



## Livestock Resources, Current Management Practices And Socio-Economic Analysis Of Cholistan Desert, Pakistan

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### Abstract

Pakistan is a developing country that has growing responses in the demand of livestock products by increases with population dynamically. In Punjab, Cholistan is an arid and hottest place which considered as notable supply line for mutton and livestock products. The main source of income of nomad pastoralists of Cholistan desert is the livestock rearing including sheep, goats, cattle and camels. Basically, desert of Cholistan is divided into two parts includes greater and lesser Cholistan. Majority of families with their animals are residing in "Toba", it is a source of fresh water made by during natural rainy season is self-made ponds. This study pertains to livestock management practices and marketing pattern in greater and lesser regions of Cholistan desert. For this purpose, field survey was conducted for data collection from representative families residing in the 24 randomly selected "Tobas". A total of 384 households were interviewed through the semi-structured questionnaire. Population of cattle and donkey were significantly higher observed in greater Cholistan as compared to lesser Cholistan at household and Toba levels. Camel population was significantly higher reported in lesser Cholistan than the greater Cholistan. Numbers of sold animal were higher (622) in lesser Cholistan compared with greater Cholistan (790). Peak milk production, total milk production and total milk sold liters/day of cattle was significantly higher in greater Cholistan as compared to lesser Cholistan. Simialry, peak and total milk production (liters per animal/day) of camel was more in lesser cholistan as compared to greater Cholistan. Higher percentage of female involvement in livestock was observed more in greater Cholistan as compared to lesser Cholistan. It is concluded that the livestock is the main source of income in region of Cholistan. The scarcity of feed availability and conventional livestock trade methods are the main obstacles to the development livestock production and

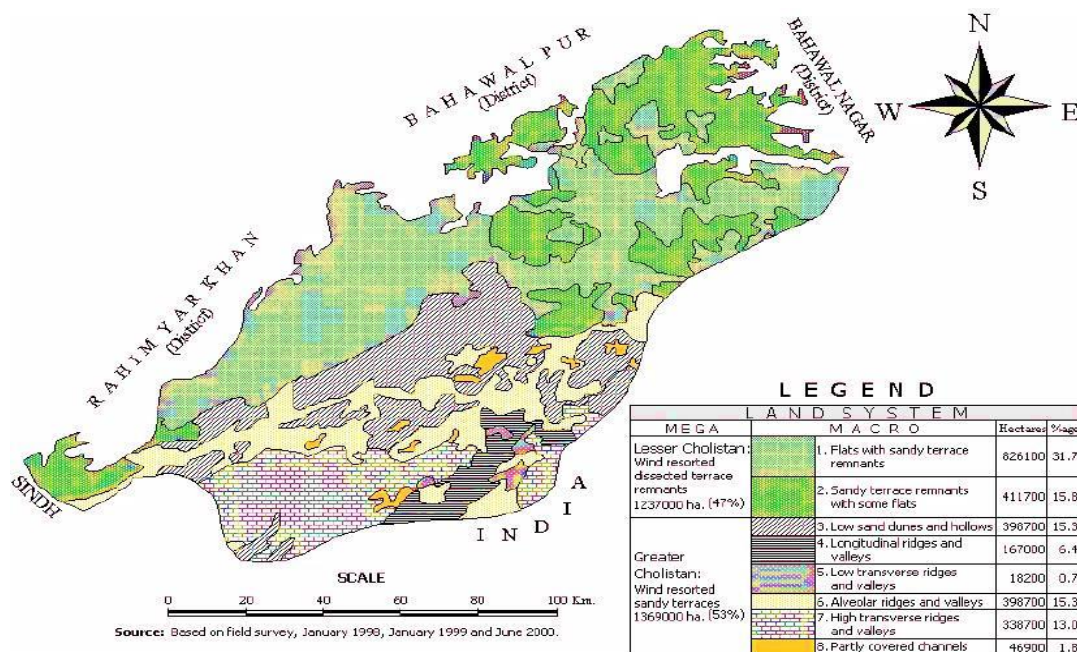
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subsequent improvement in the livelihoods of the farmers. This study will help in the planning for efficient and sustainable improvements in livestock economy of the region.

**Keywords:** *livestock, resources, management, socio-economic, cholistan*

## Introduction

In Pakistan, rangelands occupy 63.9% of the land surface and in Punjab, more than 40% of Punjab is arid and constitute grazing lands in its south, west and north-west parts. Due to the high exposure to the impact of climatic change, the region is exposed to the increasing desertification (Iqbal *et al.*, 2000). However, the frequent droughts triggered by the climatic variation is reducing the resilience capacity of stakeholder communities and increasing their vulnerability. Livestock holding is considered a big source of livelihood for rural people and provide them comfort, food security and social security (Hasnain & Usmani, 2006). Humans use livestock for various goods and services (Hoffmann & Baumung, 2013). These include milk, yogurt, butter, oil and meat in our meals on a regular basis. Other products include wool and products of wool and leather (Chaudhry *et al.*, 1999). The Cholistan is an extension of the Great Indian Desert is located above the sea level at 112m (Akbar *et al.*, 1996; Akhter & Arshad, 2006) and spread over an area of 26000 Km<sup>2</sup> (Mughal, 1982). It is bounded by the Thar desert in Sindh province of Pakistan and the Rajasthan desert in India (FAO/ADB, 1993; Jowkar *et al.*, 1996). Similarly, availability of water is less due to low rainfall and prevalence of drought which remained 2 to 3 years in many areas of Cholistan. (Ali *et al.*, 2009). Cholistan desert mainly composed of two geomorphic regions (Figure 1), that based on types of soil and vegetation. The Northern region of the lesser Cholistan has an area of 7,770 Km<sup>2</sup> while the Southern region of the greater Cholistan of 18,130 Km<sup>2</sup> (Ahmad *et al.*, 1992; Akbar *et al.*, 1996). During the rainy season, the surface water is collected in manmade ponds or natural depressions called “Tobas” and “Dahars” which is the primary source of sweet water (Khan *et al.*, 1990). Small to largely sized herds of cattle, sheep, goats and camels are owned by different clans of pastoral nomads occupying the Cholistan through a seasonal calendar. The seasonal habitations of nomads are spread around the “Tobas” each containing around 5-20 households (Akbar *et al.*, 1996).



The focus of research and development during the past has remained biased in favor of the intensive livestock production and many aspects related to research for the development of dry land livestock production has not been taken into consideration. In the year 2000, a relatively detailed baseline survey was carried out in Cholistan desert of Punjab. However, the information obtained was limited to only a few aspects including a different aspect of livelihood, traditions and vegetation (Farooq *et al.*, 2009). Keeping all this in view, the

current study was aimed to explore the current livestock management practices and marketing pattern in the Cholistan desert.

## Materials and Methods

### Location of the Study Area

The proposed study was conducted in the Cholistan desert located in the Bahawalnagar, Bahawalpur and Rahim Yar Khan districts of Punjab (Pakistan). Primarily, the Cholistan desert has pastoral economy and the lifestyle of people living there for centuries is nomadic. Small to large sized herds of cattle, sheep, goats and camels are owned by these nomads. The breeds of all livestock species are local which are well adapted to local climatic conditions (Figures 2-5). There are small habitations which are particularly spread around the “Tobas”, which are man-made large pits used for the storage of rainwater in ponds (Akbar *et al.*, 1996). Total time duration of the field surveys was comprised of 12 weeks in which data were collected through individual family member and was derived from discussions made with focused group.

### Study Design

The research design was basically exploratory, based on the individual visits to each household in the selected Toba of Cholistan regions as well as focused group discussion at Toba level. The data were obtained from the office of the Director Livestock Cholistan; Bahawalpur as a first step about the prevailing profile of Cholistan (Table 1).

**Table 1: Demographic profile of Cholistan**

S. no.	Feature	Number
1.	Total area of Cholistan	260600 km <sup>2</sup>
2.	Number of inhabitants	0.2 million
3.	Number of households	28,571
4.	Number of registered tobas (inhabited)	1100
5.	No. of unregistered tobas (partially inhabited or uninhabited)	712
6.	Total number of tobas in Cholistan	1812
7.	Average number of persons per household	07
8.	Average number of households per toba	16

Total 28571 households scattered all over the Cholistan in 1812 (inhabited, partially inhabited or uninhabited) tobas were considered as total population size. A survey was conducted through a well-structured questionnaire in 24 randomly selected tobas of Cholistan, located in all three districts i.e. Bahawalnagar, Bahawalpur and Rahim Yar Khan. By keeping margin of error upto  $\pm 5\%$ , 384 households approximately with average size of 16 households per toba, were visited individually. These questionnaires were of two types; family questionnaire and focused group questionnaire.



**Figure 2.** Shows that Tobas where people of Cholistan were lived (after rainfall season)



**Figure 3.** Shows that people live near the wells (Khu) after shortage of water in Toba



**Figure 4.** Shows that Humans and Animals are drinking same water from same Toba

### Collection of Data and Samples

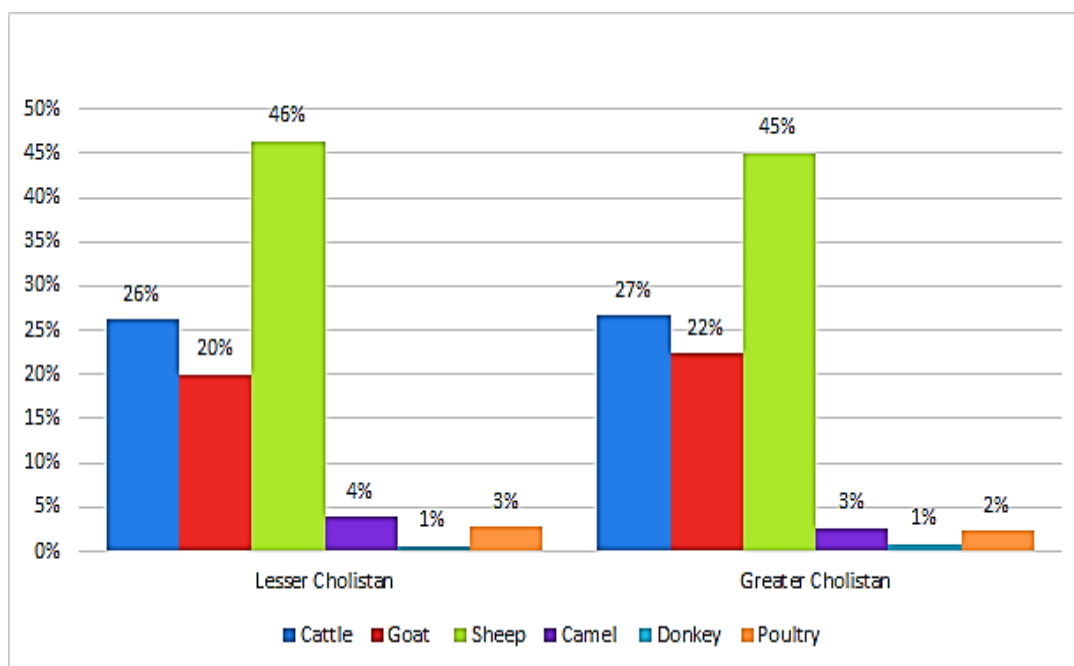
For collection of the information regarding annual herd dynamics, animal mobility pattern, use of products and family labor distribution, family questionnaires were filled up by interviewing one of the family members available at the house. Each household was marked by GPS device (eTrax Garmin). Focused group discussions, comprised of the local aged herders well responsible among the local pastoral groups representing different clans residing in each Toba which was organized for collection of the information about season of animal mobility pattern, marketing pattern of live animals and hindrances, basic facilities such as road network, hospital (BHU/RHC), Veterinary clinic (CVD/MVD), schools and water storage tanks. Each individual present in the focused group discussion session at each Toba was given a chance to answer or give his opinion about the question asked. Interviews, focused group discussions and field visits were used as the tools of participatory rural appraisal (PRA) (Lans & Brown, 1998). The survey team was accompanied by a veterinary officer / a trained field assistant from the local community or any local representative from Livestock and Dairy Development Department, Govt. of the Punjab well versed with the local language, i.e. Saraiki.

### Statistical Analysis

The data collected were entered in MS Excel spreadsheets and using SPSS version-20. The comparison between different variables was compared by using independence sample T-test. The  $P$ -value  $\leq 0.05$  was considered significant. Descriptive statistics was employed in the form of averages and percentages along with appropriate graph type. The comparison among different species was made through one-way ANOVA technique using GLM procedures in SAS software (Version-9.1.).

## Results

Population of cattle was significantly higher in greater Cholistan ( $p < 0.05$ ) at household level than the lesser Cholistan (Figure 5). Moreover, camel population was significantly higher in lesser Cholistan ( $p < 0.05$ ) than the greater Cholistan at household level. Whereas the population of other livestock species (goats, sheep, donkeys and poultry) were recorded higher for greater Cholistan, however, statistically did not show any significant difference ( $p > 0.05$ ) between greater and lesser Cholistan (Table 2). In greater Cholistan, donkey population was significantly high ( $p < 0.05$ ) as compared to the lesser Cholistan on Toba level (Table 3). Although, population of other livestock species includes cattle, goats, sheep and poultry population were recorded higher for greater Cholistan, moreover, statistical analyses showed non-significant differences ( $p > 0.05$ ) between greater and lesser Cholistan.



**Figure 5.** Percent herd composition per family in lesser and greater Cholistan

Regarding birth rate of cattle calves was significantly ( $p < 0.05$ ) higher in greater Cholistan at house level (Table 4). Non-significant differences were found among amongst other species i.e., goats, sheep, camels at greater and lesser Cholistan. Likewise, livestock species cattle, goats, sheep and camel mortality were higher for greater Cholistan at household level and Toba levels numerically as shown in tables 5 and 6. Similarly, statistically data were not showed any significant difference ( $p > 0.05$ ) between greater and lesser Cholistan. Survey data reveals that the number of heads of cattle, goats, sheep sold increased at greater Cholistan as compared to lesser Cholistan at household and Toba levels. In contrast, numbers of camels sold were higher for lesser Cholistan as compared to greater Cholistan (Tables 7 & 8). Similarly, statically non-significant difference ( $p > 0.05$ ) were found between lesser and greater Cholistan.

**Table 2.** Species wise livestock population at household level in lesser and greater Cholistan

Species	Lesser Cholistan			Greater Cholistan			P-Value
	Households (n)	Total Animal Population	Mean±SE	Households (n)	Total Animal Population	Mean±SE	
<b>Cattle</b>	168	3534	21.03±1.29	185	4893	26.49±2.01	0.027*
<b>Goats</b>	105	2697	25.68±2.84	132	4112	31.15±4.73	0.354
<b>Sheep</b>	108	6254	57.90±4.88	134	8281	61.79±5.63	0.611
<b>Camels</b>	46	527	11.45±1.94	69	499	7.23±1.27	0.059*
<b>Donkeys</b>	69	93	1.34±0.08	88	162	1.84±0.29	0.149
<b>Poultry</b>	40	368	9.2±1.03	48	432	9±1.06	0.893

**Table 3.** Species wise livestock population at Toba level in lesser and greater Cholistan

Species	Lesser Cholistan			Greater Cholistan			P-Value
	Tobas (n)	Total Animal Population	Mean±SE	Selected Tobas (n)	Total Animal Population	Mean±SE	
Cattle	11	3534	321.27±27.31	11	4893	444.81±67.43	0.105
Goats	11	2697	245.18±15.47	11	4112	373.81±69.51	0.085
Sheep	11	6254	568.54±58.47	11	8281	752.81±104.12	0.138
Camels	11	527	47.90±13.79	11	499	45.36±13.35	0.895
Donkeys	11	93	8.45±1.24	11	162	14.72±2.60	0.041*
Poultry	11	368	33.45±6.37	11	432	39.27±9.04	0.604

**Table 4.** Species wise livestock birth per year at household level in lesser and greater Cholistan

Species	Lesser Cholistan				Greater Cholistan				P-Value
	Households with livestock Birth (Total HH) (n)	Total Animal Population	Total Animal Birth	Mean±SE	Households with livestock Birth (Total HH) (n)	Total Animal Population	Total Animal Birth	Mean±SE	
Cattle	176(155)	3534	733	4.72±0.26	208(174)	4893	1077	6.18±0.42	0.004*
Goats	176(100)	2697	749	7.49±0.91	208(123)	4112	1195	9.71±1.51	0.235
Sheep	176(108)	6254	1508	13.96±1.08	208(130)	8281	2292	17.63±2.12	0.148
Camels	176(28)	527	99	3.53±0.73	208(31)	499	95	3.06±0.55	0.606
Donkeys	---	93	---	---	---	162	---	---	---
Poultry	---	368	---	---	---	432	---	---	---

**Table 5.** Species wise livestock mortality per year at household level in lesser and greater Cholistan

Species	Lesser Cholistan				Greater Cholistan				P-Value
	Households with livestock mortality (Total HH) (n)	Total Animal Population	Total Animal Mortality	Mean±SE	Households with livestock mortality (Total HH) (n)	Total Animal Population	Total Animal Mortality	Mean±SE	
Cattle	26 (176)	3534	44	1.69±0.15	38 (208)	4893	85	2.23±0.31	0.182
Goats	53 (176)	2697	262	4.81±0.90	54 (208)	4112	288	5.25±0.79	0.710
Sheep	42 (176)	6254	269	6.28±0.78	64 (208)	8281	412	6.43±0.81	0.898
Camels	2 (176)	527	4	1.5±0.5	3 (208)	499	5	1.66±0.33	0.788
Donkeys	---	93	---	---	---	162	---	---	---
Poultry	---	368	---	---	---	432	---	---	---

**Table 6.** Species wise livestock mortality per year at Toba level in lesser and greater Cholistan

Species	Lesser Cholistan				Greater Cholistan				P-Value
	Tobas with livestock mortality (Total Tobas) (n)	Total Animal Population	Total Animal Mortality	Mean±SE	Tobas with livestock mortality (Total Tobas) (n)	Total Animal Population	Total Animal Mortality	Mean±SE	
Cattle	11 (11)	3534	44	4.45±0.79	11 (11)	4893	85	7.72±2.79	0.271
Goats	11 (11)	2697	262	23.81±3.10	11 (11)	4112	288	26.18±6.08	0.732
Sheep	11 (11)	6254	269	24.45±3.95	11 (11)	8281	412	37.45±7.97	0.159
Camels	3 (11)	527	4	1.33±0.33	4 (11)	499	5	1.25±0.25	0.845
Donkeys	----	93	----	----	----	162	----	----	----
Poultry	----	368	----	----	----	432	----	----	----

**Table 7.** Species wise livestock sold per year at household level in lesser and greater Cholistan

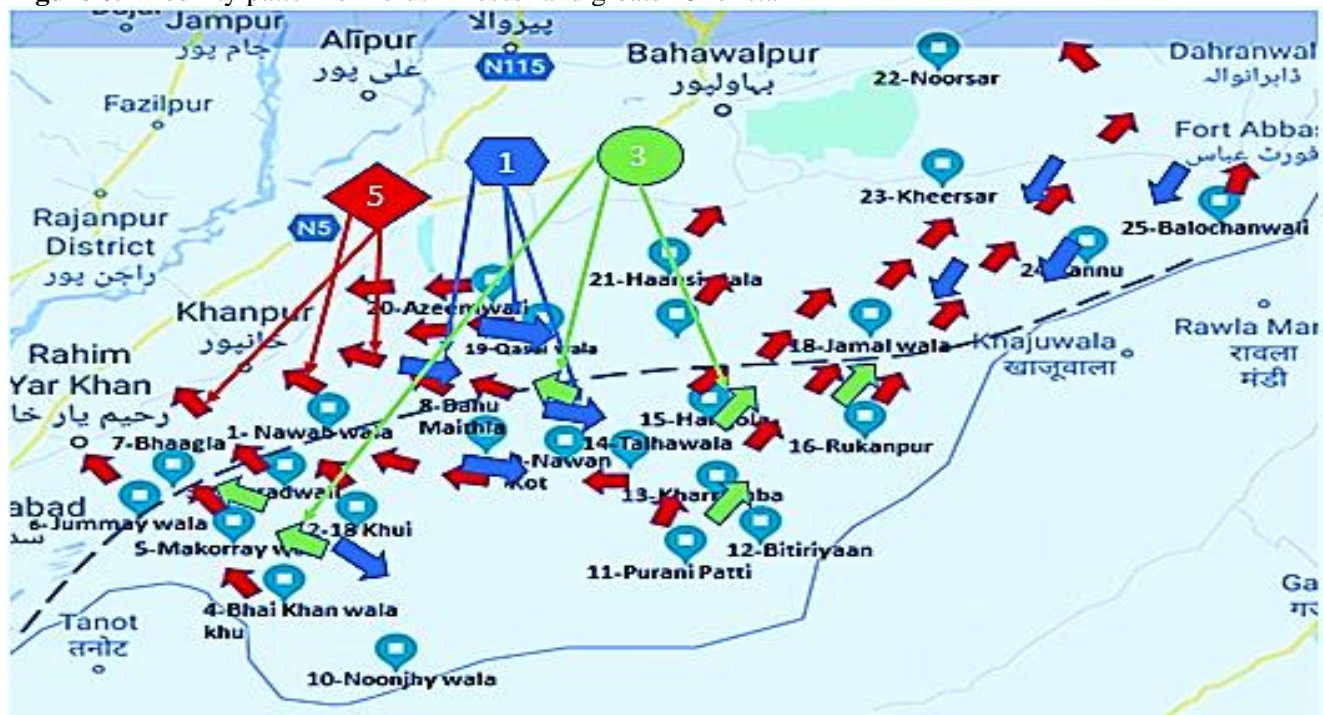
Species	Lesser Cholistan				Greater Cholistan				P-Value
	Households with livestock Sold (Total HH) (n)	Total Animal Population	Total Animal Sold	Mean±SE	Households with livestock Sold (Total HH) (n)	Total Animal Population	Total Animal Sold	Mean±SE	
Cattle	50 (176)	3534	127	2.54±0.28	59 (208)	4893	172	2.91±0.45	0.503
Goats	27 (176)	2697	145	4.70±0.71	41 (208)	4112	242	5.90±1.40	0.513
Sheep	47 (176)	6254	316	6.72±0.61	50 (208)	8281	354	7.08±1.78	0.853
Camels	6 (176)	527	34	5.66±1.47	4 (208)	499	22	5.5±1.65	0.943
Donkeys	----	93	----	----	----	162	----	----	----
Poultry	----	368	----	----	----	432	----	----	----

**Table 8.** Species wise livestock sold per year at Toba level in lesser and greater Cholistan

Species	Lesser Cholistan				Greater Cholistan				P-Value
	Tobas with livestock sold (Total Tobas) (n)	Total Animal Population	Total Animal Sold	Mean±SE	Tobas with livestock sold (Total Tobas) (n)	Total Animal Population	Total Animal Sold	Mean±SE	
Cattle	11 (11)	3534	127	11.54±2.37	11 (11)	4893	172	15.63±4.13	0.400
Goats	11 (11)	2697	145	13.18±2.45	11 (11)	4112	242	22.18±7.03	0.241
Sheep	11 (11)	6254	316	28.72±4.92	11 (11)	8281	354	32.18±9.91	0.758
Camels	4 (11)	527	34	8.5±2.95	3 (11)	499	22	7.33±3.92	0.813
Donkeys	----	93	----	----	----	162	----	----	----
Poultry	----	368	----	----	----	432	----	----	----

Table 9 presents the percentage of people movement in greater Cholistan by foot (Figure 6) and through vehicle were 72.6%, and 1.4% respectively. Moreover, some of these percentages were found higher as compared with lesser Cholistan. Similarly, in lesser Cholistan the percentage of people movement to the market by mixed movement technique (44.9%) was higher than greater Cholistan. Percentage of species wise grazing (86.9%) was higher in lesser Cholistan as compared to greater Cholistan (Table 10). Correspondingly, percentage of variable grazing depending upon weather/season in greater Cholistan was 30.3%, which was higher as compared to lesser Cholistan.

**Figure 6.** Mobility pattern of herds in lesser and greater Cholistan



➡ Jul-Aug Movement from riverine canals areas of lesser Cholistan, toward their Tobas. Livestock grazes fodder surround Tobas.

Sep-Oct	Movement of herders depends upon the availability of grazing space and water availability in toba. Movement start toward temporary camps at Tobas/ khu /kunds of other occupants, Livestock of guest herder graze far away from Tobas/kunds.
● Nov-Dec	Continued movement from one Toba to other Tobas/kunds in search of water and vegetation for livestock.
Jan-Feb	In search of water & vegetation Pastoralists Migrate continuously with short stays toward Tobas/khoo and lesser Cholistan. And livestock grazes surround the Tobas/ Khoo/kunds at distance.
◆ Mar-Apr	Return to irrigated fringes of Lesser Cholistan increases as wheat harvesting period arrives closer. Livestock grazes at distant places around Tobas/kunds.
May	Stay in villages and temporary congregations on wastelands. Livestock depends on grazing and stall feeding of purchased or self-planted fodder.
Jun	

As shown in table 11, the percentage of free grazing increased (77.9%) pursued by herders in greater Cholistan as compared to lesser Cholistan. Similarly, in greater Cholistan the percentage of feeding wheat straw from self-cultivated land (33.7%) was higher than lesser Cholistan. The percentage of TMR purchase from main market (19.2%) was higher in greater Cholistan then lesser Cholistan. Survey data of peak milk production, total milk production and total milk sold liters/day were significantly higher in greater Cholistan ( $P < 0.005$ ) as compare to the lesser Cholistan (Table 12).

With regards to the family composition, age of people and family labor distribution, it was observed that in lesser and greater Cholistan the average family size was 13 persons (1 old person, 5 adult males, 4 adult females and 4 children). In lesser Cholistan variation was observed in percentage different age groups, adult male ranging from 16-30 years were more as compared to lesser Cholistan. Similarly, adult male ranging from 46-60 years were more in lesser Cholistan as compared to greater Cholistan. About adult female ranging from 31-45 years were more in percentage in greater Cholistan as compared to lesser Cholistan. Similarly, the children ranging from 6-10 years were more in percentage in greater Cholistan as compared to lesser Cholistan (Table 13).

**Table 9. The movement techniques used in lesser and greater Cholistan**

Sr. No	Areas	Households (n)	Movement techniques used			
			By foot (%)	By Vehicle (%)	Mixed (%)	
1	Lesser Cholistan	Within Toba	176	100	0.0	0.0
		Within Desert	176	100	0.0	0.0
		Outside Desert	176	100	0.0	0.0
		To the Market	176	54.0	1.1	44.9
2	Greater Cholistan	Within Toba	208	100	0.0	0.0
		Within Desert	208	100	0.0	0.0
		Outside Desert	208	100	0.0	0.0
		To the Market	208	72.6	1.4	26.0

**Table 10. Grazing pattern of livestock in lesser and greater Cholistan**

Sr. No	Questions		Lesser Cholistan		Greater Cholistan	
			Households (n)	Percent using the pattern (%)	Households (n)	Percent using the pattern (%)
1	How do you graze your animals?	Species by species separately	176	86.9	208	76.4
		Mixed herd	176	31.8	208	37.5
		Based on production level	176	0.0	208	0.0
		Based on animal's age	176	0.0	208	0.5
2	What is the direction/site of grazing animals which you used?	Daily use same direction to grazing	176	0.0	208	0.0
		Rotational grazing	176	100	208	100
		No grazing plans	176	1.1	208	1.0
		Different species different method/site	176	0.0	208	0.0
3	When do you graze your animals?	Morning to afternoon	176	0.0	208	3.4
		Morning to evening	176	96	208	93.3
		During night	176	0.0	208	1.9
		Depends upon weather/season	176	11.9	208	30.3



**Table 11.** Feed/fodder marketing system in lesser and greater Cholistan

Sr. No	Questions		Lesser Cholistan		Greater Cholistan	
			Households (n)	Percent manage feed/fodder (%)	Households (n)	Percent manage feed/fodder (%)
1	How do you manage to get fodder/ feed for livestock?	Only by purchase of feed	176	0.0	208	0.0
		Only grazing	176	59.3	208	77.9
		Grazing along with purchase feed	176	20.5	208	23.0
2	Wheat Straw	Self-Cultivate	176	24.4	208	33.7
		Purchase from main Market	176	0.0	208	0.5
		Purchase from other Toba/Farmers	176	14.8	208	16.8
3	Green Fodder	Self-Cultivate	176	20.5	208	25.5
		Purchase from main Market	176	0.0	208	0.0
		Purchase from other Toba/Farmers	176	0.0	208	1.4
4	(TMR) (Total mixed ration)	Self-Cultivate	176	0.0	208	0.0
		Purchase from main Market	176	18.8	208	19.2
		Purchase from other Toba/Farmers	176	0.0	208	0.0

**Table 12.** The milk (liters) production of different species in lesser and greater Cholistan

Species	Lesser Cholistan			Greater Cholistan			Prices per liter	P-value	
	Households (n)	Peak milk production liters per animal/day	Total milk production at household level l/d	Total sold milk liters per day	Households	Peak milk production liters per animal/day			Total milk production liters/day
Cattle	176	3.77±0.08	14.46±0.42	11.92±0.41	208	3.95±0.11	14.77±0.65	9.50±0.85	40/=
Goats	176	0.50±0.00	2.37±0.55	0.00±0.00	208	0.05±0.01	0.25±0.06	0.00±0.00	-----
Camels	176	2.90±0.47	3.94±1.52	0.00±0.00	208	0.02±0.03	0.06±0.02	0.00±0.00	-----

**Table 13.** Family labor distribution in lesser and greater Cholistan

Items	Lesser Cholistan			Greater Cholistan		
	Number of Household	Percentage (%)		Number of Household	Percentage (%)	
<b>Family Composition (Nos.)</b>						
Adult male (16-30) years	111	42.4		141	44.2	
Adult male (31-45) years	82	31.3		102	32.3	
Adult male (46-60) years	54	20.6		63	19.7	
Old male (61-80) years	15	5.7		12	3.8	
Adult female (16-30) years	54	30.9		54	26.5	
Adult female (31-45) years	80	45.7		98	48.0	
Adult female (46-60) years	36	20.6		47	23.0	
Old female (61-80) years	5	2.9		5	2.5	
Children (1-5) years	47	25.0		46	21.0	
Children (6-10) years	80	42.6		99	45.2	
Children (11-15) years	61	32.4		74	33.8	
<b>Children Getting Education (Nos.)</b>						
Primary School	46	15.4		53	24.9	
Middle School	0	0.0		5	2.3	
High School	0	0.0		0	0.0	
Madriisa (Masjid)	1	0.3		2	0.9	
Uneducated	182	61.1		153	71.8	
<b>Family Labor Distribution (Nos.)</b>						
Primary Activity of male	Livestock handler	147	83.5	184	88.5	
	Livestock attendant	28	15.9	20	9.6	
Secondary Activity of male	Farmer	16	9.1	28	13.5	
	Labor	8	4.5	9	4.3	
Primary Activity of female	Home works	175	99.4	200	96.2	

	Livestock attendant	1	0.6	4	1.9
Secondary Activity of female	Livestock attendant	8	48.9	106	51.0
	Handlooms/no work	90	51.1	102	49.0
Primary Activity of Children	School	58	19.5	41	19.2
	Livestock handler	58	19.5	63	29.6
	Not involve in any work	182	61.1	109	51.2
<b>Number of persons go with animals during grazing (Nos.)</b>					
	One Person	45	25.6	58	27.9
	Two Persons	92	52.3	112	53.8
	Three Persons	34	19.3	30	14.4
	Four Persons	5	2.8	8	3.8

## Discussion

### Herd Dynamics and Composition

As argued during the herders meeting, the significantly higher cattle population was because of increased availability of land available for grazing and hence feed/fodder, water in greater Cholistan after the monsoon season. Also, the grazing intensity in lesser Cholistan becomes higher due to arrival of herds from greater Cholistan as a part of their annual migration cycle. Just after monsoon the vegetation in the dessert sprouts. The herders of lesser Cholistan occupy their Tobas, earlier than those of greater Cholistan providing little time for dessert grasses to reach maturity stage appropriate for grazing. The lesser Cholistan has partly been converted into cropped area, hence leaving reducing space for grazing.

As argued during the herders meeting, the significantly higher camel population in lesser Cholistan is due to easy market access for camel milk and live animal sale. According to the camel holder's higher camel population is due to more availability of feed in the form of more browse trees (in contrast to the greater Cholistan where grasses are dominant), water and availability of nearby market and thus easily sale. Moreover, camels are also used as a mean of transport in areas across Cholistan. The non-significant but higher population of sheep, goat and donkeys is due to higher standard error among the samples.

The results of present study indicate that donkey population was higher in greater Cholistan at Toba level in current study. These findings hypothesized that it might be due to use as beast of burden during the migration process. Further, people use donkeys for transportation of their daily use luggage. Findings of present study revealed that the total estimated population in lesser Cholistan was 13,473 animals and in greater Cholistan 18,379 animals. Which include cattle, goats, sheep and donkeys were higher in greater Cholistan. Anonymous (2006) reported that in Cholistan the total estimated population of livestock was 12,09,528 herds. Which include the camel population were 11,328 that makes only 1% of the total animals. Whereas, other livestock species include cattle, goats and sheep (47, 22 and 30 %), respectively.

According to the herders the birth of cattle calves was significantly higher in greater Cholistan (Table 4.3) it may be due to large number of cattle are in greater Cholistan. The total estimated numbers of birth animals were 3089 in lesser Cholistan and in greater Cholistan were 4659.

Findings of mortality of livestock numbers did not show any significant changes, however, comparatively increased in greater Cholistan. These changes might be due to managerial issues and during emergency veterinary services could not reach at a time due to longer distance compare to lesser Cholistan between Toba and CVDs. In contrast, Ali *et al.* (2009) reported that the mortality in camels was very low then other livestock in the Cholistan.

The vital role of camels is to elevate socio-economic values of this region; the camel population was declined due to no suitable attention for the benefit of this animal. Further, results indicate that the total number of animal mortality was estimated 579 in lesser Cholistan, while 790 in greater Cholistan. This was confirmed by Agrotech (2009), who reported that the cattle mortality was higher in Cholistan and ranges from 5 to 60%. The main reasons of cattle mortality were associated to shortage of water and feed/fodder, droughts, less facilities for livestock health available in the desert.

### **Herd Mobility Pattern**

The results presented as herders during their movement between Tobas, within desert and outside desert, all of them (100%) move by foot. In lesser Cholistan the percentage of mixed movement (44.9%) to the market was higher because due to less availability of roads and transports facilities. The herders also mentioned about increasing trend in use of motorcycle and other means of transport like tractors. Further, the traditional culture of movement by foot prevailing since ancient times is waning. Presented results indicates that the percentage of species by species separately grazing pattern (86.9%) and mixed herds grazing pattern (37.5%) increased in greater and lesser Cholistan respectively. It is might be the rotational grazing pattern is most common practice in lesser and greater Cholistan which leads to grazed vegetation and fodder regrow easily. Accordingly, the percentage of animals grazing time morning to evening (96%) and variable grazing depending upon weather/season (30.3%) increased in lesser and greater Cholistan. This assumed the temperature remains very high during day time and it practiced during night time in summer season. The findings of present study are in line with (Farooq *et al.*, 2009) who reported that the separate and combined herds grazing pattern of are the common practice in ruminant, however, separate grazing pattern was dominant in Cholistan. Furthermore, they stated that farmers about 2/3<sup>rd</sup> of Tharparkar practices separate patterns of grazing. While about 1/3<sup>rd</sup> or 27% of farmers in Tharparkar and Thal are practiced mixed herds grazing pattern.

### **Marketing of Fodder, Live Animals and Animal's Products**

According to the herders, the percentage of feed/fodder obtain through free grazing (77.9%) was higher in greater Cholistan. In greater Cholistan the percentage of feeding wheat straw from self-cultivated land (33.7%) was higher than lesser Cholistan. The percentage of TMR, purchased from main market was (19.2%) higher in greater Cholistan. The trend of free grazing of livestock was most common in whole Cholistan because the people of Cholistan mainly depend on the rangelands. The 68% people of Cholistan obtained feed for their livestock production and small ruminants from these sources. These results supports the idea of Zaffaruddin (1977) who reported that people of Cholistan mainly depend on rangelands for their livestock production and small ruminants obtained 60% feed from these sources.

In lesser and greater Cholistan the primary purpose of rearing cattle for milk is common. The secondary purpose of rearing sheep for sale was higher in greater Cholistan as compared to lesser Cholistan. Similarly, the tertiary purpose of goats reared for celebration was higher in lesser Cholistan as compared to greater Cholistan. About the tertiary purpose of camel reared for sale was higher in lesser Cholistan as compared to greater Cholistan. The primary purpose of donkeys rearing for draught was common in lesser and greater Cholistan. In lesser and greater Cholistan the purpose of rearing livestock was not more different due to same trend of livestock management.

Outcomes of present survey data reveals that the estimated the total number of sold animals were 622 and 790 in lesser and greater Cholistan at household levels, respectively. The results of present study is in agreement with Hussain *et al.* (2013) reported that mostly the camel meat consumed in remote rural areas. Further, they reported that the cities have no exception and 54.1 of live camel sold with the mean of two camels per farm during last one year.

Sold animals include, cattle, goats and sheep were non-significantly higher in number and a high degree compared to greater Cholistan in present study. Iqbal *et al.* (2000) reported that the people usually sold their animals during the summer season in lesser Cholistan. It may be due to large supplies of animals, livestock traders or beoparies and butchers took huge profits from this. Moreover, it leads to sub-optimal returns to the yearlong hard work of the herders.

The peak, total milk production and total milk sold liters/day of cattle was higher in greater Cholistan. However, peak and total production (liters per animal/day) at household liters/day in lesser Cholistan of camel was higher as compared to greater Cholistan. This may be due to trend of camel milk sale was not practiced in lesser and greater Cholistan, the absence of basic facilities, lack of education and awareness in people of Cholistan about the milk processing and marketing. As Farooq *et al.* (2009) reported that during the winter and summer season the daily average milk of cow was 2.35 and 3.99 liters/cows respectively.

Thereafter, total milk production per household was recoded over 42 liters/day in summer season. About 9% milk was used as domestic consumption, 56% used for desi ghee, 6% of milk allowed to young stock and about 29% was sold as fresh milk. According to the Soharwardi *et al.* (2012) environmental sciences essay UK (2013) and Iqbal *et al.* (2000) stated that the livestock production and marketing has an important role in Cholistan due to mostly people are depended on livestock and their products.

## Family labor distribution

Regarding the children education, it was observed that the percentage of children getting primary education were higher in greater Cholistan as compared to lesser Cholistan. Similarly, in greater Cholistan the percentage of uneducated children was more in greater Cholistan as compared to lesser Cholistan because there were no permanent schools in Tobas and other basic needs. As regard the family labor distribution, it was observed that the percentage of primary activity, male involved in livestock handling was more in greater Cholistan as compared to lesser Cholistan. Similarly, the percentage of secondary activity, female involved in livestock keeping were more in greater Cholistan as compared to lesser Cholistan. Farooq *et al.* (2009) reported that in Cholistan formal education were lowest and almost primary level in Tharparker and Thal desert.

## Conclusion

Cholistan is an arid and hottest place of the Punjab province. It ranked as a notable place due to its increasing livestock population dynamically. It considered a supply market for milk, meat and livestock products. Typically, livestock is the main source of income in region of Cholistan. Herd farmers are nomads and depend on buying and selling of livestock. Additionally, the herders are getting feed from adopting free grazing pattern system for their livestock in both regions of Cholistan. Small ruminants especially sheep presents as dominated the average herd composition in both regions of Cholistan. Moreover, camel and cattle populations represents as significant herd animal in Cholistan for getting production. Furthermore, the current management practices and marketing pattern is based on traditionally pattern in Cholistan regions and set on pattern of knowledge transferred within and between the generations. Such type of traditional practices leads to ignorance of adopting the current advanced management practices to improve the values of livestock. This study helps in the planning for efficient and sustainable improvements in livestock economy. In the last, it is suggested that the livestock is the mainstay of Cholistani people. Vertical expansion in livestock is the only way to bring a positive change in their lives and promote profitable and sustainable livestock farming in this ignored area.

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