

# Status and conservation of Mewari and Jaisalmeri camels in India

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## Summary

The Mewari and Jaisalmeri breeds of camel are among the four major breeds of Indian camel. The Mewari breed is known for the production of milk and its adaptability to the hilly terrain of the Aravali hills in south Rajasthan whereas the Jaisalmeri breed is known for its riding and race potential. A total of 320 camels from 16 herds in eight villages belonging to three districts of the major breeding tract of the Mewari camel were covered. The population of the Mewari camel was estimated to be 16 221 heads with a 28% decline in the last five years. The extent of cross breeding was estimated to be 36%. The average adult Mewari camel had a 193 cm height at wither, 194 cm heart girth and 158 cm body length. Adult Mewari camels produce about 700 grams of hair per annum and the females produce 5-7 litres of milk per day. An integrated rotational grazing pasture development programme could be of great use in maintaining the Mewari camels with diverse livestock species under optimum production.

To define the status of the Jaisalmeri camel, an investigation encompassing 1 760 camel breeders belonging to the 181 villages distributed over the entire strata of the tract was carried out. The population of the Jaisalmeri camel was estimated to be 118 083 heads with a 31% decline in the last five years. An adult Jaisalmeri camel had a 199 cm height at wither, 211 cm heart girth and 156 cm body length. Adult males and females weighed 593 and 519 kg, respectively. Emphasis should be placed on making the breedable males of the breed available throughout the strata and on improving the utility of the breed for *in-situ* maintenance of genetic diversity in the breed.

## Resumen

Las razas de camello Mewari y Jaisalmeri se encuentran entre las cuatro más importantes de la India. La raza Mewari es conocida por su producción de leche y su capacidad de adaptación

a las zonas de colina de Aravali en el sur de Rajasthan. Aquí, la raza Jaisalmeri es conocida por su potencial en carreras. Se han estudiado 320 camellos provenientes de 16 rebaños en ocho poblados de entre los tres distritos de mayor población de esta raza Mewari. La población de Mewari se ha estimado en 16.221 cabezas con un declive del 28% en los pasados cinco años. El impacto de cruces se ha estimado en un 36%. Un camello adulto Mewari posee una altura de 193 cm, 194 cm de circunferencia torácica y 158 cm de largura corporal. Un camello adulto Mewari produce 700 g de pelo por año y las hembras producen 5-7 litros de leche por día. Un programa de desarrollo de pastos integrados en rotación podría ser de gran interés para mantener los camellos Mewari dentro de rebaños de diversas especies con un óptimo de producción.

Para establecer la situación del camello Jaisalmeri se ha llevado a cabo una investigación con 1 760 ganaderos pertenecientes a 181 poblados distribuidos por toda la zona de origen. La población de Jaisalmeri se ha estimado en 118 083 cabezas con un declive del 31% en los pasados cinco años. Un camello adulto de Jaisalmeri mide 199 cm de altura, 211 cm de circunferencia torácica y 156 cm de longitud corporal. Los machos y hembras adultos pesan 593 y 519 kg, respectivamente. Es importante que los machos reproductores de la raza estén disponibles y mejorar su utilidad *in-situ* manteniendo la diversidad genética de la raza.

**Keywords:** Camel, Mewari, Jaisalmeri, Mewati, Characterization, Conservation.

## Introduction

The camel, the beast of burden in the desert, has diversified uses ranging from its primary use as a draught animal to sports, national security and the production of commodities like hair, milk and meat. Despite its potential to thrive well on meager resources under extreme climatic conditions, the

population of camels is decreasing at a significant rate. The world has 19.3 million camels. Somalia is the country with the highest population of 6.2 million camels (Somali Livestock Statistics, 1989) followed by Sudan with 3.3 million, Mauritania with 1.3 million, Kenya with 0.83 million, Pakistan with 0.8 million and Chad with 0.74 million. India ranks seventh with a population of about 0.635 million camels (FAOSTAT data, 2005).

The camel population in India was around 0.60 million in 1951 and increased until 1972 with an annual population growth ranging from + 2% to + 6%. It remained static until 1977 followed by a period of marginal increase-decrease ranging from + 0.6 to - 0.4% until 1992 and an annual decrease of 2% and 6% respectively in the livestock census carried out in the years 1997 and 2003. The country has four major breeds of camel; the Bikaneri, Jaisalmeri, Kachchhi and Mewari. (Kaura, 1961; Rathore, 1986 and Report of the Camel Development Committee, 1988). The status and conservation of the Mewari and Jaisalmeri breeds are discussed below.

The Mewari breed of camel is adapted to the hilly terrain of the Aravali hills of Mewar in south Rajasthan which is considered to be the major breeding tract of the breed (Rathore, 1986; Kohler-Rollefson, 1992 and Khanna, 2004). This breed has also spread to the adjoining areas of Madhya Pradesh and Gujarat (Rathore, 1986). It has also been referred to as a mountain type or hill camel in the literature (Leese, 1927), being a breed which could climb the hills and thrive on the trees that grow in the hills and withstand more rains than other camels (Rathore, 1986). Camels in most of the adverse geographical locations acted as a multipurpose animal where males were used for draught and transport, females for milk and both sexes for meat (Wilson, 1984 and 1997). The present scenario however, shows milk production as the chief reason for its use in the Mewar area.

Mewari camels have strong hindquarters, heavy legs and hard, thick foot pads. Their body hairs are coarse, and protect the animals from the bites and stings of wild bees and insects. The head is heavy, set on a thick neck. Mewari camels do not have a well marked depression above the eyes (*stop*), but their muzzles are loose. The ears are thick and short, set well apart, and the tail is long and thick (Rathore, 1986).

Jaisalmeri camels are predominantly bred in Jaisalmer, Barmer and part of the Jodhpur district of Rajasthan state and are well known for their riding and race potential (Rathore, 1986 and Rai *et al.*,

1992). The camel type in the breeding tract has been termed Pangal and the opportunity to ride a Pangal was considered as an important criterion in achieving contentment in life (Rathore, 1986). Leese (1927) and Kaura (1961) grouped the Jaisalmeri (Jessulmere) camels under the category of Desert Type camels along with the Bikaneri camels. Rollefson (1992) was able to trace the royal family sponsored breeding of Jaisalmeri camels by the Maharajas of Jaisalmer, and their relatives in Nachna village.

The quinquennial livestock census data for camel are available for the years 1951 to 2003 and show a severe decline in the camel population in the last ten years. However, no efforts were made to enumerate the populations of camel breeds. Therefore, it was decided to investigate the present status of the Mewari and Jaisalmeri breeds of camel in their breeding tracts and suggest suitable strategies for the maintenance of adequate genetic variation in the populations for optimum utilization of their production potential before they are classified as threatened breeds.

## Materials and Methods

For Mewari camels, the study was conducted in the Udaipur, Rajsamand, Chittorgarh, Alwar and Bharatpur districts of Rajasthan, the Banaskantha district of Gujarat, the Neemuch district of Madhya Pradesh and the Agra and Mathura districts of Uttar Pradesh. Since camels in this area are reared by a particular community termed '*Rebari*', three villages of Rebaris in Udaipur district, two villages in Rajsamand district and three villages in Chittorgarh district, having some sizable camel populations, were selected for the investigation. In all, 320 camels from 16 herds in eight villages belonging to five tehsils (blocks) of three districts were covered (Table 1). Individual animals of each herd were meticulously judged for the typical features of the breed according to the described breed characteristics (Rathore, 1986). Body measurements for seventeen body parameters were recorded for 57 adult camels. Production and economic aspects were discussed with individual camel herd owners (n = 16) and some other resource persons (n = 6).

The camel population data (Livestock Census, 2003) was utilized to extrapolate the figures for the availability of breedable males and females, as well as total Mewari camels by percentage at district level. The population of Mewari camels and breedable males and females in the adjacent

Madhya Pradesh was extrapolated using the proportions of Chittorgarh district which is quite similar in topography and geographically adjacent to Madhya Pradesh throughout its eastern border. Male camels of less than 5 years of age (Khanna *et al.*, 1993) and female camels of less than 4 years of age (Khanna *et al.*, 1990) were classified as breedable.

As for the Jaisalmeri camel, the whole breeding tract was divided into 10 strata for the purposes of characterisation and the preparation of conservation strategies. The Jaisalmer and Barmer districts were divided into four strata each and the Jodhpur district into two strata. Thirty field centres were opened, of which nine were in Jaisalmer district, 16 in Barmer district and five in the Jodhpur district. In all 1760 camel keepers gave relevant information for the investigation, of which 627, 1 034 and 99 were from Jaisalmer, Barmer and Jodhpur district respectively. A total of 181 villages were covered, of which 65, 85 and 31 were from the eleven tehsils (blocks) of the Jaisalmer, Barmer and Jodhpur district respectively. For *in-situ* characterization of the breed, physical characteristics and biometry of 2 918 adult camels was measured. Since the weighing of the camels was not feasible in the tract itself and the Mewari breed is not maintained at any organized farm in this country, the body weight data recorded at the National Research Centre on Camels, Bikaner, India for the Jaisalmeri breed were analyzed for the period 1977 to 2005. Due to similar reasons the exact reproductive performance data belonging to the Centre were analyzed for Jaisalmeri breed for last eight years.

This investigation was carried out during the period 2001-2004. The population figures were extrapolated at the district level and pooled for estimating total population of the breed in the habitat. The latest livestock census conducted by the government of India during the year 2003 was taken as the basis of extrapolation of the population figures.

## Results

### Habitat and distribution

The breeding tract of Mewari camel consists of the hills of the Aravali in the Mewar area. The major breeding tract of the breed encompasses the Udaipur, Chittorgarh, and Rajsamand districts and the adjoining Neemuch and Mandsoor districts of Madhya Pradesh in India. The adjoining Banaskantha district of Gujarat was also surveyed but the camels found there now were more of Kachchhi x Bikaneri type than Mewari. The camel population present in the Mewar area represented a different picture which is discussed separately. However, the major breeding tract extends east from 73°02' to 75°92' longitude and north from 23°30' to 25°46' latitude with fairly good vegetation and rainfall. Average height from main sea level is about 575 metres.

The breeding tract of the Jaisalmeri breed encompasses the Jaisalmer, and Barmer districts and part of the Jodhpur district in Rajasthan, India (Figure 1). The breeding tract extends east from 69°30' to 73°04' longitude north from 24°37' to 28°15' latitude. The average altitude of the tract



Figure 1. Breeding tract of Mewari and Jaisalmeri camels.

from main sea level is about 250 metres. Sand dunes are the typical features of the tract. A few open wells (Figure 2), tube wells and branches of the Indira Gandhi Canal are the three chief sources of drinking water for the livestock in the breeding tract.

### Physical features

Physical features are the primary indicators for an individual to be classified in a particular breeding group. The Mewari breed of camel has been described very briefly in the literature. Kaura (1961) described the hill camels of North Punjab. The features described by the author match the description of the Mewari camel. Rathore (1986) described the development of the Mewari camel from the hill camels of old Punjab state, thus the findings are commensurate with one another. Kohler-Rollefson (1992) briefly discussed the Mewari camels and could not trace evidence of royal family sponsored breeding in the ancient literature. However, the exhaustive listing of physical features and analysis of the extent of

variation exhibited by the camels of the Mewari breed within each phenotypic class was largely lacking. Henceforth, the physical features along with body measurements for seventeen parameters for the two sexes were recorded (Figure 3 to 5). The body colour in Mewari camels generally varies from light brown to dark brown but some animals are almost white (Figure 6), such variation in body colour is generally not seen in other breeds of camel. The milk vein is prominent and the udder is well developed in females. The physical features have been summarized in table 2.

The Jaisalmeri camels are gracious, lightly built, slightly lean and thin in appearance. They are of active temperament and are quite tall with long, thin legs. They have a small head and mouth with a narrow muzzle. The head is well carried on a thin neck and the eyes are prominent. The forehead is not dome shaped and is without any depression above eyes (stop). Also, there is no luxuriant growth of hairs on their eyebrows, eyelids and ears. The body colour is predominantly light brown. The Jaisalmeri camels have thin skin and short hairs on their body. The udder is mostly round in shape (Table 2 and Figures 7 and 8).



Figure 2. Open well in the breeding tract.

Table 1. Composition of camel herds in the breeding tract of Mewari camel.

Districts	Tehsils (Blocks)	Villages	Resource persons	Herds	Total camels	Mewari		
						Total camels	Breedable males	Breedable females
Udaipur	Girva	2	8	5	89	49	1	29
	Kurabad	1	1	1	9	9	2	4
Rajsamand	Nathdwara	2	7	5	61	61	7	27
Chittorgarh	Chittorgarh	1	3	2	141	70	0	30
	Bhadesar	2	3	3	20	20	3	10
Total	5	8	22	16	320	209	13	100

### Body parameters

Apart from characterizing a breed, body parameters have their own importance. The body length, height at wither and heart girth have been shown to be positively correlated with the draught potential of the camel (Annual Report: 1990-1991, National Research Centre on Camel, Bikaner) whereas the size of the hump is more related to the nutritional status of the camels. Long and thin legs indicate better racing potential (Khanna and Rai, 1989). Long tails have been designated as a tool for protection from wild honey bees (Rathore, 1986). Henceforth, seventeen body parameters of Mewari and Jaisalmeri camels were measured and their average values were calculated. An adult Mewari camel had a height up to wither of 193 cm, a heart girth of 194 cm, a body length of 158 cm, a tail length of 58 cm, a neck length of 107 cm, a distance between the eyes of 18 cm, an ear length of 12 cm, a distance between the ears of 19 cm, a face length of 45 cm, a hump circumference hump (horizontal/vertical) 103/51 cm, a fore leg length of 144 cm, a hind leg length of 154 cm, a fore leg foot pad (length/width) of 20/22 cm and a hind leg foot pad (length/width) of 18/19 cm. On the other hand, an adult Jaisalmeri camel had height up to wither of 199 cm, a heart girth of 211 cm, a body length of 156 cm, a tail length of 55 cm, a neck length of 109 cm, a distance between the eyes of 22 cm, an ear length of 12 cm, a distance between the ears of 19 cm, a face length of 53 cm, a hump circumference (H/V) of 100/45 cm, a fore leg length of 146 cm, a hind leg length of 154 cm, a fore leg foot pad (length/width) of 19/19 cm and a hind leg foot pad (length/width) of 17/17 cm.

### Growth

The Jaisalmeri camels are lighter than the Bikaneri camels as the camels of this breed were used for

long distance travel and accordingly selection for this type of build might have been done (Rathore, 1986). The average body weight in males and females was 37 and 37, 212 and 211, 277 and 278, 359 and 339, 423 and 391 and 490 and 442 kg respectively at birth, 12, 24, 36, 48 and 60 months of age. An adult male weighed on average 593 kg and an adult female 519 kg. Analysis of growth data indicated that up to 24 months of age the superiority of the males over females fluctuated but after 24 months of age the males were consistently heavier than the females. However, the effect of sex was non significant ( $P>0.05$ ) up to 36 months of age and thereafter it was significant ( $P<0.05$ ) at 48 and 60 months weight and highly significant ( $P<0.01$ ) in adult weights.

## Production, Reproduction and Health Aspects

### Milk production

Female Mewari camels maintained on free grazing land without any supplementary feeding give 5-7 litres of milk per day. The lactation length is 14-16 months. According to present investigation, about 8 000 quintals of camel milk is being sold daily at Rs. 6-10 (1 INR = 0.0224517 US\$) per kg for human consumption in Udaipur and adjoining cities, such as Chittorgarh, Nimbahera, Neemuch, Ratlam, Jawara, Mandsour etc. The chief use of this milk is in the preparation of tea and coffee.

The females of the Jaisalmeri breed are poor in milk production. The average daily milk production was highest in two teat stripping ( $3.72\pm 0.17$  kg) followed by four teat stripping ( $2.17\pm 0.16$  kg) and machine milking ( $2.02\pm 0.19$  kg). The lactation length can continue up to 14-16 months. The milk production data indicated an increasing trend up to

Table 2. Physical features of Mewari and Jaisalmeri camels.

Physical characteristics	Mewari		Jaisalmeri	
	Male	Female	Male	Female
<i>1. Body color</i>				
a. Very Light brown (%)	7	7	3	1
b. Light Brown (%)	43	44	54	55
c. Deep Brown (%)	50	49	43	44
<i>2. Hair on ears and eye lid (Jheepira)</i>				
a. Absent	Yes	Yes	Yes	Yes
b. Present	No	No	No	No
<i>3. Head</i>				
<i>I. Size</i>				
a. Small (%)	54	20	19	16
b. Medium (%)	43	77	70	77
c. Large (%)	3	3	11	7
<i>II. Well marked depression above the eyes(stop)</i>				
a. Absent	Yes	Yes	Yes	Yes
b. Present	No	No	No	No
<i>III. Fore head</i>				
a. Normal	Yes	Yes	Yes	Yes
b. Prominent	No	No	No	No
<i>IV. Supra-orbital fossa</i>				
a. Deep	No	No	No	No
b. Normal	Yes	Yes	Yes	Yes
<i>V. Muzzle</i>				
a. Type	Loose	Loose	Narrow	Narrow
b. Lips	Droopy	Droopy	Normal	Normal
<i>4. Body size</i>				
a. Small (%)	61	24	8	6
b. Medium (%)	25	56	81	86
c. Large (%)	14	20	11	8
<i>5. Hump size</i>				
a. Small (%)	71	41	15	13
b. Medium (%)	29	46	72	82
c. Large (%)	0	13	13	5
<i>6. Udder</i>				
a. Round (%)	-	97	-	98
b. Pendulous (%)	-	3	-	2
<i>7. Milk vein</i>				
a. Small (%)	-	0	-	10
b. Medium (%)	-	32	-	81
c. Large (%)	-	68	-	9
<i>8. Temperament</i>				
a. Active (%)	91	88	91	88
b. Dull (%)	9	12	9	12



Figure 3. Mewari male adolescent.

the sixth month of lactation and thereafter a decreasing trend. Morning production was 10-27% higher than that in the evening and production from rear teats was significantly higher than that of front teats (Sahani *et al.*, 1998).

### Draught

Mewari camels have a multipurpose utility but camels of this breed are mainly classified as milk animals and baggage type. Both males and females can climb with loads on hilly and stony land. Males are good baggage animals on hard land. Camel carts in this area are generally confined to transportation in the mining area. The

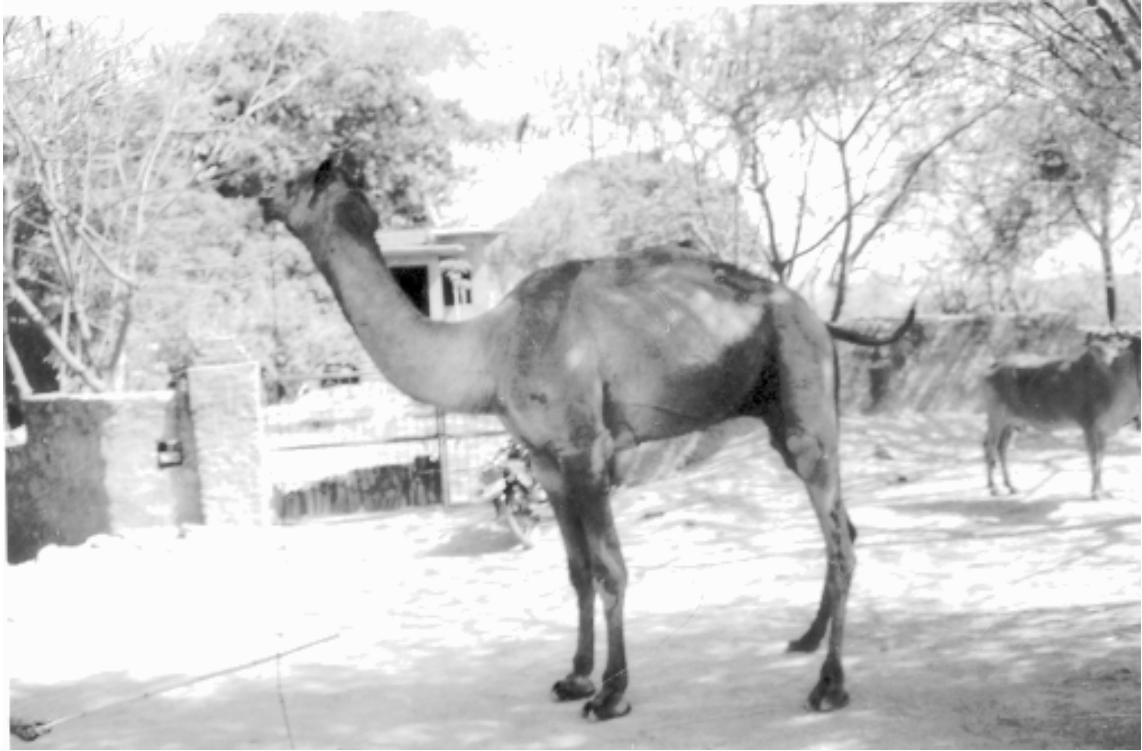
transportation of bricks and other raw materials over a short distance is done to a very limited extent.

The efficiency of Jaisalmeri camels in racing has been judged to be better than Bikaneri and Kachchhi breeds of camel on the basis of duration of strides, strides per second and speeds at trot and gallop (Rai *et al.*, 1992). The Jaisalmeri camels at 20% of their body weight as draught ( $111 \pm 5$  kg) work for a period of  $58 \pm 1.7$  minutes, cover a distance of  $3.30 \pm 0.00$  km before exhaustion and generate  $1.46 \pm 0.10$  horse power (Annual Report: 1990-1991, National Research Centre on Camel, Bikaner). A good number of camel carts are being used throughout the breeding tract for transportation of various goods (grains, fuel wood, fodder, construction materials, water, LPG cylinders, etc.) and a camel owner earns on an average Rs. 150 to 200 per day depending upon the location.

### Safari

Camel safaris are not a feature of the breeding tract of Mewari camels. However, one or two camels may be available near some historic monuments for short rides by children and tourists. In contrast to the above, it is a very important feature of the Jaisalmeri breeding tract. The camels of this breed are preferred for safari. A

good number of safari operators are found in Jaisalmer, Jodhpur, Bikaner and other cities. They organize safaris for a distance of 80 to 300 km (variable) depending on the availability of tourists and time. About 15-30 (variable) tourists are sent at a time for such tours. About 300 camels (variable) in each city are being used for this purpose. A camel owner earns Rs. 100-300 per day depending upon the availability of tourists. Apart from this, the individual camel owners are making a good number of camels available for short rides at various locations in the breeding tract. The famous sand dunes of *Sam* and *Khudi* are located in this tract, where about 50-100 camels are generally available at any time for such rides.



*Figure 4. Adult Mewari male.*



*Figure 5. Adult Mewari female.*





Figure 6. Mewari calf.

### Hair production and quality

An indirect source of income to the breeder is camel hair. Adult Mewari camels produce about 700 grams of hair per annum. Fine quality hair from camel calves is utilized for blankets whereas coarse quality adult hair is used for carpets. Some weavers in the towns of Rajsamand and Jawara in the Mewari breeding tract are engaged in the production of carpets and blankets but this is not their full time occupation (Figure 9). The charge for yarn production is Rs.15 per kg and for carpets and blankets Rs. 40 per kg. These carpets and blankets are very cheap and durable. The life of a carpet is approximately 50 years and that of a blanket 15 years. Camel hairs are also used in making ropes, which are subsequently used for tying the animals and in making cots.

The annual hair production of adult Jaisalmeri camels has been recorded as  $0.733 \pm 0.016$  kg (Bhakat *et al.*, 2003). The analysis of hair quality attributes of Jaisalmeri camels indicated a  $6.16 \pm 0.24$  cm staple length,  $35.52 \pm 0.59$   $\mu$  hair diameter and the percentage composition of different types of hair was revealed to be  $36.31 \pm 0.71\%$  pure,  $38.41 \pm 0.60\%$  hetero,  $36.31 \pm 0.71\%$  hairy and  $1.25 \pm 0.18\%$  kemp fibres (Bhakat *et al.*, 2001). Calf hair is superior in terms of hair diameter and the presence of pure type hairs with minimum kemps. Camel hair is being

used in village cottage industry by the camel keepers and weavers for the production of blankets, ropes, carpets and other items of daily use.

### Reproduction

The observations on the reproductive efficiency of the Mewari and Jaisalmeri camels indicated that the females show the symptoms of puberty at an age of 4 to 4.5 years and first successful conception takes place at an age of 4.5 to 5 years. The gestation length is 13 months. The males exhibit the symptoms of rut at an age of 5.5 to 6 years and can be used for regular breeding at the age of 6 to 6.5 years. The analysis of Centre's data revealed that the average age at first calving, calving interval and gestation length in Jaisalmeri females was  $2089 \pm 70.8$ ,  $740 \pm 11.8$  and  $390 \pm 1.0$  days respectively.

### Health

The major clinical problem identified by the camel owners of the Mewari breeding tract was that of trypanosomiasis. Almost all camel keepers favour prophylactic treatment of this disease. Mange was second cause of worry to the camel breeders. Indigestion, ectoparasitic infestation, diarrhoea and

pneumonia were the other health problems associated with camels in the tract. On the other hand, mange was the major health problem identified by the camel keepers in the breeding tract of the Jaisalmeri camel. Digestive disorders were the second cause of worry. The digestive disorders included tympany, constipation, diarrhoea, abdominal pain and gastrointestinal obstruction. Trypanosomiasis and reproductive diseases were the next most prevalent. Other health problems included wounds and abrasions, saddle gall, cataracts, kumari (neuromuscular weakness of the hind legs), pneumonia, lameness, pica, ectoparasites excluding mange, tumours and poisoning. In the Jaisalmeri breeding tract about 52% camel keepers favour local treatments followed by allopathic treatment (41%) and herbal treatment (7%). The choice of line of treatment was observed to depend on the nature and severity of the disease and economic status of the farmer (Mehta, 2004).

### Status in the breeding tracts

The population of Mewari camels in its natural habitat was estimated to be 16 221 heads with 950 breedable males and 7 874 breedable females and a ratio of 1:8.3 (Table 3). The total population of camels in the breeding tract was 25 473 (Livestock Census, 2003). The population of males and females of less than 3 years of age was 7 877 and 11 983 with a ratio of 1:1.52. This clearly indicated that there was an apparent availability of 4.45 crossbred studs for every Mewari stud competing to breed with the female population available in the tract. The conservation of the Mewari camel is going to be a difficult task as this biased ratio was easily observable on the ground due to the absence of Mewari studs from 50% of the camel herds covered in the investigation. The herd structure in the tract suggested the availability of

64% Mewari camels with 6% breedable males and 48% breedable females (Figure 10). An average herd consisted of about 20 camels (Table 1).

Kohler-Rollefson (1992), while discussing management aspects of camel husbandry under contemporary production systems indicated the smaller size (20-50 head) of the camel herds in the Aravali hills. The extent of crossbreeding in the native tract was estimated to be 36% (Figure 10). This crossbreeding was mainly with the Bikaneri breed. The major source of breeding males for the breeders of Mewari camels was the Pushkar fair which is invariably attended by most of the camel keepers of Rajasthan and the adjoining states. The camel breeders share the experience that the calves sired by Bikaneri males are 'maru' ('maru' means good-looking) but they face difficulty in climbing and walking across hilly terrains especially during the rainy season (personal discussion with Bagdiram Rebari).

The male to female ratio in the entire breeding tract was 1:1.53 and approximately same ratio (1:1.52) was observed among the males and females of more than 3 years of age. Camels in this region are chiefly maintained for the production of milk and camel slaughter for meat is exceptionally rare in the tract. On the basis of the above facts it could be logically assumed that the ratio among the population of breedable males and females would be 1:1.52. Accordingly for breeding of available breedable Mewari females, 5 180 Mewari studs were required as against the available 950, which amounts to about only 18%. A straight comparison between available males and females of more than 3 years of age and the estimated population of breedable males and breedable females revealed that the breedable Mewari females constituted 66% of the females (more than 3 years of age) available in the tract as against the Mewari males which constituted only 12% of the males more than 3 years of age. The above figures clearly indicated that the

Table 3. Population of Mewari camel in the breeding tract.

Breeding tract (districts)	Total camel population <sup>1</sup>	Mewari <sup>2</sup>		
		Camels	Breedable males	Breedable females
Udaipur	9 125	5 400	279	3 072
Rajsamand	3 815	3 815	438	1 689
Chittorgarh	4 533	2 534	84	1 126
Adjoining Madhya Pradesh <sup>1</sup>	8 000	4 472	149	1 987
Total	25 473	16 221	950	7 874

<sup>1</sup>2003 Livestock census figures.

<sup>2</sup>Extrapolated figures (see text).



Figure 7. Adult Jaisalmeri male.

population of crossbreds in the tract would further increase at a much faster rate due to the acute deficiency of available Mewari studs (Figure 11). The livestock census data indicated that there has been 28% decline in the population of camels in the breeding tract of Mewari camels (Livestock Census, 2003). The above statistics show that the population of Mewari camel could reduce significantly due to the cumulative effects of crossbreeding and declining camel population in the country.

The population of the Jaisalmeri camel in the breeding tract was estimated to be 118 083 heads with 32 899 breedable males and 41 349 breedable females. The entire tract had 126 984 camels (Table 4). One very important feature noticed when

surveying the camels was that the sex ratio was not very much distorted; it was only slightly in favour of females (1:1.25). In most of the livestock species, very few breedable males are left as compared to the breedable females. In camels this was mainly due to the preference of the camel keepers to use the male camels for almost all sorts of work. Females were not preferred for cart pulling, ploughing etc., however this thinking is also changing and some villagers are now using females for draught work due to their docile nature, especially during the breeding season. A severe reduction in the number of breedable males accounts for the inbreeding but in the Jaisalmeri breed, due to the availability of a

Table 4. Population of Jaisalmeri camel in the breeding tract.

Districts	Total camel population <sup>1</sup>	Jaisalmeri camels		
		Total	Breedable	
			Male	Female
Jaisalmer	36 952	35 129	10 560	11 275
Barmer	69 712	64 835	16 150	25 799
Jodhpur <sup>2</sup>	20 320	18 119	6 189	4 275
Total	126 984	118 083	32 899	41 349

<sup>1</sup>As per Livestock Census 2003.

<sup>2</sup>Part of Jodhpur district.

good number of breedable males, this problem is not likely to play a major role in near future.

The latest livestock census indicated that there has been a decline in the overall camel population. The magnitude of this decline is about 31% in the breeding tract of the Jaisalmeri camel in last five years (Livestock Census, 2003). This decline can be attributed to increased mechanization, a severe reduction in the grazing land and vegetation therein, deforestation and the diversion of more land to agriculture due to the Indira Gandhi Canal etc. There has been about a 5% decline in the permanent pastures and other grazing land available in the last decade in Rajasthan (Statistical Abstract, Rajasthan - 2002). Due to commercialization and population pressures the average herd size of camels reduced to 3.74 camels per herd whereas the range was from 1 to 200 (Table 5). An average herd had 7% crossbred

camels. This crossbreeding was mainly with the Bikaneri breed of camel.

On an average about one stud was available in a herd but about 36% camel keepers were not keeping any males of the breed. The majority of them (75%) were keeping only one camel for work but about 5% camel keepers were maintaining more than five camels and not having any breedable males of the breed. This situation can not be considered as conducive to the conservation and propagation of the breed (Alderson, 1981; Simak, 1990).

### Mewari camels in Mewat area

The Mewat area refers to the Alwar, Bharatpur, Karauli and Sawaimadhopur districts of Rajasthan, the Agra and Mathura districts of Uttar Pradesh



Figure 8. Adult Jaisalmeri female.

Table 5. Availability of breedable males and females of Jaisalmeri breed in a herd.

Districts	Average herd size	Jaisalmeri camels in an average herd		
		Jaisalmeri camels	Breedable	
			Males	Females
Over all	3.74	3.49	0.97	1.23
Jaisalmer	4.20	3.99	1.20	1.28
Barmer	3.19	2.97	0.74	1.18
Jodhpur	6.43	5.74	1.96	1.35



Figure 9. Traditional carpet weavers showing a camel hair and cotton mixed handmade carpet.

and the adjoining areas of the Mahendragarh, Rewari and Gurgaon districts of Haryana. This region also has some camel populations. There were about 30-35 villages of the Rebari caste in the Alwar and Bharatpur districts. The camel breeders have shifted to this area from Mewar due to the availability of dense forest and green vegetation. Rebaris, the traditional camel breeders, in the Mewar area prefer Mewari females as they are good producers of milk and are well adapted to the hilly tracts (Rathore, 1986) whereas the Mev (Muslim) camel users prefer Bikaneri camels because they are engaged in the transportation of goods and the Bikaneri camel has good draught potential (Rai *et al.*, 1992). The above observation is commensurate with Leese (1927) who mentioned that the camels found near Agra, Mathura, Delhi, Meerut and other places are from semi-desert areas of Rajasthan and many are crosses between Mewari and Bikaneri camels.

### Improvement and conservation

In the breeding tract of the Mewari breed, camel milk was being sold for human consumption much earlier than in the year 1978 when the first case against a vendor selling camel milk was registered in Udaipur. The case ended with the legalization of

the sale of camel milk for human consumption by the Supreme Court of India in the year 2000. Still, the setting of standards for camel milk and the inclusion of camel milk in the Dairy Act are awaited (Rollefson, 2004 and Bagdi Ram Raika, 2004). There is a general sense of apathy and neglect regarding the breed. If concrete measures to overcome the existing declining trend in camel populations and the problem of cross breeding in the Mewari tract are not taken, it is likely that the Mewari breed would qualify to be considered as endangered in the not too distant a future.

In view of the long lactation length (Sahani *et al.*, 1998) and the increased consumption of camel milk by the human population in the breeding tract (Rollefson, 2004 and Bagdi Ram Raika, 2004) there is a need for improvement in the milk production potential of the camels in this area. The traditional use of camel hair (Figure 9) and present day use of camel skin and bones for the manufacture of gift items should be encouraged to ensure increased utility of the breed and hence the *in-situ* conservation of the breed. An integrated rotational grazing forest or silvi pasture development programme along with a disease control and breed improvement programme could be of great use in maintaining the Mewari camel with diverse livestock species under optimum production conditions.

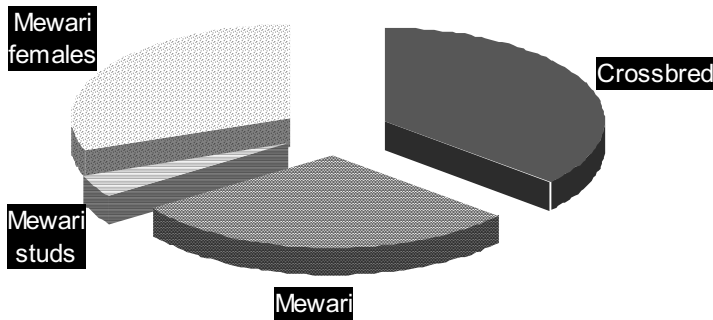


Figure 10. Status of Mewari camel in the breeding tract.

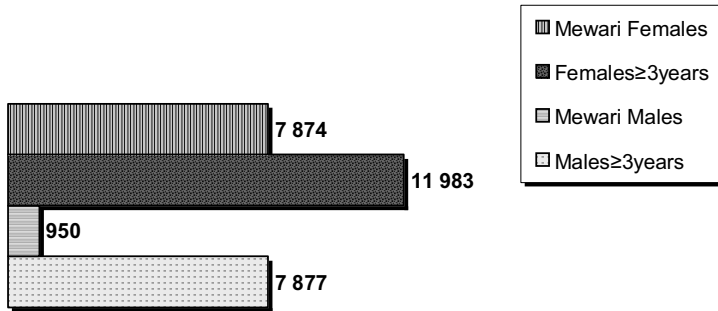


Figure 11. Breedable population of Mewari camel in the breeding tract.

The Jaisalmeri camels inhabit the Indian part of the Thar desert in Rajasthan state which has about 78% of the camel population of this country. Low fertility of soil, low rainfall and humidity, poor vegetation and scant water resources are the typical features of this tract. Due to the international Indo-Pak border, the road connectivity between important places has improved but there are still several villages, which do not have proper road connectivity. Camels in this part of the country are used for safaris, riding, travel, the transportation of goods, ploughing etc. Due to various reasons discussed earlier, the population of camels in this tract is declining very fast. In the last five years, i.e. from 1997 to 2003, a 31% decline in the population of camels in the breeding tract has been noticed. Further, this rate of decline in the camel population is expected to increase substantially in the near future. The average size of herds has reduced to only 3.74 camels per herd and a good number of

herds (5%) did not have a single stud of the Jaisalmeri breed despite the sizable female population. On the other hand, due to a continuous increase in the price of fossil fuel, an increase in pollution, severe consecutive droughts, a reduction in underground water availability etc., the community has been forced to make use of some eco-friendly alternatives i.e. animals in general and the camel in particular in the desert region.

To sustain this breed in its breeding tract *in-situ*, there is a need to ensure improvement, increase the utility of the breed, ensure the availability of elite males for breeding in all strata of the tract, increase public awareness of the need for conservation and encourage the formation of breed societies. Under *ex-situ* situations, the National Research Centre on Camels, Bikaner is maintaining a herd of the breed with elite studs and has cryo-preserved the semen from certified camels of the breed. This Centre is also distributing breedable males through the state government for genetic improvement in the field and providing consultancy services for conservation.

### List of References

**Alderson, L.** 1981. The conservation of animal genetic resources in U.K. Animal Production and Health Paper 24, FAO, Rome, Italy, pp. 53-76.

**Bagdi Ram (Rebari) Raika.** 2004. Deliberations and recommendations from the National Grazing Workshop. In International conference on "Saving the camel and people's livelihoods". November, 2004, Pali, Rajasthan, India.

**Bhakat, C., B. Yadav & M.S. Sahani.** 2001. Effect of certain factors on hair quality attributes in Indian dromedary camel managed in an organized farm. Indian Journal of Animal Sciences 71, 992-994.

**Bhakat, C., S.C. Mehta & M.S. Sahani.** 2003. Annual hair yield attribute in indigenous camel breeds. The Indian Journal of Animal Sciences 73, 1189-91.

**Department of Agricultural Research and Education: Livestock Census.** 2003. 17<sup>th</sup> Livestock Census, Department of Agricultural Research and Education, Ministry of Agriculture, Government of India.

**FAOSTAT.** 2005. <http://faostat.fao.org/faostat/collections?subset=agriculture>. Date of access: 9 March 2006.

**Kaura, R.L.** 1961. Indian Breeds of Livestock (Including Pakistan Breeds). Prem Publishers, Lucknow, India, pp. 95-97.

**Khanna, N.D. & A.K. Rai.** 1989. Work performance of camel. *Indian Journal of Animal Sciences* 59, 1172-1177.

**Khanna, N.D., S.N. Tandon & A.K. Rai.** 1990. Breeding parameters of Indian camel, *Indian Journal of Animal Sciences* 60, 1347-1354.

**Khanna, N.D., S.N. Tandon & A.K. Rai.** 1993. Reproductive status of Bikaneri camels managed under farm conditions. In: Proceedings of the Workshop on: Is it possible to improve the reproductive performance of the camel? September, 1990, Paris. Published by CIRAD-EMVT, France, 1993, 337-351.

**Khanna, N.D., A.K. Rai & S.N. Tandon.** 2004. Camel breeds of India. *Journal of Camel Science* 1, 5-15.

**Köhler-Rollefson, I.** 1992. The camel breeds of India in social and historical perspective. *Animal Genetic Resource Information* 10: 53-64.

**Köhler-Rollefson, I.** 2004. The camel in Rajasthan: Agricultural biodiversity under threat. In International conference on: Saving the camel and people's livelihoods. November, 2004, Pali, Rajasthan, India.

**Leese, A.S.** 1927. A treatise on the one-humped camel in health and disease. Stanford, UK, Haines and Sons Pub., pp. 51-53.

**Mehta, S.C.** 2004. Characterization and conservation of Jaisalmeri camel - a project report, National Research Centre on Camel, Bikaner, Rajasthan, India, pp. 31-32.

**National Research Centre on Camel: Annual Report 1990-1991.** National Research Centre on Camel, Bikaner, India, pp. 7-26.

**Rai, A.K., A.K. Roy & N.D. Khanna.** 1992. Speed and strides of different breeds of camel. *Indian Journal of Animal Sciences* 62, 91-92.

**Rathore, G.S.** 1986. Camels and their management. Indian Council of Agricultural Research publication, New Delhi, pp. 10-18.

**Report of the Camel Development Committee.** 1988. Ministry of Agriculture, Government of India, New Delhi, pp. 11-15.

**Sahani, M.S., M. Rathinasabapathy, Gorakhmal & N.D. Khanna.** 1998. Milking technique and other factors affecting milk production potential in different breeds of camels under farm conditions. *Indian Journal of Animal Sciences* 68, 254-256.

**Simak, E.** 1990. The conservation of rare breeds in West Germany. In L. Alderson (Ed.), Genetic conservation of domestic livestock. CAB International, Wallingford, UK. pp. 65-69.

**Somali Livestock Statistics.** 1989. Cited by Abdi, A.O.H. and Cagnolatti, V. In The camel in Somalia - an overview., [www.agrar.hu-berlin.de/nutztier/ntoe/Aktuell/works/Papers/09.pdf](http://www.agrar.hu-berlin.de/nutztier/ntoe/Aktuell/works/Papers/09.pdf).

**Statistical Abstract, Rajasthan.** 2002. Directorate of Economics and Statistics, Government of Rajasthan, Jaipur, India.

**Wilson, R.T.** 1984. The camel. Longman Publication, London, pp. 16-30.

**Wilson, R.T.** 1997. Types and breeds of the one-humped camel. *Journal of Camel Practice and Research* 4, 111-117.