

WORKING PAPER

Rates for a Night's Stay: Unpacking the Penning Economy in Maharashtra and Telangana

Ashwini Kulkarni, Kanna Siripurapu,
Sajal Kulkarni and Ajinkya Shahane



**Centre for
Pastoralism**

Rates for a Night's Stay: Unpacking the Penning Economy in Maharashtra and Telangana

**Ashwini Kulkarni, Kanna Siripurapu,
Sajal Kulkarni and Ajinkya Shahane**

**Working Paper Series
2026**



**Centre for
Pastoralism**

Centre for Pastoralism's Working Paper Series

The Centre for Pastoralism (CfP) Working Paper Series provides a dedicated platform for sharing research on pastoralism and grasslands conducted by CfP researchers, collaborators, and partners we support. By fostering intellectual curiosity and interdisciplinary engagement, the series seeks to advance the field of pastoral studies across diverse academic and practical domains. It serves multiple objectives: promoting early research findings by disseminating preliminary outputs, theoretical frameworks, and methodological approaches; fostering collaborative research by encouraging feedback, partnerships, and transdisciplinary dialogue; and nurturing academic discourse by sparking debates, inspiring new lines of inquiry, and presenting research in accessible formats. Through this series, CfP aims to enrich understanding, build networks, and stimulate meaningful discussions on the complexities and contributions of pastoral systems and grassland ecosystems.

Published by Centre for Pastoralism, 2026
© Centre for Pastoralism, 2026

Rates for a Night's Stay: Unpacking the Penning Economy in Maharashtra and Telangana

Authors: Ashwini Kulkarni, Kanna Siripurapu, Sajal Kulkarni and Ajinkya Shahane

Editors: Radhika Chatterjee, Aniruddh Sheth and Manaswi Raghurama

Design: Pranavi Arora

Cover Photograph: Aniruddh Sheth

Citation: Kulkarni, A., Siripurapu, K., Kulkarni, S., and Shahane, A. 2026. Rates for a Night's Stay: Unpacking the Penning Economy in Maharashtra and Telangana. Working Paper Series. New Delhi: Centre for Pastoralism.

Centre for Pastoralism
96, Anupam Apartments,
Mehrauli-Badarpur Road, Saket
New Delhi, 110068

research@centreforpastoralism.org

All rights reserved
Permission to reproduce material from this publication is not required; however, proper citation and acknowledgment of the author and the Centre for Pastoralism are mandatory.

Editorial Note

This report presents a foundational, field-based exploration into the economic and socio-cultural dimensions of sheep penning as practised by pastoral communities in Maharashtra and Telangana. Long marginal in both policy and academic discourse, the penning economy is here accorded the attention it deserves, as a crucial, if often informal, livelihood practice that binds pastoralists and farmers through reciprocal, evolving relationships centred around soil fertility, crop cycles, and livestock mobility.

While the analysis presented in the report remains preliminary in some respects, we believe it is important to foreground the fact that the study significantly advances our empirical understanding of penning. The dataset, though modest in size and geographically bounded, offers strong evidence of penning's contribution to pastoral household incomes, often second only to livestock sales, and highlights its role as a cost-effective source of soil nutrition for farmers. This dual benefit is of increasing importance in the context of the rising costs of inorganic fertilizers, widespread soil degradation, and deepening climate uncertainty.

Importantly, the report documents a set of practices that have persisted over decades, even as the terms of exchange between farmers and pastoralists have shifted from barter to cash, and the nature of pastoral mobility has been altered by changing land use, forest access, and regulatory pressures. It also offers valuable preliminary quantification of penning-related expenditures and revenues from both pastoralist and farmer perspectives, opening the door to further economic modelling and policy recognition.

Several analytical and methodological gaps remain. The study is regionally specific and more robust in its coverage of Maharashtra than Telangana. It does not yet assess the full agronomic impact of penning on soil fertility or crop yields, nor does it systematically compare outcomes between farms that practise penning and those that do not.

Additionally, certain methodological elements, such as the pairing of pastoralist and farmer interviews, could have been more explicitly integrated into the analytical frame. However, rather than seeing these as limitations, we view them as the starting points for future research.

In summary, this report succeeds in placing the penning and dung economy squarely within the frame of rural livelihoods and agricultural productivity. It surfaces compelling evidence for the role of mobile livestock

in sustaining soil health and local economies, and lays the groundwork for larger, more interdisciplinary studies on extensive agro-ecological systems. We hope readers will engage with the material in this spirit: as a provisional but necessary step towards recognising the value of pastoralist livestock penning in India's rainfed agricultural landscapes.

Contents

Introduction	1
Sampling & Methodology	2
• Objectives	
• Study Area	
• Pastoral Communities	
• Research Methodology	
• Sample Selection	
Findings - Maharashtra	4
Pastoralists	
• Sample coverage and demographics	
• Migration Patterns	
• Herd composition	
• Sources of income	
Farmers	
• Sample coverage and demographics	
• Landholding	
• Perceptions of crop yields	
• Nutrient management practices	
Farmer–pastoralist relationships around penning	
• Communication between farmers and pastoralists	
• Changes in farmer–pastoralist relationships over time	
• How pastoralists choose farms for penning	
• Terms and conditions of penning agreements	

Findings - Telangana

14

Pastoralists

- Sample coverage and demographics
- Migration Patterns
- Herd composition
- Sources of income

Farmers

- Sample coverage and demographics
- Landholding
- Investment in penning and fertilizers

Farmer–pastoralist relationships around penning

- Communication between farmers and pastoralists
- Changes in farmer–pastoralist relationships over time
- How pastoralists choose farms for penning
- Terms and conditions of penning agreements
- Pastoralists' views on the future of penning

Insights into the Penning Economy

21

Future Research

22

Policy Recommendations

23

References

24

Introduction

India's 535.78 million (estimated) livestock population (20th Livestock Census, Government of India) produces more than 2,600 million tonnes of dung per year (Kaur et al. 2017). About 80% of this livestock population is reared by rural and pastoralist communities and maintained under extensive livestock management systems (Phand et al. 2021). While much has been studied about the potential of dung as a source of bioenergy and manure, very little is known about the penning practices that are followed as a part of mobile pastoralism, in the Deccan in particular, including its socio-cultural dimensions, traditional usage patterns, and the economy of dung and its economic underpinnings. The practice of penning in the Deccan plateau in India is a reciprocal relationship between pastoralists and farmers. In this relationship, sheep and other livestock (mainly, cattle and goats) are made to stay in a temporarily fenced piece (a "pen") of farmland. The flocks eat the crop residue and graze on the adjacent commons, thereby sustaining themselves, while providing dung and urine which help increase the fertility of the farmland. Penning of livestock is an ancient practice that can be traced to the Neolithic Age in Southern India (Krishna & Morrison 2009). Penning of sheep and other livestock not only provides a regular supply of dung which is used as manure, fuel, and building material (Portillo et al. 2015), but also has cultural and ritualistic significance (Notermans 2019; Udayavani 2020).

Given the context of climate change, rising prices of inorganic fertilizers, and the increasing importance of soil health for agricultural productivity (as understood by farmers), the potential of penning to benefit both pastoralists and farmers should be investigated. Can the penning of pastoralist herds be adopted as a larger, sustainable model in our rainfed regions to supplement inorganic fertilizers, while also supporting pastoralists and their herds? While recent studies have helped initiate a preliminary understanding of its economic dimensions (Shivkumara & Kiran 2019; Kolay 2007), as also its contribution to soil fertility and organic farming (Sriveda & Srihita 2020; Nandhini & Suganthi 2018; Natarajan et al. 2024), further investigation is needed to build a comprehensive understanding of penning and the reciprocal relationship it is embedded in. The continued presence of penning in India's drylands suggests an enduring value provided by this practice in these geographies – value that remains unquantified.

With this background, this study was commissioned by the Centre for Pastoralism to start building an understanding of the penning practice in the Deccan

plateau of India. The aim was to understand the economics related to penning for both the pastoralists and the farmers, the transaction between these two actors involved in penning, and the influence of agricultural cycles on the migration patterns and behaviour of the pastoralists. Originally intended as a brief study, it was ultimately completed over roughly two years (2020–21) owing to interruptions related to the Covid-19 pandemic.

Pastoralists and farmers from five districts across two states, multiple agro-climatic regions, and five pastoralist communities were studied, with sheep penning the sole common factor.

There is a general dearth of literature regarding penning in India's rainfed regions, where it is primarily practiced. Some regions have been studied — Rajasthan, for instance (Robbins 2004) — while others like Maharashtra and Telangana have remained unstudied, despite these states having large rainfed areas and large pastoral populations. This study was aimed at bridging this gap by examining penning in Maharashtra and Telangana, and by seeking insights on the communities involved in this practice.

Sampling & Methodology

The study was carried out in the states of Maharashtra and Telangana in Central India. The surveys were carried out with the help of two organizations – Pragati Abhiyan and Watershed Support Services and Activities Network (WASSAN) – working closely with pastoralists in these regions. The surveys were designed by researchers from these organizations and by CfP researchers with some understanding of these landscapes.

While pilot surveys were done to validate the initial design of the survey, the actual surveys were delayed by the Covid-19 pandemic, and the subsequent lockdowns. A combination of interviews pairing pastoralists and farmers together and focus group discussions were undertaken to understand the diverse perspectives regarding penning and its functions.

As the project and field data collection was undertaken, two separate methodologies were used in Maharashtra and Telangana as a result of region specific trends and dynamics. This is examined in detail in sections devoted to each state.

Objectives of the study

The study aimed to

- Build an understanding of the penning landscape in Maharashtra and Telangana, Understanding the spatial dynamics of specific pastoralist communities and the rationale for their decision to pen their animals
- Understand the spatial dynamics of specific pastoralist communities and the rationale for their decision to pen their animals, and
- Quantify preliminary metrics for the penning economy.

Study Area

In Maharashtra, the study was conducted in the districts of Ahilyanagar (Previously Ahmednagar), Chandrapur, and Wardha – previous discussions with pastoralists suggested that these districts have the largest number of pastoralists and farmers who engage in penning.

In Telangana, the study was conducted in the districts of Kamareddy, in the north, and Vikarabad in the southern part of the state.

Pastoral communities studied

Maharashtra

In Maharashtra, four major pastoral communities were studied:

- **Dhangars:** They are present throughout Maharashtra.
- **Kurmars and Golkars:** They are both present mostly in the districts of Chandrapur and Gadchiroli.
- **Dhebariya Rabaris:** They are present mostly in the Vidarbha region.

In the current study, we surveyed the Dhangars in Ahmednagar district, the Kurmars in Chandrapur district, and the Dhebariya Rabaris in Wardha district (the Golkars live in the same areas as the Kurmars, and some of them keep buffalos which are not used for penning).

Dhangars

The Dhangars of Ahmednagar district have been mobile sheep rearers for generations. They own small and marginal rainfed land holdings, grow millets and pulses in the Kharif season, and follow an agro-pastoral way of life. They seasonally migrate to irrigated parts of the district – a region that lacks forest cover or other uncultivated land, and hence requires the Dhangars to be entirely dependent on private farms for fodder for their sheep.

Kurmars

The Kurmars are a shepherd community who inhabit Chandrapur and Gadchiroli districts in Maharashtra. Their counterparts in Telangana and Karnataka are called “Kurubas” or “Kurumbas”. They generally migrate throughout the year, unlike the other pastoral communities in the region. They are also more dependent than other pastoral communities on forests, grasslands and other uncultivated lands.

Dhebariya Rabaris

The Dhebariya Rabari community is a nomadic community that originally hails from Kachchh in Gujarat. Because of continuous droughts since 1977-78, many of them went out in search of fodder and water for their livestock, and reached Vidarbha. They are often called “Gujarati/Rajasthani Dhangar” by the local farmers. The community is now present all over Vidarbha and is constantly on the move, due to which they have well-established relationships with settled communities in the region. Much like other pastoralists in the region, they directly contact farmers using mobile phones to enquire about the status of their crops and the likely time for penning.

Telangana

In Telangana, we chose to survey two pastoralist communities: the Kurumas and the Yerragollas.

Kurumas

The Kurumas are a traditionally mobile shepherd community spread across districts in Telangana. They primarily rear sheep, and in some regions goats, practising seasonal migration within the state (Murthy 1993). The Kurumas share cultural similarities with the Dhangars of Maharashtra. Like the Dhangars, they are agro-pastoralists who typically own small rainfed plots of land on which they cultivate millets and pulses during the monsoon (Kharif) season. During the dry season, they depend on access to private farmlands and fallows for grazing.

Yerragollas

The Yerragollas belong to the broader Yadava community. They follow an agro-pastoral system combining rainfed cultivation with livestock rearing, particularly sheep and goats. Unlike the more continuously mobile Kurumas, Yerragollas often undertake shorter seasonal migrations or transhumant movements, staying closer to home villages (Murthy 1993).

Research Methodology

In order to start the process of determining some numbers associated with the penning economy, in-person, semi-structured interviews were conducted using a questionnaire, which consisted of questions regarding flock size, farm sizes, household income sources, use of fertilizers and penning, number of farms penned, etc. Additionally, we used a case-study approach to gain an understanding of the spatial dynamics of specific communities and the rationale for their choices with respect to penning. Finally, we used focus group discussions with multiple pastoralists together to understand their migratory routes.

Sample Selection

For finding pastoralists to interview, we initially approached pre-existing contacts from the pastoral communities, from whom we received contacts of other pastoralists. In many cases, we received contacts of farmers from the pastoralists themselves. In addition, the head of the pastoral community gave us the contacts of some farmers. This initial snowball sampling resulted in the pairing of farmer-pastoralists who undertake penning, allowing us to focus on the dynamics present for each participating entity.

Findings - Maharashtra

75 pastoralists (from three pastoral communities – Dhangars, Dhebariya Rabaris, and Kurmars) and 75 farmers were interviewed in the three districts of Ahmednagar, Chandrapur, and Wardha in Maharashtra.

The pastoral communities follow different migration routes, with herds mainly composed of sheep and goats, and the sizes of these herds are reported to have decreased as compared to the previous generation. The relative contribution of different activities to annual income of the pastoralists has remained stable over the last 5 years, and penning is reported to have a major contribution to the annual income of all three pastoral communities.

The land ownership of farmers has remained relatively the same over time as well, with most of their land being rainfed (rather than irrigated) lands. The farmers reported greater yields in the Kharif season from rainfed lands when compared to the Rabi growing season, which our results suggest could be related to the practice of penning, with future research required to establish the connection between penning, farm yields, and cost-effectiveness of different nutrient management practices vis-à-vis penning.

PASTORALISTS

Sample coverage and demographics

75 pastoralists were interviewed from three communities of pastoralists in three different districts – 26 Dhangars in Ahmednagar (native to the same area), 24 Dhebariya Rabaris in Wardha (native to Kachchh in Gujarat), and 25 Kurmars in Chandrapur (native to the same area) – while they were on their migration route.

Only about 25% of the pastoralists were younger than 40 years old, while around 65% of them were aged between 40 and 60 years (Fig. 1). About 53% of the pastoralists had no formal schooling, with only 7 of the 75 pastoralists having completed matriculation, and only 1 having completed undergraduate studies. Household size was 5 or fewer for 35% of interviewed pastoralists, 6 to 9 for 50%, and more than 9 for 15% (Fig. 2).

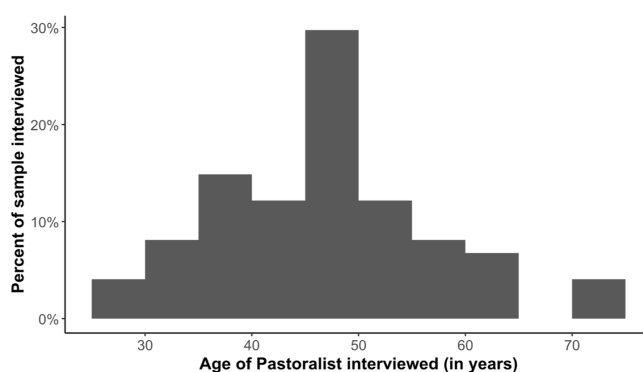


Fig. 1 Age distribution (as %) of the 75 pastoralists interviewed in Maharashtra

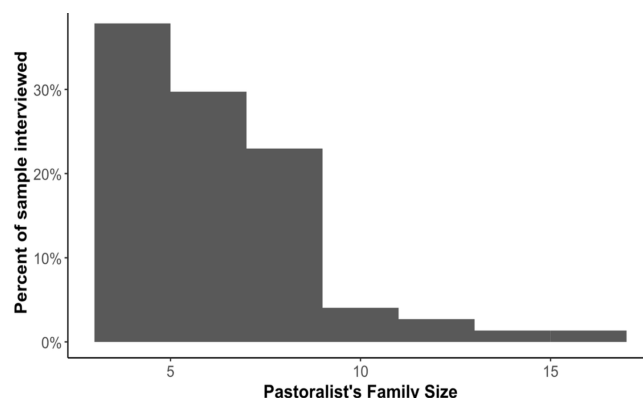


Fig. 2 Family size distribution (as %) of the 75 pastoralists interviewed in Maharashtra

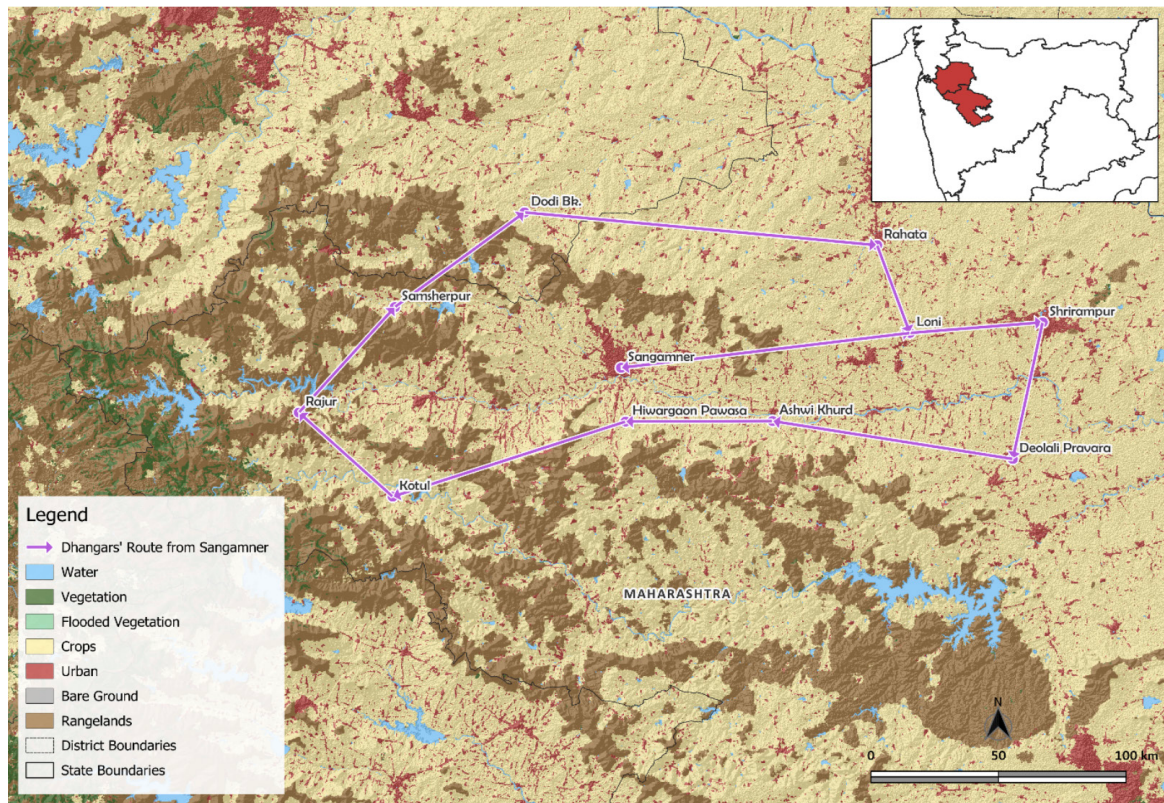


Fig. 3 Migration route of the Dhangars, starting from Sangamner in Ahmednagar district in Maharashtra. The arrows point to the direction of movement during the migration

Migration Patterns

Only 9 of the 75 pastoralists migrate exclusively alone, 14 of the pastoralists sometimes migrate alone and sometimes in groups, while the rest all migrate in groups with other pastoralists. Among the 66 pastoralists who migrate in groups (either sometimes or always), 50% of groups have 5 or fewer group members, excluding the pastoralist's own family members (Fig. 3). 30 pastoralists migrate with other groups only from the same village as them, while 36 migrate with other groups that include pastoralists from other villages.

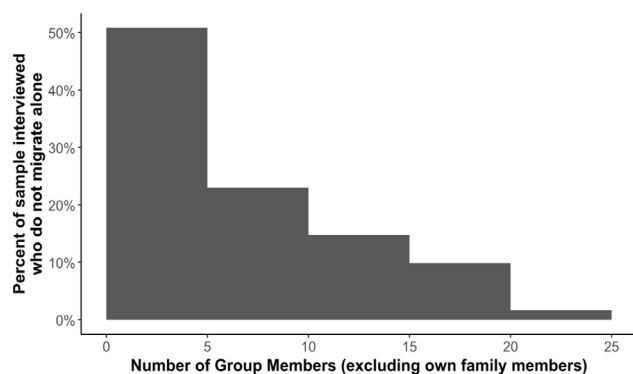


Fig. 4 Distribution (as %) of number of group members, excluding the pastoralist's own family members, of the 66 pastoralists interviewed in Maharashtra who do not migrate alone

Migration patterns of the Dhangars

The Dhangars reside, migrate and pen entirely in Ahmednagar district around the Sangamner area (Fig. 4).

Sugarcane is predominant in this region, followed by vegetables and pulses. There are abundant crop residues of various vegetables available as fodder for the flocks. However, unlike the Kurmars and the Dhebariya Rabaris (who are paid in kind for penning when crop residues are present on farms), the Dhangars are paid in cash and kind due to farmers needing speedy clearance of residues.

Most of the Dhangars begin their seasonal migration in January or February, and they also begin their annual penning season in the same months. Subsequently, most of the Dhangars end their penning season in May.

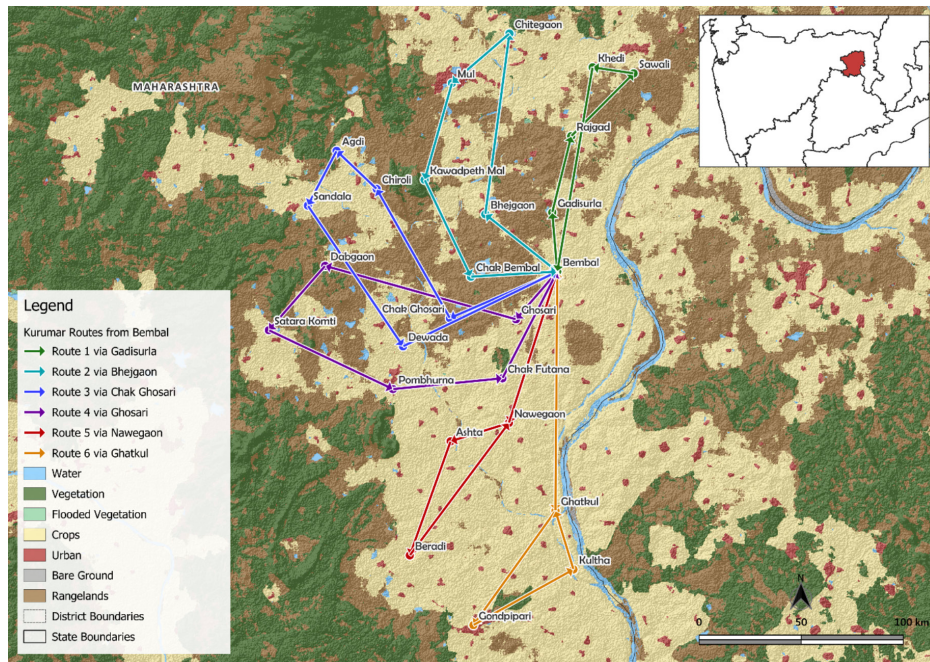


Fig. 5 Migration route of the Kurmars, starting from Bembal, if the flocks are small. Groups with small flocks go on multiple and short migratory routes, all starting from Bembal and coming back to Bembal, before going on another route

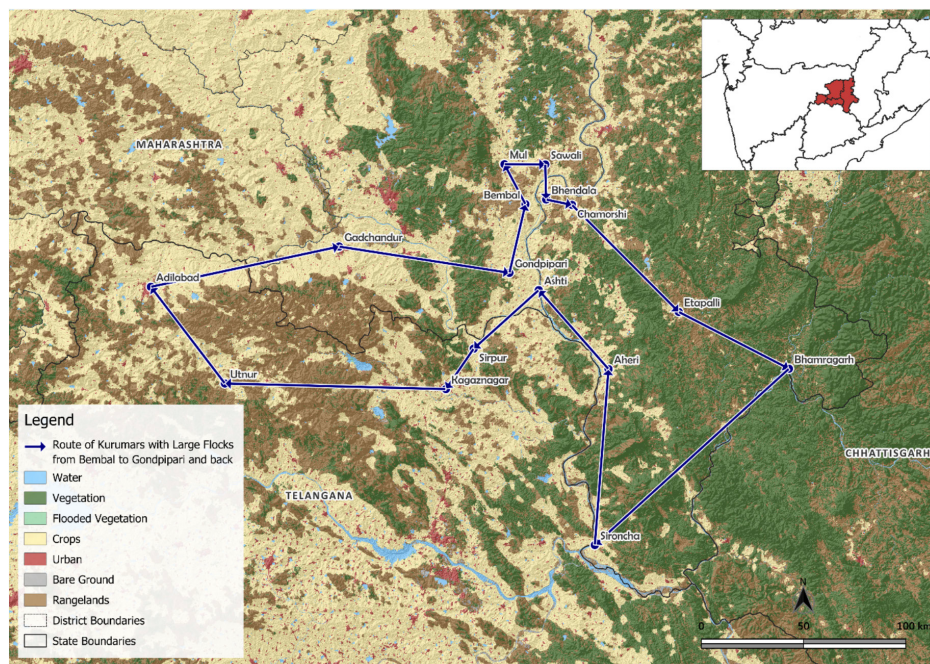


Fig. 6 Migration route of the Kurmars, starting from Bembal, if the flocks are large

Migration Patterns of the Kurmars

Most of the Kurmars migrate throughout the year. All the Kurmars interviewed in our study reside in Bembal village of the Chandrapur district. From here, their migration pattern depends on the flock size. Kurmars with smaller flocks (fewer than 150 animals) follow shorter migration routes and routinely return to their homes in Bembal (Fig. 5). On the other hand, Kurmars with larger flocks follow longer migration routes and often cross state borders (Fig. 6).

Most of the Kurmars begin their annual penning season in December, with some beginning in January, with all of them ending their penning season in June. In the Kharif season, livestock are penned on farms of paddy and pulses, and on wheat, gram, cotton, and soybean fields in the Rabi season. In places like Sirpur, Ashti, Kagaznagar and Utunur, penning is also done on farms of chili.

Unlike the Dhangars and the Dhebariya Rabaris, women of the Kurmar community do not frequently migrate with the flocks.

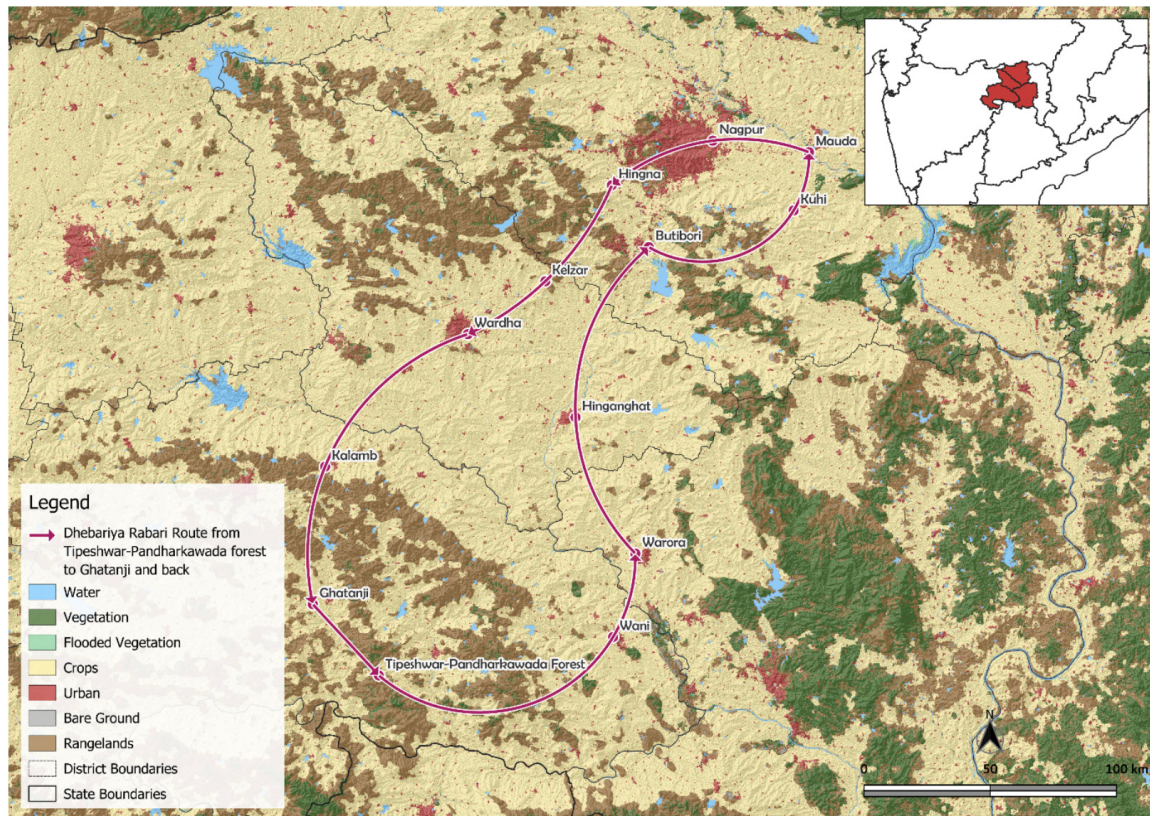


Fig. 7 Migration route of the Dhebariya Rabaris starting from the Tipeshwar -Pandharkawada forest

The map shows a route which goes from the Tipeshwar forest towards Wani, Warora, and Hinganghat, until Nagpur, and then turns southwards towards the Tipeshwar forest via Kelzar, Wardha, and Kalamb. While some Rabari groups take this route, other groups follow the same route, but the other way around (i.e., Tipeshwar → Kalamb → Wardha → Kelzar → Nagpur → Kuhl → Hinganghat → Warora → Wani → Tipeshwar). By the end of September and October, the Rabaris use common lands around Kalamb and Hinganghat to graze their herds. During this time, they also visit their homes in Kachchh during the Navratri festival

Migration Patterns of the Dhebariya Rabaris

The Dhebariya Rabaris spend the monsoon season near the Tipeshwar-Pandharkawada forest in Yavatmal. This period is critical because sheep face disease outbreaks during the monsoons in the forests. The pastoralists also face a lot of exploitation, and have to pay huge amounts as penalties and bribes to forest officials due to stringent restrictions on grazing.

They begin their seasonal migration northward from here towards Kalamb, Hinganghat, and Warora (south of Wardha) as the monsoon ends, with them arriving in these areas by September (Fig. 7). Here, the pastoralists and farmers have recently developed a new arrangement of using their herds to clear crop residue during/after the Kharif season. While the end product of this process is eventually penning, this arrangement is with the purpose of removing crop residue. Further, in this new arrangement, sheep are not kept overnight in the farm, but are made to graze the crop residue during the day and leave. This arrangement was especially observed after the harvest of soybean and cotton.

By the end of October and early November they start moving northwards towards Kelzar and Wardha. This is the time period when they generally start penning. By January end, they move beyond Wardha towards Nagpur and Kuhl. They stay in Wardha, and occasionally in Nagpur, and pen their animals on most farms there (majorly on wheat and gram in the Rabi season, and on cotton, soybean and pigeon pea in the Kharif season).

Compared to the Dhangars and Kurmars, the Dhebariya Rabaris typically begin their annual penning season later, around March or April, with most concluding in July, and some finishing earlier in June.

The Rabaris who migrate northwards from the Tipeshwar-Pandharkawada forest along the Hinganghat-Kelzar-Nagpur route return to the forest from the other side along the Kuhl-Wardha-Warora route, while those who migrate towards the north along the Warora-Wardha route return to the forest from the other side along the Nagpur-Kelzar-Hinganghat route.

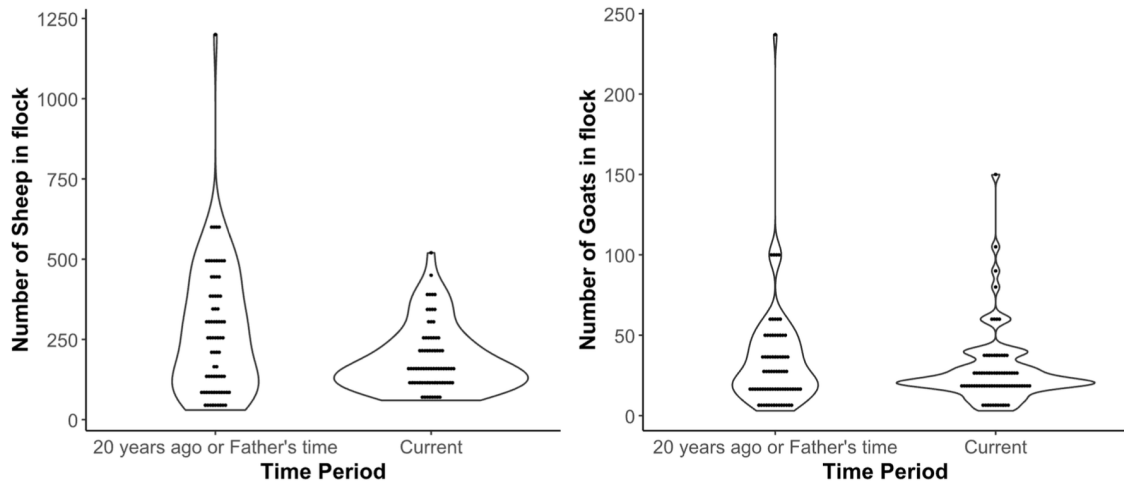


Fig. 8 Violin plots of the number of sheep (left panel) and goats (right panel) in the flocks of the interviewed pastoralists, both currently and in the past (either 20 years ago, or during their father's time). The width of the violin at a particular value of the y-axes indicates the frequency of pastoralists who reported that their flock had "y" number of sheep and goats

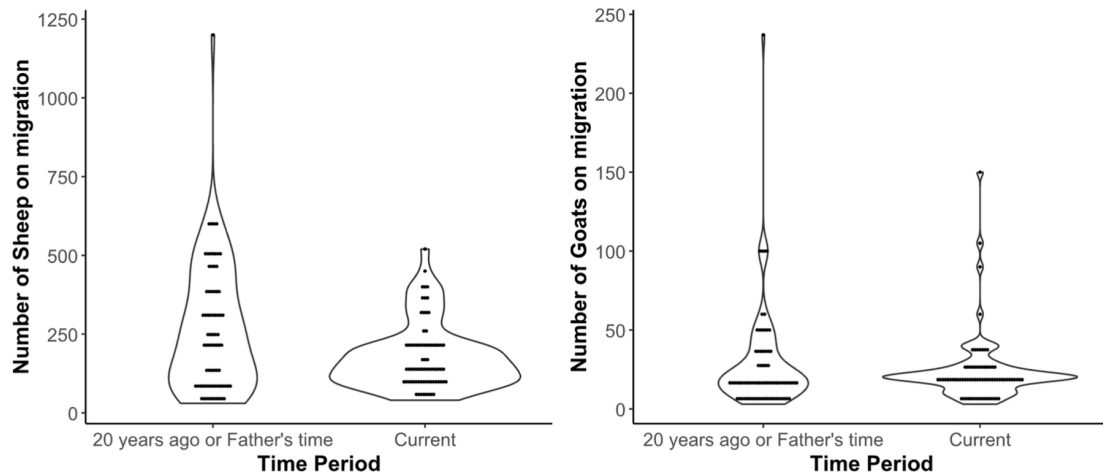


Fig. 9 Violin plots of number of sheep (left panel) and goats (right panel) on migration (and engaged in penning) of the interviewed pastoralists, both currently and in the past (either 20 years ago, or during their father's time). The width of the violin at a particular value of the y-axes indicates the frequency of pastoralists who reported that they had "y" number of sheep and goats on migration

Herd Composition

In general, the number of sheep and goats in the pastoralists' flocks (including animals kept in migration, kept at home, leased in, and leased out) appears to have decreased as compared to earlier (Fig. 8). Similarly, the number of sheep and goats on migration (which are engaged in penning) with the pastoralists has also decreased in general (Fig. 9). On average, there has been a 31% decrease in the total number of sheep in the flock (and also a 31% decrease in number of sheep on migration), and a 17% decrease in the total number of goats in the flock (and also a 17% decrease in number of goats on migration).

However, it should be noted that the pastoralists themselves reported that absolute herd sizes have not

decreased over time. Rather, they have become more fragmented over time with more divisions between the patriarchs of the families, leading to a decrease in the herd sizes held by individual pastoralists.

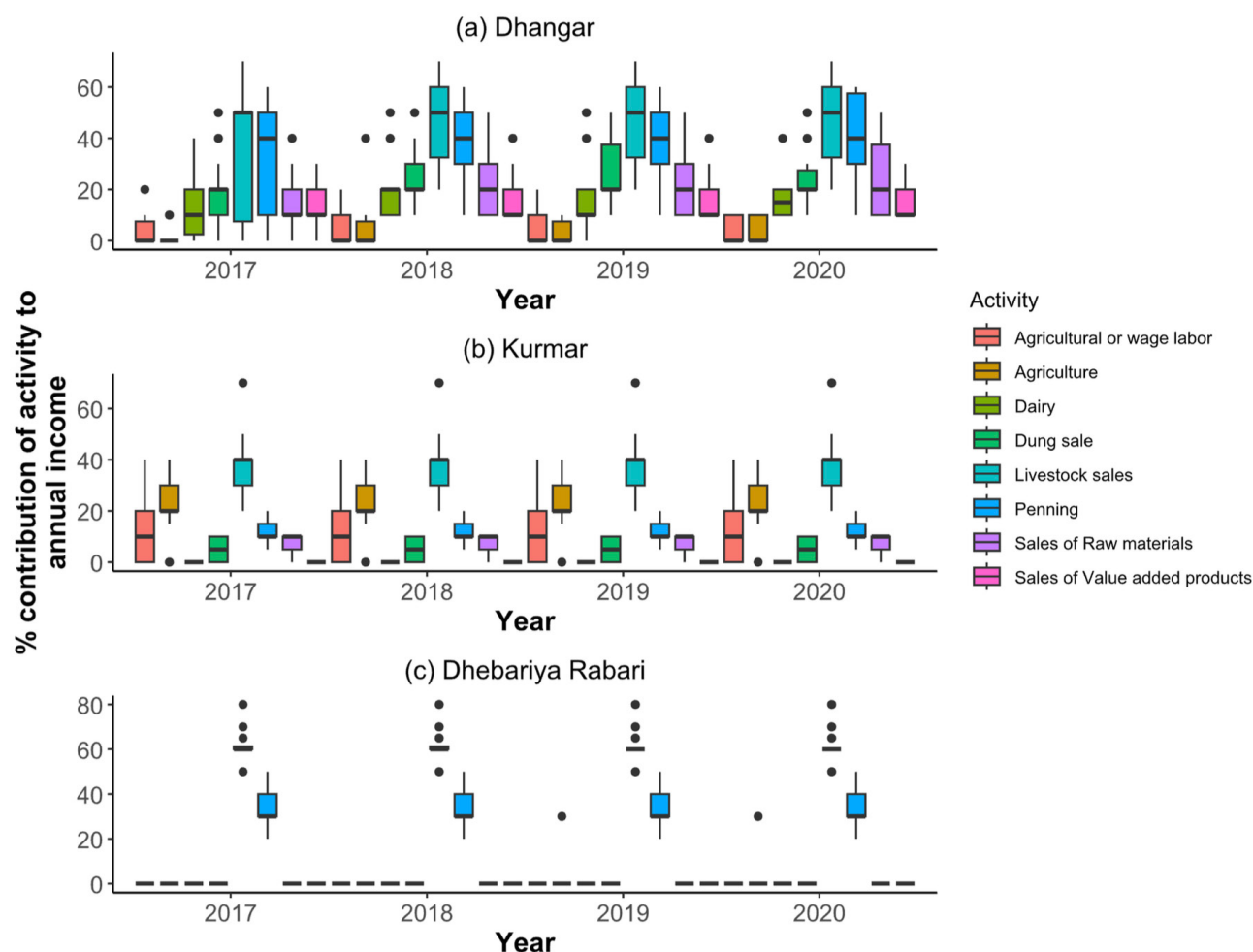


Fig. 10 Boxplots of the percent contribution of various activities to the annual income of the Dhangar, Kurmar and Dhebariya Rabari pastoralists over time (as reported by the pastoralists in interviews)

Sources of income

The relative contribution of different activities to the annual income has mostly remained stable from 2017 to 2020 for all the three pastoral communities (Fig. 10).

Livestock sales form a major part of the annual income of all three pastoral communities (Fig. 10). On average, livestock sales contribute ~44% to annual income of Dhangars, ~39% to annual income of Kurmars, and ~61% to annual income of Dhebariya Rabaris.

Earnings from penning come second only to livestock sales in contribution to their annual income (Fig. 10). On average, penning contributes ~38% to annual income of Dhangars and ~34% to annual income of Dhebariya Rabaris, but only ~12% to annual income of Kurmars. The Dhangars also charge farmers the most (among the three pastoral communities) to pen 100 animals on their farms for a night (Fig. 11). While the Dhebariya Rabaris charge farmers the least (among the three pastoral communities) to pen 100 animals on their farms for a night (Fig. 11c), they also pen the greatest

number of farms in a year (Fig. 12), explaining why penning still makes a substantial contribution to their family income (Fig. 10c).

Since the Dhebariya Rabari community is solely pastoral, livestock sales and penning are the major contributors to their annual income (Fig. 10c). Both the Dhangar and the Kurmar communities are involved in other activities (Fig. 10a, b). For the Dhangars, dung sale contributes ~24% of annual income, sales of raw materials contribute ~22% of annual income, sales of value-added products contribute ~15% of annual income, and dairy contributes ~15% of annual income, with income from agriculture and agricultural/wage labour together contributing only ~7% of annual income. On the other hand, for the Kurmars, agriculture contributes ~21% to annual income, agricultural/wage labour contributes ~14% to annual income, sales of raw materials contribute ~8% to annual income, dung sale contributes only ~4% to annual income, and dairy and sales of value-added products do not contribute at all to annual income.

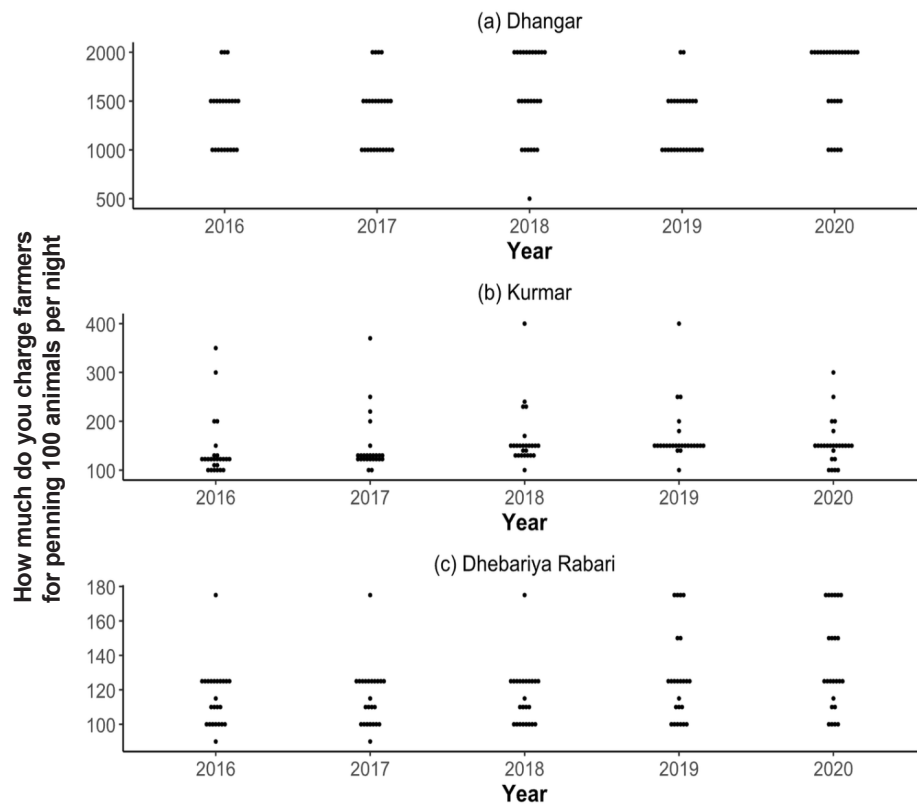


Fig. 11 Dot plots representing the price that the pastoralists charge farmers to pen 100 animals per night in their farms (as reported by pastoralists in interviews)

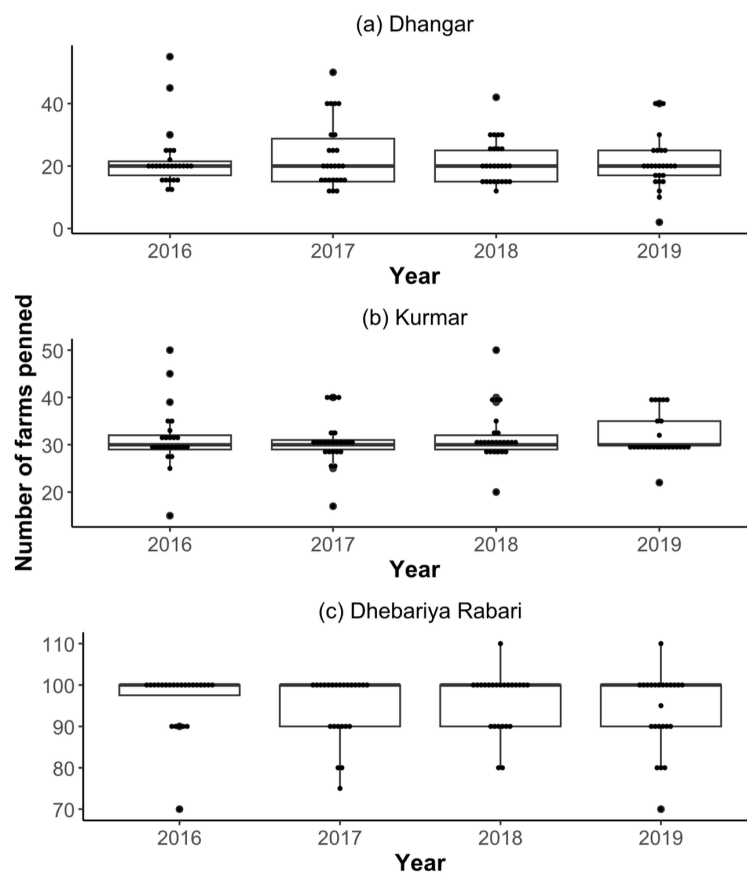


Fig. 12 Box plots showing the number of farms penned from 2016 to 2019 by each of the three pastoral communities. Dots represent the raw data points (as reported by the pastoralists during the interviews)

FARMERS

Sample coverage and demographics

We interviewed 75 farmers on whose farms the pastoralists penned their herds (except for 4 farmers, who used only chemical fertilizers on their farms; the other 71 farmers used both penning and chemical fertilizers) – 26 farmers in Ahmednagar, 20 farmers in Chandrapur, and 29 farmers in Wardha.

Only about 15% of the farmers were younger than 40 years old, while around 75% of them were aged between 40 and 60 years (Fig. 13). About 15% of the farmers had no formal schooling. While ~61% of the farmers had completed matriculation, only 1 had completed undergraduate studies. About 55% of the farmers interviewed had 5 or fewer individuals in their families, and about 45% of the farmers interviewed had 6 to 9 individuals in their families (Fig. 14).

Landholding

Land holding of farmers did not change appreciably from 2016 to 2020, either total area, or only rainfed area, or irrigated area (Fig. 15). Most of the land held by farmers is owned by them (rather than being leased in or leased out; compare Fig. 15b with Fig. 15a). Further, most of the land held by farmers is rainfed farmland, whether the total land held is considered (Fig. 15a) or whether the self-owned land is considered (Fig. 15b).



Fig. 13 Age distribution (as %) of the 75 farmers interviewed in Maharashtra

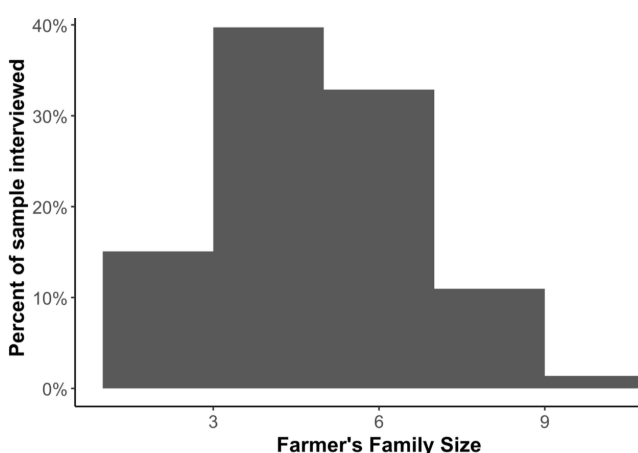


Fig. 14 Family size distribution (as %) of the 75 farmers interviewed in Maharashtra

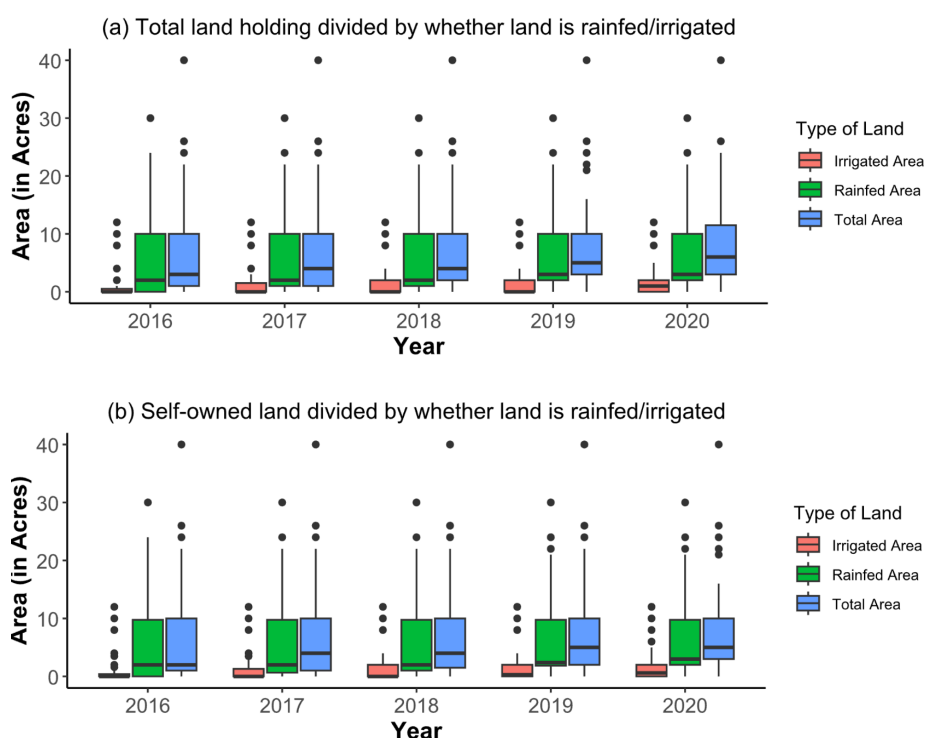


Fig. 15 Distribution of land holding (in acres) of the 75 farmers interviewed in Maharashtra: (a) Total land holding, and (b) Self-owned land; divided into whether the land is irrigated land, or rainfed land, or total (irrigated + rainfed area) land

Perceptions of crop yields

Farmers were asked about their perception of the yield (in INR – Indian Rupees) they got on their farmlands during the Kharif (Fig. 16a) and the Rabi seasons (Fig. 16b) in 2018 and 2019, both on irrigated lands and on rainfed land.

During the Kharif season, yield was perceived to be generally higher from rainfed lands than from irrigated lands in both years (Fig. 16a). However, during the Rabi season, yield was perceived to be similar between the rainfed lands and the irrigated lands (Fig. 16b). In total, the perceived yield was higher during the Kharif season than in the Rabi season (Fig. 16).

Nutrient management practices

71 of the 75 farmers interviewed in the 3 districts of Maharashtra used both penning and chemical fertilizers to increase soil fertility on their farmlands. For such farmers, we investigated details regarding the number of sacks of fertilizers they use per year (Fig. 17a), their annual expenditure on fertilizers (Fig. 17b), the number of days that they allow penning in their farmlands per year (Fig. 17c), and their annual expenditure on penning (Fig. 17d).

In general, more fertilizers are used and expenditure on fertilizers is higher in rainfed lands in the districts of Chandrapur and Wardha, but the same is not true for the district of Ahmednagar (Fig. 17a, b). Few, if any, of the interviewed farmers use fertilizers on irrigated farmland in any of the three districts (Fig. 17a). Simultaneously, penning is practiced more in irrigated lands in Ahmednagar district, but is practiced more in rainfed lands in the districts of Chandrapur and Wardha (Fig. 17c). Correspondingly, the expenditure made by farmers on penning is higher in irrigated lands in all the three districts (Fig. 17d).

As discussed before, the farmers reported higher yields in rainfed lands in the Kharif season (Fig. 16a). Our results suggest that there could be a relationship between greater use of penning by farmers (Fig. 17c, d) and greater yields from farmlands (Fig. 16a), and this potential relationship should be explored further.

Farmer–pastoralist relationships around penning

Communication between farmers and pastoralists

Usually some people from the pastoral group go and inquire about the demand for penning in an area, and the rest of the pastoral group follows them once they give confirmation.

Similarly, farmers too go out in search of pastoralists and invite them to stop by their farms for penning. They then remain in communication with each other over the phone or social networks. On average, farmers and pastoralists are acquainted with each other for more than 20 years.

Changes in farmer–pastoralist relationships over time

The respondents reported that while payment was mostly done in kind earlier, monetary transactions have become important and payment is mostly done in cash today. They also reported weaker relationships with farmers today, such as having to always talk to the farmer before stopping on their land (whereas earlier they could inform the farmer later), and having to request for cooking utensils (whereas earlier the farmer would pro-actively provide such facilities).

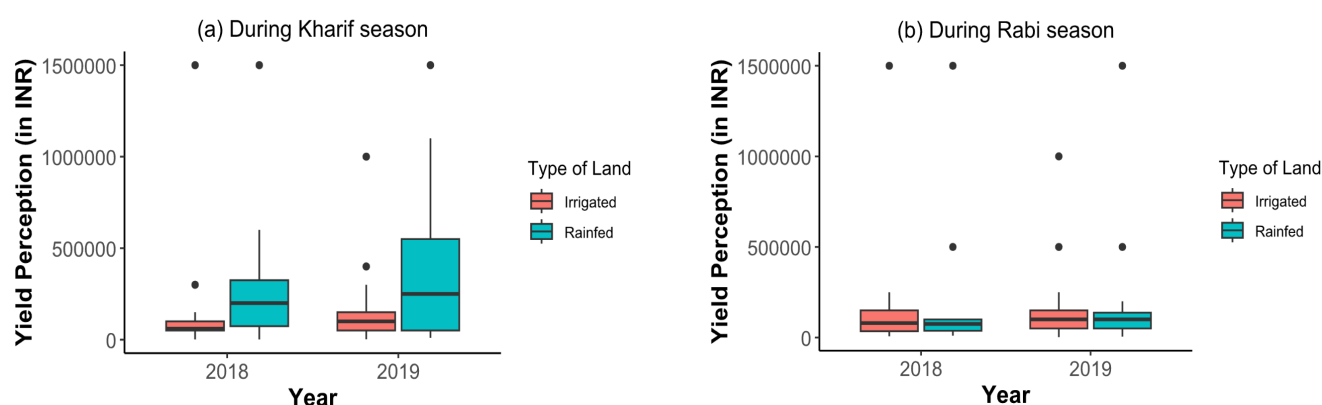


Fig. 16 Yield perception during the two cropping seasons of the 75 farmers interviewed in Maharashtra: (a) During Kharif season, and (b) During Rabi season; divided into whether the land is irrigated land or rainfed land

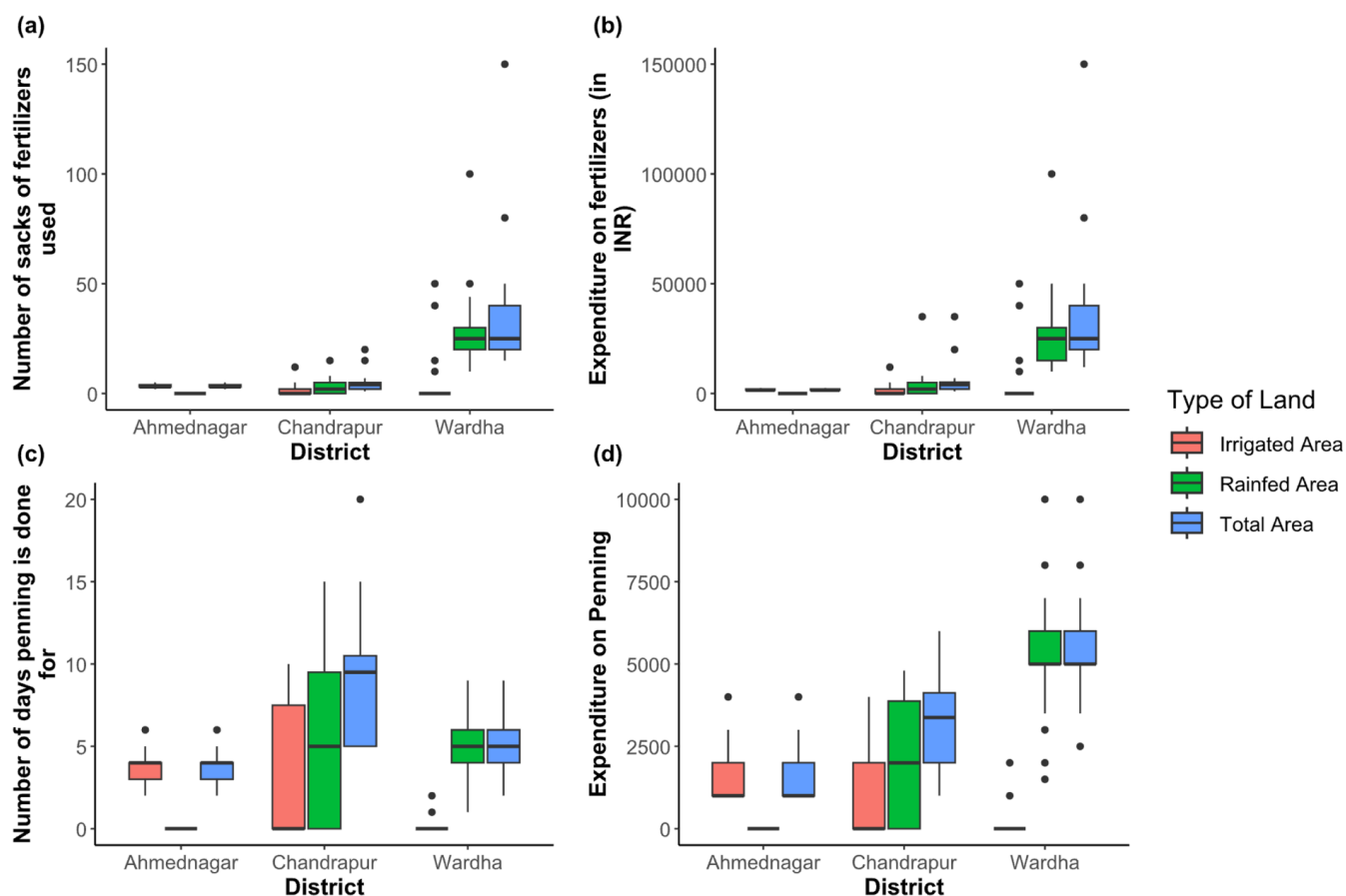


Fig. 17 Details of nutrient management practices followed by 71 farmers (of the total 75 farmers interviewed) in Maharashtra who use both penning and chemical fertilizers on their farmlands: (a) Number of sacks of fertilizers used per year; (b) Expenditure made by farmer on fertilizers; (c) Number of days penning is done on the farmer's land; (d) Expenditure made by farmer on penning

How pastoralists choose farms for penning

- Availability of sufficient fodder and water for livestock.
- Distance to the market.
- Availability of space and fallow land for the flock. Absence of thorns and thistles.
- Access to forest areas (especially for Kurmars).
- Demand for sheep manure from multiple farmers in a village, and how familiar the village is to them.
- Character of the farmer and their history of payment for penning.

Terms and conditions of penning agreements

Pastoralists usually enter into oral agreements, which include payment in cash and kind for penning. Sometimes, if there is plenty of fodder available, then they even agree to not be paid in cash.

While the pastoralists did not mention any rules that farmers use to allow them to pen on their farms, they consistently mentioned that farmers prefer to allow larger herds to pen on their land, and pay higher prices for larger herds.

Findings - Telangana

14 pastoralists (from two pastoral communities – Kurumas and Yerragollas) and 10 farmers were interviewed in the two districts of Kamareddy and Vikarabad in Telangana.

The pastoralists in the two districts follow different migration routes, with herds mainly composed of sheep and goats, and the sizes of these herds are reported to have decreased as compared to the previous generation. The relative contribution of different activities to annual income of the pastoralists has remained stable over the last 5 years, and penning is reported to have a major contribution to the annual income of both the pastoral communities. In other surveys which investigated the impact of Covid-19 lockdown on Telangana's pastoralists (Siripurapu 2021), it was reported that penning acted as a shock absorber when sales of livestock and their products were difficult.

The land held by farmers has remained stable over time as well, with most of their land being rainfed (rather than irrigated) lands. Future studies need to explore the expenditures by farmers on different nutrient management strategies and their implications for yields from farmlands.

PASTORALISTS

Sample coverage and demographics

14 pastoralists were interviewed from two pastoral communities in two districts – 6 from Kamareddy district in Telangana (2 Yerragollas and 4 Kurumas), and 8 from Vikarabad district in Telangana (3 Yerragollas and 5 Kurumas). Both the pastoral communities belong to the OBC (Other Backward Classes) category. While the Kurumas are also called “Dhangars” in Maharashtra and “Kurubas” in Karnataka, the Yerragollas are a sub-sect of the Golla/Yadava community.

Only 1 of the 14 interviewed pastoralists was younger than 30 years old, 6 were aged between 31 and 40 years, 4 were aged between 41 and 50 years, and 3 were aged between 51 and 60 years. Only 5 of the 14 interviewed reported that they had completed primary education, while the other 9 had no formal schooling. None of the respondents had completed matriculation. 10 of the pastoralists had 4 members in their family, 3 had 5, and 1 had 6.

Migration patterns

Except for one of the respondents, all the pastoralists migrate in groups (in Telangana, the migratory group is called “melam” in Telugu) with other pastoralists. These melams stick together throughout the migration season. The main reasons for multiple groups to form a melam are increased security during migration, division of labour, and larger flock sizes (since farmers prefer to pen their farms using flocks of more than 500 sheep). Of the 13 pastoralists who migrate in groups, 9 migrate with other groups only from the same village as them and 4 migrate with other groups that include groups from other villages.

While one of the interviewed pastoralists remained on migration throughout the year, for the other 13, the seasonal migration usually began between the months of November to January. The penning season usually begins in December or January, and concludes sometime between the months of April to June.

While the pastoralists of Vikarabad district migrate in the south-west direction towards Sedam (in Kalaburagi district of Karnataka; ~100 km from their native villages), the pastoralists of Kamareddy district migrate in the north-west direction towards Nanded (in Maharashtra; ~200 km from their native villages; Fig. 18).

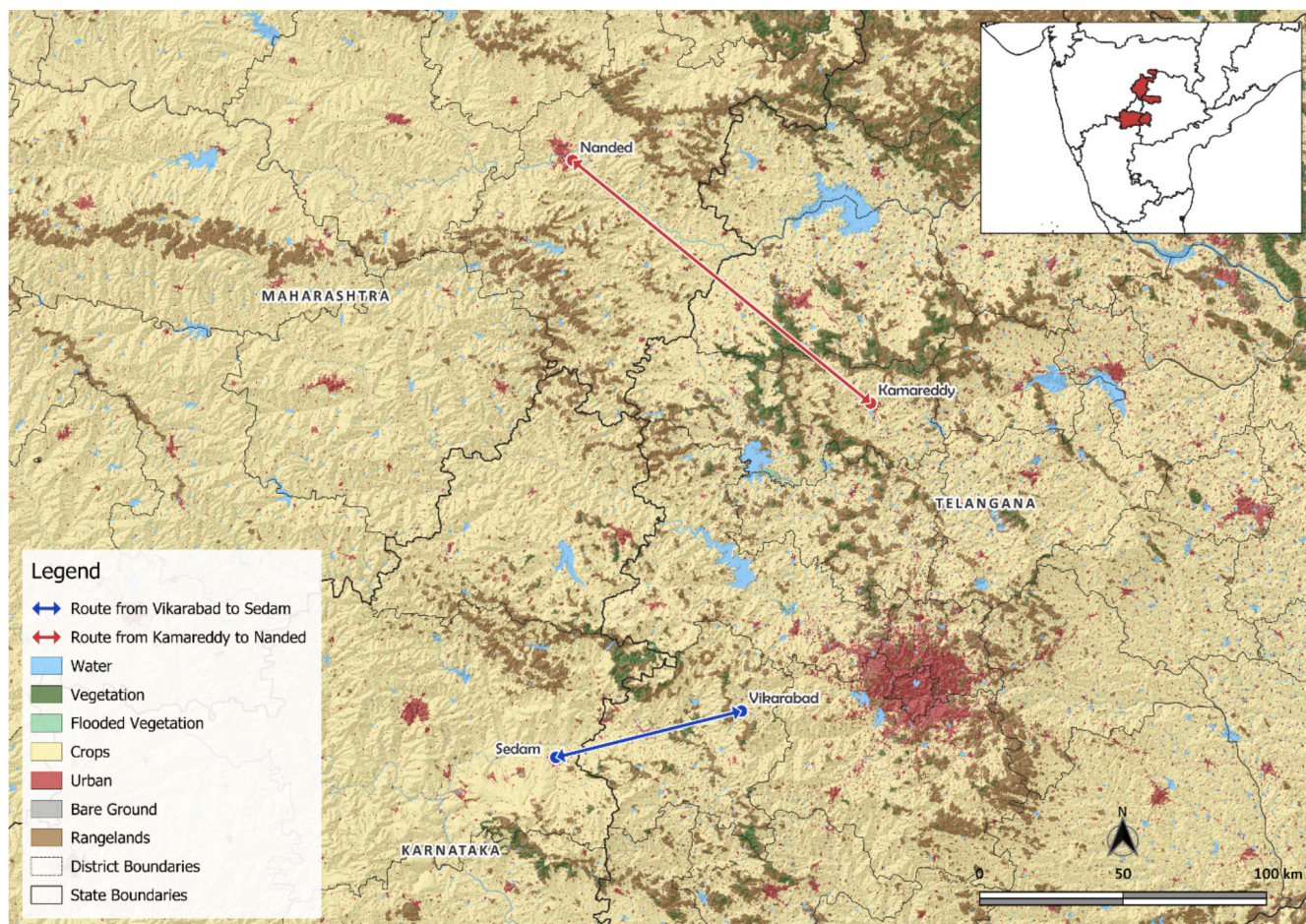


Fig. 18. Migration route of pastoralists in Telangana

Herd Composition

In general, the number of sheep and goats in the pastoralists' flocks (including animals kept in migration, kept at home, leased in, and leased out) appears to have decreased in size as compared to earlier (Fig. 19). Similarly, the number of sheep and goats on migration (which are engaged in penning) with the pastoralists has also decreased in general (Fig. 20). On average, there has been a 53% decrease in the total number of sheep in the flock (and a 55% decrease in number of sheep on migration), and a drastic 91% decrease in the total number of goats in the flock (and a 91% decrease in the number of goats on migration). These figures are perceived changes that pastoralists in the study reported. However, the reasons for this marked change in flock sizes were not investigated in this study, and future studies should explore this further.

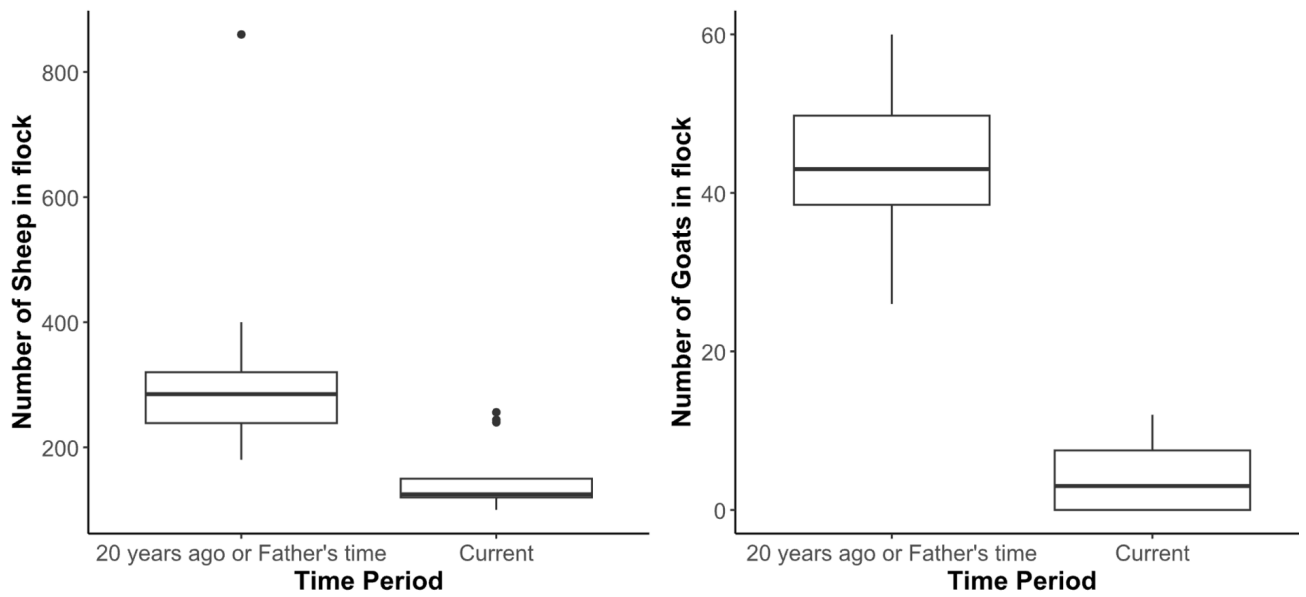


Fig. 19 Boxplots of number of sheep (left panel) and goats (right panel) in the flocks of the interviewed pastoralists, both currently and in the past (either 20 years ago, or during their father's time)

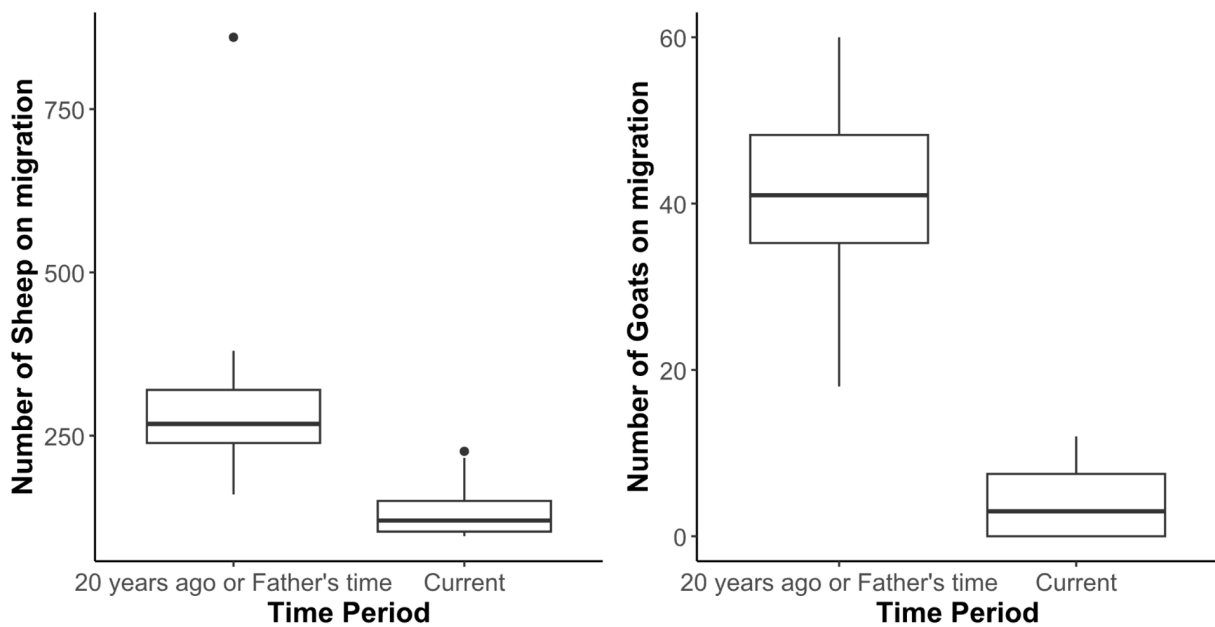


Fig. 20 Boxplots of number of sheep (left panel) and goats (right panel) on migration (and engaged in penning) of the interviewed pastoralists, both currently and in the past (either 20 years ago, or during their father's time)

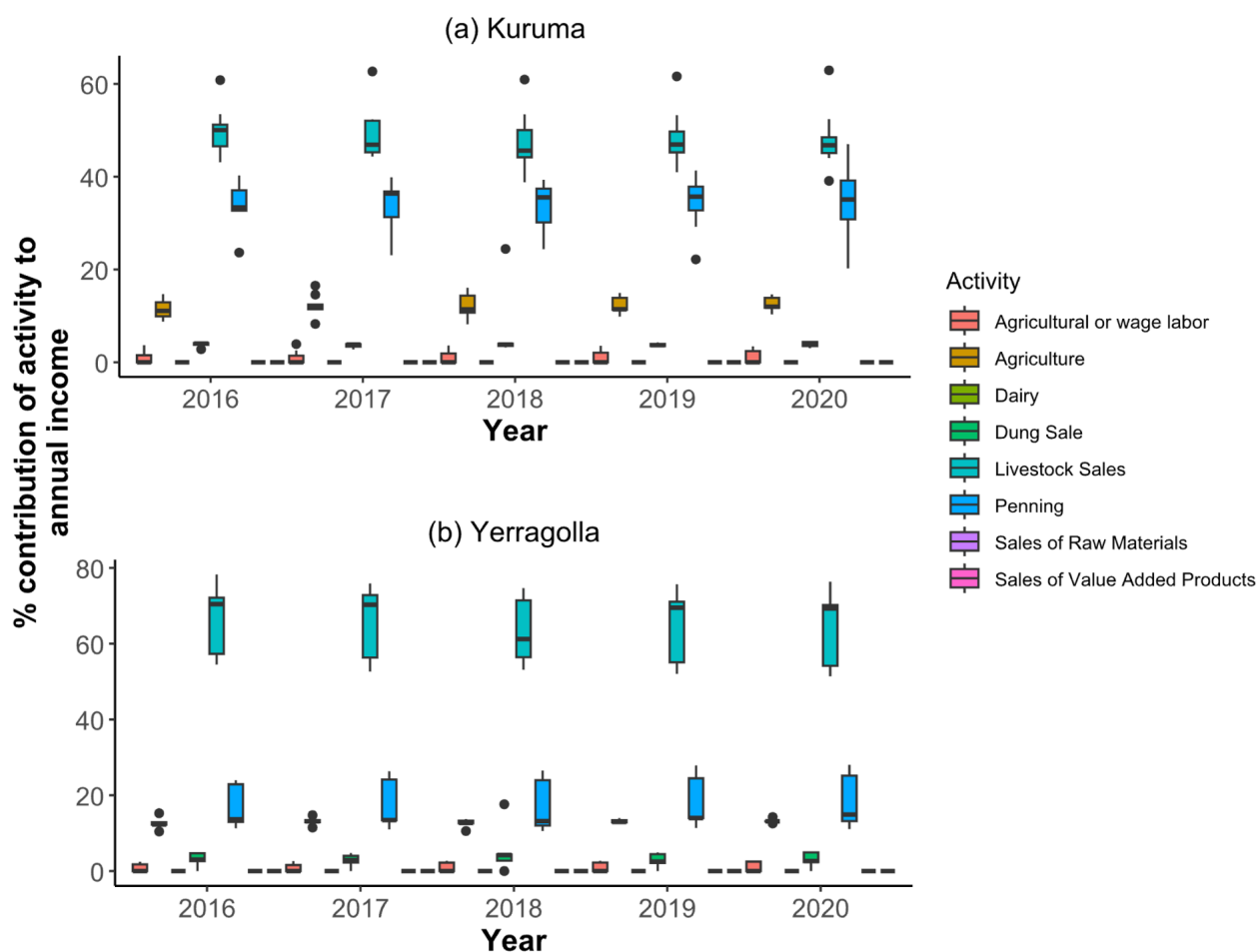


Fig. 21 Boxplots of the percent contribution of various activities to the annual income of the two pastoralist groups over time (as reported by the pastoralists in interviews)

Sources of income

The relative contribution of different activities to the annual income has mostly remained stable from 2017 to 2020 for both the pastoral communities (Fig. 21).

Livestock sales form a major part of the annual income of both the pastoral communities (Fig. 21). On average, livestock sales contribute ~49% to annual income of Kurumas, and ~65% to annual income of Yerragollas.

Earnings from penning come second only to livestock sales in contribution to their annual income (Fig. 21). Kurumas are more dependent than Yerragollas on penning – on average, penning contributes ~34% to annual income of Kurumas, but only ~18% to annual income of Yerragollas. Agriculture contributes ~12-13% to annual income of the two pastoralist communities, with ~3-4% being contributed by dung sale and ~1% contributed by agricultural/wage labour. Dairy, and the sale of raw materials and value-added products do not contribute at all to the annual income of the two pastoralist communities interviewed in Telangana (Fig. 21).

The price the two pastoralist communities charge farmers to pen 100 animals on their farms for a night has increased from ~500-600 INR in 2016 to ~800-1000 INR in 2020 (Fig. 22). Further, the number of farms penned in a year has also increased for both the pastoralist communities from 2016 to 2018 (Fig. 23). Between the two communities, Kurumas charge more for penning their flocks than Yerragollas do (Fig. 22a, b), but Kurumas pen a marginally lower number of farms per year than the Yerragollas do (Fig. 23a, b).

As per the responses of the interviewed pastoralists and farmers, the major reasons for the increase in penning fee over the last few years are the increased demand for organic farm inputs and decreased number of households rearing livestock. However, future in-depth studies are needed to establish this.

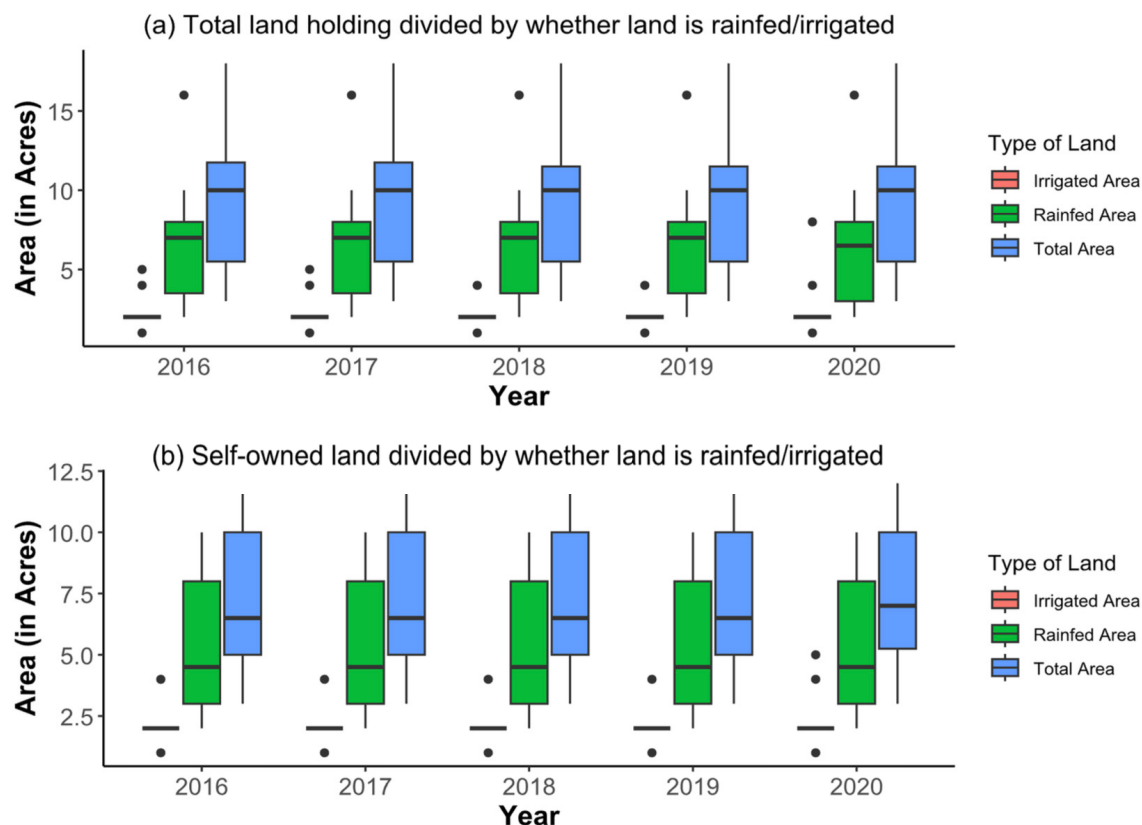


Fig. 24 Distribution of land holding (in acres) of the 10 farmers interviewed in Telangana: (a) Total land holding, and (b) Self-owned land; divided into whether the land is irrigated land, or rainfed land, or total (irrigated + rainfed area) land

FARMERS

Sample coverage and demographics

10 farmers were interviewed from 4 communities – 2 Kurumas (categorized as OBCs), 3 Reddys (belonging to the General Category), 3 Telugu Mudiraj Matsyas (categorized as OBCs), and 2 Yerragollas (categorized as OBCs). 6 of the farmers were interviewed in Vikarabad district of Telangana (4 of whom used both penning and chemical fertilizers, and 2 used only chemical fertilizers), and 4 of them were interviewed in Kamareddy district of Telangana (2 of whom used both penning and chemical fertilizers, and 2 used only chemical fertilizers).

4 of the interviewed farmers were aged between 31 and 40 years, 5 were aged between 41 and 50 years, and 1 was aged 52 years. Only 4 of the 10 farmers reported that they had completed primary education, and only 1 reported that they had completed matriculation. Most farmers had 4 members in their families.

Landholding

Land holding of farmers did not change appreciably from 2016 to 2020 across all parameters (Fig. 24). Most of the land held by farmers is owned by them (rather than being leased in or leased out; compare Fig. 24b

with Fig. 24a). Further, most of the land held by farmers is rainfed farmland, as shown in Fig. 24a and Fig. 24b.

Investment in penning and fertilizers

On average, farmers reported that pastoralists charge ~850 INR per night for penning (the rate ranges from 500 to 1,450 INR depending on the size of the flock). Farmers hire penning services for an average of ~5 days, on a cycle of 3 years (i.e., the same piece of land is penned only once in 3 years). So, to pen an acre of land [C3], farmers invest ~4250 INR per acre of land once in 3 years. Further, while farmers who only use chemical fertilizers use ~8 bags of fertilizers per acre, farmers using both chemical fertilizers and penning use ~5 bags of fertilizers per acre. Finally, while farmers who only use chemical fertilizers spend ~7500 INR per acre on fertilizers, farmers who use both chemical fertilizers and penning spend ~4,900 INR per acre on fertilizers. Future studies should investigate the connections between penning, soil fertility, farmer's expenses, and farm productivity to establish the economic and environmental consequences of penning in the region.

Farmer–pastoralist relationships around penning

Communication between farmers and pastoralists

Usually, one of the members of the melam or family member goes out in search of potential farms for grazing and penning. Similarly, farmers too go out in search of pastoralists and invite them to stop by their farms for penning. They then remain in communication with each other over the phone or social networks. On average, farmers and pastoralists are acquainted with each other for more than 20 years.

Changes in farmer–pastoralist relationships over time

Earlier, pastoralists used to generally graze their livestock at the farms of large landholders, and seldom needed to venture out for long seasonal migrations. This resulted in strong and long-lasting relationships with farmers. Further, the pastoralists were mostly paid in kind for their services.

These relationships have now transformed into shorter and monetary relationships. The pastoralists collect fees for penning, and are not allowed to pen for long periods of time. This has resulted in pastoralists having to migrate longer distances from their native villages.

How pastoralists choose farms for penning

- Availability of sufficient fodder and water for livestock.
- Potential duration of their stay at a farm.
- Existing crops both at the farm chosen for penning and at the adjacent farms.
- Character of the farmer and their history of payment for penning.
- Safety of livestock.
- Presence, convenience, and safety of migration routes for onward journeys.
- Absence of other flocks on the onward route, to avoid conflict or competition between *melams*.

Terms and conditions of penning agreements

Pastoralists usually enter into oral agreements with farmers in the presence of a third person (mediator/witness), which include agreement on payments in cash and kind for penning, and details such as whether the farmer expects a donation of a goat/sheep to allow the pastoralist to graze and stay at the farm.

Farmers reported asking pastoralists to ensure that their flocks do not go astray and raid crops on their own farm or neighbouring farms, to avoid cutting/pollarding trees in these farms, and to take their flocks to village water bodies for drinking water. It is made clear that pastoralists are liable to compensate for any crop raiding by their flocks.

Pastoralists' views on the future of penning

Pastoralists have a grim view of the future of penning in the region due to the following reasons:

- Agricultural expansion
- Shortage of labour
- Youth's reluctance to continue pastoralism and livestock rearing
- Disappearance of commons
- Increasing conflict over Forest Department restrictions on access to customary grazing lands

These reasons are making it difficult to manage large flocks of livestock, and the pastoralists have accordingly been decreasing the size of their flocks. Further, the landless poor prefer to migrate to urban areas for better job prospects or work as agricultural labour, rather than take up the job of grazing livestock.

Insights into the Penning Economy

This study provides insights into several dimensions regarding the practice of penning. Penning acts as a major contributor to the income of the pastoralist communities that were interviewed, and they use it as a means of livelihood while migrating long distances in search of fodder and water. Previous studies also show that penning acts as a shock absorber when other sources of income such as livestock sales are affected (e.g. during the Covid-19 pandemic; Siripurapu 2021).

However, the size of flocks per family that the pastoralists own and migrate with has been decreasing over time, due to reasons such as aspirations of the next generation, unwillingness of young people to continue the pastoralist tradition, labour shortage, decreased access to commons and forests (due to restrictions imposed by Gram Panchayats and Forest Departments), decreased access to fodder in common lands, etc. (Siripurapu et al. 2024; Siripurapu 2023; Siripurapu 2020; Siripurapu et al. 2020). Such challenges are resulting in many pastoralists decreasing their flock sizes to manage them more easily.

For the pastoralists, the sale of livestock and meat is the primary contributor to their income (Siripurapu 2023; Siripurapu et al. 2020). To ensure good returns on these activities, they need to take care of the animals' health, ensure regular vaccinations, and provide good quality fodder and nutrition. Challenges related to these requirements also pose a problem to pastoralists (Sudeepkumar et al. 2024).

The migratory routes of pastoralists are determined by factors such as access to commons, the availability of fodder and water, veterinary services for livestock, and markets for meat and wool. On the other hand, a farmer decides whether to practice penning or not based on factors such as size of land ownership, irrigation availability, choice of crops, and costs and availability of chemical fertilizers (Siripurapu 2023).

After the sale of livestock and meat, penning contributes the second-largest percentage share of pastoralists' annual income (Singaravadivelan et al. 2019; Siripurapu 2023). Further, farmers who use penning seem to incur much less expenditure on fertilizers. This creates a potential win-win situation for both the pastoralists and the farmers, and future studies need to explore this relationship further. However, penning is rarely considered as a livelihood and as an income generation activity, and remains neglected by the government. Perhaps the recognition and promotion of penning and dung sale, with the

support of State Agricultural and Animal Husbandry Departments, could address concerns and challenges mentioned in this report towards the development of a "penning/manure economy" (Singaravadivelan et al. 2019). Policies and regulatory mechanisms that help alleviate the aforementioned challenges related to migration and penning could help facilitate this development (Siripurapu 2023).

A back-of-the-envelope calculation suggests that the potential of developing such an economy is significant. For example, about 100 sheep can fertilize 2.5 acres of farmland in 6 nights (Nandhini & Suganthi 2018), and sheep produce around 0.5 kg of droppings and 1.2 litres of urine per day (Kolay 2007). The state of Telangana has about 17.4 million sheep, which would produce ~8.7 million kg of manure and ~20.9 million litres of urine per day. Since farmers in Telangana paid ~8 INR per sheep per night (Fig. 22), an estimated 139.2 million INR could be generated per night of penning (Natarajan et al. 2024). Assuming an average duration of 100 days of penning for a flock per year, the estimated revenue generation from penning alone is ~14 billion INR per year in Telangana (~160 million USD per year). This figure could be higher if we include revenue generated from sale of dung of sheep, goat, cattle, and buffalo (Siripurapu 2023; Siripurapu et al. 2024).

Penning provides other services to farmers (in addition to straw removal and manure), such as soil trampling, weed control, and seed dispersal, which are not accounted for (Siripurapu 2023). This study reveals that penning contributes significantly to the incomes of the pastoralists, and provides valuable contributions to the rural economy (Singaravadivelan et al. 2019; Natarajan et al. 2024). However, the full scope of the economics of penning, the economic benefits of penning to farmers, and the ecological benefits of penning to the rural ecosystem require further investigation. This points to the need for government departments and ministries to explicitly recognize penning as an income generation activity, and to provide services that facilitate the continuation of this practice.

Future Research

A longer and more elaborate study, especially with a bigger sample size, is required to establish the connections between the practice of penning and the benefits that the pastoralists and farmers accrue from it.

- Since the pastoralists are constantly on the move during the migration season, it is important to meet their families every fortnight during their migration to build a robust understanding of their lifestyles and the importance of penning, migration cycles, rituals and practices.
- The expenditures and incomes of farmers who do and do not use penning should be compared to understand the true nature of benefits accrued by penning.
- A simpler and pre-coded questionnaire, guided by the responses collected in the current study, could help expand the sample size in an efficient manner, and even help include more agro ecological zones in the study.
- A set of farmers, who are in touch with the selected pastoralists, should also be chosen to be studied deeply, in order to understand their cultivation practices and production systems, and to understand the relative importance of penning with respect to the production system they follow and the crops they grow.
- The study should include an investigation of the ecological costs and benefits of allowing animal grazing in forest lands. Potential benefits could include decreasing fire intensities by maintaining fire lines and removing excess biomass, maintaining grasslands and pasture lands, etc.

Policy Recommendations

Facilitating the continuation of the practice of penning requires several policy changes, especially in the environment of increasing restrictions on the movement of flocks, increasing restrictions on the use of common lands (by Gram Panchayats) and forest lands (by Forest Departments) by migrating pastoralists' flocks, and decreasing flock sizes over time:

- Explicit recognition of penning as a livelihood and income generation activity by State agricultural and husbandry departments and ministries.
- Mobile healthcare services should be provided to the pastoralists and their families, as well as their flocks, during the migration season in an accessible manner.
- Free and timely vaccinations should be provided to the flocks throughout the year, and especially during the migration.
- Pastoralists should be included in the 'One Nation, One Ration' card system, so that the pastoralists can shift their focus from getting paid for penning services in kind to being paid in cash, and hence further formalize the "penning economy".
- Development of a "penning economy" would also require increasing access to banking and financial services (such as access to credit, digital banking, etc.).
- Pastoralists can lose hundreds of sheep to lightning strikes at night. Mobile lightning arrestors would help prevent huge losses of livestock.
- The development of a "pastoralists' register" or inclusion of pastoralists under the "migrant labour register" in order to simplify the provisioning of these various services to the pastoralists.

References

- Kaur, G., Brar, Y. S., & Kothari, D. P. (2017). Potential of livestock generated biomass: Untapped energy source in India. *Energies*, 10(7), 847. <https://doi.org/10.3390/en10070847>
- Kolay, A. K. (2007). *Manures and Fertilizers*. Atlantic Publishers, New Delhi.
- Krishna, K. A., & Morrison, K. D. (2009). History of South Indian agriculture and agroecosystems. *South Indian agroecosystems: nutrient dynamics and productivity*, 1-51.
- Murthy, M.L.K. (1993). *Ethnohistory of pastoralism: A study of Kuruvus and Gollas*. Studies in History, 9(1). SAGE Publications, New Delhi/Newbury Park/London.
- Nandhini D. U., & Suganthi, S. (2018). Role of Sheep Penning in Organic Farming. *Approaches in Poultry, Dairy and Veterinary Sciences*, 4(5).
- Natarajan, K., Gayathry, G., Jayalakshmi, T., Sunitha, R., Harisudan, C., & Sugumaran, M. P. (2024). Sheep penning for agro-pastoral economy and restoration of soil fertility. *International Journal of Veterinary Sciences and Animal Husbandry*, 9(4), 586-589.
- Notermans, C. (2019). Prayers of Cow Dung: Women Sculpting Fertile Environments in Rajasthan (India). *Religions*, 10(2), 71. <https://doi.org/10.3390/rel10020071>
- Phand, S., Jaya, G., & Gummagolmath, K. C. (2021). *Livestock Extension Services: Time to Think Beyond Treatment and Breed*. MANAGE Knowledge Series, No. 2/21. Institute of Agricultural Extension Management, Hyderabad. Retrieved from: <https://www.manage.gov.in/publications/knowledgeseries/livestock.pdf> [accessed 12 March 2023]
- Robbins, P. (2004). Pastoralists Inside-Out: The Contradictory Conceptual Geography Of Rajasthan's Raika. *Nomadic Peoples*, 8(2), 136–149. <http://www.jstor.org/stable/43123729>
- Shivkumara, C., & Kiran, S. (2019). Economics of Sheep and Goat Rearing under Extensive, Semi-intensive and Intensive Methods of Rearing. *Economic Affairs*, 64(3), 553-561. <http://dx.doi.org/10.30954/0424-2513.3.2019.11>
- Singaravadelan A., Kumaravelu N., Vijayakumar P., and Sivakumar T. (2019). An economic analysis of the migratory sheep production system in Tamil Nadu, India. *Journal of Animal Health and Production*. 7(2): 58-64. DOI | <http://dx.doi.org/10.17582/journal.jahp/2019/7.2.58.64>
- Siripurapu, K.K., (2020). Locking Horns to Save the Sacred Cow: India's Indigenous Pastoralists Fight for Their Livelihoods and Cultural Traditions. *Langscape Magazine*, Vol 9. Retrieved from: <https://terralingua.org/stories/locking-horns-to-save-the-sacred-cow-indias-indigenous-pastoralists-fight-for-their-livelihoods-and-cultural-traditions/>
- Siripurapu, K.K., Iyengar S., Saberwal V., and Das S. (2020). An Overview of Mobile Pastoralism in Andhra Pradesh and Telangana States of the Deccan Plateau Region of India. Center for Pastoralism, WASSAN and RRAN, India. Retrieved from: <https://www.rainfedindia.org/published-page/resources?id=5f69cb8be0da67000bb90a94>
- Siripurapu, K.K. (2021). Impact of COVID – 19 Lockdown on Pastoralists of Telangana. Centre for Pastoralism, New Delhi, India.
- Siripurapu K.K. (2023). The traditional sheep penning system: An exploratory study on farmers' preferences, farmer-pastoralist relationships, and economics of sheep penning in Telangana, India. *Pastures & Pastoralism*, 01, 52–73. Doi: <https://doi.org/10.33002/pp0105>
- Siripurapu KK, Moola F., Sakkuri S., Dareddy S.R., and Das S. (2024). Mapping of the seasonal migration routes of cattle pastoralists of the Deccan Plateau region of India using Ethnographic Geographic Information System Technique. *Pastures and Pastoralism*, 2. <http://dx.doi.org/10.33002/pp0206>
- Sriveda, B., & Srihita, B. (2020). Sheep penning: Need to sustain this unique practice. LEISA India Blog. Retrieved from: <https://leisaindia.org/sheep-penning-need-to-sustain-this-unique-practice/> [accessed 12 March 2023]
- Sudeepkumar N.K., Kathiravan G., and Nisha P.R. (2024). Housing and feeding practices in South Indian pastoral sheep rearing systems. *International Journal of Environment, Agriculture and Biotechnology*, 9(1). DOI <https://dx.doi.org/10.22161/ijeab.91.19>
- Udayavani (2020). 'Gore Habba': Festival Celebrated with Cow Dung Play fights. Udayavani, 16 November 2020. Retrieved from: <https://www.udayavani.com/english-news/gore-habba-festival-celebrated-with-cow-dung-playfights> [accessed 12 March 2023]



**Centre for
Pastoralism**

Centre for Pastoralism
96, Anupam Apartments,
Mehrauli-Badarpur Road, Saket,
New Delhi. 110068.

www.centreforpastoralism.org