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An economic study of the use of draught camels and bullocks in farming in the Thar desert

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Introduction

Farming systems are the result of present day awareness regarding the concept of agriculture, which means an optimum exploitation of Plant–Animal–Human relationship. This awareness has raised the importance of draught animals in achieving total agricultural income particularly in the north–western Thar desert, where animal power is an inseparable part of agriculture. In India farming operations are carried out using manual, animal and mechanical power sources. Animal power contributes to about one third of the energy input in agriculture (Mishra, 1986). Eighty-four million draught animals are used for crop production and transport purposes (Cartman, 1994). Tractors have assumed importance in some areas, but much of the terrain of farming and the poverty

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of the population restrict their use in the interior villages of the Thar desert. The present degree of mechanised farming in the hot arid region is selective and quite low. Moreover, increased cost of fuel, non-availability of spare parts when required in the interior villages, high maintenance and upkeep of tractor engines by the farmers are problems which compel the farmer to replace mechanical devices with camel or bullock power. Singh (1999) reported that animals continue to be a major source of motive power (tractive and rotary) in India for the smallholder farmers. The animal should be compatible with crop cultivation instead of competing with it for land and water resources. A camel keeping enterprise fits well with such requirements. Camel energy is not only cost effective but also profitable and remunerable. The total world camel population is estimated to be 19.3 million of which India has a camel population of 1.03 million (FAO, 2002). Since 85% of the gross cultivated area of the Bikaner district is non-irrigated, camel carts hold a significant potential for finance (Amresh Kumar, 1999). In the state of Rajasthan the major population of draught animals is bullocks followed by camels. In comparison to other livestock species the camel remained neglected until this century when attention was drawn to it because of it's unique adaptive characteristic for surviving in the harsh conditions of the desert eco-system. Camels can tolerate high temperature, solar radiation and water deprivation and subsists on poor quality thorny vegetation. The project aimed to investigate the main features and economics of use of camel power as well as bullock power in agriculture to see whether farmers effectively use these animals and also to find out economic viability of both types of draught power farming systems.

Methods of data collection and analysis

The required data were collected in the suitably developed and pre- tested performa by survey method. Observations were recorded on farming use of camels (a single camel with implements) and bullocks (a pair of bullocks with implements). The selection of respondents was carried out using a stratified random sampling technique. The study involved a total of four zones of khajuwala tehsils (Bikaner district) of Thar desert. Each of the four zones (north, south, east and west) consisted of twenty villages. A sample of 16–17 households was drawn from each village randomly for data collection. A total sample of 180 camel keepers and 164 bullock farmers were interviewed. Detailed economics of both power systems were analysed using linear programming (Loomba, 1992). To work out the estimates of maintenance cost of draught animals (feeding and health cover etc), implements and cost of crop cultivation, the opportunity cost of owned inputs and actual prices paid by the farmers for purchasing inputs were considered. To obtain the gross returns from different sources of income of farmers, the market prices and present day value were considered.

Observations

Agriculture and draught animals go side by side in boosting the farming business into a profitable enterprise. The average time required for ploughing of each 0.5 ha of land was almost the same in camel powered (1.12±0.32 day) and bullock powered (1.23±0.37 day) systems, but the average effective working life of a camel (18.5±0.89 years) was higher than that of a bullock (14.8±0.65 years). The average 'lifespan' of animal-drawn implements was almost equal. A similar trend was found by Jain *et al*

(2000). An equal number of family labour and hired labour were employed /ha/day in both systems. Most camel keepers (91%) involved themselves in the farming operation. The exceptions were in some larger farms (9%) that engaged some hired labour. A similar trend was found in the bullock power farming systems. The average cost of a male camel was Rs. 9782 and of a bullock was Rs. 5578. The average cost of animal-drawn implements was similar in both systems. Most of the camel keepers (91%) purchased their camel on a cash basis other (6%) by instalments or loan (3%). A similar trend was found for bullock farmers. Most camels used in farming operations (90%) were male. A wide range of ages of animals was used in agricultural operations. Most camels were in the age range 6–8 year age, followed by 8–10 years, 4–6 years, >10 years and <4 years age group with an overall average age of 6.4±0.98 years. Most bullocks were in the 4–6 years age group, followed by 6–8 years, 8–10 years, <4 years and the >10 years age group, with an overall average of 4.1±0.76 years. This is similar to reports by Bhakat and Sahani (2000). The average working days in a year (in agriculture operations and carting) were almost equal in both type of farming systems. The mean working time (hrs/day) for the Rabi and Kharif seasons was about same in both cases. Annual average net income (Rs/ha) from the kharif season crop was more in the camel power system than in the bullock power system, because camels are used to cultivate groundnuts (kharif season crop), which provided a comparatively higher return per rupees investment than other kharif season crops, where bullocks were mostly used.

Most animals were kept in an intensive system of management, with some camels and bullocks being managed semi-intensively or extensively. This is mainly due to a shortage of grazing land. The chi - square test showed a significant ($P<0.01$) influence of size of farm on the way the animals were kept (Table 7).

Among the kharif season crops, groundnut provided the highest return per rupees investment followed by guar, cotton and moth where as among the Rabi season crops, mustard provides higher return per rupees investment followed by gram and wheat (Table 8). For cultivation of groundnuts, camel power is mostly used because groundnuts require sandy soil. For the cultivation of cotton, bullock power is mainly used because cotton requires a sandy-loam soil. For cultivation of all other crops, camels and bullocks are both used as per their availability.

Table 7: Influence of size of farm on the way draught animals are kept and managed in the Thar desert region

Category of Farm	Camel (%)				Bullock (%)		
	Intensive	Semi Intensive	Extensive	Overall	Intensive	Semi Intensive	Overall
Small£ 6 ha	46	34	20	15	58	42	23
Medium 7–15 ha	57	23	20	62	63	37	55
Large[3] 16 ha	60	22	18	23	79	21	22
Over all	56	24	20		65	35	
Chi square value	1.91 **				4.43 **		

** Significant at 1% level.

Table 8: Economic gain from agricultural land where camel and bullock power is used in the Thar Desert region

Crop	Season (K-Kharif R-Rabi)	Average Production (Q/ha)	Av. cost cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	Return/Rs investment (Rs)	By using Camel (C) Bullock (B)
Cotton	K	16.60	5,780	21,580	15,800	3.73	B-mostly C- rarely
Ground nut	K	31.40	9,340	45,530	36,190	4.87	C-mostly B- rarely
Moth	K	5.60	2,240	7,000	4,760	3.13	C / B
Guar	K	8.00	2,256	10,400	8,144	4.60	C / B
Wheat	R	23.60	5,460	15,340	9,880	2.81	C / B
Mustard	R	12.40	2,348	14,880	12,532	6.34	C / B
Gram	R	10.00	3,332	17,000	13,668	5.10	C / B

Table 9: Analysis of the economics of camel and bullock powered agricultural systems in the Thar desert region

	Camel powered system (N = 180)	Bullock powered system (N = 164)
Fixed cost (Rs)		
Interest on investment [@ 9 %]	1,010	1,192
Depreciation of implements[JV @ 10 %]	157	168
Depreciation of animal [SV @ 12 %]	438	663
Insurance on animal(s)	483	582
Total Fixed costs	***2,088***	***2,605***
Variable cost/year (Rs)		
Hired labour	11,310	12,246
Family labour	11,232	14,560
Maintenance of animal(s)	14,600	29,200
Repair and maintenance of animal-drawn implements	100	100
Misc/other expenditures	200	200
Total Variable costs	***37,442***	***56,306***
Economic estimate		
Total Expenditure (Rs)	39,530	58,911
Earning from different sources :		
Net income from agriculture per year(Rs / ha)	25,021	20,810
Sale of manure (@ Rs 75/Q)	821	1,600
Income from carting (Rs)	42,300	39,950
Profit(Rs)	28,612	3,449
Pay back period for investment on animal system (year)	0.39	3.84
Cost benefit ratio	1.72	1.05

Analysis of the economics of camel and bullock powered systems is presented in Table 9. The bullock system required higher interest on investment than the camel system (Rs 1,192/– and Rs 1,010/– respectively). The depreciation of all necessary implements used with camel and bullock power was almost same, when the scrap value

(J.V) of implements was considered @ 10% of average initial cost. The depreciation of a pair of bullock (Rs 663/–) was more than of a single camel (Rs 438/–) when the salvage value (S.V) was considered @ 12% . The expenditure for insurance on bullock power (Rs 582/–) was more than on camel power (Rs 483/–). Premium rate was considered @ 5% of average initial cost along with overall service tax @ 5%. The overall total fixed cost was higher in a bullock power system (Rs 2,605/–) than in a camel power system (Rs 2,088/–). The various components of variable cost were considered on a yearly basis. The expenditure for hired labour as well as family labour were almost same in both power systems. Maintenance cost of a pair of bullock (Rs 29,200/–) was higher than of a camel (Rs 14,600/–). The average contribution for expenditures towards repair and maintenance of animal-drawn implements and miscellaneous /other expenditure almost equal in both type of farming systems. The overall total variable cost was higher for bullock power (Rs 56,306/–) than for camel power (Rs 37,442/–).

The total expenditure was higher for in a bullock powered system (Rs 58,911/–) compared to a camel powered system (Rs 39,530/–) because a pair of bullock was involved in farming operations and a single camel was used for the same purpose. The average earning from selling of manure was greater in the bullock powered system (Rs 1,600/–) as more manure was available than in the camel system. The average income from camel carting was higher than for bullock carting. The use of camel power provided a higher profit than the use of bullock power in farming systems in a hot arid ecosystem. The pay back period (PBP) for investment on animal power system was much less in the case of camel power (0.4 year) than for bullock power (3.8 years). The cost benefit ratio was higher in a camel powered farming system (1.72) than in a bullock powered system (1.05).

Conclusions

The animal wealth of the farmers can be used efficiently and preserved as a fixed asset, which is a symbol of dignity, social prestige and pride to the farming community. A camel is an important asset to the rural population in the remote villages of the Thar desert. It also has the potential to provide more income and employment to the unemployed youth of a farmer's family. This study has shown the advantages of using camel power over bullock power in the farming systems in the Thar desert. This is due to a higher cost benefit ratio and shorter pay back period which makes the camel a more attractive power option than a pair of bullocks for the small and medium sized farms in the hot arid Thar region.

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Comparative studies on the work performance of indigenous and crossbred bullocks during ploughing

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Introduction

Deoni (D) and Red Kandhari (RK) are two prized cattle breeds of the Marathwada region. Cows are low yielders, but males are famous as draught animals in agriculture particularly for ploughing. The Holstein Friesian x Deoni crossbred males (HF/D) are also used for all such work. Reports on the comparative studies on the draught capability of Deoni and Holdeo bullocks during ploughing operation are available, however, scientific information on the comparative draught ability of D, RK and HF/D crossbred bullocks during ploughing is not available. This study compared the three breeds during ploughing.

Methods

Two healthy pairs, each of RK, D and HF/D were selected for the study. All the animals were between the age of 3½ to 5 years. In selecting the animals, more emphasis was given to the body weight (RK: 433 and 455 kg, D: 550 and 551 kg and HF/D: 648 kg and 650 kg) rather than the age of the animals. Ploughing in the Kharif season was performed from 25 May-9th June 1999 and for the Summer season from 15-30 March 2000.

The draught force developed, speed of the operation, horse power generated and the area ploughed were measured. All the trials were conducted at the University Campus, Parbhani. Each trial was repeated for five consecutive days for three hours during the morning (8.00–11.00 am) and afternoon (1.30–4.30pm). A randomised block design with a three factorial model was used for the statistical analysis of the data collected (Panse and Sukhatme, 1967).

Results

Draught force generated in ploughing

Breed, season and time in the day had a significant ($P<0.05$) effect on the draught forces generated during ploughing (Table 10).

Other studies have observed higher draught forces when crossbred cattle are used for work compared to values obtained when indigenous bullocks are used.

The draught generated by bullocks was equivalent to 15% of live weight in Deoni and Red Kandhari cattle and equivalent to 13% in cross bred bullocks. The results of the present work agree with the results of Vaugh (1947) who noted that the bullocks working