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# Livestock Migration in the Arid Region of Rajasthan (India)

## - Strategy to Cope with Fodder and Water Scarcity -

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**Abstract:** Livestock rearing is an important pathway out of poverty for both pastoralist communities and mixed crop-livestock farmers in drylands. Pastoral enterprises make an important contribution to the state, as well as to the national economy, despite their location in the most drought-prone part of India. Livestock keepers move their animals in search of better forage and water resources during scarcity periods. Thus livestock mobility allows pastoralists to maintain their flocks and lead productive lives. The objective of this study was to analyze the existing and emerging trends with respect to livestock mobility, issues of animal management and problems faced during migration. A stratified random sampling method was used for household surveys. The results revealed that the main community rearing livestock in western Rajasthan was the Raika. The flock/herd size varied from 42 to 250 small ruminants and 35 to 220 cattle. Three kinds of livestock migration were prevalent in the study areas: 1) local/temporary 2) semi-migration in large size flocks and 3) permanent migration where animals are permanently moved from the home tract to other districts or states. It is important to understand livestock migration within the context of the larger agricultural, environmental, and sociological systems so that rational policies can be formulated and implemented.

**Key Words:** Grazing, Livelihood, Livestock, Migration, Policies

### 1. Introduction

Livestock production is an important agricultural enterprise in dryland regions and in most semiarid agricultural systems where the animal component is present (Spedding, 1979). Pastoralists, by definition, derive most of their livelihood from raising livestock on natural forages or crop residue, rather than on cultivated and stored fodder or fenced pastures (Sanford, 1983). For the pastoralists of western Rajasthan, India, domestic animals are a living asset that contribute to household income, food security, and health through dietary diversification. The western Rajasthan pastoral system, which evolved over the last 5 centuries, is centered on the use of large tracts of uncultivable and marginal land coupled with seasonal use of rainfed cropland. The pastoralists have developed traditional migration routes and a partition of responsibilities, with some castes specializing in animal herding and others in cropping (Malhotra and Mann, 1982). Over the centuries, herders have developed traditional knowledge of animal husbandry and natural resource management. This knowledge has allowed them to endure periodic severe droughts on their communally-managed rangelands (Kavoori, 2005). This study was conducted to

analyze livestock migration with following objectives:

To document and analyze existing migration strategies and emerging trends in Rajasthan.

To analyze status of livestock husbandry and production constraints encountered by migrating flocks and herds.

### 2. Methodology

Four districts from western Rajasthan (Pali, Jodhpur, Barmer and Jalore) with significant numbers of migratory cattle or small ruminant flocks were selected for study (Fig. 1). A stratified random sampling method was used to select households within each district, tehsil (administrative unit in a district with defined geographical boundaries) and village. A complete inventory of all the migratory and non migratory livestock households was undertaken in selected villages. The livestock households were categorized into small, medium, and large based on the cumulative square root method of stratification (Singh, 1975). Finally, 125 sample households, each from migratory and non migratory category, were selected on the basis of probability proportionate to the number of households in each category. As cattle herders were migrating during the deficit period, all the 33 households rearing cattle were selected for the present study.

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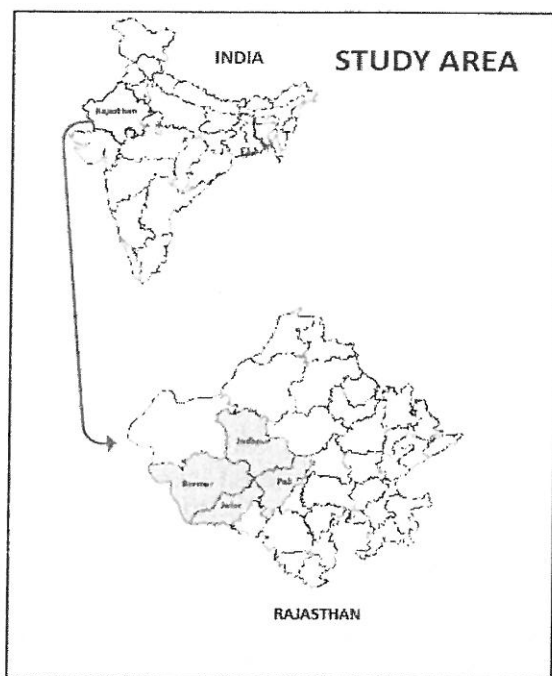


Fig. 1. Study area.

The study was conducted in a Participatory Rural Appraisal (PRA) context which integrates knowledge and opinions from rural people in rural development/research projects (Bhandari, 2003). Data was gathered through Participatory Rural Appraisal (PRA); key informant interviews (discussions with people who have specialized local knowledge of migration strategies), and personal interviews during 2012-13. Data on socio economic status of livestock owners, investment in animals, breeding, and other management practices were collected. Detailed information on migration routes and problems faced by herders was also collected. Migration routes were tracked by fitting 2 cows and 2 sheep with Clark Animal Tracking System (ATS) collars that recorded date, time, and position at 1 hour intervals during migration (Clark *et al.*, 2006).

The standard analytical and statistical procedures were used for data analysis. The linear regression equation was fitted by the ordinary least-squares method to find the relationship between migration of respondents (Y) and different factors like flock size (X1), age of respondent (X2), education status of owner of household (X3), total adult members of family indicating labor supply (X4) and size of operational land holding (X5).

### 3. Results and Discussion

#### 3.1. Socio-economic profile of households

The Raika people represent the majority of stock owners in western Rajasthan. Flock/herd size varies from 42 to 250 small ruminants and 35 to 220 cattle. These people were

mainly dependent on livestock keeping rearing for their livelihood. About 74 percent of the households had small land holdings (less than 2 ha) with an option to grow one rainfed crop only in the absence of irrigation. The survey also indicates low education levels among sample households as 88% of cattle herders and 90% of sheep flock owners were illiterate. Average family size of cattle and sheep herders was 5.6 and 5.4, respectively. As male members of migratory households move outside, female members look after the agriculture fields. Further, female members supplement their family income by general labor work on other farmer's field or getting employment under government sponsored employment schemes in the village.

#### 3.2. Migration of livestock

Migration of animals in search of better fodder and water is a common practice of western Rajasthan. The degree of mobility depends on flock/ herd size, the location of the family or village, as well as on the amount of fodder produced in a given year. Results revealed three kinds of livestock migration 1) local/temporary migration, 2) semi-migration and 3) permanent migration. 1) Local/Temporary migration is practiced by people with smaller flock (<50 head) sizes generally migrate for short periods (6-12 weeks). They move from their home villages to grazing areas in neighboring villages within the district when the local pastures are exhausted. Migration takes place mainly between November and June. 2) Semi-migration is practiced by people with larger flock/herd sizes who face difficulty in maintaining the animals near the native surroundings during the dry season (November to July/August). They typically migrate out of the district or state during the dry season, but return to their native area in the following monsoon season. 3) Permanent migration, where large herds/flocks are permanently moving from the home location to other districts or states. For long distance migration, about 10-20 persons join together and move simultaneously with their animals seeking safety and uniting against other management related problems and threats on the way. One experienced person within the group is appointed as leader who visits in advance different locations where animals are to be taken for grazing. Migration strategy of livestock owners revolves around availability of fodder and water resources in native region. In good rainfall years, they may delay their departure by 1-2 months. The departure of herds is linked with crop harvesting in other regions. During the migration, animals graze on fallow harvested fields of farmers. The regression analysis indicated significant positive effect of flock size and adult family members in family on the event of migration. The other factors viz. age of respondent, education status and operational holding size were

Table 1. Linear estimates of factors influencing livestock migration.

Variable	Description of variable	Coefficient	Standard error
Constant		0.516***	0.0927
X1	Size of flock (nos)	0.0049***	0.0004
X2	Age of respondent (yrs)	-0.0095***	0.0009
X3	Education status of owner of household (yrs of schooling)	-0.0621**	0.0341
X4	Total adult members in family (nos)	0.0318***	0.0136
X5	Size of operational land holding (ha)	-0.0122*	0.0094
N		250	
R <sup>2</sup>		0.5375***	

Note: \*\*\*, \*\* and \* indicate significance at 1, 5 and 10 percent levels, respectively.

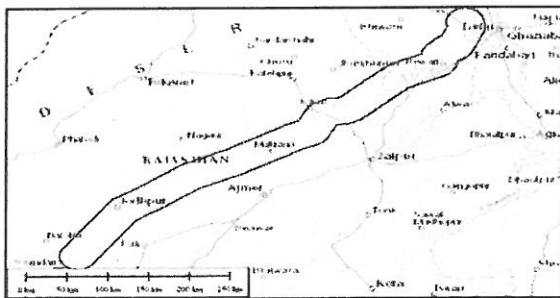


Fig. 2. Cattle Migration Buffer (of 20 kms).

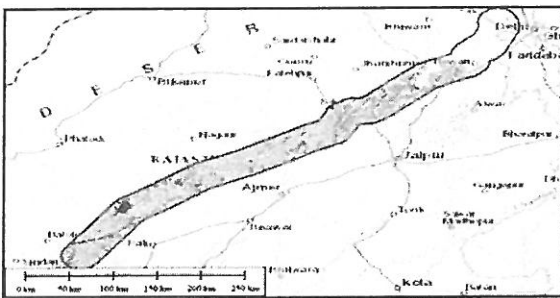


Fig. 3. Cattle Migration Route with land use and cover layer.

found to be negatively associated with migration (Table 1).

### 3.3. Migration routes

Migration routes of livestock are well established (Saha *et al.*, 2008). People from Jodhpur, Barmer, Pali, and Jalore districts generally migrate towards Uttar Pradesh, Madhya Pradesh, and Haryana. The exact routes of cattle migration, time taken to reach watering points, as well as the total distance travelled has been mapped and calculated through GPS Collars. Analysis of a 20 km land use/land cover buffer on the migration route (Figs. 2 and 3) reveals that 0.06 per cent of the urban land, 29.06 per cent of cropland, and 48.57 per cent of fallow lands was utilized by migrating animals for grazing and resting purposes.

Peculiarly, tracked migrating animals did not enter into the

forest areas. Based on animal tracking data, it has been shown that animals drink water once a day and if available, it may be twice a day. Sometimes, they have to cover 18-22 km, from the migration route, to locate a water source. The animals on an average travelled 7.09 km before migration, 8.8 km during migration, and 8.71 km/day across the entire observation period. The overall distance travelled by animals was 1550 km from 9th January to 28th June 2013.

### 3.4. Management of Livestock and Constraints

Cattle and small ruminant rearers adopt traditional livestock management practices in western Rajasthan. Animals are highly dependent on common grazing and fallow lands, and post harvested crop fields. Jodha (1986) documented the role of common grazing lands in the rural economy in a study based on 82 villages in 7 Indian states. He found that while common pastures were not highly productive, they provided an important resource for poor people lacking access to private lands and other productive resources. Grazing in common village pastures and forests was estimated to account for 31% of livestock feed consumption in India (World Bank, 1999). The decline of the common lands disproportionately harms the poor, who depends more than others on these lands (Osman *et al.*, 2001). The expenses on purchase of fodder was almost negligible. Cattle provide only 1-2 kg of concentrate feed to their lactating animals. Small ruminant owners provided strategic supplemental feed for 4-5 days to weaker sheep and lambs during winter season as not to affect their productive efficiency. Livestock migrating outside their home villages rarely consult veterinarians and treat sick animals by themselves, instead using traditional pharmacopeia or directly purchasing the medicines from the agents or nearby markets. The constraints to animal production faced at the village and during migration, as identified and ranked are explained in Table 2.

### 4. Conclusion

The migration of domestic animals in western Rajasthan is an age old practice that allows livestock keepers to maintain their herds because of better fodder and water availability in other neighboring states. The deterioration of common grazing lands has made it difficult for large herd owners to maintain the animals in their native areas round the year. Though livestock keepers have their own management system which determines routes to be followed and areas to be approached for grazing, they face difficulties in obtaining institutional health services, quality medicines at reasonable prices, and also protection from criminals on migratory routes. Improving the condition of the common grazing lands and

Table 2. Constraints faced by the respondents.

S. No.	Name of constraint	Rank
1	Rapid decline of common grazing lands ( <i>Gochar</i> and <i>Oran</i> ) due to encroachment	I
2	Proliferation of <i>Prosopis juliflora</i> (Sw.) DC. (angrezi babul) in common lands	VII
3	Lack of good quality fodder grasses on rangelands	II
4	Restrictions to livestock grazing on land controlled by the forest department	V
5	Farmers' unwillingness to allow grazing on their fallow lands and harvested fields,	VI
6	Harassment and exposure to criminal elements during migration	IV
7	Theft of animals during stay in other districts/ states	VIII
8	Lack of livestock health services and quality veterinary medicines	III
9	Communication gaps between migratory herders and government officials	IX

religious trust-owned pastures with community participation could provide better forage resources that fulfill the nutritional requirements of migrating animals. The interventions of state government by making provision of mobile veterinary services and quality medicines on different migratory routes will help in reducing losses to livestock owners. Further, control of criminals shall provide a healthy space for livestock owners in different regions and ensure safety of people engaged in this enterprise.

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