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The Somali and the Camel: Ecology, Management and Economics

K.O. Farah, D.M. Nyariki, R.K. Ngugi, I.M. Noor and A.Y. Guliye

INTRODUCTION

The Somali are one of the multi-state communities of Eastern Africa. Somalia is their main state, but they also occupy a large part of Djibuoti, northern Kenya and southern Ethiopia rangelands, loosely referred to as arid and semi-arid lands (ASAL). Unpredictable rainfall, long periods of drought, limited water, and inadequate knowledge and technology of water resource management characterize the ASAL. There is also rapid population growth, coupled with low or declining real incomes, low nutritional levels, serious environmental degradation, and the externalities of modernization and economic development (Darkoh, 1996).

Somali pastoralists are a camel community mainly because of the dry and harsh environment they live in; pastoralists, by definition, being those who primarily derive their living from the management of livestock on rangelands (Prior, 1994). There is no other community in the world where the camel plays such a pivotal role in the local economy and culture as in the Somali community. According to the UN Food and Agriculture Organization (FAO, 1979) estimates, there are approximately 15 million dromedary camels in the world, of which 65% are found in the northeast African states of Somalia, Ethiopia, Sudan and Kenya. The Somali community (in Kenya, Somalia and Ethiopia) has the largest population and highest density of camels in the world, and to the same extent this animal also pervades the Somali culture. Historically, the geographical area that is now Somalia may have been a focal point in the introduction and dispersal of the domesticated dromedary (Abokor, 1993).

The possession of a certain amount of livestock and of physical strength are the primary requirements for survival and success in the demanding environment of Somali pastoral nomads. The climatic and geographic conditions prompt the Somali pastoral nomads to pursue animal husbandry with constant movement from place to place in search of better pasture and water. This economic system in part determines social relations and institutions and creates a division of labour whereby tasks essential for survival are allocated to particular groups of people.

The camel is an important livestock species uniquely adapted to hot and arid environments (Schwartz, 1992) and therefore contributes significantly to the food security of the nomadic pastoral households. This unique adaptability makes it ideal for exploitation under the ASAL conditions. The contribution of camels to the human welfare of developing countries, including Kenya, is generally obscured by a combination of several factors, which tend to underestimate their true value. Firstly, the estimates of camel populations are usually inaccurate due to lack of regular census. Secondly, their products seldom enter a formal marketing system; thus their contribution to subsistence and the national economy tends to be grossly underestimated. As a consequence, less attention has been given to camel improvements for many years when planning national development. For example, the major livestock development effort in Kenya between 1969 and 1982 (funded by the European Community) aimed at developing range areas completely ignored the camel (Njiru, 1993).

In Somali occupied northern Kenya, camels are raised under traditional management systems. However, the changing socio-economic and environmental conditions are leading to a change in pastoral production systems from mainly subsistence towards market orientation. Generally, there are few practical, result-oriented studies on camel production. Wilson and Bourzat (1988) stated that the vast amount of research in the last two decades has contributed little to increased productivity. This has been attributed to the fact that most studies have had little general application to the practical aspects of camel production under pastoral production systems.

Pastoral camel production is under pressure because of multiple changes in the production

environment. Increasing human population pressure on pastoral grazing areas and the economic implications resulting from diseases and lack of veterinary services are some of the factors that adversely affect traditional camel production. Additionally, reproductive performance is low in camels due to late first parturition, long parturition intervals, and high calf mortality. Improvement of the reproductive performance and reduction of animal losses by management measures that are applicable to a mobile system appear to offer possibilities of increasing camel productivity and capacity to support the increasing human population. An adequate understanding of traditional camel production practices forms the foundation upon which improvement and innovations could be based. Using Moyale District as a case, this study was carried out in order to understand the status of traditional camel production systems of the Somali camel keeping pastoralists.

METHODS

Study Area

This study was carried out in Moyale District, northern Kenya. The district lies in the 80% portion of Kenya designated as ASAL, which accounts for 25% of Kenya's human population, 50% of the national cattle herd, 70% of sheep and goats, and 100% of camels (Brown, 1994). It is one of the eight districts of the northern Kenya rangelands, with the majority (85%) of the population comprising pastoralists rearing mainly camels, but also cattle, sheep, goats and donkeys (GoK, 1997). The one-humped camel (*camelus dromedarius*) constitutes a significant component of animal production in the district. Because of lack of regular census, there are no reliable livestock population data for the district. However, of the estimated 872,000–903,000 camels in Kenya (Surt, 1993; Karue, 1994), 274,000 are found in the former Marsabit District, which included the current Moyale District.

Moyale District is situated between 38° 16' and 39° 21' East and 02° 11' and 02° 4' North, bordering Ethiopia to the north, Marsabit District to the southwest and Wajir District to the south and east. It covers about 9,749km^2 and falls within agro-ecological zones IV and V (Pratt and Gwyne, 1977). Most of the district is an extensive low-lying plateau marking the southern limit of the Ethiopian highlands, with numerous ridges, hills and valleys between 500 and 1,220m. The district is hot and dry, with maximum temperatures and annual rainfall averaging 35°C and 725mm, respectively (Shongolo, 1994). The dominant vegetation consists of mixed *Acacia* woodland on stony soils and *Acacia-commiphora* bush on deeper soils. There is a regular grass cover depending on rainfall. Surface water sources (excavated dams, pans, seasonal streams) are scarce. Sub-surface water sources (boreholes, shallow wells) provide water for both domestic and livestock needs. The water facilities are unevenly distributed, with water points being concentrated on the already settled areas such as Moyale, Sololo, Godoma and Borri.

The population of Moyale District is about 36,973 (Gok, 1997), composed mainly of Somali and Borana ethnic groups, most of them concentrated around Moyale Town because of higher rainfall, better infrastructure and more water. Pastoralism and subsistence crop farming predominate. Some of the pastoralists live in permanent settlements, but also maintain *fora* (mobile livestock) camps. The target population for this study was the Somali nomadic pastoralists keeping camels. These are considered highly knowledgeable with regard to care and management of camels (Evans et al., 1995; Clarfield et al., 1995).

Data Collection and Analysis

A thorough literature search was carried out to determine the history and socio-economic aspects of the camel among the Somali community. Primary data on management and reproductive performance were collected using two separate questionnaires. These were a structured management questionnaire for qualitative and quantitative information, and a progeny life history questionnaire. The management questionnaire covered management issues, which fall under the managerial control of the pastoralists and were anticipated to affect production parameters or were suggested as production constraints in literature (O'Leary, 1985; Rutagweda, 1983; Field, 1993).

A multi-stage sampling procedure was adopted for the primary sampling units (administrative locations) and secondary units (nomadic

camps). To ensure a representative sample, the breeding female camels were selected randomly from camels in the locations and nomadic camps. The progeny history method advocated by Swift (1981) was used to collect information on reproductive performance, and involved recording the complete life history of breeding females chronologically, event by event. This was made possible by the existence of an indigenous calendar system (Table 1). Fifty-six herders were interviewed using the management questionnaire. In order to determine reproductive performance, 1,208 records of 416 breeding females, with at least one parturition were analysed. The indigenous calendar system is based on traditional methods of naming years. The pastoralists name their years according to the days of the week; hence every seven years the names of the years repeat. In addition to having a specific name for each month, the year is also classified into four distinct seasons. These are long and short, or rainy and dry seasons. The calendar system and the specification of seasons enabled the precise collection of life history data as "dates" (e.g., when the camel was born) rather than "ages" (i.e., how old it is). Thus, it was possible to determine the dates of events in the history of an animal to the nearest quarter.

Table1: Indigenous names corresponding to the last 20 years of production

Year and year name						
Sabti	*Ahad*	*Isnin*	*Talada*	*Arba*	*Kamis*	*Gumat*
1996	1967	1968	1969	1970	1971	1972
1973	1974	1975	1976	1877	1978	1979
1980	1981	1982	1983	1984	1985	1986
1987	1988	1989	1990	1991	1992	1993
1994	1995					

Descriptive statistics (frequencies, percentages) of traditional husbandry practices and reproductive performance were derived. The data were analysed using Panacea data management computer package (PAN Livestock Services, 1986). Information from the progeny history questionnaire was compiled into databases for quantitative analysis.

RESULTS AND DISCUSSION

History of the Camel in the Somali Community

As advocated by Bulliet (1975), camels were present in Africa during pre-Roman times. They first entered Africa through southern Arabia and the Horn of Africa. Bulliet supports his contention with a number of facts. First, Somali camel husbandry is very similar in its focus on milk production to the southern Arabia management type and in marked contrast to Saharan patterns of utilization that concentrate on using the animal as a beast of burden. Secondly, Bulliet contends that it is unlikely that camel husbandry could have spread into Somalia from the north, i.e., via the Sudan, since differences in climatic regime would have interfered with the camel's reproduction. By contrast, the climate in Somalia (including northeastern Kenya) and southern Arabia is very similar, especially in regard to the monsoonal rainfall scheme, which is a determining factor in the camel's breeding season. Thirdly, there are technological parallels between camel saddles in Somalia and the island of Socotra, which Bulliet presumes to be a staging point in the spread of the camel from Arabia to Somalia. This last presumption is supported by Socotran rock drawings of camels that are tentatively dated to the 10th century B.C. (Köhler-Rollefson, 1993).

Altogether, Bulliet's scenario, which draws on such a wide variety of arguments, is credible and appealing. The presence of a "colony" of domesticated dromedaries of southern Arabian origin in the Horn of Africa during the 1st and possibly as early as the 2nd millennium B.C. could also account for occasional pre-Ptolemaic incursions into areas further north, such as Sudan and Nubia. It is possible that a population of domesticated dromedaries existed in a circumscribed area in the Horn of Africa much earlier than 1st century B.C., and that occasionally camels or at least knowledge of and familiarity with them, filtered into the African countries further to the north. Such an interpretation would accommodate two of the different viewpoints on the circumstances of the camel's introduction into Africa. However, the third hypothesis of local domestication of the African dromedary cannot be totally discounted. While it is certain that the African dromedary is taxonomically not distinct from its Arabian cousin, this does not preclude independent domestication in Africa. There is, however, at present no evidence available to support this theory, although this might be due to our current lack of knowledge of Africa's more distant past. In the same line, it could be added that even Bulliet's well-developed conclusions

are only hypothetical, resting on probabilities not yet corroborated by archaeological evidence. Verification of an early date for the introduction of the camel into Africa via Somalia will require systematic surveys and excavations to document the movement of an Arabian population into the Horn of Africa as well as the recovery of camel bones or pertinent artefacts from correlated stratified deposits (Köhler-Rollefson, 1993).

The Socio-economic Importance of the Camel

Camels play an important role in the local economy of the Somali community. There is little agricultural land in most of northern Kenya and therefore most of the area is devoted to an extensive form of nomadic pastoralism. Camels are essential to the subsistence of the Somali pastoralists. In the Somali context, the monetary importance of camels depends on the way they are used in the pastoral system. There is growing tendency towards monetarization of the traditional subsistence economy of pastoralists. Highly attractive prices and strong incentives are causing more and more pastoralists to enter the market. The importance of the camel for the Somalis, however, arises primarily from its provision of milk and meat within the subsistence economy, and its use as a beast of burden for transporting milk to the market, water from wells, and household belongings when the families move to new areas.

Besides its economic importance, the camel has a social and cultural importance for the Somalis. Of the domestic livestock they raise, camels are the most highly valued. Somalis have eloquently described the practical uses of the camel in their vast oral literature (Abokor, 1986). Apart from their value in terms of milk and meat, and as transport animals, camels are prized according to their role in traditional social relations, e.g., the payment of bride wealth and compensation of injured parties in tribal feuds. In the case of tribal feuds, camels are the only means of payment of blood money to the lineage of the deceased (Hussein, 1993).

Somali pastoralists see camels as a banking system or security against drought, disease, and the other natural calamities that affect smaller stock more seriously. Their lineage members commonly provide households that lose their livestock due to drought with camels. Camels also act as a linking factor between different lineage groups and promote group solidarity. Even though a man inherits camels at birth from his father and camels are individually owned, they are at the same time the collective property of a particular patrilineage.

Camel Management

Proper husbandry and sound management techniques are the reasons for the success of Somali camel pastoralists in an environment characterized by erratic rainfall and frequent droughts. Observations and discussions with camel herders revealed that selection and breeding are the most important husbandry techniques in camel management. These and other management practices are discussed below.

Breeding Management

Breeding management consists of selection and/or culling of breeding female and male animals, and controlled breeding. Regarding the selection of breeding females, all females were used fro breeding. This can be explained by the fact that, in general, there is hardly any possibility to select among females in larger livestock species. This is particularly so due to high calf mortality, long gestation periods, and the need to build stock size. Culling of breeding females also plays only a minor role among pastoral camel herders. While culling might be desirable from a performance-oriented point, the pastoralists' attitude seems rational and may be justified when considering the slow herd growth in camels. Elmi (1989) and Adan (1995) reported that breeding management usually focused on bull selection and pastoralists selected their breeding bulls according to specific criteria. The herders interviewed widely agreed on the perceived proper criteria. Consideration was given to the bull's dam (milk production, fitness), bull's sire (fitness) and bull's performance ranking (body confirmation, fitness, docility, disease, drought tolerance). Once a bull was selected, he usually served as long as possible. Some herders have reported periods of up to 18 years. Such long active breeding is also common in Somalia (Elmi, 1989). The present study revealed that sires were kept in the herd for an average of between 4.5 and 7 years.

Breeding control is an aspect considered important by the herders. More than half of the respondents indicated that they kept two bulls. However, only the desired bull was usually grazed together with breeding females. All the unwanted males were either kept separately from the herd or castrated. Where the household herd was split, the breeding bull was usually kept in the nomadic herd. Under such circumstances, it is possible that for the females kept in the home-based herd, this practice may retard the onset of reproductive function during late lactation due to the absence of male stimuli. In the production system studied, 69% of the offspring indicated that they allowed the bull to serve his own female offspring when the latter reached puberty. Furthermore, most of the breeding bulls (70%) were selected from within the herd. Only a few bulls were borrowed (17%) from outside. Thus, limited new genetic material is introduced into the camel population. It is highly possible, therefore, that the local breeding management practices contribute to a substantial inbreeding depression in the herds.

In selecting breeding stock, herders pay great attention to two main factors in a camel—its appearance and behaviour, and the pedigree of young males. These young males are given special treatment, care and unrestricted suckling of their dams. By the time they reach the age of 5–6 years, as young potential sires, they are allowed limited breeding; only after their offspring have been proven will they be used intensively. The progeny of these males are judged by Somali standards—milk production, colour, size and other parameters (Wilson, 1984).

An outstanding male camel with a breeding lifetime of 15–20 years, can serve 150–200 female camels during a successful breeding season. Such males, besides ordinary grazing, receive supplements such as ghee, sesame oil and bran. During non-rutting seasons, they are usually kept separate from the females and given special treatment and exercise. Such breeding sires are not used for transport, unless other means of transport is not available. Breeding males used at the same time for transport purposes are called *baarfuran*, from the Somali words *baar*—meaning the hair on the top of the hump, and *furan*—meaning opened or withered away; while those breeding males that have never been used for transport, and therefore have their hair covering on the hump intact, are called *baarqab*.

The breeding of camels coincides with the rainy seasons. This seasonality ties in with the browse situation and accordingly the physical situation of the animal. The *gu* and *deyr* rainy seasons are the periods when there is a variety of green vegetation and temperatures are relatively mild, therefore body metabolism is high. Most of the female camels breed during the *gu* and the remaining during the *deyr*. However, if there is abundant browse, water and other favourable conditions, camel breeding could occur all the year round.

The gestation period of camels is about 13 months. This means that camels which mated in the *gu* season will calve during the next *gu* season, and those which mated during the *deyr* season will calve the next *deyr* season. Normally camels reach sexual maturity at the age of 4–5 years, depending on the breed and the forage situation; Somali camel herders rarely let them breed before they reach full physical maturity at 5–6 years of age. A female camel accordingly has her first calf at 6–7 years of age. Thus, under normal conditions, a female camel that gives birth every other year will have between 8 and 10 calves in her breeding life of around 25–30 years.

Somali camel herders can detect pregnancy in camels as early as 7–10 days after successful mating. Specific symptoms of camels' pregnancy recognized by herders are lifting and coiling upwards of the tail and curving of the neck when approached by a male camel, nervousness, lifting upwards of the head and pointing of the ears. A number of other more scientific methods for the determination of camel pregnancy have been developed. These include the determination of the pH and the specific gravity of the cervical mucous (Elmi, 1989).

Camel calving is difficult, and may occur at any time of the day. Therefore, as soon as the signs of imminent delivery are seen, herders take a careful watch. The Somali culture forbids women, especially those in menstruation, to approach a camel in labour for fear that either the calf will die or the camel will contract udder infection or retain the placenta. If a woman approaches a camel during labour or immediately after delivery, she is compelled to let the newborn calf smell her sweat or clothing as a kind of vaccination against any misfortune.

Calf Management

Calf management is considered important by herders and is given considerable attention. This was revealed by the fact that 96% of the calving was attended to so as to intervene in case of problems such dystocia. The respondents (68%) also indicated first suckling as taking place between one and three hours post calving. In addition, herders consider sufficient milk supply, provision of water during the dry season, provision of good pasture and tick control as important calf care measures. However, in agreement with the observation of Schwartz (1992) and Farah (1995), the majority of the respondents (75%) did not allow their calves to access initial colostrum, but instead milked it out. This arises from a belief that colostrum will result in ill-health to newborn calves. The herders consider high amounts of colostrum ingested by the calf to cause digestive problem. According to Yagil (1994), the above mentioned belief is probably due to the normal powerful laxative effect of colostrum. It is highly possible that the high calf mortality usually reported could be attributed to this practice of denying the calves access to colostrum, among other possible causes. Contrary to the existing belief, colostrum is very rich in immunoglobulins and imparts passive immunity to the otherwise unprotected newborn calves (Yagil, 1994). Furthermore, colostrum's laxative properties initialise the normal activity of the elementary canal.

Weaning of calves is at the age of 8–18 months, depending on the browse situation, the milk production of the dam, the growth of the calf and the ultimate use of the calf (future breeding, sale or slaughter). Several different systems of weaning are practised by the Somali camel herders, of which the most prominent are: tying the dam's teats with a softened bark (*maraq*); making a small incision in the skin of the calf's nose-tip and inserting *Acacia* thorns that will prick the dam whenever the calf tries to suckle; and making a small incision at the top of the calf's tongue and inserting a piece of wood that will hurt the calf when it tries to suckle. After complete weaning, the selection of future sires is made, and the rejected males at this age are castrated, sold or slaughtered. The objectives of castration are to prevent unwanted breeding, fattening for sale and to facilitate handling and training of future burden camels. Castration is done during the cooler but drier parts of the rainy season when there is abundant browse, the general condition of the animal is excellent and the presence of flies minimal. The most common method of castration is the opening of the scrotum and either breaking the epididimus or pulling out of the testes. The wound is then treated with traditional medicinal plants.

Herd and Range Resource Management

The aspects of management practices whose results are presented and selected for detailed discussion reflect those that were, or have the likelihood of being, critical for successful production. Some of the specific Somali camel herding and range management practices are rotational browsing, herd splitting, salt supplementation and watering.

Rotational Use of Browse

The Somali camel herders divide their grazing habitat into four micro-categories based on plant cover and soil type:

- *Harqaan/gabiib*—thick bush, clay soil
- *Adable/dhoobey*—thick bush, black soil (agricultural)
- *Dooy*—open bush, red soil with good water conservation
- *Bay*—open bush, mixed grey and red soil

For Somali camel pastoralists, the rainy season plays the decisive role in their management decisions. They have developed an elaborate subdivision of the seasons, related to the rotational use of the browsing areas (Table 2). This system of migration is in harmony with the harsh environmental conditions and unreliable rainfall.

Table 2: Migration cycle of camel herds

Season	*Climate*	*Period*	*Area of stay*
Gu	Cool/rainy	April/July	Inland/scattered
Hagai	Warm/dry	July/October	Home wells
Deyr	Hot/rainy	October/ December	Inland/home wells
Jilaal	Hot/dry	December/ April	Home wells, river zone

Herd Splitting

As already pointed out, the success of pastoralism stems from well-adapted principles

and strategies designed to overcome the harsh and variable conditions dominant in arid areas (Oba and Lusigi, 1987). The intimate knowledge of the environment common to many of the pastoralists allows a great flexibility in decision-making and enhanced ability to utilize all resources available (Farah et al., 1996). The present study reveals that the Somali camel herders of Moyale District adopt herd splitting as a risk spreading strategy. They split their herds into home-based herds (usually lactating) and nomadic herds (mostly dry). Home-based herds were kept close to settlements with possible deficiency in forage supply, whereas nomadic herds utilized better distant pastures. Lusigi (1981) reported that overgrazing around settlements and under-utilisation of remote grazing areas constituted signs of mismanagement of grazing resources. Herd splitting aims at reducing competition for forage and water resources between herds, thereby optimising pasture utilisation. The strategy appears to be a desirable and realistic attempt to utilise range resources more evenly while maintaining the productivity of the animals. The strategy also guarantees continued provision of milk for settled families. When surplus milk is available, it is sold in settlements to provide cash income for other family needs. Thus, the strategy responds to both the needs of the camel and those of the family. The management of the herd this way ensures a sustainable flow of benefits from the camels to the households while coping with production constraints.

Salt Supplementation

Camels have a high salt requirement than other livestock (Wilson, 1994). In general, ruminants in tropical regions do not receive mineral supplements other than ordinary common salt (sodium chloride), but depend on pastures for their mineral needs (Mcdowell et al., 1995). The observation of Macdowell (1995) that such animals consume a considerable amount of earth was confirmed by the present study. However, the mineral contents in soils are highly variable.

The importance of salt for camels is common knowledge among camel herders. In the study area, camels depend on salt plants (halophytes), salty soils (*kuro*) and sometimes commercial salt supplements for their mineral needs. Most herders (70%) claim to follow a regular deficiency preventive routine. Camels kept in the home-based herd were more frequently supplemented with purchased salt. This was attributed to the fact that they had limited access to distant grazing areas with salt plants. "Salt deficiency symptoms" revealed by the herders included chewing bones, eating soils from anthills, reduced milk yield, reduced water intake, and increased straying in search of salty plants.

Periodic salt supplementation was reportedly done once or twice a year in Somalia (Elmi, 1989) and six to seven times in Kenya (Ayuko, 1985). Mineral deficiency can cause a high susceptibility to skin disease (Dioli and Stimmelmayr, 1992; Bornstein, 1995) and consequently affect production. In addition, there are risks of loss or predation when animals stray or break out of night enclosures in search of salty plants. Camels manifesting bone chewing (pica), an indication of poor mineral nutrition, was reported by 98% of the respondents. Further, 81% of the respondents claimed to have seen their calves born with bent or weak legs, which recovered later in life. A possible reason for the calf-hood defects is the insufficient concentration of calcium and phosphorus in the bone matrices (rickets) in calves from deficient dams. This suggests that mineral deficiency is widespread, posing constraints to the performance of camels.

Watering

The watering interval for the camels was generally in agreement with that of Evans et al. (1995) who reported an interval of between 7–10 days among the Somalis. It was also close to the range of 8–14 days given by Cossins and Upton (1987) for the Borana tribesmen. In Somalia, the watering interval for camels is 14–21 days, decreasing to 6–7 days during severe dry seasons (Elmi, 1989). The overall picture in the current study is that the home-based herds were more frequently watered than the nomadic herds (after 6 and 10 days respectively) This may be explained by differences in forage availability, the water content in the forage, and distance to water sources. The nomadic herds are less frequently watered because they feed in areas with good and relatively plentiful forage, usually far from watering points. Watering intervals are particularly important in lactating camels. This

is because water deprivation has been reported to influence milk yield and milk quality. For example, in an experimental study in northern Kenya, Simpkin (1983) reported that dehydration affected daily milk yield, with yields being significantly higher on the day after watering than the day before watering. Grenot (1992) also reported that a dehydrated camel was found to produce milk with higher water content and lower fat content when compared with the milk of fully watered camels.

Lack of water is generally a limiting factor to pasture utilisation in pastoral areas. In these areas, the challenge associated with water scarcity is compounded 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. Upton (1986) reported that inappropriate distribution of water points for livestock could limit rangeland use, leading to partial overgrazing and partial under-utilisation of the rangeland. Long watering intervals reported in the present study are part of grazing management. They take into account the available forage quality and distribution of water points. The herders, therefore, seem to compensate for low water intake through forage by reducing watering intervals during the dry seasons. The distance to the nearest watering point and the labour required to water herds may also constitute major constraints to watering frequency in camels. Better utilisation of rangelands could, thus, be achieved by improving water supply and distribution, security, and predator control.

CAMEL PRODUCTIVITY AND REPRODUCTIVE PERFORMANCE

Milk and Meat Production

Most of the husbandry and management practices of the Somali camel herders are geared towards the improvement of milk production and the continuous supply of milk for the family's needs throughout the seasons. Milk production of Somali camels is 5–6kg. This production depends on the breed of the camel, its age, the lactation period, the season of the year and the availability of browse and water. Somali camels give higher milk yields at the end of the *gu* and *deyr* seasons. This coincides with the end of the rainy season, when plants have matured and there is an abundance of many types of vegetation. Under exceptionally favourable conditions, Somali camels can potentially produce more than 15 litres of milk a day during the peak of their lactation. Camels are usually milked twice a day—morning and evening; however, if the need arises they can be milked every 2–3 hours. Milking of camels is very easy compared to cows, is done with the fingers and is performed by one man. If the camel is very productive, it takes at least two men to milk it. Traditionally only men were allowed to milk camels, but nowadays, due to shortage of labour, women do also milk them.

Meat is another important source of food from camels. In general, Somali camel herders never slaughter a camel for meat unless compelled by circumstances. Herders will slaughter a camel, especially a male calf, for meat during periods of drought when there is huge competition for milk between suckling calves and the members of the family. Other occasions when camels may be slaughtered are during very important religious ceremonies and weddings, or when camels are either crippled by predators or seriously injured.

Production of Calves

The age at first calving and calving interval in the present study were 57.4±12.8 (n=296) and 27.4±9.3 (n=528) months respectively. Mean calving for the breeding females in the sample was 2.92 calves, with a range of 1–10 (n=416). The overall calf survival from birth to weaning (12 months) was 72% (n=1,204). The abortion rate as calculated from progeny history for the herds of the respondents was 11.9%. Fifty-six per cent of the respondents kept breeding bulls born in their herd.

The age at first calving (57.4±12.8 months) reported in this study is close to 58 months estimated by Field and Simpkin (1985) in rationally managed camel herds in Kenya, and the 58.8 months reported by Wilson (1995) from a study in Niger. However, it is higher than the average of 54.2±2.8 months for many ranch herds in Kenya, as reported by Wilson (1995). This is as expected because of the better management of ranch herds. In this study, there was a wide variation in age at first calving from 28 months to as much as 108 months. Wilson (1989) also

reported such wide variations in a retrospective study from Niger in which the age at first calving reportedly varied from 24 months to 132 months.

The implication of the wide variation in age at first calving presents a wide scope for improvement. Forage quality and quantity have been suggested (Grenot, 1992) to assume a central role in determining reproductive success in ungulates. According to Wilson (1984), sexual maturity in camels may be correlated not only with absolute age and condition but also with other factors affecting the onset of breeding season such as nutrition and climate. In the current study, no supplementary feeding was provided and camels were raised on available natural pastures. Consequently, improving growth significantly by improving feeding is not feasible. Thus, it appears that little can be done to improve on the late age at first calving, which is mainly attributed to slow growth. However, Yagil (1994) states that it is possible to shorten the pre-pubertal period by hormone treatment as a result of which the females give birth at the age of 3 years.

CONCLUSIONS

The Somali camel herders in Moyale District have adopted rational and goal-oriented camel management strategies in utilising their rangeland environments. Such strategies include movements of their animals in the range in order to locate ideal grazing areas and water resources, and also establish suitable patterns of movements. Another strategy is that of herd splitting in order to cope with production resource constraints and spread risks. The reproductive performance of the camel herds indicates low efficiency, while the breeding management practices appear to contribute to high chances of inbreeding. Signs of mineral deficiencies in the camels were observed and these point towards poor mineral nutrition.

More than half (57%) of the interviewed herders were dissatisfied with the performance of their herds. Most of the respondents pointed out problems related to high camel disease incidences and lack of veterinary services. Lack of water in good pasture areas, ethnic clashes and the resulting insecurity or raids were seen as causing under-utilisation of some pasture areas. Availing veterinary drugs and training in animal treatment were suggested as possible remedies. Maintenance of security in order to open up remote areas for grazing and drilling of boreholes in good pasture areas were also proposed.

Pastoral camel production has the potential of yielding a positive impact on economic, social, environmental and gender-related aspects. Both the government and donor agencies should adopt appropriate policy recommendations aimed at fully exploiting the camels' potential. There is, therefore, a need to improve on such management practices as colostrum feeding to newborn calves, salt and mineral supplementation to both home-based and nomadic herds, breeding, and provision of animal healthcare.

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KEYWORDS Somali Community. Camel Production. Pastoral Livelihoods. Rangelands. Kenya

ABSTRACT Camel production is a major source of livelihood for the pastoralists in the drier parts of Kenya. The majority of these camels are raised under traditional management systems that are not well understood by both researchers and policy makers. This paper looks at the ecological, management and socio-economic aspects of camel production among the Somali community of Moyale District, northern Kenya. Besides a thorough literature search, a survey was conducted to collect data on these aspects. The results show that the Somali pastoralists have evolved rational strategies for adapting to the prevailing production conditions of fluctuating forage amounts, and inadequate water and mineral salts. Some of the strategies include herd splitting, watering intervals and salt supplementation. Several aspects of the production system indicate the patoralists' inability to relate their management practices to certain phenomena. A few of these are restriction of initial colostrum milk supply to calves and calf mortality, irregular supply of mineral salts, and breeding practices that tend to cause inbreeding. Inadequate veterinary services due to lack of access to drugs and veterinarians constitute major constraints to camel production. The results indicate the need to educate the pastoralists on management practices that

would improve camel productivity, as there is potential for improvement using simple techniques.

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Authors' Address: **K.O. Farah, D.M. Nyariki*, R.K. Nyugi, I.M. Noo and A.Y. Guliye,** Department of Animal Science, Egerton University, P.O. Box 536, Nigro, Kenya
E-mail: range@bidii.com

**Corresponding author*