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Economics and constraints of small ruminant rearing on common pasture lands in Rajasthan

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Abstract
A study was conducted in Pali district of Rajasthan to analyze the economics of production and management of small ruminants reared under traditional extensive systems. For drawing a representative sample (n=60) of small ruminant rearers from the district stratified random sampling technique was used. Primary data from the sampled small ruminant rearers on various aspects of costs, returns and constraints were collected by personal interview technique using a pre-tested structured schedule. The fixed investment on average flock size of 91 small ruminants unit was found to be Rs. 189630. The share of variable cost in total maintenance cost was 53.1% and that of fixed cost was 46.9%. The annual gross and net returns were found to be Rs. 159963 and Rs. 60362, respectively. The B: C ratio of 1.61 indicated the profitability of small ruminant rearing in the region. The major constraints perceived by the small ruminant rearers were high cost of fodder and concentrate feeds, costly veterinary medicines, low income, degraded/ lack of common grazing lands etc.

Keywords: Common grazing lands, Constraints, Production economics, Small ruminants

Introduction

Small ruminants i.e. sheep and goat are important livestock species of India. They contribute greatly to the agrarian economy, especially in the arid/semi-arid and mountainous areas where crop farming alone is more risky. This group of animals supports the livelihood of a large portion of small, marginal and landless farmers as income from crop farming is not sufficient and uncertain. While rearing of small ruminants not only provides employment, regular cash income, but it also provides nutritional security to these poor farmers. Small ruminants has 39.11% share in total livestock population of the country consisting of 26.40% goat and 12.71% sheep population (GOI, 2012). Rural poor people are heavily dependent for their livelihood on common property resources (CPRs) based livestock rearing, particularly small ruminants (Pasha, 1991; Sawal *et al.,* 2011). Among the small ruminants, goats are more widely distributed (Rath, 1992) and contribute as significant source of supplementary income and family nutrition to the poor rural people (Kumar and Deoghare, 2003). Small ruminants had 53.18% share in total livestock population of 57.73 million heads in Rajasthan (Govt of Rajasthan, 2016), where livestock is an integral part of the rural economy. Looking to unfavorable weather conditions in western Rajasthan, where income from crop sector is uncertain, farmers sustain their life through regular income from bovines and small ruminants (Chand *et al.,* 2015). Communities like R*ebari/ Dewasi* are solely dependent upon income earned from small ruminant rearing using common grazing resources available in the area. Though this sector of the economy has a lot of potential in this region, but there is paucity of information on economic aspects of traditional small ruminant rearing. The present study was conducted in Pali district of western Rajasthan to generate information on traditional management, profitability and constraints in small ruminants reared on common pasture lands.

Materials and Methods

***Study site*:** The Pali district in western Rajasthan was selected purposively for present study as this district is transitional region that represent both arid and semi-arid tracts of Rajasthan. This district had 91249 ha area under permanent pastures and other grazing land which is 5.45% of this category land in Rajasthan State (GOI, 2017). As cropping intensity of the district is only 117%, large tract of post harvested fields in *Rabi* season are used by small ruminant rearers as grazing lands. The stratified random sampling technique was used to select samples from the study area. All the nine tehsils of the district were categorized into three livestock densities (*viz.* low, medium and high) on the basis of deviation

from mean density of district. Pali, Rohat and Sojat tehsils belonged to low livestock density, Bali, Sumerpur, Marwar Junction and Jaitaran tehsils belonged to medium livestock density and Desuri and Raipur tehsils belonged to high livestock density.

***Data collection and analysis*:** One tehsil from each category was selected randomly for the present study *viz.,* Rohat, Sumerpur and Raipur, from low, medium and high livestock density, respectively. Further, two villages from each tehsil, one with facility of veterinary services and another without facility of veterinary services were selected, thus total six villages were selected. From each selected village 10 small ruminant rearing households were selected randomly (Table 1). The primary data were then collected by personal interview technique using a pre-tested structured schedule. Data were analyzed using frequency, percentage, mean, average, ranking and tabular method following standard statistical techniques.

Table 1. Distribution of sample households in different tehsils

Tehsils	Villages	No. of households
Rohat	Mandawas (VF)	10
(low density)	Nimbli Patelan (WVF)	10
Sumerpur	Bankli (VF)	10
(medium density)	Dujana (WVF)	10
Raipur	Piplia Kalan (VF)	10
(high density)	Karmawas Maliyan (WVF)	10
Total		60

VF: Veterinary facility; WVF: Without veterinary facility

Results and Discussion

***Demographic features of households and cropping pattern*:** Majority of small ruminant rearers (85%) belonged to *Raika/ Dewasi* community. Members of these communities traditionally rear goats, sheep and camels in this region to earn their livelihood. Seventy percent of the sample households had nuclear families which affects the size of flock managed by a household. Average family size of the sample farmers was 6.60 members consisting of almost equal male and female population. For majority of sample respondents (96.67%), income from small ruminants was the only source of earnings. It indicated that they had no alternate source of earnings and in case of any casualty to their flock due to epidemic losses incurred was unbearable for them and affected survival of these people. Average schooling of flock owners was only 01 year, indicating that they are almost illiterate and which is major constraint in convincing them for adoption of any new technology for increasing small ruminants' productivity.

Small ruminant rearers had more area under *Kharif* crops as crop cultivation mainly depends upon monsoon rains (July-September) in the district. Among three tehsils surveyed only in Sumerpur farmers were taking crops in *Rabi* season due to canal irrigation facility which again depends upon enough water in *Jawai* dam, the source of irrigation. Major crops grown in *Kharif* season were pearl millet, green gram, cluster bean and sesame. Wheat followed by mustard was the main crops grown in *Rabi* season.

***Composition of small ruminant on sample flocks*:** Small ruminant rearers in the region kept mix flock of both goats and sheep but sheep was dominating with 78.70% share in total animals' population in a flock. Porwal (2006) also recorded dominance of sheep (87%) over goats (13%) per family in western Rajasthan. Average flock size in Pali district was 90.79 units. Rohat tehsil had largest flock size (as SSRU) with 114.36 units and Raipur had smallest with 49.94 units (Table 2). The larger flock size in Rohat tehsil was due to the fact that large land areas remains fallow and available for grazing, while in Raipur tehsil maximum settlements were near wells and farmers fenced their holdings to protect it from the attack of wild/domestic animals affecting availability of common land for grazing.

***Investment pattern*:** Fixed investment on a flock comprised of investment on animals, enclosure and store, and machinery and equipment etc. Investment on an average small ruminant unit in Pali district was Rs. 189630 out of which animals alone accounted for about 94.20%. Sheep had major share in investment (72.67%). The share of investment on enclosures and store was only 5.26 % which was due to the fact that small ruminant rearers were keeping their flocks under tree and temporary/ kutcha structures, which were made for storing fodder or for keeping animals/ kids in case of bad weather like rain etc. Further these households do not require much machinery and equipment as investment on this account was a meager 0.54 % (Table 3). These findings were in agreement with earlier reports (Deoghare and Bhatacharyya, 1994; Prabhu *et al.* 2009; Tanwar and Chand, 2013).

***Resource use pattern*:** An average small ruminant rearer in Pali district had only 7.93 bigha (6.25 bigha=1 ha) of land, 80 % of which was un-irrigated. Rohat tehsil with

Table 2. Composition and value of small ruminants on sample flocks (per household)

Particulars	Rohat		Sumerpur		Raipur		Average	
	No.	Value (Rs.)	No.	Value (Rs.)	No.	Value (Rs.)	No.	Value (Rs.)
Male goat								
< 1 year	5	4000	4.35	5353	2.05	1788	3.8	3714
> 1 year	0.86	1290	1.1	3295	0.29	1048	0.75	1877
SGU	3.36	5290	3.28	8648	1.32	2836	2.65	5591
Female goat								
< 1 year	4.93	3697	7.8	6980	1.9	1686	4.88	4121
> 1 year	12.14	24280	18.55	38985	12.05	30071	14.25	31112
SGU	14.61	27977	22.45	45965	13	31757	16.69	35233
Total SGU	17.97	33267	25.73	54613	14.32	34593	19.34	40824
Male sheep								
< 1 year	17.07	13656	13.05	10880	4.86	3879	11.66	9472
> 1 year	1.07	2996	3	9630	0.76	2852	1.61	5159
SSU	9.61	16652	9.53	20510	3.19	6731	7.44	14631
Female sheep								
< 1 year	16.43	12323	16.05	13448	5.14	4282	12.54	10018
> 1 year	78.57	141426	64.8	140354	29.86	57681	57.74	113154
SSU	86.79	153749	72.83	153802	32.43	61963	64.01	123172
Total SSU	96.39	170401	82.35	174312	35.62	68694	71.45	137803
Total SSRU	114.36	203668	108.08	228925	49.94	103287	90.79	178627
Cost/ SSRU		1781		2118		2068		1968

SGU: Standard goat units; SSU: Standard sheep units, SSRU: Standard small ruminants units; Two kids/ lambs= One adult goat/ sheep

Table 3. Investment pattern on small ruminants flock in Pali district (Rs./ household)

Items/ Tehsils	Rohat	Sumerpur	Raipur	Average	Percent
A. Animals					
Goat	33267	54613	34593	40824	21.53
Sheep	170401	174312	68694	137803	72.67
Total	203668	228925	103287	178627	94.20
B. Animals enclosure and store	7114	15905	6924	9981	5.26
C. Machinery and equipment	428	1084	1554	1022	0.54
Total	211210	245914	111765	189630	100.00

Table 4. Average size of operational holding with small ruminants rearers (bigha*)

Land	Average size of holding (bigha)				Area under different
Category	Rohat	Sumerpur	Raipur	Average	categories (%)
Irrigated	0	3.75	0	1.25	15.80
Un-irrigated	16.25	1.65	1.05	6.32	79.70
Barren land	1.07	0.00	0	0.36	4.50
Pastures	0	0	0	0.00	0.00
Total	17.32	5.40	1.05	7.93	100.00

*6.25 bigha = 1 hectare

17.32 bigha land had largest holding size per respondent; while Raipur tehsil with 1.05 bigha had smallest size, indicating more dependency of these households on common grazing resources and other cultivable lands (Table 4). The difference in land holding was also reflected in respective flock size of the tehsil. Un-irrigated/ barren land was used for grazing of animals during crop season. As small ruminant rearer had meager holding size, they were more dependent upon harvested fields of other farmers and common grazing resources.

Small ruminants were reared on grazing and supplemental feeding *i.e.,* additional fodder/ tree lopping of *neem* (*Azadirachta indica*), *khejri* (*Prosopis cineraria*),

babool (*Acacia nilotica*.), *rohida* (*Tecomella undulata*), *jharberi* (*Zizyphus nummularia*) and *siras* (*Albizia lebbeck*.) etc. were provided in scarcity periods. The common pasture land/ *Gochar*/ forest land and harvested crop fields were the main sources of grazing for small ruminants in Pali district**.** Dixit *et al.* (2015) also reported dependence of marginal and small farmers on pastures and grazing land as due to small piece of land they face severe constraints of feed and fodder. Small ruminant rearer kept some part of their cultivable land fallow for grazing purpose only due to poor condition of common pasture lands. The findings were in agreement with Chand *et al.* (2015) where similar practice of keeping land fallow for grazing purpose was reported for bovine rearers in the region. Flock owners took their animals near road, railway lines and canal sides for grazing when whole agricultural land was under cultivation. Flock owners purchased tree lopping from crop cultivating farmers and animals were allowed to graze in those top feeds in lean season as an important source of nutrient supplement (Nag *et al*., 2017). The goat in milk was given 100-150 g of concentrate and about 50% of flock owners fed concentrate to pregnant doe. Seventy-two percent farmers followed group feeding method and 62 percent farmers fed minerals and common salt to animals. About 68 percent farmers reported concentrate feeding based on the milk yield while rests were feeding their animals on flat rate basis.

***Cost and returns*:** The fixed cost per year per adult small ruminant was Rs. 515 which varied from Rs. 459 (Rohat) to Rs. 557 (Sumerpur). Overall fixed cost per year for a small ruminant household in Pali district worked out as Rs. 46,714. The share of interest and depreciation in the total fixed cost was around 33.49 and 66.51 percent, respectively (Table 5).

Total cost of maintenance per flock per year was worked out after adding fixed and variable cost and was found to be Rs. 99,601 (Table 6). The proportion of variable cost in total cost of maintaining a flock was 53.10% which varied from 51.10% in Rohat tehsil to 58.35% in Raipur tehsil. These findings were in confirmation to Tanwar and Chand (2013) who reported comparatively higher share of variable cost in goat rearing. In the overall cost of maintenance per flock, feed cost alone accounted for 21.33% varying from 19.28% (Raipur) to 22.59% (Rohat). The overall gross and net return per year from a flock in Pali district was Rs. 159963 and Rs. 60362, respectively (Table 7). The major source of income on small ruminants flock was sale of animals and value addition in kids, milk, manure and wool and their share in gross return was 71.86, 18.21, 8.87 and 1.06%, respectively. The findings were in line with Gupta *et al*. (2011) and Devendran *et al*. (2012) who also reported that sale of animal (69.3%) and milk (59.7%) were the major income source in sheep and goat farming, respectively.

***Constraints perceived by the small ruminants' rearers*:** The constraints perceived by the small ruminants' rearers were studied under four major categories, *viz.,* technological, economic and management, socio-psychological and cultural, and general situational constraints. The constraints were analyzed by finding out the Mean Percent Score (MPS) and Ranking of the various constraints on MPS basis within the category (rank= R), and across the categories (overall ranking = OR). The major constraints perceived by the small ruminants households were related to economic and management category of constraints (MPS 67.12) which ranked first among the four categories, followed by technological constraints (MPS 63.93), general situational constraints (MPS 63.33) and socio-psychological and cultural constraints (MPS 49.29). The important constraints across the categories were high cost of fodder and concentrates (MPS 94.17, OR-1), costly veterinary medicines (MPS 93.33, OR-2), low income (MPS 85.0, OR-3), degraded/ shrinking common grazing lands) (MPS 85.0, OR-4), irregularity/ uncertainty of rain/ vagaries of monsoon (MPS 80.83, OR-5), small land holding (MPS 80.0, OR-6), problem during migration to other area/ state at the time of drought/ famine condition (MPS 75.83, OR-7) etc. The findings were in conformity with Suresh and Chaudhary (2015) who reported veterinary care, feed and fodder and live animal marketing as most important constraints faced by farmers.

Conclusion

Study indicated that the small ruminant rearing under traditional extensive system with utilization of common pasture resources in the region was profitable. It had annual gross and net returns of Rs. 159963 and 60362, respectively and B: C ratio of 1.61. The income from this enterprise can further be increased by improving the condition of available common grazing resources, adoption of improved technology, efficient marketing of live animals and animal products and taking care of other constraints.

Table 5. Fixed cost per year on small ruminants flock in Pali district (Rs./ household)

Particulars	Rohat	Sumerpur	Raipur	Average	Percent
a. Interest (8.25%)					
Building	587	1312	571	823	1.76
Machinery and equipment	35	90	128	84	0.18
Animals	16803	18886	8521	14737	31.55
Sub total	17425	20288	9220	15644	33.49
b. Depreciation					
Building	356	795	346	499	1.07
Machinery and equipment	86	217	311	205	0.44
Animals	34624	38917	17559	30366	65.00
Sub total	35066	39929	18216	31070	66.51
Total (a +b)	52491	60217	27436	46714	100
SSRU	114.36	108.08	49.94	90.79	
FC per animal (SSRU)	459	557	549	515	

FC: Fixed cost; SSSU: Standard small ruminant unit

Table 6. Maintenance cost of small ruminant flock per year in Pali district of Rajasthan (Rs./ flock)

Particulars	Rohat		Sumerpur		Raipur		Average	
	Qty (kg)	Value (Rs.)	Qty (kg)	Value (Rs.)	Qty (kg)	Value (Rs.)	Qty (kg)	Value (Rs.)
A. Variable cost								
Dry fodder	1108.38	2937	1313	3611	773.28	2003	1064.89	2850
Concentrate	1042.2	20844	983.82	19676	483.30	8699	836.44	16406
Rent of grazing land and cost of tree lopping		463		3500		2000		1988
Total feed cost		24244		26787		12702		21244
		(22.59)		(21.33)		(19.28)		(21.33)
Male labour for grazing (man days)	365	18000	456.25	22500	346.75	17338	389.33	19279
Female labour (man days)	146	7300	153.3	7665	91.25	4562	130.18	6509
Child labour (man days)	73	3650	127.75	6387	51.10	2555	83.95	4197
Total labour cost	584	28950	737.3	36552	489.10	24455	603.46	29985
Veterinary and misc. expenses		1653		2041		1276		1657
Total variable cost		54847		65380		38433		52886
		(51.10)		(52.06)		(58.35)		(53.10)
B. Fixed cost								
Interest		17425		20288		9221		15645
Depreciation		35065		39929		18216		31070
Tot fixed cost		52490		60217		27437		46715
		(48.90)		(47.94)		(41.65)		(46.90)
C. Total cost (A+B)		107337		125597		65870		99601
		(100.00)		(100.00)		(100.00)		(100.00)

Qty: Quantity; Figures in parentheses indicate percentage to total cost; Child labour has been converted into adult units

Table 7. Returns from small ruminants flock per year in Pali district of Rajasthan (Rs./ flock)

Particulars	Rohat	Sumerpur	Raipur	Average
A. Value of milk				
Qty (Litres)	3226.23	3301	1942.35	2823.19
Price (Rs./ lit)	10	10.45	10.5	10.32
Amount (Rs.)	32262	34495	20395	29135
	(17.74)	(18.33)	(19.68)	(18.21)
B. Sale of animals & value addition in kids				
Nos.	135.71	125	62.87	107.86
Price (Rs.)	1000	1080	1117	1065.67
Amount (Rs.)	135710	135000	70226	114943
	(74.61)	(71.74)	(67.78)	(71.86)
C. Income from wool				
Qty (kg)	96.00	93..22	45.59	78.27
Price (Rs./ kg)	20.00	23.50	21.75	21.75
Amount (Rs.)	1920	2191	992	1702
	(1.06)	(1.16)	(0.96)	(1.06)
D. Sale of manure				
Qty (Trolley)	12	15	7.5	11.50
Price (Rs.)	1000	1100	1600	1233.33
Amount (Rs.)	12000	16500	12000	14183
	(6.60)	(8.77)	(11.58)	(8.87)
E. Gross return (A+B+C+D) (Rs.)	181892	188186	103613	159963
	(100.00)	(100.00)	(100.00)	(100.00)
F. Total cost (Rs.)	107337	125597	65870	99601
G. Net return (E-F) (Rs.)	74555	62589	37743	60362
H. Family labour income (Rs.)	103505	99141	62197	90339
I. B/C ratio	1.69	1.50	1.57	1.61

Qty: Quantity; Figures in parentheses indicate percentage to gross return

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