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SOCIO-ECONOMIC CHARACTERISTICS OF CAMEL FARMERS IN DIFFERENT ZONES OF SINDH, PAKISTAN

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ABSTRACT

Present study was aimed at studying the socio-economic characteristics of camel farmers including age, family size, education, herd size, composition of camel herd, milk production and camel milk marketing patterns at various zones of Sindh province. For this purpose, 270 camel farmers were randomly selected from three zones of Sindh including sandy desert, coastal mangroves and irrigated plains. It was observed that majority of camel farmers (~51 to 60%) belonged to middle age groups (31 to 40 and 41 to 50 years) at three zones. The average family size of farmers (persons per household) engaged in camel farming was high in the desert (9.18) followed by irrigated (8.70) and coastal (8.43) zone. The rate of illiterate farmers (66%) observed high than the literate farmers (34%) in three zones of Sindh province. The camel herd size was recorded high in areas of sandy desert followed by coastal mangroves and irrigated zone. The camel milk production recorded to be at the top in the sandy desert (11.00 liters/day), moderate at irrigated plains (7.00 liters/day) and at bottom coastal mangroves zone (6.00 liters/day). The market price per camel recorded lowest at sandy desert (Rs.76, 504.43), the highest at coastal mangroves (Rs.87, 355.55) and medium at irrigated plains (Rs.86, 000.00). There was no definite pattern of marketing of camel milk reported in the study area. Therefore, making innovative marketing strategies for camel milk can support camel farmers in improving their socio-economic conditions.

Keywords: camel, marketing, milk, Pakistan, socio-economic

INTRODUCTION

The camel *(Camelus dromedarius*) is one of the important species exclusively adapted to the harsh climatic conditions and therefore, plays a vital role in the lifestyle of nomadic communities by providing milk, meat and transportation (Berhe *et al.*, 2017). This specific adaptability makes the camel ideal to be utilized in the arid and semi-arid climatic zones. The indigenous camel survives in the hard, dry, drought affected areas and mountainous regions under the management conditions of small farmers, nomads and pastoralists with very low inputs where the long term persistence of other livestock is not possible, thus the camel ultimately plays a pivotal role in the economy of the country. The camel is also regarded as status symbol in many parts of the country. Generally, the camels browse on the shrubs and tops of trees so they do not compete with other livestock for their nutritional needs. The camel is used to draw out water from wells, plough the fields for crop sowing, carries goods and used for transportation in those areas, where, especially the movement of machines is impossible or problematic (Wasim, 2007). Most of the research done on the camel focuses on nutrition, reproduction, physiology and health perspectives, while there has been a very little work conducted on socio-economic characteristics of camel and camel farmers. Therefore, there is a need of recognizing the importance of camel in the changing global scenario and to develop the strategies properly that can protect this vital species. Keeping in view the importance of the subject, the present study was designed to observe the socio-economic importance of camel and camel farmers, the potential of camel milk production and its marketing patterns in Sindh province.

MATERIALS AND METHODS

The socio-economic status of camel was monitored and camel milk marketing and the factors limiting its market development was screened.

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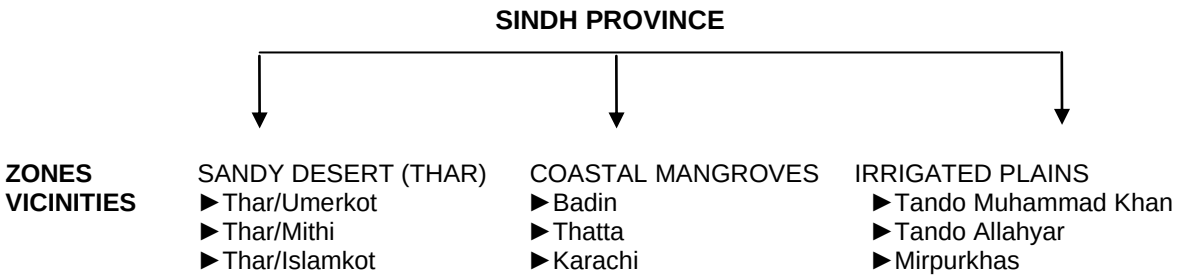

Figure 1. Flow diagram showing camel habitat zones and vicinities of study area

Study area

Three ecological camel habitat zones like Sandy desert, Coastal mangroves and irrigated plains of Sindh province were identified. A total of three vicinities from each zone were randomly included for current study. A flow diagram of experimental area is shown in Figure1.

Data collection

The data regarding the socio-economic status of camel were collected from the study areas of Sindh province as shown in Figure 1. A total of 270 respondents involved in camel business were randomly selected and interviewed face to face through a uniform pre-tested questionnaire duly divided into several parts. The data was generated on the socio-economic status of camel herders, camel population, breeding practices, feeding practices, milk and meat production and their marketing channels.

Tabulation and data analysis

The data from each respondent of camel was gathered and tabulated. Thereafter, it was analyzed through one-way ANOVA procedure of SAS Software (9.4). Means were separated using Tukey HSD test at significance level of $P< 0.05$.

RESULTS AND DISCUSSION

The socio-economic profile is an indicator of the population engaged in any profession and determines pace and pattern of future development (Ahmad *et al*., 2010). Its attributes including age, family size, education, experience and household income play key role in social and economic development of camel farmers (Salamula *et al.*, 2017).

Age distribution

In current study on the basis of age frequencies the camel farmers were divided into five age groups i.e. >30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years and ≤ 60 years (Table 1). The majority of camel farmers (~51 to 60%) belonged to middle age groups (31 to 40 and 41 to 50 years) at three irrigated, coastal and desert zones of Sindh province over five age groups of camel farmers (<30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years and >60 years). The findings are supported by Jasra and Isani (2000) who found relatively similar percentage of middle age farmers (51%) in coastal regions of Sindh. However, Mansour and Bernard (2016) studied the socio-economic situation of camel's herders in Matrouh, Egypt and described that the age of more than half of camel's herders were between 27 and 50 years old, and most of the respondents (33%) were illiterate, 57.5% of them were only camel reared and 85.24% of them possessed their camel stock through inheritance. Authors further stated that, 88.6% of the respondents depend mainly on buying camels as source of income, and 39.05% pay 4000 LE yearly for zakaat or Islamic tax.

Family size

In present study the average family size of farmers engaged in camel farming was high in sandy desert followed by irrigated plains and coastal mangroves i.e. 9.18, 8.70 and 8.43 persons per household, respectively (Table 2). Though, Salamula *et al.* (2017) reported comparatively large family size of camel farmers (11.46±5.48) than present study yet it is higher than the average size (6.45) on national level (GoP, 2017). The reason may possibly be because of joint family systems dwelling in these zones of Sindh. Another reason could be low literacy rate and lack of awareness for family planning among the camel farmers of these areas. The similar results for family size in Sindh were also studied earlier by Jasra and Isani (2000). Thus, the large family size noted in present study might imitate demographic problem in Pakistan generally and in Sindh specifically.

Education

The literacy level of camel farmers in various regions of Sindh shows that the percentage of illiterate farmers was higher than the literate farmers 66% and 34%, respectively in all zones of study area. The highest literacy level was observed in Thar/Islamkot (43%) and the lowest was found in Badin and Tando Allahyar (27%). In brief, majority of farmers (64%) of all the three zones of Sindh were illiterate (Figure 2). Education is the key element of human development and is basic right of every individual in a country. It is the most important criteria for the development of a society. The education level of farmers is an essential variable that helps them increase productivity and agricultural income (Ndour, 2017). Therefore, education level is among the key factors in order to know adoption level of technologies by the farmers (Sharma, 2016). Current study reveals the higher rate of illiterate farmers (66%) than the literate farmers (34%) in the three zones of Sindh province.

Herd size of camel farmers

There was a difference observed in the average number of different types of livestock kept by camel farmers in all three zones of Sindh (Table 3). In sandy desert the herds of camel farmers were dominated by camels 15, 16 and 16 heads in Thar/ Umarkot, Thar/ Mithi and Thar/ Islamkot regions, respectively. The number of cows in Thar/ Umarkot, Thar/ Mithi and Thar/Islamkot regions was 7, 6 and 6 heads, respectively. The number of goats 29, 28 and 27 heads and number of sheep was 26, 25 and 24 in Thar/ Umarkot, Thar/ Mithi and Thar/ Islamkot regions, respectively. Only 9 out of 90 farmers in sandy desert zone had a bullock and none of the farmers had buffalo and horse in the region. Out of 30 farms in each region the highest number of total animals per farm was found in Thar/ Umarkot 77 heads, followed by Thar/Mithi 76 heads and the lowest number of animals per farm was found in Thar/ Islamkot 73 heads. In coastal mangroves, the average number of camels was 7 in all three vicinities (Badin, Thatta and Karachi), while average 3 cows were found at every camel farmer in the three regions. There were average 9 goats, 3 sheep, 2 buffalo and 1 bullock on each farm in Badin, Thatta and Karachi all three regions of the coastal mangroves. However, only 3 horses were found on 90 farms studied in the three vicinities of coastal mangroves. The average population of all animals on each farm was recorded 26, 25 and 24 heads in Badin, Thatta and Karachi regions, respectively. While in irrigated plains there were on average 4.3, 4.6 and 4.8 camels, 3.8, 3.7 and 3.9 cows, 0.6, 0.5 and 0.5 bullocks, 9.7, 9.2 and 8.8 goats, 3.6, 3.5 and 3.3 sheep, 3.1, 2.9 and 3.0 buffalos in Tando Muhammad Khan, Tando Allahyar and Mirpurkhas regions, respectively. The average population of all animals on each farm was recorded 25, 24 and 24 heads in Tando Muhammad Khan, Tando Allahyar and Mirpurkhas regions, respectively.

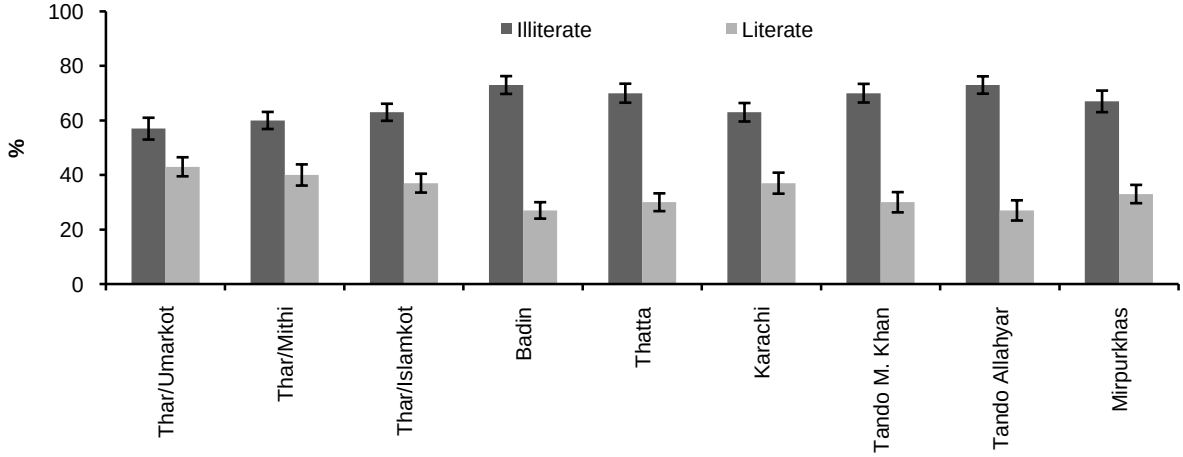

Figure 2. Literacy level of camel farmers in various zones of Sindh

Table 1. Age frequencies of camel farmers in various zones of Sindh

Zone	Vicinity	Age distribution										Total	
		< 30 Yrs		31 to 40 Yrs		41 to 50 Yrs		51 to 60 Yrs		> 60 Yrs			
		F	P	F	P	F	P	F	P	F	P	F	P
Sandy Desert	Thar/Umerkot	2	7	8	27	10	33	6	20	4	13	30	100
	Thar/Mithi	3	10	9	30	9	30	5	17	4	13	30	100
	Thar/Islamkot	2	7	10	33	8	27	8	27	2	7	30	100
	Total	7	8	27	30	27	30	19	21	10	11	90	100
Costal Mangroves	Badin	3	10	4	13	10	33	8	27	5	17	30	100
	Thatta	1	3	8	27	9	30	8	27	4	13	30	100
	Karachi	2	7	10	33	8	27	6	20	4	13	30	100
	Total	6	7	22	24	27	30	22	24	13	14	90	100
Irrigated Plains	Tando M. Khan	0	0	15	50	7	23	5	17	3	10	30	100
	Tando Allahyar	2	7	8	27	11	37	8	27	1	3	30	100
	Mirpurkhas	3	10	8	27	10	33	8	27	1	3	30	100
	Total	5	6	31	34	28	31	21	23	5	6	90	100

*F = frequency, P = Percentage

Table 2. Family size (persons/household) of camel farmers in various zones of Sindh

Zones	Mean	Standard Deviation	Maximum	Minimum	*P* value
Sandy Desert	9.18	3.04	14	4	0.598
Thar/Umerkot	9.60	3.30	14	4	
Thar/Mithi	9.13	2.85	13	4	
Thar/Islamkot	8.80	3.02	13	4	
Costal Mangroves	**8.43**	**2.69**	**14**	**4**	**0.492**
Badin	8.10	2.47	12	4	
Thatta	8.90	2.88	14	4	
Karachi	8.30	2.72	14	4	
Irrigated Plains	**8.70**	**2.85**	**14**	**4**	**0.414**
Tando Muhammad Khan	9.23	2.66	13	5	
Tando Allahyar	8.27	2.86	13	4	
Mirpurkhas	8.60	3.01	14	4	
Total	8.77	2.87	14	4	0.212

Table 3. Livestock herds (numbers) of camel farmers in various regions of Sindh

Livestock		Sandy desert			Coastal mangroves			Irrigated plains		
		Thar/ Umerkot	Thar/ Mithi	Thar/ Islamkot	Badin	Thatta	Karachi	Tando M. Khan	Tando Allahyar	Mirpur khas
Camel	Mean	15.10	16.37	15.63	7.00	6.60	6.80	4.27	4.63	4.80
	SD	13.03	12.10	11.63	3.47	2.76	2.70	2.23	2.53	2.67
	Max	75	73	71	16	13	13	10	12	12
	Min	4	6	6	2	3	2	1	1	1
Cow	Mean	6.50	6.40	6.30	3.30	3.23	3.03	3.80	3.67	3.90
	SD	5.51	5.24	5.09	3.26	3.10	2.89	3.12	3.21	2.93
	Max	22	21	20	12	11	11	12	11	12
	Min	1	1	1	1	1	1	1	1	2
Bullock	Mean	0.23	0.23	0.23	0.57	0.50	0.53	0.57	0.50	0.53
	SD	0.21	0.21	0.19	0.43	0.39	0.38	0.43	0.44	0.47
	Max	3	3	3	7	5	6	7	5	6
	Min	0	0	0	1	1	1	1	1	1
Goat	Mean	29.00	28.20	27.33	9.13	8.93	8.77	9.73	9.17	8.83
	SD	26.50	25.60	25.10	7.38	7.49	7.63	8.73	8.20	7.88
	Max	100	97	95	32	30	33	40	38	36
	Min	4	4	4	4	4	4	4	4	4
Sheep	Mean	26.03	25.30	23.83	3.60	3.50	3.33	3.60	3.50	3.33
	SD	23.12	22.31	21.82	3.45	3.28	3.10	3.45	3.28	3.10
	Max	100	100	95	10	9	9	10	9	9
	Min	3	5	5	3	3	3	3	3	3
Buffalo	Mean	--	--	--	2.23	2.10	2.00	3.07	2.90	3.00
	SD	--	--	--	2.90	2.81	2.68	3.31	3.38	3.26
	Max	0	0	0	12	11	11	12	13	11
	Min	0	0	0	1	1	1	2	1	1
Horses	Mean	--	--	--	0.10	0.10	0.10	0.10	0.10	0.10
	SD	--	--	--	0.31	0.31	0.31	0.31	0.31	0.31
	Max	0	0	0	1	1	1	1	1	1
	Min	0	0	0	1	1	1	1	1	1

SD=standard deviation, Max=maximum, Min=minimum

Table 4. Composition of camel herds (numbers) in study area

Zone	Area	Mean	Standard Deviation
Sandy desert	Thar/Umerkot	15.10 [a]	13.03
	Thar/Mithi	16.37 [a]	12.10
	Thar/Islamkot	15.63 [a]	11.63
	P value	0.9226	
Coastal mangroves	Badin	7.00 [b]	3.47
	Thatta	6.60 [b]	2.76
	Karachi	6.80 [b]	2.70
	P value	0.8752	
Irrigated plains	Tando Muhammad Khan	4.27 [c]	2.23
	Tando Allahyar	4.63 [c]	2.53
	Mirpurkhas	4.80 [c]	2.67
	P value	0.6968	
	P value for all zones	<.0001	

[a,b,c] means having different superscript along the same column are significantly different ($P< 0.05$)

Table 5. Camel milk production (liters/day) in various zones of Sindh
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Zone	Area	Mean	Standard Deviation
Sandy Desert	Thar/Umerkot	10.73	4.98
	Thar/Mithi	10.40	4.34
	Thar/Islamkot	10.70	5.26
Coastal Mangroves	Badin	6.40	2.57
	Thatta	6.07	2.18
	Karachi	6.00	2.29
Irrigated Plains	Tando Muhammad Khan	6.60	3.21
	Tando Allahyar	6.50	2.57
	Mirpurkhas	6.47	2.16

Table 6. Market price of camels (rupees) in various zones of Sindh

Zone	Area	Price (Rs)	Range (Rs)
Sandy Desert	Thar/Umerkot	74966.67	66000 - 86000
	Thar/Mithi	76433.33	64000 - 89000
	Thar/Islamkot	78113.33	63000 - 90000
Coastal Mangroves	Badin	87100.00	60000 - 150000
	Thatta	87400.00	60000 - 150000
	Karachi	87566.67	65000 - 150000
Irrigated Plains	Tando Muhammad Khan	86233.33	60000 - 150000
	Tando Allahyar	86033.33	60000 - 150000
	Mirpurkhas	85733.33	60000 - 150000

Table 7. Distance of local market (kms) from camel farms in various zones

Zone	Area	Mean	Standard Deviation
Sandy Desert	Thar/Umerkot	11.90	6.11
	Thar/Mithi	12.17	6.03
	Thar/Islamkot	12.00	4.62
Coastal Mangroves	Badin	14.00	8.80
	Thatta	14.43	9.63
	Karachi	14.27	9.44
Irrigated Plains	Tando Muhammad Khan	11.47	7.27
	Tando Allahyar	12.20	7.61
	Mirpurkhas	11.93	8.15

Composition of camel herds

Sandy desert had the highest population of camels per farm 15.10, 16.37 and 15.63 in Thar/ Umarkot, Thar/ Mithi and Thar/ Islamkot regions respectively, followed by coastal mangroves region 7.0, 6.6 and 6.8 in Badin, Thatta and Karachi regions, respectively. While the lowest camel population per farm was recorded at Tando Muhammad Khan, Tando Allahyar and Mirpurkhas regions with 4.27, 4.63 and 4.80 camels per farm, respectively.

The population of camels was highly significant ($P< 0.05$) within sandy deserts, coastal mangroves and irrigated plain zones, while there was no significant difference observed ($P> 0.05$) when compared to the districts within the same zone (Table 4). While, other study stated that only about a sixth of

households own solely camels, majority of camel-owning households combine them with small stock (Herren, 1990). Researcher further reported that half of the households own either cattle and/or a field, thus, half of the camel-owners are agro-pastoral producers and the main consequence of this is that households adopt socioeconomic strategies which are determined by a complex interplay of options and constraints.

Milk production and marketing

The milk production of camel in various zones of Sindh showed that the highest milk production per day per farm was recorded in Sandy desert (11 liters/day), followed by irrigated plains (7 liters/day) and the lowest milk production was seen in coastal mangroves zone (6 liters/day) (Table 5). The Pakistani camel has an excellent potential for milk production (Ahmad *et al.*, 2010). Camel milk has a superior keeping quality compared to cow milk, due to its high protein content that has inhibitory properties against bacteria. This makes raw camel milk a marketable commodity, even under high temperatures with very basic hygienic conditions (Yaqoob and Nawaz, 2007). The camel milk produced in the farm cannot reach the urban markets and is utilized locally. The farmers either do not sell the milk or give it free of cost mostly due to its production in far-off places (mountainous and desert areas), and thus cannot be transported to urban markets. But sometimes it is being sold in urban markets as a whole or mixed with milk of cattle and buffalo, especially in time when market demand increases than the usual supply (Yaqoob and Nawaz, 2007). There is no established marketing infrastructure for camel milk and milk products mostly the sites used are the open grounds or the facing of other shops. Sometimes the camel milk producers take their camels to major markets milked them and sold their milk to the end consumers. Their sale also occurs in exhibitions and local livestock “melas”. The poor marketing infrastructure encourages the middle man involvement so there is less profit or gains achieved by producers. Kachha and pakka dodhies purchase camel milk from producers mainly from villages at much cheaper prices, mixed it with milk of cattle and buffalo and then sale it at higher prices to the end consumers. The most common milk products include various sour milks like dahi and lassi. It is commonly claimed that camel milk is difficult to process into products and is only suitable for drinking as fresh or sour milk (Berhe *et al.*, 2017). There is a common belief in south Asia that camel milk cannot be used to prepare butter and ghee due to the small diameter of fat globules, therefore, cheese and butter are not produced by local camel farmers. However, recently the possibilities to produce several products from camel milk such as soft cheese (Ahmed and Kanwal, 2004), yoghurt (Al-Saleh *et al.*, 2011), and butter (Berhe *et al.*, 2013), have been reported. Camel milk has also been traditionally known for its medicinal properties and experimental results have revealed that camel milk has antiallergic, antimicrobial, and antidiabetic properties (El-Salam and El-Shibiny, 2013).

Marketing of camel

The market price per camel recorded lowest at sandy desert (Rs.76, 504.43), the highest at coastal mangroves (Rs.87, 355.55) and medium at irrigated plains (Rs.86, 000.00) in current study (Table 6). Regardless, there was no established marketing infrastructure in various zones of Sindh; however, there are certain local markets. Mainly the middlemen bring camels from different areas to markets. Generally, there are weekly and monthly markets for all types of livestock including camels, however, two markets are famous for sale and purchase of camels in Sindh, one is in district Badin and another in Oderolal, district Matiari. The average distance of local market was 13 kilometers from the camel farm with 12, 14 and 12 kilometers for sandy desert, coastal mangroves and irrigated plains, respectively (Table 7). For all types of livestock including camels weekly and monthly markets are arranged, particularly three markets (Badin, Oderolal and Hala) are famous for sale and purchase of camels in Sindh. Whereas, Ali *et al*. (2009) reported that the price of racing and well trained camel is between Rs.150000 to 200000, while a milking camel may fetch a price of 120000, while in meat condition animal fetches a good price of 100000 to 150000 and those which are slaughtered at Eid-ul-Azha as 100000 to 300000. They further stated that mostly in common, at various marketing places, the camel is slaughtered weekly especially at Friday and the people from far away places come there to take the camel meat.

CONCLUSION

The findings of present study suggest that the middle age groups (31 to 40 and 41 to 50 years) were more engaged in camel raising in all three

zones of camel farming in Sindh. The highest literary level was found in the farmers of sandy desert and there were more illiterate farmers than literate ones in all the three zones of Sindh. The highest population of camel was found in sandy desert followed by coastal mangroves and the lowest in irrigated plains. Similarly, the highest milk production was reported in sandy desert. However, there is no established marketing infrastructure for camel milk. Therefore, it is vital to make innovative marketing strategies that can support farmers willing to raise camels. There is need for extension services that target camel rearing where small farmers are involved.

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