

Socio-economic Profile of Camel Herders in South-western Mountainous Areas of Pakistan

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ABSTRACT

Camels provide important sources of subsistence and income to the people residing in the mountainous areas of Balochistan. To identify the problems in raising camels and feasible interventions in camel production systems, a detailed inquiry into the subject was required. Agricultural economist and range-livestock specialists from National Arid land Development & Research Institute (NADRI) conducted a formal survey in collaboration with the provincial Livestock Department in October, 1997, which comprised 200 randomly selected camel herders in three mountainous area of Balochistan.

The purpose of the study was to provide an overview of camel production systems and their contribution to different farm activities in the region; to identify the problems and constraints in camel farming and to formulate research areas and suggestions for the improvement of camel farming in Pakistan. Household profiles of the interviewed camel herders were studied. Detailed information was collected on camel demography, ownership, flock sizes and structure, production, health and management practices. Markets, marketing channels and prices received for live camels and camel products were also studied. Seasonal migratory patterns of camel herders and their impact on grazing lands were mapped. Finally, a scope of improving camel productivity, research opportunities and potential for camel industry development were concluded.

Key words: Soci-economic, Production, Camel, Pakistan.

INTRODUCTION

Pakistan possesses approximately 23 % (1 million) of the dromedary camel population of the Asian countries. This population has been increasing at the rate of 1.6 % per annum. Balochistan, the largest province of Pakistan, comprises less than 5 % of the human population of Pakistan while the provincial share of camels is 36 % (the highest amongst all provinces). Per capita camel availability is about 1 camel per 14 inhabitants. Socio-economic and physiological conditions of these areas do not allow farmers to rely on crop production as a sole source of income. Rainy areas of Pakistan make a significant contribution to agriculture. Of total cultivated land, nearly one-fourth of the area receives rain. Arid lands of Punjab and Balochistan respectively support 70 % and 80 % of the livestock population in the provinces. South-western mountainous areas are mainly comprised of Balochistan province as well as Rod Kohi region (parts of NWFP, Punjab and Sindh provinces). These areas are mainly characterized by marginal and diversified agriculture, reflecting the interaction of soil type, crop diversification and livestock grazing.

Low crop yields result in persistent food deficiency in the region and hence, livestock forms a major contribution to agriculture. The livestock sub-sector contributes 25 % to the Gross Agricultural Product in Balochistan (FAO, 1983). The value of livestock production has been increasing mainly because of larger numbers of animals, mostly camels and small ruminants. Most of the people are illiterate and women are especially disadvantaged socially.

Socio-economic and physiological conditions of these areas do not allow farmers to rely on crop production as a sole source of income because uncertain and erratic rainfall may cause failure and have a drastic effect on the economy of a small and resource poor farmer. Therefore, farmers keep camels and other livestock as security against crop failure as a means of saving and to have a source of supplementary income. The mixed livestock and crop farming systems reflect an element of complements and integration between these enterprises.

Livestock raising interacts with crop production in both directions: crop residues are the major sources of ruminant feed; livestock, in turn, supply draft power and manure to the crop enterprises (Isani, 1987). Generally, landholdings are small in the

rainy areas and subsistence farming predominates. Moreover, the small landholdings and involvement of male category of population in off-farm employment also increases the role of women on farms. As women play a major role in animal husbandry, further emphasis is given to the livestock production.

Despite their small number in comparison to the other ruminants, camels provide an important source of subsistence and income to the people residing southwestern mountainous areas. The dromedary is the only camel found in Pakistan. Since it is the most economical and efficient animal of arid and semi-arid areas, its socio-economic value is widely recognized, particularly in Balochistan province where most of the total camel population of Pakistan resides. Although peaceful mechanization is also endangering the greater role of camel in the marginalized societies, the camel shall remain an integral component of the nomadic ecosystem in Balochistan for the next few decades.

The National Aridland Development and Research Institute (NADRI), Islamabad is attempting to document the fundamental socio-economic aspects of camel producers in various camel habitats of Pakistan. This report contains the socio-economic profile of camel herders in the southwestern mountainous regions of Pakistan. The specific objectives of the study were:

- To provide an overview of camel production systems in mountainous areas.
- To explore the feeding, breeding and disease management for camel raising in mountainous areas.
- To identify the farmers' main problems in raising camels.
- To make implications for researchers and planners for future strategies.

Methodology

The present study is confined to the southwestern mountainous areas of Pakistan (mountainous areas of NWFP, Punjab and Sindh provinces). A multidisciplinary team comprised of an agricultural economist and range-livestock specialists from NADRI conducted a formal survey in collaboration with the provincial Livestock Department in October, 1997. A survey questionnaire designed by NADRI, was pre-tested both in Sibi and in the suburbs of Quetta during September, 1997.

Since a representative sample of the mountainous areas was required, it was decided to spread the sample all over the mountainous Balochistan and Rod Kohi, by targeting all major camel producing areas. The survey locations and routes were identified during pre-survey consultations with the provincial Livestock Department to avoid any personnel bias in selecting the sample population. Overall, four locations were chosen and a minimum of 30 camel herders were interviewed from each location making a total sample size of 200 respondents.

Socio-economic and biological characteristics

Based on physiographic features, Pakistan was classified into four major camel habitats: a) mountainous tract; b) sandy deserts; c) irrigated plains; d) coastal mangroves

This paper pertains to the southwestern mountainous tract. This habitat stretches over almost the whole of Balochistan province and its adjoining Sulaiman mountains in the Rod Kohi region.

Rainfall

The mountainous habitat extends over an area of 392 thousands km² (Mohammad, 1996). It may be divided into northern highlands (northern Balochistan and Rod Kohi) and lowlands (southern Balochistan excluding the coastal zone). The northern highlands (174,300 km²) receives relatively high annual rainfall (≥ 250 mm), whereas the low lands (215,000 km²) are arid, receiving annually as low as 50 mm of precipitation. Situated in the desert belt between 25 °N and 32 °N. Balochistan has an arid or semi-arid climate, with annual precipitation varying from 50 mm in the west to over 400 mm in the east.

Rainfall generally occurs in two seasons: winter (November to April), as a result of western disturbances in the anticyclone system extending from Siberia to Iran; and summer (July to October) as a result of monsoon storms originating in the Bay of Bengal and the Arabian Sea. Most of Balochistan is on the fringes of the monsoon area and so does not receive large or reliable amounts of summer rainfall. The proportion of annual rainfall received as summer rains varies from 10% to 60%, increasing in a northwesterly to

southeasterly direction. The principal land use is range land, irrigated and dry land cropping.

The terrain and soils

Mountainous terrain is a dominant topographic feature of this habitat. It consists of a series of mountain ranges with an inhospitable terrain, and intervening fairly narrow valleys. The soils of the area are classified as lithosols (very shallow) on the mountain slopes and strongly calcareous alluvial yermosols in the valley bottoms (homogenized and porous to about 100 cm depth, sandy loams to loamy clays, pH 8.0 to 8.3, 8 to 20% lime, low in organic matter, N and P content). Soil textures in the valley bottoms vary from sandy loam to loamy clay, with the property to form strong crusts following wetting.

Grazing resources

A large part of the mountainous area is uncultivated (> 90%) and animal grazing is the ultimate land use. Only 10 million hectares of Balochistan (30% of total area) can be considered as usable rangeland (Van Giles and Baig, 1991). Large scale mountain slopes are practically barren and useless for livestock foraging. Relatively healthy rangelands (half of the usable ranges) produce only 200-300 kg DM/ha/year and the other half produces less than 100 kg DM/ha/year. Balochistan rangelands are continuously degrading in terms of reduction in standing biomes and invasion by unpalatable plant species, as a consequence of over-exploitation for forage and fuel wood.

There are two types of private rangelands in Balochistan based on property regimes (common ranges and open ranges). Common rangeland is traditionally owned by tribes with customary institutional arrangements for their sustainability and effective management. Open rangelands, used to be commonly owned, have unrestricted access and are free to all and are usually deteriorated. At some point in time, the group or tribe makes a decision as to whether a rangeland is so degraded that it should not be considered anymore as a common rangeland. Open rangelands have been increasing in area as the more exclusive common rangelands have lost the ability

to sustain the animals' grazing needs and are abandoned by their owners (Buzdar, 1989).

Two factors have mainly caused rangeland deterioration (institutional implications due to excessive population growth and external social and economic forces coupled with no management). For example, migration of 0.6 million Afghan refugees with their 4.8 million animals to Balochistan have devastated large scale grazing resources in the northern highlands. The other effects of this sudden increase in Balochistan, equivalent to 14 % of the total livestock and human population in Balochistan, on a fragile environment have been drastic.

On the other hand, the differential within communal setup has gradually given way to increased divergence of interest and unequal concentration of power. This, in turn, enabled the more powerful families to press for exclusionary use and de facto appropriation of common resources. As a consequence, they are subverting and eroding gradually the corporate communal institutional arrangements.

Human resources

Balochistan makes up 5.1% of the national population and its share would improve (8.5%) by the year 2010 (Van Giles and Baig, 1991). Comparatively, the southwestern mountainous region is sparsely populated however, the rate of increase invites great concern. From 1972 to 1981, the human population multiplied annually by 7% (equally contributed by both internal growth and influx of Afghan refugees). It was further estimated that the total population in 1991 was 7.1 million and would rise to 10.7 million by the end of this century. The anticipated growth rate is well above the already high national average (3.1 %).

About 50 % of the population is below 15 years of age. This may indicate a negligible awareness about the applicability of modern family planning techniques. Children are perceived as a source of labor for subsistence operations. The sex ratio is 112 males to 100 females. This is probably due to a lower life expectancy within the adult female segment, as a consequence of high maternal mortality rate, a prevalent feature in sub-continent countries.

The literacy rate in rural areas is 9.8 % for male and 1.8 % for females. Conversely, in urban areas, it is 42.4 % for males and 18.5

% for females. In rural areas, 77% of the population is engaged in agriculture, animal husbandry or forestry (GOP, 1983). The average family size in survey areas is 9.5.

Migration patterns

The migratory period starts with the onset of winter. A migration may originate from somewhere in Afghanistan and may end up in any part of Balochistan or the Indus plains. In most cases, migrations start from a locality in the northern highlands with a final destination in the southern foothills or irrigated plains of the adjoining provinces. They stay there with their animals until February or March. With the onset of the spring season, they move back to the mountainous areas. The movement is along traditionally fixed routes. The migration involves both activities (pastorals and trade) as the migrants are accompanied by their flocks and trade goods are transported on camels.

The migration rate with both families and livestock varies from 60 to 70 % depending on the climatic conditions of the areas. The major reasons of migration as reported by respondents are severe cold, lack of range forage and shortage of water. Ninety % of the camel herders agreed that they would not migrate to lowlands in the critical period of winter if adequate arrangement for sufficient feed and water were made. Visible impacts of migration on the camels were losses due to weaknesses and infectious disease and overgrazing of rangeland resources along specific migratory routes.

Camel production systems

Pakistan possesses approximately 23 % of the camel population of the Asian countries (FAO, 1985). This population has been increasing at the rate of 1.6 % per year. The major portion of this population is found in Balochistan (36%), followed by Punjab (34 %), Sindh (23 %) and North West Frontier Province (NWFP) (7 %). Afghan refugees have also brought 0.16 million camels with them which are located in Balochistan (65 %) and NWFP (35 %), (GOP, 1989). Per capita camel availability is about 1 camel per 14 inhabitants. The annual rate of increase in the human population from 1972 to 1981 was 7 %. Camels play an important role in the economy of these ecologically difficult areas.

Camel rearing is considered as a source of investment and income with low risks and minimum management attention. Camels are widely distributed all over Balochistan, but nearly 70 % of them are concentrated in the southern zone. Since the seventies, camels are losing their importance when trucks and buses have emerged as popular transport in Balochistan. The mechanization process did slow down the annual camel population growth rates (1.6%). Most of the camels are owned by farmers, peasants, landless laborers and pastoralists. Farmers are usually crop oriented subsistence peasants with low incomes, living close to the poverty line (Mahmood, 1995). The majority of them invariably possess goats or sheep, or both, along with camels (Table 1 & 2). Landless peasants may be hired as camel shepherds for extensive grazing.

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

Table 1: Camel herd structure in survey areas, Balochistan, 1997.

Camels	Kharan	Talli, Sibi	Mastung	Duki	All
Total No.	2310	1092	91	810	4303
No. of Respondents	70	60	30	40	200
Ave. No. of Camels/herder	33	16.8	2.6	27	21.5
Range	4-150	1-120	1-5	13-45	1-150
SD	36.62	27.61	1.48	11.53	29.12

SD= Standard deviation

Table 2: Camel herd structure in survey areas, Balochistan 1997.

Camels	Kharan	Sibi	Mastung	Loralai	All
No. of camels	2310	1590	91	810	4801
	-----%				
Adult male	15	13.9	46.2	27.5	18.8
Adult female	64.1	68.7	53.8	50.3	61.9
Lactating	26.7	23.7	23.1	23.8	24.9
Dry	37.4	45.0	30.7	26.5	36.9
Calves	20.9	17.3	0	22.3	19.3
Male	9.4	5.9	0	8.5	7.6
Female	11.5	11.4	0	13.8	11.7

Nomadic system

Nomadism 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:

- 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.
- Movement of herds is an obvious fundamental strategy for survival including various types of migration (seasonal, short-distant and long distant disaster migrations).
- 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 in surveyed areas 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 % 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.

Transhumant system

Transhumance or semi-nomadism is also basically a livestock system differing from nomadism. It 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 maybe subject to available feed and water.

Buzdar, (1989) distinguished between transhumants with land ownership (semi-sedentary transhumants) and land-less (semi-nomadic transhumants). The semi-sedentary transhumants (18 %) cultivate rainfed crops, mainly winter wheat. Every winter after sowing wheat fields, they move from the central highlands of

Balochistan 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.

Sedentary system

Approximately 50 % of the camel herders living in southwestern mountainous areas 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.

Income

In the survey areas, the major activities were camel raising along with sheep and goats, crop production and farm labor. Because of the joint family system, a large number of families had members engaged in more than one enterprise. In Kharan area, 95 % of respondents were engaged in camel raising, wheat and melon production, whereas in Sibi area, main activity was camel raising and

providing labor services to perform various farm operations, particularly wheat harvesting, threshing and transporting farm products. In fact, the socio-economic conditions in most of the survey areas were such that all enterprises had to be at subsistence level and small scale. The natural resource base as well as traditional technology, does not extend conducive conditions for large scales economic activities. Average annual income shares from various enterprises under camel production systems in survey areas is presented in Table 3.

Table 3: Income source of camel herders in Balochistan, 1977

Source	Nomadic	Transhumance	Sedentary
	%		
Sale of Camels	29.5	8.8	22.4
Sheep,goats,hides/skins /wool	30.6	6	11.7
Value of home consumption ¹	14	6.2	10.6
Farm operations & transportation ²	18.4	22	12.8
Crops production	0	46.9	28
Off-farm employment	07.5	10.1	14.5

¹Include value of home consumption, gifts to relatives, bridal price or sacrifices.

²Draft power for farm operations and transportation of wood, farm inputs and products.

Camel husbandry and management practices

The camel plays an important role as a riding and work animal within the prevailing socio-economic set-up of the three production systems. During the survey, it was observed that a camel was used for ploughing for 6 to 8 hours with one or two breaks of half an hour. Meanwhile, land ploughed by a camel varied from 0.5 to 1.0 ha depending upon the type of soil. Farmers used camels (55%), bullocks (33%) and tractors (12%) as traction power at their farms

for performing various agricultural operations in both irrigated and dry land farming systems of Balochistan (Rees *et al.*, 1988). It was estimated that per acre ploughing charges for a tractor, a pair of bullocks and camels was respectively, Rs. 80, Rs. 64 and Rs. 56. Hence, the camel is an economical source of draft power for cultivation and therefore, farmers prefer camels for various agricultural operations over tractor or bullocks.

Water is a scarce commodity in this region where underground water depth varies between 100 to 300 feet. One very important task the camel performs is pulling out water from very deep wells and/or transporting drinking water from sparsely located wells and springs. It was observed that a camel worked for 8 hours on average depending on total volume of water required for various needs.

The camel has significant importance as a riding animal and for transportation of trade goods in mountainous areas. Much of the trade between Sindh and Balochistan across the mountains is carried out with the help of camels. It was estimated that on average a riding camel traveled 12 km per hour with a range of 8 to 20 km. Transport charges are Rs. 5.00 per 40 kg for 5 km and Rs. 9.00 per 40 kg for longer distance. The respondents revealed that on average, a transporting camel could cover 60 km in a day. However, distances covered by hired camel ranges between 25 to 100 km. It was estimated that camels carried average of 280 kg with a range of 220 to 370 kg, depending upon type of commodity and distance.

Milk production

The economic benefits of camel products (milk, meat, etc.) are not apparently visible. However, the domestic value is considerable. The mainstay of a nomad's food is camel milk. It is consumed fresh or soured. Farmers reported a lactation length of 270 to 525 days. The daily milk yields vary from 4 to 12 liters. As high as 22 liters of milk were daily obtained from a few milk camels. The total milk yield ranges between 1,250 to 3,650 liters with an average of 1,800 liters (Table 4). The lower milk yields attributed to poor feed supplies. Females were milked twice a day. Young camel calves weaned at an age of 9 to 11 months.

Table 4: Milk yields of camels in mountain areas of Pakistan.

	Source of Feed		
	Good	Poor	Range
Average milk yield (l/d)	11.5	4	8
Lactation yield	2,450-3,380	1,264	2,400-3,200
Lactation length (days)	345-540	365	365
Calculated yield for 305 days (liters)	2,650-3,650	1,180	2,140-2,840

Meat production

The camel may be a good source of meat in areas where the climate adversely affects other animals. The slaughter rate of camels in Balochistan is three % (GOP, 1989). The carcass weight in underfed camels has been reported at 188 to 253 kg and in the case of healthy and wellfed camels, it was 350 to 500 kg. The dressing %age about 55 %. At present, about 9,000 metric tons of camel's meat is being produced annually in Pakistan. Balochistan contributes approximately 40 %. Camel meat is generally not preferred by the majority of local people, due to its salty taste and low quality because aged camels are usually slaughtered. Most of the good specimens are smuggled through southern Balochistan to Iran and other Arab countries for meat.

Production of 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 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.

Camel feeding

One of the most advantageous attributes of the camel is its ability to utilize plants that grow well under arid conditions and are not relished by other grazing animals (Knoess, 1977). Camels take 30 to 70 % of their feed from grazing on rangelands. The reported average daily intake was 6 to 7 kg of dry matter. Camels can thrive for months by eating only 5 kg of dry matter a day. The camel's way of feeding is entirely different from that of sheep and goats, which graze intensively. Camels rarely overgraze and are constantly moving and taking only small portions of each plant. They cover large areas while foraging even if food is plentiful. They prefer grazing in early morning and late afternoon, which are the coolest times of day for foraging.

Although water is an essential part of an animal's diet, the camel can survive long periods without drinking and would replenish the loss in a very short time. Nevertheless, the water requirement varied from season to season from 5 to 15 liters a day.

Camels manage to store sufficient energy as hump fat during a season when food is plentiful which enables them to survive the times of poor forage. They obtain about 44 % of their feed requirements from forage averaged over the whole year (Rees *et al.*, 1988). December through February is the period in which, households supplement all ages of camels, whereas only weak and disease camels are supplemented under nomadic and transhumant systems during winter. Supplement feeds are Lucerne, crop residues, wheat/barley straw, grains, maize and sorghum. During the scarcity period, especially winter, transport camels are supplemented with one to two kg of crushed wheat and barley mixture called "khadeen".

Breeding practices

The pattern of reproductive cycle appears to relate to the harsh environment in which camels live. The camel reaches puberty at 4 to 5 years of age. In Balochistan, the breeding season is from December to March. Since there is no organized breeding policy, all breeds are

getting mixed up due to lack of selective breeding. The age at which young females are exposed to breeding males for the first time is 4 to 5 years and the gestation period is about twelve and half months. Farmers with no male breeding camel can hire one at a cost of Rs. 2,000 to 3,000 for a breeding season. The reported calving interval is 24 months. A female with a life span of 30 years would produce about 6 to 8 calves in her lifetime (Yasin and Wahid, 1957). A breeding male is used for breeding at 4 years of age and one male (Stallion) is adequate for 30-35 females (Evans and Powys, 1979). The best male is chosen on the basis of his vigor and is judged by the performance of his parents.

Disease incidence

Camels do suffer from quite a few diseases. Parasitism (both external and internal) is most common in all herds. Mange and ticks are a big problem, infesting the entire body. Surra (*Trypanosomiasis*), a parasitic disease, is deadly if not treated properly. Symptoms are often diagnosed after 2 to 4 years of infestation. Meanwhile it is manifested chronic and periodically febrile diseases which leads to abortions, premature births and inability to nourish the young. Farmers reported 25 % mortality due to Surra.

Camel pox is the main viral disease. There are regular outbreaks among young camels. Foot and mouth disease (FMD) is sporadically found, but on the whole camels are unaffected. Anthrax and frequent abortions (20 %) are also found.

The mortality rate in camels as reported by farmers is 5 to 10 %. They do not know causes of deaths. Seventy % of herders tried traditional medicines for treating sick and 20 % called a veterinarian only after home remedies were ineffective. The reason for not calling the services of a veterinarian was non-availability (65%), expense (25%), and services not effective (10%).

Labor use

Labor requirements for camel enterprise vary with the type of production system and herd size. Traditional pastoral systems have high employment capacity at low levels of output per person engaged in pastoral pursuits. Most labor used for camel raising is by family

members. Where large herds are maintained, men would most likely provide the required labor. Women and children mostly herd smaller herds. In most regions where camel and other livestock are milked, women and children provide most of the milking labor. Low labor requirements and low skill required to maintain a small herd of camels make it possible for a household to generate an economic return from family labor that has little or no opportunity cost elsewhere (Aujla and Jasra, 1996). Shepherds are also hired by 10 to 15 % of owners for a period of one year. Camel shepherds get their wages on the basis of having 50% share in calves.

Marketing

There are only two major camel markets (Quetta and Dalbandin) in the whole region. 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 all over the region to both markets. Less occasionally, an individual producer may take his animals directly to one or both major markets. The marketing activity starts early in the morning and may continue till evening. The market is held throughout the year with rare holidays or weekends. The market is loosely organized by the concerned municipality and it charges a nominal entry fee (Rs. 3.0 per camel) and commission agents charge (Rs. 50 to 100 per camel) to both sides on successful transaction. The market size of Quetta is 50 to 250 with an average of 100 camels. Dalbandin size is a little less than Quetta.

The Quetta market also serves as a focal market for other provinces. Camels are transported from Sindh (Thar desert, Badin, etc.) and Punjab (Multan, Dera Ghazi Khan, Muzaffar Garh, etc.) to this market for sale. Off-take occurs throughout the year. However, it is higher in spring as well as summer. Camel sales also occur at a few occasional markets (annual exhibitions). Sibi Mela Livestock show is a major annual event for all kind of livestock producers. This occasion leads to considerable livestock marketing activity for about a week. For this purpose, camels from all over the southwestern mountainous regions and all other camel habitats are especially transported to Sibi during the last of February, each year.

Very few producers can afford travelling a long distance ranging from 50 to 350 km to reach Quetta of Dalbandin market. In

the absence of well developed marketing infrastructure and resources (transport cost, etc.), the herders prefer to dispose of 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). 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.

Implications for development

1. Social and institutional implications are accelerating the degradation process of grazing lands. Current intense and high grazing pressure levels with no parallel resource development/improvement activity is largely converting common ranges into open lands. It is a dangerous phenomenon and requires urgent measures. It is imperative to involve community based organizations (CBO) to save these natural resources. While focusing on cracks and gaps within a given communal and social set-up, the CBOs should implement resource rehabilitation and management programs. A target community must come to realize that repair and rehabilitation of communal common and/or open land is a primary responsibility of its individual member. It is a most neglected aspect and has rarely been targeted by any public or social organization. Since the social environment is complex and sensitive, development agencies are generally reluctant and consider it a difficult task with little or no success.

2. The human population has multiplied quickly as compared to other provinces of Pakistan. A very low literacy rate (< 10%) in the countryside gives a little apprehension of resource degradation and its long term socio-economic impacts on the marginalized societies. The socio-cultural trends need to be redirected away from

subsistence at the grass-root level. All kinds of grass-roots including camel herders would need pursuance and motivation through training for shifting to commercial as well as profitable production.

3. Seasonal migration is a primary feature of camel herders. It causes a sudden imbalance and very high pressure well beyond the threshold level of a particular resource and ultimately inflicts irrecoverable annual damage to it. More than 90% of herders agreed that they would not migrate to low lands in critical period of winter in case adequate arrangements for sufficient feed and water were made at their origin. For this purpose, any unconventional approach for feeding animals has to be employed. However, it must match with existing socio-economic norms.

4. Crop cultivation is expanding due to over exploitation of underground water by tube wells. It must be supported by adequate watershed management activities otherwise a severe lack of water resources may lead to big trouble for the whole region.

5. The socio-economic value of camel is closely associated with the existing camel production system. It appeared that the camel generated considerable annual income (> 40 % of gross income) in all three types of production systems. Introducing modern applied technologies, particularly for feeding, disease control and marketing may effectively enhance its role. The ingredients of a development package may differ for each production system.

6. Current management practices of all three-production systems are quite rustic. Despite its significant contributions to annual gross income, the camel is considered an animal, which requires little management and input as compared to other kinds of livestock, which influences greatly its current productivity levels.

7. Marketing of camel products (milk, meat and hair) is not customary. Milk is consumed at the domestic level. Camel meat gets a low dietary preference by local people and hence, little is consumed locally. This situation discourages commercial production of camel products. Conclusively, the present market value of an individual camel is largely based on its work potential and/or travel needs of dwellers. Commercial camel ranching for meat production has big scope for export to Middle East countries. It would involve a policy decision for establishing a camel meat processing plant at a local market (Quetta). An established market infrastructure would in turn induce improvement in camel husbandry and input flow.

8. Inadequate forage supplies coupled with heavy parasitism cause heavy economic losses to camel herders. A producer considers heavy infestation by external and internal parasites as the single biggest problem. Having good control only over parasitism, the overall performance of camel herds may improve 100 %.

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