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# Socio-economic constraints on camel production in Pakistan's extensive pastoral farming

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## Abstract

The present research is aimed to evaluate the diverse husbandry practices, ethno-veterinary practices, socio-economic status and distressing constraints of camel pastoralists inhabiting desert (Thal) areas of Pakistan, where they maintain herds of Marecha and Barela dromedaries in extensive production regimes. For this purpose, 200 pastoralists were selected at random to fill out an on-site questionnaire. According to the farmers' responses, it was perceived that their living status had improved in the last decades due to the progressive optimization of camel productivity and herdsman responsiveness. In contrast, calf mortality rates, some traditional husbandry practices and the lack of market investments continued to be the major constraints affecting camel overall production. Ethno-veterinary medicines are widely applied as primary health care, thus influencing the general health, production potentials and relief of camels in the study region. With this scenario, concerned stakeholders and authorized institutions must re-evaluate the urgent needs of indigenous communities; their education and husbandry skills to promote economic/ financial support in low-income remote areas. In turn, traditional communities will be adapted to the changing socio-economic and cultural values with regard to camel husbandry and welfare. Current societal perceptions and demands within this livestock production industry, where camels are conceived as a sustainable food security animal, if accomplished to the highest possible extent, will increase effectiveness of the camel value chain and breeders' quality of life will be noticeably enhanced. However, this success could be multiplied if government may devise community education, veterinary cover, marketing facilitates and interest-free small loans for pastoralists.

**Keywords:** Husbandry strategies, Ethno-veterinary uses, Constraints, Extensive pastoralism, Desert areas

## Introduction

Livestock production is an integral structural element of the agricultural sector globally by guaranteeing a variety of goods and services, using different animal species and various sets of resources, in a broad array of agro-ecological and socio-economic circumstances (Thornton 2010). In Pakistan, the livestock sector has a relative contribution of 11.7% to Gross Domestic Product, and is

a major source of government revenue and export earnings, which sustains the employment and income of the deprived rural community. It is the only food and cash security for underprivileged masses, extensively contributing draught power energy and manure for fodder and cash crop production (GOP 2019-20). The sale of livestock and their products often constitutes the only source of cash income in rural areas and hence the only way in which subsistence farmers can buy agricultural inputs like seeds, fertilizers and pesticides for cash crop production. Indeed, it represents the main income source for smallholder subsistence farming in some

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developing countries by providing round-the-year sustainable food and livelihood products (Faraz et al. 2019a). Besides that, at times of crop failure, this economic niche helps to conceal such rent temporal decreasing and raises the socio-economic status of low-income rural local communities (Faraz et al. 2018). Pakistan ranks eighth in the top ten camel producer countries in the world, with around 1.1 million heads (FAOSTAT 2019) and at least 20 different officially recognized camel breeds (Isani and Baloch 2000). Camel is an important domestic animal well adapted to extremely harsh environments of the desert. Due to its multi-purpose role, the camel is gaining importance, particularly as a milk- and meat-producing animal (Farah and Fisher 2004; Faraz et al. 2019b).

Camel production systems in Pakistan are mainly based on sedentary regimes where dromedaries (the one-humped camels *Camelus dromedarius*) are maintained from birth to finishing. Camels are mainly raised on the rangelands having natural vegetation which provide habitat apt for camel herds. The range livestock production system is linked to the pastoral systems whose main product is milk and the main function of livestock is subsistence of the community. Management is characterized by the adaptation of the feed requirements of the animals to the environment through migration; land tenure is communal and transient. In contrast, transhumant and nomadic herds are progressively disappearing because of the advancement of agriculture and the advent of intensive livestock farming systems (Blench 2001; Kaurajo et al. 2020). More than 40% of Pakistan's camel population is in Balochistan, 30% in Sindh, 22% in Punjab and 7% in Khyber Pakhtunkhwa Province (ACO 2006). Numerous research studies (Jasra et al. 1999; Jasra and Isani 2000, 2003; Khan et al. 2003; Pasha et al. 2013) have discussed and documented the production, management and socio-economic importance of camels in Pakistan.

Pakistani camels are well-adapted to their native environment (desert and arid regions) and act as a multi-purpose animal for the basic needs, satisfaction and survival of local livelihoods (Samara et al. 2012; Faraz et al. 2019c). Their physiologically unique characteristics allow them to produce even under harsh climatic and extreme environmental conditions, whereas the productive potential of other livestock species are adversely affected and their performance is relatively reduced (Faraz et al., 2013). Such peculiarities are especially exploited by nomadic pastoralists whose subsistence in arid and semi-arid areas of Pakistan is associated with the camel's productive potential (Iqbal et al. 2012). However, the updated technical skills for camel welfare and general health status are lacking for these local communities, so the camels' productive potentialities may be

overlooked. The primary cause of failure in most cases by the government and communities has been lack of sufficient understanding of relationships between the biological, economic and social components of each pastoral and rangeland production system (Faraz et al. 2019c).

Given the fact that current trends in camel-derived product consumption are expected to change in the present millennium (Khan 2012; Samara et al. 2012), it is imperative to illustrate husbandry practices and related constraints for camel extensive pastoralism in the country. Under this framework, since the role of camels in the economy of Pakistani marginal areas is still scarcely detailed (Faraz et al. 2020), the present study constitutes, to the knowledge of the authors, the first attempt to evaluate the socio-economic status of native pastoralists and extensive cost-effective camel farming in a Pakistan desert region as well as sketch a few recommendations.

## Material and methods

### Study area

The present research was carried out at Bhakkar district in the province of Punjab, Pakistan (31° 33' 39" north latitude, 71° 50' 33" east longitude). Most of the area lies in the plain of the Thal desert, and the climate ranges from arid to semi-arid subtropical conditions. The mean monthly highest temperature goes up to 45.6 °C, while in winter, it varies from 5.5 to 1.3 °C. The mean annual rainfall in the region ranges from 150 to 350 mm, increasing from south to north areas (Rahim et al. 2011).

Different areas within Bhakkar district (*Notak, Behal, Jahan Khan, Hyderabad Thal, Katemar, Khio, Mahni, Je-theend, Siraey Mahajar, Kohawar Kalaan, Thalla Shrein, Mankera, Kaloor Kot, Dariya Khan, Zammai Wala, Rodi Wala, Ghulamaan, Khasoor, Maloo Wala, Noona Wala, Mozah Sial, Muslim Kot, Panj Garaein, Haitoo and Loday Wala*) were visited to administer the questionnaire (attached as Additional file 1) designed for data collection.

### Quantitative sample

A total of 200 camel pastoralists were selected using a purposive sampling technique. The variables registered were herd composition, mean age of animals, physiological status, milk yield, feeding regime, housing conditions, calves' birth weight, general management strategies, ethno-veterinary practices and different socio-economic conditions perceived by camel breeders as potential constraints affecting camel production. The field study was carried out in accordance with standard guidelines for ethno-veterinary investigation (Albuquerque et al. 2014), including ethnobiological and anthropological methods

such as free listing, participant observation and interviews (Puri and Vogl 2004; Bernard and Gravlee 2014). The criteria described by the International Livestock Center for Africa (ILCA) was used to rank the major contributions of dromedary camels from herds involved in the study (ILCA 1990). Microsoft Excel was used for data compilation. Descriptive statistics (frequencies, percentages and average values) for the different variables registered were derived using SPSS software (SPSS 2008; Steel et al. 1997).

## Results

### Herd composition and productive parameters

Herd size was quite variable in the pastoralist communities: most herders (70%; 140) reared 2–3 adult animals and 2–3 calves while the remainder was in charge of 4–5 adult dromedaries and the same number of newborns (60% were females). Sex ratio within herds ranged between 1 and 2 males and 2 and 3 females.

In terms of average useful life, she-camels are reared for at least 15 years of age whereas male camels are sold for some domestic needs and religious sacrificial purposes (Eid-ul-Adha) at a maximum age of 8 years. The markets are seasonally owned by district governments of a particular area. Most of the camels are slaughtered at religious festivals. However, one day of the week, camels are slaughtered at butcher's shops too. Market value for the camel milk and meat is rising, especially the milk sold in the peri-urban areas, while meat is sold on Fridays at butchers' shops. Various companies purchase milk from these herders through middlemen to export powdered milk. Ordinarily, milk men purchase milk

from remote areas of the desert and take it to nearby cities for sale.

The number of females with progeny within each herd was about 80%, with most in the lactating stage of 6–18 months when carrying out the questionnaire. Seventy per cent of these fertile females had given birth on average four times. Calves' birth weight was found to be 36–50 and 33–39 kg in male and female calves of Marecha camels while 34–48 and 32–38 kg in male and female calves of Barela, respectively.

The main income source for these indigenous communities is the sale of milk, and daily milk yield was found to be 4–8 kg in Marecha and 5–9 kg in Barela camels under extensive pastoral conditions (Table 1).

### Husbandry general practices

Housing facilities and feeding regimes of dromedaries in the study area were explored in-depth. According to the respondents, about 35% of the camels were reared in completely open housing systems, while 65% were in semi-open facilities, with both types of housing properly cleaned and maintained by family members. The housing is an individual type, not communal; they are managed in an extensive system. Most of the camels are managed under the shady trees during the sunny days. The herders have made the semi-open sheds by using bamboos and *sirki*. The camels are mostly sent for grazing for 8–10 h daily and also fed gram and mung straw and household wastes (Table 1).

All surveyed breeders confirmed that they provide water to these animals 2–3 times per day and give stomach powder and/or salts for proper functioning of their digestive system, apart from the grazing plant species

**Table 1** Productive parameters and herders' response ( $N = 200$ ) from the study area

Parameters	Response
Herd composition	70% herders have 2–3 adult animals and 2–3 calves 30% herders have 4–5 adult animals and 2–3 calves
Sex ratio	1–2 males and 2–3 females
Mean age of animals	15 years for she-camels, males were sold at an earlier age or at the age of 8 at the Religious Holy festival (Eid-ul-Adha)
Physiological status	80% females were with progeny, 90% of them were in the lactation stage of 6–18 months, 70% had given birth on average of four times
Birth weight	36–50 and 33–39 kg in male and female calves of Marecha, 34–48 and 32–38 kg in male and female calves of Barela
Milk yield	4–8 kg in Marecha and 5–9 kg in Barela
Housing conditions	35% of the camels were reared in completely open housing systems while 65% were in semi-open system
Feeding regimes	8–10 h grazing, fed with crop straws and household wastes
Watering regimes	2–3 times per day
General management practices	20% calves fed with colostrum immediately after birth, restricted suckling with two teats from the right side was performed in 90% calves, weaning age was found as 12–16 months in 70% cases, deworming was performed in 25% calves, mortality rate was 20%

that camels have access to during the day. The herders have their land segregated between the groups. The camels graze on the land of herders and in desert areas (jungle grazing as well), consuming crop residues, and browsing trees and shrubs of the desert. The Government has also allocated grazing land of the Forest department.

People use ground water through drilled and water pumps; also, in some areas of the desert, the *toba* (stored rain water) system is available to be used for animals and for the community too.

At the breeding season (November to March), camelers mostly used village bulls for matings. Pastoralists allow males to mate 2–3 times and give extra flushing allowance to bulls in the rutting season. Poll gland secretions and Dulla protrusion were observed in bulls during the breeding season for a proper assessment and optimization of the reproductive status and performance of the animals.

For newborn care, it was found that in about 20% of herds in the present study, calves had access to colostrum immediately after birth, however in the remaining herds the pastoralists waited until the placenta had been shed before allowing calves to suck the colostrum. In 90% of calves, restricted suckling was practiced, as they were allowed to suck two teats, mainly from the right side of she-camels, with the left teats used to obtain milk for domestic self-consumption or to sell. Weaning age was found to be 12–16 months in most of the calves (about 70%). Deworming was only performed by 25% of herders, and calf mortality rates were about 20% (Table 1).

The camels were stall-fed with available fodders like *Medicago sativa*, *Sorghum bicolor*, *Pennisetum glaucum*, *Cicer arietinum* and *Vigna radiata* and household surplus of vegetables, fruits and bread waste. Feeding depends on seasonality and rainfall. Mostly, there is free-range grazing, and with the summer rainfall, more grazing is made available. The forage species available for grazing/browsing were *Acacia nilotica*, *Acacia modesta*, *Ziziphus mauritiana*, *Albizia labbek*, *Prosopis cineraria*, *Tamarix aphylla*, *Cenchrus ciliaris*, *Suaeda fruticosa*, *Cymbopogon schoenanthus*, *Kochia indica*, *Tribulus terrestris*, *Capparis spinosa*, *Haloxylon salicornicum*, *Caligonum polygonoides*, *Capparis decidua* and *Haloxylon recurvum*.

#### **Ethno-veterinary practices**

According to the general opinion and judgement of most herdsmen, their living status had improved in the last decade. They perceived an improvement in camel production rates, management practices, onset of organized farming and value chain effectiveness. Ethno-veterinary practices are still used by some herders for the treatment

of complex diseases affecting their animals and are having wide economic impacts. Herders explained the complexity of such diseases in terms of the duration, the intricacy in treatment, morbidity and mortality rate and production losses. This last item not only involved the poor quality of derived products but also enhanced feeding and labour expenses until the animal is completely recovered. According to their experience, the most common diseases and health risks within extensive pastoralism farming in the study area were trypanosomiasis, sarcoptic mange, contagious skin necrosis/lymph node swelling (*jhooling*), camel pox and snake bite.

A common disease trypanosomiasis (*surra*) badly affects the productive and reproductive life of camels, having symptoms like anorexia, fever, pale eyes, rough appearance and progressive emaciation. The disease is economically important as it diversely affects animal health and productivity. Pastoralists believe that the flies are the major causative agents in the spread of disease, and this belief is supported by the study of Jaji et al. (2017) who also reported the same findings in their study about herd growth parameters and constraints of camel rearing in northeastern Nigeria. While the Pakistani pastoralists try to control the flies, the basic treatment strategy is to neutralize the blood poison by bitter taste of plants and to awake the animal sleepiness. The second important disease is mange; the progressive weakness of the animal makes it prone to the disease. Mange is also economically important as it affects the fertility. It is contagious in nature and affects the draught ability, resulting in poor growth. Pastoralists believe that it is spread by rats and mange is of two types: white and black. White mange is of mild nature and covers only a certain area, the animal itches its body against hard objects and skin becomes thick and balled with whitish scabs. Black mange affects the major parts of the body, and baldness occurs which causes skin to become red-blackish and muddy. Animals become emaciated as cracks appear on the body and blood oozes out. Mostly, the crack localizes in the neck area which bleeds and invites the flies that cause infection and make the animals restless. Treatment includes washing and rubbing of the skin with sand and then washing and cleaning with laundry soap so that the affected skin becomes red and clean. Trichlorfon powder added to used engine oil or *taramira oil* or *chopra* (phenyl oil + turpentine oil + Neguvon powder) is applied on the skin.

Contagious skin necrosis (*jhooling*) is another disease mostly affecting young camels. The pastoralists believe that the disease is good for future health as purulent fluids drain the unidentified disease factors. Pustules are formed on the body of the camel which recover when the pus is discharged. The soft area of the body like the neck, shoulder and thighs are the main sites for attack.

Lymph node swelling, fever, anorexia, emaciation and constipation are major signs of the disease. Treatment includes hot application to the growth and maturation of nodules with the use of fly repellants and supportive therapy. Another common problem is snake bite in the desert area and most of the time the animals died. People use bitter plants to cure the poisonous effects on the animal. Indigenous veterinary knowledge of herders is mainly based on the hot and cold philosophy of food. The soups made of different meat, eggs, cereal, pulses and chilies make the hot food. These are the nutrients which keep the body active and energetic and enhance the activity of the body.

Regarding other ethno-veterinary practices, pastoralists mostly use cold application for the treatment of fever and give castor oil orally to control indigestion. For impaction and enteritis, pastoralists use butter with *ispaghul*, *taramira* oil, *lassi* and *desi ghee*. They use different formulations of stomach powder by using herbal and English items. For mastitis control, the pastoralists mostly use chillies and pepper, while for camel pox control, they use hot food, hot bread for the treatment of nodules in the mouth. Different hot soups are also used for the cure of disease.

#### **Socio-economic status**

The livelihood of the majority of the pastoralists depended upon the practice of livestock grazing on range vegetation. According to respondents, in District Bhakkar (the largest desert area of Punjab), 48% of the population was illiterate while the majority of the literate persons had only primary education. Forty-two per cent of pastoralists were land owners while the rest were landless or land tenants. Most of the houses were made of mud plastering while the others were made of bricks. The area owned by the pastoralists varies from 1.95 to 4.63 ha per family. On average, 70% of family members of all the pastoralists were involved in open grazing as their major occupation. Livestock herd size varied between 8 and 121 animals. The majority of the pastoralists preferred to rear goats and sheep due to early maturity of these animals. Among camel breeds, Marecha is the most favorite and beautiful raised in that area, as an aesthetic preference for dancing and riding purpose. In contrast, the Barela is very famous for its milking potential.

The sources of feeding for livestock during emergencies were wheat straw, gram straw and mung straw, concentrate mixture and cotton seed cake. Thirty per cent of all categories used veterinary facilities while 70% could not, due to more distance from the veterinary hospitals. Major sources of grazing for livestock were crop harvested areas while other minor sources were natural vegetation of road-side village wastes and along canals.

#### **Main constraints affecting camel production**

The second largest desert of Pakistan is the Thal desert, which is rich in indigenous livestock resources and located in District Bhakkar of Punjab province. The herders mainly raise camel, sheep and goats there. The use of these animals for meat and dairy purposes is still limited, due to many cultural and socio-economic factors. The major issues observed regarding intensifying the camel husbandry practices in the study area are discussed here.

Camel husbandry has a strong attachment for the herders in the area, and it is interwoven with their socio-economic system and dryland farming. While camel products are a novelty and have yet to achieve preference over cow or buffalo milk and meat, there is a lack of information and guidelines regarding value addition of camel milk and meat products, while attractive market and value chain services regarding camel products are not available. People still consider the use of camel milk as taboo and have not developed a taste for it yet. They usually sell the milk by mixing with cow or buffalo milk. No doubt in urban areas the people are getting aware of the therapeutic worth of camel milk and meat and setting a trend regarding its consumption. The extension services should be provided to guide the pastoralists about the significance of camel products so they better can exploit the hidden gold of their camels.

People in Pakistan raise camels mostly for riding, dancing and draught purposes, so the utility of their meat and dairy products as well as wool is minimal. Due to the lack of information on nutritional requirements, guidelines on formulation of camel feed ration and nutritional standards for growth, production and reproduction are immediately desired for improved husbandry and enhanced profit. Lack of advice regarding commercializing the camel husbandry and nutritional profile for rearing camels as meat and dairy animals has not yet been standardized.

According to 70% of the respondents, the major issue in camel production is calf mortality, because they are born in harsh and hostile climatic conditions. The calf growing season is mainly May and June—which is the period of forage scarcity, so the cow camel cannot meet her own feed requirements. The feeding allowance for lactation is too small to achieve a better growth rate for calves in that season.

In addition to this, poor extension and advisory services for farmer education, empowerment and entrepreneurship is a major hurdle faced by cameleers, which also has to be taken into account. Persistence with traditional husbandry practices, the lack of gender training and the main reliance on ethno-veterinary practices are also issues on the list. As the major livestock chores are met by the females, so

there should be gender training in the area to educate the females equally with males to strengthen the camel husbandry practices. Local and mobile veterinary dispensaries should be established to treat the camels in remote areas so that the reliance on ethno-veterinary practices could be minimized.

## Discussion

### Productive parameters

Observed milk production yields in the current study have supported the findings previously reported by Husien (1989), Gedlu (1996), Kebebew and Baars (1998) and Tezera (1998) who found milk production values ranging from 4.5 to 7.5 l/day in Eastern African camels, in contrast to the findings of Zeleke and Bekele (2001) in Ethiopian camels (1.5–3.1 l/day). Similarly, Khan and Iqbal (2001) reviewed the production of various breeds of Pakistani camels in different production systems and reported range of 3.5–20 kg of milk per day.

Recently, Raziq et al. (2010a) evaluated the milk production potential of Kohi dromedaries selected from pastoral herds in northeastern Balochistan and reported an average daily milk yield of  $10.2 \pm 0.4$  kg/day ranging from 6.1 to 11.7 kg. The dromedary camel is a milk-producing animal, and its potential as a commercial dairy animal was evaluated in this study. The highest milk yield 3168 kg was demonstrated in the 5th parity (13.5 years), followed by 3051 kg in the 3rd parity (8.8 years) and 3010 kg in the 4th parity (11.5 years). The lowest milk yield was 1566 kg produced in the 1st parity (4.5 years). In the same context, Faraz and co-workers investigated milk production in Marecha she-camels under extensive conditions (Faraz et al. 2020) and Barela she-camels in traditional systems within the Thal desert (Faraz et al. 2018). Parity and age of the camels significantly affected the milk yield in all the studies, and vast potential exists as regards to milk production that needs to be explored through extensive genetic studies and intense selection on the basis of breeding values.

During the current course of the study, it was observed that birth weight of camels significantly affected their productive potential. Birth weight data of dromedary calves from the database of one of the world's largest dairy herds Dubai, UAE, was evaluated by Bene et al. (2020). Based on the results of this study, they concluded that the birth weight of dromedary calves was more influenced by the dam's intrauterine rearing capacity and by the environment, management and feeding of the pregnant female camels than the hereditary growth potential. Considerable differences were found among male dromedaries in their breeding values for the birth weight trait. The birth weight of dromedary calves was the subject of interest in various former investigations reviewed by Tibary and Anouassi (1997). More recently, Bissa

et al. (2000) also summarized the available literature but focused primarily on Indian camel breeds. According to their results, the birth weight of dromedary calves belonging to the Bikaneri camel was 26–51 kg, while the average birth weight of male and female calves were 38.2 kg and 37.2 kg, respectively (Bhargava et al. 1965). Similarly, Wilson (1978) and Bissa et al. (2000) found the average birth weight of a dromedary camel calve as 35–39 kg with variations due to genetic and environmental factors. In contrast, Ouda (1995) reported the influence of sex on birth weight of the dromedary to be minimal, and in other studies, no differences in body weight between sexes were observed up to 2 years by Ouda (1995) or up to 4 years of age by Simpkin (1985); this variability was not clearly pronounced in our study sample

### Socio-economic relevance

Despite being overlooked for centuries as a multi-purpose animal, camels are now fortunately gaining recognition for their productive potentialities in the last decade (Faraz et al. 2019d, 2019e). As a consequence, majority of herdsmen interviewed stated that their living status had improved, as it was connected with camel rearing and production.

Most of the herdsmen possess she-camels while the male camels remained small in number. Camels are sold generally to the middlemen (beoparies/traders) where the price depends on the market demand and the general health status of the animal; however, herdsmen also take their animals to the nearby livestock markets where they can obtain higher prices. The main income source of the cameleers was the sale of milk, meat, animals and to certain extent draught power or crop cultivation.

For newborns, males were sent for slaughterhouses at an early age, except those selected as future breeding stock in the herd. In other cases, some male newborns are castrated and allowed to grow up to 3–6 years of age, then are sold for slaughter at the religious Holy festival (Eid-ul-Adha).

Notwithstanding, we encountered many camels with low milk production rates as a direct consequence of erroneous selection practices over decades, which have resulted in an increase in undesirable genetic pool. However, even poor milkers, producing up to 5–6 l of milk per day, can still provide sustenance for whole families due to the 'filling effect' (Faye and Esenov 2005). Elsewhere, it is very well documented that camel husbandry makes a significant contribution to national economies in Sudan as reported by Zubeir et al. (2006).

Finally, when uncertain, erratic rainfall causes crop failures, this has a drastic effect on the economy of the small, resource-poor farmer, such that socio-economic and environmental conditions of the area do not allow

these people to rely on crop production as a sole source of income. Therefore, the herders keep camels and other livestock species as a security against crop failure and as a means of income supplementing and saving. Despite the small numbers, in comparison to other animals, camels provide an important source of subsistence and income to the desert people in Pakistan. The camel's socio-economic values are widely recognized; in the marginalized societies, although mechanization is also endangering the greater role of camels, they have remained an integral part of the nomadic ecosystem of the country (Faraz and Waheed 2017).

### Ethno-veterinary practices

The herders in the study area had an immense experience and deep indigenous knowledge about prevalent diseases and treatment of the camels. They were well-acquainted with the symptoms and clinical signs of such pathologies and can differentiate properly between which morbid process a camel is suffering or could be suffered in a future moment. As people live deep in the desert or away from towns/cities or veterinary services, they have developed their own way of treatment for various diseases of camels, reported for other places (Volpato et al. 2015).

The herdsmen have different ethno-veterinary practices to resolve the issue of diseases, many of which are much alike those reported from other camel habitats around the world (Raziq et al. 2010b). Generally supportive treatments which promote healthy conditions and ensure the animal is fit for normal performance are very common in many societies (Grade et al. 2009). The healers regard ethno-veterinary practices as reliable, harmless, cheap, painless, readily available and easily applicable (Mertenat et al. 2020). However, ethno-veterinary medicine has its own strengths and weaknesses. Not all, ethno-veterinary practices provide ideal and effective circumstances to animal health troubles—no more than does allopathic veterinary medicine (Mathias and McCorkle 1989; Abbas et al. 2002; Lin et al. 2003).

### Production constraints

Calf mortality is a major problem that slows down herd growth in camel production systems, and it is mainly due to poor management and infectious diseases (Farah 2004). The reason behind is the lack of veterinary care and mostly the pastoralists rely on ethno-veterinary practices and traditional treatment methods (Chafe et al. 2008) while it is well proved that the access to veterinary services considerably reduced camel calf mortality (Simpkin 1985).

Coding from the literature data, the major constraints about camel production are found to be education, water

supply and veterinary services (Abdalatif et al. 2011) and reliance on ethno-veterinary treatments (Jaji et al. 2017)

### Conclusions and recommendations

The notions about camel as 'ship of the desert' and 'beast of the burden' have shifted their place to food provider. Hence, the camel is a very useful desert animal which could be harvested by maximizing its productive potential. The dromedaries are hardy and relatively resistant to many diseases, as well as able to thrive with limited resources more than other domestic livestock species. In Pakistan's desert areas, arid and semi-arid rangelands, they are being used as an important food animal. The camel husbandry system in extensive production is mainly related to traditional practices, ethno-veterinary treatments having numerous production constraints which could be overcome by incorporating modern practices.

Based on the results obtained, it is concluded that there is an urgent need for extensive educational and training programmes and/projects for pastoralists with the intent of improving their management practices and to refine their traditional knowledge. That is, ethno-veterinary practices should be preserved in the form of indigenous knowledge while the government should provide health cover and mobile veterinary dispensaries/clinics in desert areas. In addition, village cooperative societies should be developed, incorporating local members. Regular social events must be organized and coordinated to learn and discuss the pastoralists' concerns through these cooperative societies. For value chain further opportunities, herders should be provided with regular markets with ample facilities. Artificial re-seeding of grasses, trees, herbs and shrubs at the proper time (rainy season), along with rotational grazing, could be an added-value initiative. Interest-free small loan facilities should be devised through Agriculture Development Bank, Pakistan, on the recommendation of the cooperative societies to facilitate organized camel farming.

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13570-020-00183-0>.

#### Additional file 1.

### Abbreviations

FAO: Food and Agriculture Organization; GOP: Government of Pakistan; ACO: Agricultural Census Organization; KPK: Khyber Pakhtunkhwa; ILCA: International Livestock Center for Africa; BCR: Benefit-cost ratio

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#### Statement of animal rights

The procedures followed are in compliance with the ethical standards of the Animal Welfare Committee from the University of Agriculture Faisalabad.

#### Authors' contributions

All authors contributed equally to the research objectives' fulfillment and data presentation. Asim Faraz designed the protocols and conducted field research, Muhammad Younas supervised the field works, Muhammad Shahid Nabeel gave technical and practical support when conducting field research, Abdul Waheed was in charge of data analysis, Nasir Ali Tauqir helped in writing the article and Carlos Iglesias Pastrana was responsible for the thorough proofreading of the paper before submission. The authors read and approved the final manuscript.

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#### Consent for publication

Open access.

#### Competing interests

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