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Herding and Livestock Management Strategies in the Upper Thar Desert, Sindh (Pakistan): A Zooarchaeological and Ethnoarchaeological Approach

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ABSTRACT

Animals and plants have been domesticated since Neolithic period, this culture change is widely known as "Neolithic Revolution". Consequently, the animal domestication became essential supplementary source in subsistence economy besides agriculture, fishing and hunting. In the ancient civilizations of Indus, Egypt and Mesopotamia animals kept for milk and other dairy products. Similarly, the Indus valley people mainly thrived on animal husbandry; the preferred animals were goat, sheep, cattle and water-buffalo along with several wild animals for hunting. The animal keeping continues till today, and Thar desert is chosen to understand the traditional ways where large herds of cattle and goat are seen roaming on the sand dunes and low-lying valleys among the sand dunes without any custodian. Therefore, this paper details and deals with socioeconomic behavior and system of animal herding, identification, ownership and other social attitudes of the people of Hakra river valley in Thar Desert of Sindh Pakistan.

The research integrates zooarchaeological documentation and ethnoarchaeological observations for collection of field data to understand herd composition, animal movement patterns, and ownership systems. These patterns also reveal important aspects of social organization, including herd ownership, identification practices, and cooperative herding behaviors among local communities.

This paper contributes to understanding pastoral adaptations in arid environments and provides valuable ethnoarchaeological analogies for interpreting animal management strategies in ancient desert societies, particularly within the broader context of South Asian pastoral traditions.

Keywords: Livestock Management; Ethnoarchaeology; Zooarchaeology; Thar Desert; Pastoral Economy; Herd Composition; Mobility; Pastoral Traditions, Indus Valley

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Introduction

The domestication of animals represents one of the most significant developments in human cultural evolution. Beginning in the Neolithic period, animal husbandry became a central component of subsistence economies alongside agriculture, hunting, and fishing. This transitional food sources composition, often associated with the 'Neolithic Revolution', marked a shift toward sedentary life and food production systems that transformed human societies (Childe, 1951; Zeder, 2012; Harris, 1996). Archaeological record illustrates plant and animal domestication revolution initiated in the fertile crescent of Mesopotamia and then spread into rest of the world. While early farming communities relied heavily on cultivated crops, pastoralism emerged as a particularly effective adaptive strategy in arid and semi-arid environments where agricultural productivity was limited. In such landscapes, livestock provided reliable sources of food, transport, trade goods, and social wealth, thereby shaping both economic and social organization (Smith, 2005; Frachetti, 2012).

In South Asia, the earliest animal and plant remains have been recorded at Mehrgarh; a 9000 years old settlement located in Bolan Valley near Bolan Pass for communication with Sindh and Baluchistan. The Indus Archaeologists have established the temporal sequence for this particular settlement representing the whole region of Indus valley. After four thousand years, several cities appeared along with numerous towns and villages and all became the part of a great Civilization of the world famously called as Indus Civilization. The noteworthy city settlements were Mohenjo-Daro (Marshall 1931); Lakhanjo-Daro (Mallah 2013, 2017); Chanhujo Daro (Mackay 1943), Harappa (Vats 1940, Wheeler 1947); Lothal (Rao 1979); Mohenjo Daro (Marshall 1931, Mackay 1938), Surkodata (Joshi 1990), Dholavera (Joglekar 2009); Kanmer; and Gola Dhoro (Chase 2010) and many others. The archaeological research shows that almost all parts of Indus Valley were occupied and people were moving and roaming at large distances. Thar Desert was one of the region(s) of South Asia where several villages and camps were existed and people had immense opportunity for animal herding. The Thar Desert of Sindh, Pakistan, represents one of the most distinctive arid environments in South Asia where pastoralism continues to play a central role in local livelihoods. Characterized by sand dunes, inter-dunal valleys, seasonal rainfall, and limited water resources, the Upper Thar Desert presents ecological conditions that favor livestock herding over intensive agriculture. Communities inhabiting this region have developed flexible and resilient pastoral strategies that allow them to adapt to fluctuating environmental conditions, including seasonal droughts and variable grazing resources (Wright, 2010; Kenoyer, 1998).

The Hakra River Valley within the Upper Thar Desert provides an important setting for understanding long-term pastoral adaptations. Although the Hakra River is now dry, its ancient channels and associated landscapes continue to support grazing areas that are utilized by local pastoral communities. These areas serve as important seasonal grazing grounds where livestock such as goats, sheep, cattle, and water buffalo are herded across sand dunes and low-lying interdunal plains. In recent periods, camels have also become increasingly important, reflecting adaptation to desert mobility and long-distance grazing strategies (Possehl, 2002; Fuller, 2006).

Ethnoarchaeological research in pastoral settings provides valuable insights into animal

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management practices, herd composition, mobility patterns, and social organization. Zooarchaeological data, brought patterns of herd management, species preference, seasonal movement, and economic decision-making that are otherwise difficult to detect in archaeological contexts alone (Binford, 1983; David & Kramer, 2001; Meadow, 1999).

In the Upper Thar Desert, large herds are often observed grazing freely across dunes and valleys, sometimes without constant human supervision. Such patterns reflect locally developed systems of herd ownership, identification, and cooperative management among pastoral households. These practices also reveal broader socioeconomic relationships, including shared grazing rights, kinship-based herd management, and traditional knowledge of desert ecology. Understanding these behaviors is essential for reconstructing past pastoral systems and for interpreting archaeological faunal assemblages from desert environments (Zeder, 2006; Halstead, 1998).

This study therefore examines herding and livestock management strategies in the Upper Thar Desert of Sindh, with particular focus on the Hakra River Valley region. By integrating zooarchaeological observations with ethnoarchaeological field data, this research aims to document herd composition, animal mobility, ownership patterns, and pastoral decision-making strategies. The study also explores the socioeconomic and cultural dimensions of pastoral life, including herd identification, cooperative grazing, and adaptation to desert landscapes.

Recently, a permanent village site of Thar Desert named as Poonger Bhanbhro was excavated and from the excavation several bones were documented (Mallah 2016). Scientific analysis showed the presence of sheep, goat, cattle and pig. The ethnoarchaeological research shows that these animals are still found in abundance and many herds are moving free without any custodian. How these animals are managed by locals is very interesting feature and illustrated in this paper largely which may explain the pattern of animal management in remote past.

Topography and Vegetation of Thar Desert

The Thar Desert is the largest desert of South Asia which spread in the several provinces of two countries of India and Pakistan; covering an area of about 446000 square kilometers. The desert in Pakistan covers two provinces Cholistan occupying the Southeastern side of Punjab and Thar covering entire eastern side of Sindh. The Thar Desert of Sindh is further divided into two parts (a) the Pat and (b) the Thar (Panhwar 1969, Pithawalla 1959). This is a region of constantly shifting sand dunes, with sparse vegetation in some areas.

The geologic origin of the Thar Desert is associated with early Precambrian gneiss (granite like metamorphic rocks formed in the oldest geologic era, which began 3.8 billion years ago), sedimentary rocks from about 2.5 billion to 570 million years old, and more recent material deposited by rivers (alluvium). The surface sand is Aeolian (wind-deposited) sand of the Quaternary Period (the most recent geologic period, which began about 1.6 million years ago). The geological survey has shown various period of establishment of the dunes within given time frame. The further division has shown some part belong with early and other with recent Quaternary periods (G.S.P. 1964 map

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as cited Mallah 2019).



Figure 1: General view of Thar Desert

The desert in present form has a rolling surface, with high and low sand dunes separated by sandy plains and low, barren hills, which rise abruptly from the surrounding plains (**fig1**). The dunes are in continual motion and take on varying shapes and sizes. Older dunes, however, are in a semi-stabilized or stabilized condition, and many rise to a height of almost 500 feet (150 m). Several playas (saline lakes), known as dhands, are scattered throughout the desert region.

This current investigation was commenced in this desert area demarked by Pithawalla and Panhwar "pat section" of desert (Pithawalla 1959:27, Panhwar 1969) in east of Saleh pat, districts Sukkur. In this area three features of geomorphology like: (a) sandy Desert (b) alluvial valleys and (c) traces of dried River courses are prominent. In these features the diversity of flora is an additional source which provided the economic and subsistence supplementary very suitable for the consumption of both human being and animal.



Figure 2: Another view of Thar Desert

As mentioned earlier that the region consists of the sand dunes covered with sparse

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vegetation cover. This part of Thar section is full of high sand hills with a definite N.E.S.W. orientation and higher than 500 feet with greater rainfall (Pithawalla 1959). The pat is the northern section of the desert consisting of clay or slit covered with longitudinal Bhits or sand hills.

The scattered sand dunes are less than three hundred feet in height and large in extension, flatter in setup and are less rugged in nature. In their appearance the northern side usually has high and steep look on the contrary, the southern side mainly have gentle slopes. The alluvial valley surrounds these scattered dunes. These slopes have been occupied by humans since long times as is proved from the discovery of numerous archaeological settlements. Some sites are also recorded on the flat top and fall in the category of campsites (Mallah 2002). Nevertheless, the similar notion of spot selecting is seen through contemporary villages in desert as those are located on the flat top surface on the southern side where the sand dunes have (a) valley in front and (b) gentle slope connecting the valleys.

The recurring geomorphologic element in this part of Thar creating and providing favorable subsistence resources and conditions for the people, such as, hunter-gatherer, nomads, pastoralists, and agriculturist of every era must have selected to establish their settlements on comfortable spot having easy access for themselves and herds. The Old Stone Age i.e. Lower Paleolithic artifacts were found scattered on the top surface of sand dunes which suggests that the dunes were stabilized before/during the Stone Age and thus people roamed since those times. The documentation of archaeological remains suggested that the subsistence resources were intensively exploited during Indus periods and early historic times when many settlements were established permanently and people chose to live longer at one spot. The exploitation of resources is continued till today and after (every monsoon season many nomads set up camps locally known as “Wandh” for grazing their herds (Mallah 2000, 2002, 2016). They stay until the smaller plants are green and leafy, grassy patches survive and the desert does not become very hostile during June and July months of summer season but in case of monsoon rain which occur sporadically and give a hope to residents for green floras and water for their herds. The months of August to onwards are easy living for them. The people of Desert are familiar with the hot summers with (50°C) temperature and in December and January that sometimes reaches below freezing point as cold winters. Theses extreme climatic nature is maintained through the thatch huts and their locations- because of the high steep northern sides the winter winds has moderate touch and the southern summer winds please them as their houses are located on the slopes with open southern sides.

The Thar region has typical pattern of alluvial valleys which may have received the high flood water of ancient river systems. The desert areas consist of either of windblown deposits known as “loess” or alluvium slit left by flood. The soils of the desert area are mostly sandy loams with patches of clay (Encyclopedia Britannica online). Those alluvial valleys appeared after disappearance of sweet water lakes. It can be hypothesized that the banks of those lakes may have been very suitable for agriculture purpose. Now-a-day, white patches of river sand and alluvial valleys are present almost after every sand hill sequence. As mentioned above that the soil of these valleys is loamy and silty and contain dominant floral colony of either Kirir *Capparis*

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decidua or the Khabar *Salvadora oleoides* trees. Otherwise, the common desert floral repertoire consists of **Khabar** *Salvadora oleoides*, **Kirar** *Capparis deciduas* and **Kandi** *Prosopis* cineraria; **Phog** *Calligonium polygonoides*, **Ak** *Calotropis procera*, **Khip** *Leptadenia pyrotechnica* and **Booh** *Avera javanica*; **Lano** *Haloxylon stocksii*. The herbs are: **Chhapri** *Neurada procumbens*, **Ghorawal** *Cassia* italica, and the grasses are: **Katan** *Cymbopogon jawarancusa*, **Lumb** *Stipagrostis plumosa*, **Boro** *Saccharum bengalensis* and many others are most frequently available. All varieties are suitable for grazing of herds of cattle, camel, goat and sheep. After every monsoon, those valleys and sand dunes become green and because of the easy accessibility factor; the animal herds can go easily and return back at evening. In contemporary times; the desert people store their water in handmade tanks and utilize it during the drought times.

Archaeology of Animal Herding in Indus Valley

The science of Archaeology includes 'Zooarchaeology' specifically for understanding the ancient bones and for reconstruction of human+animal behavior (Renfrew and Bhan 1996:266). As mentioned above that archaeological research in Indus valley has shown that Mehargarh is oldest site of Indus valley civilization. Site is located in Baluchistan at the foot of the Bolan Pass in the "Bolan River Basin". Zooarchaeological investigation comprehended presence and utilization of wild and domesticated animals like Gazelles (*Gazella doreas*), wild sheep (*Ovis orientals*) wild goat (*Capraaegagrus*) Swamp deer (*CervusDuvauceli*) large antelope (*Boselaphus*), wild pigs (*Sus Scrofa*), onager (*Equis hemoinus*) and wild cattle were collected. In the domesticated species cattle (*Bos Indicus*) goat (*Caperahircus*) water Buffalo (*Bubaius bubalis*) and sheep (*Ovis aries*) were domesticated (Asthana 1985:53& 191).

According to the Richard H. Meadow and Ajita K. Patel the Neolithic resident of the settlement hunted the wild animals from hilly areas and river plains. From hilly areas they hunted wild sheep (*Ovis orientalis*), goats (*Capra aegagrus*) and chinkara *(Gazella bennetti*) and from the plains the onagers (*Equus hemionus*) and blackbuck (*Antilope cervicapra*) were hunted. In addition to this Mehargarh resident also hunted animals in waterlogged areas where species of deer like (*Cervus/duvauceli* and *Axis* (?)*axis*),boar (*Sus scrofa*), water buffalo (*Bubalus arnee*), wild cattle (*Bas namadicus*), and possibly elephant (*Elaphas maximus* (Meadow and Patel 2003:70). Richard Meadow has registered at least "12 forms of big game" (Meadow 1996:402).

Another settlement named as Kile Gul Mohammad located in Baluchistan from where a total of 15000 bones were collected and out of which 200 bones were cataloged as wild animals. This total inventory contained bones of sheep, goat and cattle (*Bos Indicus*) throughout all periods of its occupancy. From another site of the Baluchistan named as Rana Gundhai some different type of animals like humped Cattle (*Bos indicus linn*) sheep, ass (*Equus asinuslinn)* horse (*Equus caballus linn*) onager or Khur (*Eqauus hemionus khur*) were collected (Asthana 1985:193).

Around 2400 to 1900 BC, the Kulli culture appeared in southern Baluchistan. In the settlements the pottery paintings carried beautiful motifs of the humped bull, ibex, and tiger (Hideaki et al 2010: 53-93).

In the Indus plain settlements including Jalil Pur, Nusharo, Harappa and Mohenjo Daro; Richard H. Meadow has analyzed similar type of animals Chinkara and Gazelle

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(*Gazella bennetti*), the zebu and humped bull (*Bos indicus*), goat (Capra hircus) and sheep (Ovis aries) along with a huge variety of wild animals as Indian Elephant (*Elapha maximus*), one-horned rhinoceros (*Rhinoceros unicornis*), wild boar (*Sus scrofa*) Chital spotted deer (Axis axis), Hog deer (*Axis procinus*), *barasingha*, swamp deer (*Cervus duvauceli*), nilgai, blue bull (*Boselaphus tragocamelus*), Blackbuck (*Antilope cervicapra)*. Particularly, the humped bull *(Bos indicus*), non humped bull (*Bos taurus*), goat (*Capra hircus*) and sheep *(Ovis aries*) as domestic animals have been documented (Meadow1989:65-66). As the settled life intensified and civic development happened the animals turned into property and favored economic source were the water buffalo, sheep and goat and 'especially cattle' (Meadow1996 pp 405).

William Belcher 2003, added that the urban resident had supplementary reliance on the wild fish species found locally and the marine catfish which was imported to the cities as dry commodity (Miller 2004:366). At Harappa, three species of wild big mammals named as buffalo (*Bubalus bubalis*) and two cattle (*Bos indicus* and *Bos taurus*) species have been reported (Miller 2004:366).

The archaeological research in east of Thar Desert in Gujarat region of present India; the animal presence is perceived at both larger and smaller settlements like (Dholavera Bisht 2000b); Kanmer (Kharakwal et al. 2007) ; Lothal (Rao 1979), Nageshwar (Hegde et al. 1991) ; Shikarpur (Bhan & Ajithprasad 2008) ; Gola Dhoro (Chase 2010) ; and Surkotada (Joshi 1990). Only from Gola Dhoro, a total of 20000 bone fragments were examined which explained the use of animals (Chase 2010).

At Kanmer settlement both wild and domesticated animals like buffalo, cattle, pig , cat, sheep , goat and nilgai, wild ass, elephant, Samber, spotted deer, mouse deer Chowsingha, wild pig, Barking deer, Gazelle, wolf, jungle cat, Indian fox, porcupine, Indian hare, house rat, bandicoot rat, and field mice have been listed (Goyal and Joglekar 2012).

The above research has confirmed the interaction and relationship of animals with human in past which is further proved through other mediums of physical data sources like seals with illustrations of animals in various forms and shapes. These illustrations showed importance of animals beyond source of staple food and economy. The depiction has religious and ritual value as well. This was attested in true copy in shape of figurines in which the humped bull is most common and sometimes the dog, tiger and other animals are recorded as well. Another common and authentic representation is through the painting on the pots in which a variety of animals have been painted. Like seals, their painting has multiple meaning and importance some time they abstractly show, other time mythological depicted and commonly the decorative element is maintained. For instance, horn-deity motif found from Kot-Diji has been explained with mythological concept which is perhaps an illustration of a buffalo. The similar horn-deity represented in number of ways into seals as well.

Zooarchaeological Reconstruction of Fauna of Thar Desert

The current documentation of data is from Poonger Bhanbhro site associated with mature Indus period of Indus civilization dated as 2600-1900 BC located in Thar Desert region. A small scale excavation was done and a total number of 129 bones were found. All three types like large, medium, and small mammals have been identified.

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Nevertheless, these bones suggested that the meat was essential part of their diet. Geomorphologic setup of the region seems suitable for all goat, cattle and camel. The environmental setup and Ethnoarchaeological setup further suggest the presence of these animals as herded animals. The natures of archaeological sites having a good number of campsites also support this idea.

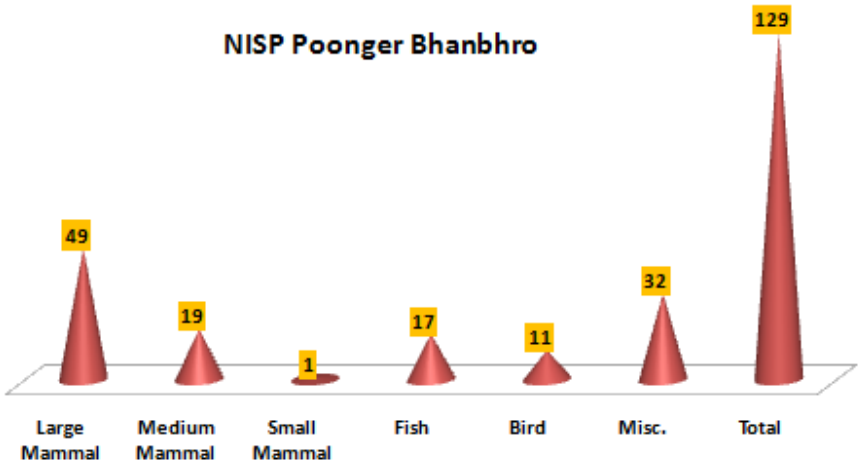


Figure 3: Graph showing archaeological record from anceint settlement Poonger Bhanbhro of Thar Desert

The bone data from archaeological site Poonger Bhanbhro of Thar Desert was classified and three broader categories like (a) animals, (b) birds and (c) fish bones were identified (**fig3**). In animal bones all three types like large, medium and small mammals were classified. The bird bones were not categorized; however, in fish bones, the catfish (*Rita rita*) was identified which suggest that the Hakra river was used for fishing purpose (Rajput2013).

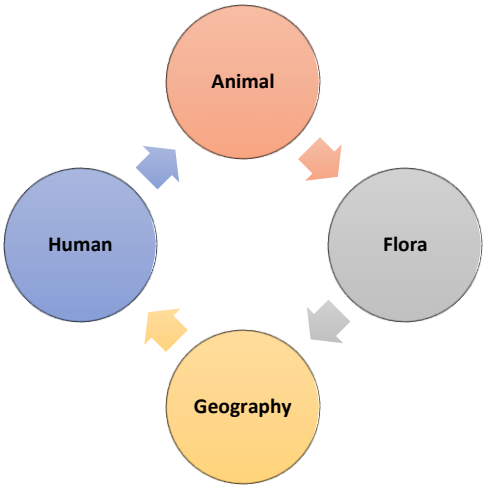
Ethnoarchaeology of Animal Herding

The archaeological data was further supported through ethnoarchaeological approach. The data for ethnoarchaeology mainly documented and explained in bionetwork diagram (**fig4**) were about essential factors like (i) living pattern, (ii) animal keeping (iii) use of animal and (vi) use of animals to supplement the subsistence and economy.

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Figre 4: Diagram of human, fauna and floral bionetwork.

Settlement Pattern

People in desert have two types of settlement (a) permanent village and (b) seasonal herding camp. The people mainly associated with same caste group reside in village. In case there are people associated with different caste group have cluster of houses at a little distance. They live with peace and harmony and economically depending/surviving on only animal herding. The further details of their living pattern are provided hereafter.

Permanent Village

As mentioned above that people live at one place called village /Goth (**fig5**). It can be cluster of five families or a hundred families. The first and foremost rule for establishing village is availability of the permanent water source. Once the water source is available then the villages are usually established on top of the sand dune having slope on southern side.



Figure 5: View of a deserted village within Thar Desert

This is strategically chosen location for (i) accessibility (ii) wind direction and (iii)

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watchtowers/ lighthouse. All villages have an open valley in front. The southern slope provides easy access for both kids and pets for coming back and forth from valley to village. The houses in the villages are entirely constructed with wood and thatches with canopy and /or wagon -vaulted roof called as "Chonra". The construction material consists of locally available material like Khip Leptadenia pyrotechnica and Leptadenia spartium and Sinnh Crotalaria burhia thatches and wood from Krir Capparis deciduas and Khabar Salvadora oleoides trees. Some items like Kana and ropes made from Boro Saccharum bengalensis are brought from villages located nearby the plain areas. The base of house is either in circular or rectangular or both in plan. If circular then at certain height takes canopy shape and if rectangular it takes inverted "V" shape at top. The permanent houses can survive up to 20 years with little or no maintenance. These houses are good in every season i.e. cold during hot summer and warm during cold winter. The rainfall does not disturb the family.

These houses are not only the weather proof, however, harmless in any catastrophic situation like sever storm and/ or earth quick. These houses do not hold any heavy material which may cause death. The wooden material used in the houses is recycled for generations. During research, in one house the shaft from Kirar *Capparis deciduas* was documented used firstly during 1900 AD and has been utilized and recycled eight times and is still in use. In other words, after the first use, it was passed down within family and was reused eight times continuously. As mentioned above that the life span of one house is almost twenty years after which it becomes very difficult to maintain and needs to be rebuilt. Thari people do not move away; thus they only shift their houses a little bit here and there within the same limited locale.

In the large village, nearby houses, sometime other arrangements are made for marriage or other ceremonies. The chamber like huts area made in row where guest mainly male members can stay. Those huts can be utilized in large gathering happing for dispute settling or visit of any notable(s) (**Fig6**).

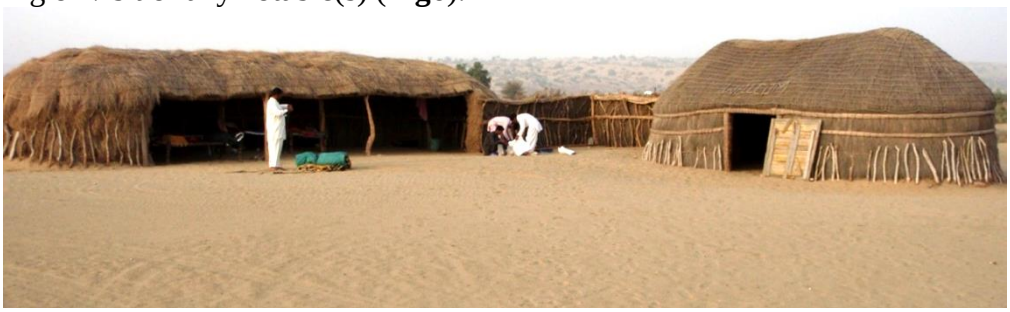


Figure6: another view of the village where people still live

The arrangements of houses contain common elements like, living room/hall and kitchen. The store for extra item is not made separately, but kept within living area. In winter, people mostly sleep on floor for which the sand is very comfortable and compatible with cold season. At the center of house, the fire is lit throughout night. In summer, people sleep outside and hence they usually have fixed sleeping bed higher from the ground. The guests are treated well and they would be given sleeping bed called as charpoy or 'Khatt' which are kept back inside the house. In some villages the use of charpoy is limited and when any guest visited them the available persona

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generally male but if the male member is not present; then female usually come forward for greeting. A beautiful bed cover called as 'Rilly' is spread on the ground and pillows are kept for the comfort of guests where they will be served with tea or food latter on.
Each family has their own space not only for house but keeping their domesticated animals just besides the houses. As The internal arrangements of each house contains a hearth/ cooking spot and a charpoy like table again made of thatches for keeping household items. The extra milk for making butter/ ghee is stored in earthen pot or metallic pot made of (zinc/bronze) and dangled in pole outside the house.
At the night time, only local people can travel or the scientific devices can be used for arriving exact location. The 4x4 vehicle or camel are best option for non-problematic travel. The local people travel in moon night or early morning at dawn times – they can have halt at any village or the camp. Everybody/ traveler is treated well with meal, tea and water. The sleeping bed will also be provided them. After dinner, all people sit around the fire in winter and at open place during summer night and have talk and stories from local and distant lands about animals, places, and major happenings. Sometimes they sing the songs as well.
The activities within these villages are diverse. Some people are engaged in cultivation and others resume pastoral activity. The villages in deep desert completely have pastoralist economy. The general activities include various kinds' rope, charpoy and Rilly (cover) making. Women actually work hard as they maintain house, animals, cook food and prepare butter, clarified ghee and Lassi (a watery product of the milk after extracting butter).The spare time they usually engaged themselves in embroidery and Rilly making and they produce very beautiful designs. The Rilly is usually manufactured from recycled clothes. Male member in spare time keep hands on making ropes. The ropes are usually produced from goat/sheep hair called as "Dass" perpetually collected and thin ropes are made. The rope is also sold in market with significance that the thin and fine is the rope; the greater price it will yield. Almost similar designs are produced skillfully on the charpoys as on the Rilly. The clarified ghee and ropes are sold in nearby markets.
The villages are one of the strong components in the development of cities. No any village in this part of Thar contain any single shop thus for everything of daily use is sought from the Shahr (city) and basic products are sold in the markets in Shahr which is further connected with large cities of the country. This way the tribal lords maintained their economic supremacy, hierarchy and control over the masses.

Camp (Wandh)

Another settlement type is a seasonal camp which is usually made and utilized after monsoon each year. Each caste and village has given area where Phog, and other plants are frequently found within five kilometers range. Thari people establish a camp where some family members along with animals reside for a season (**fig7a**). The camp area becomes their property and nobody else would use the area. Nevertheless, the remaining dunes are commonly used by everyone and are located more than ten kilometer distance from their village(s).

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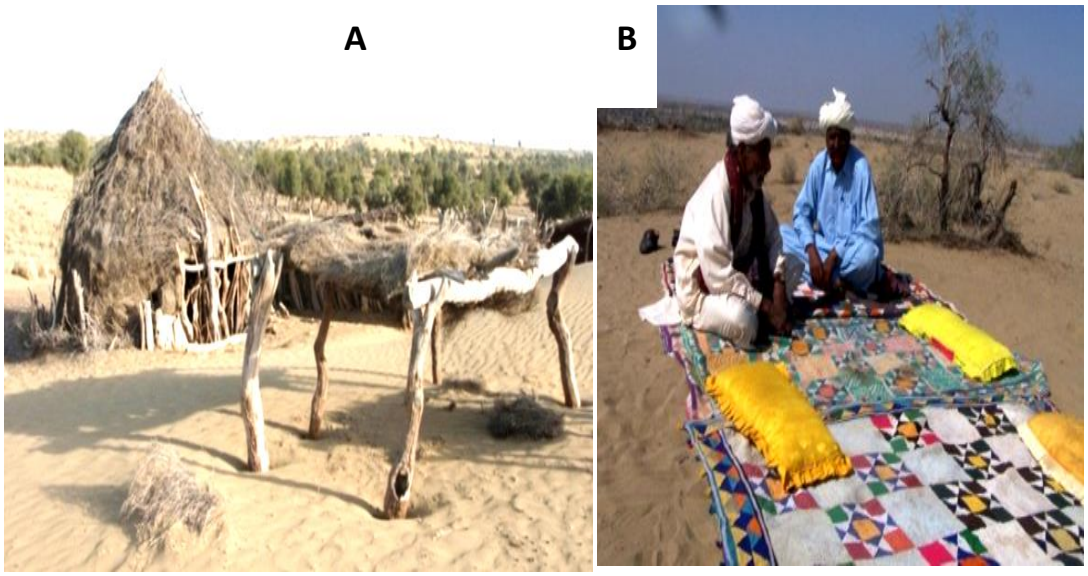


Figure 7: view of camp (a) residential houses and (b) arrangments for guest greetings



Figure 8: Two views from different camps showing internal arrangements of daily use item keeping

The camps / Wandh are the base tier in settlement hierarchy of the Thar Desert settlement pattern. A Wandh is a temporary dwelling, where animal herds are kept seasonally (**fig8**). At a Wandh where a well of drinking water is available is called as Tarr and it is occupied year round. The Wandh usually consists of 2 to 3 canopy type huts very similar to the other houses in villages. Like villages, the Wandhs' are usually built over high mound having slope towards an open valley in southern side. The fundamental purpose of building camps on high mounds is the visibility for (a) person who is lost in this sea of sand and need conformity of the route and (b) a traveler who wants short stay to continue his/her journey.

These camps are simple in their internal arrangement, just house for living, cooking spot and animal hedge/ peen. The sleeping beds are fixed and made in table shape out of thatches locally available in immediate surroundings. The cooking place made fixing wooden poles from either Krir or Khabar trees in round shape and externally covered with thatches from Khip and Booh. The household item are few as cooking pan, cooking pot, storage jars for water, milk, ghee, honey and flour, glass, cup, plates etc. The daily use items like tea, sugar, wheat-flour and rice are stored. The routine meal

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consists chappati with butter or ghee and Lassi in the breakfast and in the dinner chappati with milk.

The Wandhs are usually located at a junction position where several routes congregate. This creates an opportunity of small scale exchange of items. The leather, goat-hair, wool, honey, ghee, seasonal fruits like Peroon and mushrooms are sold to nearby market.

Pattern of Animal Herding

As mentioned earlier that the desert is covered with sparse vegetation and it provides excellent posture for animal grazing and it is further supplemented during the monsoon season. There are numerous alluvial valleys which become very green during rainy season and provide seasonal grasses to the flocks of animals both wild as well as herded. Within desert environment there are several lakes where not only the grass and shade but drinkable water can be available (**Fig12**).



Figure 9: (a) animal keeping hedge (b) toddler keeping area within the hedge

The people in Desert mainly live on animal husbandry. The preferred animals are goat, cattle, sheep and camel. Large herds of goat can be see roaming on the sand dunes and low-lying valleys among the dunes. The thorn hedges are made to keep goats (**fig9a&b**).The camel is also highly valued animal that is used for personal and goods transportation. The camel used for personal transport is covered with multicolored cloth and decorated bells and beads. It is considered the fastest mode of transposition in desert areas and hence popularly called as a “Ship of the Desert” (**fig10&11**). The induction of automobile has diminished the reliance on camel for transportation**.**

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Figure10: Camel used for transportation



Figure11: The Ship of Desert 'Camel' ready to go.

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Figure 12: A flock of goats in desert environment for drinking water at Tarr

Management of herds

In Thar Desert particularly the flocks of animals wonder freely within huge areas. The flocks are taken care periodically just to check their presence and newly born. In case of the addition, the animal must be given identification. The baby animals are specially cared and cured until they are grown enough to feed themselves and walk within the grazing area consisting over some kilometer. They are put into the pen having a door made of wooden sticks and are provided with small shelter. The herds of animals are taken out in the morning and return back at dusk. The camels and goats are brought back to home every day. The cattle, however, wander freely in the vast land of desert. Herders usually tie bells in their neck as an echo pointer of whereabouts. The people of Thar are very sharp to understand the behavior of animals. They can surely pinpoint their location and presence without being with them. They are expert to understand the routine behavior and movement.

The larger animals like cattle and camels wander freely and mix with other animals thus the owner place an identifier Nishan called as Dagh/Thapo (stamp /mark/ symbol). The stamp hereafter "Dagh /Thapo" is made of iron and it is heated when given animal is able to walk. The Dagh/Thapo is placed either on the neck or hind leg. Each caste and sub-caste has their own stamp. In case the animal is sold to another person belonging to different caste or sub-caste; an additional stamp is placed (**Figure** 13&14). This is a tradition that has continually survived since generation and shows great similarity with Indus script of Mohenjo-Daro period dated as 2600BC.

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Figure13: Iron stamp used to mark the animals B: cattle having stamp on hind leg.



Figure14: Camel having stamp on face and hind leg.

The goat is perferd animal which can survive better in hostile and harsh claimatic conditions of Thar Desert. It is kept in herds up to two/ or even three hundred animls with each family (**Figure** 12). The gaot is also marked with cutting the ear. In this system one family will cut three spots on one ear and one cut on the other ear; it will make four cuts in total and is called “Cho Lakhi” and if gaot has only on cut it is called “Hik Lakhi” (**Figure** 15). In this way, the series goes on by cutting the ear on both sides and every one in area know the number of cut belonging to given family. The herds are waterd at well called “Tarr”. Sweet water is rare in the desert areas, however, when it is found a well is dug and it is free to every one for use.



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Figure 15: The cuts in their ear identify them



Figure16: Baby animals are cared and loved by a child.

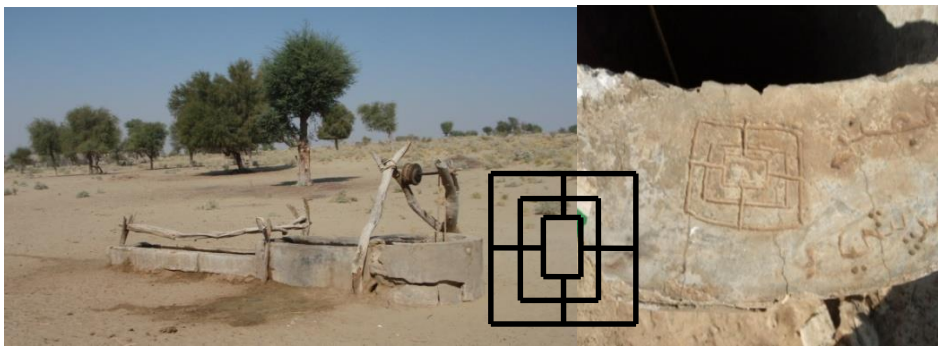


Figure17: A well for sweet water and close-up of a game engraved on the edge of well

While the animals are resting under the shade, the herders pass their time with game. The most famous game is Naotinn for which two people play at a time (**Figure** 17). It is very complicated game that explains the trapping and killing strategies. M. H. Panhwar explains that "it may have its origin more than 12000 years ago when hunters and food- gatherer moved for killing wild animals". A terracotta brick type piece was discovered from Mohenjo Daro and Lothal, having similar engraved lines suggesting that during 2600 to 1900 BCE, the Naotinn was also a famous game that has not lost its popularity till today.

Symbols of various caste groups of Thar Desert

As mentioned earlier that easch caste group at large and the splited familes all stamp symbol on the large mamel like cattle and camel(**fig13&14**); nonetheless, in the case of goat the cut the ear in specific shape for identification (**fig15**). During ethnoarchaeological survey following symbols were documented and some of them were compared with Indus Script to see any similarty.

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List 1

CASTE	SYMBOL	INDUS SCRIPT
Jiskani		
Mihrani		
Veesar		
Shar		
Talpur		
Bhurgri		
Khaskheli Bhambhro		
Pata		
Nidamani		
Panheyar		
Rid		
Sahita		
Rajper		

List 2

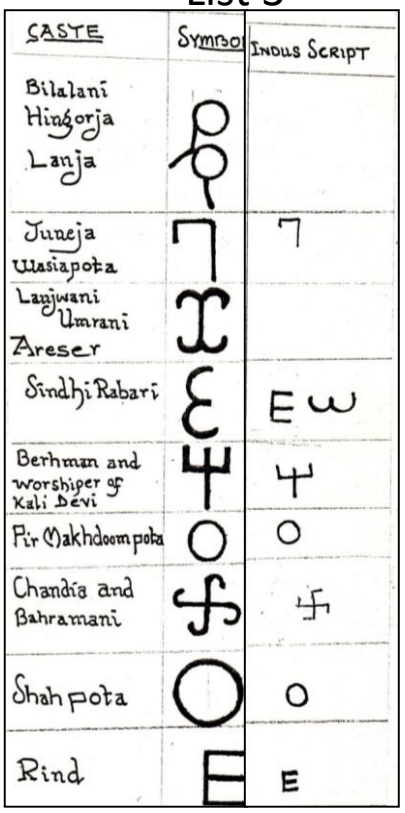
Symbols	Cast Group
	Asghar Mangria
	Kula Mangria
	Mahar Gaglani
	Nehal Ja Mngria
	Bhanbhra
	Lali Pota Mahar
	Syed Khadim Hussain
	Asani Mahar
	Jhangi Mangria
	Abra Mangria
	Gaglani Mahar Jo Paro

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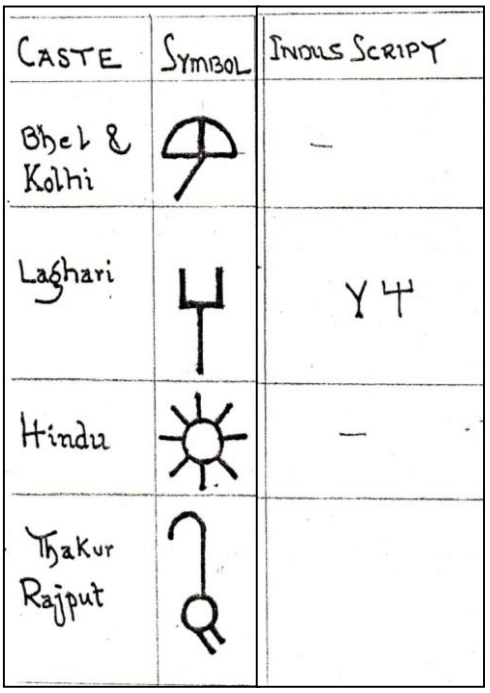
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List 3



List 4



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List 5

Caste group	Symbol
Mahar	
Mangria	
Mangria	
Mangria	
Mahar	
Mahar	
Bhanbhra	

Use of Animals to Supplement the Subsistence economy

The major use of animals besides the meat and milk is the byproducts like clarified ghee, hairs and leather. The goat hairs are widely used for making several items of daily use like rugs, sags, and netting the charpoy. The processes start with cutting and collecting hairs, making ropes and then use it as desired.



Figure18: Goat hair- these will be processes and marketed.

In addition to the subsistence animal play pivotal role in economy. The milk, meat,

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leather, and hair are marketed. These all products are very essential and are largely utilized by the humans. The region of Thar Desert the clarified ghee and products made of goat/sheep hairs were brought into nearby markets. The goat hairs are widely used for making ropes from which the rugs called Frase of Khatho; Charpoy netting and many other things are being produced (**Figure 19**). The goat hairs are collected each season and processed at home to make ready for marketing. The process of making rope is very simple, the hairs are twisted and continually added to make long rope than they are wrapped around stick; while watching animal herds they also produce ropes.



Figure 19: The rug and frontal view of netted Charpoy.



Figure 20: Rope making and the finished product.

Creating decoration on the Charpoy, camel skin is favorite activity of Thari people. They expert in hut making and produce beautiful design on the roof with Kana material. Their Chorpies, when netted beautifully with goat hair and /or Wann are sold at high price in the nearby market (**Fig** 20-21).

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Figure 21: View of the Charpoy netted with goat hair ropes in Geometrical design.

Discussion and Evaluation of Collected Data

The documentation of data is based on the disciplines like (i) Archaeology (ii) Zooarchaeology and (iii) Ethnoarchaeology. This multidisciplinary approach provided vast provisions and evidences for animals use through the figurines, bones, paintings, depiction on seals and sealing's etc. Archaeologically, the animal remains have been recorded from all period archaeological settlements including Mehrgarh, Balakot, Jalilpur, Harappa, Mohenjo-Daro, Sibri, Pirak and many others within the time period of 7000 BC to 2000 BCE (Meadow 1979, Jarrige 1995, Dales 1979, Mughal 1972**)**.

History of Animal Use

Tracing the history of animal use, it occurs since Old Stone Age; the human has always exploited the wild species of animals for their food. No matter how huge and furious animals were, but human got them down. The highlands, plains and deserts were the places of prey. The Blackbuck (*Antilope cervicapra*), gazelle (*Gazelle bennetti*), mountain goat (*Capra aegagrus*) sheep (*Ovis orietallis*) spotted deer (*Axis axis*) hog deer (*Axis procinus*), swamp deer (*Cervus duvauceli*) and Nailgai (*Boselaphus tragocamelus*) wild boar (*Sus scrofa*); all were easy to hunt and kill.

It is not clear yet whether or not, the Indus valley people ventured to kill the large and furious animals like rhinoceros (*Rhinoceros unicornis*) and elephant (*Elaphas maximus*). But the smaller game was supplemented to their dietary pattern. The smaller animals were not only hunted bur were domesticated. The archaeological discoveries have provided a chronicle of some common animals that were domesticated by human since 10,000 years ago.

During 2800 -2600 BCE, people started depicting symbol on various items like pots and jars to identify themselves for personal commercial or even ritual purposes. This symbolization was continued and developed in the form of seal; nevertheless, the pots and jars were continually symbolized. This tradition still prevails in desert area where animals are symbolized for recognition of ownership.

Seal of Indus period dated 2600-2000 BCE, discovered from almost all larger sites of Indus valley has carving of various types of animals in different styles and shapes. The

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iconographic motifs include, group of different types of animals, jointed or composite animals. These iconographic representations of animals show that they were not only utilized for economical purpose but they also had importance for ritual activities as well.

The terracotta figurines also depict the daily routine use of animals. The figurines of bull are widely found from almost all Indus period settlements. It suggests that the cattle were vital part of their economy, subsistence and ritual activities. Nevertheless, other animals like goat, sheep, water buffalo and others are represented as figurines.

Bones are the direct category of physical data that explain various social attribute clearly. For instance, type of animal, if wild or domesticated; age, and pattern of usage along with other social complexities like selection of body part for utilization and particular utilization of body parts for particular purpose; for instance, the antlers were used for making stone tools and piercing, the rib bone were used as needles etc.

The data revealed from Thar Desert site of Poonger Bhanbhro correlates with a variety of objects including figurines, seals, and bones. This data set has provided the clues of presence and utilization of animals. The cut mark on the bones, depiction of animal on the seals though is not related but describes the value and relation of animals with humans on one hand and the environment or habitat where animals live. The sites are particular example but explain the whole Indus Civilization.

The behavior of contemporary peoples particularly those who live in desert area where Poonger Bhanbhro site is located. Actually, they have wonderful system to use, manage and maintain their animals. This documentation within theoretical frame of Ethnoarchaeology provided affirmative guiding factor for understating and explaining of the past activities about animal use.

Socio-Commercial Use and Continuity of Herding Traditions

Animal herding in the Indus and Thar regions was not limited to subsistence but formed a central component of socio-economic and commercial systems. Livestock provided multiple products including milk, meat, hides, wool, and transport, enabling communities to engage in exchange with agricultural and city/town populations. Archaeological evidence suggests that cattle were particularly important for transport and agricultural traction, facilitating the movement of goods such as raw materials, craft products, and agricultural surplus between rural settlements and urban centers. This indicates that herding contributed directly to the development of trade networks and economic integration within the Indus Civilization (Miller et al. 2023, Biagi, 2024).

The continuity of animal herding traditions across South Asia further demonstrates the resilience of pastoral economies. Contemporary pastoral groups in South Asian regions still practice seasonal and /or perpetual migration, livestock exchange, and mixed subsistence economies and maintain traditional herd management knowledge despite modern pressures such as climate and technology change. This persistence suggests that pastoralism represents one of the everlasting cultural traditions in South Asia, linking prehistoric Indus with modern desert herding systems (Singh & Kerven, 2023).

Herd Management Traditions

Animal herd management in the desert regions reflects a highly structured pastoral

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economy combining mobility, species diversification, and environmental adaptation. Zooarchaeological evidence from Indus settlements indicates that cattle (*Bos indicus*), water buffalo, sheep, and goats formed the primary livestock base, with cattle and goat comprising between 50–60% of faunal assemblages, highlighting their central role in traction, transport, and agricultural production. The patterns seem deliberate to maintain the environmental risks, and ensure long-term herd sustainability (Miller et al., 2023).

Moving animals between riverine plains, desert margins, and upland pastures depending on rainfall and grazing availability. This mobility was integrated into broader settlement systems rather than being purely nomadic. Additionally, isotopic and faunal evidence from Indus sites indicates that while sheep and goats were often raised locally, some cattle were moved across longer distances, reflecting organized herd management and regional livestock circulation networks (Petrie et al., 2020; Miller et al., 2023).

The Upper Thar region provides significant examples of pastoral herd management system. Surveys conducted in the region indicate that this landscape supported mobile nomad communities that relied on livestock movement across seasonal grazing zones. The distribution of Indus period campsites suggests that nomadic groups moved between desert margins and riverine plains, following seasonal vegetation and fodder cycles. This pattern reflects a transhumant pastoral system, where herders strategically relocated animals based on water availability and pasture conditions, a pattern still visible in modern Thar pastoral communities (Biagi, 2024).

Zooarchaeological data from Thar, indicate that cattle, sheep, goats, and buffalo formed the core domestic herd composition. These animals served complementary roles: cattle were used for traction and transport, while sheep and goats were more resilient in arid landscapes. These animals were strong source of meat, milk, and wool. Such herd diversification reflects adaptive herd management strategies in desert environments where rainfall was unpredictable and grazing resources fluctuated seasonally, suggesting adaptability of communities and herds to local ecological conditions, including desert and semi-arid zones such as Upper Thar (Miller et al., 2024).

Ethnoarchaeological studies from Thar illustrate continuity in pastoral traditions. Modern pastoral communities in the Thar Desert rely heavily on livestock rearing and depend on livestock such as cattle, goats, sheep, and camels. The number of goats herd is greater as compare to other type animals. During harsh and dry years, animals are moved to riverine areas periods and returning to desert grazing lands during favorable conditions (Channa et al., 2020; Talpur & Mari, 2022).

The socio-economic role of herd management extends to exchange and trade systems. The groups transport their productions like ropes, leather, butter, honey, fuel wood and animals for sale and receive other required material for daily life. The movement of these materials suggests the involvement of pack animal caravans, linking Thari communities with city/ town dwellers through trade networks. This indicates that Upper Thar was not isolated but integrated into broader Indus economic systems, supporting long-distance exchange and regional interaction (Mallah 2016, Biagi, 2024).

Importantly, the Upper Thar demonstrates remarkable cultural continuity as Thari communities maintain herd composition, cooperative herd management and regional

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interaction system, reflecting strategies similar to those as determined from archaeological evidence. This long-term persistence suggests that Upper Thar represents one of the most persistent adaptive traditions in South Asia, linking prehistoric Indus pastoral practices with contemporary desert herding economies.

Conclusion

The animal herding is vital part of human activities and economy. There are several parts of the world where herding is prime activity and a source of economy. Thar desert is one of them. The archaeological and ethnoarchaeological survey showed excellent features of animal herding having deep roots in past. One Indus period (2600-1900 BC) settlement named as Poonger Bhanbhro showed inhabitants of Thar Desert utilized various types of animals like wild boar (*Sus scrofa*), cattle (*Bos indicus*) and goat (*Caperahircus*). They also utilized the catfish (*Rita rita*). The bones contained some cut marks affirming the meat used by resident of ancient settlement.

The ecology played major role – there were permanent sources of water through the River Hakra which could have been utilized for navigation of small boats and connecting very distant land like Gujarat India. The river had problem of scattered sand dunes but it was achieved and through the valley – Hakra made it flow steady and arrived in the Nara Plain where it took the western side of desert up to coastal areas. In addition to this, there were numerous lakes of sweet water and supplementary subsistence source and could have used for animal use as well.

Nowadays, the ecological situation is little different but the basic floras are still there along with ground water. Thus the animals herding is continued showing best management system. The pattern found in contemporary settlement system through ethnoarchaeological studies also has similarities with Indus period in which villagers establish camps away from their village during monsoon season. Camp is temporary halt but an essential seasonal economic hub where ghee, honey, goat hairs and other byproducts are produced and traded in the nearby towns. Having these socioeconomic benefits, the animals herding continues till today.

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