

Assessment on major production constraints, and reproductive performances of camel in West Hararghe Zone Oromia Ethiopia.

Abstract

The study was conducted in Mieso and Bordede districts, in West Hararghe Zone of Oromiya National Regional State with the objectives of assessing major constraints of camel production, reproductive performances, and physicochemical quality of camel milk in the study areas. A total of 120 households (camel owners) were selected purposively for interview (i.e 20 households from each kebeles). Feed shortage, conflict over the scarcity of natural resources, low productivity of grazing land, and water scarcity were the main constraints of camel production. The mean age at first mating for male and female camels was 5.92 ± 2.91 and 4.79 ± 1.84 years respectively, similarly, the average number of services per conception of camels in this finding was 1.73 ± 0.64 . The reproductive span of male and female camels in the study area were 20.04 ± 6.50 and 25.20 ± 7.83 years, respectively and the gestation period of camels recorded in this study was 1.73 ± 0.64 . The lactation length of a camel was 9.77 ± 2.10 and 17.30 ± 5.66 months in Mieso and Bordede, respectively. Late maturity is reported as the primary reproductive constraint followed by long calving interval, the presence of reproductive disease, low conception rate and the birth of stunted calves in Mieso district. Whereas in Bordede district the primary reproductive constraints were late maturity followed by the presence of reproductive disease, long calving interval, low conception rate and birth of stunted calf. In conclusion, camel is one of the most important livestock for pastoralists' livelihood as a source of milk, meat and draught power. In order to increase the productivity of camels, the major constraints such as shortage of feed and water, disease problems and others should be given attention.

Key words: Camel, constraint, physicochemical, production, reproductive performance

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Introduction

The camel (*Camelus dromedaries* or one humped camel) is the fairly dominant and widely distributed animal in the tropical continents of Africa and Asia. It makes an important contribution to human survival and utilization in dry and arid land. In case of the increasing desertification and recurrence of drought and famine in sub-Saharan Africa, particularly in East Africa, the camel plays a very significant role as a source of milk, meat and draft power. The chief role of the camel is related directly to its remarkable adaptation to extremely harsh conditions and it can flourish where no other domestic animal can survive.¹

In spite of the great ecological and economical value of the camel production little is known about the cons and prone of its production compared to that of other domestic animals. Fertility problems, diseases, lack of social services, deforestation, and lack of water were the major constraints for camel production. Yohannes, Teshale, Angassa, Alemayehu.²⁻⁵ also stated that the major problems of camel production in Afar and Kereyu areas were disease, feed and water shortage, marketing and poor genetic potential of camels.

The reproductive performance of camel depends on the genetic potential of the species, breed, the management and the production conditions.⁶ The reproductive efficiency of camel under natural pastoral conditions is low, due to short breeding season, late age of puberty and long gestation period (13 months) Skidmore.⁷ Other factors contributing to low fertility in camels include age at first calving, low libido of male thereby reducing breeding opportunities and late postpartum oestrus Al-Qarawi.⁸ Full exploitation of camels for milk and meat production would only be possible when their

reproductive performance is properly understood and improved Kalla and Hermas.^{9,10} However, few studies were conducted on camel production constraints and, reproductive performance in Ethiopia in general and in West Hararghe in particular is inadequate. Therefore, the objectives of this study would be to assess major production constraints, and reproductive performances of camel in west Hararghe, Ethiopia.

Materials and method

I. Description of the Study Area

The study was conducted in West Hararghe Zone of Oromia National Regional State, Ethiopia. Chiro is the town of West Hararghe Zone and 325 km far from the capital city of Ethiopia, Addis Abeba to the east. The study area is located between 70° 52' 15" - 90° 28' 43" N latitude and 400° 03' 33" - 400° 34' 13" E longitude with an altitude of 1200-3600m above sea level. The mean annual rainfall of the area is from 650-1500 mm and the average temperature is 20.5-24 °C. Sample size and Sampling technique

For this study two districts were selected purposively. From each district 3 kebeles were selected purposively based on camel production, accessibility of the kebele's, area coverage and representativeness for the study areas. A total of 120 households (camel owners) were selected purposively for interview (i.e 20 households from each kebeles). The target sampling populations were the households that have at least one lactating camel herd in the selected kebeles.

II. Data sources and method of data collection

A cross-sectional study was conducted to assess major production constraints and reproductive performances of camels in West Hararghe

Zone pastoralists. Before commencing the actual study, a preliminary survey was conducted to gather information relevant to the study. The method of data collection was a single-visit-multiple-subject survey. In this study, both primary and secondary data were used. The primary data were collected through interviewed households in the study areas, whereas the secondary data were obtained from zonal Agricultural offices and districts. The data on major constraints of camel production and reproductive performance were collected by using a semi-structured questionnaire.

III. Data Management and Analysis:

Data collected from Survey was coded and entered into computer Microsoft excel sheet and analyzed using the procedure of Statistical Package for Social Sciences (SPSS) software version 20.0 computer programs. Ranking analysis was undertaken to determine camel production and reproductive constraints of the camel. The index was computed using averages and indexes were ranked using auto ranking with MS Excel 2007. The following formula was used to compute the index as employed by.

$$\text{Index} = R_n * C_1 + R_{n-1} * C_2 + \dots + R_1 * C_n / \sum (R_n * C_1 + R_{n-1} * C_2 + \dots + R_1 * C_n)$$

Where, R_n = the last rank, C_n = the % of the respondent's in the last rank, C_1 = the % of the respondents in the first rank. Differences were considered statistically significant at 5% level of significance.

Results and Discussion

I. Main constraints of camel production

Feed shortage, conflict over scarcity of natural resource, low productivity of grazing land and water scarcity were the four main constraints of camel production in Mieso district with an index value of 0.166, 0.161, 0.158 and 0.142 respectively. But in Boredede district the four major constraints for camel production were water scarcity, feed shortage, predator and disease and parasites with an index value of 0.187, 0.156, 0.152 and 0.147 respectively. Table 1 Similar to the current study feed shortage and water problem (51.8%), and disease prevalence (40.9%) were the principal constraints of camel production for afar pastoralists. Another study.⁵ reports that the major problems of camel production in Afar and Kereyu pastoralists were diseases, feed and water shortage, marketing problems and poor genetic potential of camels.

Table 1 The major constraints of camel production in Mieso and Boredede districts

Constraints	Districts			
	Mieso (N=60)		Boredede (N=60)	
	Index	Rank	Index	Rank
Feed shortage	0.166	1	0.156	2
Conflict over scarcity of natural resources	0.161	2	0.089	7
Low productivity of grazing land	0.158	3	0.093	6
Water scarcity	0.142	4	0.187	1
Disease & parasite	0.132	5	0.147	4
Predator	0.131	6	0.152	3
Low extension service	0.068	7	0.054	8
Low credit service	0.042	8	0.121	5

Comparable to the current study¹¹ reports that shortage of feed, water, grazing land, animal health facility, and predator were the major constraints of camel production in Fafen Zone. According to Ayanle¹² feed shortage, water scarcity, diseases, and parasites were the major constraints of camel production in Degahbour Woreda, Jarar Zone, Somali Regional State and this study agree with the current result. On the contrary Dejene,¹³ report that disease, poisonous plants, and low extension and health services were the main problems of camel production in Borana Zone. In line with the current study Yosef,¹⁴ reported that feed shortage, drought, disease, and water shortage were four major camel production constraints in Afar and Somali regional states.

Camel Herding and Breeding Practices

Most respondents both in Mieso (95.5%) and Boredede ((68.3%) districts herd their camels in one group. Table 2 Contrary to this study Yohannes (2013) indicated that most of the respondents in Babile district herd their camel separately but in Kebribeyah district herding of camel depends on the season which means they herd all camels in one during the wet season but separately during the dry season. In this study majority of the respondents both in Mieso (78.3%) and Boredede (75%) districts keep breeding bulls. The rest camel owners who did not keep breeding male camels were using bulls of their relatives, or friends or mixed their herds with another herd with a good breeding male.

Table 2 Herding strategy and Breeding practice of interviewed herders in Mieso and Boredede districts

Herding practice	Districts		
	Mieso (N=60) (%)	Boredede (N=60) (%)	Total (N=120)
Herd all camels in one	95.5	68.3	81.9
Herd them separately	5.0	31.7	18.35
Keeping breeding bull			
Yes	78.3	75.0	76.65
No	21.7	25.0	23.35
Number of breeding bull			
One	63.4	66.7	65.05
Two	22.0	30.8	26.4
Three and more	14.6	2.6	8.6
If no why			
lack of economy	69.2	46.7	57.95
lack of economy and Use of neighboring camel	7.7	0.0	3.85
Use neighboring camel	23.1	53.3	38.2

In the current study, about 63.4 and 66.7% of respondents in Mieso and Boredede districts kept only one breeding male and very few herders kept 2 and more breeding males. Similarly in Afar regional state indicates that about 59% of camel herders kept only one breeding male and very few herders (8%) kept 3 breeding males and the sources of breeding camel were own herd, bought and another herd. Additionally Yohannes,¹⁴ reported that the majority of respondents in Babilie (80%) and Kebribeyah (90%) districts used one breeding bull for the entire herd and another study Awoke and Ali,¹¹ in Fafen Zone indicates that over 56.7% of the respondents kept one breeding bull. The reasons put forward by respondents include the adequacy of one breeding bull for the entire herd, to avoid fighting and in order to get similar types of offspring with good performance.

II. Source of Breeding Bull and Selection Criteria

The sources of breeding camel were own herd, bought, and other herds as indicated in. Table 3 The majority of respondents both in Mieso (78.3%) and Boredede (69.6%) districts select their own bull for replacement. This finding agrees with that of Ishag.¹⁵ similarly Yosef,¹⁴ indicates that sources of a breeding camel for about 87 and 44 % of the respondents in Jijiga and Gode districts is from their own herds. According to Dejene,¹³ majority of the respondents (73.9%) in Borana Zone kept their own breeding bull born in the herds and in line with the current study.

Table 3 Source of breeding bull and selection criteria

	Districts		Total (N=120)%
	Mieso (N=60)%	Bordede (N=60)%	
Source of breeding bull			
own herd	78.3	69.6	73.95
Own herd and another herd	2.2	0.0	1.1
Other herds	10.9	8.7	9.8
Purchased	8.7	21.7	15.2
Selection criteria for bull			
Color	5.8	10.2	8.00
Based on ancestor information	19.2	1.7	10.45
Based on body conformation	17.3	76.3	46.8
Color and ancestor information	9.6	0.0	4.8
Color, ancestor information, and body conformation	15.4	0.0	7.7
Color and ancestor information	25.0	11.9	18.45
ancestor information and body conformation	7.7	0.0	3.85

Table 4 Reproductive performance of camel both in Mieso and Boredede districts

Reproductive performance parameter	Districts		
	Mieso(N=60) (Mean ± St.d)	Boredede(N=60) (Mean ± St.d)	Total(N=120) (Mean ± St.d)
Age at the first service (male)(years)	4.40±0.68	7.42±3.44	5.92±2.91
Life span (male)(years)	21.9±6.71	17.32±5.133	20.04±6.50
Age at the first service (female) (years)	3.81±0.58	5.76±2.13	4.79±1.84
Age at the first calving (years)	4.78±0.77	6.90±2.30	5.84±2.01
Calving interval (month)	21.38±3.55	24.60±5.49	22.99±4.88
Post-partum estrus (month)	8.05±2.48	9.94±3.04	8.99±2.92
Gestation length (month)	12.07±0.22	12.03±0.18	12.05±0.20
Longevity (female) (years)	27.94±9.89	22.51±3.41	25.20±7.83
Number of calves	11.13±1.98	10.08±1.93	10.61±2.02
Service per conception	1.78±0.76	1.68±0.50	1.73±0.64
Lactation length (month)	9.77±2.10	17.30±5.66	13.54±5.69

Female camel: The reproductive span of female camels was 27.94 and 22.51 years in Mieso and Boredede, respectively. The reproductive span of the female camel was longer in Mieso than Boredede district. The average reproductive span of female camels was 25.20±7.83 years with average calves of 10.61±2.02. Table 4 This finding is in agreement with those of Yohannis,¹⁹ who stated that the breeding life of female camels was between 25-30 years. However, the result of the current finding is higher than the report of who reports the average productive life of female camel was 25 and 22.5 years for the Babilie and Kebribeyah districts, respectively. The productive life of the camel obtained in this study is longer than that of Ahmed,²⁰ who

I. Production and Reproductive Performances of camels

II. Reproductive performance of camel

Puberty: The mean age at first mating for male and female camels was 4.40 and 3.81 years for Mieso district and 7.42 and 5.76 years for the Boredede districts, respectively. Table 4 The mean age at first service of both male and female camels in Boredede district is longer than the mean age at first service of Mieso. The average age at first service of breeding male and female camel in the present study was found to be 5.92 and 4.79 years respectively. Similar to this study the average age to select breeding male camels was 5.94 years in the Somali regional state. The average age at first service of female camel in the present study was 4.79±1.84 years. Table 4 The average age of the first service of the present study agrees with previous studies by in Babile and Kabribeyah of Jijiga zone. According to Abdussamad,¹⁶ bull and heifer mean ages at first mating were 5.63 and 3.85 years respectively. The average number of services per conception was 1.78 and 1.68 in Mieso and Boredede districts, respectively. This might be due to the difference in camel management in the districts. The mean average number of services per conception was 1.73±0.64 which is in line with the studies of Melaku and Gebreah.¹⁷

III. Reproductive life span of camels

Male Camel: The reproductive span of male breeding camels was 21.9 and 17.32 years in Mieso and Boredede districts, respectively. The reproductive span of the male camel was higher in Mieso than Boredede district. The average reproductive span of male breeding camels was 20.04±6.50 years. Table 4 Similar to this study the average reproductive span was 12-30 years in the Somali regional state. This finding is also in agreement with those of Abdussamad,¹⁶ and Kuria,¹⁸ in that the reproductive life span of camel bulls used for mating is 17±2 years.

stated it to be 19.7, 17.9, and 18.4 years in small, medium, and large herd sizes in the Afder zone, respectively. The reproductive span of Somali female camels was between 7-30 years with average calves of 9.17±2.67.

Based on the respondents, the average number of camel calves per dam's productive life span was reported to be 11.13 and 10.08 for Mieso and Boredede districts, respectively. This finding is in agreement with those of Ali who stated that under normal conditions, a female camel that is giving birth every other year will have eight to ten calves in her breeding life.

Age at first calving and Calving interval: The age of camels at first calving was 4.78 and 6.90 years in Mieso and Boredede respectively. The age at first calving of camel in the Boredede district was longer than Mieso district camel. The mean age of camels at first calving was 5.84 ± 2.01 years in this study. Table 4 This is in line with the age at first calving noted in previous studies Tefera and Gebreah,²¹ for eastern Ethiopia (5 years) and the Afder zone of the Somali region (5.2 years). The mean age of camels at first calving was four years in Somali Regional State Sisay.²² This result is lower than the current result. report average age at first calving of 5.18 ± 0.87 and 5.36 ± 0.74 years in the Somali regional state and in Afar Pastoralists, respectively, and this result is comparable with the current study.

The calving interval of the camel was 21.38 and 24.60 months in Mieso and Boredede districts, respectively and the calving interval of the camel in Boredede was longer than Mieso district. Table 4 The mean calving interval was 22.99 ± 4.88 months and it is comparable with previous reports Melaku and Gebreah, Kaufmann, Kedija, Farah.²³⁻²⁷ reported that the calving interval for Somalia camel was 27.4 ± 9.3 months which is higher than the Ethiopian camel Dejene.¹³ reported the average calving interval (17.73 months) of camel in Borana Zone and this result is lower than the current result. Based on Bakheit,²⁸ calving interval was shortened under the semi-intensive system, females became pregnant in the period between 5, 8, and 13 months post-partum, and the calving interval varied between 17 to 25 months. The same author in the traditional system found that camels became pregnant during the 11, 16, and 17 months post-partum and the calving interval varying between 23 to 29 months. The level of nutrition is a factor here, since when feed supplies are inadequate, maintenance, growth, and lactation take priority over reproductive performance, which becomes a physiological luxury Mukasa,²⁹ and this is further supported by Bakheit,²⁸ in that additional feeding of 2 kg concentrate and 5 kg of roughages per day during the lactating period shortened dramatically the calving interval and increased rate of pregnancy.

IV. Gestation length and Lactation length

The gestation period of camels was 12.07 and 12.03 months in Mieso and Boredede districts, respectively. The mean gestation period of camels in this study was 12.05 ± 0.20 years. Table 4 This is similar to the values reported by the earlier studies Tefera and Gebreah,²¹ In addition to this, the result of in afar pastoralists reports similar Gestation length with an average of 12.04 ± 0.2 months. The gestation period of camels in the Somali Regional State was 13 months.²²

The lactation length of the camel was 9.77 ± 2.10 and 17.30 ± 5.66 months in Mieso and Boredede, respectively. The mean lactation length of the camel in the present study was 13.54 ± 5.69 months. Dejene¹³ Table 4 reports similar results to the current study with a lactation length of 13.38 months in the Borana zone. The result of Bedilu,³⁰ indicates that the average lactation period of the camel was 10 months in Eastern Ethiopia. This is lower than the results of the current study. Another report noted that the lactation length of camels in Jijiga was 15 months, while in Shinile zone it was 13 months Getahun and Brucker.³¹ This finding is also in agreement with the previous finding of Tezera,²¹ who reported 13 to 15 months. However, it is shorter than 15 to 18 months for Afar and higher than 6 months for Kereyu camels as per the report of Schwartz and Walsh,^{19,3} respectively. The average lactation length of camel (*Camelus dromedarius*) 13 and 13.76 months was reported for arid and semi-arid regions of Ethiopia, respectively. The mean lactation length of camel in the Somali regional state was 11.51 ± 1.91 months This indicates that lactation length for camels varies from place to place. This variation might be emanated from breed type, agroecological differences, and management practices.

This finding is in agreement with who stated that the lactation length varies depending on the management decision of the owners. Generally, there was a variation in reproductive performance of the camel between the two districts. This may be due to various factors for example management differences between the districts.

V. Reproductive constraints of camel

Five major reproductive constraints were enlisted in Table 5 Late maturity was the primary reproductive constraint followed by long calving interval, the presence of reproductive disease, low conception rate, and the birth of stunted calves in the Mieso district with index values of 0.25, 0.24, 0.22, 0.18, and 0.10, respectively. Whereas in Boredede district the primary reproductive constraints were late maturity followed by the presence of reproductive disease, long calving interval, low conception rate, and the birth of stunted calf with an index value of 0.25, 0.22, 0.21, 0.18, and 0.15. Table 10 Similarly according to Abdisa,³² late maturity (29.17%), long calving interval (24.17%), the birth of stunted calf (20.83%), low conception rate (18.33%), and presence of reproductive disease (7.50%) were the main reproductive constraints of camel in Yabello district.

Table 5 Reproductive constraints of camel in the study area

Reproductive constraints	District			
	Mieso(N=60)		Boredede(N=60)	
	Index	Rank	Index	Rank
Late maturity	0.25	1	0.25	1
Long calving interval	0.24	2	0.21	3
Birth of stunted calf	0.10	5	0.15	5
Low conception rate	0.18	4	0.18	4
Reproductive disease (abortion, mastitis)	0.22	3	0.22	2

Conclusion and Recommendations

Conclusion: Camels are important livestock species for the livelihood of pastoralists whereas other animals are less adaptive and productive. Camel, cattle, goats, and sheep were the main types of livestock reared in the area with a high preference for camels over other livestock. The mean total camel population per household was slightly higher in Boredede than in Mieso, whereas the number of lactating camels per household was more or less similar between the districts.

Feed shortage, conflict over the scarcity of natural resources, low productivity of grazing land, and water scarcity were the four main constraints of camel production in Mieso district with index values of 0.166, 0.161, 0.158, and 0.142 respectively. But in Boredede district the four major constraints for camel production were water scarcity, feed shortage, predator, disease, and parasites with an index value of 0.187, 0.156, 0.152, and 0.147 respectively. Inbreeding is an unobserved problem for the camel owners of the areas because majority of them used one breeding male with same pedigree to specific camel herd.

Generally, the present study shows that the reproductive performance of camel in Boredede district is lower than Mieso district. It needs well studied management interventions. Under proper management intervention (feeding, health care, mineral supplementation and keeping proper bull to female camels' ratio) in to the reproductive parameters, it is possible to increase the performances of the camels.

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Conflicts of interest

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