were followed by the households. Semi-migratory system of livestock rearing was observed in alpine areas in western Himalaya (Dev *et al.*, 2009).

Table 2. Stall feeding/ grazing practices of animals by households (%)

Particulars	Marginal		Small		Overall		
	Stall fed	Grazing	Both fed	Grazing	Both fed	Grazing	
Cows	-	-	100	-	100	-	100
Bullocks	-	-	100	-	100	-	100
Young stock	-	-	100	75.0	25.0	52.94	47.06
Goats	-	100	-	100	-	-	100
Sheep	-	100	-	100	-	-	100
Horses/mules	-	100	-	100	-	-	100

Season-wise grazing

Season-wise grazing of different livestock on CPR land is presented in Table 3. Sheep accounted for maximum hours of grazing *i.e.* 8.34, 7.48 and 7.87 hrs day⁻¹ farm⁻¹ on CPR land during summer, winter and rainy season, respectively. This was followed by goats, which were grazed for 6.82 hrs in summer, 6.18 hrs in winter and

6.49 hrs during rainy season. It was observed that sheep were grazed for more hours compared to goats. The goats took rest after grazing, while sheep continued to graze. Sheep, goats and horses/mules were full time grazed on CPR lands throughout all the seasons. The maximum grazing hours were recorded during rainy season for sheep and goat followed by winter season. Comparison among different categories showed that number of grazing hours for all animals during different seasons were more on small farms as compared to marginal farms. In a study on animal grazing on CPR lands Pathania and Dev (2011) have also observed maximum number of animals (4.69 ACU hr⁻¹) were grazed during rainy season and number of grazing hours were more on small farms than marginal farms .

Table 3. Time spent for grazing on CPR land (hr farm⁻¹)

Items	Marginal			Small			Overall		
	S	W	R	S	W	R	S	W	R
Cows	3.06	0.94	2.88	3.97	1.74	3.66	3.46	1.29	3.22
Bullocks	1.76	0.71	1.90	2.39	1.42	2.95	2.03	1.02	2.36
Goats	6.76	6.04	6.39	6.89	6.37	6.63	6.82	6.18	6.49
Sheep	8.10	7.29	7.88	8.66	7.74	7.87	8.34	7.48	7.87
Horses/mules	0.29	0.27	0.27	3.68	3.82	3.68	1.77	1.82	1.76

S = Summer W = Winter R = Rainy

Migration System

During winter season *Gaddi* migrate to plain areas of the state viz., Bilaspur, Hamirpur, Una and some places of Punjab and during summer they migrate to high hills. On an average, 40% of the human male population and only 1.47% of the female population migrated with their flocks. About 45% and 35% of the males migrated on marginal and small farms, respectively with their flocks (Table 4 and Fig. 1). The higher percentage of male may be due to tough terrain and hard life during migration. Most of the women took care of family affairs. The women also grow crops on their land and rear milch animal to meet the requirement of family. Verma (1996) also reported that proportion of migratory males was observed higher during migration as compared to female population.

Table 4. Migration of *Gaddi* households (%)

Farm Size	At home		Outside village	
	Males	Females	Males	Females
Marginal	54.84	97.95	45.16	2.05
Small	65.00	99.21	35.00	0.79
Overall	60.00	98.53	40.00	1.47

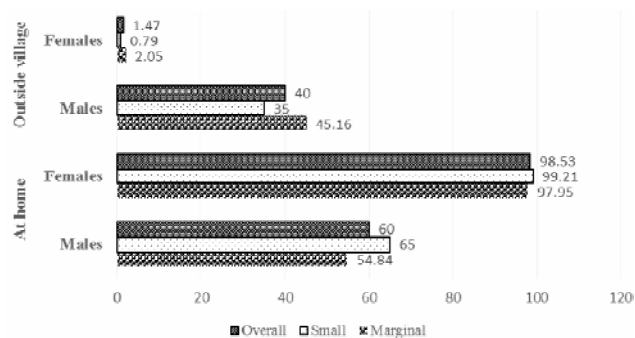


Fig. 1 Migration of *Gaddi* household (%)

Migration Schedule

In the migration schedule time of departure, arrival and stay of migratory *Gaddis* in hills as well as in plains were studied. About 47% of the sample graziers moved from higher hills in the month of September. Maximum number of graziers stayed at higher hills for four months (June to September). More than half of the graziers moved from lower hills to higher hills in the month of April. Time taken to reach grazing areas in hills from plains or grazing areas from plains to hills ranged from 31-60 days as revealed by majority of the graziers. Graziers stayed in plains for about 2 to 6 months. The maximum number of graziers (more than 60 %) stayed in plains for 4 months (December to March).

General vegetation

Alpine pastures, where migratory graziers graze their sheep and goats for 3-4 months were dominated by *Festuca*, *Cyperus*, *Artemesia*, *Phleum* etc. *Festuca* was been found to be most dominated species in the alpine pastures. Dry matter of *Festuca* was observed about 90% with an average crude protein content of 14.3%. The carrying capacity of alpine pastures ranged from 0.32 to 0.47 ACU ha⁻¹ annum⁻¹. Dev *et al* (2003) have also found that *Festuca gigantea*, the most dominated grass at higher altitude and alpine pastures having carrying capacity of 0.31 ACU ha⁻¹.

Morbidity and Mortality of Animals

The casualty of animals in hills as well as in plains is the major risk and challenge associated with this profession. Morbidity and mortality of sheep and goats in higher hills has been presented in Table 5. Higher rates of causality were observed in hills due to attack of bear as compared to diseases. Foot and mouth

disease (FMD) alone affected 3.13% of sheep, 3.42% of goats and 0.47% of lamb and kids. Mortality was more from other disease conditions (Pneumonia, pyretic fever) followed by FMD. By and large similar pattern was observed among different categories of farms. In plains (low hills) FMD was largely observed as this disease infected 6.43% (sheep), 6.35% (goat) and 2.89% (lamb/kids) in overall farm situation followed by diarrhea (Table 6). The proportion of casualty in plains was more due to animal attack in case of sheep and goats. In case of lambs and kids maximum mortality was due to disease conditions like fever, small pox, pneumonia and diarrhoea, respectively. It was interesting

Table 5. Morbidity and mortality among migratory sheep and goats in alpine region (%)

Particulars	Marginal			Small			Overall		
	Sheep	Goats	Lamb & Kids	Sheep	Goats	Lamb & Kids	Sheep	Goats	Lamb & Kids
A. Infected/ Affected/ Morbidity									
FMD	2.73	2.88	0.37	3.65	4.11	0.61	3.13	3.42	0.47
Diarrhoea	2.06	2.43	0.71	2.00	1.79	0.59	2.02	2.10	0.66
Bloat	2.02	2.25	0.57	2.19	2.15	1.34	2.10	2.20	0.91
Others	4.10	4.07	1.38	2.58	1.92	1.42	3.44	3.13	1.40
Injury	1.81	1.64	0.45	0.79	0.65	0.16	1.36	.91	0.32
B. Mortality									
FMD	0.51	0.84	0.67	0.47	0.82	0.62	0.49	0.83	0.76
Diarrhoea	0.42	0.41	0.15	0.35	0.24	0.22	0.39	0.16	0.18
Bloat	0.46	0.38	0.60	0.41	0.55	0.28	0.44	0.45	0.46
Others	2.02	1.08	1.05	1.05	0.91	0.73	1.60	1.01	0.91
Animal Attack	3.24	2.65	0.97	1.44	1.62	0.71	2.45	2.20	0.86
Accidental death	2.00	2.00	1.10	2.10	2.30	1.30	2.04	2.19	1.19

Note: FMD = Foot & mouth disease. Others include pneumonia, pox, & parasitic infestation etc.

Table 6. Morbidity & mortality among migratory sheep and goats in plains (%)

Particulars	Marginal			Small			Overall		
	Sheep	Goats	Lamb & Kids	Sheep	Goats	Lamb & Kids	Sheep	Goats	Lamb & Kids
A. Infected/ Affected/ Morbidity									
FMD	7.19	6.73	3.10	5.46	5.87	2.63	6.43	6.35	2.89
Diarrhoea	4.31	3.48	2.50	2.96	3.14	1.80	3.72	3.33	2.19
Bloat	3.51	4.26	0.71	2.99	2.49	1.86	3.28	3.49	1.21
Others	4.77	5.51	4.35	3.15	2.81	2.07	4.06	4.33	3.35
Animals attack	0.95	1.23	0.04	0.43	0.40	0.12	0.72	0.87	0.07
B. Mortality									
FMD	1.26	1.22	1.32	1.67	1.51	1.30	1.44	1.35	1.31
Diarrhoea	0.65	0.34	0.78	0.63	0.61	0.71	0.64	0.48	0.75
Bloat	0.59	0.75	1.02	0.59	0.69	0.74	0.59	0.72	0.90
Others	4.28	1.82	2.16	1.40	1.63	1.13	3.02	1.74	1.71
Animal Attack	1.25	1.27	0.15	0.76	0.53	0.26	1.04	0.95	0.40
Accidental death	1.26	1.22	1.06	0.95	1.25	1.10	0.98	1.45	1.08

to note that *per cent* infection and mortality decreased with increase in flock size. This might be due to better management and care. FMD was observed to be the major disease responsible for mortality. Both infection and mortality were more in plains as compared to migration to hills. The low mortality due to diseases in higher hills may be due to congenial climatic conditions and availability of nutritious fodder in the alpine pastures. Turton (1995) and Kumar *et.al* (2003) noticed that FMD was major disease for mortality and in case of lambs and kids higher mortality was due to diseases like pneumonia and diarrhoea.

Economics of Ovine/Caprine Rearing

Cost of rearing includes cost of fodder, feed, medicinal charges, grazing, shearing and labour charges. Data presented in Table 7 reveals that *Gaddis* did not pay anything for fodder and feed because they grazed their sheep and goats throughout the year and they paid only for labour and grazing charges. Thus, labour charge was the main component of cost followed by expenditure incurred for medicines and shearing. Similar pattern was observed for marginal and small households. Small farm incurred relatively more expenditure for salt, medicines, grazing and shearing as compared to marginal farms.

Table 7. Cost of rearing of sheep and goats by *Gaddi* household (₹ farm⁻¹ year⁻¹)

Particulars	Marginal		Small		Overall	
	Sheep	Goats	Sheep	Goats	Sheep	Goats
Fodder	--	--	--	--	--	--
Salt & concentrates*	178	156	357	460	288	289
Medicines charges	693	631	1534	1584	1060.8	1049
Grazing charges	13	26	39	62	24	42
Shearing charges	367	--	1275	--	740	--
H L for other activities	5062	4008	10461	6687	7280.4	5332
Other payments	--	--	--	13677	--	60
Total	6313	4821	13666	22470	9393.2	6772

*Concentrates to sheep and goats, HL = Human Labour

The proportions of income from sheep and goat sources on different sizes of farms were estimated and are presented in Table 8. It was observed that about 35% of the income in case of sheep and about 34.42% in case of goats came from the output of meat alone in hills, while in plains about 40% and around 43% was earned from meat, respectively in overall situation. Most of the sheep at the age of 8-9 years were disposed off in

addition to male sheep for meat/ mutton purpose. The reasons attributed for the disposal of the old sheep was decrease in the productivity of wool and difficulty in migration and high susceptibility to diseases during migration. Next in importance was sale of lambs/kids in hills, as well as in plains. About 23% of the income was derived from sheep wool in hills, whereas this share was about 5% in plains. The droppings of sheep/goats make very good manure. Therefore, during the migration, most of the farmers in plains encourage the graziers for a night halt of their flocks on their fields. For this farmers also make payments to these graziers mostly in kind and sometimes in cash. Income from sheep as well as goats was more in plains as compared to hills except in case of wool, which was higher in hills because of better productivity, quality and demand for woolen products in hills. Among different farms, per farm income from sheep and goats was higher on small as compared to marginal farms due to more number of sheep and goats on small farms as compared to marginal farms. In previous years, the graziers were not getting good price for wool and meat because of imports of cheaper livestock products, which has adversely affected this profession. Prabakaran and Thirunavukkarasu (1995); Raut and Nadkarni (1974) estimated cost and income obtained from sheep and goats rearing in their respective study and have drawn almost the similar pattern of income from milk, wool, mutton, additional stock, etc.

Table 8. Income from sheep and goats by *Gaddi* household

Particulars	Milk (%)	Wool (%)	Mutton (%)	Lambs/ Kids (%)	Additional stock (%)	Total income (₹ farm ⁻¹ year ⁻¹)
In Hills						
Marginal Sheep	-	17.91	35.84	16.70	29.55	12716
Goats	23.26	-	36.58	15.43	24.73	9416
Small Sheep	-	26.48	34.96	14.08	24.48	23181
Goats	27.60	-	32.92	15.51	23.97	17523
Overall Sheep	-	22.93	35.33	15.17	26.57	17287
Goats	25.83	-	34.42	15.48	24.27	12958
In Plains						
Marginal Sheep	-	3.49	44.78	23.06	28.48	22977
Goats	10.57	-	44.01	18.87	23.82	22554
Small Sheep	-	4.72	38.08	25.44	26.78	43413
Goats	12.44	-	41.70	17.37	25.01	40063
Overall Sheep	-	4.17	40.30	24.18	27.13	32297
Goats	11.65	-	42.68	18.00	24.51	30202

4. CONCLUSION

The number of sheep and goats reared per household was about 120 and 49. The sheep and goats were grazed for 7 to 8 hrs day⁻¹ on common forest/pasture lands

during different seasons. Maximum number of graziers stayed at higher hills for four months. About 40% of the male population and only 1.47% of the female population migrated with their herds. Foot and mouth disease (FMD) was largely observed in plains. Both morbidity and mortality were more in plains as compared to migration to hills. The major components of rearing cost were labour charges followed by expenses incurred on medicines and shearing. There was no expenditure on fodder as the entire flock was grazed on common lands (forest/pasture) in hills and plains. Income from sheep as well as goats was more in plains as compared to hills because of lack of market facilities in higher hills. The study suggests that there is a need to adopt proper measures to manage/control the infectious diseases. The graziers need to be encouraged to get their animals, insured. There is also a need to provide some incentives in order to keep their profession alive and compensate them for losses, if any.

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