Socio-economic aspects of dromedary camel management in hot arid desert ecosystem

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ABSTRACT

Present socio-economic aspects of camel management were investigated in 11 selected villages of Bikaner district (two tehsils) in Rajasthan. Analysis of data indicated that most of farmers involved in camel rearing were old-age category who engaged their animals in carting operation. The overall total fixed and variable costs of whole camel carting system were Rs 5056 and Rs 39070, respectively with actual profit of Rs 32 419 whereas PBP and B.C.R were 8.64 month and 1.73. Objective of camel-rearing significantly differed between camel keepers and camel merchants. Number of camels significantly influences rearing practices in these areas. Mostly small-category farmers fed their camels by sending at range land. The category of farmers significantly influenced feeding practices. The maintenance of regularity and provision of free access of water to camel seems to be limited. Majority of farmers kept their camels under the tree shade and used to replace loose sand dune with fresh lot to avoid health disorders. Currently maximum of old-aged farmers and a few of young were consuming camel milk in this region. Camel also played important role in socio-cultural aspects. A predominance of respondents were having low scientific, extension orientation and mass media participation. Most of carcasses were disposed off at distance of about 10 km away from residential area, in jungle or in open places. Decreasing availability of grazing pasture was first and foremost constraint for camel rearing. For sustainable camel production, it is necessary to develop suitable programme of natural resource management, low-cost rearing and health-care practices, as well as market facilities for camel products and by products.

Key words: Camel, Farmers, Management, Production, Socio-economic

The camel (*Camelus dromedarius*) has unique adaptive characteristics to survive in harsh conditions. Since 85% of gross cultivated area of Bikaner district is non-irrigated, camel carts hold a significant potential for financing (Kumar 1999). Camel energy is not only cost-effective but also profitable and remunerative. Evaluation of IRDP in arid lands have indicated that average increase in income of the beneficiaries was one of the highest among people who have taken loan for purchasing of camel (Khanna 1994). The camel management practice varies widely depending on existing socio-economic scenario of farmers of a region. It is, therefore, necessary to investigate prevailing socio-economic aspects of camel management to introduce ideal management practices appropriate to the ecosystems and tradition for sustainable camel production.

MATERIALS AND METHODS

Sampling design: Farmer families (174) were identified randomly as sample with probability proportionate to total

camel farmer families in 11 villages. Out of 11 villages 7 were from Bikaner tehsil and 4 from Kolayat tehsil of Bikaner distt. The meticulous and grass-root level of observations were recorded related to present socio-economic aspects of camel management.

Data collection: To meet objectives of the study both primary and secondary data were collected. Data were recorded through pre-tested semi structured interview schedule. The quantitative and qualitative data were also collected through interaction and discussion with farmers, key informants, housewives and secondary sources. Several visits were made to build rapport with respondents of selected village and panchayats before actual data collection. Collected data were classified properly under different categories for interpretation.

Statistical analysis: The statistical method (Snedecor and Cochran 1989) was applied to analyze data. Spearmen's rank test was applied to study the variation in objective of camel rearing between different types of farmers. Chi-square test was applied on various aspects of feeding management systems and rearing practices of camel. The knowledge level of respondents regarding socio-economic aspects of camel

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management were assessed through knowledge index as developed by Bhaskaran and Praveena (1982).

Economic analysis: The economics of camel carting systems were analysed by using all possible, feasible linear components, subcomponents and social factors (Loomba 1992). To obtain the estimates of maintenance cost of camel (feeding and health cover) and carts, the opportunity cost of owned inputs and actual prices paid by farmers for purchasing inputs were considered. To work out the total earning and expenditure from different sources of farmers, the present day value and market prices were considered.

RESULTS AND DISCUSSION

Present socio-economic scenario: Most of farmers involved in camel rearing were old aged and few were young aged category. Most of them were illiterate and a few were functionally literate. Maximum of camel farmers were having medium family size and a few were having small-sized family (Table 1). Majority of farmers involved themselves for carting operation, but a few had some hired person for this operation. Maximum farmers preferred their male camel rather than female for carting activities. Mostly breaking age of camel (first age at which camel put to work for earning purpose) was at 4 years of age although few farmers were also put to work at 3 year of age. A wide range of age of camels were using under carting system. The average age of cart camel was 7.14 ± 3.12 year. About 61% of farmers were having medium land holding (31–100 beghas), 30% of farmers were

Table 1. Present socio-economic scenario of camel management in study region

Parameters	Percentage Distribution
Age of camel farmer	
Old (> 56 year)	42
Middle (36 – 55 year)	37
Young (< 35 year)	21
Education status of camel farmer	
Illiterate	36
Literate	30
Functionally literate	34
Family size of camel farmer	
Small (1–3 member)	9
Medium (4–6 member)	63
Large (7–9 member)	16
Very large (> 10 member)	12
Farmer's involvement in carting	
Self	88.74
Hired	11.26
Sex of camel	
Male	75.79
Female	24.21
Breaking age of camel	
3 Yr.	21.78
4 Yr.	78.22

Table 2 Economic analysis for camel carting system in study area

Parameters	Estimation
Analysis of fixed cost	
Interest on investment	Rs 2092
Depreciation of cart	Rs 1153
Depreciation of camel	Rs 592
Insurance on camel	Rs 616
Insurance on cart	Rs 603
Total fixed cost	Rs 5056
Analysis of variable cost	
Wages of operator	Rs 21870
Maintenance of camel	Rs 15600
Repair and maintenance of cart	Rs 1600
Total variable cost	Rs 39070
Economic estimate:	
Total expenditure	Rs 44126
Total earning	Rs 76545
Profit	Rs 32419
Pay back period (month)	8.64
Benefit: cost ratio	1.73

having small land holding (1–30 beghas) whereas very few (9%) are having large land holding (100–200 beghas). Singh and Singh (2000 b) reported that category of farmers influenced the type of houses used. Among farmer's family, 62% of female members were consuming camel milk whereas only 38% male members were consuming it. Saley (1993) reported that main objective of camel rearing in Rajasthan is animal power for pulling a cart. Farmers were generating income per day Rs 285 to Rs 345 from camel carting at village region but income was in increasing mode while camel carting was towards city region. In these region two-wheeled pneumatic tyre wooden cart made up of sheesham, babool, neem, desi sagwan was costing average of Rs $11500 \pm 250/-$. The cost of male camel was higher than female camel. Most of farmers were purchasing their draft camel as well as cart on cash payment followed by installment basis and very few opted for loan from other person.

Economic analysis: The overall total fixed cost of whole camel carting system was Rs 5056 (Table 2). It included interest on total investment (@ 9%), depreciation of cart (junk value was considered @ 10% of average initial cost), depreciation of camel (slavage value was considered @ 12% of average purchased cost), insurance on animal and cart (@ 5%) which included basic value, liabilities, 1% of average actual value of cart and additional 5% service tax. The different components of variable cost were considered on yearly basis. It included wages of operator (@ Rs 90/day), the expenses towards maintenance (feeding and health cover) of camel, repairing and maintenance cost of cart viz: subcomponents like repairing of tyre puncture, replacement of tyre and repairing/replacement of different body parts etc. The total expenditure and earning from camel carting system

Table 3. Objective of camel rearing in different classes of farmers

Objective	Camel keepers (126)		Camel merchants (48)	
	M.S.V	Rank	M.S.V	Rank
Carting	6.78	I	5.30	III
Farming use	6.10	II	4.50	IV
Trading	2.30	VI	6.20	I
Pack loading	4.80	III	2.80	V
Riding	3.75	IV	6.00	II
Safari	3.40	V	1.20	VII
Others	1.50	VII	2.40	VI
Spearman's correlation	r = 0.18**			

**Significant at 1%, MSV: Mean scored value; figures within parenthesis indicates number of farmers.

was Rs 44 126 and Rs 76 545, respectively. The actual profit was Rs 32 419. The pay back period (P.B.P) was 8.64 month. Finally benefit cost ratio (B.C.R) was 1.73 which indicated that camel carting in these region is advantageous for farmers.

Objective of camel rearing: The objective of camel rearing varied among farmers. The Spearman's correlation test indicated that objective of camel rearing significantly ($P < 0.01$) differ between camel keepers and camel merchants (Table 3). Camel keepers usually sold their adult male camel after age of 4-5 years to camel merchants. Since females were important to increase herd size so their sale was less than males. Recently camel marketing opened a new avenue for subsidiary source of income. About 60% of camel merchants took their camels in different livestock fairs/mela for selling purpose but 40% of camel merchants also preferred to sell their camels in village itself directly to other camel keepers. Camel keepers reported that they avoid involvement of camel merchants at time of selling their animal but during purchase, they usually consult them. Selling and purchasing price were varied according to age, sex, body conformation, fodder accessibility and health condition.

Camel rearing practices: Farmers having single camel, mostly reared their camel in intensive practice. Most of 2-3 camel holders adopted semi-intensive practice (Table 4). Farmers having >3 camel, predominantly of them reared in extensive system in which camels were sent in groups for

Table 4. Camel rearing practices (%) adopted in study areas

Camel number	Intensive	Semi-intensive	Extensive	Overall
1	82.67	10.66	6.67	43.10
2-3	33.82	52.94	13.24	39.08
> 3	19.35	25.81	54.84	17.82
Overall	52.30	29.89	17.81	
Chi square	75.54 **			

** Significant at 1%.

browsing/grazing during morning and evening at range land's trees, shrubs and bushes. The groups were moving about 8 to 15 km daily or even more to get their feed and spent about 6-9 hr daily in range land. The chi-square test indicated that number of camels significantly ($P < 0.01$) influences rearing practices in these areas. Camels preferred browsing over grazing and usually takes few bites from one plant and then move on. The long legs and neck help them to utilize upper storey tree vegetation that is out of reach for other livestock. During draught, farmers took their camels outside village or even beyond regular range land to other nearby districts to have access to fodder. Wardeh (1998) in central Somalia also reported that camel avoid grazing during hot season and move about 50 to 70 km daily to attain their feeds under poor range conditions.

Feeding management: Mostly small category farmer were used to feed their camels by sending at browsing/grazing whereas maximum of large category fed their animals at house hold level (Table 5). Most of medium category adopted a mixed management of feeding as per their convenience. The chi square test indicated that category of farmers significantly ($P < 0.01$) influenced feeding practices in these region. Tendency of camel carting and stall feeding was more in Bikaner tehsil as compared to Kolayat tehsil. About 18% of farmers were providing concentrates as per scientific recommendations. Concentrates were also fed to breeding camels only during breeding season once in a month. Almost similar pattern was observed with respect of camel calves, which were fed concentrate @ 1 kg/month by majority of farmers (66.67%). Usually farmers feed concentrates like bajra/barley flour and gur (molasses) to their camels during debilitated conditions for a few days till camel regains its normal condition. Farmers provided approximately 16 kg crop residue of guar (*Cyamopsis tetragonoloba*)/moth (*Phaseolus aconitifolius*)/moongphali (*Arachis hypogaea*) daily to their working animals. Chowdhary (1994) also reported that in rural areas of Rajasthan, camel owners feed moth chara as such or after mixing with long and kutar

Table 5. Influence of categories of farmers (%) on feeding practices.

Farmer's categories	Small (1-50 B)	Medium (51-100 B)	Large (101-200 B)	Overall
Feeding				
House hold	24.24	40.00	81.82	41.96
House hold +	30.30	53.33	12.12	36.78
Browsing/				
Grazing				
Browsing/	45.46	6.67	6.06	21.26
Grazing				
Overall	37.93	43.10	18.97	
Chi square	53.85 **			

**Significant at 1%, B: Begha.

(chaffed *bajri*) during scarcity period. In this region, presently very few farmers were providing salt to camel at any stage as per their requirements. About 20 to 30 g/day of salt was given by farmers. Chowdhary (1994) reported that Ker and Lanna were salt rich bushes found in desert areas that camels prefer to eat, thus fulfill their salt requirement. Rathore (1986) also found that camel herders did not give salt to camels except as a medicinal dose. Rajput and Tripathi (2005) reported that moth chara was one of the major roughages provided to camel in all the three seasons by majority of Raikas followed by *muffali chara* and *guar phalgati*. Leaves of desert tree *khejari* (*Prosopis cineraria*) were fed to animals by majority of families in both winter and rainy seasons. However, *phog* (*Colligonum polygonoides*) was an important bush, which was also given by about 58% of the respondents during summer.

Watering management: In this study area maintenance of regularity and provision of free access of water to camel seems to be limited. Majority of farmers (80%) provided water to their camels on alternate days whereas few (20%) provided water daily. Mostly farmers (65%) were using small constructed village water storage followed by village pond (20%) as the major sources of watering to their animals. About 15% of farmers were watering their camels through home wells.

Manger for feeding and watering: Majority of households (96%) were using movable basket type pot, jute bags, sacks as a feeding manger. Generally this basket was made up of locally available agricultural materials. Some farmers (4%) used *Kuccha* manger made up of *Kuccha* bricks and mud plastering which were also easily accessible at village condition. This type of *Kuccha* manger was elevated to certain height. Some were also using metallic containers for feeding purpose. The practice of providing water trough to camel was very uncommon among the households studied. As high as 97% farmers were providing the water to their camels in iron bucket or big container or bowls.

Shelter management: All over villages, the orientation of camel keeping place/shelter was at any direction according to the farmer's own perceptions. Maximum of the farmers (98%) kept their camel under the tree shed but very few farmers (2%) kept anywhere nearer to actual residential area. The floor of shelter was with loose sand dunes. No definite type of wall was existing around the shelter. Cleaning of shelter once in a day was observed as the most common practice with over all percentage distribution of 69 among the households of study under taken. The practice of frequent cleaning in a day was observed in 20% households and the occasional cleaning was overall observed only in 11% households. Since maximum farmers clean shelter daily, overall fairly clean (62%) shelter was observed. The finding of experiment conducted by Bhakat *et al.* (2004) revealed that best suited economic shelter for camel was thatch roofed open type kuchha shelter followed by asbestos roofed close

type concrete shelter and loosing housing at an organized farm of NRCC.

Sanitation and disinfection of shelter: In these study areas, it was observed that farmers did not use any bedding materials for their camels. *Kuccha* floor with loose sand dune was the natural bedding for camel. Farmers used to replace loose sand dune with fresh lot to avoid health disorders. The adjacent position of manure pit from the shelter place was observed in 97% households and the rest around 3% households, the manure pit as such was not observed and camel dung was dumped a few meters away from camel shelter. No separate drainage system for urine was provided. Urine of camel was generally soaked by earth sand dune and it was replaced by fresh lot time to time. The practice of disinfection of camel shelter was not followed by households. Approximately 75% of farmers were practicing fumigation to control flies and mosquitoes. Neem leaves, cow and camel dung were used as common fumigants. The remaining 25% farmers were cleaning camel shelter daily to control insects. Gupta *et al.* (2000) reported that livestock owners in Rajasthan used dried neem leaves, cow dung, saw dust, mustard stems and dry grasses as major fumigants to control the flies and mosquitoes.

Milking management: Study revealed that presently 71% old aged farmers (>56 year), 22% middle aged (36–55 year) and very few young aged (< 35 year) were consuming camel milk in these region. Most of the farmers (75%) were milking their camel through knuckling method because such method helps in sucking out maximum milk from udder as per farmer's perception. Other (25%) practiced hand stripping method. Milking was done in standing position by farmers. Usually milker stands on left side of camel on one leg, while thigh of other leg was used to place milking container over it. The daily milk yield of a camel was 5–8 liters. The frequency of milking was not fixed. Milking was done as per requirements of the family and mostly calf was allowed to suckle. Among the consumers, 73% were using camel milk for calf suckling along with raw milk drinking and 27% were using for product like kheer preparation along with calf suckling. Singh and Singh (2000a) reported that family size significantly ($P < 0.01$) affected amount of colostrum feeding to calf. Some of the farmers also reported that they dispose off camel milk by giving to their neighbors or supply to hospital for patients free of cost. Brass pail metallic containers were being used by most of farmers (61%) for milking. Besides, earthen pots, aluminium containers, steel buckets were also used for milking. Storing milk in earthen pots was common practice reported by most of farmers (66%) followed by metallic containers. According to farmer's perception taste and quality of milk were not altered if kept in earthen pots.

Socio-cultural management: In this study area camel played an important role on socio-cultural aspects of desert life. During festival or occasion like participating in any mela/fair, camel festival, the bath and grooming of camel was

carried out. Although bathing and grooming was not regular practice. Mostly farmers reported that bathing was done twice or thrice in a month during summer. Grooming was done once in a week. It was generally performed in morning with the help of dry straws tied on long sticks. Most of the farmers (66%) had low participation in mass media, 23% had medium and 11% had high participation in mass media. Most of the respondents (62%) were having low extension orientation, 29% were of medium, and 9% were of high extension orientation. In these study areas 58% of respondent were consuming camel milk 42% were not consuming at all. In this region, it was observed that branding of camel was done by farmers at age of 1 to 3 years with the help of hot iron on different body parts like thigh, neck and face in forms of different shapes, sizes and numbers for their easy identification. Farmers decorate their camel by using various saddlery items during melas, camel festival, marriage ceremony and any social function.

Parturition and neonatal management: Pregnant and lactating camels were fed concentrates at weekly intervals only during advanced stage of pregnancy and immediately after parturition by 50% and 30% of farmers, respectively. Most of the farmers provided extra ration during last two months of pregnancy for better growth of foetus and maintenance of dam. Majority of farmers generally clean the parturition area and protect newly born calf from carnivores and other animals but some advance pregnant camels were separated from main herd with the rationale that dams need isolation, more rest and protection from other animals. It is consistent with earlier observation of Rajput and Tripathi (2005). Most of the farmers remove mucous from the body of newborn calf, however, dams are generally allowed for nosing and smelling the newborn to increase maternal instinct. The licking by dam was not done at all (Bhakat 2006). Weaning was not common practice among camels. Farmers allow camel calf full suckling for several months or till calf were able to graze properly. Feeding of colostrum to calf was general practice in this region.

Carcass management: Most of carcasses were disposed off at distance of about 10 km away from residential area, in jungle or in open places. When a camel died in jungle during browsing then dead camel was skinned off by village sweeper. The branded or marked portion was hung on a tree at entry point of village so that the camel owner can easily recognize it. Samajdar (2000) reported that Gujjars of Nainital district also had the practice to throw away their dead buffaloes in forest. Animals died due to contagious diseases were only buried in the forest but away from dwelling houses.

Present constraints of camel management: In this study area present constraints for camel management were identified, assessed, scored and ranked. Decreasing availability of grazing pasture was the first and foremost constraint, secondly camel rearing cost, thirdly costly

treatment of health disorders and fourthly distance marketing facilities for camel products and by-products were major constraints for camel rearing. The trend of camel rearing was also decreasing due to decreasing interest of younger generation of farmers. Most of the respondents (68%) were having low scientific orientation, followed by 24% of medium and 8% having of high scientific orientation for camel rearing. Most of the farmers (71%) have less attitude towards use of camel milk by value addition, followed by 17% medium and only 12% having high attitude towards use of camel milk by value addition.

To increase various uses of camel species in the present scenario, marketing facilities for camel products and by-products must be strengthened. It is also necessary to develop suitable programme of range land management as common property in a participatory mode, promotion of mixed farming systems, low-cost stall feeding and indigenous health care practices. Scientific training on camel management of feeding, rearing, shelter, breeding, milking and health aspects are very much required to cope up with the present constraints of socio-economic aspects of camel management.

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