CAMEL MANAGEMENT IN ARID AND SEMI - ARID ECO-SYSTEM

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The Animal Husbandry nevertheless plays a vital role in the economy of India and contributes more than 60% of the GDP of the region. Camel energy is not only cost effective but also profitable and remunerable for short distance (30-40 Km) transportation. Mainly due to higher cost benefit ratio and shorter pay back period the farming use of camel system is advantageous and profitable over the bullock system for small and medium farmers in the hot arid Thar region (Bhakat and Sahani, 2006). The abbreviation of 'CAMEL' may be expanded as 'C' - carrier, 'A' - Arid zone, 'M' - multipurpose, 'E' - Eco-friendly and L - Livestock. Their ability to survive long period under hot dry climate without water is legendary. Through ages, the anatomy and physiology of camel has evolved mechanisms to combat the hostile environment of the desert, to thrive on scanty food, to dissipate body heat and to survive without water for long periods. Modified structure of the four stomachs, ability to digest coarse vegetation, rise in body temperature, passing of concentrated urine and dry feces are some fine examples (Yagil, 1985). Since majority of the gross cultivated area of our country is non-irrigated camel hold a significant potential for financing. The ratio of camel to other livestock species in different villages of Thar districts are analysed. The camel to sheep and goat ratio is highest (1: 12.45), followed by cattle ratio (1:8.56) and buffalo ratio (1: 0.31). The overall Camel and Herbivore ratio is 1: 21.36 (Bhakat and Sahani 2001). The camel marketing through livestock fairs in western Rajasthan has opened new avenues for farmers. Marketing of camel is considered an important trade in the Rajasthan where it is widely used as draft animal. In Rajasthan the camels are mostly marketed in big livestock fair organized at Nagour, Pushkar, Tilwara, Phalodi and Gogameri every year. The camel keeping at farmer's household level varies in a wide proportion. Generally it ranges from 0 to 80 camels per farmer. 70 % of farmers owned only one camel, 20 % owned 2-3 camels, 4 % owned 4-10

camels, 3 % owned more than 10 camels and only 1 % owned 80 camels where as 2 % owned no camel (Bhakat et al 2004a).

Systems of Management

The camel has been domesticated more recently than other animals. The most probable period of domestication of camel is prior to 1800 BC. The methods of camel keeping are now changing worldwide because the grazing land is decreasing continuously as more land is brought under cultivation reducing the total area of free grazing land. Camels, which are largely maintained under extensive system earlier, are now facing problem and their management needs a better alternate system, which is socially acceptable and economically viable.

Community system:

Indian camel owners can be categorized as camel users and camel breeders. Camel user are the farmers who utilizes camel mainly for carting and agriculture purpose in cities as well as in villages areas and earning money is a means of lively hood in their day to day life. They generally do not bred camels, where as camel breeders mainly bred the camels and produce offspring and rear for few years and then sell out in livestock fairs. Camel breeders do not utilize camels for work. Camel users come from a wide variety of social background, Viz: Saansi, Meghwal, Mina, Bhil, Kalbelia who aspire to camel ownership. For these groups camels are valuable income-producing assets. These users are dependent on camel breeders for the supply of camels. Breeders own larger numbers of female camels which are kept mainly for the purpose of reproduction.

I Extensive Management System:

This practice is very common among camel breeders who rear small, medium to large camel herds. Under this system camels are grazed and reared on the available rangeland. Everyday camels covered a distance of around 15 to 20 km along with browsing and grazing. The camels in herd are collected in the spring season for hair shearing, treatment against mange, branding etc. The animals are released for free

grazing again after above operations. It is usual practice to collect camel herds during the 3 months of the rainy season (July to September) to prevent any type of damage in kharif crops. Most, but not all herders also like to supervise their camels during the breeding season which traditionally falls between the two important festivals of Diwali (around November) and Holi (around March) in order to prevent fights between competing males.

II Semi-extensive Management System :

This system is practiced around town and villages in the marginal area. Camels are partly offered with traditional local fodders like Moth chara (*Phaseolus aconitifolius*), Guar phalgathi (*Cyamopsis tetragonoloba*), as per the availability, market rate and partly allowed for grazing and browsing in near by common grazing land. The recent camel management by Raikas are extremely diverse, varying from free ranging for most of the year at one extreme to continuous closely supervised herding at the other. The ecological setting and the degree of competition from other land use strategies determine which particular herding system is adhered to it. Many of the migratory camel herd return at regular intervals to the villages for water, but they can also range several hundred km from their owners home. The Raikas are able to keep track of their movements as they can identify the footprints of each of their camels in the herd.

III Intensive Management System:

This system is mainly followed in cities /big towns as source of livelihood by transporting various materials viz : food grains, gas cylinders, building materials, fodder etc. Under this system camel are stall fed exclusively on purchased feed from market. The average daily income is around Rs 250-300/- in cities and Rs 150-250/- in small town. Some of these camel owners also do agriculture farming during rainy season (July to October months).

Reproductive Management

The Indian camels are seasonal breeder and breeding activity is

from December to March during winter. The females become sexually mature at the age of about 4 years and above, first calving takes place at around of 5 years of age and subsequent calving are biennial. Females remain sexually active upto 16 - 18 years of age. The male camel matures at the age of 6 years. The camel reproductive life varies according to plane of nutrition, management health and hereditary factors.

Rutting in male camels :

Experimentation at farm indicated that early rut in adult mature male camel can be aroused by giving regular exposure for 20-30 minutes to adult female camels, at least for two weeks period before the onset of winter season.

In India rutting starts during winter season. Important rutting signs are:

- Loss of appetite and weight.
- Aggressiveness, making territory, restlessness.
- There is copious secretion from poll (occipital) gland. The secretion is dark brown with acrid smell and androgens are present. Histologically the poll gland resembles endocrine gland. The secretion of the poll gland attracts females during breeding season (Yagil and Etzion 1980).
- Characteristically male in the rut eject out soft palate (gula) from its mouth by filling air from trachea. Air is retained for about 5 to 10 seconds, after which it is expelled with a gurgling sound, the pressure is released and gula collapses.
- A camel in rut stands with hind legs quite apart with flapping the tail up and down with frequent micturation and throwing urine over back again and again. Thus the hind portion of the back gets soiled with urine and dirt resulting in thick black streak on the back.

It was observed that sexual libido gets reduced, if rutting males are put to regular hard work like carting. One camel stud can breed three females per day at the peak of the breeding season subject to provision of good management and health. Keeping extra males is beneficial to provide genetic diversity and to check inbreeding for wider and efficient selection.

Signs of labour pain during Parturition :

- The parturient camel wants to be alone and separate of from the main herd.
- Shows two distinct grooves on either side of the root of tail.
- Concavity between the sites of pin bone, which is mainly due to relaxation of sacro-siatic ligaments.
- Vulva is visible swollen round.
- Repeated lying down and standing up.
- Superficial mammary vein become tense and tortuous.
- Swelling of udder and teats are very common sign which indicates that parturition process is likely to be start very soon.

The other sign are 'looking to the flank' and 'aggressiveness' which are not so common.

Stages of parturition :

The pictorial depiction of different stages of parturition are given in Fig 1. In majority of cases (80 %) allanto-chorian bag expelled out only after rupturing however in 20% cases where allanto-chorian bag is expelled out as such and it ruptures outside and subsequently release straw color fluid. There is an average of 9.0 liters of foetal fluids, 80-90% of which is allantoic fluid. Amniotic fluid do not exceeds more than 1 liter, which is much less in volume than either the cow or the mare. The average time (minutes) between appearance and expulsion of allanto-chorian bag is 3.50 ± 1.0 and it may range from 2 to 5 minutes. The average time (minutes) gap between expulsion of allanto-chorian

1. a parturient camel showing the sign of parturition. 2. Dam with neonatal calf just after delivery. 3. Placenta of camel (Diffuse type). 4. Nosing and smelling the neonatal calf. 5. First standing attempt by neonatal calf. 6. First milk suckling attempt by neonatal calf. 7. Dam with seven days old calf.

bag and appearance of foetus is 5.25 ± 1.66 minutes where as the range value is 3 to 7 minutes (Bhakat et al. 2001). In all most all cases presentation is normal which is out stretched foreleg with chin of the calf resting on it. The posture of dam at the time of expulsion of foetus is on sternal recumbence (100 %). The average time (minutes) between appearance and expulsion of foetus is 6.23 ± 2.44 minutes in assisted cases and 42.50 ± 6.50 minutes in unassisted cases. Assisted labour where manual assistance (slight pulling outward by holding head and leg of foetus) during the parturition process. The head of the calf appears, usually still within an intact amnion. The body gradually appears and the rear portion is then quickly ejected. If it is a breech birth the hind legs appear first, but no additional help is required. The post partum

average time (minutes) taken for expulsion of placenta is 55.86 ± 10.00 minutes but it may range from 30 minutes to 120 minutes.

Post partum behaviour of Dams :

The dam stands up as soon as the calf is expelled out. The nosing and smelling of the calf are most common feature but licking is not there. In normal and natural parturition process the placenta is not eaten by dam. After parturition majority of dams (80%) adapt their calf very promptly (within 5 to 10 minutes) but in few cases around (20%) where dam takes more time for adaptation process. In around 90% cases dams are extremely protective for her young one and not readily allow anyone to handle her calf but few dams (10%) are reluctant to this behaviour. This severs the umbilical cord. The mother do not bite the cord, lick the calf as done by bitch, sow or mare.

Behavioural features of neonatal calf :

The average time (minutes) taken for the calf to stand on its legs is 25 to 90 minutes (Table-1). The calves in normal parturition assumes sternal position with head slightly dropping towards the ground. The eyes are generally covered by mucous membrane; which gets opened after the birth. The dams nosed and smells the calf repeatedly but do not lick the young one. The newborn calf makes repeated attempts to stand up until finally the hind legs flexed sufficiently to support the body. In maximum cases (90%) the locomotary movement of newly born calves become normal within 12 to 24 hrs after parturition but in few cases (10%) take more time to normalize their locomotary movement. On the other hand majority of calves (90%) can properly walk after 6 to 7 days of parturition although there are few cases (10%) where calves can have a proper movement before 6 to 7 days. Shortly after birth the calves make effort to stand and takes about 35-50 minutes to stand. Initially the movement is unsteady with staggering gait. New born calves keep their forelegs forward with slope and hindlegs stretched behind the forelegs. The locomotion become normal after 10-12 hrs, and the calves starts to follow the mother, walking by its sides or behind.

Table 1 :- Neonatal behavioural features

CHARACTER	MEAN (N = 10)	RANGE
Time taken for 1 st standing (Minutes)	56.23 $\pm$ 10.44	25 – 90
Time taken for 1 st suckling (Minutes)	80.26 $\pm$ 8.53	60 – 100
Number of suckling (per hr)		1 – 3
Time taken for Excretion of Muconium (Minutes)	32.00 $\pm$ 5.64	10 – 50
Time taken for 1 st Urination (Minutes)	61.50 $\pm$ 2.11	55 – 70
Rectal Temperature (°C)	36.58 $\pm$ 1.29	36 – 38
Pulse Rate (Time/Minutes)	122.00 $\pm$ 8.54	115–130
Respiration Rate (Time/Minutes)	35.50 $\pm$ 2.66	29 – 43
Locomotary movement (%) Normal – (within 12 – 24 Hr) Not Normal -	90.0 10.0	
Proper walking (Days) After 6 –7 (%) Before 6 – 7	90.0 10.0	

Precautions to be taken during parturition:

- Assistance should be provided in case of difficult situation of expulsion of foetus
- The naval cord should be ligated properly and dressed regularly for 2-3 days with antiseptic solution.
- Nasal opening of calves should be cleaned immediately after birth by soft and clean cloth, the body should be cleaned.
- Colostrums must be provided to calves after 1 to 2 hrs of birth.
- In order to avoid calf diarrhea optimum suckling of colostrums should be allowed.
- Generally parturition takes place during winter season. Special care should be given to avoid direct cold wind to neonate.
- If parturition occurs during April or May month calves should be protected from high temperature and keep then in some cooler place or under thatched roofed shed / tree shed to avoid heat stroke.

- To avoid night blindness and calf diarrhoea in calves, vitamin 'A' injection (1 to 1.5 ml) and Cloramphenical (1 gm) should be given with 3-4 days of birth.
- Generally weaning is not practiced and regular milk feeding from dams should be allowed up to 12-14 months.

Care of pregnant camel :

- Advanced pregnant camels should be supplemented with mineral mixtures.
- The vitamin 'A' injection should be given to pregnant she camels 2-3 months before parturition.
- Proper care should be given in case of primepara camel.
- The pregnant camel should not be send for grazing at least one week before expected date of parturition.
- Attention should be given for expulsion of placenta after parturition.
- In case dam do not accept her calf, it is practice that a piece of thin cloth place on the calf and it is made to smell the mother. Sometime in such cases dam and calf should be kept in an separate enclosure.
- After milk suckling of calf, the excess milk in udder, should be stripped out.

Care of rutting camel :

- To prevent any bite, breeding male camel should be kept separately.
- Vitamin 'A' should be given as a prophylactic measure.
- Breeding male camel loose their body weight during rutting season, there should supplementation with concentrate.

Health Management

The mortality incidence of field in camel calves (< 1 year aged) and adult were 33.05 ± 2.63 % and 8.10 ± 1.07 %, respectively (Bhakat and Sahani, 2001). In an organised farm (NRRC, Bikaner), the camels are provided both prophylactic and curative measure to control ecto-parasite and internal parasites.

Monthly of Health Management schedule at organised farm. (NRCC, Bikaner)

Epidemiology of camel diseases in irrigated and non-irrigated zone of Thar desert.

Five years data (1998 - 2003) meticulously collected from fourteen veterinary hospitals belonging to irrigated and non-irrigated Thar regions and total of 167 camel keepers, were interviewed by survey method. Analysis of data revealed that during recent years mange problem has shown declined coupled with slight increase in trypanosomiasis and impaction problems. Pattern of disease incidence significantly varies between irrigated and non-irrigated regions with higher health hazards in irrigated belt.

Body temperature, Pulse rate, Respiration rate of camel:

Camel can increase core temperature as environmental temperature increased. The camels have remarkable ability to fluctuate body temperature according to environmental temperature. The body temperature of camel varies with an individual, season, climate and degree of dehydration. In the early morning the temperature of healthy camel is lower and rises up to 2-3°C in the evening. This is mainly due to diurnal variation. The pulse of the camel is counted at the middle of coccygeal artery located in the mid-line of the ventral part of the tail. The frequency of pulse in camels varies with time of the day and environmental temperature. The pulse rate in morning is lower as compared to evening hours. The normal respiratory rate of camel is lower than evening. The respiratory rate is affected by time of the day, status of health and disease condition. The Mean $\pm$ SE of rectal temperature, respiration rate, pulse rate in camel is presented in Table 2 (Bhakat et al, 2004b). The anatomical shape of the nostrils of camel helps in avoiding the entry of sand and dust in to the respiratory passages.

Table 2 Mean $\pm$ SE of Rectal Temperature, Respiration Rate, Pulse Rate in camel.

Time	Rectal Temperature (°C)	Respiration Rate (Beats/min)	Pulse Rate (Beats/min)
Morning	36.59 $\pm$ 0.12	10.24 $\pm$ 0.37	45.00 $\pm$ 1.08
Evening	38.39 $\pm$ 0.13	12.29 $\pm$ 0.40	50.23 $\pm$ 1.27
After Work/fatigue	39.62 $\pm$ 0.12	27.47 $\pm$ 0.91	68.14 $\pm$ 1.44
After 20 hr Rest	36.60 $\pm$ 0.11	10.28 $\pm$ 0.36	45.28 $\pm$ 1.01

Indigenous Technical knowledge of camel health management practices :

At field level, characterized and identified 156 management practices of indigenous technical knowledge regarding mange, trypanosomiasis, contagious skin necrosis, ring worm, impaction, pneumonia, other respiratory problems, camel pox, deworming, diarrhoea, retention of placenta, abscess/wound/saddle gall, pulled tendon, mouth ulcer, sudden colic, fracture, muscle pain, exhaustion, tail gangrene, tympany, constipation, any other illness and maintenance of pregnancy, milking, working stage etc. In case of trypanosomiasis, impaction, overall feeding and breeding, the variation between traditional and scientific management practices was found to be significant ($P < 0.01$), but for mange, the variation was not significant. Most of single camel owners (54.46%) opted for modern veterinary drugs; owners of >5 camels (47.27%) preferred the traditional approach, while owners of 2-5 camels (43.48%) believed in a mixed management system. The number of camels significantly ($P < 0.01$) influenced these management practices. The study is evidenced that a balanced combination of traditional and scientific practices can cope better with problems of camel management at grass-root level, and practices having a high and medium scientific relevance value must be preserved before they disappears.

Feeding Management

Camel mostly prefers browsing of trees, bushes and also eat grasses depending upon availability. Under stall feeding conditions the

average feed consumption is maximum in the initial 2 hrs which decreased subsequently. The camel continued to consume feed during night time and eat 35-40% of total feed consumption during night alone. The average daily feed consumption during day time ranges from 2.33 ± 0.36 kg to 7.22 ± 0.46 kg per day. The average feed consumption during night ranges from 2.28 ± 0.51 kg to 4.33 ± 0.42 kg per day. The average daily water consumption varies from 12.91 to 25.23 lt per day. The phenotypic correlation between the feed and water intake is high (0.86). (Tandon et al 1993)

Feeding Behaviour

The grazing and feeding behaviour reveals that animal eat fodder for 5 to 20 minutes at stretch and then paused for re-gurgitation for 10-15 minutes and resume eating again. The rate of fodder eating and regurgitation decreased as the day progress. In general camels eat minimum fodder between 6.0 to 8.0 P.M. when they preferred to lie down taking occasional rest by prostrating, squatting or simple standing. The animal should be fed twice in a day if kept at farm. The working animals should be fed thrice a day and animal which go daily for outside browsing may be fed once in a day in the evening.

Grazing behaviour

Grazing is highest in the morning time and become reduced to minimum during evening time. Camel prefers such species of trees plants that are high in moisture viz: khejri (*Prosopis Sineraria*), Pala (*Zizyphus nummularia*), Phog (*Callygonum Polygonoides*) during summer and plants high in Oxalate contents like kher (*C. decidua*) and sewan grass (*L. indicus*) during rainy season. Camel can eat off 9 to 11 ft tall trees easily. The small and younger camels follow the leader who is tall and has a trick to catch the high top branches and bring them down by giving a jerk so that the other animals can apprehend the foliage.

Housing Management

The open type shed is provided with 1.5 meter high barbed wire fencing. Studs and those experimental camels which required individual

feeding are kept under roofed shed separately. Each camels is provided with 30-35 m² space and a manger of 75cm × 75 cm × 40 cm internal dimension. Pregnant and recently calved animals should be kept in a separate open type shed. Sick camel should housed in a separately of 6m × 6m dimension. The soil should be replaced with new at regular interval.

Manger : A manger about 90-120 cm high is constructed. A square pillar about 92 cm height is erected and over it, a platform of about 70 cm × 70 cm is constructed and a wall of 15 cm thickness is built on all the four sides of it from 30 to 45 cm height. This is box manger a open from top.

Other types of Manger : The cheapest type is constructed by i) Digging a pit in the ground of about 50 – 70 cm diameter and 50 cm deep, ii) The manger is made up of kachchha bricks or mud and cow dung or pucca bricks.

At an organised farm like NRCC, Bikaner, three types of shelter of camel are available. Fig – 2 shows different types of shelters. (NATP work)

1. **Under tree shed / loose housing system :** This system have open type paddock and it is enclosed by wire fencing. The fence has supported by iron angle. Tree shed should be available to camels. The floor is Kuchchha with loose sand. Kuchchha manger has constructed with mud plastering just beneath the tree sheds. The manger is of round type. The dimension of manger, height of fence etc are almost equal to other two types of following shelters.

2. **Thatched roofed open type Kuchchha shelter :** The locally available bushes are cut as thatch. It is having covered as well as open area. The roof made up of Khemp (*Leptadenai Pyrotechnica*).

One side of roof has supported by wall and other side by pillars (14"). Kuchchha manger is constructed with mud plastering in side covered area. The enclosure are made up with balli / bamboo of 6 ft height. Front side of enclosure is having a gate which is of sliding type. The height of roof is 15 ft (Back) and 12 ft (front) with sufficient slope. The covered area is 33 ft (length) x 14 ft (breath). The floor is kuchchha with lose sand. Total area space of this shelter has length – 40 ft, Breath – 33ft. It is open type shelter.

Dimension of manger : Length-32 ft, Breath –2.5 ft, inside depth 1.5 ft, height of front wall from ground 3.5 ft.

3. **Asbestos roof close type concrete shelter :** It has covered and open area. The covering is done by asbestos sheets with concrete wall at 3 sides. The floor has loose sand dune. The manger is of concrete / pucca type. The open area is enclosed with balli/ bamboo of having a gate at front side. The gate is of sliding type. The total area space (covered and open), height of roof, dimension of manger and enclosure are almost similar to the thatched roofed open type kuchchha shelter.

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