WHAT DETERMINES MIGRATION OF SHEEP FLOCKS? EVIDENCES FROM THAR DESERT OF RAJASTHAN

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ABSRACT

Based on primary data collected from 250 households rearing sheep, the socio-economic determinants of sheep migration and major constraints faced by them in arid region of Rajasthan was investigated in the year 2013-14. *Pucca* house, electricity and veterinary services in the villages significantly restrained the migration decision of households. The migratory households had significantly larger flock size (109 sheep) and more adult members (2.08) in the family than non-migratory ones. The major constraints faced by the households in sheep rearing were poor availability and high cost of feed and fodder, veterinary services and uncertainty of rainfall. Systematic public investment in strengthening common grazing lands would be an imperative for sedentarization of migrating populations.

Key words: Arid region, Rajasthan, Sheep migration, Socio-economic determinants

Sheep husbandry has traditionally been one of the most viable components of rural economy, particularly in the regions with arid and semi-arid climatic conditions. In India, sheep with its multi-faceted role in providing meat, wool, milk, skins and manure, makes significant contribution to the livelihood of marginal sections of the society. Further, the animal fits well into the smallholder farming systems since their grazing preferences enable them to feed on weeds, grasses, shrubs and crop residues that other farm animals normally do not consume. However, declining grazing lands due to agricultural intensification, diversion of these lands for development projects and increased livestock population in the recent past (Saxena et al., 2017; DAHD, 2019) compels the pastoralists to undertake migration to sustain their livelihood (Gaur et al., 2016).

The decision to migrate is conditional depending upon several social, economic and climate related factors. Understanding this migratory process has deep socio-economic relevance for Rajasthan as sheep rearing in the state is not only important means of income but also interwoven with the whole texture of rural areas due to sheep's hardiness and adaptability to dry conditions (Chand et al., 2015). The issue of migration of sheep farmers, though socially relevant, particularly in the context of climate change, has not attracted the attention of researchers. Literature available on socio- economic issues of sheep migration in Rajasthan is very limited and largely confined to the semi-arid region of the state (Suresh et al., 2011). The lack of study and therefore lack of discussion on the issue is one major factor that

obscures the issue from getting the attention. Understanding the major factors that drive the sheep migration and their coping mechanism is critical to develop response mechanisms by the state. With the above background, the present study investigates on the socio-economic drivers of temporary sheep migration in arid region of Rajasthan and constraints faced by the households in the study area.

MATERIALS AND METHODS

The study is based on primary survey data conducted in the year 2013-14. Four districts from western Rajasthan (Pali, Jodhpur, Barmer and Jalore) with significant numbers of migratory sheep flocks were selected for the study. A stratified random sampling method was used to select households within each district, tehsil and village. A total of 20 villages were chosen and complete inventory of all the migratory and non-migratory households was undertaken. Finally, 125 households rearing sheep each (from migratory and non-migratory categories) were selected randomly. The variables tested for each research question from migrants and non-migrants are summarized in Table 1. Chi-square analysis and t-test were applied for bivariate analyses of the variables (Suresh et al., 2011). Following logistic regression was used to investigate the set of socio-economic variables that affect the migration decision of the households.

$$\text{Logit } \{y(x)\} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \text{------} + \varepsilon$$

where, α is the constant of the equation, β is the coefficient of the independent variable and ε is random error term.

Logistic regression allows the prediction of group membership from a set of categorical and/or continuous variables (x). Generally, the dependent variable is dichotomous and can take the value 1 (member of the group) with a probability of success y, or the value 0 (non-member) with probability of failure $1 - y$. The direction of the relationship between the dependent variable and a given independent variable (x) is indicated by the sign (positive or negative) of β while the odds ratio give the magnitude of the change in the odds of having the dependent variable event for a unit change in the given independent variable. An odds ratio of 1 designate that the given regressor does not influence the dependent variable. While odds ratio < 1 implies, while, other things remaining same, increasing the given independent variable decreases the odds that the dependent variable equals 1 by a factor of the odds ratio; an odds ratio above unity indicates that increasing the given independent variable increases the odds that the dependent variable equals 1 by a factor of the odds ratio when all other independent variables are controlled.

Table 1. Description of variable codes

Variable code	Description
EDU	Formal education categories of head of household (Illiterate/Primary /Above primary)
CASTE	Caste of head of household (OBC/SC/ST)
HOUSE	Type of house (Kachha/Pucca)
ELECTRICITY	Electricity connection at home and farm (Yes/No)
ANMHEALTH	Availability and use of veterinary services (Yes/No)
AGE	Age of household head (Years)
ADMALE	Total number of adult males in the household (No.)
HHSIZE	Number of persons living in the household (No.)
LANDOWN	Total land owned by the household (Bigha) (1 ha = 3.95 Bigha)
FLOCKSZ	Flock size of sheep (No.)

The constraints perceived by households were studied under four major categories, viz., technological, economic and management, socio-psychological and cultural and general constraints. Taking clue from Chand et al. (2017), the analysis of constraints was done by finding out the mean per cent score (MPS) and ranking of the various constraints on MPS basis within the category (rank=R) and across the categories (overall ranking =OR).

RESULTS AND DISCUSSION

Almost all the households rearing sheep (98%) belonged to *Raika / Dewasi* community, officially recognised as other backward classes (OBC) (Table 2). People belonging to this community traditionally rear sheep and goats for their sustenance (Chand et al., 2017). The bivariate analysis for comparing some of the socio-economic parameters of households across migratory and non-migratory categories (Table 2) indicated that the majority of households were disadvantaged in terms of formal education. The frequency of migration varied significantly (P<0.01) with the households with kachha/pucca type of houses in the village. In addition, access to electricity and veterinary services were lower among migratory households. These findings are in consonance with earlier studies on migratory sheep production system across the country (Singh et al., 2006; Kumar et al., 2015).

Table 2. Association between socio-economic characteristics of migrant and non-migrant households

Variable code	Migratory-migratory	Non value	Chi-square
EDU			3.71
Illiterate	107	95	
literate (only primary)	18	30	
CAST			1.01
OBC	124	122	
SC/ST	1	3	
HOUSE			7.74**
Kachha	72	50	
Pucca	53	75	
ELECTRICITY			10.79**
Yes	67	92	
No	58	33	
ANMHEALTH			51.11**
Yes	12	64	
No	113	61	

**- Significant (p<0.01)

The average age of the head of households from both the migratory and non-migratory category was 43 years (Table 3). Similarly, households with more adult males in the family and larger flock size tended to migrate. The number of adult members in the family indicates

household labour supply, a larger family could spare the services of male members for migration easily compared to smaller family. The average number of family members in migratory households was lower (p< 0.01) than non-migratory, though the number of male members above 18 years was significantly higher in the former category. Significant (p<0.05) difference was also observed between the two categories in land holding. The ownership pattern of sheep by household indicated that migratory households had significantly (p<0.05) larger flock size (average 109) than non-migratory (average 50).

Large flocks were taken to migration to avoid competition with smaller flocks which heavily depend on native grasslands. The positive influence of flock size and potential household labour supply on migration decision of farmers has also been reported in previous studies (Suresh and Chaudhary, 2015; Chand et al., 2017). The less than unity value of odds ratio as well as negative sign for the coefficients of electricity and animal health signifies households with access of electricity connection and veterinary services in their village were less likely to leave their native place than the households without access to these facilities. A comparison of the magnitude of coefficients of all significant variables pointed out toward the effect of larger flock size on migration decision of households than other predictors.

The decision of a household to migrate as a function of his individual socio-economic characteristics was caste-neutral and age-neutral as almost all the households belonged to the same *Raika / Dewasi* community with almost similar age of head of family. As there was no significant difference between the two categories of households in terms of education status, the independence of migration decision with education level was as per our expectation.

Table 4 indicates that economic and management constraints (MPS 69.32) were the major perceived followed by technological (MPS 64.13), general situation (MPS 57.41) and socio-psychological and cultural (MPS 53.38). Among the economic and management, the constraints perceived intensely by

Table 3. Descriptive statistics and significance of numerical explanatory variables of migratory and non-migratory households

Variable code	Migratory(n=125)		Non-migratory (n=125)		t-value
	SD	Mean	SD	Mean	
AGE	42.80	11.99	43.12	11.46	0.21
ADMALE	2.08	1.03	1.81	0.88	2.22**
HHSIZE	8.50	2.91	9.56	3.38	2.65**
LANDOWN	1.38	1.35	1.95	2.87	2.00*
FLOCKSZ	109.47	54.56	50.45	26.37	10.88**

*- Significant (P<0.05), **- Significant (P<0.01)*

Table 4. Constraints faced by households rearing sheep in the study area

Constraint	Mean per cent score	Rank	Overall rank
Economic and management	69.32		
High cost of feed and fodder	87.21	1	1
Costly veterinary medicine	83.27	2	2
Low productivity of animals	71.04	3	7
Poor credit facility	68.61	4	10
Poor insurance facility	57.81	5	15
Non-existence of cooperative wool market	54.63	6	18
Technological	64.13		
Non-availability of green fodder round the year	77.12	1	5
Lack of knowledge about improved practices	70.48	2	9
Lack of skill in new technology	62.15	3	12
Input and labour intensive nature of improved practices	59.35	4	14
Non-availability of quality inputs in time	57.31	5	16
General	57.41		
Degraded/shrinking common grazing land	82.65	1	3
Uncertainty of rain	79.41	2	4
Small land holding	76.12	3	6
Problem during *en route* migration	70.54	4	8
Socio-psychological and cultural	53.38		
Traditional attitude of people	65.20	1	11
Lack of initiative and leadership	61.82	2	13
Lack of motivation	56.23	3	17
Limited needs and aspiration of the people	46.28	4	19

the households were high cost of fodder and concentrates (MPS 87.21, R-1 and OR-1), followed by costlier veterinary medicines (MPS 83.27, R-2, OR-2), low productivity of animals (MPS 71.04, R-3, OR-7), non-availability of loan (MPS 68.61, R-4, OR-10), lack of livestock insurance facility and its long and complex process (MPS 57.81, R-5, OR-15) and non-existence of cooperative wool market (MPS 54.63, OR-18).

Among the technological constraints intensely perceived were non-availability of green fodder round the year (MPS 77.12, R-1, OR-5) followed by lack of knowledge about improved practices (MPS 70.48, R-2, OR-9), lack of skill in new technology (MPS of 62.15, R-3, OR-12), adoption of improved practices require more input and labour (MPS 59.35, R-4, OR-14), and non-availability of quality inputs on time (MPS 57.31, R-5, OR-16). The technological constraints viz., improved practices not suitable to local conditions, loss of animals due to frequent epidemics, lack of vaccination and health care facility of animals etc., were also perceived by the households but with less intensity.

The general situational constraints were degraded/ shrinking common grazing land (*Oran*, *Gochar*, wastelands etc.) (MPS 82.65, R-1, OR-3) followed by irregularity/ uncertainty of rain/vagaries of monsoon (MPS 79.41, R-2, OR-4), small land holding (MPS 76.12, R-3, OR-6), problem during migration to other area/ state at the time of drought/ famine condition (MPS 70.54, R-4, OR-8). The finding confirms the work of Rao et al. (2011) that the major constraint for sheep population was non-availability of feed sources (92.7%). The problematic soil/irrigation water, inactive/ non-existence of various basic social institutions, lack of basic infrastructure (road, transport, clean water etc.) were also perceived as other general situation constraints. Households also perceived socio-psychological and cultural constraints, and this category was topped by traditional attitude of people (MPS 65.20, R-1, OR-11), followed lack of initiative and leadership (MPS 61.82, R-2, OR-13), lack of motivation (MPS 56.23, R-3, OR-17), limited needs and aspiration of the people (MPS 46.28, R-4, OR-19). The other constraints viz., negative experience of adoption/ use of improved practices, lack of cooperation among people and community struggle etc. were perceived less intensively.

In the present study area, majority of the surveyed households sustain their livelihoods through sheep rearing which indicates the critical role of the animal in the livelihood strategies of the rural families. However, scarcity of feed and fodder resources compels the households to undertake migration to sustain their livelihood. The infrastructure variables like *Pucca* house, electricity and availability of veterinary services in village were found to restrain the migration decision of households. Therefore, strengthening infrastructural facilities at village level would add to efforts of the state to settle the migrating population. The flock size and number of adult members in the family were significant in determining migration decisions which can be considered as essential coping mechanism for saving large flocks from fodder scarcity. The major constraints perceived by the households were related to poor availability and high cost of feed and fodder resources, veterinary services and uncertainty of

rainfall. Therefore, the state government has to play critical role in systematic investment in management of common grazing resources involving rural peoples.

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