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CAMEL REARING PRACTICES - A SURVEY STUDY IN ARID WESTERN AGRO-ECOSYSTEM OF RAJASTHAN

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ABSTRACT

Camel rearing in northwestern arid region of Rajasthan was studied in 8 districts, these fall in 5 agro climatic zones of state. Camels are reared based on traditional knowledge by utilising natural available resources and the main utilities are self domestic use, breeding and selling purpose. Mostly camels are managed on rangelands, community land, restricted controlled pasture lands (gochers or orans-vernacular words). Traditional feeding constituting exclusively grazing plus providing some supplementation of leaves during lean period has shifted to grazing plus providing some additional local fodder to meet the dry matter requirement. None of the respondents provide mineral mixture to their camels. Majority of the camel keepers (60%) feed single type of local grown fodder whereas (39.0%) farmers feed mixed dry fodder. Generally green forage is not offered except 23.4% farmers of Hanumangarh and Sriganganagar district and Rajgarh tehsil of Churu, mostly from a green belt, who offer green chana fodder to their camels. Concentrate supplementation once a week is done only to debilitated camels (1 to 2 kg) against scientific recommendation of 2-3 kg/d. Irrespective of season, camels are generally kept in open housing system. Failure of availabilitiy of conventional flora and grazing resources due to frequent drought, shrinking of grazing land owing to fast urbanisation and restriction imposed by the forest department has forced camel breeders to offer some straw in addition to grazing in the rangeland thus, increasing cost of feed input.

Key words: Camel, disease, feeding, management practices, Rajasthan

Camels are reared on traditional way by utilising natural resources without any input and pastorals have a lot of knowledge about camel breeding, feeding, management and health practices (Rajput, 2001). In India, camels are primarily reared for carting/draft, agricultural operation, transportation in addition to secondary utility of milk and hair production. Camel husbandry and its practices differ in different countries of world. Camel being a large animal, its management requires special attention and precaution than other livestock species (Choudhary, 1994). Change in land use, agricultural practices in recent past and continuous drought situation reduced the availability of grazing pastures and depleting drinking water resources thus resulted in negative impact on camel population.

Keeping in view of all these facts together with socio-economic and cultural importance, the present study was undertaken to highlight the existing camel rearing practices and gap between it and scientific feeding in 5 different zones of hot arid western ecosystem of Rajasthan state.

Materials and Methods

The arid zone of Rajasthan, which spread over 0.32 million sq km and possess 62% of the Indian arid zone has been divided into 9 geographical zones on the basis of rainfall, topography and cropping pattern (Table 1 and Fig 1). In this study, 8 northwestern districts of 5 agro climate zones of the state that lies on north west of aravali form hot arid region which were selected and these were *arid western plain* (Bikaner and Jaisalmer districts), irrigated northwestern region (Hanumangarh and Ganganagar districts), transitional plain of inland drainage (Churu and Nagaur districts) and transitional plain of Luni basin (Pali and Jodhpur districts), and were designated as zone I, II, III and IV, respectively. Majority of camels of country are concentrated here on account of low cost of maintenance. Two tehsils from each camel inhabited district and 2 villages and 20 farmers from each tehsil were selected randomly thus, a total of 320 farmers formed the sample of this study. The information regarding different managemental practices was collected through an open questionnaire. The various data were compiled and analysed using frequency, simple percentage and mean.

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Table 1. Land type, location, rainfall, soil and vegetation cover in range management areas.

Zones/(Topography)	Districts	Annual rainfall (cm)	Area (ha)	Soil Type	Vegetation cover
I. (Arid western plain)	Bikaner, Jaisalmer	10-40 cm	65645	Loamy sand	Prosopis, Acacia, Zizyphus spp. Lasirus based silvi-pastoral system
II. (Irrigated north western plain)	Sriganganagar, Hanumangarh	40 cm	20634	Sandy loam-silty-clay loam	Salvadora, Azadirachta, Dalbergia, Prosopis, Acacia, Zizyphus
III. (Transitional plain of inland drainage)	Nagaur, Churu	15-40 cm	34548	Sandy soil	Salvadora, Azadirachtha, Dalbergia, Prosopis, Acacia, Zizyphus
IV. (Transitional plain of luni basin)	Jodhpur, Pali	30-50 cm	35237	Shallow sandy loam	Salvadora, Azadirachtha, Dalbergia, Prosopis, Acacia, Zizyphus

The main hot arid districts like Barmer, Churu, Bikaner, Jodhpur, Jaisalmer and Hanumangarh having only 23.04% of land under grazing/ pasture development sustain major part of camel population of desert region followed by Jhunjhunu, Sikar, Nagaur, Pali and Jalore.

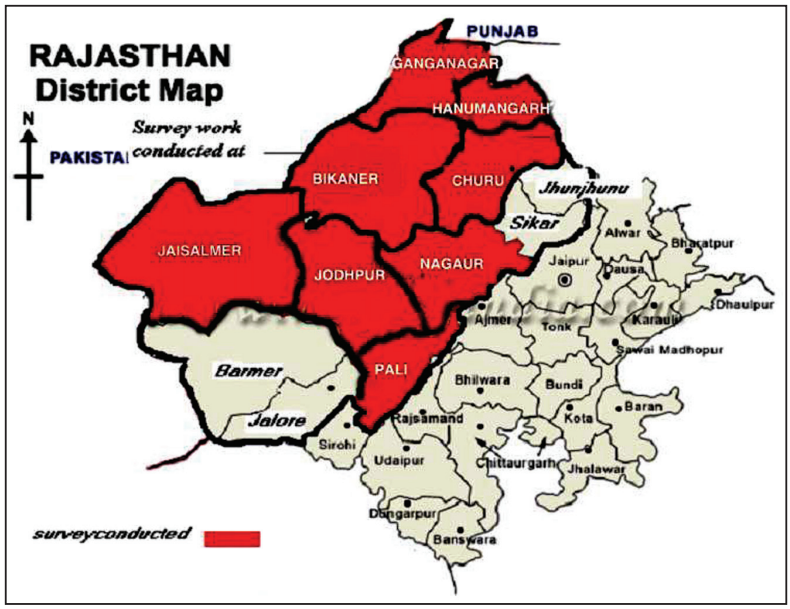

Fig 1. Districts map of Rajasthan showing 9 geographical zones.

Results and Discussion

The socioeconomic profile was studied to know the economic status of the selected farmers of this region and is presented in Table 2. The data indicated that majority of the farmers (41.25%) are in the category of medium land holding followed by large (34.69%) and small (24.06%). About 44.69% farmers are having medium family whereas 29.06% belong to large and 26.25% to small family. Besides having camel, sheep and goat are also important component of domestic livestock reared by them. Number of buffaloes is higher than cattle. Majority of 46.88% of respondent reared camel for self-use and 23.44% for breeding while 29.69% farmers reared it for selling purpose. Out of 320 camel keepers family surveyed 160 had Jaisalmeri, 130 had Bikaneri and 30 had Marwari breeds. About 67.2% area was rain fed and 32.8% was irrigated area.

Feeding resources

Mostly camel are reared on rangelands, community land, restricted and controlled lands but continuous shrinkage in grazing lands in recent past has forced paradigm shift in camel husbandry. The major fodder resources found in forest areas, barren, uncultivated lands and pasture comprising different types of grasses are Grammna *(Panicum antidotale)*, Sewan *(Lesirus sindicus)*, Dhaman *(Cenchrus spp.)*, Motha *(Cyprus rotundus)*, Sati *(Boerhavia diffusia)*, Kanti *(Tribulus terristris)*, Bakeriya *(Indigofora cordifolia)*, Anjan (C. *Cilliaris)*, Karad *(D. Annulatum)* (Table 3). Commonly available bushes and shrubs are Jharberi *(Z. nummularia)*, Ber *(Zizyphus moritiana)*, Sinia *(Crotolaria burhi)*, Kheemp *(Leptadaenia pyrotechnica)*, Wolfberry*(Lycium barbarum)*, Bui *(Arvea tomentosa)*, Phog *(Calligonium polygonoides)*, Ker *(Capparis deciduas)*. Trees are Israeli babool *(Acacia tortolis)*, Desi babool *(Acacia nilotica)*, Neem *(Azadirachta indica)*, Sesum *(Dalbergia sissoo)*, Khejri *(Prosopis cineraria)*, Vilayati babool *(Prosopis juliflora)*, Jal *(Salvadora oleiodes)*, Ardu *(Alianthus spp.)*. These fodder trees generally consumed by camel are rich in %CP and minerals. (Singh and Saini, 2002).

Regarding other resources, crop residues of cluster bean, moth bean, moong bean, horse bean

and finger millet, sorghum, pearl millet, groudnut constituted the major feed resources for the camels in this region. Out of these cluster bean straw is the major feed given by 51.25% followed by moth straw by 15.63% and groundnut straw by 13.7% and gram straw by 8.75% respondents (Table 4). Cluster bean was most preferred due to its more availability, as being a rain fed crop, its cultivation is cheaper than other crop (Bhakat and Sahani, 1999). Gorakmal *et al* (1998) has also reported moth and guar chara as a major fodder of camel in different villages of Bikaner district. Moth straw is preferred during summer and cluster been straw, groundnut straw feed during winter. Rajput and Tripathi (2005) has reported moth as major roughage being provided to camel in all the 3 seasons followed by groundnut and cluster bean straw as other common roughages. In zone I comprising of Bikaner and Jaisalmer districts and zone III comprising of Churu and Nagaur districts, Camel owners feed moth straw, cluster bean straw, groundnut straw according to availability. The farmers of zone II comprising of Hanumangarh and Ganganagar districts and Rajgarh tehsil of zone III having irrigation facilities mostly fed gram, as fresh or dry straw in addition to cluster bean straw and groundnut chara. The major feeds of zone IV (Pali and Jodhpur districts) were cluster bean straw and groundnut chara. Nagpal *et al* (1999) reported stall feeding of groundnut fodder vis-a-vis 3 tier silvi pasture grazing in arid ecosystem in camels.

Feeding Practices

The pastoral people follows traditional system of camel rearing. Farmers of zone I, IV used to follow grazing practices, whereas in zone II only stall-feeding was the common feeding method followed by 62.5% of the respondents. Likewise, in zone III grazing plus providing additional fodder was a common practice (50%). The pooled data (Table 5) however, reflects that grazing was the common practice (76.50%) adopted by a majority of the farmers in the entire region. It also revealed that grazing (37.50%) and grazing plus providing additional local feed to meet the dry matter requirement (39.0%) were

Table 2. Socioeconomic profile of the camel keepers in arid zone of Rajasthan.

	Variables	**(N=320)**	
		Category	%
Family size	Small (3-5 members)	84.00	26.25
	Medium (6-8 members)	143.00	44.69
	Large (> 8 members)	93.00	29.06
Land holding	Small (up to 3 ha)	77.00	24.06
	Medium (3-5 ha)	132.00	41.25
	Large (>5 ha)	111.00	34.69
Camel Breeds	1. Jaisalmeri	160.00	50.00
	2. Bikaneri	130.00	40.63
	3. Marwari	30.00	9.38
Avg. Annual income/ farmer	16,462.00 (In Rs.)	-	-

Table 3. Major feeds and fodder available in arid western agroclimatic zone of Rajasthan.

Tree		**Straw/Crops (Local/English/Botanical name)**		
Israeli Babool	*(Acacia tortolis)*	Guar	Cluster bean	(*Cyamopsis tetragonoloba*)
Desi Babool	*(Acacia nilotica)*	Moth	Moth	(*Vigna aconitifolia)*
Neem	(*Azadirachta indica)*	Mungphali	Peanut	*(Arachis hypogaea)*
Sesum	(*Dalbergia sissoo)*	Chane ki khar	Gram	*(Cicer arietinum)*
Khejri	(*Prosopis cineraria)*	Bazara	Pearl Millet	*(Pennisitum typhoides)*
Vilayati Babool	*(Prosopis juliflora)*	Judi	Wheat	*(Triticum aestivum)*
Jal	(*Salvadora oleiodes)*	Jowar	Sorghum	*(Sorghum bicolor)*
Ardu	*(Alianthus* spp.*)*	Ragi	Finger Millet	*(Eleusine coracana)*
Grasses			**Bushes\Shrubs**	
Grammna	*(Panicum antidotale)*		Ber	(*Zizyphus moritiana)*
Sewan	*(Lesirus sindicus)*		Sinia	*(Crotolaria burhia)*
Dhaman	(*Cenchrus* spp.*)*		Kheemp	*(Leptadaenia pyrotechnica)*
Motha	(*Cyprus rotundus)*		Wolfberry	*(Lycium barbarum)*
Sati	(*Boerhavia diffusia)*		Bui	*(Arvea tomentosa)*
Kanti	(*Tribulus terristris)*		Phog	*(Calligonium polygonoides)*
Bakeriya	(*Indigofora cordifolia)*		Ker	*(Capparis deciduas)*
			Jharberi	(*Zizyphus nummularia)*

Table 4. Different feeding practices followed by camel keepers in arid western zone of Rajasthan.

Attributes Feeding Practices	No. of camel keepers following the practices									
	Zone I		Zone II		Zone III		Zone IV		Pooled	
	n =80	%	n =80	%	n =80	%	n=80	%	n =320	%
Management of Feeding										
Grazing	40	(50)	10	(12.5)	30	(37.5)	(40)	(50)	120	(37.5)
Grazing + fodder	30	(37.5)	20	(25)	40	(50)	(35)	(43.75)	125	(39.0)
Stall feeding	10	(12.5)	50	(62.5)	10	(12.5)	5	(6.25)	75	(23.44)
Feeding										
Single fodder	50	(62.5)	50	(62.5)	45	(56.2)	50	(62.5)	195	(60.94)
Mixed fodder	30	(37.5)	30	(37.5)	35	(43.7)	30	(37.5)	125	(39.06)
Green fodder	10	(12.5)	30	(37.5)	15	(18.75)	20	(25)	75	(23.44)
Concentrate feeding										
During Rutting	50	(62.5)	50	(62.5)	40	(50)	50	(62.5)	190	(59.38)
Late pregnancy/after calving	50	(62.5)	50	(62.5)	40	(50)	60	(785)	200	(62.5)
Salt feeding	75	(93.7)	70	(87.5)	70	(87.5)	65	(81.2)	280	(87.5)
Type of fodder given										
Cluster bean straw	46	(57.5)	30	(37.5)	52	(65)	36	45	164	(51.25)
Moth straw	15	(18.7)	10	(12.5)	10	(12.5)	156	18.75	50	(15.63)
Chana (gram*[1]) straw	5	(6.2)	10	(12.5)	3	(3.75)	10	12.5	28	(8.75)
Groundnut (Mungphali) straw	10	(12.5)	20	(25)	10	(12.5)	4	5	44	(13.7)
Tree leaves	4	(5)	5	(6.25)	3	(3.75)	15	18.75	27	(8.4)
Water source										
Canal	20	(25)	60	75	0	0	0	0	80	(20.0)
Well +Tube-well	30	(37.5)	10	12.5	40	50	30	62.5	130	(4.38)
Khelli	30	(37.5)	10	12.5	40	50	30	37.5	110	(34.38)
Frequency of watering										
Once daily	50	(62.5)	60	(75)	40	(50)	45	(56.2)	195	(60.9)
Twice daily	20	(25)	0	0	30	(37.5)	25	(31.5)	75	(23.4)
Alternate day	10	(12.5)	20	(25)	10	(12.5)	10	(12.5)	50	(15.6)

Values in the parenthesis show the percentage **1 Cicer arietinum*

the only two main practices whereas stall-feeding was favoured only by a 23.44% of the farmers. The pooled data also indicate that 60% of the farmers offer single type of fodder and 39.0% farmers mix fodder i.e., combination of two or more fodders such as cluster bean straw with leaves of khejeri/pala/jal/ker/ phog or in addition to moth/ groundnut straw/gram straw. In general camels are not fed green forage but farmers of Hanumangarh and Ganganagar districts and Rajgarh tehsil of Churu (23.4%) are offering green gram forage to their camels. The practice of feeding of mixed fodder was more common in zone III in comparison to others. Rajput and Tripathi (2005) have reported that in rural areas of Rajasthan mixing of moth chara with loong (khejri leaves) and pearl millet straw is common practice to cope up during scarcity period. As per survey information, none of the respondent was feeding concentrates to their camel at any age. Rathore (1986) reported that concentrate is fed only to weak and debilitated animals. However, camel in advanced pregnancy were fed concentrate i.e., fenugreak + jaggery/sesamum oil + jaggery in (1:1)/ sweet oil and pearl millet flour whereas, newly calved lactating mothers were fed methi, sweet oil, carum daily along with jaggery for 10-15 days regularly by 62.5% of camel keepers. Concentrates were also offered to camels only during breeding season by 59.3% for a month against the scientific requirement of 1 kg/ day. Debilitated camels were being offered pearl millet / barley flour (5kg) and jaggery (1kg) and sweet oil (1kg) for few days. Majority (87.50%) of camel rearers give 20-25 gm of salt to the camel in a practice particularly to their working camel against

the requirement of 125 g/d. However, Rathore (1986) indicated that salt is not given to camels except medicinal dose because salty flora of desert meet the requirement of salt (Choudhary, 1994). Camels were fed approximately 15.5 kg roughage daily in winter and 16.6 kg in summer which is as per scientific recommendation.

Managemental practices

The managemental practices being followed in surveyed areas were also studied which includes housing, source and frequency of watering and health care. Three type of production system exist and the relative importance of 3 systems varied, depending upon purpose of camel rearing and number of camel owned. Most of the farmers (43.13%) having 2-5 camels usually prefer semi intensive system of production (Grazing in nearby plus supplementation of some straw). They rear camels for domestic use in towns/villages. Camels are sent in groups for grazing during morning and evening hours. The groups move about 5 to 15 km daily or even more for graziny. Wardeh (1998) reported that in central Somalia grazing of camel is generally avoided during hot season and 50-70 km distance is covered by camel daily to meet out their fodder requirement under poor range condition. In summer or lean period they are sent outside nearby districts for forage or they are fed some supplementary roughage, about 15 kg in a week at home to each of their breeding, pregnant, lactating and camel calves.

The farmers who maintain one camel which is utilised for carting/agriculture in villages/cities/towns as a source of livelihood follow intensive system of management (36.88%) and these camels do not go for browsing in the field but allowed to graze on road side and canal bank. These camel owners are mostly unemployed farmers/labourers. These camels are reared completely on purchased fodder.

Extensive system of management i.e., zero input still adopted by most camel breeders (20.00%) belonging to Raika or Rabari community. Under this system camel herds are allowed to graze about 30 km with some herdsman. These reproduce in the natural rangelands without any input. The camels

Table 5. Existing management practices and constraints followed by camel keepers in arid zone of Rajasthan.

Attributes Feeding Practices	No. of camel keepers following the practicesv									
	Zone I		Zone II		Zone III		Zone IV		Pooled	
	n =80	%	n =80	%	n =80	%	n=80	%	n =320	%
Method of management										
Extensive system	26	(32.5)	5	(6.25)	15	(18.7)	18	(22.5)	64	(20)
Semi intensive	38	(47.5)	25	(31.2)	40	(50)	35	(43.7)	138	(43.1)
Intensive	16	(20)	50	(62.5)	25	(31.2)	27	(33.7)	118	(36.8)
Housing										
Open	60	(75)	40	(50)	55	(68.7)	60	(75)	215	(67.1)
Protected area	20	(25)	40	(50)	25	(31.2)	20	(25)	105.0	(32.8)
Disease pattern										
Mange	40	(50)	35	(43.7)	45	(56.2)	52	(65.0)	172	(53.7)
Pneumonia	20	(25)	22	(27.5)	15	(18.7)	10	(12.5)	67	(20.9)
Pica	10	(12.5)	10	(12.5)	12	(15.0)	7	(8.75)	39	(12.1)
Colic infection	5	(6.25)	8	(10.0)	6	(7.50)	6	(7.50)	25	(7.78)
Surra	5	(6.25)	5	(6.25)	2	(2.5)	5	(6.25)	17	(5.31
Treatment										
Traditional	50	(62.5)	30	(37.5)	60	(75)	50	(62.5)	190	(59.3)
Hospital	30	(37.5)	50	(62.5)	28	(35)	30	(37.5)	130	(40.6)
Constraints										
Shrinking of grazing land	40	(50)	20	(25)	40	(50)	45	(56.2)	145	(45.3)
Mechanization	20	(25)	35	(50)	30	(37.5)	20	(25)	105	(32.8)
Feeding cost	15	(18.7)	10	(12.5)	5	(6.25)	10	(12.5)	40	(12.5)
No constraints	5	(6.25)	10	(0)	5	(6.25)	5	(6.25)	30	(9.73)

are supervised at frequent intervals during breeding season. During rainy season the herds are brought to the nearby villages and regularly supervised by some family member in order to check damage to the rain fed crops of other farmers.

Source and frequency of water

Major source of water is well and tube well whereas 34.38% farmers use water tank (khelli) constructed at centre place in village or ponds located in catchment areas to harvest the rain water followed by canal water (25%) as a major source of watering to their camel. In irrigated areas watering of animals is mainly by canals. Most of the camel herders (60.9%) provide water to their camel once a day while, 23.4% were offered twice a day and 15.63% on alternate days. Bhakat and Sahani (1999) have reported that camel owner who possess 1 to 2 camels offer water twice a day in summer and once in rainy and winter season. According to farmers, camel drinks average 50 lit/d and 37.5 lit/day during summer and winter, respectively.

Housing management

Camels are generally kept in open places irrespective of season. None of family (67.19%) constructed any type of shed for their camels. However, in rainy season and extreme summer 32.81% respondents keep their animals under the trees during afternoon or along the side of protected areas.

Health care practices

Sick camels were treated either by ethnoveterinary practice (59.38%) or through qualified veterinary assistance (40.63%). According to survey, mange was most prevalent (38.13%) followed by pneumonia (20.9%), pica (12.1%), colic (7.31%) and surra (5.31%).

Conclusion

Camel keepers reared camels on traditional methods gained from experience. Camel are reared for self use viz., agricultural operation and transportation, draft and milk. Camels being a browsing animal are reared on rangelands, community land, restricted and controlled pasture lands but shrinking of grazing land resources has forced paradigm shift in camel husbandry. Among all the three management practices, semi intensive system was most prevalent at village level and followed by majority of the respondents in all the 5 zones. Frequent drought and low availability of grazing resources and water, scarcity of feed were perceived to be main problem influencing the camel husbandry. Shrinking of grazing land forced camel keeper to offer some straw at home in addition to grazing that put extra financial load on poor farmers.

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