Important factors affecting sustainable livelihood of camel dairying in changing scenario of desert ecosystem

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ABSTRACT

The changing scenario of desert ecosystem data were collected meticulously from 141 farmer families of Bikaner district to find out the association of important factors with sustainable livelihood of camel dairying. The households belonged to 14 villages out of which 2 villages were from each of the 7 tehsils, which were predominantly camel rearing regions. Sustainable livelihood encompasses appropriate use of camel as milch animal in changing scenario resulting in generation of adequate income and employment, ensuring food and nutritional security for family, conserving environment, effective input recycling which was ascertained by developing a sustainable livelihood index (SLI). The chi-square analysis of sustainable livelihood of camel dairying (SLCD) with important socio-personnel factors indicated that family size and communication pattern have a significant association with SLCD. The social participation of farmers have significant association with SLCD at 5% level. The analysis of data of important tech-economical variables indicated that market accessibility and land holding were having significant association with SLCD. The camel keeping patterns showed a highly significant association with SLCD. Some factors like farmer's age, education, cropping pattern, and other livestock holding played important role towards camel dairying. Most of farmers were milking their camel through knuckling method and a few practiced hand stripping method. Milking was done in standing position by farmers. Presently, camel milk marketing proceeds entirely in the informal sector but major attraction of camel milk is its lower price at village level but high price at city level, due to imbalance between demand and supply. The need-based training and front-line demonstration of scientific camel dairying to farmers through suitable extension programme would provide impetus to practice profitable camel dairying. It will enhance the household income of camel keepers in changing scenario of desert ecosystem.

Key words: Camel, Dairy farmers, Livelihood, Sustainability

As desert land is prone to adverse climate, farmers of this region rely heavily on camel (*Camelus dromedarius*) rearing for their sustenance. The camel has unique adaptive characteristics to survive in harsh conditions. Generally, Indian camels are considered as a means of transportation and source of draught while their food potential has been ignored and at least underutilized. Camel energy is not only cost-effective but also profitable and remunerative (Robert *et al.* 1997). Evaluations of Integrated Rural Development Project (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 purchase of camel (Khanna 1994). Mainly due to fast mechanization, camel draughtability alone may not be enough to sustain the animals in the present day scenario. For farmers, the income generated

from camel milk sale (where practiced) is substantial and exceeds the returns obtained from their traditional use. Lately, due to changing scenario of desert ecosystem, camel keepers have realized that camel milk can provide a steady flow of cash throughout the year. The adoption of Sustainable Livelihood of Camel Dairying (SLCD) made it possible for a camel household to sustain itself. Presently, SLCD can be assessed by exploring use of camel as milch animal with respect to 6 different dimensions, which include annual income, food security, nutritional security, employment generation, input recycling, and environmental conservation. Several socio-personnel and techno-economical factors influence sustainability of livelihood from camel dairying. The use of camel as milch animal varies widely depending on existing socio-personnel practices and tech-economical potential of a region. It was, therefore, necessary to investigate the influence of important factors upon sustainable livelihood of camel dairying in the present scenario.

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MATERIALS AND METHODS

The present investigation was carried out in the rural region of Thar desert, viz. 7 tehsils of Bikaner district in Rajasthan.

Data collection: 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. Sustainable livelihood encompasses appropriate use of camel as milch animal in changing scenario of desert ecosystem resulting in generation of adequate income and employment, ensuring food and nutritional security for family, conserving environment, effective input recycling which was ascertained by developing a sustainable livelihood index (SLI). The 6 dimensions of SLCD were identified based on literature, views of some experienced farmers, NGO personnel working in this field and expert judgments. Collected data were classified under different categories for interpretation.

Sampling design: A total of 141 farmer families were identified randomly with probability proportionate to total camel farmer families in 14 villages. Out of 14 villages, 2 villages were from each of 7 tehsils, viz. Bikaner, Nokha, Kolayat, Sridungar Garh, Poogal, Lunkaransar, Khajuwala, which were predominantly camel rearing regions. To meet objectives of the study both primary and secondary observations were recorded meticulously.

Statistical analysis: The data obtained from all 6 dimensions of SLCD were analyzed according to Ponnuswamy and Gupta (2007). The Chi-square test (Snedecor and Cochran 1989) was applied to measure the extent of association of selected factors/variables with sustainable livelihood of camel dairying. The knowledge level of respondents regarding camel milking management was also assessed through knowledge index (Bhaskaran and Praveena 1982).

RESULTS AND DISCUSSION

Socio-personnel factors: Some important socio-personnel factors which affect the sustainable livelihood of camel dairy were family size, age of camel keepers, educational status, social participation of farmers and communication pattern (Table 1). Among the respondents, 53.19% were having less than and equal to 8 family members. Most of the respondents were illiterate. Of respondents 50.35% belonged to the 40 years age group. Majority of camel keepers had involved themselves in different social activities at their village level. Some of the camel keepers were using only verbal means of communication but majority of them were using multi-channels of communication, viz. verbal, newspaper, radio, TV and other electronic media. Rapid urbanization and shift to mechanization has eroded the utility of camel as a draught animal. Additionally, the depletion of traditional grazing areas

Table 1. Latest socio-personnel scenario of study region

Socio-personnel variables	N = 141 Percentage distribution
Family size	
Less than and equal to 8 members	53.19%
More than 8 members	46.81%
Age	
Less than and equal to 40 years	50.35%
More than 40 years	49.65%
Education	
Literate	36.17%
Illiterate	63.83%
Social participation	
More involvement	69.50%
Less involvement	30.50%
Communication pattern	
Verbal	48.23%
Verbal + newspaper + radio + TV + any E media	51.77%

has rendered camel rearing practically uneconomical. With returns coming only from the sale of animals at the time of livestock fairs, camel keeping is under the threat of becoming unsustainable and consequently losing favour with farmers. The situation calls for a viable solution to create additional avenues to augment the farmer's income from camel dairying.

Table 2 reveals the extent of association of socio-personnel parameters with SLCD. The family size was having a significant ($P < 0.01$) association with SLCD. As the family size increased, it greatly supported SLCD because there was food/milk security, nutritional security, better scope of increment of annual income and employment generation for family members. The age of camel keepers showed nonsignificant association with SLCD because both age groups (young and old) were of the same view i.e., in favour of shifting their camel's usage from draught to dairy sector in present day scenario. Farmer's educational status had a nonsignificant association but social participation had significant ($P < 0.05$) association with SLCD. As farmers involved themselves more in different social activities, the news/views exchange was more, which finally supported SLCD. The communication pattern also have a significant ($P < 0.01$) association with SLCD. When camel keepers

Table 2. The extent of association of socio-personnel parameters with sustainable livelihood of camel dairying

	Family size	Age	Education	Social participation	Communication pattern
Sustainable livelihood of camel dairying	**	NS	NS	*	**
	52.33	2.88	3.02	6.08	23.42

**, Significant at 1%; *, significant at 5%; NS, nonsignificant.

adopted multi-channel of communication, they could get better apprised of technical know-how through one or more of verbal, newspaper, radio, TV and other electronic media. Ponnuswamy and Gupta (2007) reported that family size and communication behaviour have highly significant ($P < 0.01$) association on sustainable livelihood in crop plus dairy system.

Camel milking management: The study revealed that most of the farmers (78%) were milking their camel through knuckling method because it helps in squeezing out maximum milk from udder as per farmers perception. Others (22%) 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 4 to 9 litres. One milker, depending on his skill may milk 10 to 12 camels including activities connected with milking like cleaning the camel, udder and feeding of concentrates. The frequency of milking was not fixed. Milking was done as per requirements of the family and mostly calf was allowed to suckle the milk. Tandon *et al.* (1998) reported that the lactation length in camel varies from 8 to 9 months and it could last for 16 months. Farmers of this study area usually milk the camel irregularly as per their own requirement. This practice leads to reduced flow of milk and undermines milk yield as well as lactation period of camel. This factor and remoteness of camel herders from marketing centre are presently adversely impacting the milk supply. As such, there is tremendous potential for greatly enhancing milk productivity of camel and ensuring steady flow of cash for camel-men throughout the year. Presently 71% old age group and 29% young age group were consuming camel milk at their household level. Among the consumers, 73% were using camel milk for calf suckling along with raw milk drinking and 27% were using for product like *kheer* (sweet and boiled rice) preparation along with calf suckling. Chowdhary (1994) found that *raika* normally consume camel milk either as such or after preparing *kheer*. Singh and Singh (2000a) reported that in rural Haryana, family size significantly ($P < 0.01$) affected amount of colostrum feeding to buffalo calves. Some of the farmers of present study also reported that they dispose off camel milk by giving to their neighbours or supply at hospital for patients free of cost. Brass pail and 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 camel milk in earthen pots was a common practice reported by most of the farmers (66%) followed by metallic containers. According to farmers perception, taste and quality of camel milk were not altered if kept in earthen pots. Rajput and Tripathi (2005) reported that camel milk is used for drinking purpose by *raikas* and sometime *kheer* is also prepared.

Techno-economical factors: The market for camel milk

Table 3. Techno-economical potential of desert ecosystem

Techno-economical parameters	N = 141 Percentage distribution
Market accessibility	
Easily accessible	7.80%
Not easily accessible	92.20%
Cropping frequency	
Single crop	62.41%
> 1 crop	37.59%
Land holding	
Small (1 – 10 ha)	39.01%
Medium (11 – 35 ha)	43.26%
Large (> 35 ha)	17.73%
Other livestock holding	
Cattle	28.37%
Cattle + sheep and goat	42.55%
Cattle + sheep and goat + others	29.08%
Camel keeping	
1 Camel	42.55%
2 – 4 Camel	39.01%
> 4 Camel	18.44%
Involvement of camel keepers in milking operations	
Self	87.12%
Hired	12.88%

was not easily accessible for most of the respondents. It was accessible to only few of respondents to city area or greater part of city area (Table 3). Now-a-days, camel milk marketing proceeds entirely in the informal sector. Some proportion of the milk is sold to tea-stalls. The customers for the milk are mostly tea-stall owners as well as some private households. Milk is collected either by bicycle or by motorbike and sold to tea-stalls as well as some households. The main attraction of camel milk is its lower price at village level but high price at city level, due to imbalance between demand and supply. Most of the camel keepers had opted for single crop cultivation. Majority of respondent farmers were having medium land holdings (11–35 ha), followed by small land holdings (1–10 ha) whereas very few were having large land holding (> 35 ha). Majority of farmers were having single camel, followed by farmers, who were having 2 to 4 camels whereas 18.44% were having herd of more than 4 camels. It is consistent with earlier observations of Bhakat and Pathak (2009). Along with camel most of the respondents of present study were keeping cattle as well as sheep and goat, followed by farmers who were keeping cattle, sheep and goat as well as other livestock species, whereas few were keeping only cattle. Majority of the farmers involved themselves for milking operation, but a few had hired person for this operation. Majority of farmers preferred their male camel rather than female for carting and ploughing activities while female camel was used as milch animal. Singh and Singh (2000b) reported that male animals are used for draught purpose and females are used as milch purpose.

The extent of association of techno-economical

Table 4. Extent of association of techno-economical parameters with sustainable livelihood of camel dairying

Techno-economical parameters		Sustainable livelihood of camel dairying
Accessibility of market	*	12.70
Cropping pattern	NS	2.39
Land holding	*	12.78
Camel keeping	**	30.02
Other livestock holding	NS	6.43

**, Significant at 1%; *, significant at 5%; NS, nonsignificant.

parameters with SLCD is given in Table 4. Accessibility of market was having significant ($P<0.05$) association with sustainable livelihood of camel dairying. As the market becomes easily available, it greatly supports the SLCD because of higher annual income and better scope of employment generation. Singh (1995) reported similar type of findings. Farmers traditionally have a taboo towards the sale of camel milk. These hereditary camel breeders believed that terrible things will happen to those who sell camel milk. Because of their belief-system, camel milk marketing could not develop in a significant manner. However, the situation has gradually changed in the last 25–30 years as farmers of study area have taken up camel milk marketing for sustenance and profit. Camel keepers have also become aware of this concept and have shown eagerness to get involved. Even their religious elders have sanctioned this change of attitude. This is a major positive development for camel dairying at changing scenario. The cropping frequency was having non-significant association with SLCD. Multi-crop cultivation supported the SLCD because of effective input recycling and environmental conservation. The land holding has a significant ($P<0.05$) association with SLCD. Mainly small and medium categories of farmers were more inclined towards camel dairy because of milk/food security, higher income, effective input recycling, and environmental conservation. Camel keeping was having a significant ($P<0.01$) association with SLCD. Farmers having more than one camel, have opportunities to put at-least one camel in dairy sector. Other livestock holding had nonsignificant association with SLCD because camel was not competing for rearing resources with other livestock at household level. Similar type of findings on other livestock were reported by Meert *et al.* (2005). Pathania *et al.* (2008) recommended that Gujjar should be settled permanently and tempted to dairy farming on scientific lines.

The camel farmer must be provided need based training, front line demonstration and extension education for adopting scientific milking practices for optimizing the yield as well as for changing their attitude regarding marketing of camel milk. There is also need to promote the processing of surplus

milk into value added products at farmer's doorstep which would provide impetus to practice profitable camel dairying. Finally, it will enhance the household income of camel keepers in changing scenario of desert ecosystem.

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