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Adaptation strategies of pastoralists to degradation of Banni grassland in India through livelihood diversification

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Key words: Arid region; *Banni* buffalo; income security; livelihood security; *Prosopis juliflora*.

Abstract

Pastoralism is the predominant livelihood in *Banni* grasslands. However, combination of factors (livestock population pressure, overgrazing, severe droughts, rapid invasion of *P. juliflora*) has led to severe degradation of the grasslands. This has increased the risk of pastoralism as a profitable and sustainable livelihood. In this context, this socio-economic study investigated the livelihood diversification process adopted by pastoralists in *Banni* grasslands. Primary data were collected from 280 households from 13 villages using stratified random sampling technique. Out of these, detailed livelihood diversification analysis of 50 households (case studies) was undertaken. Results found that pastoralists diversified into combination of eight non-pastoralism based livelihood options (charcoal production, labour, services, leather work, embroidery work, honey & gum collection, tourism and trade) for livelihood security. Based on the combination of pastoralism and other income generating activities, there were eight different household typologies in the region viz., (i) Buffalo rearing + 7 activities (66%); (ii) Buffalo & Goat rearing + 1 activity (4%); (iii) Buffalo + Cow rearing + 3 activities (4%); (iv) Cow rearing + 2 activities (4%); (v) Camel rearing + No additional activity (2%); (vi) Sheep & Goat rearing + 1 activity (4%); (vii) Goat rearing + 5 activities (12%); and (viii) 5 activities without any livestock (6%).

The adaptation strategies of pastoralists to degradation of *Banni* were reduced dependency on pastoralism (reduction in herd size of buffaloes, moving out of buffalo rearing, goat rearing in small herds) and diversification into non-pastoralism based livelihood options. Buffalo rearing households earned highest annual income. Goat rearing and livestock-less households were the poorest. It indicated that moving out of pastoralism (even after income diversification efforts) was associated with low incomes. Therefore, increasing the carrying capacity of the grasslands through scientific management and development of supply and value chain are the most sustainable options for risk reduction and enhancing income of households.

Introduction

Banni grassland in Kachchh district of Gujarat in India is a socio-culturally unique and ecologically significant ecosystem. Agriculture is not practiced in the grassland and pastoralism is the main livelihood option for more than five centuries (BCPMB 2010, RAMBLE 2024, *B*anni 2024). However, significant changes in the recent past such as the declaration of *Banni* grasslands as Protected Forest, rapid invasion of *P. juliflora*, salinity ingress, successive and severe droughts, increase in livestock population and overgrazing have led to its' severe degradation (Safriel and Vijay Kumar 2021, Manjunatha et al. 2022, Singh et al. 2023). *Banni* grassland once covered an area of 3800 sq. km (Bhandari 1990) but decreased to 2618 sq. km (Rawat and Adhikari 2015).

Banni grassland is a heterogeneous ecosystem, which has wetland, grassland, and dryland habitats. Forest department introduced *P. juliflora* (a shrub native to Mexico and South America) in 1960's to stop the advancement of Rann. However, the invasion of *P. juliflora* is slowly converting it to shrubland (Sharma et al. 2024). Further, there is a shift in livestock composition in favour of buffaloes over cows. The livestock population in *Banni* grasslands during 2021-22 is estimated to be 1,01,235 heads with the composition of buffalo, cattle, sheep and goat at 77, 13, 5 and 5% of the population respectively (Projected from Manjunatha et al. 2019a). These ecological and policy changes along with increased access to organized dairy industry have contributed to the gradual shift from migratory pastoralism to semi-migratory and sedentary animal husbandry. In this context, the objective of this study was to understand the adaptation strategies of the pastoralists to mitigate the impact of degradation of *Banni* grassland on their livelihood security.

Methods

Research design: An ex-post facto survey research design and case study method were used.

Locale of the study, sample and sampling procedure: *Banni* grassland located in Bhuj taluka (subdivision) in Kachchh district of Gujarat State in India was purposively selected as the study area. Thirteen villages were selected for the study using stratified sampling technique to represent different parts of *Banni.*

Data collection tools and analysis: A structured interview schedule was developed for the study. The primary data were collected between January 2015 and June 2017 by personally interviewing 280 households selected randomly from these 13 villages. Out of these, detailed livelihood diversification analysis of 50 households was undertaken using case study method. The primary data collected from pastoralist households were supplemented and validated with other research techniques such as participant observation, Focussed Group Discussions (FGDs) and synthesis of secondary data. Extensive field visits were made to *Banni* grasslands and pastoralists' livestock yards at their home and during migration. Charcoal production units were visited. Embroidery and leather work units were visited at the selected respondents' houses and exhibition stalls during *Rann Utsav* (A tourism event organized by the Government of Gujarat every year at Rann of Kachchh). FGDs were held with key pastoralists in each village and other stakeholders such as representatives of the *Banni* region (Banni Breeders Association) and researchers and organizations working on *Banni* grasslands. Annual incomes were calculated for the agricultural year 2016-17 based on the prices prevailing in the *Banni* region in April 2017 (Manjunatha et al. 2019b). The guidelines on methods for estimating livestock production and productivity developed FAO were followed (FAO 2018).

Results

Upto 94 percent households in Banni grassland were associated with pastoralism/ animal husbandry. The adaptation strategies adopted by pastoralists to reduce the impact of degradation of Banni grasslands were reduction in herd size of buffaloes, moving out of buffalo rearing, goat rearing in small herds and diversification into non-pastoralism based livelihood options. The pastoralists diversified into combination of eight non-pastoralism based livelihood enterprises (charcoal production, labour, services, leather work, embroidery work, honey and gum collection, tourism and trade) for livelihood security. Based on the combination of pastoralism and other income generating activities, there were eight different household typologies in the region viz., (i) Buffalo rearing + 7 activities (66%); (ii) Buffalo & Goat rearing + 1 activity (4%); (iii) Buffalo + Cow rearing + 3 activities (4%); (iv) Cow rearing + 2 activities (4%); (v) Camel rearing + No additional activity (2%); (vi) Sheep & Goat rearing + 1 activity (4%); (vii) Goat rearing + 5 activities (12%); and (viii) 5 activities without any livestock (6%).

Rearing of Banni buffaloes along with other livelihood options was the dominant typology (Figure 1). Households rearing cows and camels exclusively were very few in number (6%) but their incomes were equivalent to buffalo-rearing households. Buffalo/cow/camel rearing households represented traditional pastoralist households and they earned >70% of their income from pastoralism/animal husbandry (Figure 2). Migratory sheep rearing involving large herds (with few goats in the herd) is a traditional occupation practiced by poor pastoralists. Backyard goat rearing in small herds is a relatively recent extra income generating activity

practiced by poor households. It is an indication of shifting away from traditional pastoralism and lack of ownership of buffaloes, cows, camel and sheep. Livestock-less households represented extreme end of continuum who have completely shifted away from pastoralism. Goat rearing and livestock-less households constituted 18% households and earned their major income from non-pastoralism based activities (charcoal production, unorganized services and labour). Goat rearing and livestock-less households were the poorest indicating that moving out of pastoralism (even after income diversification efforts) was associated with low incomes. Charcoal production is mostly based on cutting of *P. juliflora.*

Households engaged in buffalo-based pastoralism earned highest annual income and had choice to engage in high-income generating livelihood options such as tourism and trade. Livestock-less and goat-rearing households earned lowest annual income and were dependent on low-income generating activities such as charcoal production, unorganized services, labour and honey and gum collection for want of better employment opportunities.

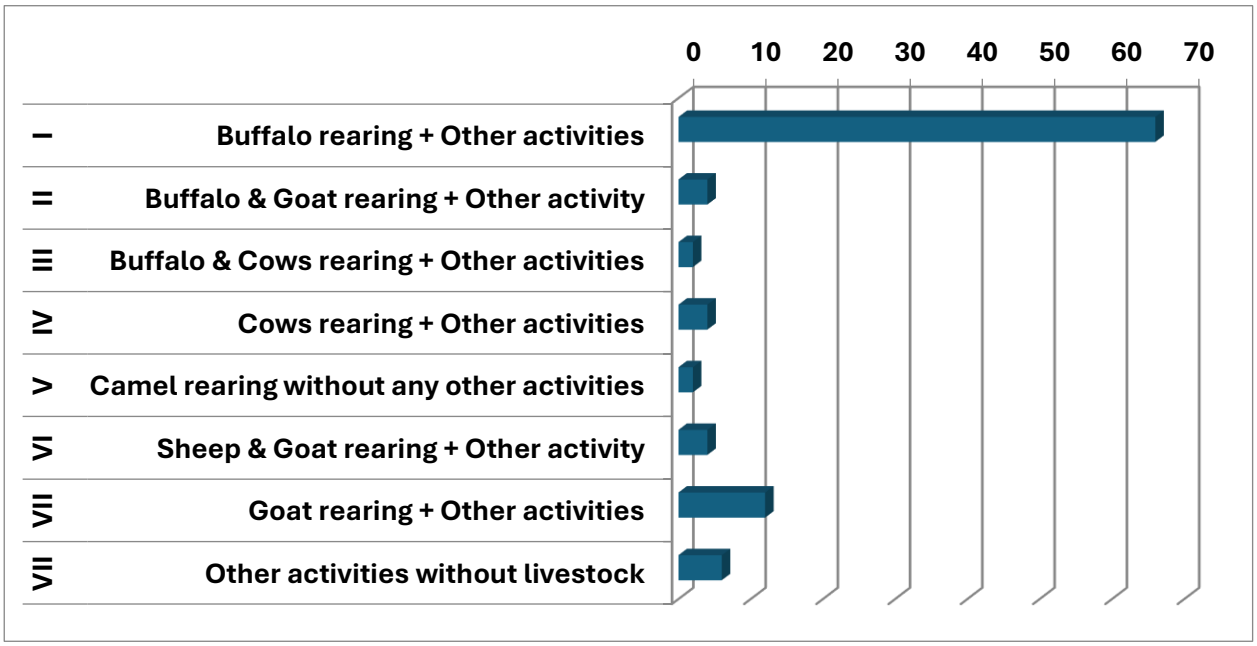

Figure 1: Household typologies and livelihood diversification adopted by pastoralists in Banni grasslands

Note: "Activities" indicate "income generating activities". The terms "income generating activities" and "livelihood options" are used interchangeably in the article.

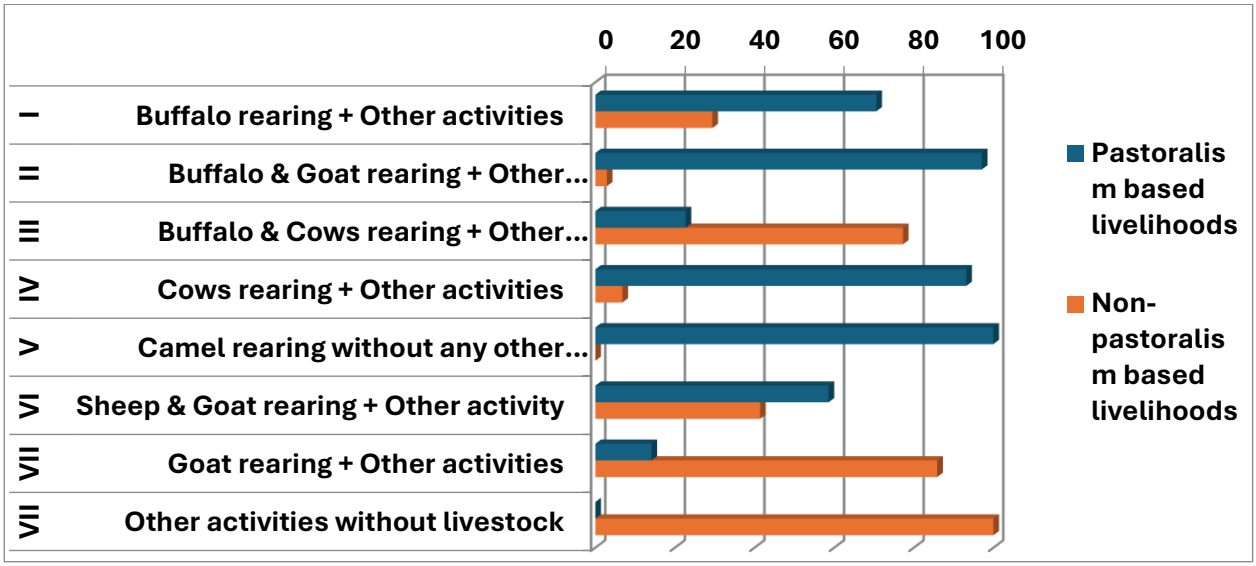

Figure 2: Share of pastoralism and non-pastoralism based livelihood options in average annual net income (%) for different household typologies in Banni grasslands

Discussion

Pastoralism/ animal husbandry as a remunerative and sustainable enterprise in *Banni* grassland is under severe pressure due to its degradation. The reduced carrying capacity has increased the cost of livestock rearing as the fodder shortage is being compensated by purchase of feed and fodder resources from market. Therefore, 98% pastoralist households have integrated non-pastoralism based livelihood options for income and livelihood security as an adaptation strategy. At the same time, the remunerative employment opportunities in secondary and tertiary sector are very limited in the region. Therefore, households shifting away from pastoralism are forced to opt for livelihood options which are less remunerative than the pastoralism/ animal husbandry itself.

Pastoralism in India is invisible in government policies and programmes since there is no authentic data available about the numbers, livestock and economic contribution of pastoralism. The 21st Livestock Census 2024, for the first time plans to include a separate enumeration of pastoral livestock which marks a significant step towards designing targeted interventions and public investment/schemes (Bhatti 2024). Grasslands are frequently ignored in sustainable development objectives. Adequate knowledge of how grassland degradation affects ecosystem services is essential for sustainable management and grassland ecological restoration (Dey et al. 2024). Ecological restoration of the grassland requires scientific management involving participation and engagement of the pastoral community and community based organizations at all levels of decision making. From 2019 to 2023, *P. juliflora* was uprooted with JCB earthmovers restoring 3000 hectares, thereby increasing vegetation species richness by 12% and tripling biomass productivity. Innovative income generation efforts such as sale of carbon credits generated from biochar production from *P. juliflora* were undertaken for sustainable management of the grasslands and economic stability of the pastoral communities (Pokar 2024).

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