A COMPARATIVE STUDY ON CAMEL CARTING VERSUS BULLOCK CARTING IN HOT ARID REGION OF THAR DESERT

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ABSTRACT

Agricultural economy of India is also dependent upon livestock as a source of draft and traction power. A meticulous grass root level survey study was conducted on various aspects of camel and bullock carting systems which involved four different Zones (north, south, east, west) of Thar Desert. A detail economics of both type of carting systems were analysed by using the linear programming method and considered all possible and feasible linear components - subcomponents to reach a final decision. The average working life period of camel (14.50 ± 0.50 years) is more as compared to bullock (10.00 ± 0.66 years) used under carting operation where as the average life period of animal drawn cart is almost same. Maximum farmers (90%) involved themselves for the carting operation in both cases. The average cost of camel cart was high (about 40%) as compared to bullock cart. The average total number of working days in a year was almost equal in both type of carting system. The average weight / load carrying by camel cart (14.5 ± 4.89 quintal) was quite high as compared to bullock cart (8.00 ± 4.11 quintal). The average working hours per day were 9.25 ± 2.11 and 8.65 ± 2.50 for camel and bullock, respectively. The average daily income from camel carting was estimated to be higher (about 22%) than bullock carting. Total distance covered per day by camel cart (21.45 ± 6.55 km) was more as compared to bullock cart (14.85 ± 5.50 km). The camel carting required higher investment in terms of interest rate, depreciation rate and expenses towards insurances. The overall total fixed cost was high in camel carting (Rs. 3331/-) than bullock carting (Rs. 2438/-). The yearly repairing and maintenance cost of camel cart was high as compared to bullock cart. In case of bullock the total expenditure for shoeing was Rs. 800/- for a year where as it was not required at all for camel. The total variable cost was high in bullock carting than camel carting. The average yearly maintenance cost of animal were Rs. 15330/- and Rs. 14965/- for camel and bullock, respectively. The total expenditure for both cases was almost equal but total earning and profit from camel carting was quite high as compared to bullock. The pay back period was almost double in case of bullock carting as compared to camel where as the benefit cost ratio was $3/4$ th time high in case of camel carting. It is evident that due to short pay back period and higher benefit cost ratio camel carting is profitable and advantageous over the bullock carting for small dry land farmer in the hot arid Thar Desert.

INTRODUCTION

As desertic land area is prone to frequent drought, the small and marginal farmers of this region rely heavily on livestock enterprise for their sustenance. The livestock should be compatible with crop cultivation instead of competing with it for land and water resources. Camel rearing enterprise fits well with such requirements. The total world camel population is estimated to be 19.286 million of which India has third highest camel population of 1.52 million (FAO 1998) after Somalia and Sudan. Animal carting provides gainful source of employment and a regular flow of income to the farmers and other deprived groups in society.

The supplementary and complementary connection between the crop sector and draught animal add to the importance of maintaining draught animals. Agriculture and draught animal go side by side in boosting farming business into a profitable enterprise. Heifer Project International (HPI), a private non-profit development agency is assisting tribal minorities who seek gainful employment using camel for transporting agricultural and Industrial products (Robert *et al.*, 1997). There has been constant increase of camel driven carts even around big cities. Evaluation of IRDP in the arid lands has indicated that average increase in the income of the beneficiaries was one of the high-

est amongst people who has given loan for the purchase of camel and camel carts (Khanna, 1994). In the state Rajasthan major population of draft animals are bullock followed by camels. In comparison to other livestock species camel remained neglected until this century when it draw attention because of it's unique adaptive characteristics for survivability in the harsh conditions of the desert Eco-system. The camel "Ship of the desert" uses various adaptive mechanism rather than bullock for survival in the desert. For instance cattle in the central desert of Australia with daily temperature of 40°C were reported to have died without water in four days while camels survived for more than 15 days in the same environment. It has been estimated that a well-fed camel could carry some six months energy on it's back while cattle are unlikely to have more than two-three months, if run out of food (Khanna 1986). Therefore, camel can tolerate high temperature, solar radiation and water deprivation and subsists on poor quality thorny vegetation. Since 85% of the gross cultivated area of the Bikaner district is non-irrigated camel carts hold a significant potential for financing (Amresh Kumar, 1999). Camel energy is not only cost effective but also profitable and remunerable. It is therefore, necessary to investigate the main characteristics features and economics of camel and bullock carting in order to know whether or not these animals are efficiently utilised by farmers and to find out the economic viability of both type of carting systems.

MATERIAL AND METHODS

Data collection: A grass root level survey was conducted on various aspects of camel as well on bullock carting system. It involves different aspects of animal carting viz. Social status of small animal keepers, economic aspects of draft animals and animal drawn carts, load carrying capacity, various aspects of draft animal rearing, feeding, earning and profits of animal keepers, distance covered, days of op-

eration in year etc. A meticulous and comparative data were recorded on single camel wooden cart with two wheeled pneumatic tyre and single bullock wooden cart with two wheeled pneumatic tyre in the suitably developed and pretested proforma by survey method during the year 2000 - 2001.

Sampling procedure: The selection of respondent was carried out by using stratified random sampling technique. The study involved a total of four tehsils of Bikaner district. Four different tehsils were categories into four different zone of Thar desert, viz. Nokha tehsil (south zone) Lunkarensar tehsil (north zone), Kolayat tehsil (west zone) and Bikaner tehsil (east zone). A total of 140 camel cart keepers and 119 single bullock cart keepers were randomly considered for data collection.

Economic analysis: A detail economics of both type of carting systems were analysed by using the Linear Programming method (Loomba, 1992) and under this method all possible, feasible linear components - sub-components were considered to reach a final decision. To obtain the estimates of maintenance cost of animal (feeding and health cover) and carts, the opportunity cost of owned inputs and actual prices paid by the farmers for purchasing inputs were considered. To work out the total earning and expenditure from different sources of farmers, the present day value and market prices were considered.

RESULTS AND DISCUSSION

In the Bikaner district land is dune and soils are low in nitrogen and organic matter content. It is naturally eroded by winds during summer and the crop yield are low and unstable. Some of animal keepers follow a trans-migratory system of animal management. Animal husbandry in this region depends upon the economic and social aspects of land use management. The mean value along with S.E of characteristic features of camel and bullock carting is presented in Table 1. Animal drawn

carting system are very much used in hot arid Thar region for all kinds of material transportation within the cities or from nearby villages to cities and vice-versa. Both type of animal keepers are using their cart to transport different materials viz. crop yields, grain bags, fuel wood, fodder, bhusa, water, gas cylinders, synthetic yarn and building materials etc. Saley (1993) reported that main objective of camel rearing in Rajasthan is animal power for pulling a cart. Two wheeled pneumatic tyre wooden cart is made up of sheesham, babool, neem, desi sagwan etc. The average working life period of camel (14.50 ± 0.50 year) was higher as compared to bullock (10.00 ± 0.66 year) used under carting operation where as the average life period of animal drawn cart was almost same. Similar trend was found by Jain *et al.* (2000). Maximum farmers involved themselves for the carting operation in both cases. But few were also keeping some hired person by which they were doing this operation. The average cost of male and female camel were Rs. $9500 \pm 279/-$ and Rs. $8860 \pm 365/-$, respectively where as the average cost of bullock was Rs. $5672 \pm 488/-$. The average cost of camel cart (Rs. $10500 \pm 300/-$) was about 17 % high as compared to bullock cart (Rs. $8680 \pm 450/-$). Maximum farmers preferred their male camel (96.43%) rather than female (3.57%) for carting operation. The consistency of present observation with earlier reports (Bhakat and Sahani, 2000) has been given. The average working days in a year was almost equal in both type of carting system. The average working time (Hrs/day) for male cart was 9.25 ± 2.11 and for female camel was 8.00 ± 3.00 where as the bullock was for 8.65 ± 2.50 . The average weight/load carrying by bullock cart (8.00 ± 4.11 quintal) was quite low as compared to camel cart (14.5 ± 4.89 quintal). Although a wide range of age of cart camel and bullock were used under both type of carting systems. The average age of cart

camel and bullock were 7.50 ± 2.42 year and 5.89 ± 1.74 year, respectively. Various age group of cart animal is presented in Fig. 1. The average daily total income from camel carting (Rs. $255 \pm 3.50/-$) was estimated to be higher than bullock carting (Rs. $230 \pm 3.00/-$). The camel cart (21.45 ± 6.55 km) covered maximum average distance per day than bullock cart (14.85 ± 5.50 km). The average number of grain bag transporting per round were too many in case of camel carting (18.00 ± 3.50) as compared to bullock carting (9.00 ± 2.58) where as the average estimated carrying cost of each grain bag was quite less on camel cart (Rs. $3.87 \pm 0.50/-$) than bullock cart (Rs. $5.22 \pm 0.74/-$). Most of the farmers were purchasing their draft animal as well cart on cash payment followed by installment and loan basis. In spite of fast mechanization in transport system, the animal drawn cart continue to play an important role because mechanization may not be fully possible due to some techno-economic or socioeconomic problems on these desert ecosystem. Therefore a meticulous and comparative study on animal drawn cart will provide information about how to minimize the cost of transportation and to efficiently utilize the suitable animal resource. The analysis of fixed cost (F.C) is presented in Table 2. The camel cart (Rs. $1800/-$) required higher interest on investment than bullock cart (Rs. $1292/-$). The depreciation on camel cart was also high as compared to bullock cart where the junk value of wooden cart was considered @ 10 % of average initial cost. The expenditures for insurance on camel and bullock were Rs. $499/-$ and Rs. $298/-$, respectively, when premium rate was considered @ 5% of average initial cost along with overall service tax @ 5 % etc. The insurance charges for cart was estimated to be higher in case of camel (Rs. $147/-$) than bullock (Rs. $128/-$). Here various subcomponents like basic value (Rs. $30/-$), liabilities (Rs. $5/-$), 1 % of average actual value of cart along with 5 % overall service tax etc.

Table 1. Mean $\pm$ S.E./Parameters of characteristic feature of camel and bullock carting system.

Parameter		Camel carting	Bullock carting
Working life period of animal (Yr.)		14.50 $\pm$ 0.50	10.00 $\pm$ 0.66
Life period of cart (Yr.)		10.67 $\pm$ 1.75 (9 - 12)	10.85 $\pm$ 1.16 (9 - 12)
Involved in carting (%)	Self	89.29	90.76
	Hired	10.71	9.24
Cost of animal (Rs.)	Male	9500 $\pm$ 279	5672 $\pm$ 488
	Female	8860 $\pm$ 365	NA
Cost of cart (Rs.)	Male	10500 $\pm$ 300 (8500 - 12500)	8680 $\pm$ 450 (6500 - 10700)
	Female	96.43	100
Sex (%)	Male	3.57	8.00 $\pm$ 1.11
	Female	14.5 $\pm$ 4.89 (10 - 20)	(4 - 12)
Weight carrying by cart (per trip) (Quintal)		7.50 $\pm$ 2.42	5.89 $\pm$ 1.74
Age of cart animal (Yr.)		240.57 $\pm$ 5.86 (235 - 246)	236.12 $\pm$ 8.78 (227 - 245)
Working days in a year		9.25 $\pm$ 2.11	8.65 $\pm$ 2.50
Working time of cart animal (Hrs/day)	Male	8.00 $\pm$ 3.00	200 $\pm$ 3.00
	Female	255 $\pm$ 3.50	4.25 $\pm$ 1.89
Total income per day (Rs.)		3.66 $\pm$ 1.25	14.85 $\pm$ 5.50
Number of trip/day (km)		21.45 $\pm$ 6.55 (15 - 28)	(9 - 20)
Distance covered/day (km)		3.87 $\pm$ 0.50	5.22 $\pm$ 0.74
Carrying cost of each grain bag (Rs.)		18.00 $\pm$ 3.50	9.00 $\pm$ 2.58
Number of bag carrying/round		(15 - 21)	(7 - 11)

Figures in the parenthesis indicates the range value of parameters.

Table 2. Analysis of fixed cost

Expenditure (Rs.)	Camel carting	Bullock carting
Interest on Investment (@ 9 %)	1800	1292
Depreciation of Cart	885	720
Insurance on Animal (@ 5 %)	499	298
Insurance on Cart	147	128
Total F.C	3331	2138

Table 3. Analysis of variable cost

Expenditure/year (Rs.)	Camel carting	Bullock carting
Repair and Maintenance of Cart	1550	1150
Wages of operator (@ Rs. 80 per day)	19245	19714
Maintenance of Animal	15330	14965
Shoeing (@ Rs. 50 for 8 iron plates)	0	800
Total V.C	36125	36929

Table 4. Analysis of economic estimate

Parameter	Camel carting	Bullock carting
Total Expenditure (Rs.)	39456	39367
Total Earning (Rs.)	61345	47284
Profit (Rs.)	21889	7917
P.B.P (Year)	0.91	1.81
B.C.R	1.55	1.20

Fig. 1. Various age group of cart animal

were considered. The overall total F.C. was high in camel carting than bullock carting due to higher initial investment. The analysis of variable cost (V.C) is presented in Table 3. The different components of V.C were considered on yearly basis. The repairing and maintenance cost of camel cart (Rs. 1550/-) was high as compared to bullock cart (Rs. 1450/-), when various subcomponents like repairing of tyre puncture, replacement of tyre and repairing/replacement of different body parts etc. were considered. Wages of operator (@ Rs. 80 per day) was almost same in both cases due to almost equal average working days in a year. The expenses towards yearly maintenance (feeding and health cover) of camel and bullock were Rs. 15330/- and Rs. 14965/-, respectively. The bullock which were used in the city area required to replace/change their shoe 1-2 times per month. Hence the total expenditure for shoeing was Rs. 800/- for a year when the current value was considered @ Rs. 50/- for 8 iron plates. The total V.C was observed to be high in bullock carting than camel carting mainly because of that shoeing component.

Shoeing was not required at all for camel due to its well adapted anatomical structure of foot pad. Khanna (1986) reported that camels have soft elastic feet with thick skin around which is good for travel in long sandy terrains. The analysis of economic estimate is presented in Table 4. The total expenditure for both type of carting system was almost equal but total earning from camel carting was quite high as compared to bullock carting. The similar trend was found in case of profit. The pay back period (PBP) was almost double in case of bullock carting as compared to camel carting where as the Benefit Cost Ratio (BCR) was 3/4th time high in case of camel carting as compared to bullock carting.

CONCLUSION

The main advantage of this study is to create awareness among the otherwise ignorant farmers regarding the advantages of camel carting over the bullock carting. To ensure a regular income and sufficient food for farmers and better living standards, it is necessary to go for some other alternate which will provide more income and employment to the unem-

ployment youth of farmer's family. Such enterprises include camel carting over the bullock carting. Camel holds practical values for cost effectiveness, sustainable, environmentally friendly and socio culturally acceptable. In fact camel are life line of the rural population in the remote village of Thar desert. The idea of sustainability of agriculture and livestock pro-

duction revolves around better utilisation of time, money, resource and family labours of the farmers. Therefore, study concludes that due to short pay back period and higher benefit cost ratio camel carting is profitable and advantageous over the bullock carting for small dry land farmer in the hot arid Thar desert

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