From liability to co-existence: Changing the relationship of the camel with communities in Bajju and Chimana clusters

Cluster Advancement Roadmap

Towards building a thriving ecosystem for camel-based enterprises for western Rajasthan

Urmul Trust

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Overview

A full industry creation exercise, over the course of three years, the Camel partnership aims to mobilize the camel herding community, knowledge & potential in the three districts of western Rajasthan- Bikaner, Jaisalmer, and Jodhpur. We aspire to facilitate herders to take charge of their livelihood and drive an inclusive, accountable, collaborative, and, sustainable enterprise ecosystem.

Cluster Advancement Roadmap provides an overview of the livelihood challenges faced by camel herders of the three districts of western Rajasthan- Bikaner, Jaisalmer, and Jodhpur. It then details out the inception of the Camel Partnership- a collaborative which is facilitating the mobilisation of resources and knowledge of stakeholders towards building a camel derived product value chain. The Partnership has developed the framework of focusing interventions on communities, enterprises, and policies.

In the past year, efforts to mobilize the herders was undertaken, support in disease and nutrition management was extended and measures to invoke the interest of the herders to revive their lost livelihoods around came-derived products were launched. Currently, focused interventions around developing camel-products based enterprises for the herders in these districts have been launched. This document provides the reader with an understanding of the challenges & opportunities that lie ahead and the required infrastructure to set-up a full-scale enterprise of camel-based products for western Rajasthan.

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Vision

Through a comprehensive set of interventions spread over three key verticals – Communities, Enterprises, Policies – the Camel Partnership plans to set-up a resilient ecosystem to support camel herders and enable camel enterprises to take on ecosystem management and development work.

- Through a comprehensive range of input services achieve qualitative and quantifiable improvement in the camel-derived products value chain in the western Rajasthan districts of Jaisalmer, Jodhpur & Bikaner
- Achieve a fair, inclusive, accountable, auditable enterprise to scale the business opportunities
- Achieve community owned and professionally managed value chain for camel products
- Achieve a cadre of enterprising changemakers across the value chain
- Facilitate the establishment of a policy environment that is responsive to the challenges faced by camel herders

Background

Animal husbandry is a traditional occupation and the backbone of the communities in ruralscape. In the Thar desert, it's more pertinent as a scope and means of livelihoods, given the high variability and unpredictability of rains. Cow, goat camels, and sheep are reared in abundance and provide for milk and wool. Camel is a unique feature of the Thar desert. Its interdependence with community and living has meant special care and utility for the animal. It has enjoyed high popularity and demand amongst the herding communities of Rajasthan for its resilience to the climate of the region and the functions it used to play.

Over the years, however, there has been a significant decline in the population of this animal – a crucial component of desert living and the overall ecology of the region. Historically, camels are used for transportation and heavy work – water lifting from well, seed sowing, mill grinding, etc. All these applications have faded away in recent years. With all these applications fading away and in the absence of alternative functions that it could play in the living of the desert, the camel is facing a great survival challenge.

The relationship of this animal has changed from coexistence to liability amongst the herding community. Today a household cannot survive and sustain itself only by rearing camels. Traditional camel products like camel milk, camel leather and products made out of camel

hair no longer have a local market or demand in the community thanks to globalization thence availability of cheaper alternatives, fast fashion and no lack of value chains. The higher feed and health costs are due to shrinkage of CPRs, loss of traditional revenue stream, and poor reach of existing support services.

Problem Statement

The camel is facing a survival challenge in the desert ecosystem. There are higher feed and health costs associated with the animal due to shrinkage of common property resources, loss of traditional camel based products revenue stream, and poor reach of existing support services. Further, the recent Rajasthan state ban on the trade, slaughter and transfer of the animal has further curbed any limited livelihood that could be earned by the camel herding community. In the absence of alternative functions that a camel could presently play in the living of the desert, the ship of the desert is facing serious threat to its existence.

Our Strategy

The above establishes the intent, spirit and the interventions process flow of the Camel Partnership. Camel and the sand dune depict our interventions around mobilising the camel herding community and addressing the gaps around input services; the core circle reflects the establishment of camel-derived products enterprise to galvanize the efforts towards business continuity and building a steady livelihood stream for the herders; the dotted line represents the policy linkages to be established for creating a conducive entrepreneurial and policy environment. By leveraging this three-pronged strategy, the Camel Partnership would enable the establishment of a thriving camel-derived value chain in the identified clusters.

Cluster Development: Bring Communities Together

The camel herding community in western Rajasthan faces a lack of capital, institutional support, and knowledge to ensure marketing of camel milk and its varied products.

We believe that adopting an approach of mobilizing government resources, utilizing social capital, and garnering financial support could result in the economic prosperity of the identified cluster. The principles of cluster development would ensure wholesome connectivity of all the actors in the ecosystem. With these principles guiding us, we see the camel based value chain ecosystem consisting of three major domains comprising of communities, enterprises, and policies.

Communities

Historically, camel herding communities in Rajasthan have been dependent on the animal for their livelihood. This domain would exclusively focus on mobilizing efforts and resources of the community to revive this traditional avenue of livelihood. The interventions would work across three levels- good nutrition, access to medical resources and generating awareness to restore this livelihood avenue. In addition, the young camel herders would be mobilised & trained to take up varied roles in the value chain such as of milk collectors, transporters, para-vets, or they could work as technicians in the value addition to camel milk in the processing unit. Their engagement would enable them to build a local lucrative employment opportunity.

Enterprises

The focus would lie on initiatives that encourage enterprises and institutions in these clusters to undertake joint actions. This would ultimately yield benefits to the cluster as a whole. These communities would require the establishment of standard operating procedures for quality control and streamlined value chain. Sufficient infrastructure allocation to support the value chain would have to be accumulated.

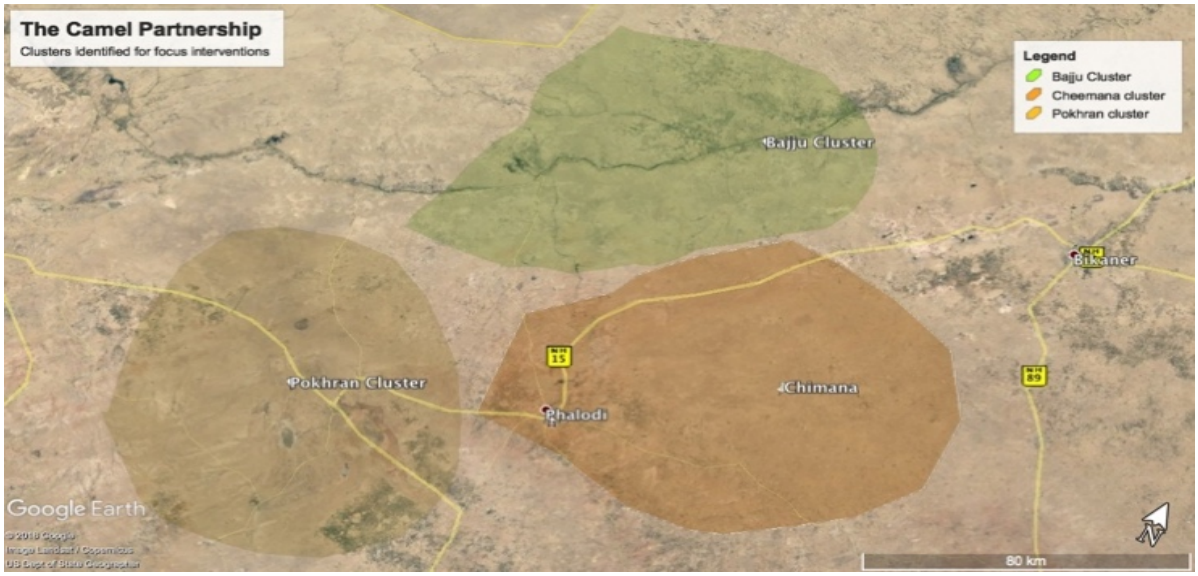
Urmul Trust would aid the camel herding community in the establishment of a model camel milk-based enterprise. Further, Urmul Trust would facilitate the community members to get linked with entrepreneurs who would provide them with the resources, sophisticated technologies and access to domestic & international markets.

Policies

Through focused policy advocacy measures a vibrant policy ecosystem would be developed. This would ensure that all the stakeholders render necessary support and their actions are

not carried out in silos. Policy advocacy dialogues with the stakeholders across levels would have to be undertaken.

Across the three focus verticals- communities, enterprises and policies, the Partnership plans to systemically engage with stakeholders, design scalable enterprise models, promote market creation and foster cadre of leadership and micro-entrepreneurs. A visual of all the verticals:



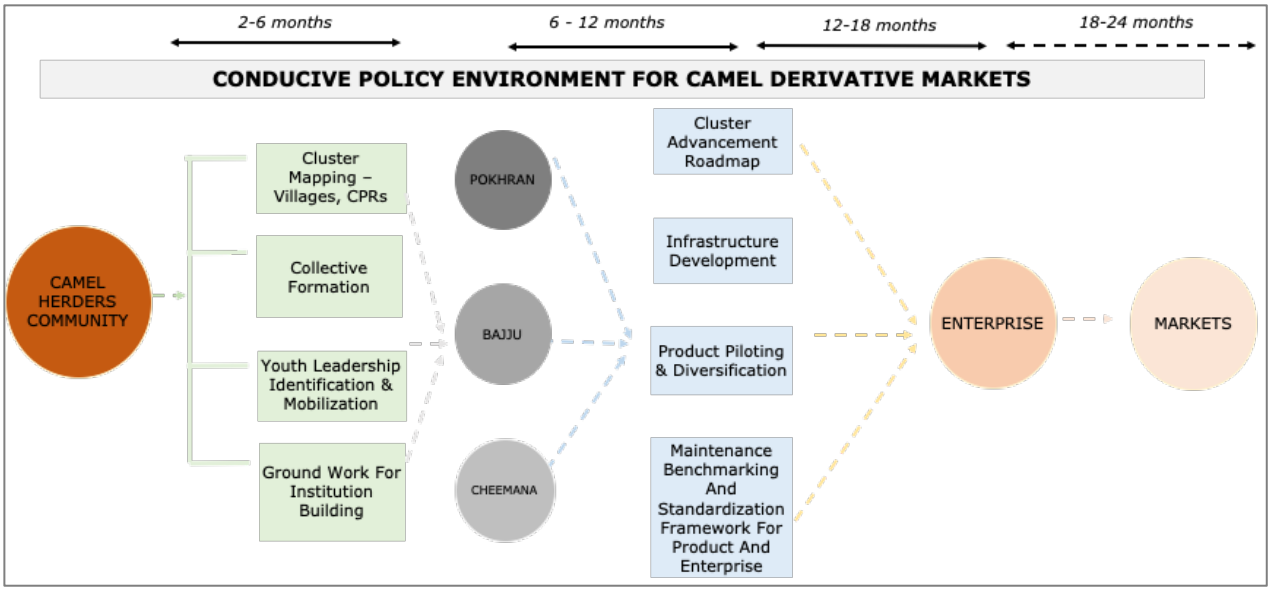
The partnership interventions shall spread across the three core verticals with a targeted reach of over 5000 households affecting over 25000 individuals in the western districts of Bikaner, Jaisalmer & Jodhpur. Spread across the three years a definitive outcome shall be a brand driven camel milk enterprise – enabling the community and markets. The timeline for organizing the community members into an enterprise and connecting them with the market is depicted in the image below. As represented,

- In the Pokaran cluster, the camel herders have been identified and mobilized for milk collection. The team is currently focusing on procuring equipment for bulk milk chiller to kickstart their camel based enterprise.

- In the Bajju and Chimana clusters, the camel herders have been mapped. Efforts to facilitate their organization into groups and build their capacities around disease prevention, grazing practices, and milk hygiene are underway.

Our Timeline

The activities in the one year focused around the concerns of the community. During the next six months, focus on building their capabilities and providing the required infrastructure & support for enterprise development would be ensured.



Our Stakeholders

TCP stakeholders map and intervention touchpoints

Current progress of the camel clusters across the verticals

	POKARAN	BAJJU	CHIMANA
COMMUNITIES			
Cluster Mapping	5 villages	37 villages	24 villages
Households reached through baseline surveying	100 HHs	546 HHs	550 HHs
Meetings and focused group discussions	Village-level and cluster level meetings organized frequently		
Health Camps for camels	16 camps for 2829 camels	8 camps for 983 camels	*Health camps were cancelled due to COVID-19 lockdown measures
Documentation of ethno-veterinary practices used to tend to diseased camels	**Detailed findings discussed in annexure 1*		
Documentation of abundantly available local vegetations that are nutritious for the camels	**Detailed findings discussed in annexure 2*		
ENTERPRISES			
Institutionalization of community groups Facilitating ecosystem management and development work through democratically elected • Steering committee: 7 members from the village committee would be elected and 3 from Urmul would be elected to guide their efforts • Village committee: 3 members would be elected by the camel herders from every village	One cluster federation formed	One Bajju cluster federation formed with Chimana cluster federation integrated with it	

Focused trainings of youth on • diseases identification & management • nutrition management • milk hygiene maintenance and quality control • generating awareness on therapeutic value of camel milk • generating awareness on growing demand of camel milk in domestic markets	Visit to Bhuj organized	Visit to NRCC organized	Planned for April
Youth cadre formation – currently working on ground ecosystem building and village level PRI advocacy	5 youth	27 youth	Yet to be identified
Collection center development	BMC center established	BMC & milk processing unit construction underway	Not planned as yet. Integrating with Bajju & Pokhran
POLICIES			
Policy and industry dialogues	Regular meetings taking place at State and District levels		
Networking for Camel Milk with Other Organizations	The Camel Partnership formation		

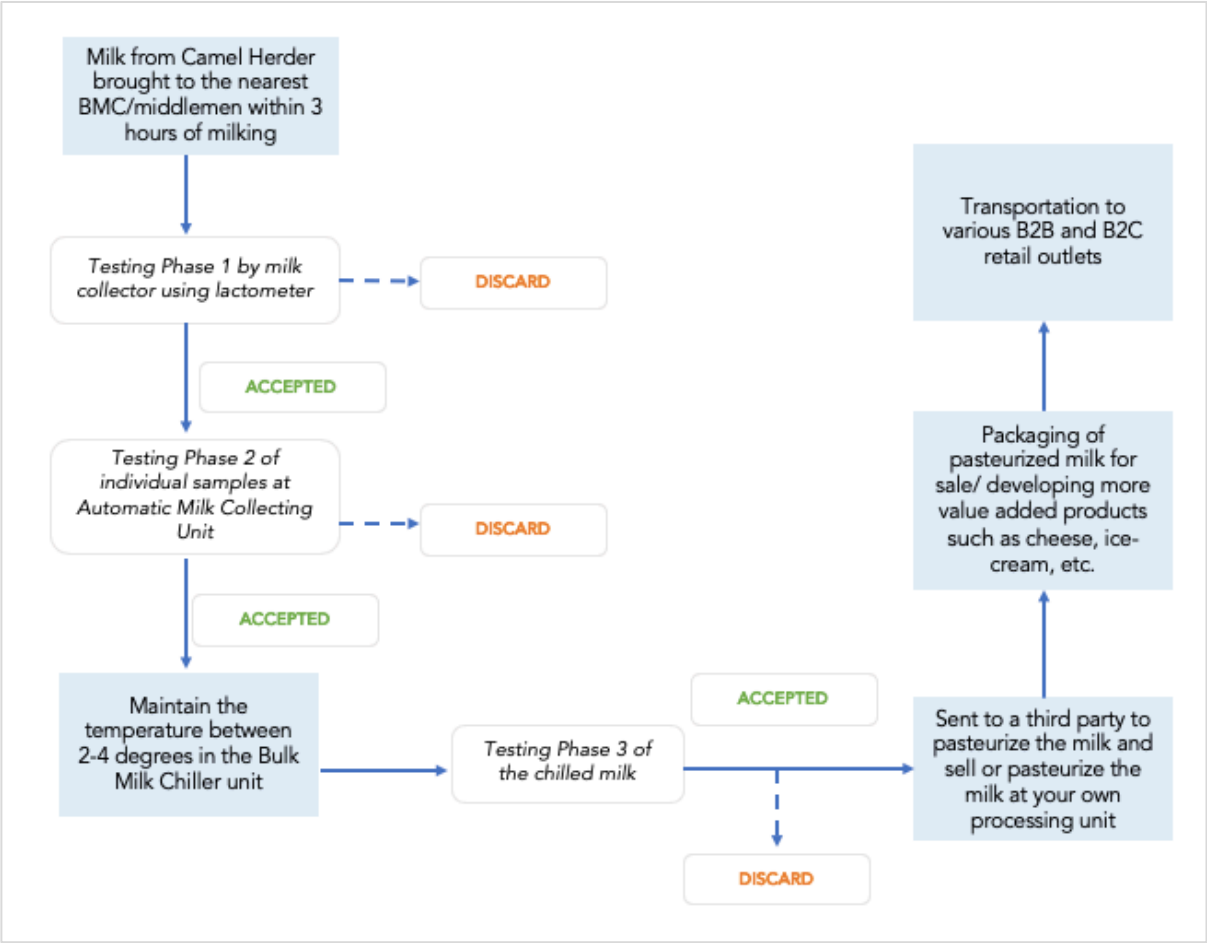
The Collaborative

A broad stroke of interventions, basis the field challenge mapping, dialogues with knowledge resources, interactions with stakeholders have been initiated

PARTNERS	COMMUNITIES	ENTERPRISES	POLICIES
Axis Bank Foundation			
Bask Research Foundation			
Centre for Pastoralism			
Desert Resource Centre			
HDFC Bank			
Government of Rajasthan			
National Research Centre on Camels			
Rajasthan University of Veterinary & Animal Sciences			
Revitalising Rainfed Area Network			
Sahjeevan			
SELCO foundation			
Urmul Trust			
Urmul Seemant Samity			

Towards building an enterprise: Milk collection and processing model

Milk collection efforts would be undertaken with the aid of youth changemakers. In addition, they would be trained and supported to establish their own camel milk derived enterprises.



The current lactating camels mapped through the baselining surveys across the three clusters are represented in the table below,

	POKARAN	BAJJU	CHIMANA
Number of villages	3	37	37
Lactating camels	1309	566	**Mapping still underway*

Swot analysis of presently building a camel milk value chain

Through a SWOT analysis, the key areas where our strengths and weaknesses lie have been identified. Further, the potential threats have been mapped and the opportunities that can be realized have been identified. Our resources and knowledge would focus on addressing these gaps and leveraging our strengths to build a camel-derived product value chain.

STRENGTHS	WEAKNESSES
▪ There is a ready local market for camel milk ▪ The 3 districts- Bikaner, Jaisalmer, and Jodhpur in western Rajasthan host the largest camel herd population in India ▪ Camel milk production is based on extensive use of natural grazing lands making it a low input system thus reducing the forage costs of herders ▪ FSSAI has published standards for camel milk ▪ The space has attracted interest from private players and has greater potential to attract venture interests	▪ Camel herders have not leveraged pooling of resources to set-up enterprises ▪ Outside western Rajasthan, there is still a lack of consumer awareness on the nutritional and health benefits of camel milk ▪ Lack of infrastructure such as good roads and electricity would hamper transfer of milk ▪ Lack of awareness on technical skills for value addition of camel milk products ▪ Expensive to adopt sustainable technologies and equipment ▪ To improve milk yield, extensive training to ensure veterinary care and manage nutrition of the camels need to be provided to the herders ▪ Potential of high milk spoilage due to microbial contamination
OPPORTUNITIES	**THREATS**
▪ Increased interest and funding support from government and entrepreneurs to build camel milk value chain ▪ Increasing demand for value added camel milk products milk powder and ice-cream ▪ Existing milk dairy cooperatives such as Rajasthan Co-operative Dairy Federation could pool resources to upscale production	▪ Existing social group hierarchy could hinder the enterprise building efforts ▪ Competition from other dairy products derived from cow and goat milk ▪ Competition from other players such as Amul, Aadvik, among others

Support required to overcome challenges

The gaps could be addressed by launching concerted efforts and aiding each stakeholder realize their potential.

STAKEHOLDER	SUPPORT REQUIRED
Camel herders	▪ Training on proper animal husbandry including o disease prevention o good breeding practices o grazing management o milk hygiene ▪ Link them to input suppliers such as for veterinary drugs, nutritious feed mixture, etc.
Milk collectors and processing technicians	▪ Training to ensure milk hygiene and prevent it from spoilage ▪ Link traders to markets and input suppliers such as equipment suppliers ▪ Infrastructure support such as milk sheds, aluminum milk cans and chilling facilities
Entrepreneurs	▪ Investment to build full scale camel milk derived products enterprise

**Government, industry representative bodies, and non-profits should collaborate and host camel milk entrepreneur dialogue platforms*

The current production level produces a daily average of 1 to 2.5 litres per camel over a lactation period of 9 to 10 months (sometimes 12 months). It is believed to be far below the camel's production potential.

Indicative business plan for processing milk at BMC

Initially, the milk would be sold to vendors who have milk processing capabilities and FSSAI license. As soon as the enterprises operating in these clusters set up their own processing units and get FSSAI license, they would have the capacity to package the milk and sell it in the market or develop value addition products and then sell those in the market.

The indicative business plan for setting up milk processing efforts at BMC has been discussed,

COST BEARING CATEGORY	QUANTITY	COST PER MONTH (APPROX.) [INR]	COST PER DAY [INR]
Electricity	1	12000 (8rs/unit)	400
Human resources	2	16000	533.33
Water	As and when required	1500	50
Machinery maintenance	As and when required	2000	66.66
Cleaning chemical	As and when required	2000	66.66
Stationery	As and when required	1000	33.33
Total		34,500	1,149.98

NOTE: These are just the primarily highlighted cost indicators. While the efficient working of the BMC will be in progress, some more expenditure costs can arise
**The initial equipment required is detailed out in the next section*

Assumption 1: The minimum amount of milk collected from the herders per day in each cluster remains to be 500 litres across the year

Assumption 2: Transportation hiring cost as per the current market prices: Rs.9/KM

CATEGORY	QUANTITY/ VALUE	AMOUNT [INR]
The transportation cost	500km [Rs.9/km] (250 km one way)	4500
Aforementioned cost		1149.98
TOTAL		5649.98

Milk/ Litre Cost: 40 + (5649.98/500)
40+ 11.29 = **51.29**

Initial equipment required

	CAPACITY	QUANTITY	POWERING	SYSTEM PLACE OF INSTALLATION	DESCRIPTION
BMC	1000 L	1	Electricity	BMC Centre	
Milk Tester Kit	-	1	Electric/Manual	BMC Centre	Proper Testing Kit is required at the BMC centre as the herders will carry the milk till there
Thermal Insulated Can	40 L	10		Milk Transportation	Required for the easy transportation of milk to the vendor/s. In future, youth would also use them for milk collection purpose
Cleaning Equipment		As per the requirement	Electric/Manual	BMC Centre	NIL
Geyser	10 L	1	Electric	BMC Centre	For the purpose of cleansing the cans and The BMC, warm water would be a requirement
Weighing Equipment		As per the requirement	Electric/Manual	BMC Centre	Nil

Way Forward

Recently, the central government has launched policies such as Start-up India to promote innovation and extend support to budding entrepreneurs. With a conducive policy environment, the stakeholders must mobilize resources, efforts and knowledge to set-up a robust camel derivative value chain.

Annexure 1

Ethno-veterinary practices: Documenting threatened traditional knowledge

The camel herders in western Rajasthan have spent their lives observing camels. They have been existing and interacting with plants, landscapes, soil, and the weather. The knowledge they gathered is the product of their regular exposure and experience. This knowledge has been passed from one generation to another. This knowledge has not been documented in books and cannot be learned from textbooks. Every generation of young camel herders has learned this from their elders. The traditional inputs were a combination of plant and animal products, with other natural products. These treatments varied according to the ailment. The use of these measures depended on how effective the therapy is and the sharing of therapeutic knowledge among the herders.

Experienced herders have developed understanding around the following:

- Knowledge about the traits of each camel in their herd.
- Its social and genetic relationship with the other camels. Male breeding camels are selected carefully, taking factors such as height, colour, temperament, and character, as well as the milk yield of his mother and female relatives.
- Gained knowledge about the effects of specific plants on the health of the camels.
- Knowledge of how varied plantation impacts the quality and taste of the milk.
- Knowledge about how to keep camels healthy by moving them to specific grazing areas where they believe the vegetation is nutritious.
- An indigenous camel disease classification system and knowledge about making medicines to treat the camels from plants collected.

This knowledge was passed across generations. However, with the younger generation opting for alternative livelihoods the interest to gain this knowledge has disappeared. Camel herders have increasingly come to rely more on modern commercial medicines. This reliance has been met with distrust from community elders. They believe that traditional medicine derived from ecological resources has a greater impact. The traditional practices that were followed were either preventive or curative in nature. In our efforts to ensure that this information does not get lost, we have documented certain ethnoveterinary practices in this section categorised according to disease areas and reproductive practices. In the first part, we share our interviews with the camel herding community elders and in the second part of the section we have compiled the information we collated during our field work.

I. Learning from the Elders: Interviews with Camel Herders*

i. Phularam Meghwal
Bikampur village, Bikaner district

Our family has been rearing camels for the past 50 years. I was responsible to take our camels to the nearby pasture lands. These animals used to feed on *Khejri*, *Ber*, and *Jaal*. They used to get the required nutritional support from these plants. Over the decades, there has been a sharp decrease in these plantations, thereby, depriving the camels of rich sources of natural forage. Currently, the camels have to feed on *Prosopis juliflora* popularly known as *angrezi babool* in the region for fodder that does not fulfil their nutritional requirements. With the decline in diverse plantations, arranging forage for the camels has become expensive and cumbersome.

In the past, when our camels were infected with *Mange* then we used to mix Sesame Oil or Mustard Oil with *Leucas Aspera* locally referred as *Tumba*, boil the mixture and then apply the mixture on the infected areas. We also used to apply sulphur mixed with sesame oil or mustard oil that is believed to be beneficial for animals infected with Mange. The camel has been an important part of our lives. We used to depend on camel milk during droughts and harsh summers. Our community needs to come together and ideate on finding a solution to our current problems. If these problems remain unaddressed then we would soon be losing the ship of the desert.

ii. Bhakar Ram Bishnoi
Gajjewala village, Bikaner district

We have been rearing camels for generations. The animal has been part of our family and our heritage. Unfortunately, with the present challenges around their health and fodder, it has become difficult for us to maintain the large herds we used to have.

**Note: The interviews of the camel herders are embedded in the document.*

Across the community, when our camels were infected with *Mange* we used to mix Sesame Oil or Mustard Oil with *Leucas Aspera* locally referred to as *Tumba*. The present-day vaccinations used by the veterinarians have barely any impact on our animals. Even the forage such as *Prosopis juliflora* popularly known as *angrezi babool* is abundantly available but it is not nutritious for our camels.

In the past the camels used to fetch a good price in the market, Even though the present current rate in the market is INR 20,000- 25,000 but with the state-wide ban on trade, this source of livelihood has been curbed. We were easily able to earn a good amount and ensure that the requirements of the camel were met from that income. However, with the mounting healthcare costs, declining grazing lands and no income from the animal, we are being forced to reduce our herds.

iii. Mahadan Raika
Charanwala village, Bikaner district

Mahadan Raika has a herd of 70 camels. He comes from a family that has for generations been rearing camels. In the past, the animals used to rely on the plantations in common property resources that comprised of *Phog, Kair, Neem, Baboool,* among others. He lamented that presently all the traditional grazing areas are getting dried up and the locals are not paying attention to manage them correctly.

He emphasised that it is important to provide good medical services to the camels otherwise their survival would be seriously threatened. He said with his herd size being so large relying on modern medicine is difficult. He believes the ethno-veterinary practices used by his ancestors are efficacious today as well. He still uses Sesame oil mixed with *Leucas Aspera* locally referred to as *Tumba for treating animals infected with Mange.* In addition, the used engine oil of vehicles along with sulphur in paste form is applied to the affected area. He believes that these practices ensure limited expenses on the healthcare of camels.

**Note: The interviews of the camel herders are embedded in the document.*

iv. Bhanwararam Raika
Bajju Tejpura village, Bikaner district

Bhanwara has one of the largest camel herd in his own and adjoining villages. Due to the mounting veterinary care costs, he has resorted to switching back to ethnoveterinary practices adopted by his ancestors. The high veterinary care expenses took a toll on his family income and presently he uses only home remedies to tend to the diseased animals.

In the past, when the animals were infected with *Mange*, we used to rely on our ethnic veterinary practices. We used to apply sesame oil mixed with *Leucas Aspera* locally referred to as *Tumba* for animals infected with *Mange.* To ensure that the animals remained healthy, they were frequently fed with jaggery and alum. He emphasized that if he does not provide good medical services to the camels then the survival challenge would continue.

v. Megharam Raika
Kolasar West village, Bikaner district

I was just 10 years old when I started looking after our camels. Our region has deficit rainfall and the amount varied every year. During the times of low rainfall, we used to rely on camel milk for sustenance. We used to prepare *kheer,* buttermilk, and tea from camel milk. Everyone in the family was fed these dishes. Most of the camel herding families used to rely on camel milk during those harsh seasons. There was a scarcity of water so we used to feed them water in 5 days. *Phog*, *Kair*, and *Khejri* were present abundantly in the common property resources. The camels were fed those plantations. We never had to worry about their forage. Currently, there has been a sharp decrease in these pasture lands. Even last-mile veterinary care connectivity was a grave issue. It was difficult for us to traverse large distances with our camels and the doctors did not use to come to our region.

**Note: The interviews of the camel herders are embedded in the document.*

We used to rely on our traditional methods for ensuring the good health of our camels. When the camels had any gastric problems then they were fed *Asafetida* and *Cumin seeds* were mixed and fed to the animal. We used to apply sesame oil mixed with *Leucas Aspera* locally referred to as *Tumba* for animals infected with *Mange.* The state government needs to help us to bear the expenses of our camels.

II. Ethno-veterinary practices discussed during fieldwork

The following ethnoveterinary practices were discussed in many of the conversations during our fieldwork in Bajju cluster. In the section, they have been classified with concerning the diseases and during their gestation cycle they are used in.

1. Mange (*khujli, paanv*)

   The cases of Sarcoptic Mange was the highest. Camel Mange is a contagious skin disease, characterized by scab formation, pruritic dermatitis, thickening and corrugation of skin and hair loss, and caused by the parasitic mite. The camel herders also remain at risk of being infected. Its severity increases during the winter months. More cases of infestation are reported from September to December as compared to January-April and May-August. The incidence of the disease is greater in adult camels as compared to younger ones.

   Traditional treatment measures include applying the following mixtures on affected areas,

   - used engine oil of vehicles along with sulphur in paste form is applied. The treated animals should not be exposed to the sun for one/two days.
   - plastering of salty mud on the body of the animal and it should be repeated twice a week.
   - spraying the water boiled with younger neem leaves in water for about 30 minutes and allow it to cool. Spray the water on the body and affected parts.
   - sulphur (50 gms), copper sulphate (50 gms), Mansil (50 gms) and Potash (60 gms), are crushed and mixed thoroughly with 5 kg of oil. In case of more severity, it is mixed with the extraction of warm aak leaves and mixed with the above mixture.
   - gammaxene powder 5% one part, 2 parts ash, 1 part sulphur is thoroughly mixed in oil. The animals should be protected from severe sun rays for a few days.
   - oil extracted from banana leaves is applied on the infected areas.

- sulphur mixed with sesame oil or mustard oil is believed to be beneficial for animals infected with Mange.
- sulphur with extracts from the linden tree is mixed with oil and applied to the impacted area.
- anti-histamine such as Avil mixed with liver extracts and vitamin B-complex supplements is useful.
- yellow soil is applied to the affected areas.

2. Trypanosomiasis (sarra)

The diagnosis of Trypanosomiasis has known to be notoriously difficult. It is difficult to identify clinical signs. All camels are susceptible to the disease regardless of breed or age. If left untreated it could also result in the death of the camels. The traditional measures are limited for this disease. The camels are fed alum which is believed to be beneficial during this disease. With the traditional medicines and practices resulting in limited relief to the animal the reliance on modern medicine for treatment has increased.

3. Injury

The camels frequently have foot rot that results in swelling and lameness. The herders use a combination of varied measures that they claim relieves the animals of the pain. It includes:

- a hot rod treatment over the ears of the camel is undertaken.
- the urine of humans sprayed in the nostrils of the animals.
- chilled water or warm water sprayed in the nostrils of the animals. It is believed that when the animal responds with a jerk then their sprain gets treated.

(left) Gena Ram Raika applying a mixture of mustard oil with sulphur on his camel infected with Mange, Grandhi village, Bikaner district

(right) Mangi Singh posing with banana oil used for tending to Mange infection, Paithro ki Dhani, Girajsar village, Bikaner district

4. Gastro-intestinal problems
   - The camel herders have adopted certain practices to aid the animal during indigestion. They believe that if followed regularly the animals would be free from gastric infections.
   - Buttermilk (chaas) is regularly given to the animals because it is believed to have de-worming qualities and help in digestion.
   - In addition, turmeric is often added to buttermilk to aid in digestion.
   - Garlic is mixed with ghee and added to the diet of the animal.
   - The leaves and seeds of bitter cumin (kali jeeri) are sometimes used as herbal medicine to aid the digestion of the camels.
   - Alum is grinded and mixed with water. It is then fed to the camels as it is believed to neutralise the laxative effect of their diet.
   - The Leucas zeylanica (tumba) is fed to animals in varied forms. The seeds are either fed directly or the fruit is heated overnight and the seeds are fed to the camel in the morning.

5. Camelpox

   The disease results in morbidity, loss of weight and reduction in milk yield. The incidence of severe cases of Camelpox outbreaks is increased during rainy seasons and the milder form occurs during the dry season. The disease is characterized by an initial rise in temperature, followed by enlarged lymph nodes, skin lesions and prostration. The clinical manifestation of Camelpox varies from mild local to severe systemic disease. The herders use a host of measures that include:

   - azadirachta indica (neem) considered to possess anti-fungal and anti-bacterial qualities is boiled in water and applied to the affected areas.

- the urine of humans when applied topically to the skin, is believed to decrease the symptoms of skin infections and is applied on the affected parts.

REPRODUCTIVE HEALTH PRACTICES

1. During gestation

   To ensure that the camel remains healthy during the gestation period as well as the calf born is healthy, special attention is given to the nutrition of the camels. Ghee and jaggery is supplemented with the regular diet of the pregnant camels.

2. Care of post-partum camels

   Post the birth of the calves, the herders are very particular about ensuring that the camels are healthy and any possible infection is prevented. The camels are fed carom seeds (ajwain) which are believed to provide relief against gastric problems and aid in the recovery of uterus.

   Mastitis is recognized to be affecting almost all domesticated species of the animals and reported from all over the world resulting in colossal losses in terms of reduced milk production, cost of treatment, veterinarian's fee, discarding of milk, etc,. It is broadly described as subclinical or clinical subclinical Mastitis. The first is the presence of infection without apparent signs of local inflammation and the latter is an inflammatory response to infection-causing visibly abnormal milk. The herders believe that making the animal engaged in moderate post-calving exercise in terms of walking to relieve odema and subsequently the development of Mastitis.

3. For maintaining breeding studs

   The number of breeding males is usually very low in a herd. To ensure that they remain healthy, fertile and fit certain dietary supplements are added. These include:

   - red alum, jaggery, and mustard oil during the breeding season to avoid fatigue and increase libido.
   - black pepper is mixed with ghee or jaggery to increase the libido of the breeding camel.

Annexure 2

Nutrition management of camels

Rajasthan is home to a lot of drought-resistant plantations such as khejri, neem, babool, among others. The herders are not fully aware of the nutritional benefits of them. This vast expanse of knowledge was beneficial for the team and would aided them in disseminating information in the community around camel nutrition.

National Research Centre on Camel recommends a feed mixture that could be prepared by the herders themselves from locally sourced vegetation:

FOOD INGREDIENT	PROTEIN PERCENTAGE	ENERGY PERCENTAGE	PERCENTAGE IN MIXTURE	TOTAL PROTEIN	TOTAL ENERGY
Pods of Vilayati Babool (Prosopis juliflora)	7	75	32	2.24	24.0
Pods of Siris (Albizia lebbeck)	14	70	32	4.48	22.4
Leaves of Khejri (Prosopis Cineraria)	14	60	32	4.48	19.2
Salt mixture	-	-	2	-	-
Salt	-	-	2	-	-
Total nutrition of diet In mixture			100	11.2	65.6

The intake of this mixture varies as per the age/reproductive cycle of the camel:

Lactating camel	2 kgs of the mixture everyday
Gestating camel	1.5 kgs of the mixture everyday
Studs	1 kgs of the mixture everyday

National Research Centre on Camel have shared a list of trees, bushes, shrubs and seasonal plants available that are widely available and should mandatorily be part of the diet of the camel. The details are mentioned in the section below:

MONTHS	TREE	BUSH	PERENNIAL GRASSES
JANUARY	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)*	▪ Ker *(Capparis decidua)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Panicum turgidum)*
FEBRUARY	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)*	▪ Ker *(Capparis decidua)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Panicum turgidum)* ▪ Dhaman *(Cenchrus ciliaris)*
MARCH	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Khejri *(Prosopis Cineraria)*	▪ Ker *(Capparis decidua)* ▪ Phog *(Calligonum polygonoides)* ▪ Pala *(Ziziphus nummularia)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)*
APRIL	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Azadirachta indica)* ▪ Leaves of Khejri *(Prosopis Cineraria)* ▪ Pods of Vilayati Babool *(Prosopis juliflora)* ▪ Pods of Siris *(Albizia lebbeck)*	▪ Pala *(Ziziphus nummularia)* ▪ Phog *(Calligonum polygonoides)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)*
MAY	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Prosopis Cineraria)* ▪ Pods of Siris *(Albizia lebbeck)*	▪ Pala *(Ziziphus nummularia)* ▪ Phog *(Calligonum polygonoides)* ▪ Murali *(Lycium barbarum)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)*
JUNE	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem	▪ Pala *(Ziziphus nummularia)* ▪ Phog	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)*

	(Azadirachta indica) ▪ Leaves of Khejri *(Prosopis Cineraria)*	*(Calligonum polygonoides)* ▪ Murali *(Lycium barbarum)*	
JULY	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Azadirachta indica)* ▪ Leaves of Khejri *(Prosopis Cineraria)*	▪ Phog *(Calligonum polygonoides)* ▪ Pala *(Ziziphus nummularia)* ▪ Murali *(Lycium barbarum)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)* ▪ Dhaman *(Cenchrus ciliaris)*
AUGUST	▪ Leaves of Khejri *(Prosopis Cineraria)* ▪ Pods of Vilayati Babool *(Prosopis juliflora)*	▪ Phog *(Calligonum polygonoides)* ▪ Pala *(Ziziphus nummularia)* ▪ Murali *(Lycium barbarum)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)* ▪ Dhaman *(Cenchrus ciliaris)*
SEPTEMBER	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Azadirachta indica)* ▪ Leaves of Khejri *(Prosopis Cineraria)*	▪ Phog *(Calligonum polygonoides)* ▪ Pala *(Ziziphus nummularia)* ▪ Murali *(Lycium barbarum)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)* ▪ Dhaman *(Cenchrus ciliaris)*
OCTOBER	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Azadirachta indica)* ▪ Leaves of Khejri *(Prosopis Cineraria)*	▪ Phog *(Calligonum polygonoides)* ▪ Pala *(Ziziphus nummularia)* ▪ Murali *(Lycium barbarum)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)* ▪ Dhaman *(Cenchrus ciliaris)*
NOVEMBER	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of Neem *(Azadirachta indica)* ▪ Pods of Vilayati Babool *(Prosopis juliflora)*	▪ Pala *(Ziziphus nummularia)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)* ▪ Dhaman *(Cenchrus ciliaris)*
DECEMBER	▪ Jal *(Salvadora persica)* ▪ Leaves and pods of Babool *(Acacia nilotica)* ▪ Leaves of neem *(Azadirachta indica)*	▪ Pala *(Ziziphus nummularia)*	▪ Sewan grass *(Lasiurus scindicus)* ▪ Murath *(Lasiurus scindicus)*

**Note: Botanical names of the vegetations are mentioned in grey color*

VEGETATION	NUTRITIONAL VALUE
Babool	An important, very thorny camel fodder tree, especially in the winter period. Camels eat both leaves and pods.
Dhaman	It is known to be more efficient at gathering carbon dioxide and utilizing nitrogen from the atmosphere and recycled nitrogen in the soil.
Jal	This plant is good for milk yields and the health of the camels, but it leaves the milk smelly.
Khejri	This tree is of immense importance for the people of the desert. Both leaves and pods are an important camel fodder. The leaves are also dried and stored as camel fodder.
Murath	*Murath* is rich in nutrition, both sustain the animals over long distances in the heat of summer.
Neem	The products of the tree are anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative.
Pala	It provides a sustenance when the ground cover is depleted. It is for this reason that it has such high importance in the desert ecosystem.
Phog	This is a drought resistant shrub providing fodder. It is also an excellent binder of shifting sand-dunes.
Sewan	It is one of the most productive and suitable grass for arid and semi-arid zones. It contains 8-10% protein during early growth.