

CAMEL REARING IN THE INDIAN ARID ZONE

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ABSTRACT

With about 6.3% of the world camel population, India ranks third after Somalia and Sudan in this respect. According to the Livestock Census(1982), Rajasthan State alone accounted for 70% of India's total camel population of which 84.5% was found in its 11 western arid districts. The Camel density in these 11 districts was 3.06 per sq km and 4.78 per 100 persons, contributing 9.9% towards the total domestic herbivore livestock. The augmentation of camel rearing has a strong case in the Indian arid zone. The camel has great adaptive mechanisms and is well suited for life in the desert. The major camel resources are energetics, milk, meat, hair and hide. It is necessary that untapped potentials of camels are explored scientifically to make camel rearing as economically viable proposition in terms of the social and agrostological aspects of livestock management and for providing sustainable subsistence to the people inhabiting Indian arid region.

In India, the arid zone covers about 12% of the country's geographical area and occupies over 0.32 million km² hot desert located in parts of Rajasthan (61%), Gujarat (20%), Punjab and Haryana (9%) and Andhra Pradesh and Karnataka (10%) (Shankarnarayan 1987). Due to restrictive resource endowment only livestock farming has certain degree of economic edge in this zone. Therefore, any initiative undertaken to enhance livestock productivity results in enhancement of total agrarian development and growth of the region. The camel is an important component of the desert ecosystem and is a multipurpose animal. Its principal uses being for draught, transport and agricultural operations. Its milk, meat, hide and hair are also of economic importance (Gauthier-Pilters and Dagg 1981).

The camel utilizes various adaptive mechanisms for life in the desert (Yagil 1985). It can survive in the hot climate with high solar radiation and sustain itself on coarse fodder and on salty and thorny bushes. The anatomical structure of its body, especially its big soft feet and its behavioural pattern cause minimum damage to the already scarce vegetation of its habitat (Wilson 1984). Camels keep on moving while browsing, thus covering larger areas than other herbivores. In short, the camel is a model desert animal (Khanna 1986).

In spite of the importance of camel for the Indian arid zone, this useful animal has remained largely neglected and has received the minimum attention, with the result that there has been little impact of developmental efforts on its improvement. There is dearth of accurate scientific information in terms of research and improve-

ment of its potentials. Thus the full resources of this species have remained untapped and its genetic potential have remained under exploited.

Distribution

Out of total world camel population of 17.4 million in 1985, 78.8% were found in Africa, 19.6% in Asia and 1.6% in the rest of the world (FAO-Production Year Book 1985). India with a camel population of 1.1 million (6.3% of the world population) ranked third after Somalia and Sudan.

The camel population has been increasing world over. The growth rate in the world population was 74.8% during 1945 to 1985. During the same period, the camel population in India increased from 0.654 million to 1.1 million showing an increase of 68.2%. The camel density in the country is approximately 0.37 per sq km. Data on State and year-wise camel population are provided in Table 1.

Table 1. State-wise and year-wise camel population in India (in thousands)

Sl. No.	State	Year							
		1945	1951	1956	1961	1966	1971	1977	1982
1.	Gujarat	—	—	—	44	45	63	56	75
2.	Haryana	—	—	—	—	312	133	130	121
3.	Himachal Pradesh	—	—	—	—	1	1	1	1
4.	Jammu & Kashmir	4	1	1	2	2	3	3	4
5.	Madhya Pradesh	1	11	11	16	20	14	12	16
6.	Maharashtra	27	39	45 ¹	1 ²	2	1	1	1
7.	Manipur						1	1	1
8.	Punjab	117	195	227	224 ¹	119 ²	102	74	64
9.	Rajasthan	380	341	436	570	653	745	752	756
10.	Uttar Pradesh	32	39	51	43	50	44	38	40
	India	654	629	770	903	1028	1109	1068	1078

1. Before division

2. After division.

Rajasthan state accounted for 58.1% of the total Indian camel population in 1945 which increased to 70.1% in 1982. In Haryana, the camel population was 30.3% of the Indian population in 1966 which declined to 11.2% in 1982. In undivided Punjab, there was an increasing trend from 1945 to 1961, thereafter, it showed a decreasing trend. Punjab had 5.9% of the total Indian camel population in 1982. The declining trend in these two states can be attributed to mechanisation of agriculture, improved road system and reduced interest in camel breeding due to lesser demand. In Gujarat, the camel population constituted 4.5% of the Indian population in 1961 which increased to 7% in 1982.

The camel population in the 11 arid western districts of Rajasthan accounted for almost 84.5% of the total camel population of Rajasthan and 59.3% of the Indian population. The camel density in this area was 3.06 per sq km and 4.78 per 100 persons while in Rajasthan state as a whole, the corresponding figures were 2.25 and 2.22 respectively. Camels constituted 9.9% of the total domestic herbivore livestock in these 11 arid districts. Camel density per sq km and per 100 persons in Haryana and Gujarat states were 2.78 and 0.95, 0.38 and 0.22 respectively (Khanna et al. 1990).

Types/breeds

Indian camels (*Camelus dromedarius*) can be broadly classified from their utilization point of view into baggage and riding types. The baggage camels are sturdy and heavily set while riding camels are lighter and slender. According to the National Commission on Agriculture, Government of India (1976), the Bikaneri breed is the only camel breed which has been well defined by a committee constituted by the state Government of Rajasthan. There are several other breeds/types which have been classified according to their physical characteristics, distinct body conformation and habitat. The Indian camel breeds include Bikaneri, Jaisalmeri, Marwari, Kutchi and Sindhi. According to Rathore (1986) there are only four distinct breeds, namely, Bikaneri, Jaisalmeri, Marwari and Kutchi and the rest are crosses between these breeds. The Kutchi breed of Gujarat has been reported to have originated from the Sindhi breed which is a very good milch breed having home tract in Sindh province of Pakistan.

A very small number of double humped camels (*Camelus bactrianus*) are found in India only in the Ladakh area of Jammu and Kashmir state. It is believed that these double humped camels are descendants of stock which was originally brought to India by traders of Yarkhand through the Silk Route from Gobi desert. Only 50-56 such animals are presently available (Khanna and Khan 1988).

Case of camel rearing

It is generally accepted that the majority of the people inhabiting the arid regions in the country live at a very low level of subsistence simply because they have very few alternatives of livelihood. In spite of the fact that much attention is being focussed in recent years on the development of arid lands, the camel and camel rearing have remained neglected subjects. This is as much true for the social and economic aspects of the camel keepers as for camel husbandry and management. Another unstudied aspect concerns camel products like milk and meat. Production systems based on camel rearing have a great potential for the development of arid zones and there is an acute need for research that link closely with the developmental plans (Hjort 1988). Livestock management which includes camels, is a multidimensional programme involving economic, social and political

aspects of farmers rearing livestock and also ecological and agrostological aspects of land use. It is, therefore, necessary to look into the kind of support required for the existing system and how alternatives that do not risk this system can be formulated. Encouraging camel based livestock system will be beneficial to arid lands because the camel is excellently adapted to this ecogeological system. The various camel resources are described in the following account :

Camel energetics

In the arid and semi-arid zones, the camel is an important work animal. Draughtability equivalent to 27-40% of body weight has been reported for the camel which is superior to that of other draught animals (Maurya, 1985). Goe and McDowell (1980) estimated that light and heavy camels, weighing 370 kg and 600 kg respectively, produced 0.6 and 1.1 hp at low speed and 0.5 and 0.9 hp at high speed respectively. Camels weighing 520 kg could carry pack loads of upto 210 kg at a speed of 4 km/hr. The camel draught power can be utilized for a variety of functions including pulling carts, drawing wheels, ploughing, conveying water, transportation, operating sugarcane crushers, oil mills etc. Camels are capable of exerting energy equivalent to 1 hp during ploughing covering 1 ha in 11.25 hr (Wilson 1978). Camels can be used singly or in pairs or even in combination with other large draught animals like cattle and buffaloes. Nanda (1957) suggested that camels should not be used for more than 6 hrs and estimated that the Indian camels can carry weights equal to its own weight for short distances. Matharu (1966) reported that the Indian camel could pull a cart with one ton load and a pack load of 180 kg at a speed of 3.2 to 4.8 km per hr. The experimental results presently under progress at the National Research Centre on Camel, Bikaner indicate that a well built adult camel weighing about 650-700 kg could haul 18-20 q for 4 hr covering a distance of 20 km at an average speed of 5 km per hr without showing any sign of distress. The slender riding camel can cover upto 100 km in a day at an average speed of 15 km/hr over long periods and a stocky pack dromedary can cover 20-25 km per day at an average speed of 4-5 km per hr carrying a burden of 200 kg on its back (Burgemeister 1978). For optimum work output, the work/rest cycle under different conditions is important, however, at present very little information is available on camels in this respect.

Information about energy requirements of working camels is also very meagre. Mathur (1976) reported that camels weighing 350-450 kg require 0.34-0.59 kg DCP. The dry matter intake of Bikaneri camel on *ad-lib* feeding, pulling 1.8 ton load for 4 hr per day, was between 1.8 to 2% of body weight.

It may be emphasised here that extensive research on development of camel drawn implements and improvement of the existing harness system is necessary for achieving optimum draughtability of camel. In India, the camel is routinely utilized by the Border Security Force in Rajasthan and Gujarat area along the international

border for patrolling and for transporting ration, water and personal effects to the far flung posts (Pokharia 1988).

Milk resource

Knowledge on milk production of the camel is incomplete and often confusing. The available data indicate, however, that this species has great potential for milk production (Knoess 1984). Camels can produce large quantities of milk both under extensive and intensive management conditions. The composition of camel milk is comparable to that of milk from other domesticated milch animals. The keeping quality of camel milk is very good and the milk is a rich source of vitamin C (Yagil 1985). The length of lactation in camels can vary from 9 to 18 months (Wilson 1984). The calculated average lactation yield of 305 days has been estimated to range from 1250 to 10,000 liters in camels from different countries (Knoess, 1984). The average daily yield varies from 3.5 to 35 liters. Rao (1974) reported that the Indian camel could yield 4.5 to 18 liters. The fat percentage in camel milk varied from 2.9 to 3.5, SNF 8.2 to 14.3, lactose 3.4 to 5.8, protein 3.5 to 4.6, ash 0.7 to 0.9 and water 81.4 to 87% (Yagil 1982). The camel milk contains per kilo about 2930.8 KJ of energy and about 35 g of proteins (Wilson 1984). The total daily energy requirement of a human-being can be met by 4 kg of camel milk and his entire protein requirement by 1.75 kg. The camel milk has, therefore, considerable potential to combat malnutrition in inhabitants of arid lands. Camel milk has comparatively better keeping quality and is reported to have medicinal properties (Wilson 1984).

Meat resource

It is not a common practice to eat camel meat in India, although it is consumed in substantial quantities in several other countries. According to Wilson (1984) camel meat might be sweeter and coarser but few people would be able to note the difference. The available information on camel meat has been reviewed by Mukasa-Mugerwa (1981) and Tandon et al. (1987).

Dressing percentage of camel carcass ranges from 47 to 57%. Camel meat contains about 22% protein and only 1% fat (Nasr et al. 1965). It has been estimated that an average carcass weighing 210 kg would yield 10 kg fat, 160 kg meat and 40 kg bones and would thus yield 35 kg protein and 9973125 KJ energy which will be sufficient to meet the protein requirements of about 35 people (Wilson 1984). The optimum age for camel slaughter is around 3-4 years old when the meat is akin to that of beef. The body weight gain in the Bikaneri calves under normal feeding conditions ranged from 267 g per day in 2-3 years old calves to 528 g per day in calves aged 0-6 months. However, there is much scope of higher gain under intensive feeding programme in genetically improved strains. Considering the steep increase in

demand of animal protein for human consumption, it is suggested that the camel may be included in intensification of efforts for augmenting meat production, particularly in the animal husbandry dependent zones of arid lands.

Hair and hide resource

The areas and prospects of utilization of camel fibre and hide, although limited, warrant exploitation. Presently, camel hair is usually utilized for making clothings for animal cover, rough cloth, blankets, carriage bags, ropes etc. The annual availability of camel hair in India is approx. 0.8 million kg. The fineness of camel fibres ranges from 26 to 38 microns and its length varies from 51 to 67 mm. The fibre is as strong as wool and its moisture regain content at 65% relative humidity and 70°F is 15%. The raw camel hair contains 15-55% sand and dirt, 0.5 to 1% wool wax, 3.5% sulphur and the pH is 7.02. Vegetable matter content of camel hair has been reported to be between 4-5% (Gupta et al. 1989). According to Patni and Dhillon (1988) it is worthwhile to blend camel hair with polyester, wool or silk waste. Sliver and yarn tests indicated that camel blend slivers of 40/60 and 60/40 proportion exhibited the maximum strength. The future prospects of use of camel hair lie in proper grading and blending. It has been estimated that a camel hair fabric of 620 g weight will be as warm as a pure wool fabric of 900 g weight.

Camel hides, if properly tanned and converted into leather or furs, have advantage on account of having good "substance". The translucent structure of camel hides makes them useful for making items of tourist interest such as lamp shades, toys, drums, leather containers and items of art objects etc.

According to Kalla (1987), feasibility of livestock development in arid areas needs to be examined on the basis of the following issues :

- (1) basic stability of livestock for protective resource use in desert areas,
- (2) long term viability, stability and quantum of risk covered and income generating capacity,
- (3) employment absorption capability,
- (4) spatio-vertical income distributive capacity of livestock enterprises from amongst the rural enterprises mix.

The case of camel rearing fits the bill conforming to the above points due to its multi dimensional use in the arid lands and its extraordinary capability of adaptations to conditions generally prevalent in the arid lands. In subsistence economy in the desertic areas, camel rearing can be regarded as a fairly constant resource to the rural poor farmers (Hjort 1988). There has been constant increase in camel numbers over the years inspite of its getting lower priority amongst the domesticated animals.

Due to slow herd growth and low turnover some risk is linked with regrowth and replenishment. Hjort (1988) opined that for long term capital gains, appropriate herd management, disease control, marketing and proper utilization of camel resources are necessary.

The labour needed for management of family herds varies seasonally. There are great fluctuations in the quantity and quality of pastures due to unpredictable rainfall. These factors, therefore, affect migration pattern of camel rearing societies which fall under nomadic to settled families. Large and already sustainable households having capacity to diversify, also keep various other domestic livestock. It is generally, observed that at present viable camel herds are owned by a few wealthier farmers and given for management to the poorer and landless labourers.

Marketing of live animals is an important trade in the arid lands. The general price level is increasing substantially over the years, thus contributing towards economic uplift of animal keepers. Large number of camels are being transferred to the bigger cities and other neighbouring states from traditional camel breeding areas of western Rajasthan, thus helping in providing job opportunities. Large number of people in the arid zone are particularly dependent on camel power which is used for agrarian jobs and transport of their produce. Camel carts remain the mainstay for short distance transport in villages and cities which include human transport, water carrying, transport of material etc. For short distance transport, the camel driven carts are still the major mode of conveyance available even today in most of the villages. It can be said that a rural economy based on the camel system will collapse in case of non-availability of good camels. Therefore, the slow growth rate of family camel herds has to be improved and be made more economically viable through scientific research.

Findings of the evaluation studies on Integrated Rural Development Programme in Rajasthan supported by various Banks, State Organisations, Development Institutes etc. indicated that average increase in income of the beneficiaries was the highest amongst people who were given loan for camel and camel carts (Desai 1988).

According to this study, about 73-80% of the loans were being distributed for the purchase of camels and camel carts. The credit flow was substantially higher in this sector and is predicted to increase in the years to come. Realising the importance of camel in the rural economy, the banks have opted to make large financial assistance to the camel and camel cart keepers. The estimated refinance released for financing in this sector in Rajasthan was to the tune of 156.9 lakhs and 1247.7 lakhs for camel and camel carts respectively under IRDP and 211.2 lakhs and 158.9 lakhs under projects during the 4 years from 1984 to 1988. Further, statistics based on physical numbers indicated that during 1983-84 finances were provided for 701 camels and 17938 camel carts which increased to 2349 camels and 23353 camel carts

in 1988, thus indicating an effective increase of 235% in financing camels and 30% in camel carts over a period of 4 years (Desai 1988).

The total energy available from all animals from the arid areas of Rajasthan during 1977 was estimated to be 0.909 million hp of which 0.442 million hp (48.6%) was contributed by camels (Kalla et al. 1986). In a survey conducted in Chandan village in the Jaisalmer district during 1986-88, it was revealed that energy utilization and consequent value of such exertion was limited to only medium and large farmers families. The value of energy utilization through camels was higher than all the values of other draught animals including bullocks. Camel energy was found to be not only cost effective but also remunerative in the arid areas when every other source of biotraction energy succumbed to the pressure of climatic stresses during severe drought. Studies on dynamics of livestock energetics in western Rajasthan from 1961 to 1983 revealed 32% increase in camel energetics as compared to 27% decrease in cattle energetics (Kalla et al. 1988). These figures reflect the importance of camel rearing and camel energetics in the economy of societies inhabiting the arid regions of India.

In summing up, it can be said that the camel is a multipurpose utility animal adapted to extreme conditions of scarcity and aridity. In spite of modern developments of transport systems and mechanisation of agriculture, camel rearing still remains an economically viable proposition for meeting the needs for bioenergy in the arid and semi-arid regions. The untapped potentials of camels are, however, required to be explored optimally. The augmentation of camel rearing has, therefore, a strong case in the Indian arid zones.

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