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Equity, efficiency and profitability of migratory sheep production system in Rajasthan

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ABSTRACT

An equity, efficiency and profitability aspect of migratory sheep production system was examined using primary data pertaining to year 2011 using Gini concentration ratio, data envelopment analysis, and cost accounting method, respectively. The study concluded an inverse relationship between size of farms and size of flocks, and per animal income realization was inversely related to flock size. Net income distribution was almost equitable among large flocks but still some scope existed for equitable income distribution among small flocks. Interestingly, landless sheep owners were technically more efficient but were allocating their resources judiciously. Allocative efficiency and farm size has directly positive relationship. Efforts are required in the forms of technologies, institutions and policies to enhance the production capacity of the sheep system besides tailoring the interventions to tap the existing potential.

Key words: Cost, Equity, Efficiency, Flock business income, Profitability, Return

According to Livestock Census 2007, Rajasthan ranks second in sheep population and have about 113 lakh sheep and accounts for 16% of the total sheep in the country. The populations of migratory and non-migratory sheep are 26 and 87 lakh in the state, respectively. Further, temporary and permanent migratory sheep accounts for 4 and 22 lakh in the state respectively. Migratory sheep production system is essentially related to search of fodder and water in times of vagaries of nature. The flocks return to their native place with the onset of monsoon. A considerable decline has taken place in migratory sheep rearing, yet it is still the only occupation of a large population in this area of the country. This stimulates debate among researchers to quantify the distribution of ownership (equity) of flocks in the system in new economic environment.

From the perspective of the poor, small animals like sheep, goat, pig and backyard poultry are considered important, because of their low initial investment; zero/low input requirement and quick returns to investment on a continuous basis (Birthal *et al.* 2003). Sheep rearing acts as a cushion at the time of distress like drought and famine especially for economically weaker and socially backward section of the society. It is movable assets of high liquidity and a source of household nutrition and income generation. It is expected that by 2030 demand for meat will be 15 million tonnes of which 5% will be contributed by sheep amounting to 0.58 million tonnes. To meet the domestic demand and increase the share of India in international trade for mutton and wool products, the domestic production of sheep has to be enhanced. The evidences suggest that the government has taken several steps to enhance the productivity and sustainability of sheep production system in the country. However, the flock owners have faced a lot of constraints like, the scarcity of grazing area, lack of fodder, unfavourable environmental conditions, low price, lack of markets etc (Suresh *et al*. 2008). The earlier literature has dealt with some issues of migratory sheep production system relating to its cost and returns (Bhatia *et al*. 2005, Singh *et al*. 2006 Kumaravelu *et al.* 2008) but no systematic attempt has been made by researchers to comprehensively examine equity, efficiency and profitability of the system. In this backdrop, it becomes essential to examine the extent of distribution of ownership (equity) among the different flock sizes; distribution of flock specific efficiencies; and ultimately, profitability of the different flock sizes; across different categories of farmers. The knowledge emanating from this study would help policy makers and researchers in framing

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policy for development on migratory sheep production in Rajasthan in particular and country in general.

MATERIALS AND METHODS

In this study, Ajmer district was purposively selected based on mainly two criteria: (i) having a large population of migratory sheep and the share of sheep population in the total livestock is around 25% in the district; and (ii) district is prone to mild and normal type of droughts based on drought analysis on agriculture. Primary data from a total sample of 64 migratory sheep farmers from Ajmer district were collected using multistage random sampling technique pertaining to year 2010–11. From the district, 2 blocks, 4 villages from each block and 8 migratory sheep farmers from each village were selected randomly. The information on various socio-economic aspects of migratory sheep rearing at native place (each village) as well as en-route migration were collected from migratory sheep farmers using focused group discussion approach. To study the economics of flock-size, the selected flocks were divided into small and large flocks based on the average number of sheep in the total flocks (120 sheep). Migratory sheep farmers were also categorized into four sub-groups according to their land holdings as landless (no land holding), small (up to 3 ha), medium (3–6 ha) and large (more than 6 ha) farmers to ascertain equity and efficiency in the system using Gini Concentration Ratio (GCR) and Data Envelopment Analysis (DEA) technique, respectively. The cost of production, yield and income were computed on per animal as well as per flock basis to have a better insight of profitability aspect in migratory sheep production system with the help of cost and return concepts devised (Appendix 1).

Gini concentration ratio (CGR): GCR was calculated to measure inequality in net returns realized from migratory sheep production among different farm classes and flock size using formula:

$$GCR = 1 - \sum_{i=1}^{n} P_i \left(Q_i + Q_{i-1}\right)$$

Where, P_i, proportion of number of flocks; Q_i, cumulative proportion of income and Q_{i-1}, preceding cumulative proportion of income. Its value near to one indicates inequality and close to zero indicates equitable distribution of income among the sheep farmers.

Data envelopment analysis (DEA): DEA technique is a non-parametric linear programming approach applied to estimate the flock level technical efficiency, allocative efficiency, and economic efficiency in migratory sheep production system. The distribution of migratory flocks according to technical efficiency was categorized as good (> 80%), moderate (> 60 and < 80%), poor (> 40 and < 60%) and very poor (< 40%) efficiency range.

Envelopment form of the model was used to capture technical efficiency:

$$Z^* = \text{Min } Z$$

subject to

$$-Y_0 + \sum_{j=1}^{n} Y_j \lambda_j \geq 0,$$

$$ZX_{i0} - \sum_{j=1}^{n} X_{ij} \lambda_j \geq 0,$$

$$\lambda_j \geq 0,$$

$$X_{ij}, Y_j \geq 0,$$

Where, Z^*, technical efficiency score of the flock '0' under study; λ_j, weights in the linear programming analysis, X_{ij}, level of use of i^{th} input on the j^{th} flock; Y_j, gross returns on the j^{th} flock; Y_0, gross returns on flock '0' and X_{i0} is the level of i^{th} input being used by the flock '0'. The number of flocks, j, was equal to 1 to 'n' and number of inputs, i, was equal to 1 to 's'. On solving the model separately for each flock, the technical efficiency scores were estimated. For the calculation of economic and allocative efficiencies, the

Appendix 1

The cost and return concepts suiting to the migratory sheep rearing were devised for analyzing the profitability of this business.

Cost concepts: Cost A included wages of hired labour, medical expenses, vaccination expenses, feed and salt expenses, shearing expenses, miscellaneous expenses, interest on working capital, depreciation on fixed capital (value of equipments).

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% of cost C to account for the value of management

Return concepts: Gross income from migratory sheep rearing included income from animal sale (sheep, lamb and ram), wool sale, appreciation in the value of flock and other income from night stay, other animal sale, milk sale, manures etc. Flock business income and other incomes over gross income were calculated as:

Flock business income = Gross income – Cost A

Family labour income = Gross income – Cost B

Net income = Gross Income – Cost C

The prevailing wage rates for hired labour in the study villages were used for deriving the imputed value of family labour. A rate of 10% per annum was used for computing interest on the working capital as well as fixed capital (value of flocks and equipments). Further, the straight line method was used for calculating depreciation on the value of equipments. The seven and five months operating cycle was considered for calculation of depreciation, interest on the working and fixed capital for en-route migration and native place. The revaluation method was employed for estimating the appreciation in the value of the flocks.

following cost minimization DEA was run using price information about the inputs and considering the behavioural objective of cost minimization.

Min $$W_{i0}Z^{*}_{i0}$$

subject to $$-Y_0 + \sum_{j=1}^{n} Y_{mj}\lambda_j \geq 0,$$

$$Z^{*}_{i0} - \sum_{j=1}^{n} X_{ij}\,\lambda_j \geq 0 \quad \text{and}$$

$$\lambda_j \geq 0$$

where, W_{i0} is the vector of input prices for the flock '0' and Z^{*}_{i0} is the cost-minimising vector of input quantities for the flock '0'.

The economic efficiency (EE) was calculated as the ratio of minimum cost to observed cost.

$$EE = W_{i0}Z^{*}_{i0} \Big/ W_{i0}X_{i0}$$

Then, allocative efficiency was calculated as:

$$AE = EE/TE$$

For estimation of flock level efficiencies, per flock use of family and hired labour in days, medicine and vaccination expenses in rupees, feed expenses and other expenses were considered as inputs and the gross returns in rupees as output. The actual wages for hired labour and imputed wages family were used for estimation of economic efficiency. The DEAP V2.1 computer programme was employed with the assumption of constant returns to scale.

RESULTS AND DISCUSSIONS

Information regarding socio-economic status of migratory sheep farmers and background for inferring the results that will help in capturing broad meaningful conclusions is given in Table 1. The small and large numbers of flocks were 34 and 28 containing on an average 84 and 169 migratory sheep respectively. According to size of land holding of small flock owners, 8, 17, 36 and 39 % were landless, small, medium and large farmers. Similarly, according to large flock owners, 39, 18, 21 and 21% were landless, small, medium and large farmers. In small flocks, the average size of flocks were 76, 90, 87 and 80 sheep. In large flocks, the average size of flock were 176, 183, 170 and 142 sheep under landless, small,

Table 1. Socio-economic status of migratory sheep farmers

Particulars	Landless farmers	Small farmers	Medium farmers	Large farmers	Total farmers
Small flocks					
Sample flock (No.)	3	6	13	14	36
Average size of flock (No.)	76	90	87	80	84
Average size of land holding (ha.)	-	2.5	4.1	7.5	5.3
Rainfed land (%)	-	90.1	87.1	84.3	85.6
Average size of family (No.)	9.0	10.0	10.8	11.6	10.8
Education in family (years)	7.5	5.3	5.7	5.4	5.6
En route family labour (No.)	2.0	1.5	1.3	1.5	1.5
En route hired labour (No.)	-	0.5	0.6	0.2	0.4
Large flocks					
Sample flock (No.)	11	5	6	6	28
Average size of flock (No.)	176	183	170	142	169
Average size of land holding (No.)	-	1.9	4.0	10.9	5.8
Rainfed land (%)	-	82.5	77.5	95.4	89.8
Average size of family (No.)	10.3	12.7	14.0	10.3	11.5
Education in family (years)	5.3	6.3	5.5	7.8	6.0
En route family labour(No.)	2.0	2.3	1.8	1.5	1.9
En route hired labour (No.)	0.7	0.7	0.8	0.8	0.7
All flocks					
Sample flock (No.)	14	11	19	20	64
Average size of flock (No.)	154	132	113	99	121
Average size of land holding (No.)	-	2.2	4.1	8.5	5.5
Rainfed land (%)	-	87.1	84.1	88.5	87.2
Average size of family (No.)	10.0	11.2	11.8	11.2	11.1
Education in family (years)	5.8	5.7	5.6	6.1	5.8
En route family labour(No.)	2.0	1.9	1.5	1.5	1.7
En route hired labour (No.)	0.6	0.6	0.6	0.4	0.5

Source: Survey data by Author, 2010–11.

medium and large farmers.

The family size did not affect flock size among respondents. The sheep rearing was a labour oriented occupation and en-route migration employed 1.5 and 1.9 male members of family of small and large flock owners, respectively. During migration, along with male family members, hired labour was also employed and at native place, only family members were engaged in rearing. The average land holding in predominantly rain fed for small and large flock owners was 5.3 and 5.8 ha respectively. It discerned dependency of farmers on rain-fed agriculture. Nevertheless, the education level was not satisfactory revealing deprivation of basic education level of family members. This has enhanced more dependency of flock owners for sheep rearing for their livelihood security. As expected, an inverse relationship between size of farms and size of flocks was evident. Interestingly, a substantial numbers of landless farmers had maintained large migratory flocks for livelihood security. Obviously, this was the most preferred moving liquid asset available with them for securing their livelihood security.

Input costs incurred in migratory sheep rearing: Different costs were incurred in en-route and at native place in migratory sheep rearing. On an average, per flock total input cost (en-route and at native) was ₹1,07,098 per annum and it showed inverse relationship with farm size (Table 2). On per animal basis, total input costs incurred in rearing was ₹885 which had a direct relationship with farm size. On flock size basis, per sheep cost was lesser on large flocks in comparison to small flocks. Interestingly, per sheep cost of rearing was higher in landless farmers in small flocks and large farmers in large flocks. This might be due to diseconomies of scale since landless farmers in small flocks and large farmers in large flocks maintained the smallest size of flocks.

The migratory sheep production system needed very high human labour input in comparison to other production systems like farming and dairying. On perusal of Table 2, labour was the major cost which accounted for 79 and 77% of input cost on small and large flocks, respectively. Most of this labour requirement was met by the members of family. This confirms that the imputed value of family labour occupied a lion's share in total input costs. These results were in consonance with the findings of Bhatia *et al.* (2005) and Singh *et al.* (2006). The labour had to be hired during migration on account of pressing labour demand and was paid in cash and kind (food, cloths, smoking etc.) as per requirements. The share of wages of hired labour was around 12% in total input cost. Another major cost component was supplementary feeding (cakes, grains, concentrates and salt) which formed around one-tenth of the total input cost. The share of feed and salt cost was more at native place as compared to enroute migration. The cost of medical care (medicine and vaccination) was around 7% in total input cost.

Wool production and income realization: The wool production was around 82 kg on small and 151 kg on large flocks with an overall average of 112 kg in migratory sheep production system (Table 3). The wool yield was 0.98 kg on small flocks and 0.89 kg on large flocks. The poor wool yield of this production system might be partially on account of

Table 2. Inputs cost and their share in total cost in migratory sheep rearing

Categories	Inputs cost (Rs)		Share of different inputs in total cost (%)						
	Per flock	Per sheep	Family labour	Hired labour	Medicine	Vaccination	Shearing	Feed & salt	Other exp.
Small flocks									
Land less farmers	84,783	1,115.6	83.5	-	4.7	2.1	1.8	6.3	1.5
Small farmers	98,355	1,092.8	67.4	11.7	5.1	2.7	1.9	9.6	1.6
Medium farmers	93,277	1,072.2	62.5	14.5	5.1	2.3	2.0	12.4	1.3
Large farmers	88,346	1,104.3	74.2	5.8	4.6	2.4	1.9	9.3	1.7
Total farmers	91,498	1,089.3	69.4	9.6	4.9	2.4	1.9	10.3	1.5
Large flocks									
Land less	1,34,099	761.9	62.2	12.9	5.5	2.6	2.5	12.8	1.4
Small	1,34,416	734.5	67.1	10.9	4.7	2.3	2.5	11.2	1.2
Medium	1,23,048	723.8	64.6	15.9	4.5	2.4	2.8	8.6	1.2
Large	1,12,478	792.1	61.6	16.7	6.3	2.5	2.7	8.8	1.4
Total	1,27,154	752.4	63.5	13.9	5.3	2.5	2.6	10.9	1.3
All flocks									
Land less	1,23,531	797.0	65.3	11.0	5.4	2.5	2.4	11.9	1.4
Small	1,14,747	869.3	67.3	11.3	4.9	2.5	2.2	10.5	1.4
Medium	1,02,678	908.7	63.3	15.1	4.9	2.3	2.3	10.9	1.2
Large	95,586	965.5	69.7	9.7	5.2	2.4	2.2	9.1	1.6
Total	1,07,098	885.1	66.3	11.8	5.1	2.4	2.3	10.6	1.4

Source: Field Survey by Author, 2010–11.

Table 3. Wool production and income realization in migratory sheep rearing

Categories	Wool production (kg)		Gross income (₹)		Share of gross income realization (%)			
	Per flock	Per sheep	Per flock	Per sheep	Animal sale	Appreciation in value	Wool sale	Other income*
Small flocks								
Land less	94.7	1.25	1,32,152	1739	68.8	22.4	4.0	4.8
Small	81.3	0.90	1,56,892	1743	64.8	27.9	4.0	3.3
Medium	95.0	1.09	1,45,189	1669	69.3	19.4	5.1	6.2
Large	67.5	0.84	1,29,158	1614	68.0	21.9	3.9	6.2
Total	81.9	0.98	1,39,786	1664	68.0	22.1	4.4	5.6
Large flocks								
Land less	153.8	0.87	2,43,112	1381	64.1	28.3	4.4	3.1
Small	180.3	0.99	2,37,521	1298	67.9	25.3	5.1	1.7
Medium	146.8	0.86	2,22,622	1310	71.5	22.0	5.2	1.3
Large	126.2	0.89	1,99,006	1401	71.5	21.0	5.1	2.4
Total	150.9	0.89	2,28,064	1349	67.8	25.0	4.9	2.4
All flocks								
Land less	141.5	0.91	2,19,535	1416	64.7	27.6	4.4	3.3
Small	126.0	0.95	1,93,406	1465	66.6	26.4	4.6	2.4
Medium	111.4	0.99	1,70,350	1508	69.9	20.8	5.1	4.1
Large	85.2	0.86	1,50,988	1525	69.0	22.0	4.3	4.7
Total	112.0	0.93	1,79,026	1480	67.7	24.0	4.6	3.8

* Income from night stay, other animal sale, milk sale, manures etc. *Source:* Field survey by Author, 2010–11

its migratory nature wherein wool production was not an important source of income for sheep farmers.

The returns to farmers from the system came from sale of sheep, lamb, wool and other products (income from night stay, manure, sale of other animal like goat and sale of milk) besides the appreciation in the value of flocks. The overall gross income realization was ₹ 179,026 per flock and ₹ 1,480 per animal per annum. According to size of flocks, per flock income on small was ₹ 139,786 and on large flocks was ₹ 227,680. Per animal income realization was ₹ 1,664 and ₹ 1,349 on small and large sheep flocks. This confirmed that per animal income realization was inversely related to flocks

Table 4. Per flock and per sheep profitability analysis of migratory sheep production system, 2010–11

Categories	₹per flock			₹per sheep		
	Flock business income	Family labour income	Net income	Flock business income	Family labour income	Net income
Small flocks						
Land less	1,17,719	94,601	12,956	1,549	1,245	171
Small	1,21,352	91,666	12,180	1,348	1,018	135
Medium	1,07,479	78,537	7,746	1,236	903	89
Large	1,04,399	79,630	2,607	1,305	995	32
Total	1,09,414	82,456	6,888	1,302	982	82
Large flocks						
Land less	1,88,722	1,36,275	33,821	1,072	774	192
Small	1,90,497	1,39,193	30,122	1,041	761	165
Medium	1,76,192	1,24,543	27,318	1,037	733	161
Large	1,53,128	1,09,536	24,341	1,078	771	171
Total	1,78,519	1,28,345	29,528	1,056	759	174
All flocks						
Land less	1,73,707	1,27,545	29,550	1,120	823	190
Small	1,52,646	1,13,134	20,201	1,156	857	153
Medium	1,29,886	93,774	14,635	1,150	830	130
Large	1,19,894	89,477	10,003	1,211	904	101
Total	1,40,266	1,03,151	17,411	1,160	853	144

Source: Primary survey data by Author, 2010–11.

size. This might be due to better management and more attentive nature of the small flock owners compared to large flock owners.

The sales of sheep ram and lamb formed major share in gross income. The overall contribution of animal sale to the income was around two-thirds on small as well as on large flocks besides around one-fourth share of appreciation in the value of flocks. The remaining proceeds around 5% went to wool. The income from wool was more at native place on account of 2 shearing as compared to 1 shearing en-route migration.

Flock business analysis: As an enterprise, migratory sheep rearing provided good returns and employment. Labour wages formed a major part of total cost which ate away a major portion of the income. Flock business analysis was applied to get better insight of migratory sheep business in the region. The results of per flock and per sheep profitability analysis are presented in Table 4. Its perusal revealed that the migratory sheep production system generated impressive returns in terms of flock business income of ₹ 1,40,266 per flock and ₹ 1,160 per sheep and family labour income of ₹ 1,03,151 per flock and ₹ 853 per sheep. These returns in the form of flock business income of ₹ 1,302 and family labour income of ₹ 982 were higher on small flocks in comparison to large flock owners (₹ 1,056 and ₹ 759, respectively). However, per annum net income realization was moderately poor (₹ 29,528 per flock and ₹ 174/sheep) on large flocks and poor (₹6,888 per flock and ₹ 82/sheep) on small flocks. Poor net income realization on small flocks might be explained due to considerably higher use of family labour and moderate net income realization on large flocks may be on account of advantage of scale of economies.

Equity in income realization: Gini Concentration Ratio (CGR) values indicated the usefulness of sheep farming in generating distribution of income among different farm sizes and flock sizes in the drought prone Rajasthan. On large flocks, GCRs were estimated to be only 0.06 and 0.03 on the basis of number of flocks and number of sheep among farm categories, respectively (Table 5). Contrary to it, GCRs were 0.15 and 0.18 for small flocks. Palanichamy *et al.* (2007) also reported similar findings. This inferred that migratory sheep system generated almost equitable income among large flock owners and some inequality among small flock owners. Overall net income was more equitably distributed based on number of flocks in comparison to number of sheep.

Flock level efficiencies in migratory sheep rearing: Technical efficiency shows the ability of a flock to obtain maximum output from a given set of inputs. The overall level of average technical efficiency of migratory sheep flocks was 74%. It decreased from 79% of landless farmers to 71% of large farmers (Table 6). Flock-wise analysis results were quite contrary to it. The distribution of flocks according to technical efficiency showed that 30%, 55% and 15% of migratory flocks were in good (greater than 80%), moderate (60–80$) and poor (40–60%) efficiency ranges, respectively. Flock-wise analysis showed that all large flocks (39% and 61%) were in very good and good efficiency levels than that of small flocks which were 22% in good and 50% in moderate technical efficiency levels. This concluded that all the landless farmers and large flock owners used their resource inputs more efficiently and achieved moderate and good levels of technical efficiency in this system.

Table 5. Gini Concentration ratio of income realization among migratory sheep flocks

Categories	Gini Concentration ratio according to	
	No. of flocks	No. of sheep
Small flocks	0.18	0.15
Large flocks	0.06	0.03
All flocks	0.19	0.11
Between total small and large flocks	0.33	0.16

Source: Field Survey by Author, 2010–11.

Allocative efficiency reflects the ability to use the inputs in optimal proportions given their respective prices at a level of output. The overall average allocative efficiency of migratory flocks was 81% and higher than technical efficiency (Table 6). The allocative efficiency on large flocks was 84% compared to small flocks (80%). Farm-size-wise analysis established that allocative efficiency and farm size had direct and positive relationship. The distribution of all flocks according to allocative efficiency revealed that 53% and 42% of total flocks achieved good and moderate efficiency levels in the system, respectively. From the standpoint of farm-size-wise, all the flocks were in good and moderate efficiency ranges except landless farmers.

The migratory sheep farmers in small and large flocks realized 57% and 65% average economic efficiency levels of their production potential, respectively (Table 6). In addition, the distribution of flocks, 17% and 50% of small and 7% and 39% of large flocks were in very low and low efficiency ranges, respectively. Around 10% of both small and large flocks were highly efficient economically. The results concluded that landless sheep owners were technically more efficient in production, but were not allocating their resources judiciously. Contrary to it, large farmers were able to allocate their resources more judiciously, but were not able to obtain maximum output. The plausible reason for this fact might be that the landless farmers paid more attention for income generation only and large farmers might be interested in proper combination of resources considering their prices. In essence, it led to poor economic efficiency realization in this production system.

At the time of adversities and in comparison to farming, animal husbandry provides most important and stable source of livelihood. Migratory sheep farmers have poor socio-economic status and mainly depend on sheep rearing. The

Table 6. Distribution of migratory sheep flocks according to level of efficiencies

(%)

Particulars	Small flocks					Large flocks					All flocks				
	Land-less farm	Small farm	Medium farm	Large farm	Total farm	Land less farm	Small farm	Medium farm	Large farm	Total farm	Land less farm	Small farm	Medium farm	Large farm	Total farm
Technical efficiency range/ level															
Below 40%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40–60%	0	0	31	43	28	0	0	0	0	0	0	0	21	30	15
60–80%	67	100	23	50	50	45	100	67	50	61	50	100	37	50	55
Above 80%	33	0	46	7	22	55	0	33	50	39	50	0	42	20	30
Average technical efficiency (%)	75	68	78	66	71	80	71	76	85	79	79	69	77	71	74
Allocative efficiency range/ level															
Below 40%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40–60%	33	0	0	0	3	18	0	0	0	7	21	0	0	0	5
60–80%	34	83	54	50	55	18	40	33	17	25	22	64	47	40	42
Above 80%	33	17	46	50	42	64	60	67	83	68	57	36	53	60	53
Average allocative efficiency (%)	75	77	80	82	80	79	88	86	86	84	78	82	81	83	81
Economic efficiency range/ level															
Below 40%	0	17	23	14	17	18	0	0	0	7	14	9	16	10	13
40–60%	100	66	31	50	50	36	40	66	17	39	50	55	42	40	45
60–80%	0	17	15	36	22	46	60	17	66	47	36	36	16	45	33
Above 80%	0	0	31	0	11	0	0	17	17	7	0	0	26	5	9
Average economic efficiency (%)	54	53	63	55	57	62	63	66	73	65	60	57	64	60	61

Source: Computed by Author, 2010–11.

human labour is the major cost component in migratory sheep rearing and most of the labour demand is met by family labour. Hired labour worked on almost a half of flocks during migration only. The sheep sale is the major component of income generation for flock owners. The system is profitable in terms of flock business income and family labour income. Net income realization is moderately poor on large flocks and poor on small flocks. Net income distribution is almost equitable among large flocks but still some scope exists for equitable income distribution among small flocks.

The economic efficiency is moderate and poor on account of less-judicious allocation of resources on landless farmers and also sub-optimal realization of output on large farmers. This warrants efforts in the form of technologies, institutions and policies not only to be directed to enhance the production capacity of the system but also tailored the interventions to tap existing potential. Sheep flock owners need be educated about proper combination of feed and concentrates and more efforts are required to enhance their access to fodder and drinking water. The liberal credit policy could be a desirable option to realize the economies of scale by increasing the flock size.

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