NAVIGATING THE PASTORAL TERRAIN

Mapping Resource Dependencies and Seasonal Grazing Routes of Surendranagar District's Sheep and Goat Pastoralists



sahjeevan

Surendranagar Sheep & Goat Breeders' Association

This report was prepared by Ms. Pratiksha Chik Baraik, an intern from Azim Premji University, during her internship with our organization in 2024. The objective was to gain field experience with pastoral communities, understand their perspectives, and identify the challenges they face in sustaining their livelihoods. Additionally, it highlights how Sahjeevan's development interventions are supporting these communities to overcome these challenges and strengthen their economic well-being

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Acknowledgement

Pastoralism or mobile livestock rearing as a livelihood is subject to the twin vulnerabilities of livestock herding and migratory systems. Sahjeevan took the opportunity to document those challenges faced by the sheep and goat pastoralists, (*Maldharis*, as they are known locally) of Surendranagar region. As an intern, I conducted the fieldwork and documented the report with the help of Sahjeevan's personnel. I am grateful to Kiran Patel, Suresh Kuvadiya, Kujan Kalotara, Malaika Mathew Chawla, Laljibhai Tramta, Govindbhai Tramta, and the members of the Surendranagar Gheta Bakra Uccherak Maldhari Sangathan; without whose support this endeavour would not have been possible.



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CHAPTER 1

DISTRICT AT A GLANCE



Overview of Surendranagar District

District Profile

Surendranagar district is located in Gujarat's Saurashtra region and represents a landscape rich in pastoral heritage and cultural vibrancy. This district has a subtropical climate and receives an average annual rainfall of 760mm to 967mm. It experiences drought every alternate year on an average. Surendranagar is divided into ten blocks and includes 654 villages. Among these, the Sayla and Chotila blocks, together known as the *Panchal Vistaar*, which fall in the North Saurashtra agroclimatic area, stand out as a focal point for pastoralists, having long been known for their lush grasslands, particularly in Chotila's hilly terrain. The soil is shallow, medium and black in Muli, Chotila, Sayla and Wadhwan blocks.

Economic Activities

The district is now a major trading and processing centre for agricultural products, cotton, salt, pharmaceuticals, chemicals and plastics, textile bearings, ceramics, and sanitaryware. However, the majority of households in the district practice agro pastoralism, with livestock providing the primary source of income, mainly through the sale of raw milk to local dairy cooperatives. The socioeconomic fabric of Surendranagar reflects the symbiotic relationship between agriculture and pastoralism.

Agriculture

The main crops grown are pearl millet, sorghum, groundnut, wheat, and gram. Cotton and other cash crops are grown during years of abundant rainfall, demonstrating the local community's adaptive resilience to environmental fluctuations. Nevertheless, since these cash crops are modified crops there are high chances of their not being as resilient as the native crops, with the resultant uncertainties for livelihoods. Agriculture is primarily rain-fed or with minor irrigation from canals. Dry farming dominates, with most operations taking place from November to April following the monsoon season.

Ecology and Climate

The locality itself serves as a beacon of ecological diversity and socioeconomic dynamism. There are quite a few Reserve Forests in the form of grasslands, thorn and scrub forests, besides revenue waste land and private '*vidis*'or grasslands available in the region. However, challenges such as erratic rainfall patterns, increasing droughts, and most importantly limited availability of forage, have forced pastoralists towards distress migration, affecting the distribution and composition of livestock in the area.

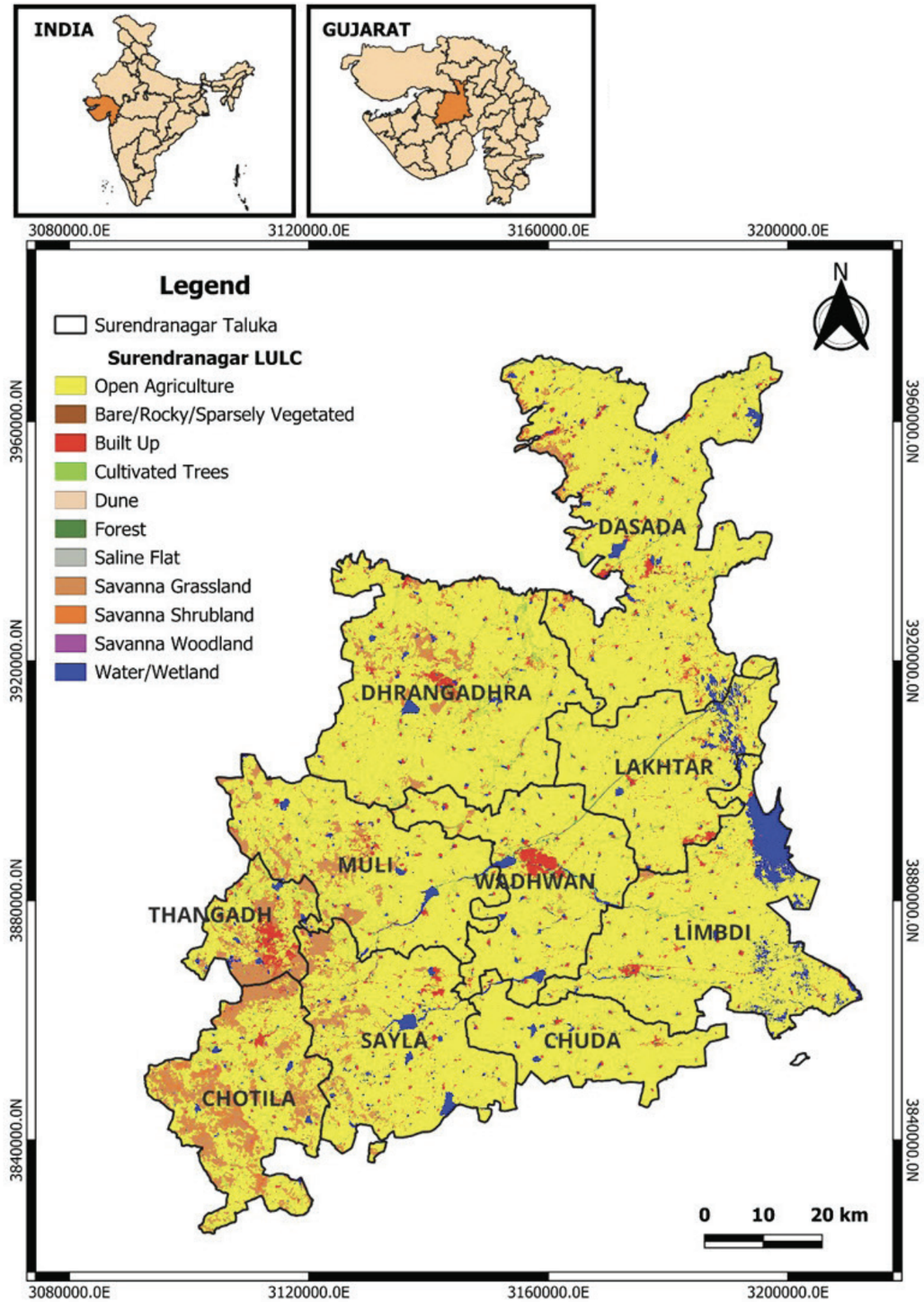


Figure 1. Land Use and Land Cover (LULC) map of Surendranagar District, Gujarat, delineating major land cover classes alongside taluka boundaries, illustrating the spatial distribution of agricultural lands, grasslands, settlements, and other landscape features across administrative units.

Pastoralism in Surendranagar

Surendranagar district illustrates the enduring impact of pastoralism on its landscape and communities. The communities and livestock breed that arose in the region are frequently named after princely States. The district, which was previously divided into the princely States of Panchal and Zalawad, has developed several livestock breeds, such as the Panchali sheep or Dumma, Zalawadi goat, Gohilwadi goat. The region also inhabits Gir cow, and Jaffrabadi buffalo. These livestock are mainly raised by *Nanabhai Bharwads, Panchali Rabaris,* and *Motabhai Bharwads*. There are also *Charan* and *Jatt* pastoral communities present in the region, who mainly rear buffaloes and cows. The Gir cow and Jaffrabari buffalo, which are famous for their milk production capabilities, dominate the region's dairies.

These maldhari communities, with their rich cultural traditions and resilient livelihood strategies, embody the essence of Surendranagar's pastoral traditions. They are an important part of Gujarat's diverse social fabric, adding to the state's agricultural and pastoral heritage. They engage in selling milk and milk products (clarified butter, *mava*, buttermilk) as well as manure, and, when a larger income is required, selling livestock as well.This is the foundation of their economy. Furthermore, in Surendranagar's case, it was found that the new generation frequently finds work as informal labourers in ceramic factories, driving construction vehicles, viz. excavators, or in agriculture if they own land.

Table 1. Geographic distribution and population density of Rabari and Bharwad Maldhari communities across major districts of Gujarat.

Maldhari Community	Districts with dense populations	Districts with thin populations
Rabari	Surendrangar, Rajkot, Bhavnagar, Ahmedabad, Junagadh, Kutch, Porbandar, Patan, Dwarka, Sabarkantha, Banaskantha	Amreli, Jamnagar, Surat, Bhuj, Kheda, Anand, Gandhinagar, Vadodara
Bharwad	Bhavnagar, Surendrangar, Ahmedabad, Rajkot, Jamnagar	Kutch, Amreli, Surat, Baruch, Narmada, Anand, Dahod, Vadodara





Figure 2. Rabari Community

Pastoral Communities

Rabari

The Rabari community is another nomadic pastoral group indigenous to northwestern India, particularly to modern-day Gujarat. As with the Bharwads, their rich customs, mythology, and ancestral heritage are inextricably linked to their traditional occupation of animal husbandry. According to mythology, they originated in the Himalayas, and are said to have been created by Shiva and Parvati. Parvati shaped dirt from her body into a five-legged camel, which Shiva brought to life. They then created the first Rabari man, Sambad, to care for and graze the camels. Over time, the Rabari community moved from the Himalayas to various regions such as Punjab, Haryana, Mathura, and Rajasthan, eventually settling in Kutch, Gujarat, via Pakistan. The community is known by different names in different states, such as Rabari in Gujarat and Raika in Rajasthan and Pal in Punjab. Rabaris are further divided into sub-groups known as praganas. In Surendranagar, Rabaris are divided into Panchali, Zalawadi and Khakhrapat (Dasada, Patadi).

Despite their close-knit nature, the Rabari continue to face constitutional challenges due to their nomadic lifestyle and limited governmental understanding. Today, the Rabari community preserves its distinct cultural identity, with its women known for their exquisite embroidery designs inspired by mythology and the desert landscape. Rabari attire is adorned with the vibrant colors of this intricate embroidery. The Rabari people, through their artistry and traditional way of life, contribute to India's rich cultural heritage.



Figure 3. Bharwad Community



Bharwad

The term “Bharwad” is derived from the Gujarati word “badawad”, which is a combination of the words “Bada” and “Wada,” which translate as “sheep” and “fence.” There are mythical reasons for their division into two groups, one of which is that Krishna ordered them to move their herds to different locations and spread out. They worship both Krishna and their own clan-specific female deity. Historically, the *Bharwads* were known for their expertise in animal husbandry, particularly raising camels, cows, buffaloes, goats, sheep, and donkeys. They lead a semi-nomadic lifestyle, travelling with their herds in search of grazing land and water sources. This way of life has shaped their identity and traditions for generations.

The *Bharwad* community primarily resides in Gujarat, specifically Surendranagar, Bhavnagar, Surat, Baroda, but are also found in other parts of western India. They are divided into two groups: *Nanabhai* (literally, ‘younger brother’) and *Motabhai Bharwad* (literally, ‘elder brother’). Additionally, they are divided into clans, which essentially determine the eligibility for marriage. *Nanabhai Bharwad* are primarily found in Bhavnagar, Surat and Baroda districts, whereas *Motabhai* reside in northwestern Saurashtra.





Pastoral Breeds

There are quite a few nationally recognised sheep and goat breeds in the state of Gujarat, among which Zalawadi, Gohilwadi and Panchali are predominantly found in Surendranagar district. Rabari and Bharwad communities rear them for their adaptable nature, multipurpose use and resilience during migrations.

Zalawadi Goat

Zalawadi goats have a remarkable ability to adapt and thrive in harsh environments, in addition to their visually appealing conformation and multipurpose utility. This is one of the most famous goat breeds in Surendranagar. It is believed that the breed originated in Zalawad province.They are medium to large in size and have dark, shiny, lustrous hair.Both males and females have twisted screw-like horns and long, leafy-dropping ears.The Zalawad breed has an average milk potential of 1.75 liters per day, ranging from 1.5 to 2.0 L. The optimal body weight is between 40-50 kg. The lactation period lasts 150 to 200 days. The kidding percentage is 78%, and the litter size is mostly single (82%), with occasional twins (18%). Their dark coat helps them absorb heat on hot days, and their long legs allow them to easily navigate the rugged terrain of their semi-arid environment. Zalawadis are known for their browsing ability, as they feed on leaves, shrubs, and pods that other animals may struggle to digest. This makes them well-suited to their environment, where lush green pastures are scarce. Interestingly, the Zalawadi's long, drooping white ears are thought to help regulate body temperature by increasing air circulation around the head and neck.The pastoral communities benefit from their dual utility since it provides milk as well as meat.These hardy goats are not only required for their resources, but also play an important social and cultural role in the Rabari and Bharwad communities.

Gohilwadi Goat

Gohilwadi goats are native to Saurashtra's Gohilwad region. This breed is highly valued by Rabaris and Bharwads for its multipurpose use for producing meat, fibre, and milk. With their sturdy build and striking black coats of long, coarse hair, they represent resilience in Gujarat's arid plains. These goats, valued for their contributions to livelihoods, have distinctive characteristics such as a slightly convex nose line, drooping ears, and slightly twisted horns. Female Gohilwadis, known for their high twinning rate of 40 to 50%, reach breeding maturity at 12-20 months. They produce, on average, approximately 1.7 kilograms of milk per day over a 227-day lactation period. In essence, they represent the long-standing relationship between humans and animals in Kathiawad's pastoral landscape.



Figure 4. A mature Zalavadi Goat in its native habitat, displaying the breed's characteristic black coat, long pendulous ears with white speckling, and prominent corkscrew horns.



Figure 5. A lateral view of a Gohilvadi goat, illustrating the breed-specific convex nasal bridge (Roman nose) and large, drooping ears.



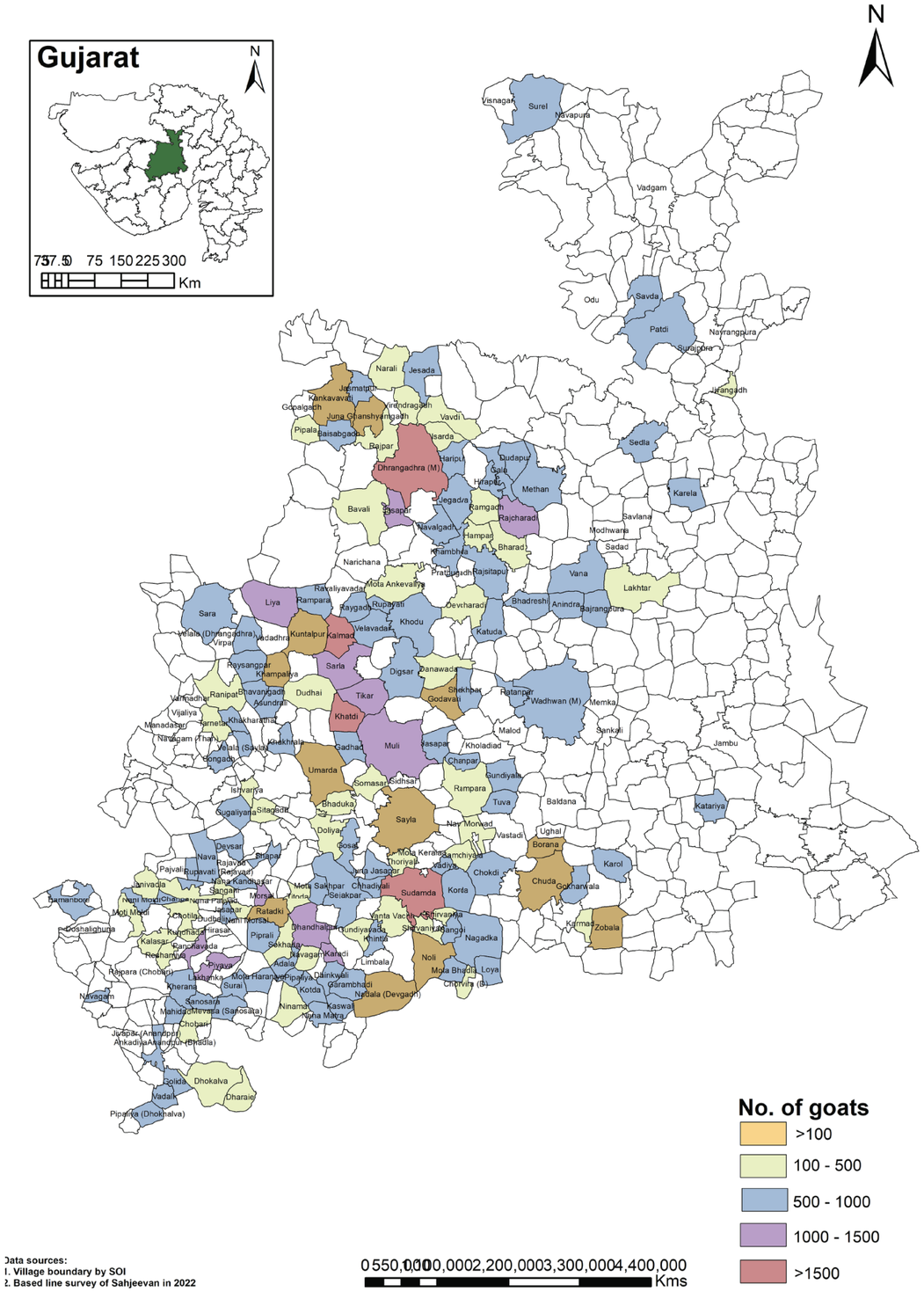


Figure 6. Spatial distribution of goat populations across villages in Surendranagar District, Gujarat, based on Sahjeevan's 2022 survey, highlighting clusters of high livestock density and the prominence of pastoral livelihoods in the region.

Panchali Sheep

The Panchali sheep, also known as Dooma, Dumma or Baraiya, is indigenous to Gujarat's Panchal region. Recently, in 2018, the breed was recognised by the Indian Council of Agricultural Research. It is valued for its milk, meat, and wool. The Panchali sheep, with its robust physique, large size, long legs, and exceptional migration ability, thrives in its natural environment. The breed is easily recognised by its predominantly white coat with facial markings ranging from black, blackish brown and brown to light brown, as well as its long, hanging ears and lengthy tail.

Panchali sheep produce between 0.4 and 1.2 litres of milk per day, significantly contributing to dairy operations. Furthermore, their meat is of high quality, increasing their value as a source of protein. Panchali sheep produce approximately one kilogram of wool per year, which, despite its being coarse, contributes to the textile industry.

Their reproductive ability adds to their economic significance, as newborn lambs weigh between 3.5 and 4 kilograms and reach 18 to 20 kilograms within 3 to 4 months, making them profitable for shepherds. Adult males weigh 69.29 kilograms on average, while females weigh 47.13 kilograms on average. Females reach reproductive maturity at 12 to 15 months. This breed has approximately 16 per cent of littering ability to give birth to twins. In essence, the Panchali sheep represents resilience, adaptability, and productivity, making it a valuable asset to shepherds not only in the Panchal region but also elsewhere.



Figure7. A mature Panchali Sheep demonstrating the breed's distinct morphological features: a long, rectangular body, drooping ears, and a white, coarse wool coat.

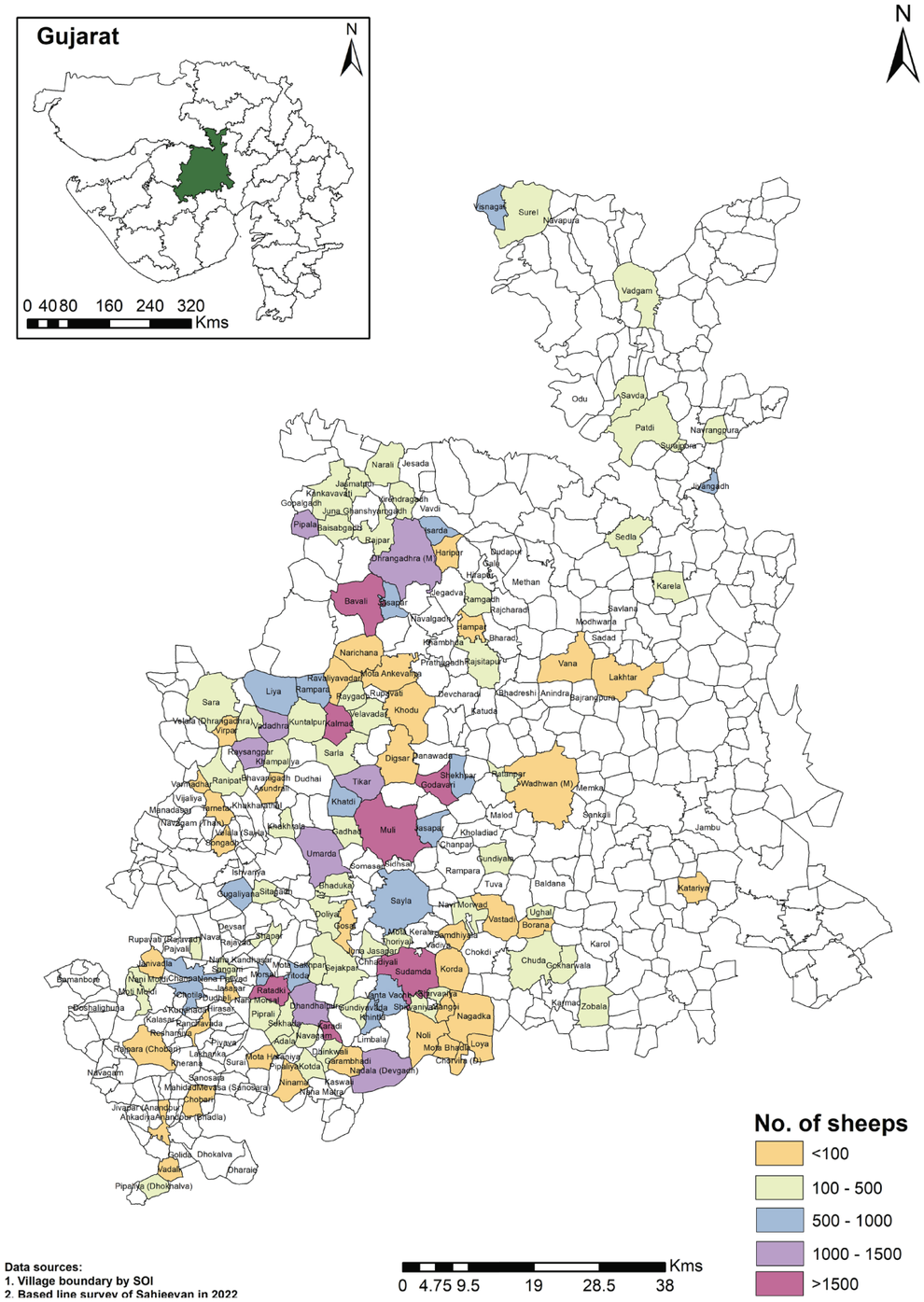


Figure 8. Spatial distribution of Panchali Dumma sheep across villages in Surendranagar District, Gujarat, based on Sahjeevan's 2022 baseline survey, illustrating key concentration zones of this indigenous breed and reflecting patterns of pastoral dependence, breeding strongholds, and landscape use within the semi-arid grasslands.

Rearing Practice

Herd Profiles

Traditionally, some communities have raised particular animal breeds. Panchali sheep, Gohilwadi goats, and Zalawadi goats are raised by the Rabari and Bharwad pastoralists of Surendranagar. In the past, these people also relied on camels for their livelihood. However, due to a significant decrease in available fodder, they were forced to sell their camels. While those who already had goats and sheep continued raising them, some who sold their camels opted to switch to cows instead. This shift also led them to abandon their nomadic lifestyle and settle down in a permanent location. All these animals feed on different types of forage, and have different feeding patterns; some graze while others browse. In contrast to camels, who browse relatively large shrubs or trees, goats browse small to medium-sized shrubs and trees. Sheep, however, graze on grasses and herbs; this is the primary difference in forage consumption.



Figure 9. Typical herd profile of Zalavadi goats. Pastoralists maintain a high female-to-male ratio (often 50:1 or higher) to optimize milk yield and seasonal kid production, while selecting only the most vigorous males for breeding purposes.

Impact of Invasive Vegetation

Elderly pastoralists claim that many grasses and herbs are in danger of becoming extinct, and that the dominance of invasive alien species like *ganda bawal (Neltuma juliflora)* and *kuvadiya (Senna uniflora)* and *abhagini (Lantana camara)* has reduced the amount of space available for growing native plants. In times of crisis, *Neltuma juliflora* and *Senna uniflora* fruit are fed to sheep and goats. Nevertheless, livestock generally dislike them. The locals determine whether an alien species is invasive or not based on their usefulness in their environment and whether they are native or introduced. The thorny parts of *Neltuma juliflora* frequently hurt their animals and they suffer for months. It is also commonly believed that N*eltuma julifora* leaves are toxic to cattle.



Figure 10. A Maldhari pastoralist grazing sheep in the semi-arid grasslands of Surendranagar, with the invasive Neltuma juliflora (Prosopis juliflora) encroaching alongside—illustrating the growing challenge of invasive species on traditional grazing landscapes and pastoral mobility.

Breeding Practices

Sheep and goats breed once a year. The breeding age begins at around 12-20 months. As per the seasonal calendar, pastoralists migrate twice a year, once for eight months and then for four months. According to the Gujarati calendar, the 8-month long migration is considered to be the first one because it begins in November (the first month in Gujarati). The second migration, *choumasa*, which is of four months (commencing in the monsoon with the destination being Kutch), is mainly for goat-keeping pastoralists. While returning home (the beginning of November) the livestock begins to breed. It is somewhat synced that while kids and lambs are delivered, they are at home or engaged in village-based pastoralism. For months, these kids and lambs are fed in separate groups; once they reach adulthood, pastoralists begin feeding them together. In order to boost immunity, female goats and sheep are fed mustard oil for months, depending on financial capacity. It ranges from 100 ml to 200 ml, at least twice a month or weekly. The four-month migration is vital for goats as it allows them to graze on better quality forage and herbs during the gestation period; the choumasa migration tenure is synced with their gestation period. Dungars (or hills) in Kutch appear to be a hub for nutritious, palatable forage for goats.



Figure 11. A visual representation of "genetic capital." Exceptional males are not only valued for flock expansion but are often shared or rented within the community, reinforcing social bonds and maintaining the genetic health of the regional population.



Grazing Resources

The Surendranagar landscape, located within the larger arid and semi-arid mosaic of scrub thorn forest and savanna grasslands of Gujarat, serves as a critical habitat for a diversity of carnivores, functioning as a vital shared space for both wildlife and pastoral communities. The grasslands comprise diverse land ownerships like privately-owned grasslands called vidis, Village Panchayat grazing lands known as gauchar, revenue lands and Forest Department-owned Reserved Forests.In comparison to stall feeding, free-range grazing and browsing are found to be superior. Surendranagar's goat and sheep pastoralists rely heavily on the sale of milk and milk products instead of meat, due to religious reasons. Surendranagar has traditionally had semi-arid grassland savannas and thorn forests, locally known as vidis.

Gauchar (Village Grazing Commons)

These are public lands managed by the Village Panchayat and legally set aside for grazing. However, despite this protected status, gauchars are decreasing in size and are heavily overrun by *Neltumajuliflora* and *Lantana camara,* which lowers their value for grazing.

Reserved Forests

Managed by the Forest Department, Reserved Forests are valuable for the environment but can cause social issues. In Thangadh, turning key grazing areas into Reserved Forests has caused conflicts, as pastoralists face fines for grazing in afforestation areas. In Chotila, these forests are also heavily invaded by *Neltuma juliflora,* which limits their grazing usefulness.

Revenue Grasslands (Classified as "Wastelands")

These lands are officially marked in the Wasteland Atlas of India but are still often used for grazing. They are very susceptible to degradation due to industrial activity, encroachment, and invasive species.

Private 'Vidis'

Vidis are ecologically rich and biodiverse grasslands that were historically owned by the Kathi Darbars during the princely state era. Although now legally owned by the state government, many of these lands remain under the informal possession of the Kathi Darbars, who manage them and lend them to pastoral communities for between 50k - 1 lakh/ per season. In addition to these grazing lands, *gauchar* land (Village Panchayat grazing commons), revenue 'wasteland', and agricultural fields are available. However, due to management failures, Surendranagar pastoralists are now limited toprivate *vidis, gauchar* or open grazing lands, or agricultural lands in general.The table indicates a few shrubs, herbs and grasses on which sheep and goats are dependent. However, some of them are not common nowadays.



Figure 12. Gauchar



Figure 13. Reserve Forest



Figure 14. Revenue Wasteland



Figure 15. caption needed

Table 2. Inventory of primary trees and shrubs identified by Maldhari pastoralists as key forage species for indigenous goats and sheep in the study area.

Maldhari Community	
1 Aamli – Tamarind *(Tamarindus indica)*	8 Harmo – White Bark Acacia *(Acacia leucophloea)*
2 Desi Babool – Indian Gum Arabic Tree *(Acacianilotica)*	9 Gangeti – Phalsa Cherry *(Grewia tenax)*
3 Gorad – Gum Arabic *(Acacia senegal)*	10 Gugal – Indian Bdellium *(Commiphora wightii)*
4 Bor – Wild jujube *(Ziziphus nummularia)*	11 Neem – Neem Tree *(Azadirachta indica)*
5 Vikado – Red spike thorn *(Gymnosporia emarginata)*	12 Galovel
6 Kachela – Mysore Sumac *(Rhus mysorensis)*	13 *Awal – Mature Tea Tree* (Cassia auriculata)
7 Ingorio – Desert Date *(Balanites aegyptiaca)*	

Table 3. Diversity of herbaceous flora and graminoids identified as seasonal forage for indigenous goats and sheeps in the study area.

Herbs and Grasses	
1. Lapdi – Needle Grass *(Aristida sp.)*	13. Sadli
2. Rather – Black Spear Grass *(Heteropogon contortus)*	14. Khotdo
3. Haniaar – Rat-Tail Grass *(Sehima nervosum)*	15. Lano
4. Makhni – Prostrate Bindweed *(Convolvulus prostratus)*	16. Vekarwo
5. Vanso	17. Ubhikhatdo
6. Jinsowa	18. Tanaa – Frilly Lepidagathis *(Lepidagathis trinervis)*
7. Jinjru	19. Gokhru – Puncture Vine *(Tribulus terrestris)*
8. Panaphaid – Coat Buttons *(Tridax procumbens)*	20. Oondar Picchu
9. Manso –	21. Kutela
10. Vakarkaya – Blue Panicgrass *(Panicum antidotale)*	22. Gadardhi
11. Dhudhiyatrop – Euphorbia sp.	23. Stinkgrass *(Eragrostis cilianensis)*
12. Kaliyokhad	

Table 4. Major agricultural crops utilized by pastoralists for seasonal residue grazing and flock penning, categorized by local importance and botanical classification.

Agriculture field pastoralists are dependent	
1. Cotton – *Gossypium sp.*	6. Tomato – *Solanum lycopersicum*
2. Paddy – *Oryza sativa*	7. Tobacco – *Nicotiana tabacum*
3. Wheat – *Triticum sp.*	8. Chickpea – *Cicer arietinum*
4. Cumin – *Cuminum cyminum*	9. Pearl millet – *Pennisetum glaucum*
5. Groundnut – *Arachis hypogaea*	



Figure 16. Participatory display of locally foraged plant species used by goats and sheep in the study area, showing vernacular (local) names alongside sampled specimens. The arrangement reflects traditional ecological knowledge of pastoral communities in Surendranagar, highlighting key fodder species and their cultural significance in everyday grazing practices.



Figure 17. A Zalavadi goat exhibiting typical browsing behavior on native thorny vegetation. This ability to utilize high-level canopy forage allows the breed to thrive in regions with sparse ground cover.

CHAPTER 2

STUDY DESIGN

Objective of the Study

The present study was carried out to understand the migration pattern amongst the pastoral communities across the different clusters of Surendranagar district and to map their migratory routes, however, the specific objectives include -

- To understand the process of migration of sheep and goat pastoralists of Surendranagar and map out the seasonal grazing routes.
- To understand the dependency of pastoralists on various resources.
- To understand the various reasons for shrinking commons and rapid change in land use in Surendranagar District.
- To understand the challenges faced by pastoralists to get resource access.
- To understand the pressures affecting the quality and availability of forage from these commons.

Methodology

Focus and Parameters

The study focuses on Surendranagar district's nomadic and semi-nomadic sheep and goat pastoralists. To be more specific, the sample size was limited to densely populated pastoralist blocks. These are Sayla, and Muli. These blocks are further divided into clusters, which includes group of villages. Muli has four, and Sayla block has six clusters. Each cluster contains from four to eleven villages inhabited by herders who raise sheep and goats. However, not all of those households migrate, so only those that migrate within Surendranagar or to other districts were selected. The study conducted during the period of two months starting fromNovember 17th, 2023 to January 12th, 2024.

Tools and Techniques

The study used purposive sampling with a semi-structured interview guide. The sample included at least 3 FGDs and 3 interviews from each block, with 1 Focus Group Discussion (FGD) of Chotila block for the route-specific study. This was not the case for the interviews of women or farmers, which were determined by situation and availability. The age range was 22 to 60 plus, because the study required both younger and elder pastoralists to understand the historical changes that occurred as well as the perspective of the next generation. Female pastoralists ranged in age from 18 to 45. The farmer was more than 50 years old.

Table 5. **Route Specific:** *Sampling matrix for primary data collection, categorized by short-distance, long-distance, and mixed migratory patterns among Maldhari pastoralists.*

Type of Migration Opted	FGDs	Interview
Short Distance Group Migration	-	6
Long Distance Group Migration	6	6
Mixed	6+1(Chotila)	6

Table 6. **Women Specific:** *Frequency of women respondent engagement within the short-distance migration stratum.*

Type of Migration Opted	Interview
Short Distance Group Migration	3

Table 7. **Farmer Specific:** *Distribution of individual interviews across sedentary and agro-pastoralist occupation categories in the study area.*

Type of Occupaton	Interview
Only farming	1
Agro - Pastoralism	2



Figure 18. Stakeholder engagement and participatory field interviews with the migratory Maldhari pastoralist community in the Saurashtra region.



Figure 19. Conducting a semi-structured questionnaire session with Maldhari pastoralists. This primary research phase focused on documenting traditional breeding practices and livestock health management.



Figure 20. Conducting a Focus Group Discussion (FGD) with Maldhari livestock keepers to identify community-level challenges, breeding objectives, and perceived trends in indigenous breed populations.

CHAPTER 3

KEY FINDINGS

The Centrality of Grazing Land

Throughout the interviews and discussions with the respondents, the one key resource that came up is land. Pastoralism as a lifestyle ultimately depends on the land, and there are various kinds of lands that practitioners engage with: agricultural land made available to them in exchange for money or some other benefit, to private vidis for money, Reserved Forests where they have to engage with the forest rangers, open grazing lands or gauchar that fall under the Village Panchayat, and revenue 'wastelands' notified by the government.

Agricultural land is found to be the most used form of land among pastoralists. Reasons for this include the simple availability of agricultural land, and a mutually beneficial relationship between the farmers and pastoralists. Agricultural land is rich in forage, with water sources often found nearby. For the farmers, the pastoralist's animals help in clearing fields by removing crop residue after harvest, and their excreta can provide natural fertilizers through manure. Pastoralists are often paid by farmers for this purpose. This ranges from Rs. 300 to Rs. 500 per night, depending on livestock count. Another kind of relationship between the farmers and pastoralists that emerged was that farmers require them to engage in farm labour for access and stay on their land. The labour can range from weeding and helping with putting away irrigation supplies, to getting rid of agricultural waste.

Private vidis are managed land with higher quality forage owned by Darbars, and pastoralists are required to pay in the order of lakhs of rupees per season for groups of five families for access to this type of land. The exact amounts vary depending on the size of the vidis; forage availability; herd size, and the number of months for which they graze there. Despite the relatively high costs of access, pastoralists bear them;sincevidis have an assured quantity and quality of forage which is not accessible elsewhere. Interestingly, while legally these lands are owned by the government, in reality they are wholly controlled by these landowners.

Reserved Forests have historically also been significant grazing areas for pastoralists. Village-based and short distance migratory pastoralists would rely on access to outer parts of forests for a significant part of their grazing and browsing needs. But, owing to new plantations and subsequent monitoring by the authorities, pastoralists have been denied access to even the parts of the forest that they were previously allowed to use.

Water for livestock and humans alike is second only to land in its resource significance. On agricultural land, access to water is largely ensured by the farmer, otherwise they have to resort to whatever water sources they can find nearby. Availability of water presents a significant issue on other types of land.

Shrinking commons represent another serious challenge, and one of the major reasons for this contraction is encroachment by farmers, by illegally expanding their agricultural land and adding commons to their own land. Additionally, technological advancement, and introduction of renewable energy farms has brought drastic changes in the accessibility of commons and patterns of land use. Large tracts of land, whether in forests or open land, are leased to operators of these wind turbines or solar farms as they provide better profits. Infrastructure projects are also taking their toll on land availability. One unusual instance of conversion of commons into closed land is due to the construction of the Rajkot International Airport (Hirasar). Earlier, the whole region was open for pastoralists, but now because of the airport's safety and security requirements, access to the area converted for the airport and surrounding areas is completely restricted.

Other threats prevail too. Sand and coal mining and the reckless dumping of ceramic waste in grazing lands have contributed significantly to degradation and reduction of commons and changes in land use. Waste dumping limits the land available for grazing and also worsens soil quality.



Migration Patterns

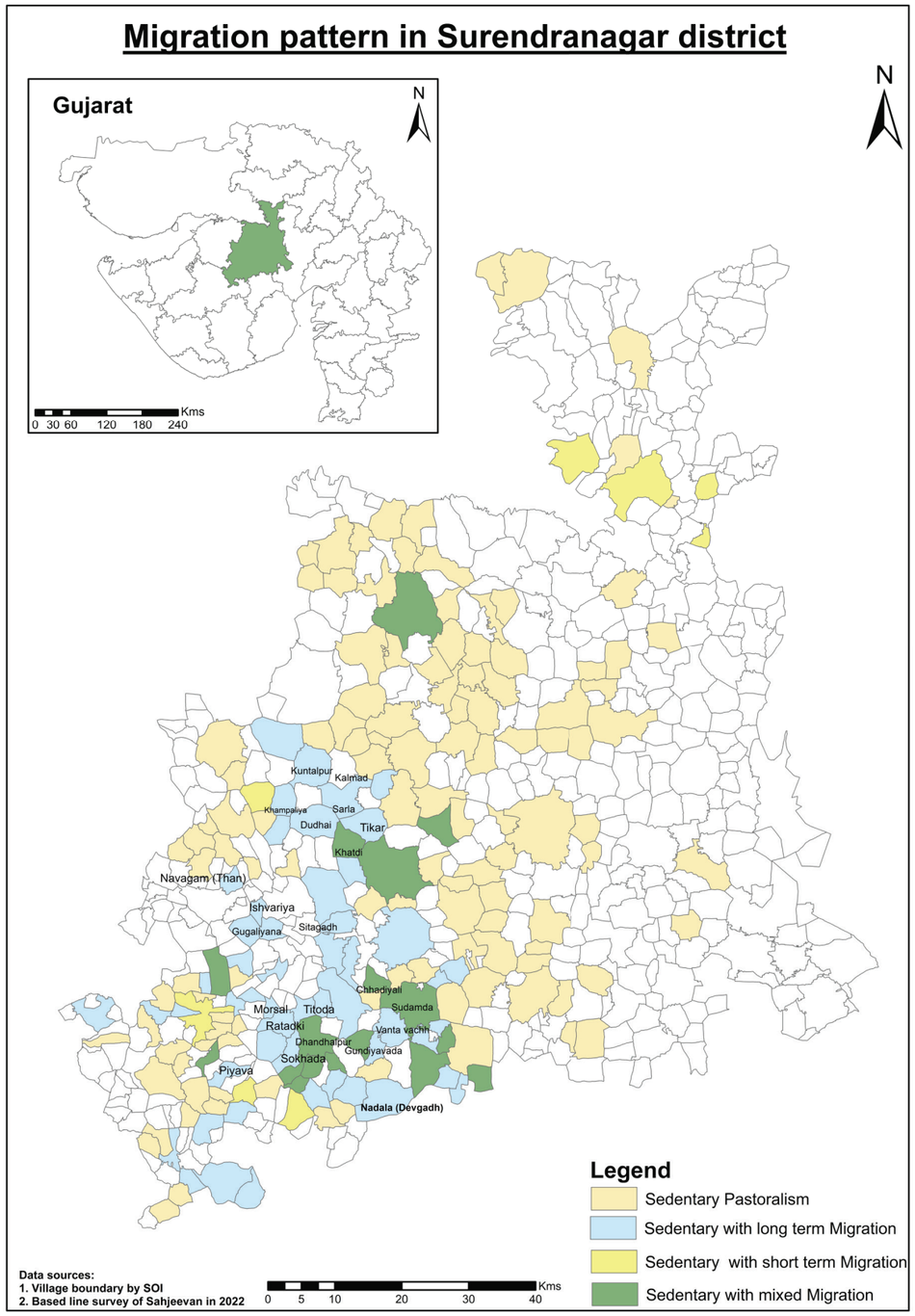


Figure 21. Spatial distribution of livestock migration patterns in the Surendranagar district of Gujarat, categorized by sedentary pastoralism and varying migratory durations (Short-term, Long-term, and Mixed).

Introduction

One of the most important aspects of this study is to understand and map the migration pattern. An examination of pastoralists' traditional migration patterns reveals that the migration route they take is not fixed; however, no significant changes can be observed. Rain and the farmers are the most important factors in determining the route. They are primarily dependent on agricultural land, so farmers play an important role; whereas, in turn, farmers rely on rain to harvest their crops. Farmers contact pastoralists once the harvest is complete. Pastoralists suffer significantly when harvests are delayed. They largely choose the same blocks that have been used in the past; the only difference is that the villages they select may differ. The pastoralists generally visit predetermined and fixed groups based on long-standing relationships with farmers, but they do not have to be from the same village, cluster, or block. Sometimes a neighbour or relative takes care of their herd in their absence, in exchange for personal interests, such as caring for their children, but this is an exception. Throughout the study, it was found that there were distance- and time-related categories of pastoralism. There are three types of trends observed: village-based pastoralism, short-distance group migration, and long-distance group migration.

Village-based Pastoralism

VBP pastoralism is typically used by owners of small to medium-sized goat, sheep, and cow herds. Pastoralists travel alone to nearby villages, but they return to their village by night. They do not stay outside of their home. This trend only involves men. Considering their nature of rearing the livestock they fall under village-based pastoralism. However, this is not static in nature. Pastoralists who do village-based pastoralism may jump into other given categories depending on the availability of forage.



Figure 22. Sedentary pastoralism in a village setting. Unlike migratory flocks, these livestock are managed within the village periphery, utilizing local common property resources (CPRs) and household-level inputs.

Short Distance Group Migration

In this migration trend, it was observed that the pastoralists migrate in small groups within their native district. These small groups may include neighbours or people from different villages, clusters, or blocks, but not from different districts. Short distance is defined as being limited to different blocks of the native district. The entire family typically travels together for around 8 months. This type of migration occasionally opted for 4-month migration as well. They travel at night and do not settle in any one location for more than 5 days. They walk the entire route and don't use any vehicles. However, they use Halari donkeys to transport their goods.

Long Distance Group Migration

Pastoralists migrate in large groups containing five to six families, sometimes more. They primarily move from one district to another. These types of migrations typically last 8 to 12 months (an extra 4 months). For eight months, the entire family migrates, and for the remaining four months (monsoon), women and children are left at home with the sheep, while the men travel with their goats owing to the latter's different browsing needs. With a few exceptions, pastoralists travel most of the time on foot. They only use vehicles to return home (for kids and lambs) except for Kutch. These groups travel together to help each other and to overcome insecurity on their path until they reach the predetermined location. After successfully arriving at their destination, these families may remain within the same group or else merge with other pastoral families from different villages, clusters, blocks or districts.

Apart from the given categories based on distance, there is tenure-based migration,that is, four and eight months. The four-month migration occurs during the monsoon season, known as choumasa in Gujarati. Only goats are taken to Kutch during this time period. The eight month migration includes both the short and long distance group migration.

Timeline and Seasonal calendar

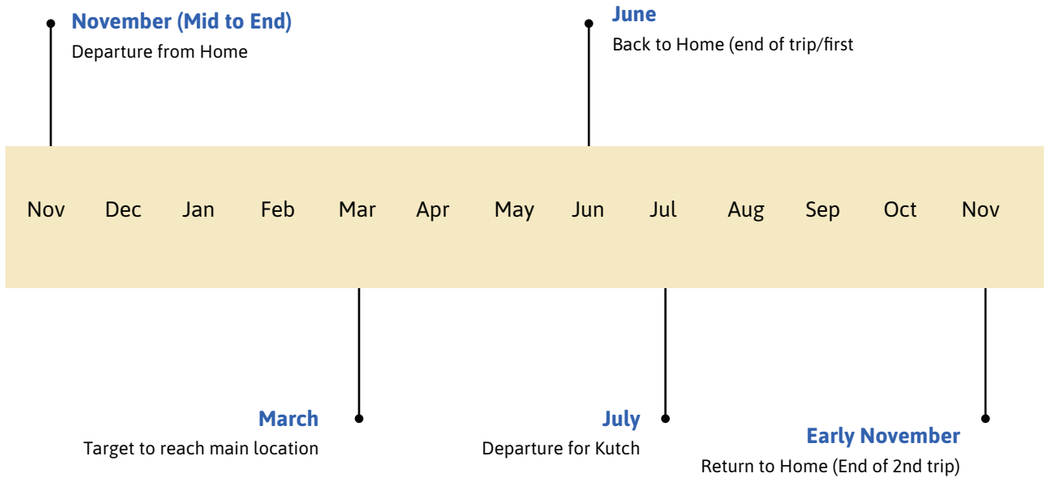


Figure 23. Seasonal migration calendar of Maldhari pastoralists, illustrating the annual cycle of departure, arrival at primary grazing locations, and the bi-annual return to the home base.



Figure 24. Short-distance group migration of Zalavadi goats. This migratory strategy involves localized movement between neighboring talukas, allowing herders to maintain closer ties to their home villages while accessing seasonal forage.



Figure 25. A temporary settlement during the seasonal migration. This strategy is essential for the survival of indigenous breeds during peak dry seasons, allowing pastoralists to navigate hundreds of kilometers in search of sustainable forage and water.

Cluster-wise Migration Routes

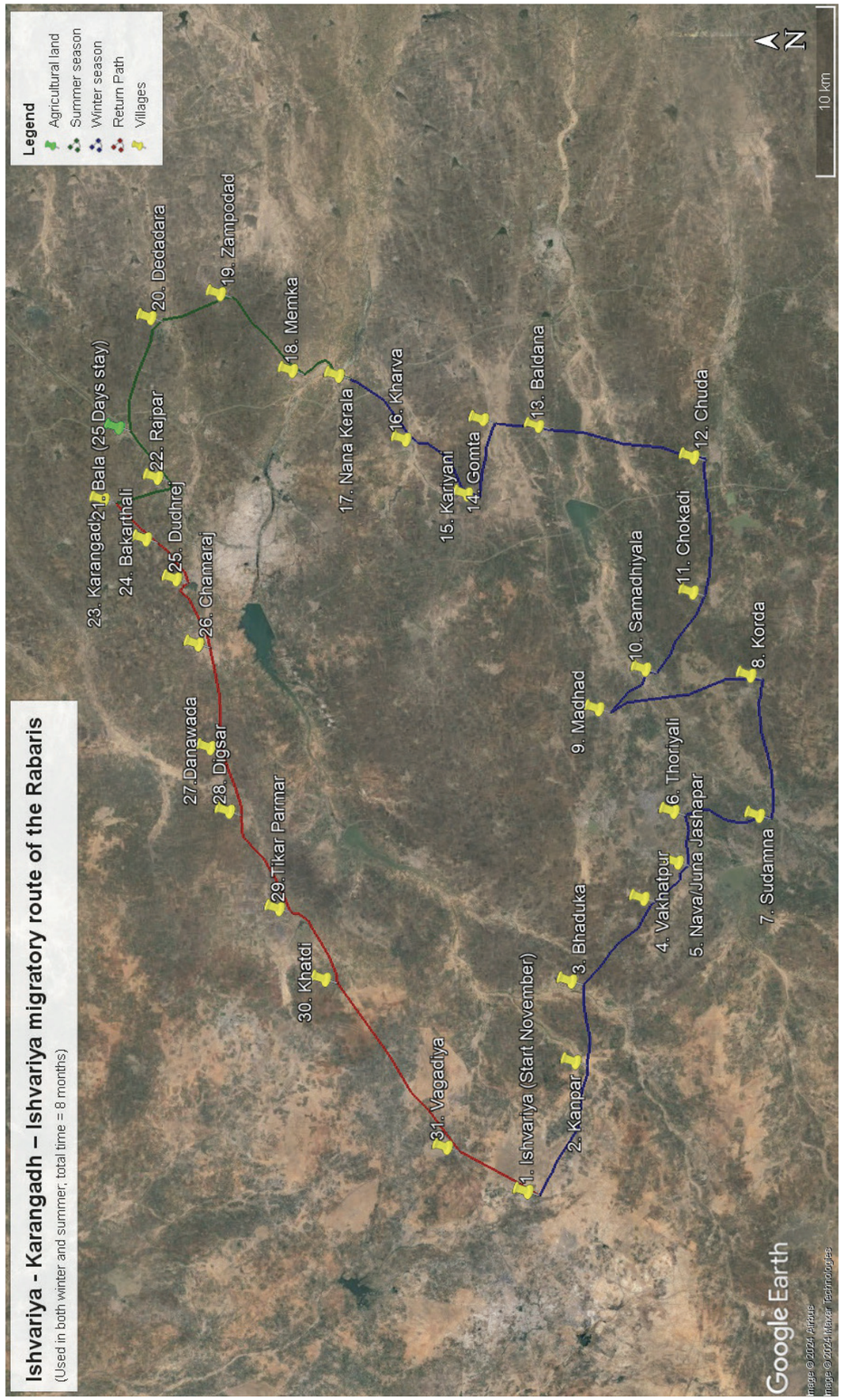
Overview

Table 8. Detailed migration matrix of surveyed pastoralist clusters. The data identifies specific villages and their corresponding transhumance durations, serving as the basis for the spatial analysis of migratory vs. sedentary systems. SDGM: Short-Distance Group Migration LDGM: Long-Distance Group Migration

	Block	Cluster	Village	SDGM	LGDM
1	Sayla Muli	Doliya Kuntalpur	Ishvariya Sarla Dudhai	Ishvariya Sarla Dudhai 8Ms	Dudhai 4Ms
2	Sayla	Dhandalpur Doliya	Ratakdi Navagam Morsal	Ratakdi Navagam Morsal 8Ms	Ratakdi Navagam Morsal 4Ms
3	Muli	Muli	Khatdi Tikar	Khatdi Tikar 8Ms	Khatdi Tikar 4Ms
4	Muli	Kuntalpur	Khampaliya, Kuntalpur	–	Khampaliya Kuntalpur 8Ms
5	Sayla	Sudamna	Chadiyai	–	Chadiyai 8Ms
6	Sayla	Dhandalpur	Sokhada	–	Sokhada 8Ms
7	Sayla Muli	Sudamna Kuntalpur	Vanta Vachh Gundiyavada Kalmad	–	Vanta Vachh, Gundiyavada, Kalmad 8Ms, Matrabhai (extra3M)
8	Sayla	Dhandalpur	Titora	–	Titora 8Ms
9	Sayla	Dhandalpur Sayla Sudamna Doliya	Dhandalpur Thoriyali Sudamna Morsal	Dhandalpur Thoriyali Sudamna Morsal 4Ms	Dhandalpur Thoriyali Sudamna Morsal 8Ms
10	Sayla	Nadala	Nadala	–	Nadala 8Ms
11	Sayla	Doliya	Sitagadh	–	Sitagadh 8Ms
12	Muli	Kuntalpur	Kalmad	Kalmad 8Ms	Kalmad 4Ms
13	Chotila	Mevasa	Piyava	Piyava 4Ms	Piyava 8Ms

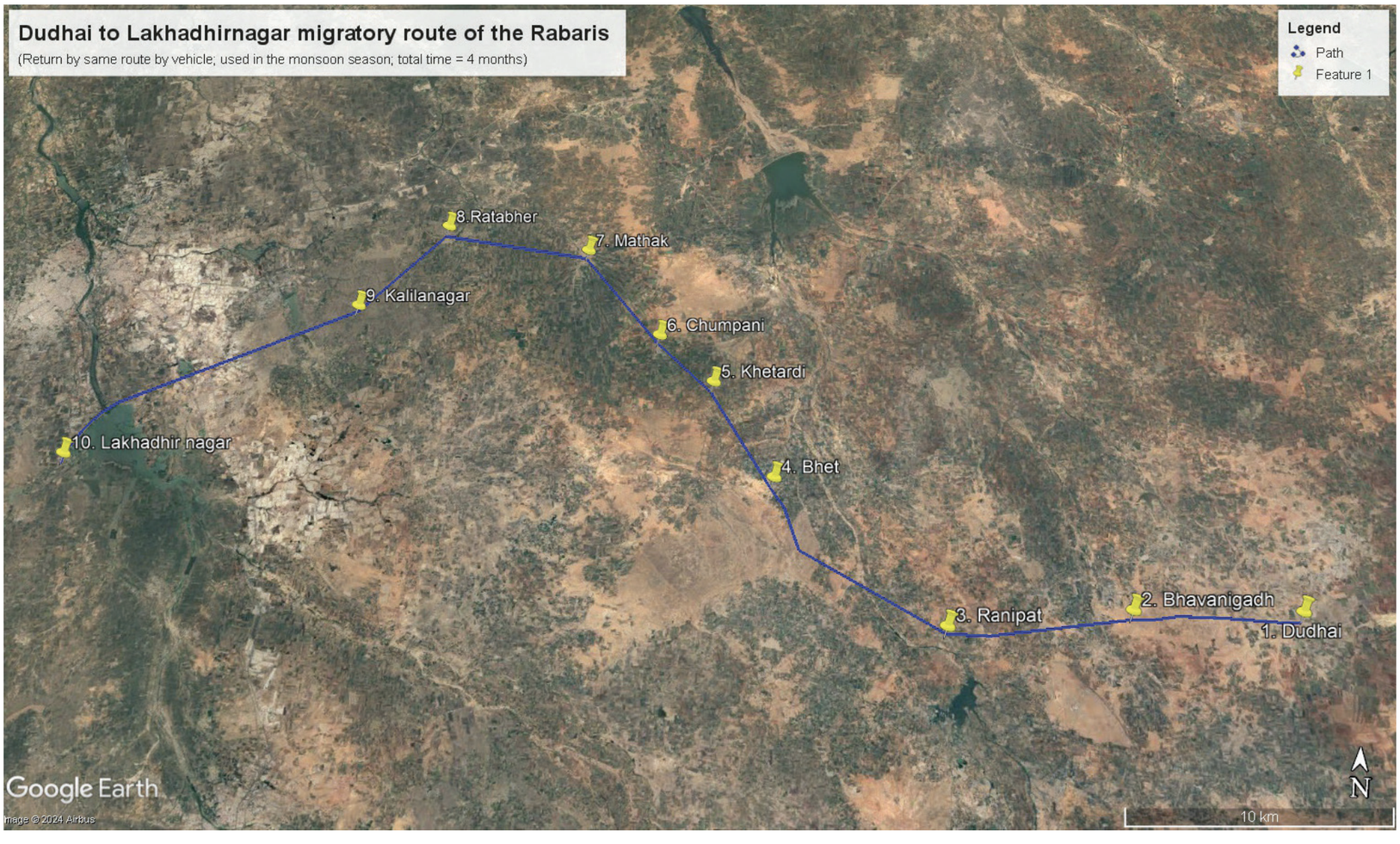
Note: (4Ms = 4-month migration; 8Ms = 8-month migration)

1. [Ishvariya– Kanpar – Bhaduka –Vakhatpur– Nava/Juna Jashapar– Thoriyali – Sudamna – Korda – Madhad – Samadhiyala – Chokadi – Chuda – Baldana (Limdi) – Gomta – Kariyani – Kharva – Nana Kerala – Memka – Zampodad – Dedadara – Bala – Rajpar (Start to return) – Karangadh – Bakarthali – Dudhrej – Chamaraj – Danawada – Digsar – Tikar (Parmar) – Khatdi – Vagadiya –Ishvariya]



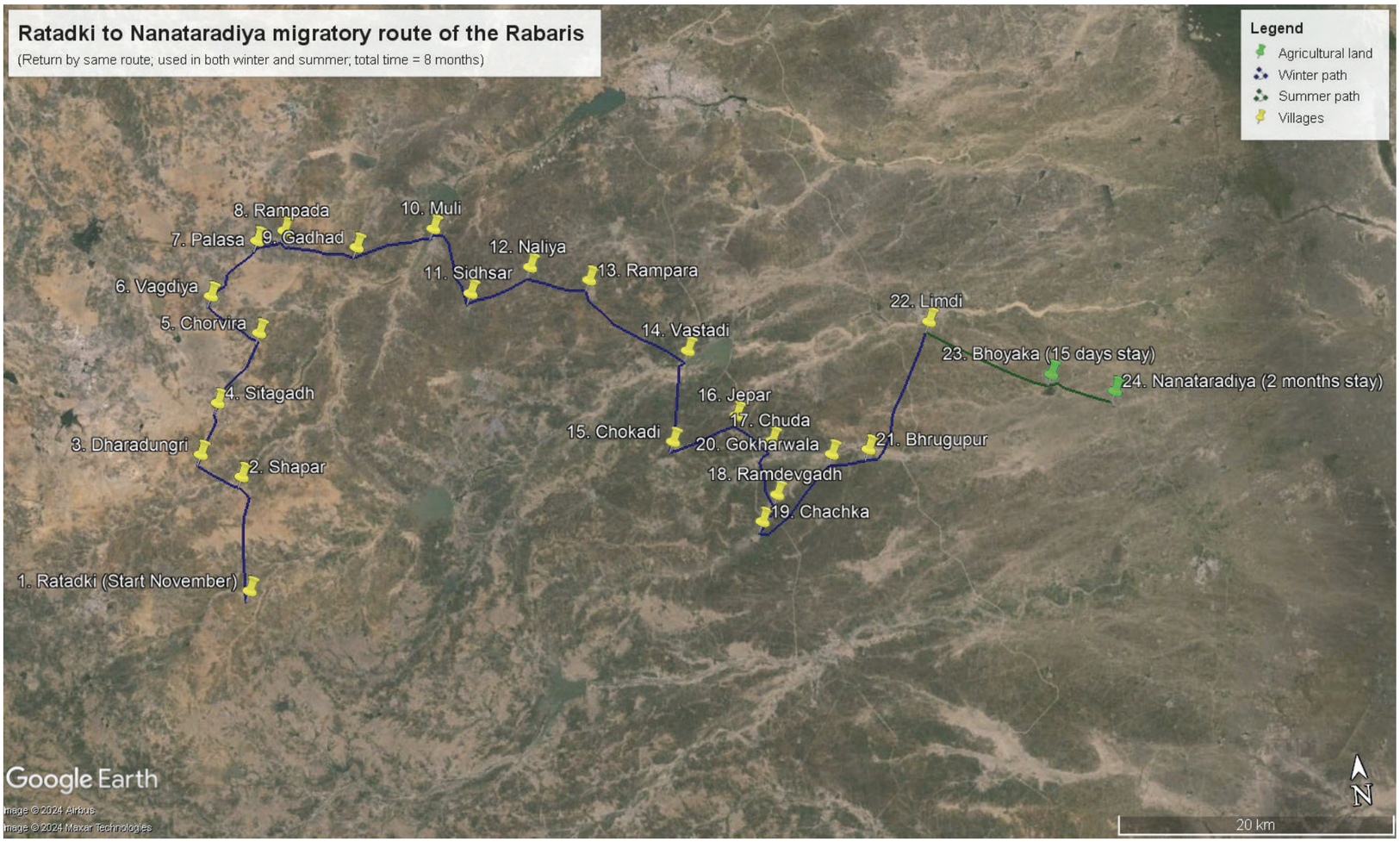
(This route is for SDGM and used for 8 months.)

2. [Dudhai – Bhavanagadh – Ranipat – Bhat – Khetardi – Chumpani – Mathak – Ratabher – Kalilanagar – Lakhadhir nagar (return by same route, vehicle)



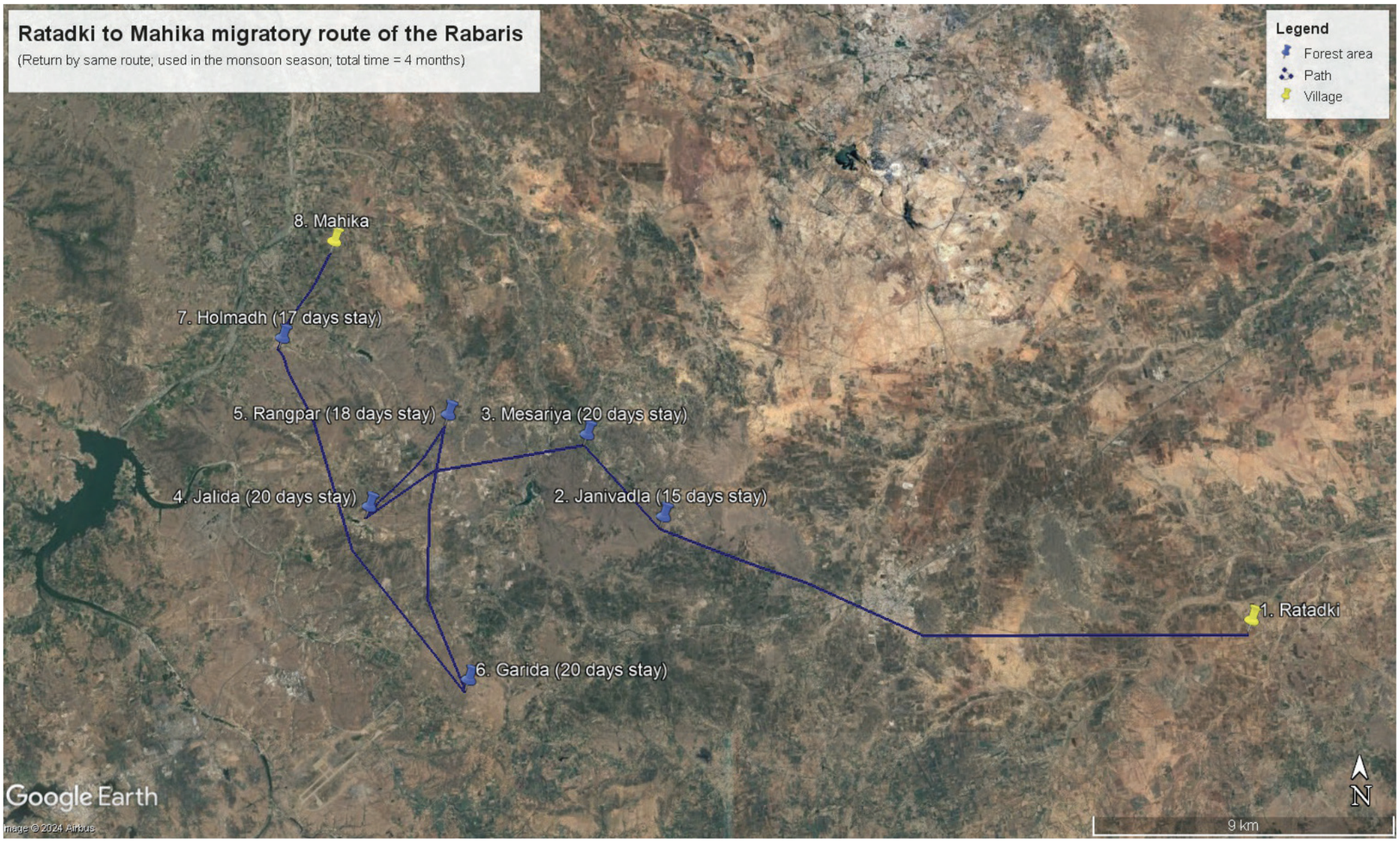
(This route is for LDGM and used for 4 months.)

3. [Ratadki – Morsel – Shapar – Dharadungri – Sitagadh –Chorvira–Vagdiya– Palasa – Rampada – Gadhad – Muli – Sidhsar – Naliya – Rampara – Vastadi – Chokadi – Jepar – Chuda – Ramdevgadh – Chachka – Gokharwala – Bhrugupur – Limdi – Bhoyaka (Bhaika) – Nana Taradiya (Hadala Highway)]



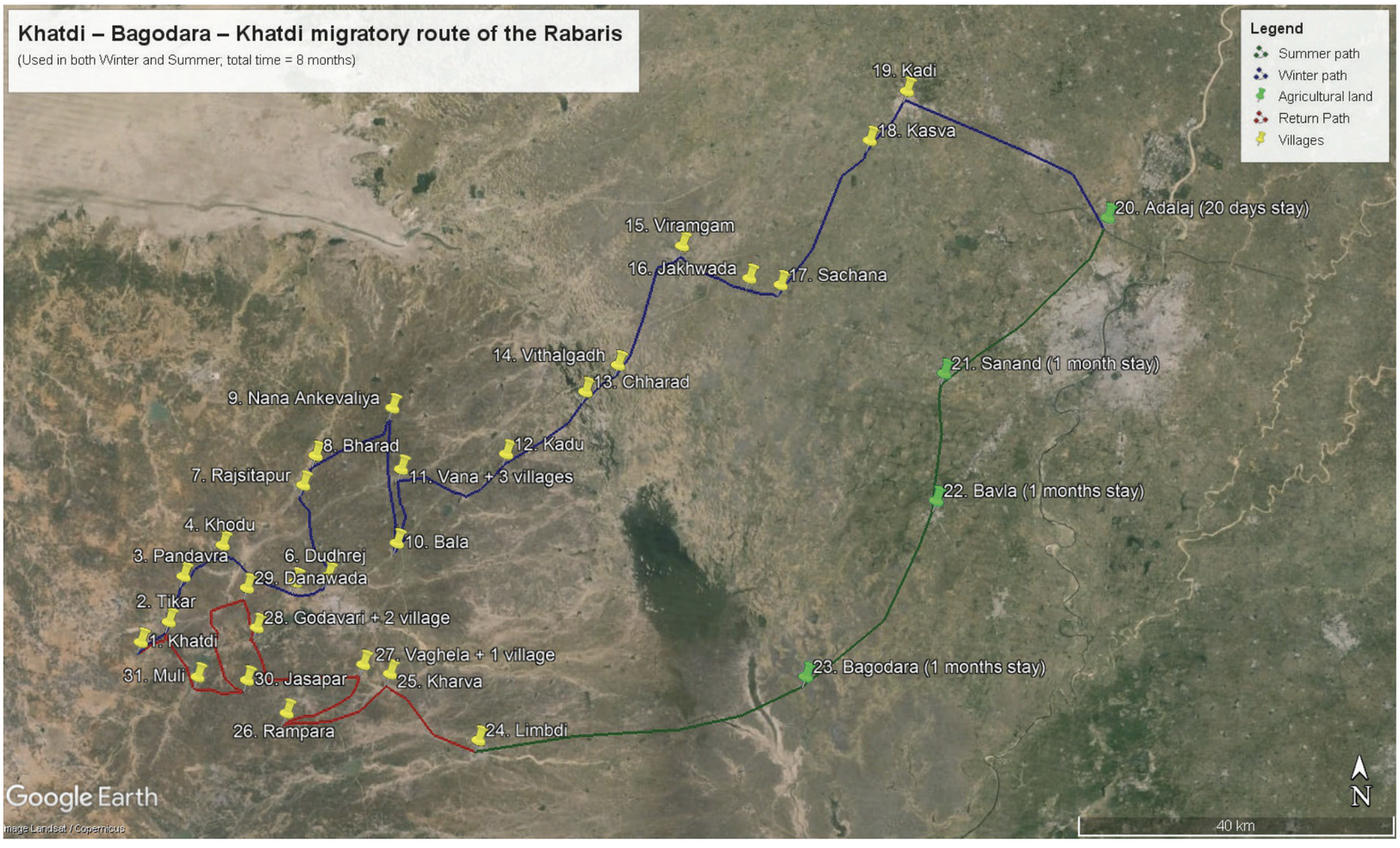
(Return route is the same. This route is for SDGM and used for 8 months.)

4. [Chotila – Janivadla – Mesariya – Jalida – Rangpar – Garida – Holmadh – Mahika]



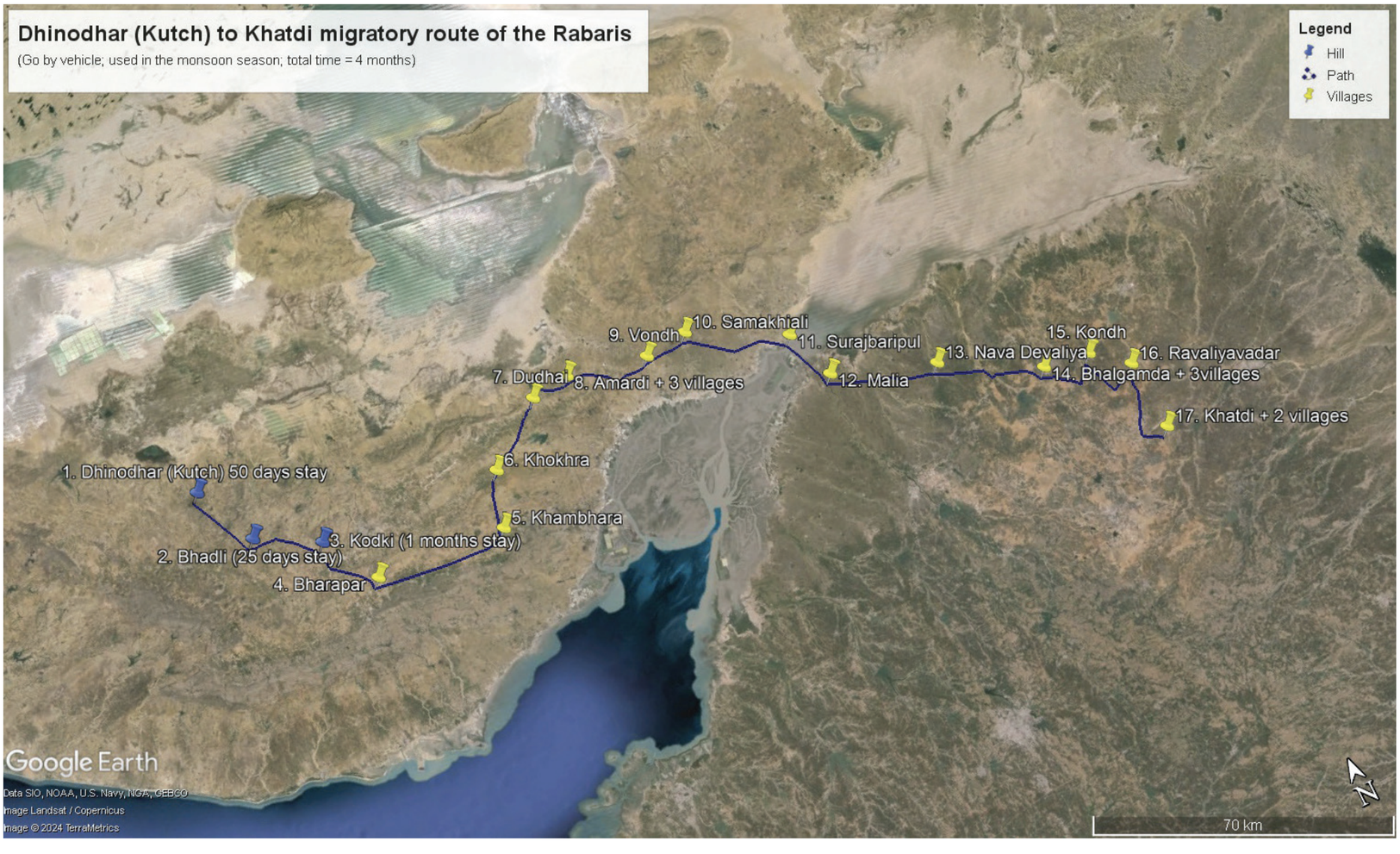
(Return route is the same. This route is for LDGM and used for 4 months.)

5. [Khatdi – Tikar – Pandavra – Khodu – Chamaraj – Dudhrej – Rajsitapur – Bharad – Nana Ankevaliya – Bala – Anindra – Vana – Ghanad – (Lakhatar – Kadu – Chharad – Vithalgadh – Viramgam – Jakhwada – Sachana – Kasva – Kadi (Places in the brackets are where pastoralists are prone to being victims of livestock theft.) – Aidesan – Sanand – Bavla – Bagodara (Start of return) – Limbdi – Kharva – Rampara – Timba – Vaghela – Munjpar – Godavari – Danawada – Digsar – Goutamgadh – Jasapar – Muli – Tikar – Khatdi]



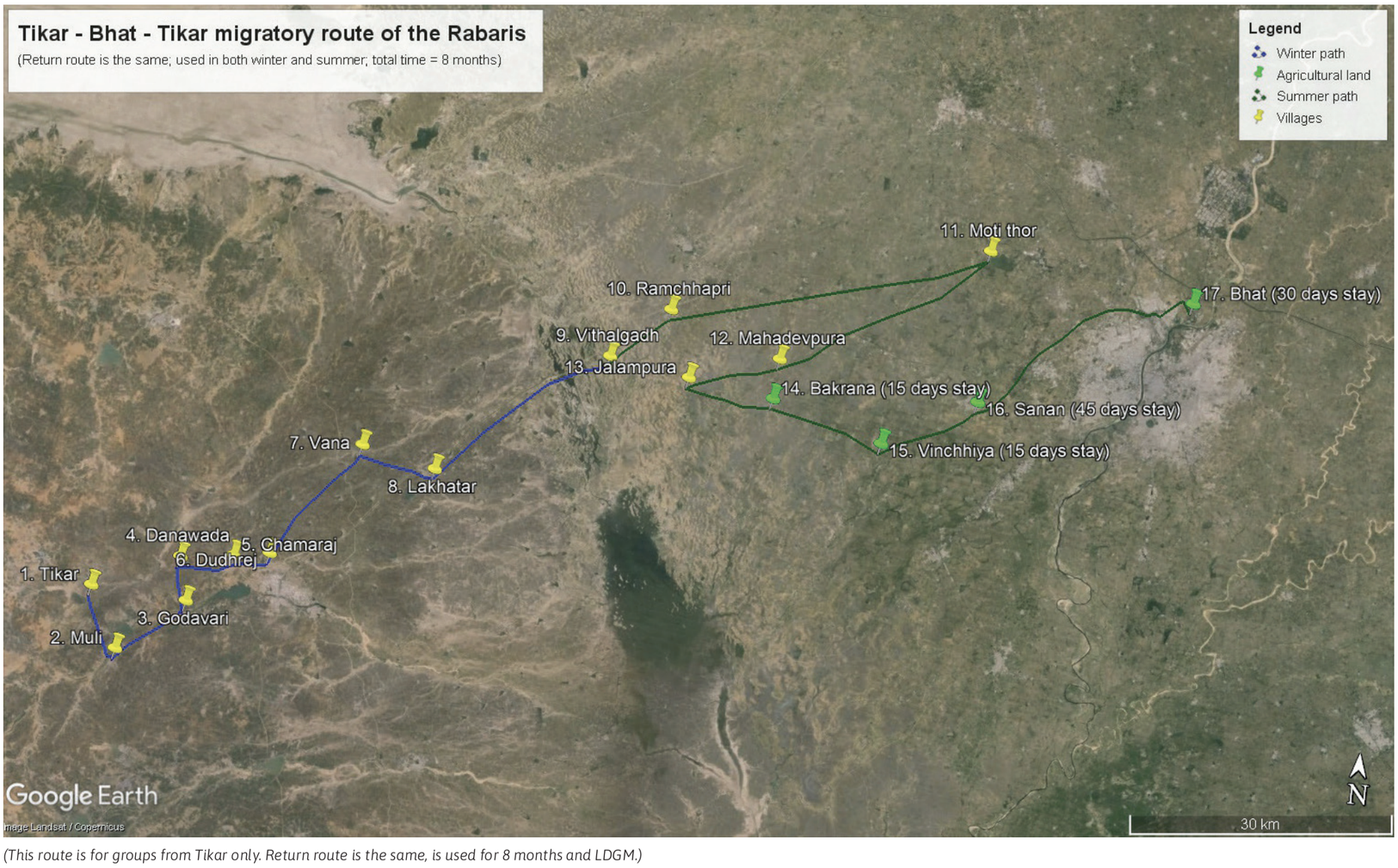
(Return route is the same. This route is for SDGM and is used for 8 months..)

6. [Dhinodhar (Kutch) – Bhadli – Vinchhiya – Kodki – Mankuwa – Bharapar – Khambhara – Khokhra – Dudhai – Dhamdka – Amardi – Kumbhardi –Bachau– Vondh – Samakhiali –Surajbaripul– Malia – Nava Devaliya –Ishvarnagar–Sundargadh– Merupar – Bhalgamda – Sapkada – Ratanpar – Kondh – Rampara – Ravaliyavadar – Kalmad (This is where groups from Sarla and Tikar groups separate) – Dudhai – Khatdi]



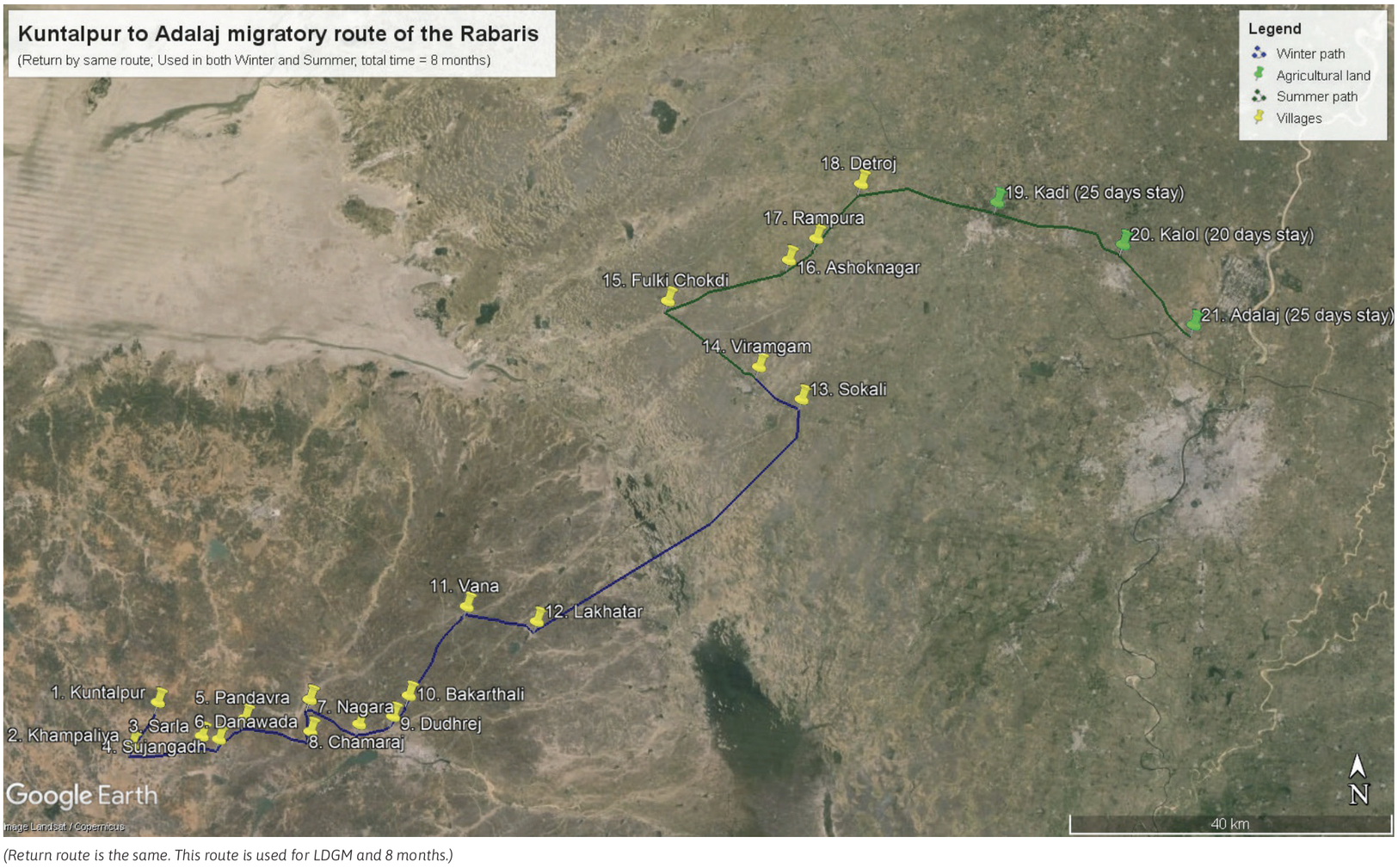
(This route is LDGM and used for 4 months.)

7. [Tikar – Muli – Godavari – Danawada – Chamaraj – Dudhrej – Vana – Lakhatar – Vithalgadh –Ramchhapri (Hotel) – Moti Thor – Mahadevpura– Jalampura – Bakrana – Vinchhiya – Sanan – Bhat]



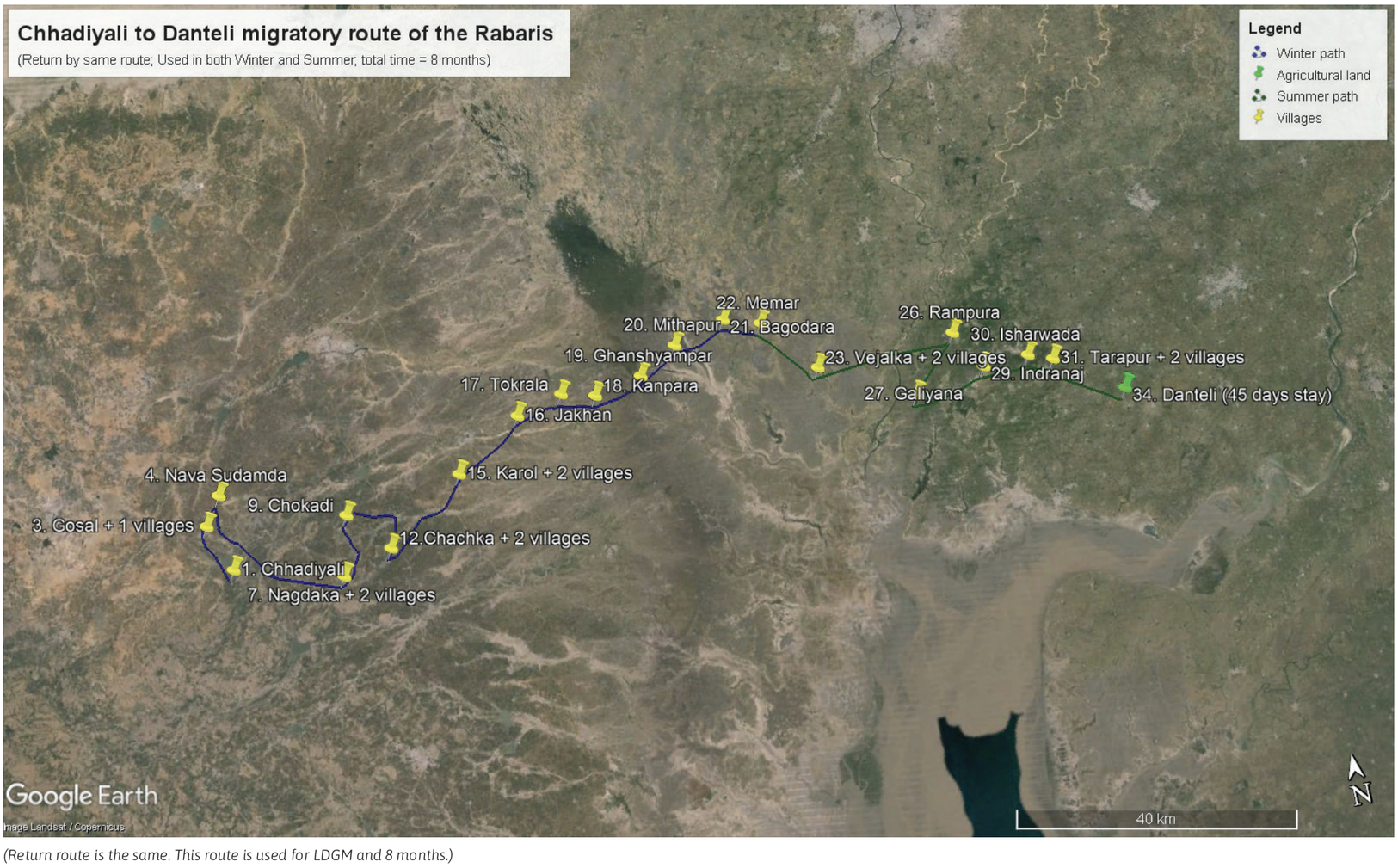
(This route is for groups from Tikar only. Return route is the same, is used for 8 months and LDGM.)

8. [Kuntalpur –Khampaliya– Sarla – Sujangadh –Pandavra– Danawada – Nagara – Chamaraj – Dudhrej – Bakarthali – Vana – Lakhatar – Sokali– Viramgam – Dasada (Road) – Fulki Chokdi – Ashoknagar (Aghar) – Rampura – Detroj – Kadi – Kalol – Adalaj]



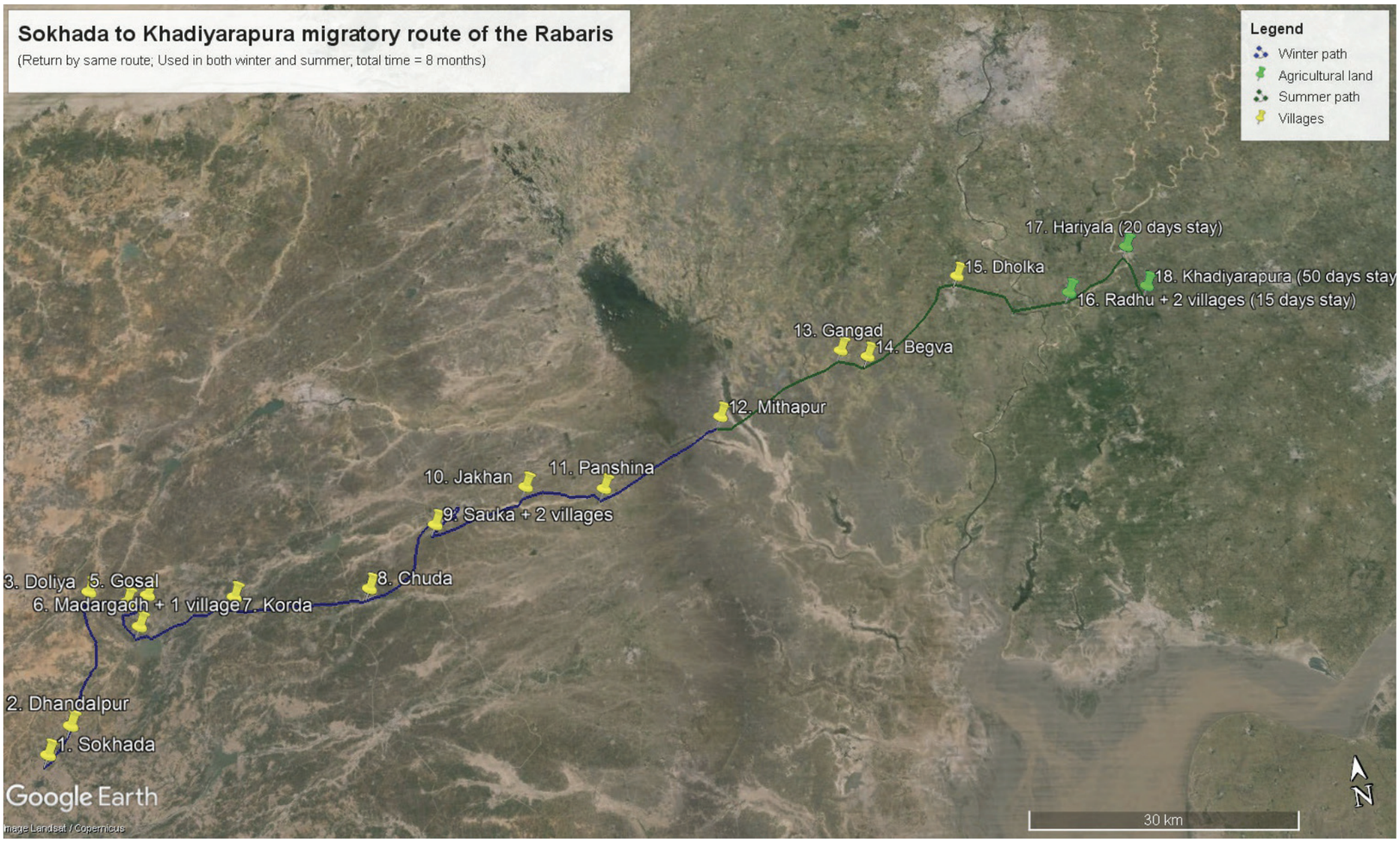
(Return route is the same. This route is used for LDGM and 8 months.)

9. [Jashapar–Madargadh– Gosal – Nava Sudamda – Vakhatpar – Sudamda – Nagdaka – Bhanejada Jashapar – Madargadh – Gosal – Nava Sudamda –Vakhatpar– Sudamda –Nagdaka– Kudla –Chokadi– Chuda – Ramdevgadh – Chachka – Gokharwala – Bhrugupur – Karol – Jakhan – Tokrala – Kanpara –Ghanshyampar– Mithapur – Bagodara – Memar – Vejalka – Raipur – Vataman – Rampura – Galiyana – Varasada – Indranaj – Isharwada – Tarapur – Manej – Bhurakoi – Danteli]

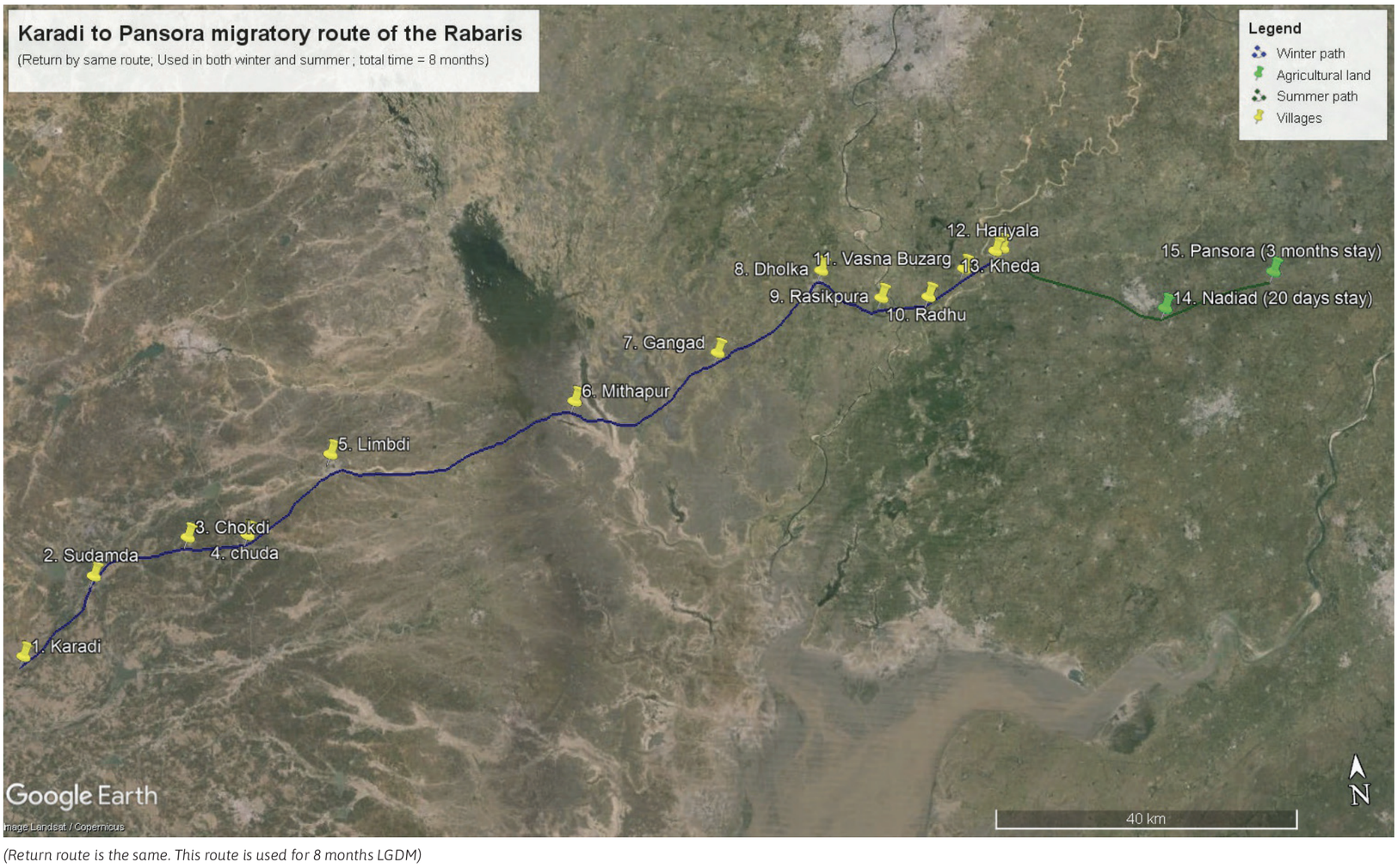


(Return route is the same. This route is used for LDGM and 8 months.)

10. [Sokhada – Dhandalpur – Doliya – Vakhatpar – Gosal – Madargadh – Thoriyali – Korda – Chuda – Limbdi (Highway) – Sauka – Choki – Jakhan – Panshina – Mithapur – Gangad – Begva – Dholka – Rasikpura – Radhu – Vasna Buzarg – Hariyala (Karadi people separate from here, their route is given after)–Memdabad Road –Khadiyarapura]

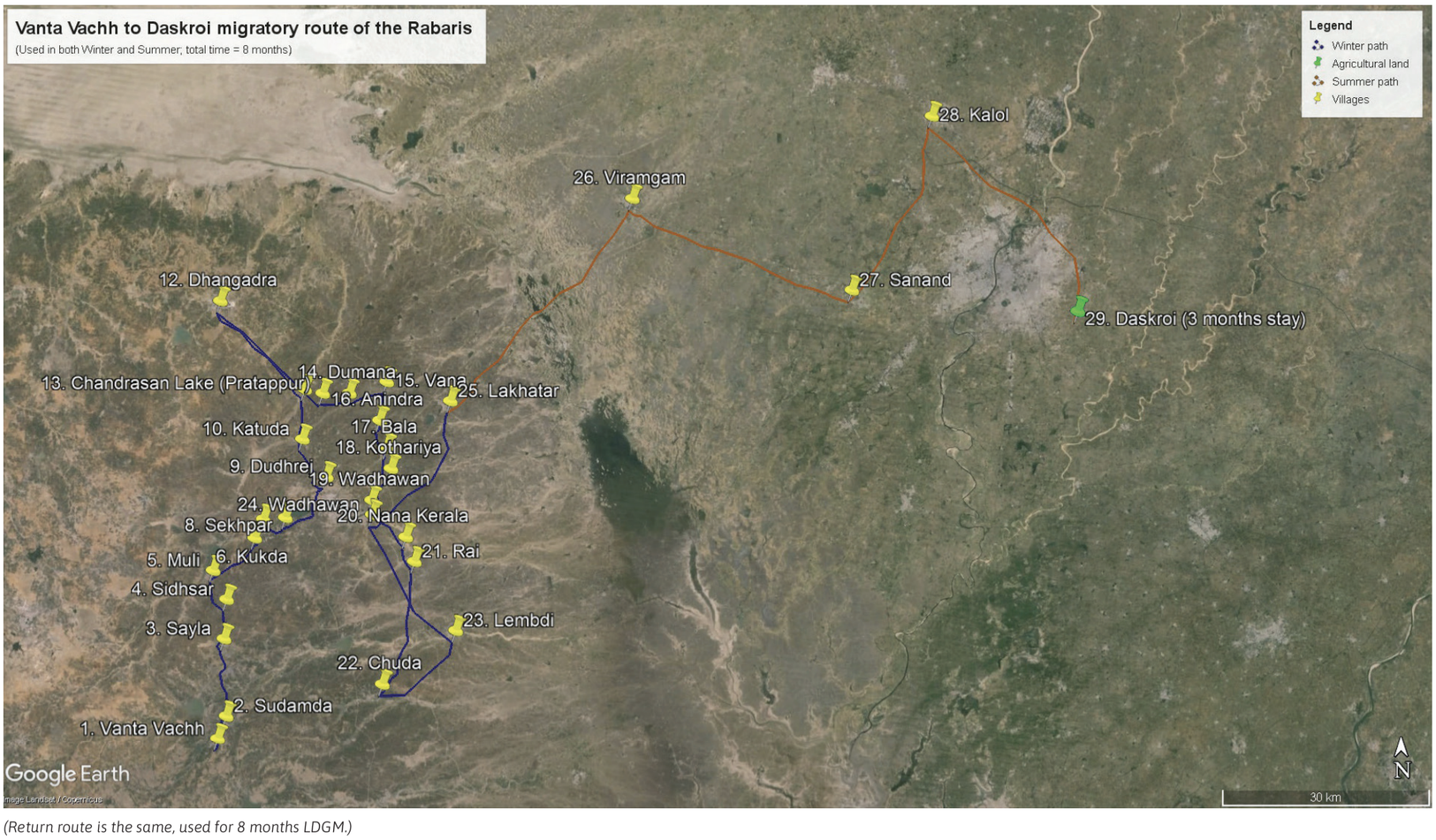


11. Hariyala – Kheda – Nadiad –Pansora** (Karadi people's route from



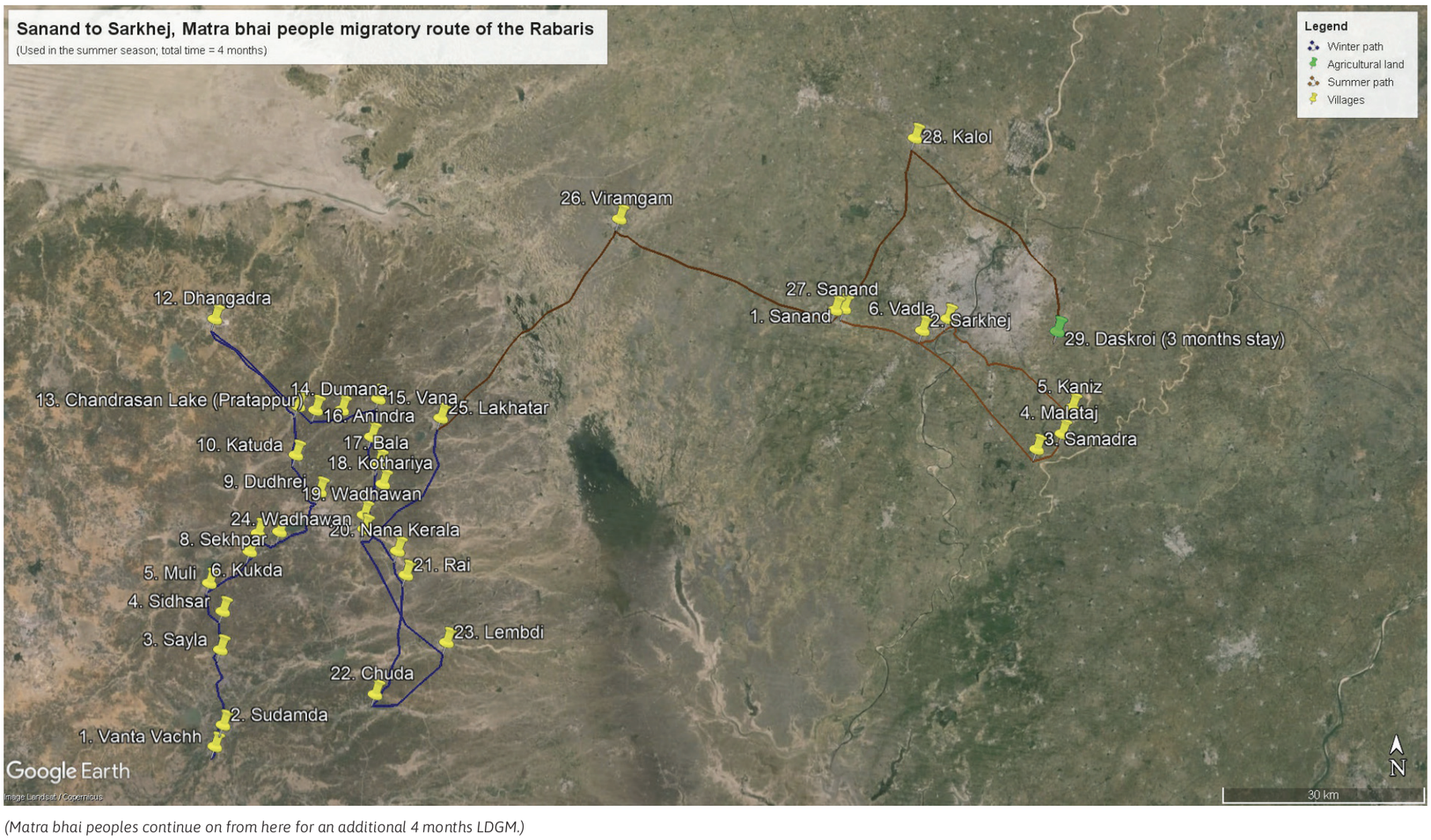
(Return route is the same. This route is used for 8 months LGDM)

12. [Vanta Vachh – Sudamda – Sayla – Sidhsar – Muli – Kukda – Godavari – Sekhpar – Dudhrej – Katuda – Rajsitapur –Dhangadra– Katuda – Chandrasan Lake (Pratappur) – Dumana – Vana – Anindra – Bala – Kothariya – Wadhawan – Nana Kerala – Rai – Limbi – Chuda – Limbdi – Wadhawan – Lakhatar – Viramgam – Sanand – Kalol – Daskroi]



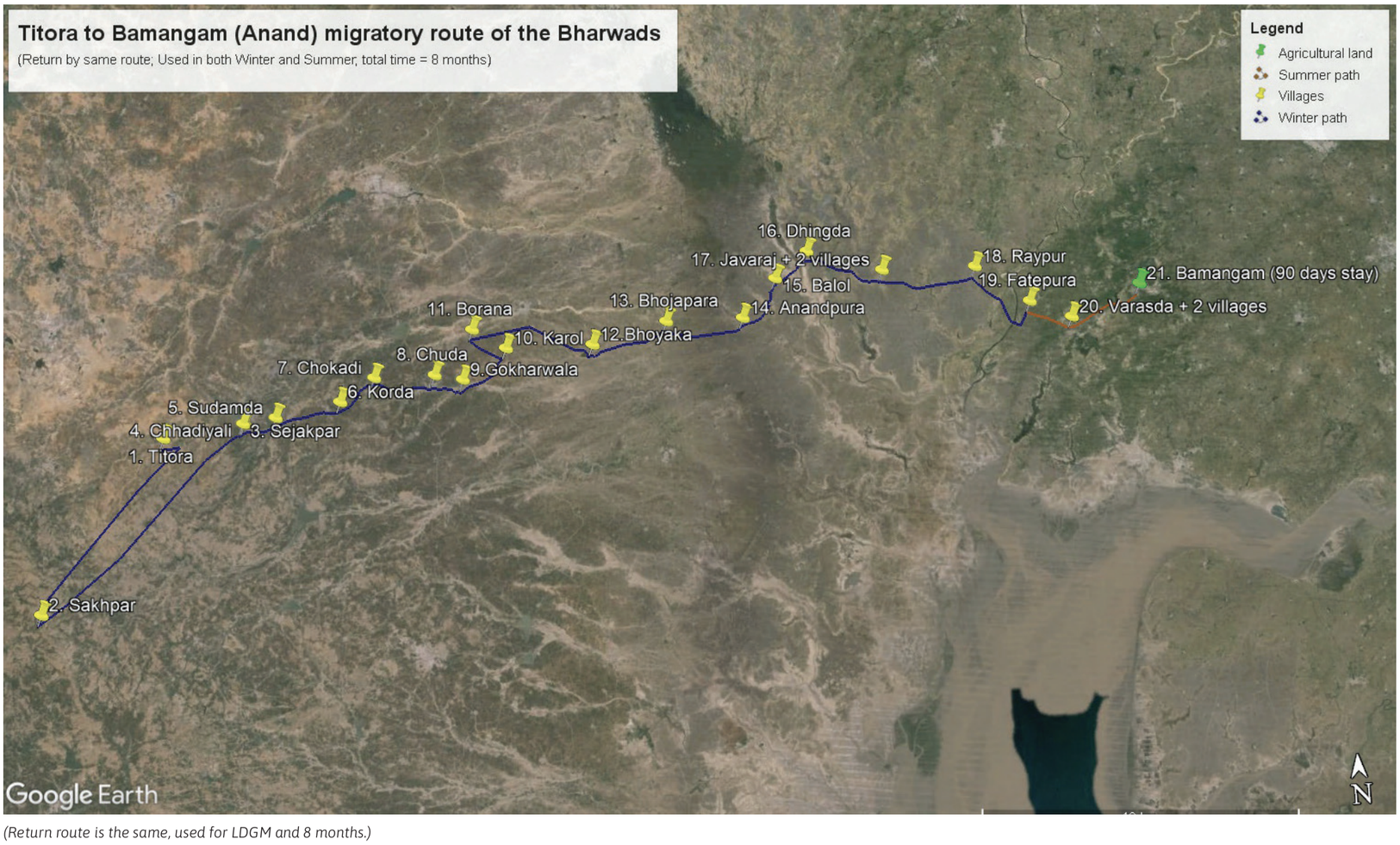
(Return route is the same, used for 8 months LDGM.)

13. [Sanand – Sarkhej – Samadra – Malataj – Kaniz – Vadla – Sarkhej] (3 Months)



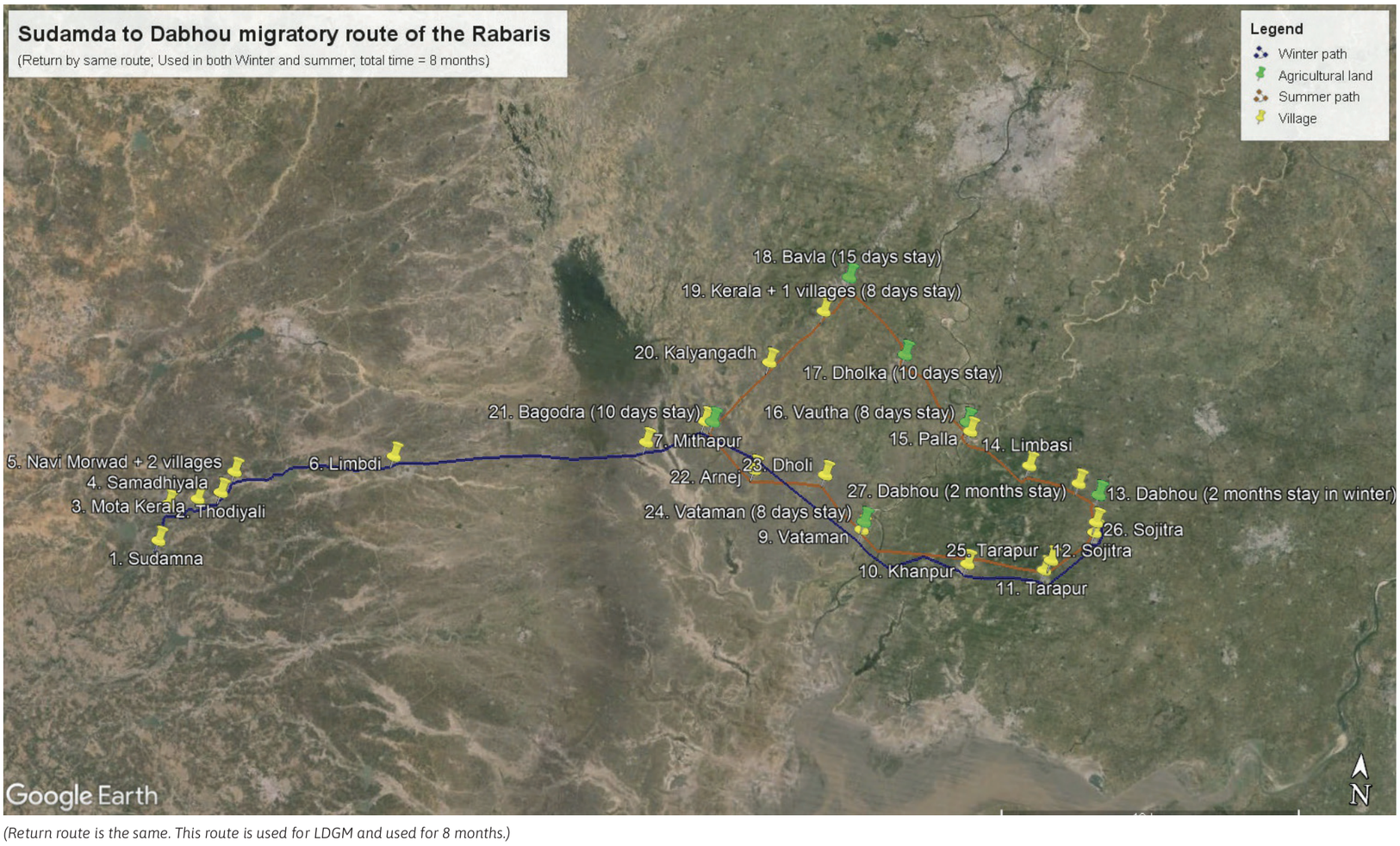
(Matra bhai peoples continue on from here for an additional 4 months LDGM.)

14. [Titora – Sakhpar –Sejakpar–Chhadiyali– Sudamda – Korda –Chokadi– Chuda – Gokharwala – Karol – Borana – Bhoyaka – Bhojapara – Anandpura (Bhai) – Badol – Dhingda – Bhurkhi – Javaraj – Vejalaka – Raypur– Vataman –Fatepura– Varasda – Indranaj – Mahiyari – Bamangam (Anand)]
(This is their predetermined destination, they stay here for four-five months.)



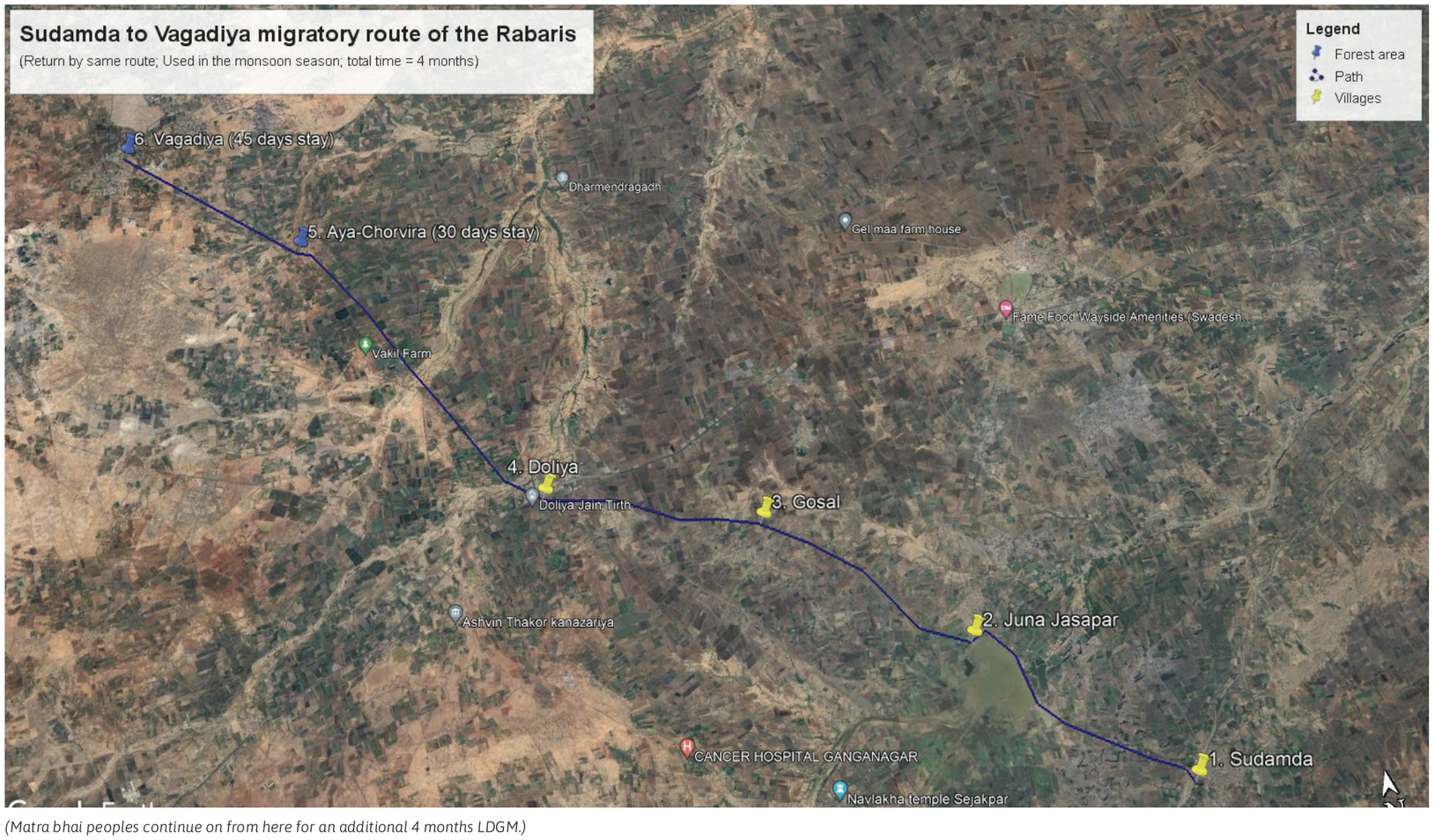
(Return route is the same, used for LDGM and 8 months.)

15. [Sudamna – Thodiyali – Mota Kerala – Samadhiyala – Navi Morwad – Limbdi – Mithapur – Bagodara – Vataman – Khanpur – Tarapur – Sojitra – Dabhou (They stay here for 2 months.) – Limbasi – Palla – Vautha – Dholka – Bavla – Kerala – Bhayala – Kalyangadh – Bagodra – Arnej – Dholi – Vataman – Tarapur – Sojitra – Dabhou]



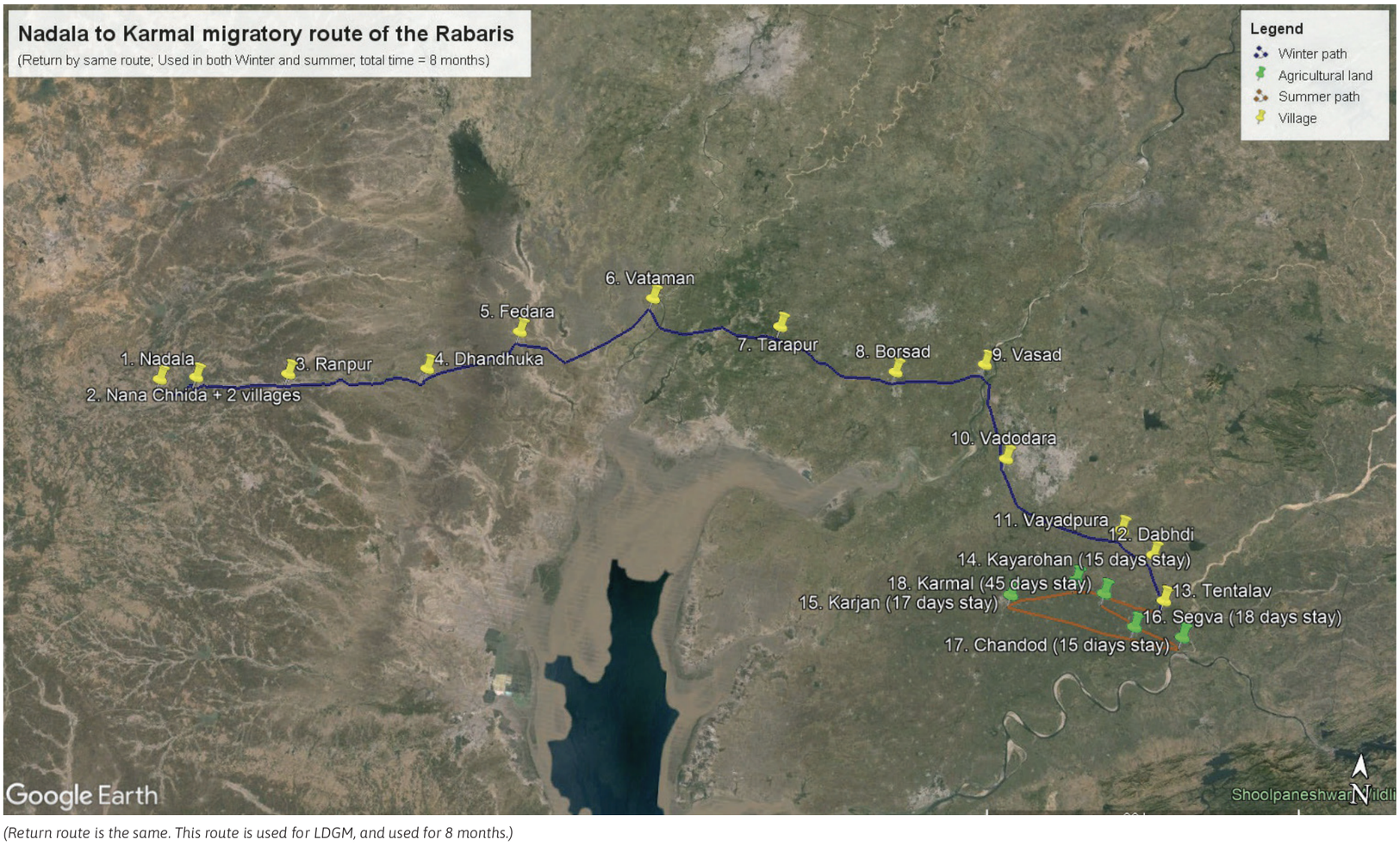
(Return route is the same. This route is used for LDGM and used for 8 months.)

16. [Sudamda – Juna Jasapar – Gosal – Doliya – Aya-Chorvira – Vagadiya]



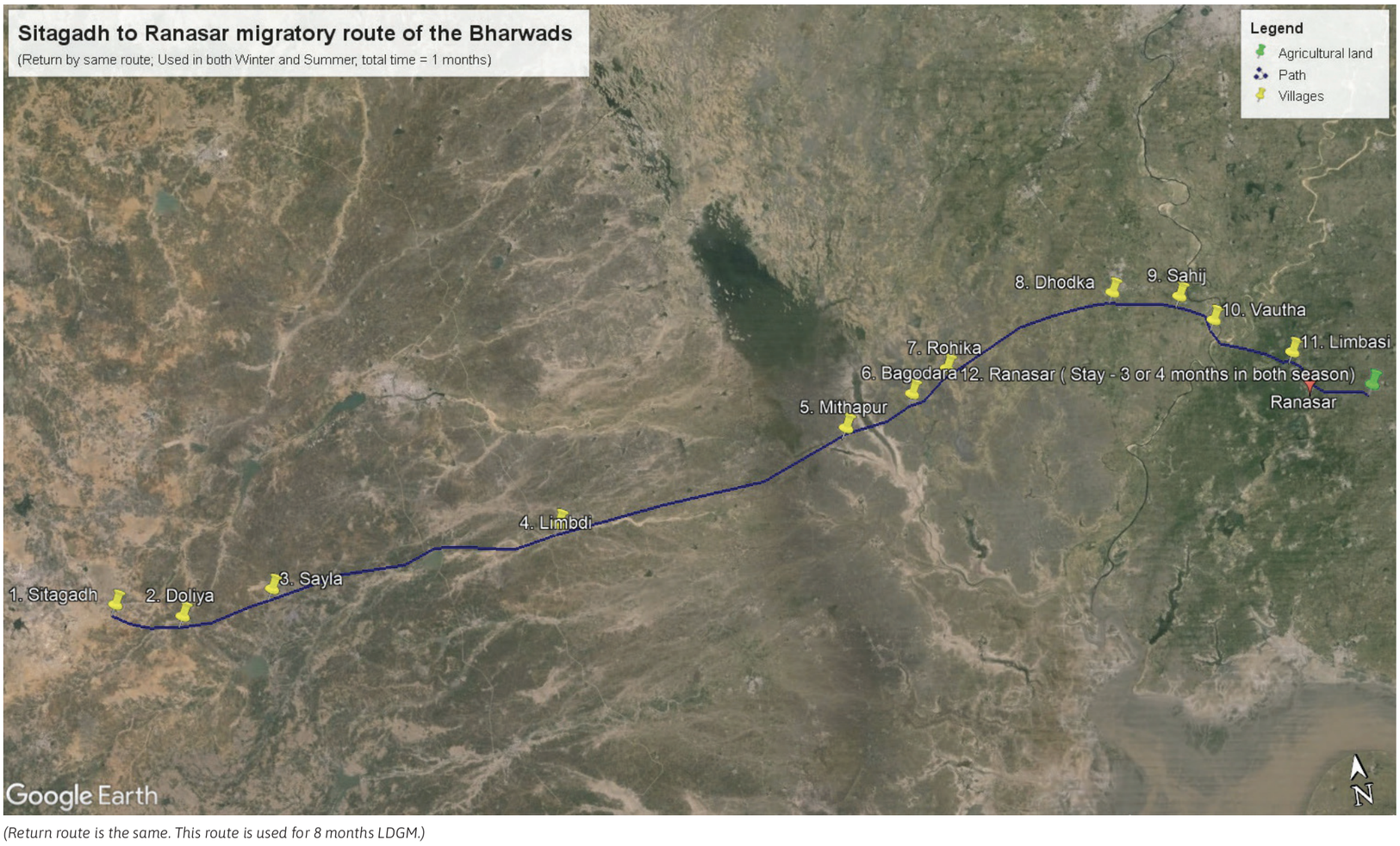
(Matra bhai peoples continue on from here for an additional 4 months LDGM.)

17. [Nadala – Sukhbhadar (Riverway) – Nana Chhida – Bhadla – Ranpur – Dhandhuka – Fedara – Vataman – Tarapur – Borsad – Vasad – Vadodara – Vayadpura –Dabhdi– Tentalav – Kayarohan – Karjan – Segva –Chandod– Karmal]



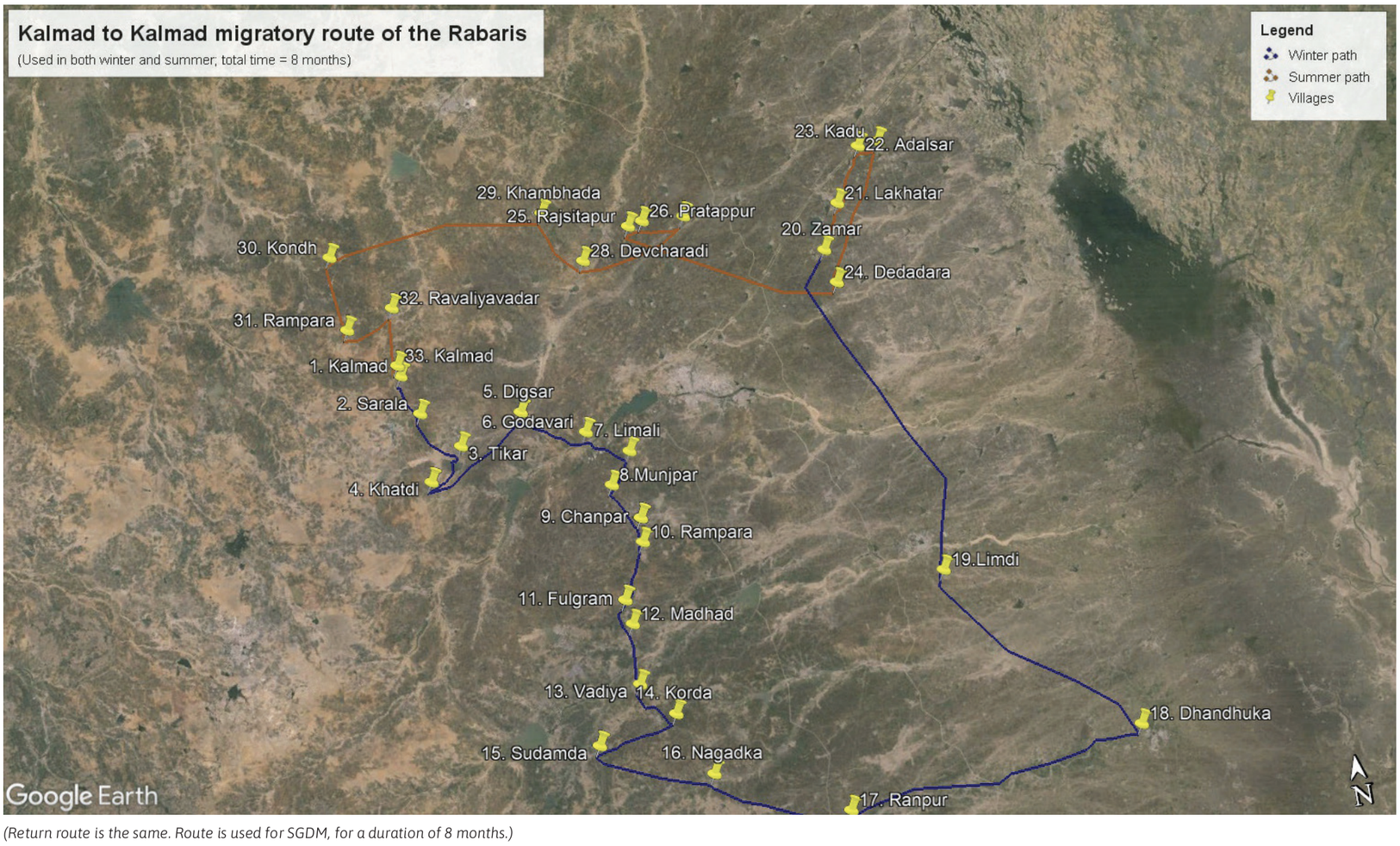
(Return route is the same. This route is used for LDGM, and used for 8 months.)

18. [Sitagadh – Doliya – Sayla – Limbdi – Mithapur – Bagodara – Rohika (Petrol Pump) – Dhodka – Sahij – Vautha – Limbasi – Ranasar



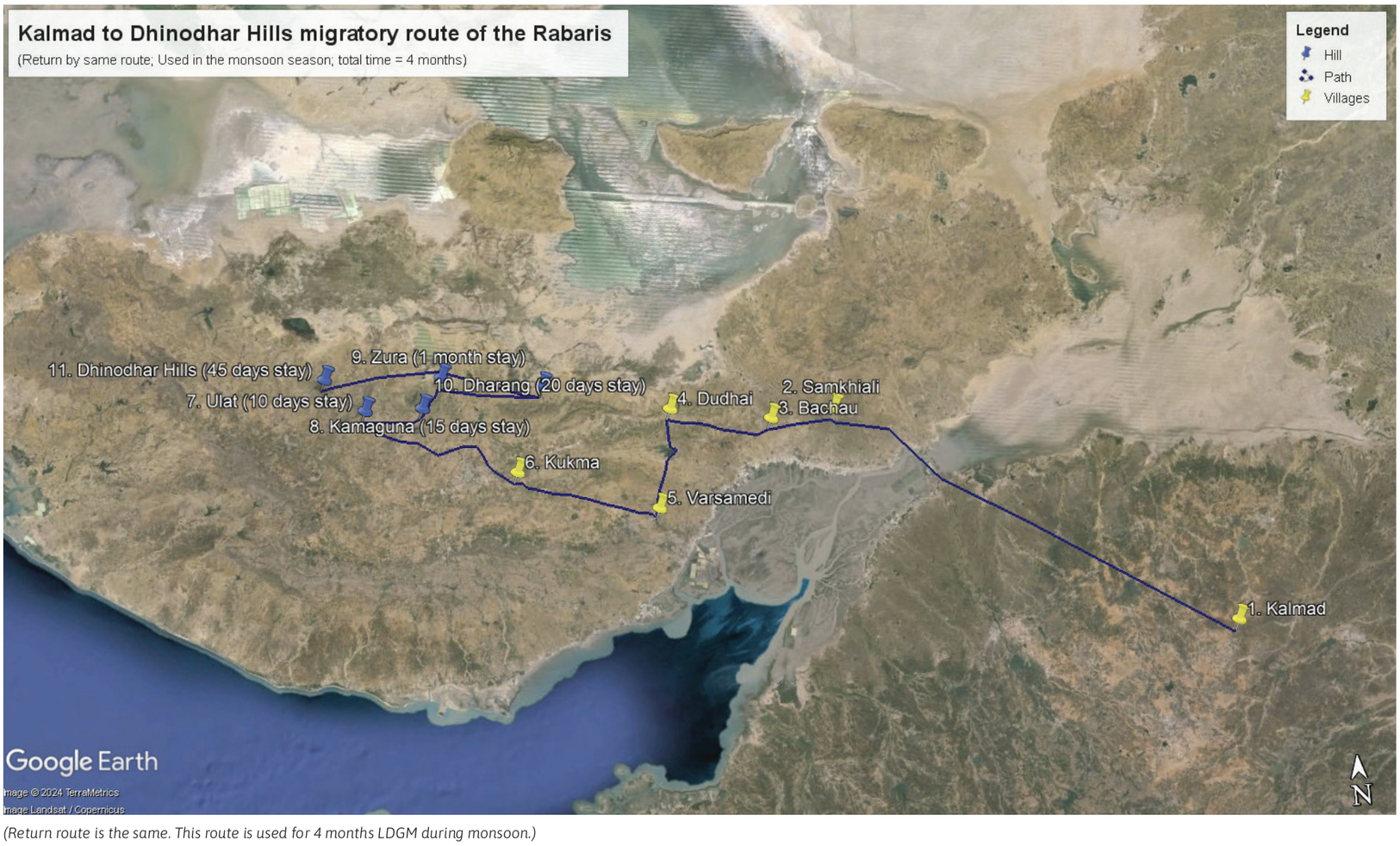
(Return route is the same. This route is used for 8 months LDGM.)

19. [Kalmad – Sarala – Tikar – Khatdi – Digsar – (Nayka Dam) – Godavari – Limali –Munjpar–Chanpar– Rampara – Fulgram – Madhad – Vadiya – Korda – Sudamda – Nagadka – Ranpur – Dhandhuka – Limdi – Zamar – Lakhatar – Adalsar – Kadu – Dedadara – Rajsitapur – Pratappur – Dumana – Devcharadi – Khambhada – Kondh – Rampara – Ravaliyavadar



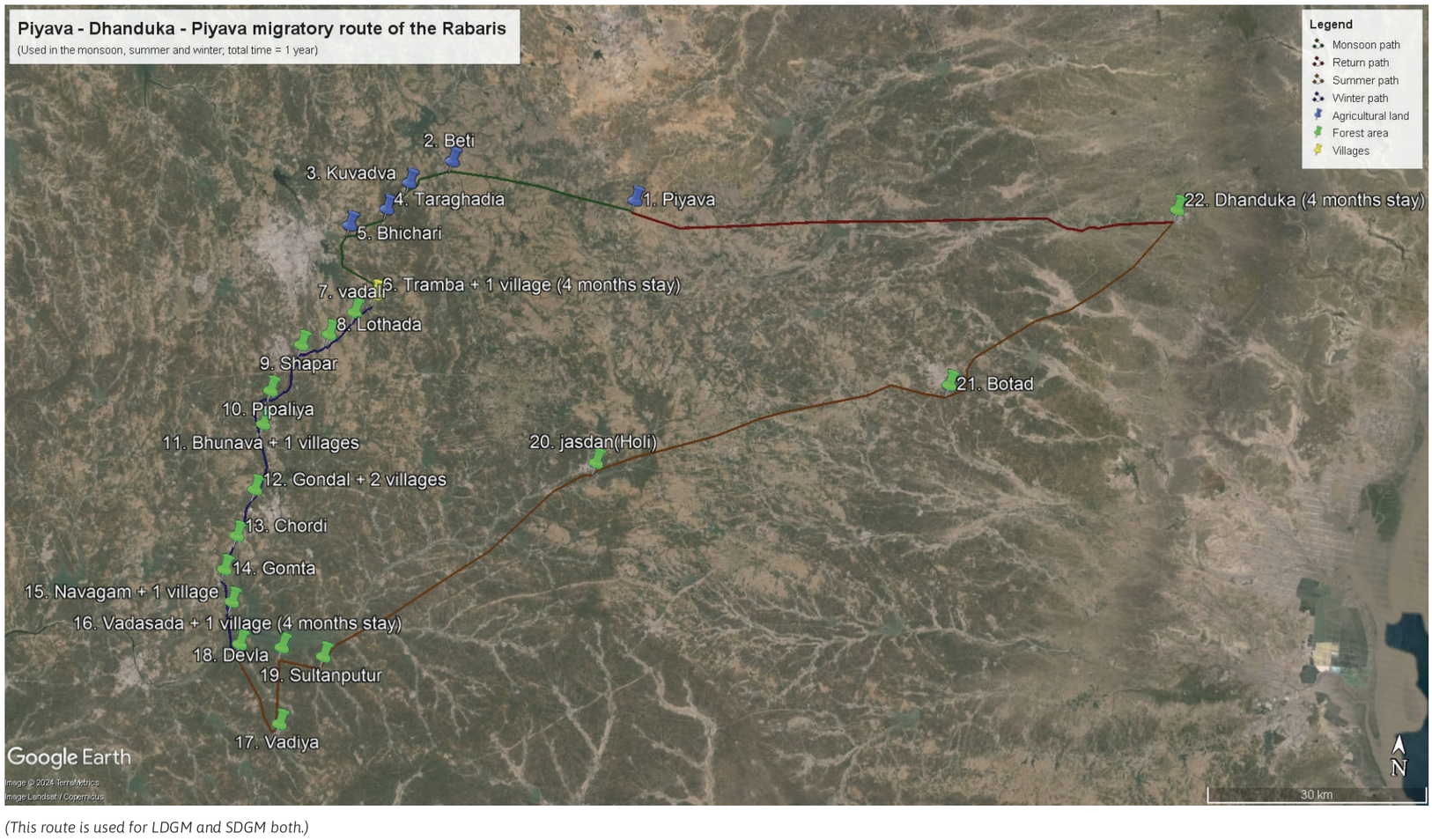
(Return route is the same. Route is used for SGDM, for a duration of 8 months.)

20. [Kalmad –Samkhiali (by vehicle) – Bachau – Dudhai – Zura – Varsamedi – Ulat – Kamaguna – Kukma – Dharang – Dhinodhar Hills]



(Return route is the same. This route is used for 4 months LDGM during monsoon.)

21. [Piyava – Beti – Ravaliyavadar – Kuvadva – Taraghadia – Bhichari – Tramba (4Ms) – Kalipat – Vadali – Lothada – Shapar – Ribda –Pipaliya – Bhadudi – Bhunava –Biliyala – Bhojpara –Gondal – Jamvadi – Chordi – Gomta – Navagam – Lilakha – Vadasada (4Ms) – Amarnagar – Vadiya – Devla – Sultanputur – Amreli –Jasdan(Holi) – Botad –Dhanduka (4 Ms)]



(This route is used for LDGM and SDGM both.)

Pastoral Economy and Various Stakeholders

Introduction

The sheep and goat pastoralists' economy is largely dependent on selling milk or milk products. When in immediate need of money, pastoralists sell mawa, reduced thickened milk, although the market for selling mawa has shrunk. Auctions are held in Surendranagar, Wakener and Rajkot , or else the items are sold to a spearate mawa market Apart from milk and milk products, they also sell manure, and livestock is sold when a lump sum amount is required.

Owing to their constant movement, they come into contact with various actors. Farmers, veterinary doctors, Panchayat officials, members of the Darbar community, forest rangers, milk collectors, vehicle owners, Public Distribution System (PDS) dealers, and wool shearers are among the most important stakeholders. These stakeholders are not simply passing through. They have the potential to alter the experience and shape the lives of pastoralists.

Farmers

Sheep and goat pastoralists in Surendranagar rely heavily on agricultural land, particularly those involved in long-distance group migration. Farmers and pastoralists have a symbiotic relationship, in contrast to transactions involving middlemen. In order to benefit from the animal excrement that enriches the soil, encourages its regeneration, and lowers the need for fertilizers, farmers welcome pastoralists to camp overnight in their fields. In exchange, farmers pay pastoralists in grain or cash, depending on the farmer's ability. Furthermore, farmers may provide drinking water as well. Unfortunately, this is not always the case. Pastoralists are often required to work in the assigned agricultural field for nothing in return other than permission to stay. Weeding, restocking irrigation systems, harvesting cotton, and disposing of cotton agricultural waste are all tasks performed by pastoralists. In quality rainfed agricultural areas such as Anand and Kheda, farmers have completely shifted to paddy cultivation. Owing to damp soil, often livestock cannot move freely and the damp area is a hub for mosquito breeding. Mosquito attacks are extremely dangerous to both livestock and humans. In addition, the theft issue prevails while reaching these areas. Pastoralists frequently decide to avoid these places due to these risks.

In Surendranagar, farmers used to have livefences in the form of *fafda thor (Opuntiasps.)* and *danda thor (Euphorbia sps.),* but increasing numbers of nilgai and wild boar has forced them to use electric fencing, which limits the amount of forage availability. Furthermore, agricultural encroachment on common lands has severely reduced the forage. In addition, due to the unseasonal heavy rains currently in Surendranagar, farmers harvested cotton ahead of schedule and planted cumin. Pastoralists who choose short-distance group migration are supposed to visit these fields, but the harvesting times for cumin and cotton differ. The agricultural fields of Surendranagar are essential to both small-scale group migration and village-based pastoralism. As a result, they were severely affected by the phenomenon.

Veterinary Doctors

Veterinary doctors are essential to pastoralist communities because they provide critical healthcare services that protect the well-being and productivity of livestock. The unavailability of veterinary doctors frequently disrupts pastoralists' lives. Pastoralists are required to vaccinate all of their livestock twice a year. Each sheep or goat vaccination costs around 40 to 50 rupees. Along



Figure 26. Indigenous goats grazing on post-harvest cotton stalks (Gossypium sp.). This agro-pastoral practice effectively clears crop residue while providing high-fiber nutrition for the flock and natural fertilization for the soil.



Figure 27. A veterinary professional administering essential vaccinations to a Panchali sheep. Regular immunization programs are vital for migratory flocks to prevent outbreaks of contagious diseases such as PPR (Peste des Petits Rumineurs) and FMD (Foot and Mouth Disease)

with that, livestock require other medications. When treating livestock, one cannot treat only half of them; the entire herd must be treated. AMUL's free vet policy for cows and buffaloes often provides relief in this situation for those who keep cows in addition to sheep and goats, as they correspond with AMUL veterinary doctors. The accessibility issue remains, as AMUL is not present in every block. While seeking subsidized medicine for livestock in another area, often pastoralists are denied this because they belong to a different area. This creates an additional challenge for pastoralists.

Panchayat Officials

People who choose long-distance group migration frequently need to obtain a No Objection Certificate from the Panchayat Office. They stay at their destinations for a longer period (about 3 months) than in other areas. This NOC enables them to graze their livestock freely within the boundaries of the Gram Panchayat jurisdiction. Pastoralists use this NOC in groups of 5 to 6 people. The costs are declared based on the livestock and the Gram Panchayat's policy, and it costs them between Rs 20,000 to Rs 1 lakh depending on the group size. Traditionally, these panchayats used to provide clean drinking water and security guards for all NOC holder groups because livestock are frequently stolen. Livestock theft continues to occur, but the provision for security has been discontinued.
Those who already have positive relationships with Panchayat members are less likely to invest in these NOCs, preferring to rent and settle in for similar periods of time for a relatively cheaper rate(Rs 20,000 for 3 vigha/8 month). Those who rent land are frequently seen buying dry fodder for their livestock. Perhaps due to the storage facility and obviously for the herd's food safety as well. They purchase for Rs 50,000 per year/ 100 livestock on an average.

Darbar Community

'Darbar' is a title given to former owners of pre-independence princely states with large land holdings. However, after the Land Reforms Act was implemented in Gujarat, disputes arose. Though they may no longer own it on paper, *de facto* they have complete control over the land. These Darbars hire people to regulate private Vidis and lend to pastoral groups. However, this land is gradually shrinking due to technological development. Wind turbine and solar companies have rented these spaces, subsequently reducing the available grazing land.

Forest Rangers

Those who opt for short distance group migration or village-based pastoralism often take their herds to Reserved Forest areas, where they come into contact with forest rangers who charge penalties and do not allow them to graze their herds. Hence, despite the provisions of the Forest Rights Act, local forests are inaccessible to pastoralists, which creates obstacles in accessing forage for their livestock.

Milk Collectors

Surendranagar sheep and goat pastoralists depend heavily on milk for their primary source of income. They typically sell their milk to four types of buyers, which include local dairies and local residents.
The accessibility of the area they live in frequently influences their decision about whom to sell to. Due to time constraints during their travels to remote areas, pastoralists sell milk to either private dairies, locals or middlemen. Middlemen frequently take the milk and supply it to the State or affiliated cooperatives, reaping the most benefits. There is provision to receive an annual bonus based on how much milk suppliers have provided, on an average it ranges from 8% to 12%. This bonus system is only available in the case of State cooperatives and affiliated cooperatives. If middlemen come into play they get the bonus instead. Therefore, these constraints on the pastoralists lead them to being



Figure 28. Maldhari pastoralists submitting an Aavedan Patra (formal application) to local authorities for securing vaada (designated shelter/ enclosure spaces) for their livestock, including goats and sheep—highlighting collective efforts to formalize grazing infrastructure and



Figure 29. Small-scale milk collection at a roadside hub. Private dairy procurement of indigenous goat milk provides a steady daily income for Maldhari households, incentivizing the conservation of high-yielding Zalavadi and Gohilvadi breeds.

deprived of their benefits.

Vehicle Owners

The pastoralists need vehicles for reaching migration destinations and returning home on choumasa via long distance group migration. They walk for the most part but there are exceptional cases for those who travel to Kutch, they need to take a vehicle. The hire of one large vehicle costs a minimum of Rs 10,000 Vehicles remain one of the heavy out-of-pocket expenditures for pastoralists.

PDS Dealers

Food often runs out while migrating to remote areas, which are often far from markets. Pastoralists rely heavily on the PDS system to ensure food safety. However, not every pastoralist can avail of food through PDS. Pastoralists generally have a rich and nutritious diet,but nutrition tends to suffer during migration. They cannot carry sufficient food for their entire tenure. Even if they attempt to, climatic difficulties like sudden rainfall pose an additional problem in the storage of grains.. Also, during the breeding season, milk production drops drastically which in turn affects incomes. During times of scarcity, they are unable to meet even their basic food requirements. Here, PDS may play an important role and change their experience by providing subsidized quality food.

Wool Shearers

Shearing wool is a crucial need for any sheep farmer. Certain plants produce thorn-like fruits that cling to a sheep's wool and irritate the animal. Thick wool may also interfere with their ability to regulate body temperature. Shearing the wool thus becomes mandatory for pastoralists. In the past, the Gujarat Sheep and Wool Development Corporation Limited (GUSHEEL), would purchase the wool at a rate of 10 to 20 rupees per kg , but this is no longer the case. Pastoralists who own small numbers of sheep shear the wool by themselves. However, those with large herds employ a wool shearer. Shearers charge 15-20 rupees per sheep. Many pastoralists discard the wool because there is virtually no market for Panchali wool, with only a few enterprises using it for



Figure 30. A pastoralist woman processing milk in a rural household in Surendranagar, reflecting the central role of small ruminant milk in local livelihoods.



Figure 31. Members of the Darbar community discussing the changing dynamics of land lease and grazing rights. Their role is pivotal in the pastoral economy, as they facilitate the seasonal rental of private rangelands to migratory Maldhari groups.



Figure 32. Mechanized shearing of Panchali sheep. The use of electric clippers improves efficiency, reduces the risk of skin injuries to the animal, and ensures a more uniform fleece length compared to traditional manual shearing methods.

producing carpets and coats.

Health and Education

Health Challenges

Continuous travel has significant repercussions, affecting women and children the most. Migrating pastoralists sleep in the open irrespective of the season. Only a few of them set up tents and keep their belongings inside. Otherwise, they generally sleep on khatlass, i.e., cots,in the open. The lack of toilet facilities leads them to practice open defecation. They rely on nearby wells, ponds, or canals for water, often drinking from these sources, especially when farmers do not provide drinking water. When severely ill, pastoralists engaging in short-distance group migrations may return home, while others tend to ignore health issues altogether. They typically visit nearby clinics if needed, but women during their pregnancy mostly miss antenatal check-ups while migrating, posing risks to their health and that of their unborn children. Despite these challenges, women say that during migration they have less work compared to being at home. When asked about their preference, most of them expressed a preference for fieldwork as it is essential for their livelihood. However, they also acknowledged the rewarding and comforting aspects of being at home, despite the risk of starvation.

Educational Constraints

Children between the ages of 0 and 5 years usually migrate with their parents. They consequently lose out on receiving an elementary education. Many are left at home when they turn five, cared for by other family members, relatives, or neighbors while their parents keep moving. High school students frequently attend two distinct schools: one in their hometown and one while migrating. Some students from pastoral communities also reside in hostels in order to continue their education. The social capital and financial standing of a child's parents frequently play a role in education decisions. Many pastoralist children struggle to enjoy school because they were not given an elementary education, and they frequently drop out before finishing, especially after they have reached tenth grade. In pastoral communities, gender norms also have a big impact



Taking Stock of the Challenges

Cumulative Impacts of Multiple Challenges

As we have seen, pastoralists face numerous challenges these days, ranging from invasive species of plants to climate change factors to changes in crop patterns by farmers. The introduction of external plant species such Neltuma juliflora and Senna uniflora to hold back desertification and deforestation and to improve soil fertility, has over time emerged as a problem, as these species take over grazing lands and replace usable forage. As these species propagate rapidly and do not possess much use for pastoralists along with potential toxicity to livestock, they pose a significant problem to pastoralists.

Climate Change

Issues such as sudden and erratic rainfall resulting from climate change present an additional problem to pastoralists. Their migration patterns, and lifestyle when they are away from home, get severely disrupted, and there are even casualties among both livestock and pastoralists because of dangerous events such as sudden hailstorms. Additionally, these problems also disrupt harvesting patterns for farmers, which adversely affects the availability of opportunities related to agriculture land forage to pastoralists.

Changing Agrarian Scenario

Farmers shifting to newer crops, rather than continuing with the ones that pastoralists are used to and derive benefits from, has also adversely affected their relationship with farmers and has caused their available options to shrink. For instance, earlier, farmers used to plant groundnut and legumes, which are highly desirable to pastoralists as most parts of these crops can be utilized by them. However, the shift towards planting castor, cumin and paddy have affected pastoralists negatively as their harvest does not align with their migration patterns and not much of these crops can be utilized by them. Additionally, although paddy does not clash with migration patterns, it has other disadvantages such as making the farmland muddy, which hinders livestock mobility and causes mosquito infestation harming livestock and humans and leading to diseases.

Negotiating Local Governance

An additional hurdle pastoralists face is that of obtaining No Objection Certificates from Gram Panchayats for access to grazing land in these Panchayats' areas. Pastoralists have to pay a significant fee to avail of an NOC, ranging from Rs 20,000 to 1 lakh , depending on the number of families applying as a group. This fee can present an additional financial burden during times of crisis. Earlier, panchayats also used to provide security for pastoralists against livestock theft, but this provision has been discontinued, which has further made justification for fees difficult.

Additional Emerging Costs

Lastly, the shrinking of commons, and changes in land use patterns themselves present major challenges to pastoralists, as they lead to a multitude of adverse impacts on their lifestyle and livelihoods. For instance, pastoralists have increasingly resorted to purchasing dry fodder for their livestock as sufficient forage is not available.



Conclusion

In conclusion, the findings from interviews and discussions with pastoralists underscore the critical role that land plays in their livelihoods. Agricultural land emerges as the most utilized form of land, fostering mutually beneficial relationships between farmers and pastoralists. However, challenges such as encroachment, wind turbine and solar farms , and illegal activities like dumping ceramic waste significantly impact the availability and quality of grazing lands.

Pastoralists also face multifaceted challenges ranging from invasive species to climate change-induced disruptions, exacerbating their already precarious existence. Changes in crop patterns by farmers further limit pastoralists' options, affecting their traditional migration patterns and access to forage.

Moreover, bureaucratic hurdles, such as obtaining No Objection Certificates, impose additional financial burdens on pastoralists. The discontinuation of security provisions by Gram Panchayats adds to their challenges.

Overall, the shrinking of commons and changing land use patterns pose significant challenges to pastoralists, necessitating concerted efforts from policymakers, stakeholders, and communities, to safeguard their lifestyles and ensure their sustainable livelihoods. Addressing these challenges requires holistic strategies that balance the needs of pastoralists with broader environmental and socioeconomic considerations.



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