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Improving a transhumance livestock system of India with modern technologies

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Introduction

Traditional livestock rearing systems in grasslands evolved in response to social, climatic, vegetative and technological conditions that existed scores, hundreds, or in some cases up to a thousand of years ago. Many of these systems involve vertical transhumance where flocks and herds are moved up elevation gradients for summer pasturage or horizontal transhumance in which livestock migrate across greater distances in response to regional rainfall patterns and the resulting availability of forage. In spite of the relatively low earnings of individual herders, these pastoral systems can contribute substantially to the national economies, while providing sustenance and food security to significant portions of the population. Additionally, traditional livestock rearing often contributes a rich social culture in regions where it is practiced and many societies closely identify with traditional livestock herding lifestyles. In many parts of the world herders still use traditional transhumance systems but they are coming under increased pressure from a number of forces such as social, economic (globalization) and political both within and external to these societies. Yet, many rural people living at or near the subsistence level still rely heavily on small flocks or herds that migrate for their livelihoods. These traditional pastoral or agro pastoral systems and the people that use them have an opportunity to employ modern technologies to change and improve with developing technologies. We studied the Indian Raika (Dewasi/Rebari) horizontal transhumance system of sheep and cattle from their home villages in western Rajasthan to the regions of Haryana and Delhi. During this project we attempted to understand the constraints to production, techniques that could increase animal health and family income of herders. One of the main goals of the project was to also identify programmatic opportunities whereby information at the national or international level could be used to improve sustainability and efficiency of movement from one grazing location to another.

Materials and Methods

Our study was conducted in a Participatory Rural Appraisal (PRA) context which integrates knowledge and opinions of rural people in rural development/research projects (Bhandari, 2003). Four districts from western Rajasthan with significant numbers of migratory cattle or small ruminant flocks were selected for the study. Within these four districts a stratified random sampling method was used to select households within district, tehsil, and villages for participation and detailed survey. Data were gathered through key informant interviews (discussions with people who have specialized local knowledge of migration strategies), personal interviews, and personal observations. Information was also collected from governmental departments involved with migratory herders (Louhaichi *et al.*, 2014). In addition, 2 cows and 2 sheep in 4 different large herds or flocks were fitted with GPS collars that recorded date, time, and position at 1 hour intervals during the migration. We employed Clark Animal Tracking System (ATS) collars because they offered both long deployment lives (*e.g.*, up to 1 year) at intensive sampling rates (Clark *et al*., 2006). During the migrational transit, all animals in the herd were treated similarly. GPS information was overlaid on world topographic maps (ESRI, 2014a), as well as satellite images with a ground pixel resolution of 1m (ESRI, 2014b). The government of India (GOI) GIS data sources on roads, railroads, forest/natural reserves, and water points were also used when evaluating livestock migration routes. Such information was helpful in understanding movements and trends.

Results and Discussion

Examination of the track logs of sheep and cattle revealed daily movement of animals including where herds rested for the night and grazed during the day. Because each point was tagged with the date and time, it was possible to determine when animals began to move in the morning and when they bedded at night. Animals typically began moving around 8:00am and ended the day by 8:00pm in the evening. Crop residues was a major source of forage and animals spent the bulk of their foraging time in farm fields (49% fallow fields and 29% crop lands) but natural lands (19%) and lands associated

with seasonal river channels (1%) were also used along the route. When animal movement was overlaid on areas with restricted livestock grazing (those lands controlled by the Forestry Department), we found that the monitored herds did not enter these areas. This is significant because the creation of reserves has reduced the land available for the migratory herds and flocks. The creation of reserves is a response to increased sensitivities regarding environmental degradation. Although the animal number remained the same in the study area, reduced grazing area has increased grazing pressure as there has also been encroachment from farming on traditional common grazing lands named locally as Gochar and Oran. The results show that the monitored herds complied with governmental regulations. Herder's daily routes typically paralleled highways or railways and the speed of transit across the land varied based on the availability of forage and water. This landscape is mainly level and very dry. Herds typically traveled on average 8.8 km day-1 during migration, however the transit through areas without available drinking water was rapid and direct. If water was available at these locations, herders could stay longer with additional forage and less stress on both herders and livestock. Creation of water points that are optimally spaced to access forage sources in these areas, could benefit the herders. In fact, in arid areas watering points will reduce the walking distance which indirectly will enhance livestock productivity. As we interacted with herders we realized that although most were illiterate (≈90%), many carried cell phones so they could communicate with family members left behind in their home villages. Based on the survey data, communication using cell phones could be developed to help the migratory herders. For example, local officials apprise herders of forage conditions and land owned by farmers willing to allow grazing. This could help guide flocks towards optimal routes. Market and pricing information could also be made available. Herders also reported harassment and theft of animals along the migrational route. Cell phone technology could be used to report and, if coupled with rapid response, hopefully reduce theft. Increased security for flocks would be welcomed by herders. In a similar fashion, livestock health could be improved if veterinary advice via cell phone was available to migratory herders. It is likely that application of veterinary interventions in a timely fashion could reduce morbidity and mortality of livestock. Multiple information systems have been tailored to illiterate users. Lastly, rangeland improvement projects such as desert development programme and/or watershed and wasteland development programmes, in areas where degradation has been most intense could have both environmental and productive benefits if grazing is monitored and controlled. Herders specifically mentioned the increase in undesirable shrubs at the expense of palatable species as a trend that was making their life more difficult. Natural plant communities make up approximately 20% of the land available on the migration route and could improve the forage balance. Thus, forage availability could be increased by regulating grazing. For improved pasture, rotational grazing may be adopted or cut and carry system may be practiced. Rehabilitation of degraded natural vegetation with full participation of local communities is needed on degraded land currently classified as grasslands, scrublands, wastelands, sandy areas, and gullied land. Such efforts would lead to the revival of native species and reverse the trend of degradation.

Conclusion

The Raika herders of western India are maintaining a horizontal transhumance system in spite of reduced natural pasturage. Opportunities exist to assist these herders by creating water catchments in areas with available forage along the migration route. Cell phone communication, coupled with local officials knowledge of forage availability and crop stubble. In a similar fashion, veterinary advice and market prices could be made available via cell phone. We encourage continued exploration of programs that improve the life of herders using Participatory Rural Appraisal.

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