



# Sustainable \_\_\_\_\_ **Camel Farming**



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**National Research Centre on Camel**  
(Indian Council of Agricultural Research)  
Jorbeer, Bikaner- 334 001. (Rajasthan) India





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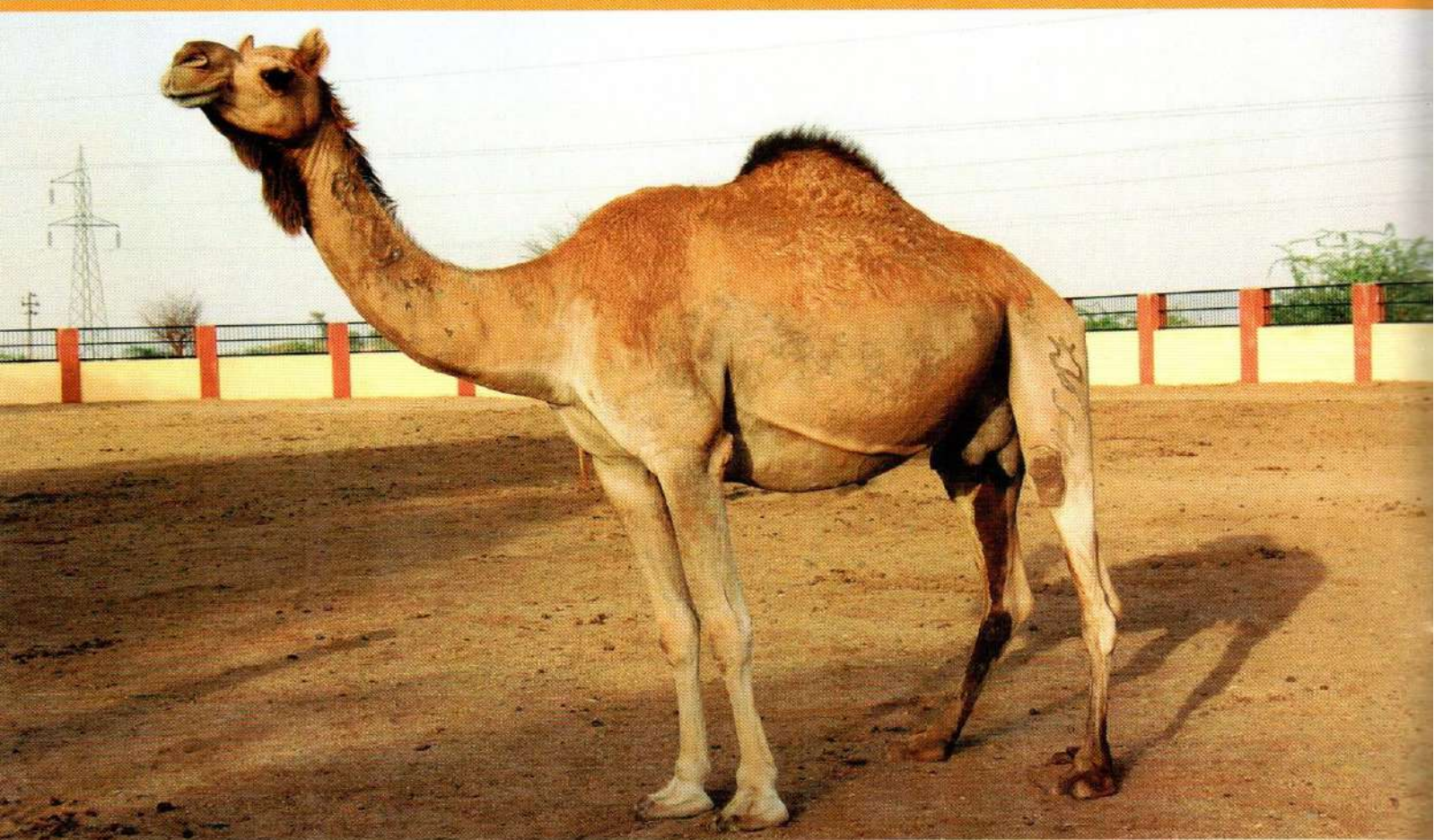






Camel is an integral part of livestock industry in India as well as a major contributor to the socio-economic well being of arid zone states like Rajasthan , Gujarat and Haryana. Despite a global surge of interest in this animal, there is an appalling lack of awareness regarding camel among the common citizen. Even the educated Indian gentry is frequently guilty of nursing several misconceptions and half truths about this wonderful creature. It was in this back ground that the NRCC felt it as its prime responsibility to bring out a brief technical note incorporating the basic information on camel from an Indian perspective. Various aspects of the status of camel, its multiple roles and benefits to society, its breeding, feeding, disease problems and sustainability as a vital component of biodiversity have been outlined in a lucid manner. It is our fervent hope that it helps in creating better understanding of this unique animal in the general public on one hand and providing authentic information base to animal scientists on the other. At the same time, it is intended to generate renewed interest in the welfare of the camel in the minds of our policy planners.







## Introduction

Camel belongs to the Family Camelidae in the order Artiodactyla which includes even-toed ungulates. It is one of the largest mammalian orders, comprised of about 150 species. This order as a whole is of more economic and cultural benefit to the mankind than any other group of mammals. Camel comes under the sub-order Tylopoda that means pad-footed. The genus *Camelus* has two species viz. *Camelus dromedarius* i.e. Arabian or single humped camel and *C. bactrianus* i.e. Asiatic or double humped camel. Due to its capability to survive under tough environmental conditions, the camel is regarded as the “ship of the desert”. The unique adaptability features of camel make it far more superior to other livestock species in the region. It is capable of surviving on the scarce desert vegetation and low water intake. The camel has great mobility on sandy terrain because of its body attributes such as height, shape, long legs and footpads. An adult camel can pull a weight of 12-18 quintals by cart at a speed of 5 km per hour. Therefore camel is a creature *par excellence* with a wonderful

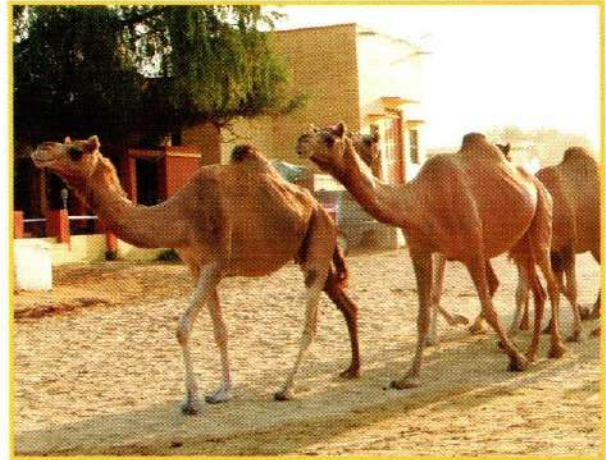


adaptive anatomy and physiology which offers an ideal means of exploiting the limited resources of arid zones for human benefit. The camel traditionally has been:

- A means of transportation that carries men and material goods to the far off places in the desert.
- A source of food like milk, meat and their by-products.
- An icon of social and cultural heritage, a

symbol of strong and friendly bond between the man and the animal.

- A source of amusement during camel sports, safaris, fairs, competitions and entertainment promoting tourism.
- A source of medicine due to the therapeutic value of its milk and urine.



- A source of fuel energy as its faecal matter is burnt like fire wood for cooking meals
- A source of manure as its faeces enrich the desert soil.

Camels are therefore, very beneficial to the nomads as well as small and marginal farmers as they not only conserve our desert ecosystem but also provide a means of socio-economic sustainability of the inhabitants of the region.

## Distribution

There are an estimated 19.3 million camels in the world of which Africa has the largest population of 15.1 million. As per the livestock census of 2003, India ranks sixth in the world with 0.63 million camels. Rajasthan has the maximum number of camels (500,000) among the Indian states, followed by Gujarat (53000), Haryana (50000), Uttar Pradesh (16000) and Madhya Pradesh (8000). They are reared mainly for riding, transportation and agricultural operations by the farming community. They also produce milk, meat, fibers and leather. The bactrian or double humped camel is mainly found in the Gobi desert of Mongolia and Central Asia. Only about 60 of these camels survive in India confined to the Noubra valley of Laddakh region.



## Adaptive Features

Camels are able to travel long distances while carrying heavy loads on the sandy terrains of the desert. They can tolerate dehydration and food scarcity extremely well. Camels have much lower metabolic rate at rest which helps it to work easily and efficiently at high temperature without any heat stress. These



extraordinary capabilities have enabled it to survive under most hostile dry hot environments. The camel has got a long neck and tall legs due to which it can easily view far off places beyond the sandy dunes. It also allows it to reach up to the foliage located at the extreme height. The lips and mouth are hard and resilient to thorny plants eaten by the camels. It can digest Dry Matter, Crude Protein and Crude Fiber better than sheep due to its higher nitrogen recycling ability for better microbial protein synthesis in the rumen. It can sustain itself on poor quality roughages available in the desert. It has three compartments unlike the four chambers of the ruminants and therefore known as pseudo ruminant. Here the omasum cannot be distinguished externally from the abomasum which is very small and forms just  $1/5^{\text{th}}$  of the third compartment. Glucose metabolism in camels is extremely low in comparison to pigs and sheep. The basal blood glucose levels are also higher in comparison to these species whereas the basal plasma insulin level is low in camels. The low insulin responsiveness seems to be an important factor in the ability of camels to cope with poor feeding conditions and longer starvation periods. Its eyelashes and hairlines

above the eyes protect it from the desert storms. Its feet are broad and spongy that would not sink or trap in sand while walking. Camels have horny chest pads located between the front leg joints with a thick skin which protects them from the heat of the ground and the hard stony surface when the animal is couched. Its skin is rough and tough which is unaffected by the thorny bushes in the desert. Moreover it loses the least quantity of water due to evaporation. Camels store lot of fats in the hump which is used to provide a limited quantity of energy and water during famine. Camels sit during summer in such a way that the least body surface is exposed to the sun. They store a lot of heat in the day time to increase their body temperature. This heat is dissipated by conduction and convection during cold nights. The unique structure of its nostrils and nasal mucosa avoids the loss of water during breathing whereas the heat is lost through the exhaled air. Water is extracted from the exhaled air by fine hair on the nasal mucosa and the incoming air is cooled due to moist mucous membrane. Camels suffer minimum loss of blood volume under conditions of desiccation. It can tolerate a water loss amounting to one third of its body weight. Camels use one third of water in comparison to cattle. A minimum quantity of water is lost through semi-dried faeces. The urine is also concentrated due to its highly efficient kidneys that reabsorb a lot of water during glomerular filtration.

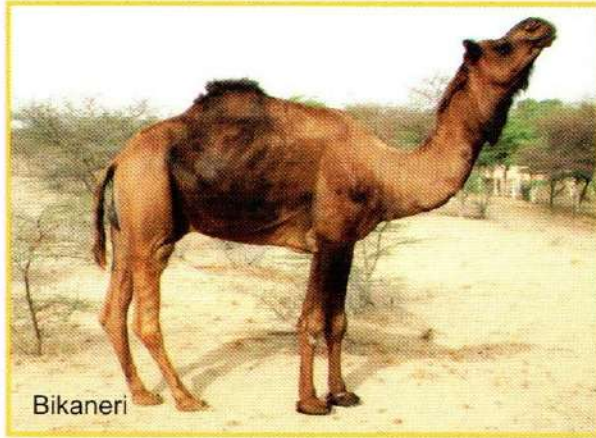


Its heart is capable of pumping blood at a height where the head is held above the hump while browsing on tree leaves. The warm

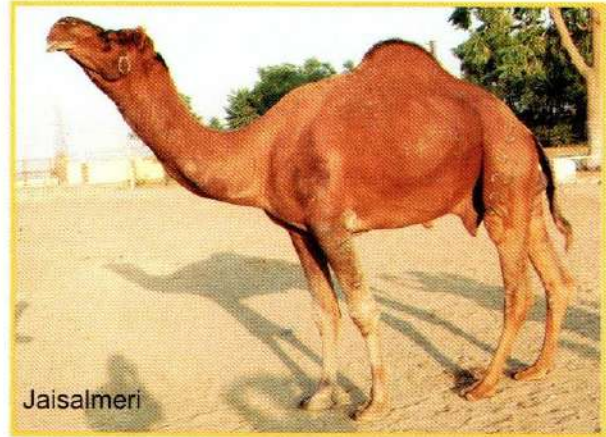


arterial blood flowing to the brain is cooled by the cold venous blood from the nasal passages that have been cooled by evaporation. The red blood cells of camels are oval shaped and thus resist any change in their shape or volume under water deprivation. It also has got more

forehead has a characteristic depression called "Stop" above the eyes. Nose extends along the two third of the head. Animals with hairs on their eyebrows, eyelids and ears are not uncommon and called *Jheempa* in the local dialect.



Bikaneri



Jaisalmeri

hemoglobin than other mammals that facilitates to survive at higher altitudes where the oxygen is scarce.

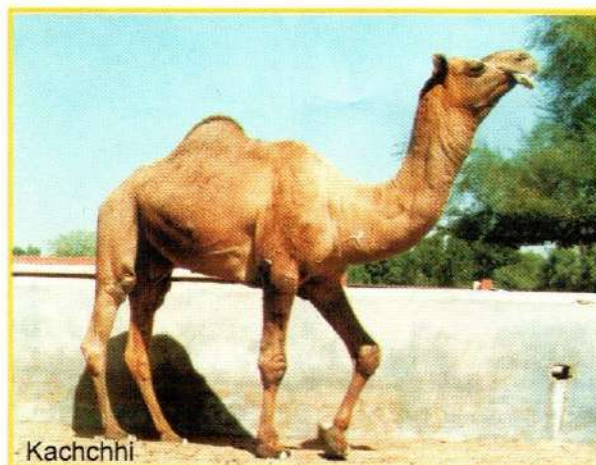
### Breed Characterization

Bikaneri, Jaisalmeri, Kachchhi and Mewari are the important breeds of dromedary or single humped camels in India. The characterization of breed is an important task before undertaking the conservation of a specific breed.

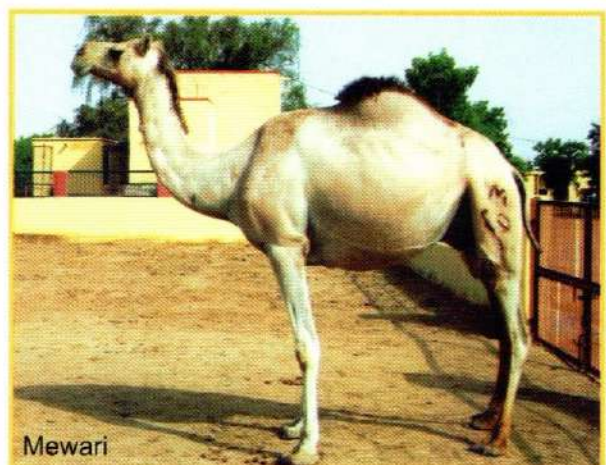
**Bikaneri:** These animals are bred in Bikaner and adjoining districts of Sriganganagar, Hanumangarh, Churu, Jhunjhunu, Sikar and Nagaur. The animals are heavy-built and used for carrying heavy loads. The body is symmetrical with dome shaped head. The

**Jaisalmeri:** This breed is reared mainly in its home tract of Jaisalmer district. The breed is comparatively light and most suitable for riding and camel sports. Jaisalmeri camels are lean and thin in appearance. Its body color is predominantly light brown. It is utilized for border patrolling by the security men of Border Security Force in Rajasthan.

**Kachchhi:** This breed is found in the Kachchh region of Gujarat comprising of Bhuj, Lakhpat and Raper districts. These animals are medium sized with dark brown coat color and small erect ears with tips turning in. They have small and wide-set muzzles and lips. She camels have large bowl udder and medium sized cylindrical teats.



Kachchhi



Mewari



**Mewari:** The animals of this breed are found in Udaipur, Chittorgarh, Rajsamand, Bhilwara, Banswara and Dungarpur districts of Rajasthan. They are also seen in the Neemach and Mandasour districts of Madhya Pradesh. These animals are shorter than Bikaneri in body size. The hindquarters are strong with heavy legs and hard thick footpads. The body color varies from light brown to dark brown and the hairs are coarse. Ears are thick and short in size. The females have well developed udder and prominent milk vein.

### Present Status

A demographic decline has been observed in the population of camels due to the fast depletion of grazing areas. Lack of feed



resources affects the health of the camel herd which ultimately leads to the early calf mortality and poor reproductive efficiency. Camels getting poor nutrition are also susceptible to the diseases whereas there is a limited availability of prophylactic health care facilities and medicines in the villages of camel keepers. Since there is no organized market for the sale of camel milk, fiber, skin and bone products, so it is discouraging camel farming among traditional herder communities.

There is a diminishing demand of these animals for work due to the widespread use of mechanized vehicles like tractors and trucks. Lack of encouragement and moral support for the *Raikas* have also contributed to the decline of camel breeding in the rural areas. India had the world's third largest camel population but a decline of almost 50% has been observed in the last decade. It is likely to affect the thousands of

families living below poverty line who had made camels as their source of income and sustenance. The animal husbandry department under the state government has more focus on the cattle, buffaloes, sheep and goats but there is no one to look after the interests of camel farmers. This negligence has made the sustainability more difficult in the desert areas where droughts are encountered frequently. So there is a need to discuss this problem at all forums and devise a suitable strategy to reverse the trend of declining camel population.

### General Management

Patience and positive attitude are most important in handling camels effectively. Camels may learn good or bad behavior quickly if not handled properly. When camels are handled quietly with a minimum of fuss, they may be trained to obey their keeper within a couple of days. Bulls in rut are fearless to pose a danger to other camels and humans alike. When in rut they should be held separately from other camels and treated with the utmost care by the handlers. In small breeding herds it is better to bring the she camel to the bull than let the bull into the herd of females. Management practices that may cause pain may be avoided as far as possible. Restraint should be the minimum necessary to perform management procedures efficiently. Any injury, illness or distress symptoms observed in camels should be treated promptly. Camels are not normally broken for riding until 3 years of age. This allows the bone structures and muscles to grow for taking the weight of the rider. It takes 4-5 years for a camel to mature. Maximum loads that can be carried by draught camels vary according to the type of





camel. Camels are often haltered or neck roped to fences, trees, etc. during resting periods. Once a camel starts to sit down it must sit all the way down before it can stand up again. Because of this phenomenon in camels it is appropriate to use longer rope to avoid strangulation during sitting. Hobbling is also an acceptable husbandry procedure for camels. But the hobbles should be well constructed and used so as to avoid injury or pain to the animals. If



camels hobbled by both forelegs are left free in the range lands they can still cover large areas while grazing. If trained, camels can be temporarily hobbled by one foreleg to trees, yards, etc. during rest periods. The tethered camel must be checked regularly if required. If a camel is tethered as part of a daily routine then the constant supervision is not needed.

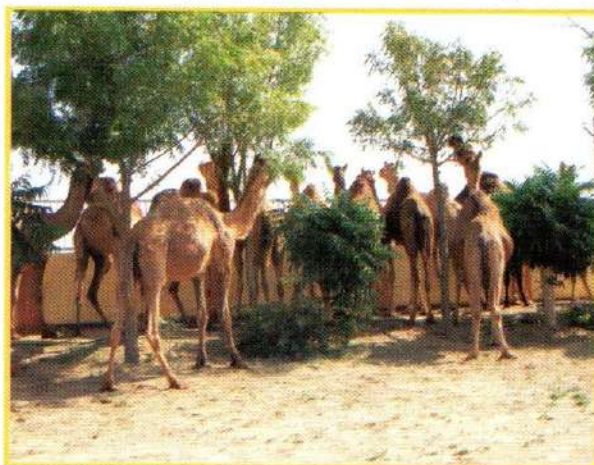
It is well known fact that nose-pegged camels are more easily controlled than the haltered ones. The nose peg is used for steering purpose and not to restrain the camel. Once a camel has learnt to sit down and stand up, only a light tug is necessary since the camel starts responding to the voice commands. The string attached to the nose peg must be designed to break in emergencies. It must not be used to pull continually as this may cause injury. Nose pegging must be carried out by a trained and competent person. Selection of the correct position avoids damage to the nasal septa by the base of the nose peg and limits bleeding during installation. Pegs must not be used on freshly punctured nose until the wound is completely healed. Other methods of control of camels are the use of a rope halter or a nylon halter. These

may be preferred to the nose pegs on welfare grounds, but the camel is not controlled effectively.

There is a need to develop a suitable method for permanent identification of camels. Branding is performed by hot iron rod for making identification marks but the procedure is not much acceptable on welfare grounds. Freeze branding has not been attempted, but may be suitable on the skin of darker camels. Plastic and metal ear tags are also used but these are good for temporary identification only. The use of microchips for permanent identification of camels may find its application in large herds of camels.

### Feeding Management

It grazes on the tree leaves and thorny bushes (e.g. *Prosopis cineraria*, *Acacia tortalis*, *Albanthus excelsa*, *Salvadora oleoides* and *Zizyphus nummularia*) found in the desert. Camels are primarily browsers and possess a split upper lip which is well suited for this purpose. Free-ranging camels prefer to eat leaves from the prickliest trees and shrubs by selecting a very wide range of plants. The plants with high moisture and mineral contents are preferred over grass. Camels fed in yards need a diet higher in bulk roughages.. They can also adapt to the gradual introduction of pelleted feeds in their diets. Feeding facilities should allow adequate access for all camels and should be maintained under hygienic conditions. Feeding of camels in concrete mangers located off the ground avoids consumption of sand and reduces the transmission of intestinal parasites. When the shrubs with high mineral contents are scarce in the pasture it is essential to provide





coarse salt or soft type salt blocks for feeding to camels. Many plant species eaten by the camels are digested in the small intestine. Products from these plants are absorbed by a different pathway in contrast to those which are broken down in the rumen. Camels are able to digest dry matter, fiber, cellulose and crude proteins



more efficiently than other domestic animals. The copious saliva assists in eating dry and coarse fodder by providing suitable conditions for regurgitation and rumination of digesta. The volume of its fore stomach is about 48 litres as compared to 38 litres in cattle which ensures better fermentation patterns. Camels should be protected from feeding of toxic plants or other substances deleterious to their health. Camels are susceptible to many poisonous plants found in the desert. They may eat these poisonous plants if hungry. It is therefore essential for the camel keepers to make themselves aware of any poisonous plants found in the pasture.

There are 3 types of camel feeding management systems being followed by camel-keepers depending upon their herd size. The management practices also depend upon the purpose for which the camels are raised.

- a. **Extensive System:** The camels are left free in the rangeland area for grazing and breeding under natural conditions. This is the traditional system of management where the camel herders are able to raise their animals at zero input.
- b. **Semi-intensive System:** The camel owners residing in the villages send their camels for grazing in the rangeland and supplement

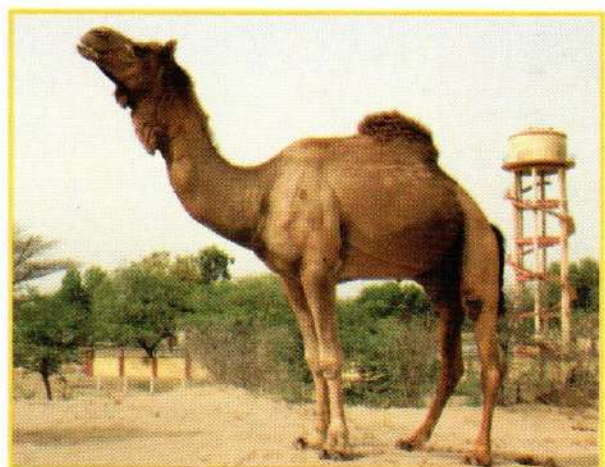
with special ration whenever required. This is a very common practice now-a-days due to the depletion of grazing pastures around human habitation.

- c. **Intensive System:** This type of feeding system is followed by those people who use camels for the draft purpose e.g. pulling loaded cart carrying firewood, grains, agricultural produce to agricultural market. The security men of the Border Security Force who maintain camels for patrolling international borders feed high energy rations to maintain camels in good health. This system of management is costly and need based.

### Camel Breeding

Camel is known to be a seasonal breeder which is sexually active during few months in a year. This period is known as rutting season and lasts generally from November to March. The age for sexual maturity in male camel is around 5 years. It is influenced by the environment, breed and management practices followed. If fed and managed well, a male camel may provide service to 2-3 females per day and cover 50-80 services during an entire breeding season.

The stud shows strong aggressive behaviour known as Rut or *Musth* during the breeding season. While rutting it frequently grinds its teeth, draws the head back, stands with hind legs wide apart, tends to remain off feed due to the loss of appetite, lashes its tail on the penis, passes urine frequently and froths at the mouth with gurgling sound and dulaa or gulla formation from the soft palate. The peak





testicular activity in male corresponds to the follicular development in the female. The poll glands secrete a dark brown fluid that oozes out as drops rolling down in streaks over the neck. There is enhanced poll gland secretion in the presence of female. The secreting function of the poll glands appears to be influenced by the concentration of male sex hormones in the



blood. The poll gland secretion has characteristic odour during breeding season that probably acts as sex pheromone to attract female for mating. This peculiar odour however, is absent during summer months or non-breeding season. The poll gland secretion observed in the non-breeding season could be differentiated on the basis of its light colour, low levels of sex hormones and comparatively lower volumes. A male camel may lose its libido very quickly if put to hard work very often.

Female camel attains puberty at 4 years of age and the age at first calving is around 6 years. The reproductive life goes beyond 20 years. Most of the farm animals exhibit oestrous cycle and oestrus behaviour that determines the appropriate time of insemination or service. However such type of cycle or behaviour is missing here. Moreover, there is no correlation between the sexual behaviour of female with the postpartum follicular activity. There are generally no heat symptoms and thus the status of follicular growth remains unknown. There are waves of follicular growth, maturation and atresia going on throughout the breeding season. The duration of follicular wave and cycle varies in relation to geographic locations and the management practices

followed. Ovulation is not spontaneous as in case of other farm animals but is induced normally after coitus. Intra-muscular administration of luteinising hormone or seminal plasma may also be useful to induce ovulation. The duration of so called heat is long and it is difficult to identify the correct time for insemination or service. The female could be considered as a polyoestrous breeder with the low ovarian activity in some months and higher during the specified breeding months *i.e.* November to March during which they are given a service.

The female may exhibit restlessness and offer mating posture by allowing others to mount it. At the time of coitus it adapts a squatting posture by sitting itself or forced by the male who presses it and bites on the neck. The male sniffs the hind quarter and exhibits the Flehman's symptoms and mounts dorso-ventrally, while clasping the fore legs around the trunk of female camel. The male often bites and fondles whereas female makes typical mating sounds. The copulation lasts for about 5-10 minutes during which semen is discharged in several jerky movements of the pelvis. The female is either given service or inseminated in one season and delivers a calf in the subsequent one. So it is sexually inactive until the next breeding season and hence a long inter-calving period sets in, which is undesirable from the breeder's point of view.

The female is identified for service on the basis of involution of uterus which is achieved within 25-30 days of parturition under ideal livestock management system. Such she camels are mated and pregnancy can be





established within two months of parturition in some cases, thus leading to the reduction in the inter-calving period. The gestation period lasts from 385-390 days and the parturition season falls between January to March. The birth weight of camel calves ranges from 35-40 kg. The body weight of an adult male ranges from 500-750 kg and that of female ranges from 400-600 kg. The average age for survival in camels is 25 years. The lactation period in females lasts from 14-16 months and 3-6 litres of milk is produced per day. The milk has got adequate quantity of proteins, carbohydrates, fat, minerals and vitamin C.

### Reproductive Efficiency

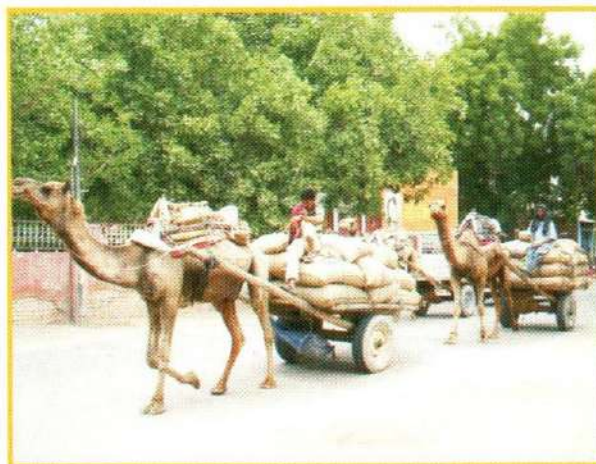
Camels have a poor reproductive efficiency due to several reasons. The onset of puberty in the young male camel has been reported to be a slow process. It takes more than 6 years for a male camel to achieve full puberty. It is a seasonal breeding animal and it is difficult for the breeders to ascertain the correct time of ovulation in she camels. Moreover camel is not a spontaneously ovulating species since the induction of ovulation is mandatory to perform artificial insemination which is difficult in this case. The gestation length is 13 months that brings in a long inter-calving period which is not desirable. It is a single bearing species and response to the induction of multiple ovulations through hormonal treatment is also poor. As a result, it renders difficult to improve reproduction by means of embryo transfer technology. Abortion, early embryonic mortality, endometritis and metritis etc. are also responsible for the low fertility rate in camels. Therefore it is important to augment



reproduction through all possible means to provide enough opportunity for its selection and breed improvement.

### Productivity Status

The camel is a multipurpose animal of the desert eco-system with huge production potential.. This is a wonderful creature that can thrive under the most hostile conditions of scarce food and water especially during the droughts. Despite of the limited resources it contributes a lot towards the socio-economic



development of the poor people in this region. Camels are not only the source of employment for the thousands of nomads but also assist the marginal farmers in their day-to-day agricultural operations. They produce milk, meat, leather, fibers, bones and dung as fertilizer. Thousands of people are engaged in the cottage industry to manufacture and market the value added products based on camels. They also contribute precious bio-energy that saves the growing bill of fossil fuel in our country.

### Health Management

Though camel is a hardy animal, well adapted anatomically and physiologically to the arid and semi-arid areas, it suffers from many diseases resulting in the widespread economic losses to the camel keepers. It suffers from parasitic, bacterial, viral and metabolic diseases. The camels also suffer from various congenital and acquired surgical ailments, lacerated wounds at nostrils and camel bite during rutting season.

**Parasitic infections:** The camel is less prone to



parasitic infestations due to browsing habits. However, with the arrival of Indira Gandhi Canal in the semi-arid region of Rajasthan, not only the geo-climatic conditions have changed, but the feeding habits of camel have also got



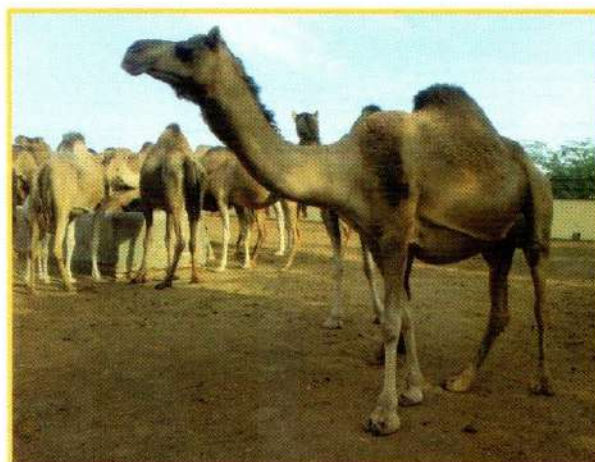
altered mainly due to the availability of fodder crops and grasses. This has in turn resulted in the increased occurrences of parasitic infections with consequent loss of health and productivity. The canal has also altered the ecological conditions favourably for breeding of flies, the vectors of transmission of many diseases.

Among protozoal infections, trypanosomiasis caused by *Trypanosoma evansi* is the most important disease. A variety of local names, descriptive of the clinical signs of the disease are used by the camel owners e.g. "Purana"- A chronic or old; "Tibersa"- three years disease, "Dubla"- emaciated but the Hindi term "Surra" meaning rotten or emaciated is the name applied almost universally to describe the disease. The organism is transmitted mechanically from infected camel through blood sucking flies, mainly *Tabanus* and *Stomoxys*. The disease is associated with progressive anaemia, loss of condition, emaciation, intermittent fever, abortion, oedema and restlessness. The disease is diagnosed on the basis of clinical symptoms, blood examination, mouse inoculation test, antigen detection assays and polymerase chain reaction (PCR). Quinopyramine methyl sulphate is used as curative white prosalt is applied for prophylactic purpose.

Coccidiosis, caused by *Eimeria cameli*, *E. rajasthani* and *E. dromederi* and *Isospora*

*spp.* The infection is restricted to calves occasionally coccidia are associated with diarrhoea in camel calves and faeces are stained with blood and mucous. The infected animals can be treated with amprolium, sulphadimidine and nitrofurazone. Balantidiosis, caused by *Balantidium coli* is another intestinal protozoon infecting camel which may cause severe diarrhoea.

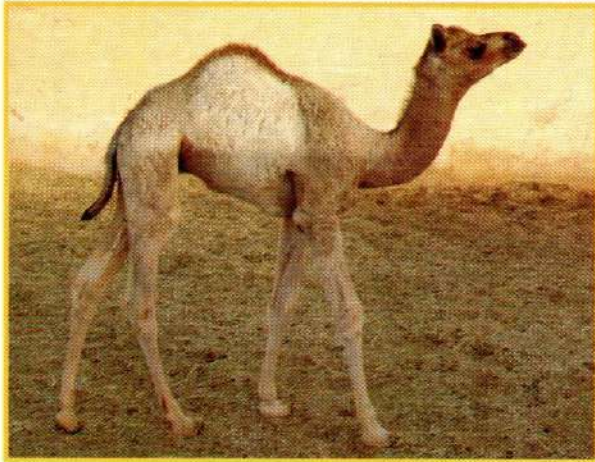
The common helminthic infections in camel are: (i) Haemonchosis where species of *Haemonchus spp.* parasite cause haemorrhages in the abomasum. (ii) Fasciolosis due to *Fasciola gigantica*, which is found in the bile duct destroying the liver parenchyma. (iii) Trichuriasis caused by *Trichuris* species producing thickening of caecum resulting in the secretion of mucus in the faeces. (iv) Nematodirosis and Strongylosis caused by *Nematodirella* and *Strongyle* species respectively resulting in gastro-intestinal disturbances. High levels of gastro-intestinal nematodes result in the symptoms of off-feed, diarrhoea, dehydration and emaciation. The helminthoses can be controlled by prophylactic administration of broad spectrum anthelmintics. Rotation of anthelmintic agents should be practical in order to avoid the development of resistance. Onchocercosis, caused by *Onchocerca* species is common nematode infection in camel. It is transmitted by *Culicoides* species. In this disease sub-cutaneous nodules are found in the head and neck region. Dipetalonematosis, caused by filarial worm, *Dipetalonema evansi* is also very common in camel. It is transmitted by mosquitoes belonging to *Aedes* species. The





diseased camel suffers from dyspnea and orchitis. The disease can be treated with injections of ivermectin.

The ecto-parasitic infections of camel comprise of ticks mainly of *Hyalomma* species as well as mites mainly *Sarcoptes* species. Mange in camels is a serious, debilitating and



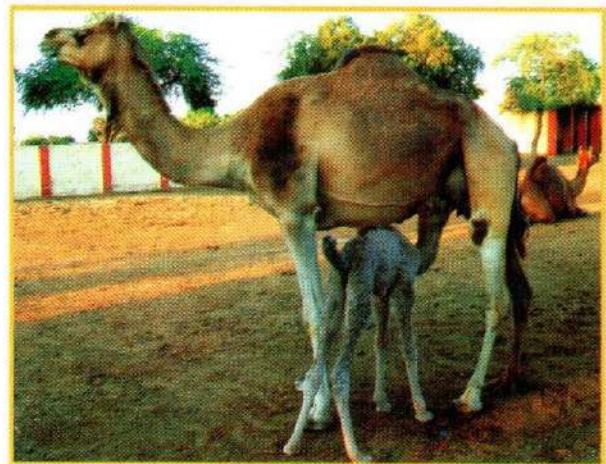
dreaded disease caused by the burrowing of mite *Sarcoptes scabiei* var. *cameli* in the epidermis resulting in the deterioration of hide quality and predisposing affected camels to other infections. Due to the thickening of skin, drug penetration during therapy is a problem. So scrubbing of skin to remove scaly material will be beneficial prior to the treatment. Synthetic pyrethroids such as fenvalerate, deltamethrin and amitraz can be used for the control of mange but are not wholly satisfactory. Indigenous formulations should form part of the integrated ecto-parasite control. Biting flies transmit the most important disease of Surra apart from being a serious menace due to their blood sucking and annoyance.

**Bacterial infections:** Anthrax is an acute contagious disease caused by a spore forming Gram positive bacterium called *Bacillus anthracis* and characterized by the sudden onset of laboured respiration, swelling of the throat and groin region, bloating and death within 10-12 hours. Penicillin and tetracycline may be advised for prophylaxis at an early stage. Attenuated spore vaccine can be used in camels for prevention of this disease. Antibiotics should not be given to the animals at the time of vaccination. Hygienic conditions and quarantine should be maintained strictly.

Colibacillosis is an infectious disease of camel calves caused by *Escherichia coli* which is a Gram negative coccobacillus and characterized by fever, anorexia, yellowish diarrhoea, weakness and death, if untreated. Ampicillin, gentamycin, sulfonamides and trimethoprim are considered to be most effective in treating *E. coli* infection. Fluid therapy is useful in the dehydrated camels. A clean environment should be maintained to prevent the infection through feed and water. Different types of vaccines are also available for the prevention of colibacillosis.

Haemorrhagic septicemia is a fatal disease of camels caused by *Pasteurella multocida* type B and characterized by fever, edema of the throat region, dyspnea and sudden death. Diagnosis can be made by clinical signs and pathological lesions. It is treated with sulfamethazine with supportive therapy of feed supplements and vitamins. Vaccination is recommended during early phase of an outbreak.

Brucellosis is a bacterial disease caused by various species of *Brucella* which is zoonotic in nature and characterized by abortions and sterility. The treatment of brucellosis is not advisable because of latency since each case serves as a potential source of infection to other animals and humans.



Tuberculosis is a chronic wasting disease caused by acid fast bacilli and characterized by low morbidity, miliary nodules in lungs and progressive weakness. It poses a serious threat to humans through contact or consumption of raw milk. Diagnosis can be





based upon clinical signs and tuberculin testing, though ELISA test is considered to be more reliable. Treatment of tuberculosis requires a long term oral medication which is not advisable and tuberculin positive cases should be kept separately to prevent the spread of the disease.

**Viral infections:** Camel pox is a contagious viral disease of camels caused by orthopox virus with high morbidity and low mortality rate. It can be diagnosed through clinical signs and lesions present on skin and mucous membrane. Treatment with antibiotic and sulfonamide drugs prevent secondary bacterial complications. Symptomatic treatment for anorexia and pain is also helpful in recovery while topical application of antiseptics on mouth lesions is highly effective. However fluid therapy is also recommended in severe cases of camel pox. All infected animals should be isolated from the healthy herd and all premises must be kept clean and disinfected to check the spread of this disease.

Camel contagious ecthyma or scabby mouth is characterized by pustule formation on the lips, gums and tongue due to Parapox virus. It is highly contagious but recovered animals exhibit life long immunity from this disease. Local application of antiseptics such as povidine iodine is effective on lesions along with antibiotic therapy to prevent secondary bacterial infections. A camel herd may be vaccinated to prevent the spread of this disease.

Rabies is an important viral disease which is zoonotic in nature. It is caused by Lyssavirus of the Rhabdoviridae family which infects camels through the bite of stray dogs and

wild carnivores. There is no treatment of the rabid animals and all persons handling such animals must be vaccinated as per the guidelines of the World Health Organization. Vaccination against rabies is the safest way to prevent its occurrence.

## Camel Products

**1. Milk:** The camel milk is not very popular in our country probably due to its limited production. It is little salty in taste depending upon the nature of plants consumed by camels during grazing. Most of the milk produced is either suckled by calves or consumed by *Raikas* for their domestic purpose. It has about 9% total solids, 2.8% fat, 2.5% protein and 4.25% lactose. It has higher vitamin C in comparison to the milk of other farm animals. The raw milk has got a shelf life as high as 8 hours. It has higher concentration of minerals and protected proteins. Several value added products like cheese, ice cream, curd and *paneer* are being prepared from the milk. The raw milk is also



considered very good for health due to its nutraceutical properties.

**2. Meat:** The camels are rarely slaughtered for the purpose of meat in India. Although the

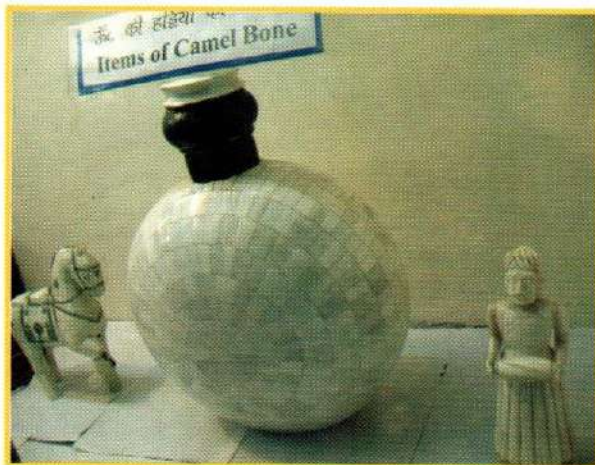


camel meat is not popular because of its different taste yet it is consumed by minorities on religious occasions at a few places. *Raikas* are the only pastoralists in the whole world who oppose the slaughter of camels for meat. The camel meat is very popular in African and Middle East countries.

**3. Hair:** A camel may produce up to 1.5 kg of hairs if cut annually. Camel hairs are utilized by camel keepers for the manufacture of the household items such as rugs, carpets, blankets, ropes for cots and saddles. However, most of these products are made to meet family needs and very few for commercial use. There is a very limited value of hairs due to its coarse nature. It is possible to manufacture fine quality fabrics if it is blended with polyester, fine wool, silk and cotton. A lot of people are engaged in this cottage industry to produce value added products from hairs.

**4. Skin:** The skin is used to manufacture belts, purses and containers for storing oil. It is also utilized to make show pieces like toys, drum covers and certain types of jewelries to decorate camels during festivals. The skins are also used for making shoes and sandals by the leather processing working community. The traditional artisans make lamp shades and other decorative items by drawing paintings with colors and gold which are popular among foreign tourists.

**5. Bones:** The bones are similar to that of other animals and processed into fertilizers. They are



also used as a cheap substitute of ivory for the production of jewelry and ornamental show pieces. The value added products prepared from

the bones offer employment opportunities for the rural artisans.

**6. Dung:** The dung can be used as a fertilizer in the fields although its fertilizing ability is not as high as that of goat or sheep dung. It has better



effects if compost is prepared from dung and urine. Camel keepers also use it to burn like firewood to cook their meals. Nomads and camel keepers may also receive some compensation in kind from the land owners where their herd stays over night.

**7. Bio-energy:** The camels have got a great potential to offer bio-energy that can be utilized for transportation of goods and agricultural operations by the rural farmers. The economic importance of camel as race animal has increased recently in the Gulf countries. The race camels have relatively low heart rate as compared to race horses. The skeletal muscles of camels have highly oxidative capability. It has also been reported that camels have higher locomotive efficiency due to its lesser relative oxygen consumption per kg per km while walking.

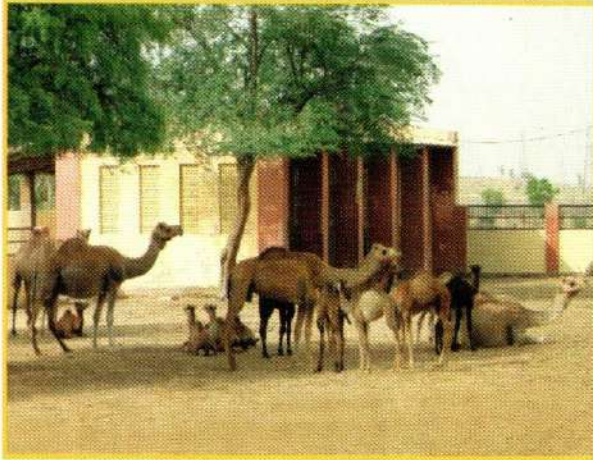
### Suggested Package of Practices

The mortality of new born camel calves have been reported to be 20-30% under field conditions which can be controlled by adopting scientific management system during the gestation period. The females should be offered concentrate with 1% minerals and 2% salt properly mixed with roughages during the last quarter of the gestation period.

1. Pregnant females should be kept separately from the male camels.



2. The camels should be given balanced ration near parturition.
3. The naval cord of the calf should be cut with a sterilized blade at a distance of about 5" from the naval and tincture of iodine or an antiseptic should be applied.
4. The new born calves should be offered colostrums and vitamin A injection.



5. It is important to protect calves from the extreme hot and cold weather.
6. Early weaning of calves should be practised.
7. De-worming at one month of age can reduce the calf mortality by 5%.
8. The calves may be offered dry fodder besides milk after 3 months of age so that they may develop rumen for the digestion of roughages.
9. Maintenance of hygiene and sanitation at the place where the camels are reared. The excreta should be removed from the enclosure at regular intervals.
10. Complete cleanliness should be maintained during the milking of camels to improve its keeping quality.

## Epilogue

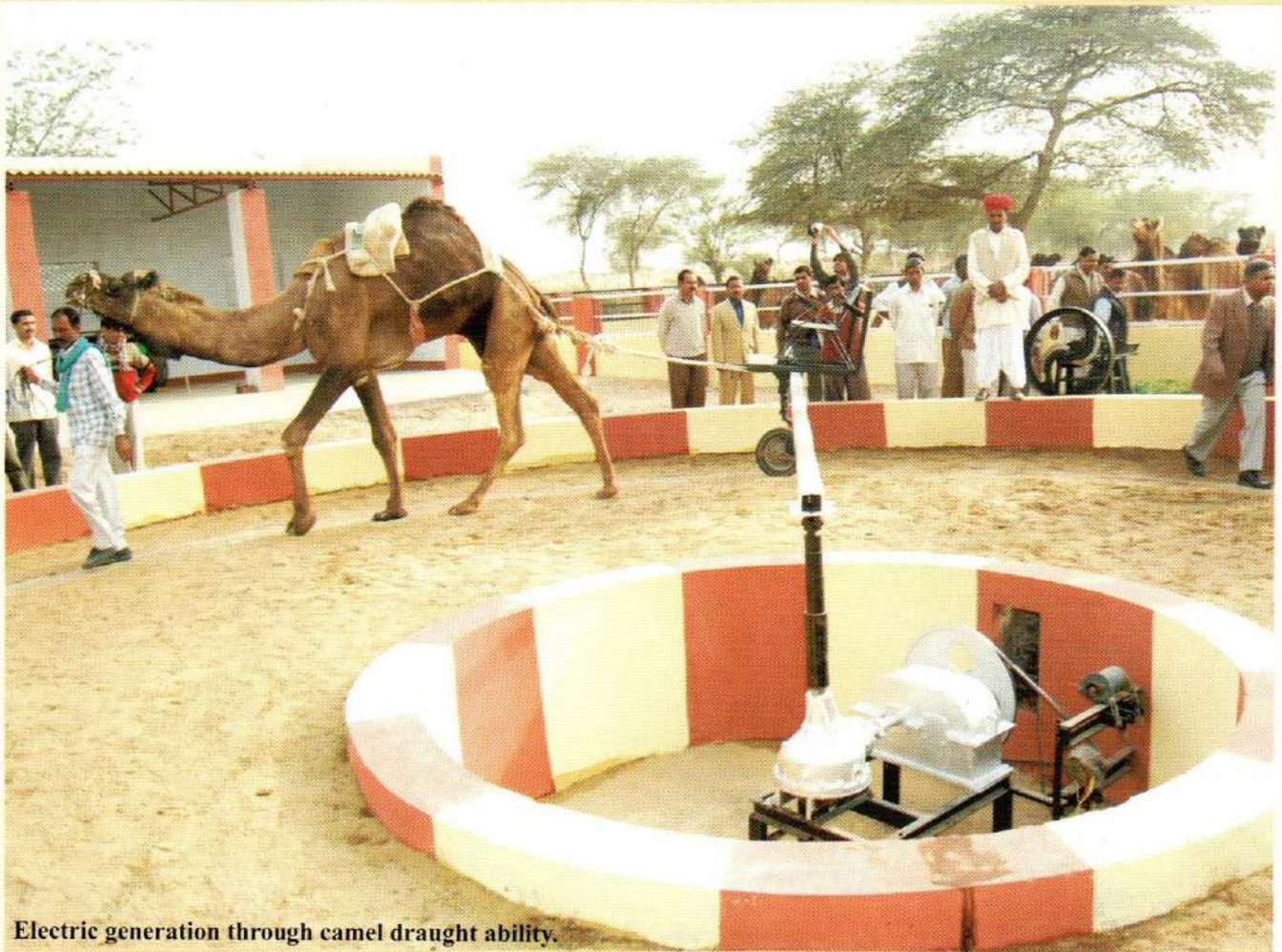
The camels have been reared very economically and traditionally by *Raikas* for so many years. The *Raikas* have used their old knowledge and wisdom in rearing and treating their camels against different health problems. The age old ethno-veterinary practices are the basis for the treatment of camels against common diseases. However, the genetic

improvement of camels is undertaken with the selective breeding using proven sires. The camel farmers may be provided with the following special incentives and measures to improve their socio-economic conditions.

1. Development of rangeland to provide sufficient grazing area for camels
2. Providing free veterinary health care facilities for camel keepers
3. Distribution of superior male camels for breeding purpose by the state government.
4. Provision of subsidies in the form of complete feed block rations especially during droughts
5. Distribution of loans to the farmers who want to utilize camel energy for the cart and agricultural operations
6. Exploring markets for the sale of value added products prepared from camel fibers, skin and bones.
7. Popularizing the camel milk products and increase its marketing among urban population.
8. Creating awareness about camel husbandry and its benefits among the camel herders.
9. Training of camel keepers to adapt the latest technology and package of practices developed by the camel researchers.
10. Organizing camel farmer's fair and distribution of special incentives or prizes for raising best camels.
11. The utility of camel carts may be promoted through subsidy as camels are the source of eco-friendly bio-energy.







Electric generation through camel draught ability.



Camel drawn multi-purpose tool frame in the field.







