

CAMEL REARING IN CHOLISTAN DESERT OF PAKISTAN

I. ALI, M. SHAFIQ CHAUDHRY¹ AND U. FAROOQUniversity College of Veterinary and Animal Sciences; ¹Cholistan Institute of Desert Studies,
The Islamia University of Bahawalpur, Pakistan

ABSTRACT

The camel is one of the typical and the best adopted animals of the desert, capable of enduring thirst and hunger for days and is the most patient of land animals. For desert nomads of Pakistani Cholistan, it is a beloved companion, a source of milk and meat, transport facility provider and a racing/dancing animal, thus, playing an important role in the socioeconomic uplift of the local community. Camels of Marrecha or Mahra breed are mainly used for riding and load carrying but may be trained for dancing or racing. Berella is another heavy and milch breed of camel famous for milk production and can produce upto 10-15 liters of milk per day. This breed is also suitable for draught purpose, though comparatively slow due to heavy body. The present paper also describes the traditional camel rearing system used by nomads of Cholistan desert. Some aspects of camel health, production, feeding, socio-economic values, marketing and some constraints and suggestions are also given so that the policy makers may consider them for the welfare of this animal.

Key words: Cholistan, camel, breeds, production, health.

INTRODUCTION

Cholistan desert, once used to be a prosperous, lively and thriving forest, is now by and large a deserted piece of land. It is a very typical rangeland and contributes significantly towards country's supply line for live animals and their products (milk and meat), but now its productive potential is on the decline in spite of the fact that the number of animals in the desert is on the increase, whereas its bioresearches are on the decrease. Under this deteriorating situation, the hardest hits are the most valuable assets of the area including the domestic animals, which may desiccate if their exodus is not promptly arranged through distantly located canal colonies or bank of river Sutluj for the supply of water and fodder on the failure of rains (Ahmad, 2005).

The desert is situated in the South-West of Punjab province (Pakistan) and is spread over an area of 26,000 square kilometers with patches of highly saline soils and brackish sub-soil aquifer or water (Fig. 1). It is located between latitudes of 27° to 42° and 29°N and longitudes of 57° to 60°E. The length of the desert is about 480 Km and breadth is from 32 to 192 Km (Akbar *et al.*, 1996).

Geologically, the Cholistan desert comprises two natural regions: (i) Greater Cholistan that comprises an area of 13,630 Km and (ii) the Lesser Cholistan consisting of 12,370 Km area. Greater Cholistan lies to the Southwest of the most recent course of the defunct Hakra river and extends to the border with India (Akhter and Arshad, 2006).

Lesser Cholistan extends north east from the Hakra river to the end, along the bank of the Sutluj River. This

part of Cholistan is arid apart from the presence of the intersecting perennial waters of the Sutluj and Beas rivers. Low-lying sand dunes, mostly smaller than those found in the Greater Cholistan (i.e. less than 100 meters) and extensive flats of exposed alluvial clays (dahars) are present here. In its original form, Lesser Cholistan would have been used as an extension of the grazing land for the Greater Cholistan. However, the extensive low lying flat lands and proximity of perennial waters in this part lend itself to the development of irrigation. Thus, from the turn of this century an intensive irrigation system based on canals was constructed along the northern fringes of Lesser Cholistan. The extent of free grazing land has, thus, been reduced by roughly one-third.

The only source of fresh water is the surface water collected in natural depressions or man made ponds, called "Tobas" during monsoon period. The water in these "Tobas" does not last long due to seepage and high rate of evaporation. The secondary source of water is underground which is mostly brackish and is found at the depth of 30-40 meters. The salt contents varies from 9000 to 24000 ppm which is not fit for traditional agriculture or drinking purpose (Akram *et al.*, 1986). The climate of the area is arid, hot subtropical and monsoonal. It is characterized by great annual and daily variations in temperature and rainfall (Fig. 2). The bioclimatic system falls in the category of "Tropical desert" and is famous for bush formation.

This desert is situated at 112m above the sea level with mean annual temperature of 28.33°C, occasionally surpassing 46°C. The hottest month is June with average monthly temperature of 38.5°C. The summer is mostly dry, hot and with the highest temperature.

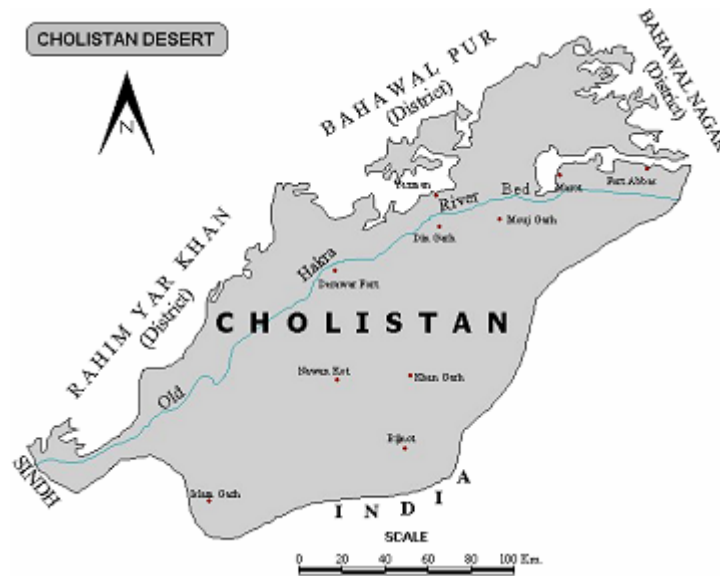


Fig. 1: Location map of Cholistan desert

It experiences soaring temperatures touching 50°C or more with periodical long droughts. Some plant species do survive during the droughts but undergo tremendous pressure of the grazers, leading to partial eradication. Scorching hot dust storms are common. The winter is mild with lowest temperature rarely touching the freezing.

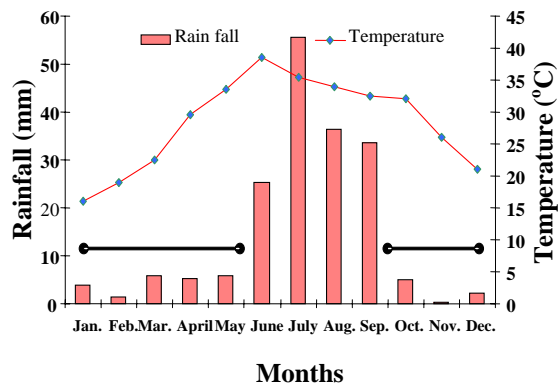


Fig. 2: Monthly mean temperature and rainfall in Cholistan desert during 2000-2005: Processed from the raw data provided by Regional Office of Pakistan Council of Research in Water Resources, Bahawalpur.

The average rainfall is 180 mm (Fig. 2) but it may be as low as 2 mm. The peak rainy months are July and August with the rainfall ranging from 38 to 56 mm. Thus, the area is least influenced by summer monsoon and in most part of the year remains handicap of water. Droughts in this region are quite common, sometime extending from 2 to 3 years, causing much sufferings (Chaudhry and Nasim, 1995).

Cholistan desert has long been famous for raising different breeds of livestock and supply of excellent quality of their products, which contribute a significant share to the national meat, milk and wool output. The total livestock population estimated during 2006 was 12,09,528 heads, out of which the camel population was 11,328 which makes only 1% of the total animal population, compared to 5.7% of previous years. The main species of other animals include 47% cattle, 30% sheep and 22% goats (Anonymous, 2006). In spite of the fact that the camel is playing a vital role in the socio-economic uplift of the area, no proper attention has been given for the welfare of this animal, resultant; the population of camel is on the decline.

The present paper presents the overall perspective for the camel rearing system used by the nomads/local inhabitants based on the partial studies of Local Knowledge Management System (LKMS) of a project funded by The Islamia University of Bahawalpur, Pakistan.

CAMEL BREEDS OF CHOLISTAN

On the basis of their utility, locality, body characteristics and size, two main groups of camels are classified in Cholistan desert. These are the groups of camels with distinct characteristics that they possess, yet, locally, these are recognized as breeds. These include Marrecha or Mahra, (Riding and dancing camel) (Fig. 3) and Barella or milch breed, with heavy body (Fig. 4).

Marrecha or Mahra

Marrecha or Mahra is a popular multi-purpose camel breed well adjusted to the Cholistan climate.



Fig. 3: A beautiful dancing, Marrecha or Mahra camel.

These animals are fine, fast and gracious looking and are called the riding camels. It is believed that these have been developed from Tharparker camels having their home tract in Sindh province of Pakistan (Rathore, 1986). It is estimated that these animals can travel 100 to 125 Km a day at a high speed of 20-25 Km per hour. This breed is also used for load carrying. These animals are lightly built, medium sized with medium head which is carried on a lean long beautifully curved neck.

The mouth is small with tight lips, ears are small and pointed, with prominent round bright eyes, and narrow muzzle. The legs are strong, fine and well shaped. The coat color varies from light sandy to dark blackish. Female she camel can give milk up to 10 liters a day.

Barrela

Barrela camel is mostly reared in the Lesser Cholistan and on the fringe irrigated areas of district Bahawalpur. The Barrela camels have heavy strong built and large body frame. The coat color varies from light sandy to dark brown with short coarse hair. Dark brown colored animals are preferred by local people. Barrela camels have muscular body with dome shaped head. The head is heavy, with a well defined looking. The neck is medium sized with marked curve. Eyes are bright, round with alert look and are protruding. Nose is thick, lips pendulous and ears are rounded and coarse. Shoulders are strong, broad and well set to the chest. Hump is very well developed in males and is placed in the center of the back. The chest pad is well developed and its touching ground evenly shows good confirmation. Legs are strong, bony, stout and well separated so that legs do not rub while walking. Hind legs are slightly weaker than fore legs and are inward curved. The foot pads are medium sized and soft. The milk vein is straight and prominent. Milking capacity of female camel is around 10 liters, while well fed animals can produce up to 15-20 liters of milk daily. Shah *et al.*



Fig. 4: A Barella camel.

(2008) recorded significant differences in the genotype frequency among different breeds of camels.

CAMEL PRODUCTION AND FEEDING

The Cholistan desert rangelands are monsoonal and the forage production in such lands is mainly governed by the monsoon rains in relation to the time, amount and frequency. The health and production status of animals depends upon the breed, birth and mortality rates and all other parameters which depend upon the availability of vegetation. During the normal rainfall years (i.e. when average rainfall is 100-200 mm), the amount of green fodder remains low and livestock do not have enough fodder. However, when there are rains above normal (i.e. 250 mm or more), large amount of fodder is available and the animals become healthy. When there is successive occurrence of drought, forage production is severely hampered coupled with overgrazing and virtually no vegetation is left for livestock feeding.

Under such rangeland conditions, camels are best suited than any other type of livestock for making best use of desert areas. Their grazing behavior is ideally adapted to scarce and patchy vegetation and they can walk long distances between bites. They usually do not destroy their habitat; however, when confined to one place, they may over graze the area. Because camels can go for many days without drinking, they can graze over areas very far from water resources, so can use very remote pastures (Gauthier-Pilters, 1979). In Cholistan, whenever the camel herds move from one rangeland to another, they graze and browse under the watchful eyes of shepherd for the first three months and then they are left alone for the further nine months of the year, hence they do not need watch and ward and they do not leave the area and their herds.

The food intake of camels in relationship to their body weight is low. They require only about 5–10 kg of dry matter to perform a day's work of carrying 120 Kg over 30 Km (Gauthier-Pilters, 1979). Even under

conditions of extreme drought, camels continue to produce milk. Because camels can minimize water expenditure for cooling and excretion, they yield milk with high water content even if they are dehydrated. Their lactation period is 9–18 months which enables pastoralists to subsist on their milk practically all year round. According to some calculations, camels need only 1.9 Kg of dry matter to produce a liter of milk, compared to a cow which needs 9.1 Kg of fodder to produce same amount of milk (Stephenson *et al.*, 1980).

Camels need about six to eight times as much salt as other animals, so they need to regularly graze on halophytic plants to remain healthy. In Cholistan desert, their favourite fodder halophytic plants are *Haloxylon recurvum*, *Haloxylon salicornicum*, *Salsola baruyosma*, and *Sueda fruticosa* and *Calligonum polygonoides* (Table. 1). Apart from these plants, camels also browse on trees like *Prosopis cineraria*, *Tamarix aphylla*, *Salvadora eleoides* and *Acacia species*. During the time when there are enough rains and enough fodder is available, camels also have the luxury to graze on grasses like *Panicum antidotale*, *Sporobolus iocladius*, *Lasiurus scindicus* and *Ochthochloa compressa*. Herbs are available only during the monsoon and post monsoon seasons, therefore, they form little part of food for the camel in Cholistan desert (Table 1).

SOCIO-ECONOMIC VALUES

According to 2006 Census of Pakistan, the total population of Cholistan camel was about 1,10,000 heads, out of which 51% were males and 49% were females. This structure of population is prevalent all over the desert, distributed in the form of small hamlets or semi settlements. The size and site of settlement depend on the availability of water from depression (“Toba”) in the vicinity. The people of Cholistan are pastoral nomads. Their social, cultural, religious and spiritual activities are mostly bound to this area. Any climatic change influencing their livestock also affects their living status.

Mostly, people of Cholistan are willing to enhance the number of camels in their herds and have more demand for male camels as a source of draught power by the poor sections of the Cholistan nomad community. But the root of the problem is the alienation of the traditional grazing areas due to crop cultivation into Cholistan lands, which makes it impossible to raise camels number in the area.

No doubt, population boom has compelled the government to expand the agriculture fields to satisfy the cereal needs. However, as is obvious from the reports about groundwater depletion in most Asian countries, including Pakistan, this land use strategy can be used for short time - only up to the availability of water. On the other hand, camels represent a prime source for putting desert areas to long-term productive use. Their population decline may lead to the abandonment of an indigenous and ancient method of

extracting energy and food from the arid habits like Cholistan (Ilse, 2004).

Apart from acting as a significant source of power, camels also fulfil many other human needs and there is plenty of potential for value-addition to their products. They are potential suppliers of commercial products such as camel hair, hide, meat, milk, raw bones and manure.

Camel meat is a special dish in large wedding banquets and receives highly esteemed guests. The camel is also becoming increasingly popular as a sacrificial animal at the occasion of Eid-ul-Azha (a religious sacrificial day of Muslims). Camel milk in various processed forms is an esteemed dietary item. As already discussed, Barrela she camel can yield up to 10 liters of milk daily which is very important for the nomads of Cholistan as supplement of food especially during the drought years. Camel milk on an average consists of 5.1% lactose, 4.8% fat, 3.8% proteins and 0.9% ash (Khaskheli *et al.*, 2005). Camel milk is high in vitamin C and can be used for the treatment of many diseases, including tuberculosis and dropsy (Ilse, 2004). It is somewhat difficult to get butter fat separated from camel’s milk due to minute fat particles/globules and their homogeneous presence in the milk. Since camel skin does not make good leather, camel hide is used for making suitcases as well as for large skin receptacles “Kuppas” used for storing oils and ghee. Camels play an important role in the defense of our country as they are needed for carrying defense equipments and ammunition from this part of the desert to another along the desert border with India.

MARKETING

The camel rearing is not only the earning source for the Cholistan desert nomads but other species of animals such as sheep, goats and cows are also reared for earning purposes. Livestock marketing is generally practiced through middlemen called “Buparies”. These Buparies usually visit various camps of nomads near water points (“Tobas”) and purchase animals in the interior of Cholistan by negotiation on the spot. In addition, marketing centers for livestock and livestock products are the small towns mainly situated along the northwestern boundary of Cholistan. The important ones are Fort Abbas, Marot, Khairpur Tamewali, Yazman, Liaquatpur, Ahmadpur East, Khanpur, Rahim Yar Khan and Bahawalpur. Since the nomads of Cholistan are not educated and skillfull in marketing their livestock, Buparies usually exploit the situation and purchase the animals at much less price than its actual value. The prices of a camel vary according to its health, quality and milking capacity of she camel. The price for the trained and racing camels may range between Rs. 1,50,000 and 2,00,000, while she camel with good milking capacity (i.e. 10 Kg per day) may fetch up to Rs.1,20,000. In most cases, prices for the camel range between Rs. 45,000 and Rs. 60,000.

Table 1: Major forage species and season of their availability to camel for grazing in Cholistan desert

Plant species	Palatability	Season available for grazing	Frequency of occurrence
Grasses perennial			
<i>Lasiurus scindicus</i>	High	B, C, E	V. Common
<i>Panicum antidotale</i>	High	B, C, E	Rare
<i>Panicum turgidum</i>	High	B, C, E	Rare
<i>Sporobolus iocladius</i>	High	B, C, E	Rare
<i>Stipagrostis plumose</i>	Moderate	B, C, E	Common
<i>Ochthochloa compressa</i>	Moderate	B, C, E	V. Common
<i>Cenchrus ciliaris</i>	High	B, C, E	Rare
<i>Cymbopogon jwarancusa</i>	High	B, C, E	Common
Grasses annual			
<i>Cenchrus biflorus</i>	Low	B	Common
<i>Cenchrus prieurii</i>	High	B, C	Rare
<i>Eragrostis barrelieri</i>	Moderate	B	Common
<i>Leptothrium senegalense</i>	Moderate	B	Common
<i>Tragus racemosus</i>	Moderate	B	Rare
<i>Enftopogon desvauxii</i>	High	B	Common
Sedge			
<i>Cyperus conglomerates</i>	High	B, C, E	Common
<i>Cyperus rotundus</i>	High	B, C, E	Common
Herbs			
<i>Tribulus longipetalus</i>	Low	B	Common
<i>Launea nudicaulis</i>	Moderate	D	Rare
<i>Launea residifolia</i>	Moderate	D	Rare
<i>Heliotropium crispum</i>	Low	B, C, E	Common
<i>Zaleya pentendra</i>	Moderate	B	Common
<i>Sesuvium sesuvioides</i>	Moderate	B	Common
<i>Dipterygium glaucum</i>	Low	B, C, E	V. common
<i>Convolvulus microphyllus</i>	Moderate	B	Common
<i>Trianthema portulacastrum</i>	Low	B, C, E	Common
<i>Heliotropium strigosum</i>	Moderate	A, B, C, D, E	Common
<i>Farsetia hamiltonii</i>	Low	B, C, E	V. common
<i>Cleome brachycarpa</i>	Moderate	B, C, E	Common
Shrubs			
<i>Calligonum polygonoides</i>	Moderate	A, B, C, D, E	V. common
<i>Aerva persica</i>	Low	A, B, C, D, E	Common
<i>Crotalaria burhia</i>	Low	A, B, C, D, E	Common
<i>Pulicaria rajputanae</i>	Moderate	A, B, C, D, E	Common
<i>Calotropis procera</i>	Low	A, B, C, D, E	V. common
<i>Salsola baryosma</i>	High	A, B, C, D, E	V. common
<i>Haloxylon salicornicum</i>	High	A, B, C, D, E	V. common
<i>Suaeda fruticosa</i>	High	A, B, C, D, E	V. common
<i>Capparis deciduas</i>	Low	A, B, C, D, E	Rare
<i>Haloxylon recurvum</i>	High	A, B, C, D, E	V. common
Trees			
<i>Zizyphus nummularia</i>	High	A, B, C, D, E	Reare
<i>Acacia jacquemontii</i>	Low	A, B, C, D, E	Common
<i>Prosopis cineraria</i>	High	A, B, C, D, E	V. common
<i>Acacia nilotica</i>	Moderate	A, B, C, D, E	Common
<i>Prosopis juliflora</i>	High	A, B, C, D, E	Rare
<i>Zizyphus spina</i>	Moderate	A, B, C, D, E	Rare
<i>Tamarix aphylla</i>	Moderate	A, B, C, D, E	V. Common
<i>Salvadora oleoides</i>	Low	A, B, C, D, E	Common

A = Pre-monsoon, B = Monsoon, C = Post-monsoon, D = Winter, E = Spring.

BREEDING BEHAVIOR

The pattern of reproductive cycle in camels is related to the season and climate under which they live. Under the harsh conditions of Cholistan desert, winter (November to January) is the breeding season for camels. Male and female camels reach puberty at the age of 3 and 4 years, respectively. If the pregnant she camel is beaten on her neck or she is made to run fast, the fetus may abort. Since there is no organized breeding strategy, all breeds are getting mixed up due to lack of selective breeding. The young females are exposed to the breeding male at the age of 3 to 4 years and gestation period is about twelve and a half month. Usually the calving interval is 24 months but if the female is looked after and well fed, then the calving interval may be reduced to 18 months. The female also has the ability to produce twins. A female with a life span of 35 years would produce 6 to 8 calves in her life time. The newly born camel baby is called "Toda" and is allowed to feed on mother's milk for one year, when it starts grazing. The breeding camel is used for breeding at the age of 4 years and one male camel ("Sand huter") is adequate for 30 to 50 females (Evans and Powys, 1979). According to Cholistani nomads, when a male camel is ready for mating, it usually leaves eating, always shakes his tail, rubs his teeth, and produces smelly black colour saliva from his mouth. In this situation, if the camel is stopped to go with female, then the male camel may take revenge and can even kill his owner. Only one male camel can be allowed to go with one female herd and if two camels are placed in one herd then they will wrangle with each other. In Cholistan desert, a female herd usually comprises 50 to 100 animals.

DISEASES AND CURE

Camel health is important both in terms of financial loss to the owner and sufferings that the animal bears. Camel rearing in Cholistan desert is mainly pastoral. Its ability to utilize plants that usually are not grazed by other livestock, low feeding and water requirements, endurance to harsh conditions, courage, hard working and contentness make this animal quite special among the other livestock. In Cholistan desert, the camels do suffer from diseases but their incidence is quite low compared to other breeds of animals such as cow, sheep and goat. Parasitism (both endo and ecto) is most common in camel herds. Free mixing of infested animals in herds is the main cause for the spread of parasites. Mange and ticks are a big problem, sometime infecting the entire body. Among parasitic diseases "Surra" (trypanosomiasis) is reported to be most deadly if left untreated. Majority of the camel deaths occur due to this disease.

The incidence of febrile disease, Rift Valley Fever (RVF) is very rarely reported. After rainy season, the cases of abortions and premature births have been observed and she camels do not allow their young ones to suck milk. Since these symptoms are more close to the RVF, the researchers thought that this might be due to this disease. However, more indepth studies and scientific endeavors are needed to reach a solid conclusion in this regard.

Other diseases include camel pox, especially in young camels, Foot and Mouth disease and anthrax (Ahmad, 2005). The mortality rate in camels is reported to be very low compared to other livestock in the area. At present, the veterinary dispensaries are available only near the fringe settlements of Cholistan desert such as Fort Derawar, Janu Wali, Chananpir and Head Farid localities, while such facilities are not available in the interior or remote areas of Cholistan. The traditional facility of disease diagnosis is usually available at the "Toba" level but treatment capabilities are very limited. Usually the traditional knowledge and medicines are being practiced for treating the sick animals, otherwise, due to the non availability of veterinary services and medicines, the herdsmen become helpless and large number of diseased animals may die as a result of absence of the proper treatment facilities.

CONSTRAINTS AND SUGGESTIONS

Animal husbandry measures deal with multifarious aspects which have direct or indirect impact on the outcome of breeding, feeding, housing, disease control, growth and production of animals (Mares, 1954; Hartley, 1979). The Cholistani desert camel is not only used to transport the load but are also being used for the amusement of the guests by dancing and racing in communal ceremonies of nomadic communities. In spite of huge cultural and economical values, this animal has failed to attract the due attention of general public and government functionaries.

In spite of the fact that the best male camels are found and are the choice of the herdsmen but the quality animals are not available for breeding due to poor breeding knowledge and the selection of male animals, as this is not based on production parameters such as genetic make up, docility and temperament but these animals are randomly used for breeding purpose. For choosing the male animals for breeding, the education and basic level training of nomads is necessary and should be arranged. Like the old cultural values, the traditional role of camel is also disappearing, hence, it is dire need of the area to start new and improved methods of camel raising so that the natural potential of the camel to produce milk, meat, fiber, skins and energy may be fully realized.

With traditional method of breeding, the female camels become six years of age when they first give birth to a baby and then they calve after every two years. Due to lower production rate, the building up a herd becomes expensive. The calving interval can be reduced to 18 months by improved breeding techniques and better feeding. Stall feeding may be one of the options when there is deficiency of fodder in Cholistan ranges by transporting it from nearby cultivated areas. But cost and difficulty of transportation of fodder is an issue. However, introduction of camel preferred fodder plants in the natural vegetation seems to be more feasible choice according to the Cholistan prevailing conditions.

There is lack of cooperation between animal scientists and botanists to achieve the common goal of improving fodder which can ultimately improve the camel husbandry and bring more earnings to the local people. It is suggested that scientists working on camel welfare should be provided the opportunities to meet and discuss their experience and research findings through arranging seminars and conferences by the concerned government departments, universities and private agencies.

Poor health coverage in the interior of Cholistan is another major constraint for healthy camel production. In the far flung areas of the desert, traditional know-how to diagnose the diseases do exist at the "Toba" level and nomads try to treat their animals through traditional medicines that sometime work and sometime do not. The veterinary service must be extended towards the interior of desert. This can be achieved by increasing the number of mobile veterinary dispensaries fully equipped with medicines and modern diagnostic equipment. Another way to improve the health situation of livestock may be to train the local people for vaccination and other veterinary basic health coverage techniques.

Camel can survive for longer periods without drinking and can replenish the loss in a very short time compared to other kinds of livestock (Farah *et al.*, 2004). However, easy access to water is necessary for effective performance of animals and their water needs are dictated not only by the climate, but also by feed (Gautier-Pilters, 1979). In Cholistan, during monsoon and post monsoon seasons, there is plenty of water for camel loved plants such as *Haloxylon recurvum*, *Haloxylon salicornicum*, *Salsola baruyosma*, *Sueda fruticosa* and *calligonum polygonoides*. So, camels wandering in ranges have little desire to drink water, but during summer season when the vegetation is dried up and plants have little water stored in them, the camel do need to drink. Therefore, such plants may be introduced in the camel pasture which can store enough water to compensate water requirements of these animals, especially during summer season.

At present, there is no authentic data on the diseases of camel in Cholistan. Disease profile of Cholistan camel must be identified on scientific basis and must be researched upon further for an effective treatment of diseases and for disease control plans.

Usually at the end of rainy season, the main markets of Cholistan are flooded with livestock including camels. This lowers the prices of animal, reducing the profitability of camel herdmen, who come long way from anterior desert and can not afford to hold their animals for longer periods around these markets nor they can go back home, which make them to sell their animals on lower rates. It is, therefore, very desirable to set up marketing network in the interior of Cholistan so that middlemen may not take an advantage for such miserable situation of these herdmen.

Conclusions

The nomads of Cholistan are pastoral and earn their livings by rearing and selling livestock. Camel, which is uniquely adapted to the harsh conditions of desert, is precious animal for them as it is used in variety of ways. For them it acts as a mode of transportation, energy, food and a source of amusement during their cultural festivals. Camel rearing is mainly pastoral and any natural or man-made change to the pastures directly affect the health of livestock. Camel production system is traditional and breeding is practiced on set patterns of knowledge transferred from generation to generation. This type of breeding practice is leading to loss of pure genetic pool and cross breeds emerging usually do not have desired characteristics and are of poor quality. Overstocking and overgrazing of existing rangelands is disturbing the delicate balance of ecosystem, resultantly, the most palatable plant species are being eradicated and are under the severe threat of extinction. Under these situations, the grazing behavior of camel can make this animal much suitable and economical. There is a dire need to encourage the local camel breeders by facilitating them by provision of veterinary health cover, better marketing facilities, and training of manpower for breeding techniques. Government interventions for the welfare of this animal can be much fruitful in terms of camel research and systematic production. This action will not only help in improving the shortage of meat, milk but also elevate the socio-economic conditions of local nomads.

REFERENCES

- Ahmad, A., 2005. Agro-pastoral systems in Cholistan. Pakistan Geographical Review, 60(2): 65-69.
- Akbar, G., T. N. Khan and M. Arshad, 1996, Cholistan desert, Pakistan. Rangelands, 18(4): 124-128.
- Akhter, R. and M. Arshad, 2006. Arid rangelands in the Cholistan desert (Pakistan). Secheresse, 17(1-2): 210-217.

- Akram, A., A. K., Wallyat and A. S. Bashir, 1986. Desertification Processes in Cholistan Desert. Technical Report, Pakistan Council of Research in Water Resources, (PCRWR) Lahore, Pakistan, pp: 5-16.
- Anonymous, 2006. Economic Survey of Pakistan, Finance Division, Government of Pakistan, Economic Advisors Wing. Islamabad, Pakistan.
- Chaudhry, S. and M. Nasim, 1995. Combating desertification in Cholistan desert. *Sci. Tech. Islamic World*, 13(2): 75-85.
- Evans, J. O. and J. G. Powys, 1979. Camel husbandry to increase the productivity of rangeland camels. IFS Symposium, Sudan, 241-250.
- Farah, K. O., D. M. Nyariki, R. K. Ngugi, I. M. Noor and A. Y. Guliye, 2004. The Somali and the camel: Ecology, management and economics. *Anthropologist*, 6(1): 45-55.
- Gauthier-Pilters, H., 1979. Some ecological aspects of the camel in Western Sahara. IFS Symposium, Sudan, 387-398.
- Hartley, J. B., 1979. Camels in the horn of Africa. IFS Symposium, Sudan, 109-124.
- Ilse, K. R., 2004. The camel in Rajasthan: Agricultural diversity under threat. Saving the camel and peoples' livelihoods building a multi stockholder platform for the conservation of the camel in Rajasthan, International Conference, Sadri, Rajasthan, India, pp: 6-18.
- Khanna, N. D., S. N. Tandon and A. K. Rai, 1990. Breeding parameters of Indian camels. *Indian J. Anim. Sci.*, 60: 1347-1354.
- Khaskheli, M., M. A. Rrain, S. A. Chaudhry, H. Soomro and Qureshi. 2005. Physico-chemical quality of chamel milk. *Agri. Social Sci.*, (1-2): 164-166.
- Mares, R. G., 1954. Animal husbandry, animal industry and animal disease in the Somaliland Protectorate. *British Vet. J.*, 110: 411-423.
- Rathore, G. S., 1986. Camels and their management. Indian Council of Agricultural Research, New Delhi, India.
- Shah, M. G., M. Reissmann, A. S. Qureshi and H. J. Schwartz, 2008. Evaluation of six camel breeds for heterozygosity through Restriction Fragment Length Polymorphism. *Pakistan Vet. J.*, 28(1): 13-16.
- Stephenson, R. G. A., R. D. Hooley, J. K. Findlay and P. S. Hopkins, 1980. Effects of heat stress on the lactation performance of ewes accustomed to tropical conditions and the total fluid intake of their lambs. *Aust. J. Biol. Sci.*, 33: 449-456.