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Research Note

Migratory Sheep and Goat Production System: The Mainstay of Tribal Hill Economy in Himachal Pradesh

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Abstract

The migratory and socio-economic aspects of sheep and goat flock-owners have been studied to examine yield, cost, income and employment in migratory sheep and goat production system in the Kangra district of Himachal Pradesh for the year 2001-02. A direct relation has been revealed between flock-size and resource endowments. Human labour has been found as the major cost component in the maintenance of this production system. Although, the contribution of sheep-rearing has been found higher to gross income, rearing of goats generates markedly higher income than of sheep on per animal basis. The flock business and family labour income in this system have been observed impressive and net income has been rated meagre for small flock-owners and nominal for large ones. This system has provided enough employment opportunities to family as well as hired labour. The existing breeds have been found good in terms of quality and quantity of meat, disease resistance and reproduction. The disease management technologies have been reported satisfactory, but medical facilities are not available at higher altitudes. The fodder availability at foothills and in plains during the winter season has been perceived as a major constraint, while the other constraints have been lack of marketing and processing infrastructure, low prices of output, high morbidity rate and wild animal attack. To enhance the profitability and sustainability of this system in the long-run, the study has suggested that the flock-owners need to be educated about the importance of timely vaccination and feeding of concentrate, roughages and feed supplements to the animals, specially during the winter season.

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Introduction

In the livestock sector, the sheep and goats, being a valuable and renewable resource, occupy an important position. Sheep and goats are traditionally raised under either stationary or migratory system. Several times, the stocking density on rangeland far exceeds its carrying capacity. This scenario forces the flock-owners to migrate with their flocks for sustenance. This migration may be temporary (of short duration to neighbouring locations) or permanent where flocks spend most of the time on migration, usually to long distances (Kaul *et al.*, 2004). Though, with the changing times and availability of diverse occupations, there is a decline in the number of pastoral nomads, this system is still the main occupation of a large population. Migratory sheep and goat-rearing is very common in the economically weaker sections of society in the tribal hilly areas of Himachal Pradesh. The tribes in the state extensively practise migratory pastrolism (Verma, 1996). They migrate from foothills of the Himalayas to high altitude alpine ranges during the summer months and to foothills and plains during the winter season (CSWRI, 2001; Pandey *et al.*, 2002). Although, it is quite difficult to make an exact estimate of the migratory sheep and goat population in the state of Himachal Pradesh, it has been reported that these constitute about 70 per cent of the total sheep and goat population (Misri, 1998). The present investigation was undertaken in the Kangra district of Himachal Pradesh with the following objectives: (i) to study the migratory aspects and socio-economic conditions of migratory flock-owners, (ii) to examine cost, yield and income realization and employment generation in migratory sheep and goat rearing, and (iii) to document the existing technology status and constraints in migratory sheep and goat production system.

Database and Methodology

In this study, the primary data collected in the sub-project entitled "Impact Assessment of Technology Interventions in Migratory Sheep Production Programme for Tribal Farmers in North-West" under Jai Vigyan National Science and Technology Mission (NATP project) on "Household Food and Nutritional Security in Tribal, Backward and Hilly Areas" was used. The data were collected from twenty-six migratory sheep and goat owners from different villages of the Kangra district. The survey data pertained to the year 2001-02. Besides the household-level survey, a detailed discussion was held with the leading migratory sheep-owners, agricultural extension-personnel and researchers to understand the issues precisely. Based on the average number of animals in the total flocks, all the selected flocks were divided into small and large flocks to study the economics of flock-size. The cost of production, yield, income and employment were computed on per

animal as well as per flock basis to have a better insight of the migratory sheep and goat production system. The methods of simple statistical analyses such as averages and percentages were used to analyse the collected data. The farmers' perceptions were recorded about the existing breed and medical technology, improved feeding practices and constraints in migratory sheep and goat-rearing in the study area. The migratory sheep and goat production system is peculiar in the sense that it involves some unique costs in the rearing. In order to have more clarity, some modifications in cost and return concepts suiting to the migratory sheep and goat rearing were devised for analyzing this business.

Cost Concepts

Cost A: It includes wages of hired labour, medical expenses, mineral (salt) cost, private grazing charges, government grazing charges, shearing expenses, miscellaneous expenses, interest on working capital, depreciation/appreciation on fixed capital (value of equipments and flocks)

Cost B**:** Cost A + interest on fixed capital (value of equipments and flocks)

Cost C**:** Cost B + imputed value of family labour

Cost C*: Cost C + 10 per cent of cost C to account for the value of management input

Return Concepts

Flock business income = Gross income – Cost A

Family labour income = Gross income – Cost B

Net income over Cost C= Gross income – Cost C

Net income over Cost C*= Gross Income – Cost C*

The prevailing wage rate for hired labour in the study villages was used for deriving the imputed value of family labour. A rate of 10 per cent per annum was used for computing interest on the working capital as well as fixed capital (value of flocks and equipments). The six-month operating cycle was considered for calculation of interest on the working capital. Further, the straight line method was used for calculating depreciation on the value of equipments. The revaluation method was employed for estimating the depreciation/appreciation in the value of the flocks. Net appreciation on the value of flock and equipments was calculated as the difference between appreciation on the value of flock and depreciation on the value of equipments. Although, the total number of sheep and goats was used for computing different costs per animal, only sheep were considered for computing per

animal mineral and shearing cost, as only sheep were fed with salt and sheared. Further, young sheep (lambs) were also considered to work out the cost on per sheep-shearing and wool yield, as they were also sheared once in the reporting year. All the costs and returns for sheep and goats were computed either separately or apportioned on per animal basis.

Results and Discussion

Migratory Aspects of Sheep and Goat Rearing

Migration, followed throughout the year in the study area, takes place from the native places to the higher altitudes like Dhauladhar, Bharamour, Lahaul-Spiti, Dhawaldhar, etc. during the summer and to the foothills and plains during the winter season. The summer migration starts from the months of April-May to higher heights and the flocks start returning during September-October and reach their native places by November. In the winter, the flocks leave their homes for the foothills and plains in November and graze on crop residues in the harvested fields, natural vegetation on fallow lands, and in the forest areas. They start returning to their native places in the months of March-April. The animals are mostly bred when migration from the alpine pastures begins during September-October, so that lambing takes place during February-March. Dogs are maintained to guard the sheep and goats from wild animals, specially at the higher altitudes. Horses and mules are also kept for transportation purposes.

All the flock-owners revealed that the final destinations and number and duration of halts during migration were not fixed (Table 1). Shearing of wool was practised during April-May and October-November at home only. All the flock-owners opined possibility of attack by the wild animals on their flock en-route migration, specially at higher altitudes. The flock-owners of the study area were not nomads in the real sense, as only the male members migrated with flocks. They followed several routes at higher altitudes as well as on foothills/plains. The migratory routes were only for transit purposes and the flocks stayed for most of the time in either lower hills, plains or alpines. One of the commonly followed routes for migration was as follows:

Baguna → Una → Shantla → Nadaun → Thurai → Khaira → Jalag → Baiznath → Pasai Nalah → Alsujoth → Hassan → Kugti → Chobu Joth → Bara Gram → Jalgujoth and back.

Flock Composition and Socio-economic Characteristics

The study on composition of 26 selected migratory flocks revealed that about 46 per cent were small and 54 per cent were large, maintaining 34 and 66 per cent of the total animals, respectively (Table 2). The average

Table 1. Migratory aspects of sheep and goat-rearing in Himachal Pradesh

Particulars	Type of response	Farmers' perception (%)
Duration of migration	Throughout the year	100
Final destination	Not fixed	100
Number and duration of halts	Not fixed	100
Month of return to home	April-May (from foothills/plains)	
	Oct.-Nov. (from higher altitudes)	81
Month of leaving home	November (to foothills/plains)	
	May (to higher altitudes)	100
Time taken to reach destination	3 months	96
Sending a part of his flock with others	No	100
Taking others' flock with him	No	96
Shearing time at home	April-May and Oct.-Nov.	100
Wild animal attack	At higher altitudes	100
Migration of family with flock	Only male members	100

number of animals was 318 on small and 528 on large flocks, with an overall average of 431 animals per flock. The decomposition of migratory flocks showed rearing of a good number of goats (31%) also along with sheep. The share of goats was higher on small (35%) than large (29%) flocks. The average family-size and landholding varied widely according to flock-size. The number of migratory family workers (male) was higher for large than small flocks. The average size of landholding was 0.30 ha for small and 0.77 ha for large flock-owners. The large flock-owners had some pasture land. In view of these facts, it may be concluded that resource endowments such as family workers and landholdings have direct bearing on the flock size.

Cost of Rearing

The total input cost, cost A, cost B, cost C and cost C* (cost C plus value of managerial input) and important cost items in the migratory sheep-rearing are presented in Table 3. The total input cost was worked out to be Rs 1.1 lakh/flock/year. The cost on family labour constituted the highest share in the total input cost, followed by hired labour and private grazing. The proportion of cost on family labour was higher on small (58%) than large (45%) flocks. On the other hand, share of costs on hired labour was more on large (31%) than small (22%) flocks. The per flock analysis showed that cost A, cost B, cost C and cost C* were higher on large than small flocks as expected, because of rearing of more animals. On the other hand, per animal analysis revealed that cost A and cost B were higher on large

Table 2. Flock composition and socio-economic characteristics

Particulars	Flocks		
	Small	Large	All
Flock			
Sample flocks, No.	12(46)	14(54)	26(100)
Total flock size, No.	3816(34)	7392(66)	11208(100)
Average flock size, No.	318	528	431
Sheep, %	63.99	69.98	67.94
Goat, %	35.22	29.45	31.42
Others (dogs, horses, etc.) , %	0.79	0.57	0.64
Family			
Average family-size, No.	7.6	8.8	8.2
Average migratory family worker (male), No.	1.9	2.2	2.0
Average schooling of the head, years	3.8	4.9	4.4
Land			
Average size of holding, ha	0.30	0.77	0.55
Irrigated land, %	67	62	64
Leased-out land, %	40	15	22
Pasture land, %	0	10	7

Note: Figures within the parentheses are percentages to total.

flocks and cost C and C* were higher on small flocks. This was due to the fact that small flock-owners employed largely family labour and less hired labour than that of large flock-owners. The total input costs and costs A were higher for sheep than goats because only sheep were fed with salt and sheared. Further, cost B and cost C were higher for goats due to per animal higher interest on the fixed costs, i.e. value of the goats.

Yield and Income Realization

The success of any production system depends on the returns generated through it. The amounts realized from sale of sheep (eve, lamb and ram), wool and goats were the main components of gross income. The income realization from the night stay of the flocks was the main component in other income. The yield of wool was poor (0.55 kg per animal per year) in the study area (Table 4). The gross income realization per flock was much higher on large than small flocks, as expected. On the other hand, per animal gross income did not vary much between small and large flocks. Although, gross income per animal showed that goat-rearing generated markedly higher returns than that of sheep-rearing, the contribution of sheep-sale to gross income was more on account of higher proportion of sheep in the flocks. The flock business income and family labour income were found to be impressive on per flock as well as per animal basis. The net income (income

Table 3. Costs of migratory sheep and goat rearing in Himachal Pradesh

(Rs/year)

Items	Per animal			Per flock		
	Small	Large	All flocks	Small	Large	All flocks
Family labour charges	166.72	110.37	129.53	52600	57943	55477
Hired labour charges	63.39	76.74	72.20	20000	40286	30923
Medical expenses	4.95	5.24	5.14	1563	2750	2202
Mineral (salt) cost	1.14	1.08	1.10	232	400	322
Govt. grazing charges	1.95	1.83	1.87	616	960	801
Private grazing charges	34.87	28.50	30.67	11000	14965	13135
Shearing cost	4.03	4.59	4.41	821	1696	1292
Misc. expenditure	13.63	17.80	16.38	4300	9343	7015
Total input cost	290.68 (285.5)	246.14 (240.5)	261.29 (255.8)	91131	128342	111167
Interest on working capital	14.53 (14.28)	12.31 (12.02)	13.06 (12.79)	4557	6417	5558
Net appreciation on value of flock and equipments	7.41 (7.73)	11.00 (11.28)	9.79 (10.09)	2373	5823	4230
Interest on value of flock and equipments	88.21 (117.77)	88.35 (120.00)	88.42 (119.15)	31185	51350	42043
Cost A	131.07 (125.34)	137.09 (130.82)	135.05 (128.97)	40714	70994	57019
Cost B	219.28 (243.11)	225.35 (250.82)	223.47 (248.12)	71899	122344	99062
Cost C	386.00 (409.83)	335.80 (361.19)	353.00 (377.65)	124499	180286	154538
Cost C*	424.59 (450.81)	369.38 (397.13)	388.30 (415.41)	136949	198315	169992

Note: Figures within the parentheses are related to goats.

over cost C*) analysis showed a negative net return from sheep-rearing, while goat-rearing was found to be a profitable occupation. However, the farmers can rear migratory goats along with sheep but their number should be less than half of the total number of sheep as per norms. The flock-wise analysis showed that net income realization over cost C* was nominal for large and negative for small flocks. It may be concluded that although migratory sheep and goat rearing is generating a reasonably good flock business and family labour income, it is not profitable in small flocks.

Employment Potential

It is evident from Table 5 that migratory sheep and goat production system generated employment opportunity of 1151 mandays per flock per

Table 4. Returns from migratory sheep and goat rearing in Himachal Pradesh

(Rs/year)

Items	Per animal			Per flock		
	Small	Large	All flocks	Small	Large	All flocks
Wool yield (kg)	0.52	0.56	0.55	106.25	207.14	160.58
Income from sheep sale	340.79	322.06	328.06	69350	119000	96085
Income from wool sale	26.02	27.55	27.06	5296	10179	7925
Income from goat	492.56	498.85	496.45	55167	77572	67231
Other income	2.36	3.40	3.05	746	1786	1306
Gross income	369.17 (494.92)	353.01 (502.25)	358.17 (499.50)	130558	208536	172546
Flock business income	238.11 (369.58)	215.92 (371.43)	223.12 (370.52)	89844	137542	115528
Family labour income	149.90 (251.81)	127.57 (251.43)	134.70 (251.47)	58659	86192	73484
Net income over cost C	-16.82 (85.09)	17.20 (141.07)	5.17 (121.85)	6059	28250	18008
Net income over cost C*	-55.42 (44.11)	-16.38 (104.95)	-30.13 (84.08)	-6391	10221	2554

Note: Figures within the parentheses pertain to goats.

Table 5. Employment potential in migratory sheep and goat production system in Himachal Pradesh

(Mandays/ year)

Particulars	Per animal			Per flock		
	Small	Large	All flocks	Small	Large	All flocks
Family labour	2.12	1.44	1.67	669	757	716
Hired labour	0.96	1.04	1.02	304	547	435
Total	3.08	2.48	2.69	973	1304	1151

year. Of the total employment, share of hired labour was 38 per cent (435 mandays per flock per year). Migratory flock-owners' perceptions revealed that, on an average, one labour (365 mandays per year) was required to maintain 100 animals, whereas the analysis showed that only 0.74 man (269 mandays per year) was employed for this purpose. Although, the per flock analysis showed that large flocks provided more employment opportunity than small flocks, the per animal employment was worked out to be higher on small (3.08 mandays per annum) than large (2.48 mandays per annum) flocks. It may be concluded that this production system is generating good employment opportunities for the weaker section of the tribal areas.

Table 6. Farmers' perceptions about existing technology status in Himachal Pradesh

(in per cent)

Technology	Number of respondents	Farmers' perceptions about technology			
		Good	Satisfactory	Poor	Very poor
Breed					
Quantity of wool	26	0	27	73	0
Quality of wool	26	69	31	0	0
Quantity of meat	26	58	42	0	0
Odour of meat	18	61	39	0	0
Disease resistance	26	69	31	0	0
Reproduction	26	0	100	0	0
Disease Management					
Treatment	26	8	57	35	0
Vaccination	26	42	58	0	0

Existing Technology Status and Adoption of Improved Practices

The migratory sheep and goat production is heavily influenced by the status of existing technologies. Nearly three-fourths of the flock-owners felt that the existing breed was poor in wool production (Table 6). On the other hand, all the respondents revealed that the existing breeds were good/ satisfactory in terms of quality of wool, meat yield, meat odour, disease resistance and reproduction. The existing medical technology was found to be appropriate as sixty-five per cent of the total flock-owners responded that the existing medicines were effective in the treatment of animals. Vaccination was reported to be satisfactory or good by all the respondents.

The adoption of improved feeding practices was poor in the study area. The flock-owners perceived that they did not feed concentrate, feed supplements and vitamins to their animals. Further, they did not feed roughage to their animals when fodder availability was poor, specially during the winter season. However, common salt was regularly fed to the sheep. Although, adoption of improved medicine was satisfactory, it was observed that flock-owners generally vaccinated their flocks after the incidence of diseases.

Constraints

The perception of migratory flock-owners was poor about the fodder availability at native place as well as en-route migration at lower hills and in plains, although response about grazing land was satisfactory. Responses were good/satisfactory about availability of fodder en-route migration at higher altitudes. At higher altitudes, veterinary facilities were reported to be very poor by almost all the flock-owners. However, at native places, foothills and plains, it was ranked satisfactory/good by about half the respondents.

Table 7. Constraints to migratory sheep and goat rearing in Himachal Pradesh

(in per cent)

Particulars	Foothills and plains					Higher altitudes				
	Respondents (No.)	Good	Satisfactory	Poor	Very poor	Respondents (No.)	Good	Satisfactory	Poor	Very poor
Fodder availability										
-Winter	26	0	0	92	8	-	-	-	-	-
-Summer	-	-	-	-	-	26	0	85	15	0
-Rainy season	-	-	-	-	-	26	100	0	0	0
Veterinary services	26	12	42	46	0	26	0	0	4	96
Market availability										
-Live sheep	26	0	58	42	0	26	0	0	15	85
-Sheep meat	20	0	0	0	100	20	0	0	0	100
-Wool	26	0	38	62	0	26	-	-	-	100
Price of output	26	0	23	69	8	26	0	0	42	58
Processing facilities	26	0	0	27	73	22	0	0	0	100
Transport facilities	26	100	0	0	0	25	0	0	12	88
Wild animal attack	-	-	-	-	-	26	0	31	35	35

The marketing facilities for live animals, meat and wool were rated very poor at higher altitudes. These were poor at native places, foothills and plains also, except for live animals. The processing facilities were reported to be very poor. The prices of wool, live sheep and goats were rated poor/ very poor by all the respondents at higher altitudes and poor by 62 per cent respondents at the native place and foothills/plains. Transportation infrastructure was found very poor at higher altitudes and satisfactory at foothills and plains. Wild animal attack was reported to be a severe problem at higher altitudes by 70 per cent of flock-owners. They opined that about 8-10 per cent of the flocks were killed by the wild animals. All the respondents perceived that morbidity rates were severe (15-25%). However, mortality rate was reported to be low at foothills/plains (2-3%) and higher altitudes (4-6%). During the rainy season or cold stormy days at higher altitudes, flock-owners faced acute shortage of food, drinking water and shelter. They were prone to pneumonia/nausea disease due to extreme cold and insufficient food. They had to face risk of their lives and their animals' lives, when there was snowfall in the month of August. They had to face some hostile forest officials and local people during migration.

Conclusions and Policy Perspectives

The study has revealed that the migratory flock-owners migrate from their native places to higher altitudes during the summer/rainy season and foothills/plains during the winter. They maintain a good number of goats along with sheep. The flock size has a direct relation with resource endowments. Human labour has been found as the major cost component in migratory sheep and goat rearing. The flock business income and family labour income have been found impressive in this production system. However, migratory sheep and goat rearing is not profitable in small flocks. This system has provided enough employment opportunities to family as well as hired labour. The existing breeds have been perceived to be good in terms of quality and quantity of meat, disease resistance and reproduction but poor in wool production. The existing disease management technologies are satisfactory, but medical facilities are not available at higher altitudes. The non-availability of fodder at foothills and plains during the winter season is a major constraint to migratory sheep and goat production system. Lack of marketing and processing infrastructure, low price of output, higher morbidity and wild animal attack are the other constraints in migratory sheep and goat rearing.

The study has clearly established that migratory sheep and goat production system is generating reasonable returns and good employment opportunities

in the existing production environment. The following policy measures would help enhance profitability and sustainability of this system in the long-run:

- Flock-owners need to be educated about the importance of timely vaccination and feeding concentrates, roughages and feed supplements to the animals, specially during the winter season.
- Efforts should be made to improve the forage availability during the winter season by plantation of grasses, fodder bushes and trees in the foothills and plains and to regulate grazing in a sustainable manner.
- Adequate medical facilities should be provided en-route migration, particularly at higher altitudes.
- Marketing and processing infrastructure should be developed.

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