



Watering frequency and its impact on camel milk production in selected districts of the Somali regional state, Ethiopia

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ABSTRACT

This study was conducted in Babilie and Kebribeyah districts, Jijiga Zone of the Somali Regional State with the objective to assess watering frequency and its impact on camel milk production. The method of data collection employed was a single-visit-formal-survey, and data were analyzed using Statistical Package for Social Sciences (SPSS). All respondents in the study areas were agro-pastoralists, and migration is common to all. Migration places were different between and within district. The reason for migration according to respondents was in search of forage, water, and mineral salt. The source of water for camels is predominantly well-water in Babilie district whereas in Kebribeyah district Birka (51.7%) and well water. There was no significant difference ($p>0.05$) between the districts on the frequency of watering camels in base camps for both seasons. On the contrary, days camels stayed without water in Satellite camps was significantly different ($p<0.05$) between Babilie and Kebribeyah districts. Water problem is more severe in Kebribeyah compared to Babilie district, especially when the Birka water depletes. During dry season, the price of water increases to the extent of forcing the camel owners to send their camels to other areas. For the better productivity of camels, the major constraint that is, water, should be mitigated.

Keyword: Water utilization, Camel, Ethiopia.

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INTRODUCTION

The population of camel in Ethiopia is close to 3 million heads, and nearly 60% are found in Somali region. Camel is the source of livelihoods and income for millions of pastoralists and agro pastoralists in dry lands of Ethiopia. The camel, due to its unique anatomical, physiological and behavioral adaptive features, is well adapted to hot arid and semiarid areas of the country where excessive heat

load from the environment, shortage and salinity of drinking water, and scarcity of feed are main features. The camel has been known since time immemorial in providing almost all basic necessities of pastoralists. It is almost everything to pastoralists (sources of food, power, cash, prestige, and means of storing wealth). In general, subsistence and sustenance of most of the pastoralists is based on camels (Zeleke, 1998).

Water is essential to life and the camel has to survive often on limited quantities of water for long periods of time. To do this, it has developed not only a very low rate of water use but mechanisms for restricting water loss as soon as its intake is reduced (Wilson 1984).

Lack of water is generally a limiting factor to pasture utilization in pastoral areas. In these areas, the challenge associated with water scarcity is confounded by high ambient temperatures and high solar radiation, in addition to poor nutrition. Additionally, watering interval determines the foraging radius around water sources. Thus, watering management is closely related to grazing management. The distance to the nearest watering point and the labor required to water herds may also constitute major constraints to watering frequency in camels (Farah *et al.*, 2004).

As camels can go for many days without drinking, they can feed over areas very far from water resources that is, camels can utilize very remote pastures. Even under conditions of extreme drought, camels continue to produce milk. Since camels can minimize water expenditure for cooling and also reduce loss through excretion, they yield milk with high water content even if they are dehydrated (Kohler-Rollefson, 2005). Even though camel is the animal of food security to the pastoralist in general and Somali region pastoralist in particular, there is huge gap on the availability of information on understanding the water utilization of camels vis a vis the distribution and capacity of the watering points, as well as the factors constraining the utilization of water in the Somali Region. This study was, therefore, initiated to bridge the information gap

by understanding the issues around water and camel production in reference to Jijiga zone, Somali Regional State, Ethiopia.

MATERIALS AND METHODS

This study was conducted in Jijiga Zone of the Somali Regional State. The Somali Regional State, which forms part of the Federal Democratic Republic of Ethiopia, is situated in the eastern part of the country. It is located at 4° to 11° North Latitude and 40° to 48° East Longitude. The total area of the Regional State is estimated to be around 325 thousand km² (MOARD-PADS 2004).

Jijiga administrative zone can be divided into three separate food economy zones (FEZs), namely, sedentary agriculturalists, agro pastoralists and pastoralists. Agriculture is entirely rain fed within the FEZ and highly vulnerable to years of inadequate rainfall (SCF-UK *et al.*, 2001). Within this FEZ, there are two main seasons: *Gu* (wet season) and *Jilaal* (dry season).

The sampling procedure was purposive as strictly random sampling procedure would not be possible due to mobile, scattered and less accessible nature of pastoral communities. The household heads were selected based on camel possession and willingness to be part of the study. Forty camel herders from Babilie and 60 camel herders from Kebribeyah districts were interviewed using a structured questionnaire. Both primary and secondary data were collected. Primary data sources were the household heads, key informants and Focal group discussants in the respective weredas. Secondary data were collected from different concerned line ministries and NGO's working in the study area. The method of data collection employed was a single-visit-formal survey (ILCA 1990). The data were analyzed using

Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Socio-demographic Characteristics of Sampled Household Heads

Household characteristics: Socio-economic characteristics of the population of the agricultural households are important to the agricultural production. Majority (95%) of respondents in Babilie have access to school but, on the contrary,

72% of respondents from Kebribeyah district have no access to school (Figure 1). This great disparity lies on location advantage in that Babilie is closer to Harar town than Kebribeyah. The total human population engaged in agriculture was found to be 12,927 and 110,335 for Babilie and Kebribeyah districts, respectively (CSA 2003). The mean family size of the study area was found to be 4.95 and 3.52 for Babilie and Kebribeyah districts, respectively.

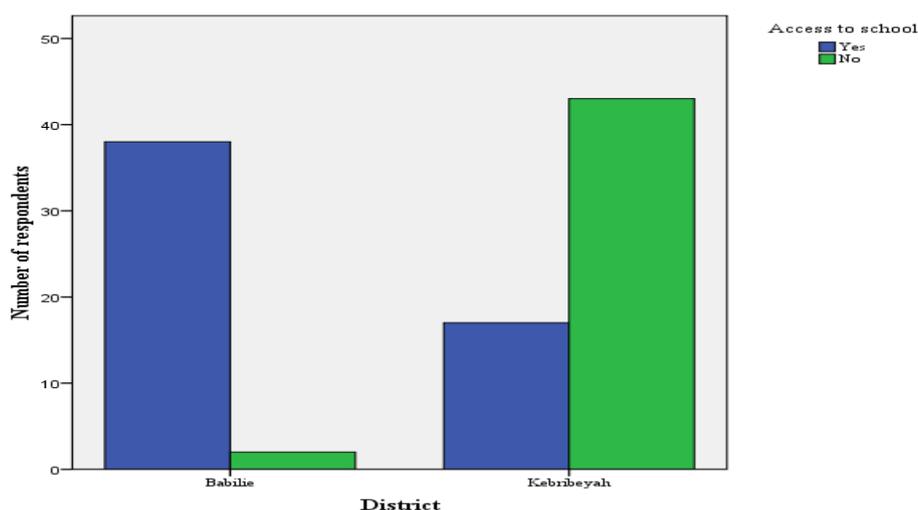


Figure 1. Educational background of respondents in Babilie and Kebribeyah districts

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Resource ownership: Half of the respondents in Babilie and a big majority (90%) in Kebribeyah reported on the increasing trend in camel holdings in the last five years. This trend was attributed to higher birth rate than death rate, too little sale, purchase of additional camels and/or increased incoming gift, and increment in the number of female camels born.

The ownership right for camels, according to key informants, in Kebribeyah district was for both male and female household members, whereas in Babilie district the ownership right goes to the male only. The number of camels for dowry depends on the wealth status of

parents. On average 4 to 10 camels are given for newly engaged youngsters irrespective of districts. Camel ownership is a male prerogative. As with many African pastoralists, an Amar'ar man (Sudan) obtains stock from his parents by two processes. The first concerns significant ante mortem gifts, and the second inheritance according to Muslim law (Hjort and Dahl, 1984).

To overcome effects of the hostile environment and assure their food security almost all pastoralists in the study areas owned different kind of livestock in combination; however, camels are the most dominant in number (Table 1).

Table 1: Livestock numbers owned by individual respondent in Babilie and Kebribeyah districts

District		Type of Livestock						
		Camel	Cattle	Goat	Sheep	Donkey	Mule	Poultry
Babilie (N=40)	Mean	14.35	8.05	6.75	1.75	0.6	0	0
	Minimum	1	0	0	0	0	0	0
	Maximum	150	30	90	20	3	0	0
Kebribeyah (N=60)	Mean	20.42	3.43	2.57	1.98	0.1	0.03	0.05
	Minimum	1	0	0	0	0	0	0
	Maximum	112	35	24	25	2	1	2

N=Number of respondents

Herd Management: Virtually all camels in east Africa are kept in traditional production systems. Only very small fraction of the regional herd is kept on modern, commercial ranches or in research stations, which extend improved management to camels. Even in these rare cases, there are no management techniques which are specific to camels, but rather solid and common sense management measures applicable to all large domestic herbivores (Dioli *et al.*, 1992). As is the case in other countries, the experience in Ethiopia is that there are no developed techniques and management modalities specifically tailored for camels. This poses a problem in terms of bringing-in herd management changes.

All respondents from Babilie and Kebribeyah districts were agro-pastoralists, and migration is common to all. This finding is in agreement with the findings of Zeleke (1998) who stated that camel owners move with their animals seasonally. Similar findings documented previously (Mohamed 1993; Tezera 1998; Ahmed 2002; Negatu *et al.*, 2004) indicated that during dry season camels are divided into base and satellite herds. Migration places were different between and within district. Key afer, Qorqor, Dof, Segeg, Habliye, Babilie, Degahamedo, Gelelcha, Milih, Diro and Daketa were identified by respondents as migration places for herders in Babilie district. Fafen, Fike,

Degahabur, Borale, Daketa, Taketo and Bulale were reported to be migration places for respondents in Kebribeyah district. This finding is in agreement with that of Tezera (1998) who stated that the households of Abskul and Bertire clans in Jijiga move between Kebribeyah through Jijiga highlands of Fafen areas. The reason for migration according to respondents was for search of forage, water, and mineral salt.

Water utilization

Sources of water: According to the respondents, the source of water for camels is mainly well-water (92.5%) in Babilie district and both *Birka* (51.7%) and well water (40%) in Kebribeyah district. Based on Ahmed *et al.* (2004) camel pastoralists in Hartisheik and Kebribeyah depend on ponds (60%), birka (30%) and on natural depression (7.5%) and on others (2.5%). On the contrary, temporary surface water, ponds, traditional well “*Ellas*”, hand dug wells fitted with hand and solar pumps, and bore holes are the main source of water for livestock in Borana (CARE 2009) and permanent rivers, boreholes, ponds, lake, and water extracted from temporary rivers beds are the major sources of water for pastoralists in South Omo (Admasu *et al.*, 2010). The distance of watering points from grazing area for well-water users (54.05 and 33.33% for Babilie and Kebribeyah districts, respectively) was greater than five kilometers (Table 2). In the case of Kebribeyah district,

for 45.16% of *Birka* users, the distance of *Birka* source from grazing area was more than five kilometers. This is in agreement with (MOARD 2007) in that the most usual practice during the dry season is to walk animals ranging 2 to 4 km to the closest river and water them. On the other hand, this finding is much less than Admasu et.al (2010) that the Hamar travels more than 10-20 km distance to river Omo and 15-30 km to river Kako, Benna pastoral moving more than 10-20 km distance

to river Kako and 10-20 km to river Omo, and Tsemay pastoral groups walking more than 10 km to river Weyto and more than 30 km to river Kako. Based on the respondents, water problem is severe in Kebribeyah than in Babilie district, especially when the *Birka* water depletes. During dry season, the price of water increases to the extent of forcing the camel owners to send their camels to satellite camp for the sake of unaffordable water price.

Table 2: Distance of watering points from grazing area in Babilie and Kebribeyah districts (Percentage of respondents that use respective water sources)

Sources of water	District	Distance from grazing area (Km)			N
		1 - 2	3 - 5	> 5	
Well	Babilie	2.70	43.24	54.05	37
	Kebribeyah	54.17	12.50	33.33	24
<i>Birka</i>	Babilie	NA	NA	NA	NA
	Kebribeyah	19.35	35.48	45.16	31
Pond	Babilie	33.33	55.55	11.11	9
	Kebribeyah	50	25	25	4
Stream	Babilie	0	100	0	1
	Kebribeyah	100	0	0	12
Others	Babilie	0	100	0	2
	Kebribeyah	NA	NA	NA	NA

N= Number of respondents (respective water users only)

NA= Not Available

Watering frequency: Livestock watering frequency varies from season to season, species to species and accessibility of water sources (CARE 2009). Camel has a well-developed power to smell. They can detect water 50 miles away by smelling geosmin which is a fragrance produced by streptomycetes species growing in the dump soil. Under very hot conditions, the camel may drink only every 8-10 days (Abdul 2011). The mean days camels can stay without water in wet season in base camps was found to be 37.63 and 35.32 for Babilie and Kebribeyah districts, respectively. The mean days camels stay without water in dry season in base camp was 15.65 and 18.22 in Babilie and Kebribeyah districts, respectively. The mean days camels stay without water in wet

season in satellite camp was reported to be 81.05 and 35.47 days for Babilie and Kebribeyah districts, respectively. Similarly, the mean days camels stay without water in the dry season in the satellite camp is 34.17 and 21.30 days for Babilie and Kebribeyah districts, respectively (Table 3). This finding concurred with observations reported by Farah *et al.*, (2004) who stated that home based herds were more frequently watered than satellite herds. Similarly, Wilson (1998) reported that camels spend more energy at high temperatures and this increases the need for water and so reduces the time interval between waterings. Herds get access to water point on average at every five days and salt supplementation every week

depending on season and decision of herd owners (Bekele 2010a).

Table 3: Watering frequency of camels (days) across season and camps (base and satellite)

District		Season			
		Dry		Wet	
		Base camp	Satellite camp	Base camp	Satellite camp
Babilie (N=40)	Mean	15.65	34.17	37.63	81.05
	Minimum	3	1	3	6
	Maximum	120	180	180	300
	Median	7	15	30	60
Kebribeyah (N=60)	Mean	18.22	21.3	35.32	35.47
	Minimum	5	5	3	3
	Maximum	50	40	90	90
	Median	20	20	40	37.5

N= Number of respondents

There was no significant difference ($p>0.05$) on the frequency of watering camels in base camps for both seasons. On the contrary, days camels stayed without water was significant ($p<0.05$) between Babilie and Kebribeyah districts in satellite camps for both dry and wet seasons. The possible reasons for the difference may be due to variation in the degree of succulence of forage grown between the two districts. Water problem is severe in Kebribeyah than in Babilie district especially when the *Birka* water is depleted during the dry season. This finding was much higher than Bekele

(2010a), this may be emanated from geographical difference between the surveys.

The impact of water on milk production: Bekele (2010b) indicated that milking frequency influenced milk yield. The milking frequency can also be affected by water availability. There was a significant difference ($p<0.05$) across districts in milking frequency during the dry season and the difference in milking frequency between the two districts was the consequence of water problems during dry season in Kebribeyah than in Babilie district.

Table 4: Mean milking frequency per season for Babilie and Kebribeyah district camels

District	Season		Stage of lactation		
	Wet	Dry	Early	Mid	Late
Babilie (N=40)	3.01 ^A	2.78 ^A	3.47 ^a	2.93 ^a	2.23 ^a
Kebribeyah (N=60)	3.23 ^A	2.29 ^B	2.92 ^b	3.18 ^a	2.45 ^a
Total	3.14	2.49	3.14	3.03	2.32

N= Number of respondents

Seasonality plays a major role in milk marketing as its supply, quality and transport problems change drastically from the dry to the wet seasons. The estimated daily milk yield in Babilie district was 5.64 and 4.18 liters for wet and dry season, respectively whereas, in Kebribeyah district it was found to be 5.73 and 3.58 liters in wet and dry season, respectively (Table 5). There

was highly significant difference ($p<0.01$) for estimated mean daily milk yield between the two weredas at an early stage of lactation. The prevailing water problem in Kebribeyah district, especially in dry season, may affect the higher milk yield potential during the early stages of lactation. On the other hand, there was no significant

difference ($p>0.05$) for mid and late stages of lactations.

Table 5: Estimated mean daily milk yield of camels in Babilie and Kebribeyah (kg)

District	Season		Stage of lactation		
	Wet	Dry	Early	Mid	Late
Babilie (N=40)	5.64	4.18	6.41 ^a	5 ^a	3.2 ^a
Kebribeyah (N=60)	5.73	3.58	5.09 ^b	5.12 ^a	3.19 ^a
Total	5.69	3.82	5.62	5.06	3.48

N= Number of respondents

In general, the mean daily milk yield was higher during the wet season than the dry season for both districts. This finding is in agreement with Zeleke

(1998) who stated that, the average daily milk off take was higher during wet season than during dry season.

Table 6: Milk produced and sold during wet and dry seasons in Babilie and Kebribeyah districts

District	Season	Milk produced			Milk sold			
		CM	CT	GT	CM	CT	GT	
Babilie (N=60)	PR	Wet	55	70	5	50	65	0
		Dry	55	70	5	50	65	0
	VM (lt)	Wet	321	148	5	117	93	0
		Dry	253	94	1	102	60	0
	Mean (lt)	Wet	14.6	5.3	2.5	5.9	3.6	0
	Dry	11.5	3.4	1	5.1	2.3	0	
Kebribeyah (N=60)	PR	Wet	47	15	2	46	11	2
		Dry	47	15	2	27	11	2
	VM (lt)	Wet	1219	190	16	949	145	16
		Dry	759	25	1	346	21	1
	Mean (lt)	Wet	22.3	7.9	5.3	16.2	6.4	8
	Dry	14.7	2.8	0.7	9.5	2.2	0.5	

N= Number of respondents PR= Percentage of respondents VM=Volume of milk produced or sold

CM= Camel

CT= Cattle

GT= Goat

lt=Liter

The amount of milk produced as well as sold reduced during the dry season (Table 6) so that it reduces the amount of marketable and/or consumable milk and this in turn create negative impact on the food security.

CONCLUSION

Camels are important animals for the livelihood of agro-pastoralists in Somali regional State of Ethiopia. Scarcity of water is one of the limiting factors for production and productivity of camels even though camels are known to be more tolerant animals

than cattle. Camel owners migrate from one place to the other for search of feed and water for their camels. Nonetheless, they extended watering interval of their camels during dry season be it in base or satellite camps due to extreme scarcity of water. Consequently, milking frequency and total milk yield from camels have been diminished. Therefore, development of water source for camels, especially for dry season needs to be a priority concern of pastoral and agro-pastoral areas.

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