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STUDIES ON UTILIZATION PATTERN OF CAMEL AND TRACTOR IN HOT ARID DESERT ECOSYSTEM

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ABSTRACT

The present farming system research was carried out in eighteen arid villages of two districts in Rajasthan covering four zones. Analysis of data indicated that mixed farming (51.08%) was the major occupation although 48.91 % of respondents opted animal husbandry as major occupation. The advantages of camel in comparison to tractor were so many where as maximum number of demerits of tractor in comparison to camel were perceived by arid farmers with favorable attitude towards the utilization of camel. Most of the farmers having 1 camel (88.64%) fed their animal at household level where as farmers having more than 4 camels, majority of them reared their camel in extensive management practices. The Chi-square test indicated that camel keeping pattern significantly ($P< 0.01$) influenced feeding management practices. Hence suitable measures need to be taken to conserve the indigenous camel with proper feeding management in changing socio-economic scenario.

Key words : **Camel, Desert region, Economics, Farmers.**

INTRODUCTION

Camel plays a crucial role in Indian economy by providing gainful employment and regular flow of income to the farmers of arid zone. In recent years although tractors have assumed importance in some areas but much of the sandy terrain of farming and poverty of the population preclude this type of power application in interior villages of Thar desert. Moreover, increased cost of fuel, non-availability of spare parts in interior village conditions on time, difficult maintenance and upkeep of tractor engines, pose problems to farmers compelling them not to replace camel power with mechanical devices. As fossil fuel sources are fast depleting, the working group on animal husbandry and dairying, for 11th five year plan (2007-12), of Govt of India, observed that the role of draught animal for agriculture and allied operations would continued to remain important. Hence under the existing situation in arid agriculture, it is felt essential to know the comparative utilization pattern of camel and tractor through farming system research.

MATERIALS AND METHODS

Data collection: **In a study to understand the characteristics of utilization pattern of camel and tractor system in hot arid region, both primary and secondary data were collected through pre-tested semi structured interview schedule during the year 2010 to 2011. The quantitative and qualitative data thus collected were through interaction and discussion with farmers, key informants, housewives and secondary sources after several visits were made to build rapport with respondents and panchayats before actual data collection.**

Sampling technique: **The selection of respondent was carried out from two districts i.e Bikaner and Hanumangarh by using stratified random sampling technique based on camel population. From Bikaner district, eight tehsils were selected and from each tehsil two villages were taken covering four zones *viz* north, south, east, west. Two villages of Hanumangarh district also belonged to north zone. The farmer possessing draught camels were based on land holding stratified into small (1- 7.57 ha), medium (7.58 – 25.25 ha) and large (> 25.25 ha) categories and farmers were selected randomly to represent different socio-economic strata. In Bikaner district, non-command land holding is more and in Hanumangarh district the canal command land is predominant. In such agricultural operations, the**

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camel and tractors play main role. A sample of 3 to 5 farmers was drawn randomly from each village for data collection. A total sample size of 65 farmers were interviewed from eighteen arid villages.

Statistical analysis: The collected data were analyzed as per Snedecor and Cochran (1989). Chi-square test was applied on various aspects of feeding management systems and rearing practices of camel. The attitude of farmers towards utilization of draught animal in agriculture operations were done as per Likert method of scoring (Natarajan and Mahesh, 2009). The knowledge level of respondents regarding socio-economic aspects of camel management were assessed through knowledge index as developed by Bhaskaran and Praveena (1982). Collected data were classified under different categories for interpretation. The meticulous and grass-root level of observations on socio-economic aspects of camel management were subjected to tabular analysis.

RESULTS AND DISCUSSION

Socio-economic profile of arid farmers: The analysis of data on socio-economic status of farmers indicated that most of respondents belonged to old (45%) followed by middle (39%) and young (16%) age categories. The literate respondents were 29 % where as 35 % were functionally literate and 36 % illiterate. Most of the respondents were having medium (64%) type house hold (4–6 members) followed by large (17%), very large (12%) and small (7%) type. Most of them were having nuclear type (72.83 %) family and few (27.17 %) were having joint family. Most of the farmers involved themselves or family labour (91.13 %) in agriculture operations, whereas, few employed the hired (8.87 %) labour. Majority male (78.32 %) camels were being used by the respondents, whereas, few females (21.68 %) were also used for the agriculture operations. The mixed farming (51.08%) was practiced by the majority of respondents although 48.91 % of respondents were opting animal husbandry as major occupation. Most of respondents (77.87 %) preferred to put the camel for agriculture operation after the age of 4 years but 22.13 % of respondents started to use the camels below 4 year age for agricultural work. The camels of various age groups were used under farming operations and the average age of draught camel was 6.43 ± 1.98 year in Bikaner regions (Bhakat *et al*, 2003). The cost of male camel was higher than female camel. Most of farmers were purchasing their draught camel as well as the implements on cash payment followed by those who purchased it on installment basis and very few opted for loan from other person.

Camel's advantages and demerits in comparison to tractor system: Many advantages of camel system in comparison to tractor system were reported by respondents (Table 1) in various agriculture operations which included camel requiring comparatively less maintenance cost, protection of land fertility and its sustenance for longer time. The advantages and demerits of camel in comparison to tractor system were also assessed from the respondents. The farmers felt that camels were suitable to all type of works on various types of lands and camel ploughing enhanced the soil fertility. The respondents reported that comparatively less cost was involved in camel ploughing and whenever needed, camels were available and work can be done easily. It was also reported that in less moisture arid soil, single attempt seeding by camel was successful,

TABLE 1: The opinion of farmers about comparative use of camel and tractor system

Advantages of Camel in comparison to tractor	%	Demerits of Camel in comparison to tractor	%
Required comparatively less maintenance cost	97.82	Consume more time	73.91
Land fertility can be protected and maintain for longer time	95.65	Shrinkage of grazing / browsing land	96.74
Suitable to all works and all types of lands	93.48		
Comparatively less cost involvement in ploughing	82.61		
Whenever needed, it is available & work can be done easily	70.65		
In less moisture soil, single attempt seeding is successful, so repeated seeding is not needed, cost of cultivation become less	98.91		
No harm to soil texture during continuous use	100		
Camel manure is pivotal during cultivation activities	85.87		

so repeated seeding was not needed which ultimately reduces the cost of cultivation specially in case of cash crops like ground nut (*Arachis hypogaea*) cultivation in hot arid villages. The respondents opined that camels never harm the soil texture even during continuous use and camel manure was pivotal during cultivation activities. The demerits of camel in comparison to tractor were also reported as it require more time to complete the work, work difficulty, problems in meeting out feed cost, shrinkage of grazing / browsing land, and it was felt as burden during the idle period. To resolve this it was suggested that camel work days need to be increased. For better work effiency the camel of better body condition was required and work difficulty can be reduced by the use of appropriate camel specific implements. This will be useful for farmers who depend on camel. The reduction in camel population and less number of skilled labours in using camel were seem to be man made demerits in use of camel. Respondents suggested that proper training in use of camels will be helpful for younger generation of farming community. The respondents felt that the higher cost of camel along with decreased population is causing problems for farmers to hire camels for needed operations. The farmers felt that camels are burden during idle period when drought prevails and in such case they sell out them but when they require to purchase, they have to buy at a higher cost. Singh (1999) reported that animals continue to be a major source of motive power (tractive and rotary) in India and are being used by the small farmers.

Advantages and demerits of tractor in comparison to camel system: Although tractors were used in many cases, majority of respondents reported that the tractors can finish the work quickly and there is less labour involvement (Table 2). On the contrary, many demerits of tractor in comparison to camel were perceived by farmers viz: high input cost requirement and rate of hire are higher. Most of respondent felt that tractor can harm to soil texture in continuous use because it harden the land and it was not suitable for any type of land and work. The low skill of operator, its non availability during needed hours, costlier fuel expenditure were reported as major demerits. Most of respondents felt that in less moisture arid soil, single attempt seeding may not be successful, so repeated seeding by tractor increase the cost of cultivation. Apart from this spare parts were not available in interior villages and quality of ploughing depends on the operator's skill. If the operator lacks in that, output is affected adversely. It was also perceived by farmers that cheating by tractor operators also resulted in poor ploughing. It can be resolved, if farmers own tractor themselves but it may not be possible for resource poor dry land farmers. In India, various farming operations are carried out by manual, animal and mechanical power sources and animal power contribute about one third (Mishra, 1986). Eighty-four million draught animals are used for crop production and transportation purposes (Cartman, 1994). The present degree of mechanized farming in hot arid region is selective. This situation prevents to use any labour saving equipment like tractors etc.

Assessment of attitude of farmers towards the utilization of camel system: The assessment of attitude of farmers towards the utilization of camel system for cultivation purpose (Table 3) revealed that most of respondents were having favorable attitude (91.30%), towards use of camel for agricultural operations, few were in undecided position (6.89 %)

TABLE 2: Farmer's view about comparative use of tractor and camel system

Advantages of tractor in comparison to camel	%	Demerits of tractor in comparison to camel	%
Fast operations	91.30	High cost requirement	73.91
Labour involvement Less	83.69	Harm to soil texture in continuous use	95.65
		Not suitable for all types of land and all types of work	96.74
		Low skill of operator	64.13
		Not always available during needed hours	53.26
		Costlier fuel expenditure	68.47
		In less moisture soli, single attempt seeding may not be successful, so repeated seeding increases cost of cultivation	98.91
		Spare parts not available in interior villages	46.74

TABLE 3: Attitude of farmers towards the utilization of camel system for cultivation purpose.

Attitude (Average score)	Category of farmers (%)			
	Small (1 - 7.57ha)	Medium (7.58– 25.25 ha)	Large (> 25.2 5 ha)	Overall
Favourable (45 – 60)	97.83	89.13	86.95	91.30
Undecided (35 – 44)	2.17	10.87	7.62	6.89
Unfavourable (20 -34)	0	0	5.43	1.81

whereas, very few were having unfavorable attitude (1.81 %). In Bikaner district canal non-command land holding is more and in Hanumangarh district the canal command land is predominant. In such agricultural operations, the camel and tractors play main role. Though mechanization came into arid agriculture few years back, tractors are used by farmers of large categories but use by other categories of respondents is still very limited in hot arid regions. The results of investigation amply demonstrated that the average size of operational holdings on the tractor-operated farms was substantially higher than those who use camel. Acquisition of tractor helps in timely accomplishment of farm operations. Despite of application of tractors in arid agriculture farming, camel power contributes substantially in hot arid villages. The value produced by draught animals in India would be over Rs 1000 billion whereas; mechanical sources of agricultural power depend on fossil fuel that has only limited life. According to current estimates, India's petroleum and natural gas resources may last 25-30 years and coal 130-140 years (Sastry and Thomas, 2005). So it calls for a viable solution to use the camel for dry land agriculture.

Feeding management practices for draught camel: Investigation on camel keeping pattern and the observations on feeding management practices indicated that the practices (Table 4) varied as per number of animals at household. The analysis of observation indicated that 88.64% farmers having 1 camel, fed them at household level. Farmers having 2 – 4 camels, fed their camel at house hold level along with 6 to 9 hrs grazing/browsing at back yard area, whereas, farmers having more than 4 camels, fed their camel in extensive management practices. The Chi-square test indicated that the camel keeping pattern significantly ($P< 0.01$) influenced feeding management practices of these study area.

The detailed studies on use of type of feed materials revealed that in west, north, east and south zones of Bikaner district, farmers were predominantly using crop residue of moth (*Phaseolus aconitifolius*), guarphalgati (*Cyamopsis tetragonoloba*), groundnut (*Arachis hypogaea*). In Hanumangarh district, most of respondents were predominantly using crop residue of *guar phalgati* and *channe ki khar*. In extensive management practices camel groups were moving about 8 to 15 km daily or even more to get their feed and spent about 6-9 hr daily in range land (Bhakat and Pathak, 2009). Camels preferred browsing over grazing and usually takes few bites from one plant and then move on. The long legs and neck help them to utilize upper storey tree vegetation that is out of reach for other livestock. During drought, farmers took their camels outside village or even beyond regular range land to other nearby districts to have access to fodder. Concentrates were fed to breeding camels only during breeding season once in a month. Almost similar pattern was observed with respect to camel calves, which were fed concentrate once in a month by majority of farmers (61.42%). Usually farmers fed concentrates

TABLE 4: Influence of camel keeping pattern on feeding management practices at four zones of study area.

	Feeding Management Practices (%)			
Camel number	Household level	Household + Grazing / browsing	Grazing / browsing	Overall
1 C	88.64	6.82	4.54	47.83
2 – 4 C	22.50	67.50	10.00	43.48
> 4 C	12.50	25.00	62.50	8.69
Overall	53.26	34.78	11.96	
Chi-Square Value		61.78 **		

** Significant at 1%

like bajra/barley flour and gur (molasses) to their camels during debilitated conditions for a few days till camel regains its normal condition. Farmers provided approximately 16 kg crop residue daily to their working animals. In this region, presently very few farmers were providing salt to camel at any stage as per their requirements. About 20 to 30 gm salt was given per day. Rajput and Tripathi (2005) reported that *moth chara* was one of the major roughages provided to camels in all three seasons by majority of Raikas followed by *groundnut chara* and *guar phalgati*. Leaves of desert tree Khejri *(Prosopis cineraria)* were fed to animals by majority of families in both winter and rainy seasons. However, Phog *(Colligonum polygonoides)* was an important bush, which was also given by about 58 % of the respondents during summer.

Manger for feeding and watering of camel: Majority of households (95 %) were using movable basket type pot, jute bags and sacks as a feeding manger. Generally this basket was made up of locally available agricultural residue materials. Some farmers (5 %) used kuccha manger made up of Kuccha bricks and mud plastering which were also easily accessible at village condition. This type of Kuccha manger was elevated to certain height. Some were also using metallic containers for feeding purpose. The practice of providing water trough to camel was very uncommon among the households studied. As high as 91 % farmers were provided water to their camels in iron bucket or big container or bowls. In this study area, maintenance of regularity and provision of free access of water to camel seem to be limited. Majority of farmers (82%) provided water to their camels on alternate days whereas few (18 %) provided water daily. Mostly farmers (61 %) were using individual small constructed village water storage facility followed by village pond (22 %) as the major sources of watering to their animals. About 17% of farmers were watering their camels through home wells.

The result of this study revealed that with greater advantage and lesser cost, the camel was useful to perform the arid agricultural operations than when it was done by using the tractors. Use of camel in farming may be advantageous and beneficial for small and medium farmers who were in majority in dry land agriculture. Hence suitable measures need to be taken to conserve the indigenous camel with proper feeding management in changing socio-economic scenario.

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