



## Review Article

### Economic Importance of Camel: A Unique Alternative under Crisis

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#### ABSTRACT

Increasing human population in the world has arisen the issue of food security. In order to combat with this issue, there is need to explore a new world of resources. Camel can serve the best useful addition to the food supply chain in terms of milk, meat and other products. Dromedary camel is found in Pakistan and its population is highest in Baluchistan (41%). In Pakistan, there are 21 breeds of camel. The main two types are riverine and mountainous. Camels are of vital socio-economic importance in the country as people use it for drawing water from wells, ploughing and leveling land, working mini-mills for oil extraction, grinding wheat, corn and other grains and for crushing sugarcane, and pulling carts for the transportation of goods as well as people. Well-fed camel can yield 10-15L milk per day. Camel milk can also be used for making yogurt, kurth, butter, ghee, rabbri and khoa. Meat, hides and hair are useful by-products of camel. Camel farming will be beneficial for farmers when proper marketing infrastructure is established. Also, standard procedures for the classification and identification of camel breeds for different purposes need more attention. Camel ranching schemes and collaborative research approach are need of the hour. These measures can lead us to utilize this novel animal as a natural resource for coping food demand of ever increasing population.

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#### INTRODUCTION

Livestock sector has traditionally been, and is expected to be, the part of social set-up to play its role beyond the commercial one. It is the most important sub-sector of agriculture in Pakistan that accounts for nearly 52.2% of agriculture value added and about 11% of the GDP. The net foreign exchange earnings from livestock products have exceeded 53 billion rupees in 2007-08. Livestock sector has its due importance in Pakistan due to the fact that about 30-35 million rural population is directly or indirectly engaged in livestock keeping and derives about 30-40% of their earnings (Economic Survey of Pakistan, 2007-08).

The camel is an important species uniquely adapted to hot and arid environments (Schwartz, 1992) and, therefore, contributes significantly to the food security of the nomadic pastoral households. This unique adaptability makes this specie ideal for exploitation under the arid

and semi arid land conditions. The contribution of camels to the human welfare of developing countries is generally obscured by several factors, which tends to underestimate their true value. Firstly, the estimates of camel populations are usually inaccurate due to lack of regular census. Secondly, their products seldom enter a formal marketing system; thus, their contribution to subsistence and the national economy tends to be grossly underestimated. As a consequence, less attention has been given to camel improvements for many years in the national development plans (Njiru, 1993).

In spite of an active member of the food producing family of livestock, camel has for a long time remained the most neglected animal in the field of scientific research. One of the important reasons for this neglect seems that it is predominantly found in arid, semi-arid and tropical areas of Africa and Asia where poor nutrition and husbandry are the major shortcomings (Sohail, 1983).

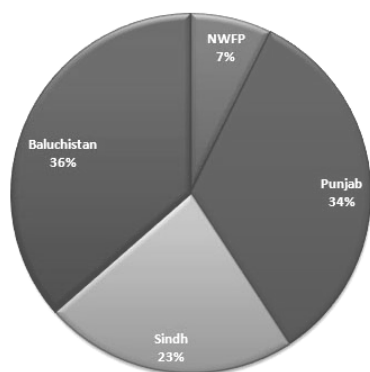
The versatility of camel and its suitability to survive and perform in the hard arid and semi-arid regions of the world have earned the name "Ship of the Desert". In other words, its unique physiological system aids this animal to fill important niche in desert ecosystem. Its strength, stamina and docility have been exploited for various agricultural operations, transport and riding purposes (Iqbal, 1999; Khan *et al.*, 2003).

This animal has a unique ability to convert the scanty plant resources of the desert into milk, meat and fibre. Camel has almost no competition for feed with other animals and is a hardy animal, comparatively eats less, goes into so called sleep for short intervals and possesses a long lasting memory (Khan *et al.*, 2003). The main objective of this article is to review the potentials, problems and solutions pertaining to camel raising, production systems and value chain addition in the marketing of camel as a whole in Pakistan.

### Population and distribution

Pakistan, with an estimated camel population of 1.2 million heads, ranks 3<sup>rd</sup> among major camel-raising countries after Somalia and Sudan (FAO, 2003). The highest population of one-humped camels (dromedaries) is in Baluchistan (41%), followed by Punjab (27%), Sindh (25%) and NWFP (7%; Economic Survey of Pakistan, 2006-07).

Pakistan teems with dromedaries but a few herds of two-humped camels (Bactrians) are also bred in the extreme northern areas. According to Qureshi *et al.* (1993), the camel population is unevenly distributed over the country, mainly in four distinct ecologic zones of Pakistan: i) Sandy deserts (Thal and Cholistan in the Punjab and Thar in Sindh); ii) Coastal mangroves (Thatta, Badin and Karachi districts of Sindh), iii) Mountainous tracts (all of Baluchistan, and the D.G. Khan and D.I. Khan districts of Punjab and NWFP, respectively); and iv) Irrigated plains (all irrigated districts of Punjab and Sindh).

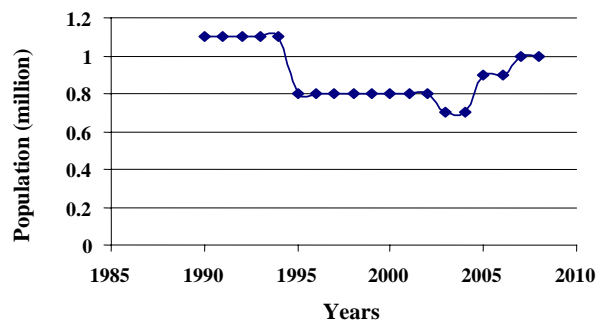


**Fig. 1: Graphical representation of population distribution of camels in four provinces of Pakistan (Source: Economic Survey of Pakistan, 2007-08).**

### Population trends in Pakistan

Over the last 18 years (1990-2007), camel population has shown mixed trends of negative and positive (Fig. 2). The population of camel remained at 1.1 million heads between 1990-1994, whereas, it decreased from 1.1 to 0.8

million in 1995 and remained at this level up to 2002. Again, there was a decreasing trend in population from 0.8 to 0.7 million which lasted for two years and was followed by increasing trend from 0.7 to 0.9 million. Pakistan faced a decline of 29% in the camel population between 1994 and 2004. In 2007-08, the population of camel was one million (Economic Survey of Pakistan, 2007-08).



**Fig. 2: Camel population dynamics during 1990-2008 (Source: Economic Survey of Pakistan, 2008-09).**

### Types and breeds

Two types of camels are found in Pakistan (riverine and mountainous). Mountain camels (locally known as Pehari or hill camels) are found in Northern Punjab and Baluchistan, whereas riverine camels are found in the deserts and irrigated plains of Punjab and Sindh. Recently, Isani and Baluch (2000) have documented 20 breeds of camel in Pakistan comprising seven breeds of Baluchistan (Kacchi, Brahvi, Kharani, Makrani, Lassi, Pishin and Rodbari), four of the NWFP (Gaddi, Ghulmani, Khader and Maya), four of Sindh (Dhatti, Kharai, Larri or Sindhi and Sakrai) and five of Punjab (Bagri, Brela, Campbelpuri, Kala-Chitta and Mareecha). Raziq and Younas (2006) reported another camel breed in Baluchistan named Kohi or White mountainous camel.

### Socio-economic importance

Iqbal (1999) and Raziq (2009), while working on socio-economic importance of camel, described the camel as an animal of great importance in large tracts of the industrializing world, where it serves as a cheap source of power for drawing water from wells, ploughing, leveling of land, working mini mills for oil extraction (from oil seeds), grinding wheat, corn and other grains crushing sugarcane and pulling carts for the transportation of goods as well as people. Camels are also engaged in the transport of salt, fuel wood, agricultural produce and household goods. In addition, a baggage camel comfortably carries loads up to 300 Kg to distant places at a rate of 30 Km/day. These facts tend to suggest that the camel can be of immense help to improve the livelihoods of those involved in its raising, provided they supplement their traditional management systems with modern husbandry practices and health care of their animals. In addition to power and transport, camels provide milk and meat, not only in very arid regions but also in several urban areas in many countries. It has the ability to

withstand the adverse effects of severe drought. Compared to small and large true ruminants, the mortality rate in adult camels is very low in the event of drought conditions (Khan *et al.*, 2003).

Better camel husbandry practices can improve the life of African nomads who largely earn their living through raising camels. In the light of the predictions of increased global warming, the camel probably would be the most favored animal to develop. In Arabian Gulf states, a thriving camel industry exists based on camel racing. Twelve years ago, a racing camel in Sudan could fetch high price up to 15 million dirham, while the price for good race winner was 2–6 million dhs. A non-descript camel in the general market could bring 2–3 thousand dhs/male and 4–6 thousand dhs/female (Manefield and Tinson, 1997).

In Pakistan, 0.24 million tons camel milk is produced annually, which values at Rs 2.4 billion. Moreover, 50 thousand tons of camel meat is produced annually, valued at Rs. 250 million (Economic Survey of Pakistan, 2007-08). The native camel also indirectly contributes to the economy by surviving under the management systems of pastoralists, nomads and small farmers with surprisingly low inputs, mostly in the difficult and arid, drought-stricken areas and mountainous regions where the long-term survival of other livestock does not seem possible. Also, they do not compete with other livestock for their nutritive requirements, since most of the time they browse the tops of trees and shrubs. About 22 500 camel hides are obtained annually in Pakistan and are used to manufacture saddlers, sandals and beautiful decorative articles, some of which are also exported. Camel hair produced in Pakistan amounts to 20 thousand tons and is used for manufacturing blankets, floor mats, tent cloth and ropes. The calves are born with a soft woolly fleece, which is usually shorn once and is mixed with hair for manufacturing blankets (Khan *et al.*, 2003).

### Production systems

Socio-economic importance of camel is closely associated with existing production systems. These systems are largely determined by climatic conditions, topography of the land, plant growth phenology and water sources. There are three major camel production systems in this region *i.e.* nomadic, transhumant and sedentary.

Nomadic system is characterized by extensive animal husbandry. Lack of grazing forage and water shortage is a primary motivation for roaming from place to place. Camel husbandry in nomadism is intimately linked to the social life of the people. Nomadic camel management has three basic features: 1) Camel herds are diversified with other species of livestock (sheep, goats and donkeys). Different animal species in a herd with different dietary preferences and grazing habits (browsers and grazers) not only utilize a wide range of forage but also reduce the probability of total loss of livestock. It also involves socio-economic considerations of a nomadic family. 2) Movement of herds is an obvious fundamental strategy for survival including various types of migration (seasonal, short-distant and long distant disaster migrations). 3) Loaning camels and sharing herds is usual activity. It enables a nomad producer to share camels with other fellows of different areas in case of a drought or less forage availability. It is also a good means of establishing

and strengthening social contacts. True nomads follow the seasonal patterns of forage production. They are allowed to pass through the local tribal common rangelands, but cannot prolong their stay. In the lowlands of Sindh, they have contracts with local farmers for buying stubble grazing rights, straw and other feed for livestock. They would sell their animals and animal by-products in exchange. The arrival schedule in the lowlands coincides with the harvesting season, extending opportunity to nomads for working as a labor force in cultivated fields and to buy cheap feed for their animals. Likewise, their return to the highlands in spring and summer coincides with seasonal re-growth of vegetation and with seasonal labor requirements (Buzdar, 1989).

Twenty-six percent of the camel herders follow this type of production system. An average nomadic family would own 24 heads of camel along with 95 sheep and 32 goats. Three or four families keep their livestock together and making up a flock of about 380 animals. A nomadic herd of 24 camels (72% female and 28% male) usually has 15 breeding camels and 6 calves. Forty-eight percent of the gross income is constituted by the sale of live camels and camel services, 30% by marketing small ruminants and 8% by off-farm employment (Aujla *et al.*, 1998).

Transhumant system usually involves shifting of tillage operations among rainfed areas during certain seasons of a year (Wilson and Clarke, 1975). These migrations sometimes follow fixed annual routes because the transhumant producers would always move between specific locations. The extent of movements from one cropping area to another may be subjected to available feed and water. Camel raisers cultivate rain fed crops, mainly winter wheat. Every winter after sowing wheat fields, they move from the central highlands of Baluchistan to the Indus valley where they behave like a true nomadic population.

The semi-nomadic transhumants (5%) are almost completely dependent on their camels and small ruminants. They are co-owners of common tribal rangelands, and in most cases their movements take place only within the limits of their tribal lands. They move from commonly owned rangelands to the open rangelands, as forage availability fluctuates, and would usually return to their permanent dwellings during the summer months. In case of a drought, some of them take their families and animals to adjoining agricultural valleys to work as laborers, and their animals graze on stubble or vegetation in and around the fields. Camels and donkeys are used for transportation of crops and other goods. They would earn enough by these means to buy wheat grain and other supplies for living (Buzdar, 1989). Transhumant flock size ranges from 1 to 5 camels along with 5 sheep and 15 goats. Overall, 23% of camel herders raise camels as transhumant flocks (Aujla *et al.*, 1998).

Approximately 50% of the camel herders raise camels under sedentary system. Camel raising constitutes 35.2% of household income and helps increase farm productivity. Women play a major role, not only in raising animals, but also in converting their by-products into useful food and marketable items like carpets, mats, blankets, gunny bags, etc. Since mid 70's, there has been a steady decrease in the number of nomadic and transhumant herds. Herds are gradually becoming

sedentary by settling around permanent agricultural fields established by an influx of tube wells where former shepherds find increasing alternate work opportunities (Aujla *et al.*, 1998).

### Milk production

The Pakistani camel has an excellent potential for milk production (Table 1). The Marecha is probably the best milk yielder in the world, with an average milk yield of 4179L per year. Lactation varies from 270 to 540 days and the total milk yield ranges from 1300 to 4200L. The milk yield of a well fed camel is recorded as 10–15L per day. In areas with poor fodder and in desert conditions, the daily average yield was 4L (Yasin and Wahid, 1957). Heavy breeds of Pakistani camel produce up to 35L per day (Aujla *et al.*, 1998). Unlike cattle, the camel can maintain an average daily milk yield up to at least one year, provided fodder and feed are adequate. An analysis of the milk shows a substantial variation in the percentage of fat (between 2.1 and 2.6; Knoess, 1977). Camel milk is rich in proteins, fat, minerals and vitamins, especially in vitamin C. The high vitamin C content is important in areas where green vegetables and fruits are not readily available. The phosphorus content of camel milk is higher than that of cows, buffaloes, sheep and goats. The fat content is equal to cow milk. It is therefore evident that camel milk in many aspects is superior to the milk of other domestic animals (Qureshi, 1986). A comparison of camel milk with that of other mammals is presented in the Table 2.

Camel milk also possesses a superior keeping quality compared to cow milk, due to its high protein content that has inhibitory properties against bacteria. This makes raw camel milk a marketable commodity, even under high temperatures with very basic hygienic conditions (Yaqoob and Nawaz, 2007). The development of camel dairying and the commercialization of milk are elements of new production systems that will have important implications for the future management and husbandry of camel in

Baluchistan province and other areas of camel concentration like the Cholistan rangelands, Thal and the Thar Desert (Aujla *et al.*, 1998).

Camel milk is consumed fresh or converted to yogurt (Abu- Ruqaie *et al.*, 1989). Because of the nature of the camel, its milk has different sensory characteristics. The Pakistani camel possesses all the prominent dairy characteristics that enable it to serve as a good dairy animal. Camel dairy farming on the basis of modern husbandry practices can become a source for exploiting its dairy potential. The production records indicate the variability in the production potential of different camel breeds. Baluch (2001) reported that the average milk production of Pakistani camel was 1894.93L per lactation with daily yield of 4.25L.

The camel produces more milk per Kg body weight than Sahiwal cow, the Friesian X Sahiwal cow and the buffalo (Knoess *et al.*, 1986). In a similar environment, the camel also produced more milk for a longer period of time than any other species, while their requirement for feed was modest (Wilson, 1998). It was further reported that in Punjab, a well-fed dromedary camel produced more milk than even the high-performance exotic cattle and their crosses (Knoess *et al.*, 1986). The camel thrives in areas where green fodder is only seasonally available as a result of erratic rainfall, and can survive on feed rejected by other animals (Knoess, 1977; Yagil, 1994). The efficiency of the camel should be appreciated in terms of its productivity parameters, as well as with respect to its superb adaptation to a harsh environment, the sustainability of production across seasons and its accessibility to people living on marginal lands.

### Milk products

Products of camel milk include various sour milks, cheese (kurth), khoya, butter and ghee. Despite common belief in south Asia that camel milk cannot be used to prepare butter and ghee due to the small diameter of fat globules, some local and foreign workers have devised

**Table 1: Milk production and lactation length of Pakistani camels**

Source	Average daily yield (L)	Lactation length (months)	Lactation yield (L)
Yasin and Wahid (1957)	10-15	16-18	2721-3629
Leopold (1978)	8.3 (6.7-10)	9-18	2700-3600
Knoess <i>et al.</i> (1986)	18.7	-	6688
Qureshi (1986)	8-10	-	-
Schwartz (1992)	-	9-18	12000
Aujla <i>et al.</i> (1998)	4-12	9-18	1250-3650
Iqbal (1999)	-	-	4260
Khan and Iqbal (2001)	3.5-40	9-18	3629
Baluch (2001)	4.25	15	1894.93
Raziq (2009)	-	-	2590

**Table 2: Comparison of camel milk composition with those of other species**

Species	Water (%)	Total solids (%)	Fat (%)	Protein (%)	Lactose (%)	Ash (%)
Camel	86.6	13.36	4.33	4.02	4.21	0.79
Buffalo	83.56	16.42	6.95	4.25	5.10	0.82
Cow	86.2	13.8	4.4	3.8	4.9	0.70
Sheep	82.0	18.0	6.4	5.6	4.7	0.91
Goat	87.0	12.9	4.1	3.7	4.2	0.80
Horse	90.1	9.9	1.0	2.6	6.9	0.35
Human	88.0	12.0	3.8	1.2	7.0	0.21

Source: Qureshi (1986).

methods to make butter and ghee successfully (Knoess *et al.*, 1986; Qureshi, 1986). The most common products made from camel milk are dahi (yoghurt), lassi (sour milk) and kurth (cheese) in north-eastern Baluchistan. There was a general belief that butter could not be made out of camel milk, but the Livestock and Dairy Development Department Punjab obtained 175g butter from 4L camel milk (Qureshi, 1986). The detailed procedure has been described by Raziq and Younas (2006).

“Kurth” is a name given to a white local cheese, which is a hard, rounded piece of the dry matter of whey. To make kurth, camel lassi is sieved through a muslin cloth, filtering out the total solids, and salt is added for taste and further preservation. It is further dried in the sun to make hard balls and used in this form or changed again into lassi when needed. The lassi of kurth is also used for making a local dish (kurtho marrie). Another popular local dish is prepared by soaking bread in kurth solution and pouring melted butter (locally called desi ghee) over it before eating it (Yaqoob and Nawaz, 2007).

“Khoa” is made by evaporating small amounts of milk over hot, steady fire (Aggarwala and Sharma, 1961). The milk is continuously stirred to prevent scorching. At first the mass left over has a buttery consistency, but after cooling, it turns into a semi-solid dough with a sweet taste. “Khoa” can be kept for about 200 days. If sugar is added it keeps for longer periods.

“Rabbri” is also made by heating milk in a shallow iron pan over hot fire. The difference with “Khoa” is that the solids are removed successively from the thin layer of coagulated milk on the surface. Then the product is allowed to cool. When the milk reaches a fifth to an eighth of the original volume, it is removed from the fire. The mass is now gently mixed, without damaging the flakes that have formed. Sugar is added and it is then allowed to cool.

### Meat production

Milk and meat are the principal products of the camel. Meat is usually a by-product of a camel system and the demand for camel meat appears to be increasing among societies not herding camels that come mainly from old males and females that have served usefully in other functions in earlier life. Only a limited number of castrated males are raised especially for slaughter. The camel meat annually produced in Pakistan is 50,000 tons valued at Rs. 250 million (Khan *et al.*, 2003). About 0.17

million camels are slaughtered in various countries by well-to-do Muslims on their annual religious festival, Eid-ul-Azha. Many people raise camels simply for their sacrificial slaughter on this annual festival. Camel meat markets, except in Sudan, are not well developed, but lucrative export opportunities to Egypt, Libya, Saudi Arabia and Gulf states exist. Camel meat has been scored as high as or better than beef by taste panels in the Arab states. Even outside Arab states, meat from young camels has been graded as having the taste of prime beef. Camel meat is usually only a small proportion of the meat consumed in a country. In Pakistan, approximately 70–75 camels are slaughtered daily in various slaughter houses. In several African and Asian countries, the consumption of camel meat is equivalent to 5–50% of nationally produced red meat. The meat is usually eaten fresh, cooked in pieces or minced, but is sometimes air dried. Meat from camels is also used for sausages, in which form its cooking and taste qualities are similar to those made from beef (Khan *et al.*, 2003). The dressing percentage of the camel is in the range of 45–55%, but exceptionally it can rise to 60%. The live and carcass weights and dressing percentage reported by Wilson (1998) are given in Table 3.

Using standard cattle butchery procedures, the forequarters comprise about 34% of the total carcass, while the hindquarters constitute 25%. The rest of the carcass includes about 5% liver, heart and lungs, with the head being 3.6% and the feet about 4.3%. The wet hide is equivalent to about 10% of live weight and the blood to about 3%. Reports of weight gains in camel vary greatly. Under open range conditions, a live weight increase of 1 kg/day has been reported. In Egypt, animals fed on a high energy diet compounded from cottonseed, rice, molasses and mineral mix gained 150Kg body weight in 6 months (almost 0.82 Kg/day). Well-fed young camels under intensive conditions have gained 0.58Kg/day (Khan *et al.*, 2003). The reported live weight variation in camels suggests there is ample scope for the genetic manipulation and development of a meat type (Manefield and Tinson, 1997).

### Hair and hides

Hair production of adult animals ranges annually between 1 to 3 Kg. Hair is used for making ropes, bags, mats, carpets and blankets. Camel hides are used for making shoes and saddles. A hide is commonly sold at Rs. 300 to 550. Its value goes as high as Rs. 3,000 to 5,000

**Table 3: Live and carcass weights and dressing percentage of Sudanese camels from Darfur**

Parameter	Sex		Total (n=60)
	He camel (n=21)	She camel (n=39)	
<b>Live weight (Kg)</b>			
Mean	447.9	414.4	426
Range	305.5-581.0	307.5-522.5	305.5-581.0
<b>Carcass weight (Kg)</b>			
Mean	231.3	196.3	208.5
Range	144.0-310.0	141.0-248.0	141.0-310.0
<b>Dressing percentage</b>			
Mean	51.4	47.4	43.8
Range	46.2-55.6	41.3-53.5	41.3-55.6

Source: Wilson (1998).

when used for manufacturing table lamps. These products have great export potential. The hide of the dromedary is not of good quality and is mainly used for making whips and other products like a container for water and milk (Khan *et al.*, 2003).

Nevertheless, the food producing characteristics of the desert-living camel, in respect of both milk and meat, are complemented by accompanying yields of wool, hides, skins and bones, which all help to provide man with clothing, shelter and other useful products. When breeding for the ideal milk producer, the meat provided by the calves and the wool can supplement local industry. As with beef, the most economical age for slaughter, and the age of the animal having the best-tasting meat must be determined. This will quickly reverse the misconceptions regarding camel meat which are mainly due to the slaughter of aged animals that have outgrown their usefulness (Wilson, 1998).

### Marketing

The camel milk produced in the far-off mountainous and desert areas cannot reach the urban markets and is utilized locally. However, camel milk is sold in big cities as pure milk, or mixed with milk of cows and buffaloes, especially when the supply of cows and buffaloes milk does not meet the market demand (Yaqoob and Nawaz, 2007).

In fact, there is no established marketing infrastructure at either site and the market places are no more than open grounds. Mainly the middlemen bring camels from different areas to markets. Less occasionally, an individual producer may take his animals directly to one or both major markets. Camel sales also occur at a few occasional markets i.e. annual exhibition. Some "Livestock Melas" at different places of the country in different seasons especially in spring as well as in summer also take place. For this purpose, camels from long distances are transported to the exhibition sites. But this transportation of camels is unaffordable for the producers (Aujla *et al.*, 1998).

In the absence of well-developed marketing infrastructure and resources (transport cost, etc.), the herders prefer to dispose off their camels at the village level. Moreover, it is uneconomical for a producer to take one or a few animals to a long distance market, because a producer would sell his animals as per his occasional cash needs. The situation encourages a middleman to travel as a buyer of camels and camel products and make contacts with herders, individually. Producers are generally at a bargaining disadvantage because middlemen have a wider experience and more knowledge of market conditions for stock. Middlemen in mountainous areas are reported to make a profit as high as 35 to 40% and it is in reality a big loss to the producer (Mahmood and Rodriguez, 1993). The price of a camel depends upon its health status, quality and milking capacity of she-camels. 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/day) may fetch up to Rs. 1,20,000. In most of the cases, prices for the camel range between Rs. 45,000 and Rs. 60,000 (Ali *et al.*, 2009).

Usually, camel milk is utilized subsistently due to the lack of proper transportation facilities and unaffor-

dable expenses of transportation. *Dodhees* buy this milk from the producers and mix it with buffalo/cow milk and sell it in the city. A thorough analysis of the camel marketing system and marketing margins is required to understand properly the current marketing system, and secondly, to devise ways to improve the system so that herders receive a reasonable proportion of the consumer's price (Aujla *et al.*, 1998).

### Conclusions

Although the indigenous dromedary camel (*Camelus dromedarius*) has continued to be the sole source of food, transport, and income for hundreds of thousands of nomads, its potential for increasing food supplies and family income has almost been ignored by planners of development projects and researchers. There is sufficient evidence to indicate that the dromedary camel possesses practical and unique attributes for meat and milk production under intensive and extensive management in the arid and semi-arid regions of Pakistan.

Due to prevailing droughts and the trend towards decreasing production of other animals, the camel has gained more attention as a way of bridging the gap between demand and supply. Decreasing camel population demands that we attend to the factors contributing towards its decline. Recent studies have shown that the camel is a prime candidate for meeting the milk requirements of pastoral people, as well as other populations if managed, bred and fed properly. Furthermore, in the context of change and global warming, under-exploited species like camel will find a better place to thrive and produce even under harsh climatic conditions. There are many virgin areas of research and development in this species, demanding that proper milk recording, selection and breeding practices are made to exploit its genetic potential to the maximum. Some planned and integrated efforts are needed in the camel-populated areas of Cholistan and Baluchistan to undertake research and development on this species and allied matters. This is expected to bring revolutionary changes and further improvements in enhanced milk production and assist camel herders by improving their pastoral economy.

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