

## **Analysis on the contributions of and constraints to camel production in Shinile and Jijiga zones, eastern Ethiopia**

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*Abstract:* Contributions of the dromedary camel and constraints to camel production in Jijiga and Shinile zones of eastern Ethiopia were assessed. A total of 73 households were interviewed on the significance of the dromedary camel and constraints associated to camel production in the area using a single-visit-multiple-subject diagnostic survey. All the households interviewed owned camels and milk production was the primary reason for keeping camels in the area. The major contributions rendered by dromedary camels in the study area were milk production and transportation, while the major constraints associated with camel production in the area were feed shortage and prevalence of disease. Camels in these areas feed mainly on poor-quality natural vegetation. Cactus and acacia were the dominant plant species consumed by camels in the area. Camels were not given supplementary feed except salt and/or mineral soil. Dromedary camels play an important role to the livelihood and survival of nomadic pastoralists in the study areas. Thus, development interventions aimed at improving the productivity of camels in the study areas should take into account the major socio-economic contributions of camels and the prevailing problems in the area.

*Keywords:* Camelus dromedaries, constraints, contributions

### **Introduction**

The one-humped camel (*Camelus dromedarius*) plays an important role as a primary source of subsistence in the lowlands of Ethiopia. It lives in arid and semi-arid areas which are not suitable for crop production and where other livestock species hardly thrive. Pastoralists in the eastern lowlands of Ethiopia rely mainly on camels for their livelihood. Ethiopia possesses over 1 million dromedary camels (FAO, 2002) and the majority of these camels are found in

eastern part of the country. In spite of the large number of camels in Ethiopia, the productivity of camels is generally low and the camel has been given little research and development attention. Until recently, there is no development project in the country that features the camel nor is any attention given to this domestic species in connection with other livestock development programs.

The primary reasons for keeping dromedary camels and management of camels vary from country to country and from one place to the other. For instance, camels are kept mainly for riding in countries in the Arabian Peninsula (Wilson and Bourzat, 1988), for transportation in Eritrea (Gebrehiwet, 1998) and for milk production in Somalia (Schwartz, 1992). Understanding the major role of camels and the traditional management practices used by camel owning societies would help to design appropriate intervention techniques that are applicable to local situations. To date, little information if any has been reported about the major contributions of pastorally managed dromedary camels in eastern Ethiopia and there is limited information on the traditional management practices used by camel owning pastoralists in this region. This study was, therefore, designed to assess the contributions of the dromedary camel and constraints to camel production in Shinile and Jijiga zones of eastern Ethiopia.

## Materials and Methods

### Description of the study area

This study was conducted in Shinile and Jijiga zones in eastern Ethiopia. The areas are characterized by unreliable and erratic rainfall with a precipitation ranging from 300 to 600 mm per annum, high ambient temperature ( $>30^{\circ}\text{C}$ ), sparsely distributed vegetation dominated by *Cactus* and *Acacia* species, and bushy woodlands (Bekele, 2001). These are arid and semi-arid lowlands lying at an altitude of 500-1500 m above sea level and are not suitable for crop production. In these areas, camels are herded by nomadic pastoralists who rely mainly on livestock husbandry for their livelihood. The majority of camel herders in the Jijiga and Shinile areas are Somali ethnic groups and Islam is the predominant religion in the area. Numerically, camels are the most abundant domestic animals in these areas followed by small ruminants and thus this region is considered as the camel belt.

### Sampling method and data collection

Traditional husbandry practices, contributions of the dromedary camel,

constraints associated with camel production and major feedstuffs of pastorally managed camels in Jijiga and Shinile zones were assessed by using a single-visit-multiple-subject diagnostic survey (ILCA, 1990). A total of 73 households (37 from Shinile and 36 from Jijiga) who owned camels and who are familiar with camel husbandry were selected using purposive sampling technique. Households in each region were selected based on accessibility of the village and willingness of the camel owners to take part in the study. Information about traditional management, herd size, milk yield, lactation length, milking frequency, milking procedure, contributions of camels, constraints to camel production, and major feeds of the dromedary camels in the study areas was obtained from camel owners by means of a semi-structured questionnaire.

### Description and management of camels

The camels were at different stages (1-10 months) and numbers of lactation (1-9), and were of various age groups (5-25 years). The camels were fed exclusively on natural browse; herded during the daytime on communal grazing lands and kept at night in traditional enclosures (Corral) made of thorny bushes and tree branches as protection from predators.

### Statistical analysis

Descriptive statistics was used to analyse the data using the Minitab software version 12.21 (Minitab, 1998). Ranking of the major contributions of dromedary camels in the study area was done according to the method described by the International Livestock Centre for Africa (ILCA, 1990). Ranking was done after calculating the weighted average score for each variable (contribution) by adding weighted scores and then dividing the sum by the total number of respondents.

## Results and Discussion

### Herd structure and composition

The structure and composition of nomadic herds in the study area are indicated in Table 1. The average number of camels owned by a nomadic household in the study area was 26. This figure is high and indicates how important are camels to the pastoralists in the area. Among the total number of camels owned by a given household, the number of female camels far exceeds that

Table 1 - Herd structure, milk yield and lactation length of traditionally managed camels and the composition of nomadic herds in Shinile and Jijiga zones of eastern Ethiopia ( $n = 73$ )

PARAMETERS	HOUSEHOLDS	RANGE	MEAN $\pm$ SD
<i>Camel herd structure/ household</i>			
Total number of camels		1-150	25.7 $\pm$ 29.8
Lactating camels		0-50	4.9 $\pm$ 7.1
Male camels		0-23	5.2 $\pm$ 5.1
Calves		0-50	4.9 $\pm$ 7.1
<i>Herd composition/ household*</i>			
Camels	73 (100%)		
Cattle	49 (67.1%)		
Goats	27 (37%)		
Sheep	10 (13.7%)		
<i>Milk production and lactation length</i>			
Daily milk yield (kg/camel)		1-10	5.2 $\pm$ 2.2
Lactation length of camels (days)		180-720	382.7 $\pm$ 96

*Values in column two under the heading herd composition indicate the number and proportion of households who possess the indicated species of animals; SD = Standard deviation; n = number of households interviewed.*

of male camels. This suggests that the main reason for keeping camels in the area is milk production. Male camels are mainly used as a pack animal in the area.

As is the case in most pastoral societies, livestock herding is the main activity of the pastoralists in the study areas. The nomadic pastoralists in the area possess mixed livestock species the composition of which varies depending on the vegetation and climatic condition of the area. In terms of number, the predominant livestock species kept by the pastoralists was the camel followed by cattle, goats and sheep in the order indicated.

### Camel milk production

The estimated daily milk yield per camel and the estimated lactation length of camels are indicated in Table 1. Camel milk is an important source of protein for the nomadic pastoralists in the study area and the pastoralists rely mainly on camels for their livelihood. The average daily milk yield per camel observed in this study ( $5.2 \pm 2.2$  kg) is higher than the mean daily off take rate of  $4.14 \pm 0.04$  kg per camel reported by Bekele *et al.* (2002).

The average daily milk yield per camel ( $5.2 \pm 2.2$  kg) observed in the current

study is much higher than the reported daily milk yield obtained from local Zebu cattle (1.5 – 2 litres) raised in similar environments (Felleke, 2003). The milk yield obtained from pastorally managed camels in the study area indicates the role of camels as dairy animals and their value to the pastoral community. Since the quantity of milk produced by camels depends mainly on environmental factors such as supply and quality of feed and water available, the climate and the level of management (Dorman, 1984), there is a possibility to increase camel milk production in the study areas by improving these environmental factors.

The average lactation length of camels observed in the present study ( $382.7 \pm 96$  days) is higher than the values reported by Bekele *et al.* (2002) ( $353 \pm 14$  days) and Kebebew and Baars (1998) (282 days). Lactation length depends on availability of feed and pregnancy during which camels stop giving milk. If not pregnant, the lactation length can be extended up to 2 years. Camel calves were not weaned until the end of lactation.

#### Milking procedure and milking frequencies

The milking procedure and the frequency of milking of camels in the study areas are indicated in Table 2. Before milking, the owners prepare the milking vessel, call the lactating camel by name from the enclosure where she is kept overnight together with other camels to a separate open milking area where the calf is kept. Then the calf is allowed to suckle its dam for a few minutes to stimulate milk ejection. After this, one man holds (protects) the calf while another man milks the camel at a standing position with one knee raised to support the milking vessel on his lap. Milking of camels in an area which is full of dust and dung and without shade could have a negative impact on the quality of the milk produced. Thus, education of camel owners about the importance of sanitary milking practices would help solve the problem in the future.

Unlike the case in the highlands of Ethiopia where women are responsible for milking of dairy cows, in the study area usually male members of the household milk camels. According to the pastoralists report, presence of the calf is crucial to initiate milk-ejection by camels. This is in agreement with the report by Dorman (1984) who indicated that milk is only letdown from a lactating camel if the calf is present or the dam has been deceived into thinking this is the case. The inability of camels to letdown milk in the absence of their calves suggests the need for careful and proper management of camel calves so as to reduce calf mortality.

Washing of the udder and teats of the camels before milking was not practiced

Table 2 - Milking procedure and frequency of milking of traditionally managed camels in Shinile and Jijiga zones of eastern Ethiopia (n = 73)

PARAMETERS	NUMBER AND PROPORTION (%) OF RESPONDENTS
<i>Milking procedure</i>	
Wash udder/teats before milking	None
Wash hands before milking	29 (39.7%)
Wash/smoke milking utensils before milking	21 (28.8%)
Let the calf to suckle before milking	73 (100%)
<i>Milking frequency</i>	
Twice a day	37 (50.7%)
Three time a day	24 (32.9%)
Four times a day	12 (16.4%)

*n* = number of households interviewed.

in the study area (Table 2). Besides, the majority of the respondents reported that they don't wash their hands and the milking vessels prior to milking camels. Unhygienic milking procedure is one of the factors which predispose dairy animals to mastitis infection. An earlier study revealed high rate of prevalence of mastitis in camel herds in the study areas (Unpublished data). Thus, hygienic milking procedures and hygienic production systems should be followed in order to increase milk production and improve the quality and safety of camel milk in the study area.

The majority of the households reported that they milk their camels twice a day (Table 2) at 7 am in the morning and at 4 pm in the afternoon. However, some respondents mentioned that they milk camels three (at 7 am, at 12 am and at 4 pm) to four (at 7 am, at 11 am, at 4 pm and at 9 pm (21 h)) times a day (Table 2) depending on milk yield and availability of feed. The frequency of milking of camels in the study area was influenced by supply of and demand for milk, season, feed supply and stage of lactation. Season, the quantity of milk produced per animal, the number of milking animals present, availability of other food for the herders' household, and sex, age and health of the calves are factors that affect frequency of milking of camels (Dioli *et al.*, 1992).

#### Contributions of dromedary camels

The major contributions of dromedary camels in the study area are indicated

*Table 3 - Ranking of the major contributions of the dromedary camel in Shinile and Jijiga zones of eastern Ethiopia (n = 70)*

MAJOR CONTRIBUTIONS	RANKS*
Milk production	1 <sup>st</sup> (4.6)
Transportation	2 <sup>nd</sup> (4.2)
Meat production	3 <sup>rd</sup> (1.5)
Income from sale of camels	4 <sup>th</sup> (0.7)
Indemnity	5 <sup>th</sup> (0.4)

*\*The contributions were ranked by calculating the weighted average score for each variable; values in brackets are weighted average scores.*

in Table 3. Large proportion of the respondents mentioned milk production as the major contribution rendered by camels and the main reason for keeping camels in the area. Thus, much research and development efforts should be geared towards improving the potential of the camel as a dairy animal in the region.

Transport of people, goods and mobile houses of the pastoralists during their seasonal migration in search of feed and water for their animals was the second important contribution rendered by dromedary camels in the area. In the study areas, camels are often hired as a cargo for transport of goods. Usually male camels are used as a draft animal for transportation of goods and people. Similar observations were reported by Gebrehiwet (1998) and Dioli *et al.* (1992) about the role of the camel as a pack animal in Eritrea and East Africa, respectively. In view of lack of roads and transportation facilities and the inaccessible terrain in most pastoral areas, the role of the camel as a pack animal is crucial and determines the survival of the nomads in the hostile environments of the desert. Camels are often considered as “ship of the desert” by the pastoralists in the study area.

Meat production, ranked the third important contribution of dromedary camels in the area. Although pastoralists in the study area consume camel meat when available, camels are never slaughtered for home consumption of meat; however, camels are slaughtered occasionally during festive times, to fulfil cultural obligations such as when a person dies from the family or when camels are accidentally injured. This observation is inline with earlier reports. Dorman (1984) reported that home consumption of camel meat is rare among the dromedary owning nomadic tribes. The Regueibat of Western Sahara eat camel meat when it is absolutely necessary or for celebrations (Dorman, 1984). In East Africa,

slaughter of camels for home consumption is rare and off take of live animals for sale as slaughter stock is limited Schwartz (1992). The calving interval (2 years) and age at first calving of camels (5 years) (Schwartz and Walsh, 1992) are generally long as compared to other livestock species. In view of the slow reproductive potential of camels, the pastoralists' practice of not slaughtering camels for the sole purpose of eating meat sounds logical.

Although not that significant, some of the respondents indicated that income from sale of camels and indemnity (compensation for loss of life) are also contributions that they obtain from their camels. Similar observations were reported by Gebrehiwet (1998) from Eritrea. Understanding the major socio-economic contributions of dromedary camels and the need of the pastoralists is important to design appropriate development interventions aimed at improving the productivity of camels in the study area.

### Constraints to camel production

The constraints that deter the productivity of dromedary camels in the study area are indicated in Table 4. The major constraint that hinders camel production in the study areas was feed shortage. These areas are characterized by high ambient temperature ( $>30^{\circ}\text{C}$ ), low and erratic rainfall with precipitations less than 350 mm per annum in most places. The vegetation in the region is dominated by sparsely distributed perennial shrubs and tree species the majority of which are not palatable. This natural vegetation barely provides more than maintenance requirements of camels even in the rainy season. Lack of grazing land and bush encroachment of the rangelands further compound the problem of feed shortage in the area. Increasing trend of sedenterization and introduction of crop farming in the area have been causing shrinkage of grazing lands of the nomadic herds. Besides, the majority of the rangelands in the area are being invaded by poisonous and unpalatable plant species. Appropriate management of the rangelands, introduction of improved feeding systems such as provision of good quality supplementary feeds to camels, and introduction of drought resistant, palatable and nutritious shrub species as feed for camels may help to solve the problem of feed shortage in the area.

Disease prevalence is the second most important problem that limits the productivity of camels in the study area. In the study area, camels are affected by outbreaks of various contagious and parasitic diseases. This situation is worsened due to lack of sufficient and appropriate veterinary services in the area. When



Table 4 - Constraints to camel milk production in Shinile and Jijiga zones of eastern Ethiopia (n = 70)

MAJOR CONSTRAINTS	NUMBER AND PROPORTION (%) OF RESPONDENTS
Feed shortage	34 (48.6%)
Disease prevalence	25 (35.7%)
Water shortage	4/ (5.7%)
Labour shortage	3 (4.3%)
Shortage of mineral lick	3 (4.3%)
Lack of money to buy camels	3 (4.3%)
Fly infestation	3 (4.3%)

*n = number of households interviewed*

camels get sick, pastoralists use various traditional medicines to treat their camels; however, if this doesn't work the destiny of the sick camel is eventually death. If the livelihood of the pastoralists is to improve, their livestock are to survive and to help them become self-sufficient in food production, appropriate veterinary services and improved animal health care need to be provided to the pastoralists in the area by the government or non-governmental organizations involved in livestock development.

Small proportion of the informants reported shortages of water, labour and mineral lick; lack of money to buy camels; and fly infestation as additional problems associated with camel husbandry in the area. Similar observations were reported by other authors (Dorman, 1984; Dioli and Stimmelmayer, 1992; Yagil, 1994) elsewhere.

### Major feeds of camels

The major plant species consumed by camels and plant species that are poisonous to camels are indicated in Table 5. Except certain poisonous plant species, camels eat various shrubs, weeds and tree species in the area. The major plant species consumed by camels in the area were cactus and *Acacia* spp. These are low-quality feeds which hardly meet the nutrient requirements of camels. When camels eat cactus in the dry season which is characterized by critical shortage of water, it results in bolus formation in their stomach and this may eventually cause death of the animals. Three plant species viz., *Euphorbia tirucalli*,

Table 5 - Major feeds of pastorally managed dromedary camels in Shinile and Jijiga zones of eastern Ethiopia (n = 73)

PARAMETERS		NUMBER AND PROPORTION (%) OF RESPONDENTS
<i>MAJOR FEEDS</i>		
<i>Vernacular name (Somali)</i>	<i>Scientific name</i>	
Tiin	<i>Opuntia</i> spp.	10 (13.7%)
Hadhac	<i>Acacia</i> spp.	5 (6.8%)
Dhunkaal	<i>Pergularia daemia</i>	4 (5.5%)
Is wadhwadh (Iswadh)	<i>Acacia brevispica</i>	4 (5.5%)
Aday (Caday)	<i>Salvadora persica</i>	3 (4.1%)
<i>SUPPLEMENTARY FEED*</i>		
Salt		11 (15.1%)
Mineral soil ("Bole")		5 (6.8%)
Dhunkaal ( <i>Pergularia daemia</i> )		3 (4.1%)
<i>POISONOUS PLANTS</i>		
<i>Vernacular name (Somali)</i>	<i>Scientific name</i>	
Gamor (Gamboor)	<i>Acacia oerfota</i>	4 (5.5%)
Gumar	<i>Acacia nubiaca</i>	3 (4.1%)
Irgin	<i>Euphorbia tirucalli</i>	2 (2.7%)

\*Supplementary feed is given mainly to calves; n = number of households interviewed.

*Acacia oerfota*, *Acacia nubiaca* were reported to be poisonous to camels in the area. Plant poisoning of camels is common in most African countries where camels are raised. The medicinal plant *Capparis tomentosa* has been associated with plant poisoning in camels throughout Africa and causes toxicosis in camels characterized by a variety of neurological disorders (Dioli and Stimmelmayer, 1992).

In study area, mature camels are not given supplementary feed; however, supplementary feed is sometimes given to calves. Supplementary feeding of camels is not common in most camel herding societies. Gebrehiwet (1998) reported that camels in Eritrea live under semi-wild conditions, browsing and grazing throughout the year without any supplementary feeding. Thus, in addition

to proper management of the rangelands, introduction of palatable, good-quality green and leguminous shrub species that are adaptable to the area needs to be given due attention in the future.

## Conclusion

The camel is an important factor for the survival of nomadic pastoralists in the study areas. The most important contributions of camels in the area were milk production and transportation. Camel production in this region is constrained by a number of factors of which feed shortage and prevalence of disease are the most important ones. Camels in the study area feed exclusively on unimproved perennial natural vegetation of low nutritive value and they are not given supplementary feed. In order to improve the productivity of dromedary camels in the study area, development interventions should take into consideration the socio-economic contributions of camels and the prevailing problems in the area.

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