On-farm characterization of the indigenous small East African Shorthorn Zebu cattle (SEAZ) in the Southeast rangelands of Kenya

J.M. Mwacharo[1] & J.E.O. Rege[2]

[1]National Range Research Centre-Kiboko P.O. Box 12 ***Makindu,*** *Kenya*
[2]International Livestock Research Institute, P.O. BOX 5689, ***Addis Ababa****, Ethiopia*

Summary

The small East African short horned Zebu (SEAZ) is an important source of animal protein in Kenya. This indigenous genotype is well adapted to environmental stresses including endemic diseases of the tropics. However, literature available on its genetic potential is scarce. The Government of Kenya, in order to study this valuable germplasm in a systematic manner, has recently initiated some research and breed improvement programmes. This paper reports on some of the results of this work. Information was obtained-using a structured questionnaire administered to 430 farmers in Makueni, Kitui, Taita Taveta and Kajiado districts, Kenya. A multi-level stratified sampling technique was used to select the farmers to be interviewed. Utilization and reasons for preference of SEAZ cattle differed across and within districts in rankings. Generally, the SEAZ cattle are kept as multi-purpose animals and were mainly preferred to the exotic breeds due to their superior adaptive capacity to the local environmental stresses. Herd structures differed between the agro-pastoral and pastoral herds, but showed a management system that is subsistence oriented with milk production and draught power being the main objectives of herd owners. Breeding bulls were sourced from within or obtained from other herds for pure- or crossbreeding by natural, uncontrolled mating. Natural pastures, under continuous grazing were the main source of livestock feeds. The herds surveyed had advanced ages at first calving and prolonged calving intervals. The average milk production per day was 1.6 litres with significant differences being observed between districts, and hence Zebu strains, at the start and peak of lactation.

Résumé

La race de Zébu de petite taille à cornes courtes de l'Est africain (SEAZ) est une importante source de protéines au Kenya. Le génotype indigène est bien adatpé aux stress environnemental, y compris les maladies endémiques des tropiques. Cependant, il existe peu de litérature disponible sur son potentiel génétique. Le Gouvernement du Kenya, pour pouvoir étudier ce germoplams de grande valeur d'une façon systématique, a initié récemment quelques programmes de recherche et d'amélioration. Cet article présente les résultats de ce travail et l'information obtenue à travers un questionnaire soumis à 430 éleveurs dans les zones de Makueni, Kitui, Taita Taveta et Kajiado au Kenya. On a utilisé une technique d'échantillonage stratifié à différents niveaux pour sélectionner les éleveurs. L'utilisation et les raisons pour la préférence du SEAZ diffèrent à travers les zones et à l'intérieur même de celles-ci. En général, le SEAZ est utilisé à double propos et on les préfèrent aux races exotiques car plus adaptés aux stress du milieu. La strcture des troupeaux aussi diffère entre agro pastorale et pastorale, mais montre de prévalence une conduite de subsistence basé sur la production de lait et la traction. Les mâles reproducteurs sont choisi parmi le troupeau ou obtenu à travers d'autres

troupeaux de race pure ou de croisement naturel non contrôlé. Les pâturages naturels sont la source principale d'alimentation de cet élevage. Les troupeaux contrôlés présentaient un âge avancé à la premiére mise bas et un interval entre mise bas prolongé. La moyenne de production laitière par jour était de 1,6 litres avec des différences importantes entre les zones observées et les lignées de Zébu, au début et au maximum de la période de lactation.

Keywords: *Characterization, Functions, Herd structures, Management, Preferences, Zebu.*

Introduction

The Small East African shorthorned Zebu (SEAZ) is the main type of cattle in Kenya. This type, represented by several strains (Rege and Tawa, 1999), plays various socio-cultural and economic roles in the livelihoods of a majority of the populace and has successfully adapted itself to almost a large range of vegetation and management systems. These adaptive characteristics are very important for the development of a livestock industry that is suitable for resource poor farmers whose production system is fairly simple and extensive; with a relatively low level of managerial skills.

In spite of their ecological and economic importance, the SEAZ is inadequately characterized. This has indirectly contributed to the lack of sufficient interest to sustainably utilize, improve and conserve these unique genetic resources. Furthermore, literature available relating to the SEAZ has been gathered from unsystematic surveys or anecdotal reports whose reliability is questionable. There is a need for well-designed on-farm and on-station studies to evaluate the SEAZ and to provide an insight into possible areas for interventions. Documentation of the indigenous knowledge applied by farmers to select superior genetic stocks and priorities they attach to each function played by, and the reasons why farmers prefer, the SEAZ over exotic cattle, is also necessary. This study undertook to address some of these questions by conducting an on-farm survey in four administrative districts of the arid and semi-arid lands (ASAL) of Kenya where these cattle populations predominate.

Materials and Methods

Study sites

The survey was conducted in four districts in Kenya, namely Makueni, Kitui, Taita-Taveta and Kajiado. The inhabitants of Makueni and Kitui (Kamba tribe) and Taita-Taveta (Taita tribe) are agro-pastoralists. The Maasai of Kajiado are pastoralists. The climate of the study area has been summarized by Jaetzhold and Schmidt (1983). The study sites are characterized by very low agricultural potential being mainly arid and semi-arid lands where natural conditions favour livestock or game ranching and subsistence farming, given the present level of technology.

Data collection, classification and analysis

Data were collected in 1992, 1998 and 1999. In 1992, 185 farmers were interviewed in Makueni and Kajiado. The 1998 survey was done in Kitui where 65 farmers were interviewed while in the 1999 survey, which was deliberately designed to cover multiple districts, 180 farmers were interviewed, 60 each from Makueni, Kajiado and Taita-Taveta. Only in the 1998 and 1999 surveys were farmers asked to rank, in order of importance, the functions and reasons why they preferred the SEAZ cattle.

Information was obtained on the functions, preferences, management, adaptive traits, herd structures and production and reproductive attributes of the SEAZ cattle, through formal interviews, using a structured questionnaire administered to cattle-owning households. These households were chosen at random within a structured, stratified framework. That is, in each district, a

multi-level stratified sampling technique was used based on the local administrative boundaries. For example, in Kitui, three locations in each division were chosen at random. In these locations, three sub-locations were chosen and in each sub-location, three farmers were interviewed. For the 1999 survey, only three divisions with the highest population of the SEAZ cattle were sampled and farmers having the highest and lowest numbers of cattle in each of these divisions were included in the survey.

The functions played by, the reasons for preferring, individual cattle types / breeds and age-sex classes were each categorized, classified and coded for analysis. Frequency counts were determined to obtain the number of individuals in each class. Tests of independence were performed by Chi-square to investigate association of responses across and within districts. Milk yield data were collected based on three stages of lactation (start, peak and end). Farmers were asked to indicate average yields at each of these stages. The mean daily milk yield was calculated using the following approach:

$$\text{“Total” milk yield} = x_1y_1 + x_2y_2 + x_3y_3$$

$$\text{Adjusted daily mean milk yield} = \frac{\text{“Total” milk yield}}{(x1 + x2 + x3)}$$

where:
y_1 = milk yield at the start of lactation
y_2 = milk yield at the peak of lactation
y_3 = milk yield towards the end of lactation
x_1, x_2 and x_3 denote the interval lengths of the different stages of lactation (start, peak and end) and they sum up to lactation length. Based on farmers' views, within the first 30 days (x_1) of lactation, there is a rise in milk production, peaking during the second and third month of lactation (60 days = x_2). The end of lactation, a time when milk production is declining, was from the beginning of the fourth month to the end of lactation, varying in length depending on the district surveyed and was x_3 = 204 days for Makueni; 150 days for Kitui; 112 days for Taita Taveta and 115 days for Kajiado. Data were analysed using the GLM procedure of SASÒ release 6.12 (SAS Institute, 1993).

Results and Discussions

Functions played by indigenous breeds

The role of indigenous cattle differed across and within districts in their ranking ($P<0.05$), (Table 1). Within districts, milk production ranked first in Kitui, Taita-Taveta and Kajiado and second after draught power in Makueni. Slaughter of cattle for home consumption or sale was more common amongst pastoralists than agro-pastoralists. This result indicates milk production as being the principal function of the herd in the study area. Slaughter of cattle either for home consumption or sale is uncommon, as many households either prefer to slaughter sheep and goats or chicken or even purchase meat from butcheries in smaller quantities that can easily be consumed at the household level without the need for preservation. In Kajiado, cattle are slaughtered during socio-cultural ceremonies such as circumcision.

The use of cattle as a source of income (commercial sales) is gaining in importance in the study area compared to the socio-cultural value of cattle (Table 1). Throughout districts, commercial sales were ranked second overall after milk production in Kitui, Taita-Taveta and Kajiado, while in Makueni it was ranked third after draught power and milk production. This implies that commercial sale is gradually replacing the socio-cultural value of cattle as the communities in the study area are being integrated into cash economy.

Throughout and within districts, draught function had higher priority amongst residents of Makueni and Kitui district. The Kamba community have traditionally been known to use cattle for draught while Taitas and Maasais have learnt this technology recently by interacting with the Kamba community. That a few farmers use cattle for draught in Kajiado was not surprising. This is a more arid and predominantly pastoral

Table 1. Functions performed by indigenous breeds (percentage of respondents ranking each function as 1, 2 or 3).

District	Makueni				Kitui				Taita-Taveta				Kajiado			
Uses/Rank	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total
Draught	21.1	3.4	6.1	30.6	10.0	6.3	7.8	24.0	1.4	5.8	2.9	10.1	0.6	0.6	3.3	4.4
Milk	7.5	17.0	4.8	29.3	15.6	13.1	3.1	31.8	29.5	3.6	1.4	34.5	22.1	11.6	-	33.7
Cash	4.8	8.8	10.9	24.5	6.8	10.5	8.9	26.4	2.9	8.6	7.9	19.4	11.1	14.9	3.9	29.8
Manure	0.7	2.0	10.2	12.9	1.6	2.6	9.4	13.5	-	5.1	10.1	15.1	-	-	1.7	1.7
Meat	-	0.7	-	0.7	-	-	1.6	1.6	0.7	7.9	2.2	10.8	-	5.5	15.5	21.0
Social value	-	2.1	-	2.1	-	1.6	1.6	3.2	0.7	2.9	5.8	9.4	-	0.6	5.5	6.1
By products	-	-	-	-	-	-	-	-	-	-	0.7	0.7	0.6	0.6	2.2	3.3
Total	34.1	34.0	31.9	100.0	33.9	33.9	32.3	100.0	35.3	33.8	31.0	100.0	34.4	33.8	32.1	100.0

Table 2. Proportion of respondents (%) using animal dung as fertilizer, fuel or for building.

	Fertilizer		Fuel		Building	
District	Yes	No	Yes	No	Yes	No
Makueni	96.0	4.0	-	100.0	-	100.0
Kitui	88.9	11.1	1.7	98.3	1.7	98.3
Taita-Taveta	75.0	25.0	11.8	88.2	17.7	82.3
Kajiado	42.2	57.8	26.3	73.7	92.5	7.5

district where extensive cattle grazing is practised. Crop farming is limited to Ngurumani escarpments along the river Ewaso Nyiro South and the Kimana irrigation scheme. Moreover, among the Maasai, the use of cattle for draught is still not acceptable to a large measure: such practice is equated to slavery. In Taita-Taveta, the use of cattle for draught is confined to the lowlands of Mwatate and Taveta Divisions, due to the steep and rugged topography of the remainder of the district.

The majority of the animals used for ploughing and transportation were male Zebu cattle and donkeys (data not shown). This is related to the commonly held belief that female animals should not be overburdened, that is to produce milk, calves and till land. Generally, animals are preferred as a source of draught power due to their easy availability and affordability, in terms of the initial purchasing costs and maintenance requirements compared to tractors.

Animal dung was predominantly used as manure in Makueni, Kitui and Taita-Taveta and for building and partly as a source of energy in Kajiado (Table 2; Figure 1). Agro-pastoralists have long recognized the value of animal dung as manure due to the need to improve soil fertility as chemical (inorganic) fertilizers are unaffordable. The result that only a few farmers in Kajiado used animal dung, as manure was not surprising. It reflects the diversification of the Maasai lifestyle from one traditionally dependent on livestock to that increasingly embracing arable farming. The use of animal dung for building by the Maasai is a long tradition of this community (Figure 2).

Preference for the indigenous breeds

Indigenous cattle were preferred over exotic breeds due to their superior adaptation to local environmental stresses especially extensive droughts and endemic diseases and

Figure 1. Taita zebu, commonly found in Tantia-Taveda District.

Table 3. Proportion (%) of respondents ranking each preference as 1, 2 or 3 in each district.

		Preference								
District	Rank	Survival during droughts	Resistance to diseases and parasites	Better draught animal	Ability to work for long hours	Better milking animal	Highly Fertile	Better carcass	Others	Total
Makueni	1	13.9	8.0	10.2	1.4	-	-	-	-	33.8
	2	17.5	6.6	2.6	5.1	2.2	-	-	-	34.1
	3	21.2	7.3	1.5	2.2	-	-	-	-	32.2
	Total	52.6	21.9	14.3	8.8	2.2	-	-	-	100
Kitui	1	11.8	2.9	2.1	-	-	2.6	-	2.1	21.3
	2	22.8	12.4	2.6	-	-	1.3	-	0.5	39.3
	3	23.4	10.4	4.6	-	-	-	-	1.0	39.4
	Total	58.0	25.7	9.3	-	-	3.9	-	3.6	100
Taita	1	9.0	12.6	-	0.9	10.8	-	-	1.8	35.1
Taveta	2	11.7	12.6	-	1.8	4.5	-	-	4.5	35.1
	3	13.5	9.0	-	2.7	0.9	-	-	3.6	29.7
	Total	34.2	34.2	-	5.4	16.2	-	-	9.9	100
Kajiado	1	24.9	3.0	-	-	4.2	-	1.8	1.2	35.1
	2	18.8	6.7	-	-	3.0	-	3.6	1.2	33.3
	3	19.3	8.5	-	-	1.2	-	0.6	1.8	31.5
	Total	63.0	18.2	-	-	8.4	-	6.0	4.2	100.0

Note: Others
1. Kitui = Better milking animal, better carcass quality, docile, high calf survival, better mothering ability
2 .T/Taveta = Better carcass quality, docile, better draught animal, high calf survival, better mothering ability, high fertility rates
3. Kajiado = Docile, better draught animal, ability to work for long hours, high calf survival, high fertility rates

parasites (Table 3). These two main reasons given for the preference of indigenous breeds of cattle were not surprising. These are low risk, low investment animals capable of subsisting on poor quality forages without supplementation and minimal levels of veterinary care.

Apart from the adaptive traits, farmers in Makueni and Kitui preferred the SEAZ cattle as better draught animals, pointing out their ability to work for long hours. That, farmers in Makueni, Taita-Taveta and Kajiado preferred the SEAZ cattle to exotic breeds for milk production was interesting, but not totally surprising. This result reflects the ability of Zebu cattle to produce milk in extreme conditions under which their exotic counterparts are totally unproductive or unable to survive.

Herd structures

Two types of sex structures were observed, one in Taita-Taveta and Kajiado and the other in Makueni and Kitui (Table 4). The former showed a male:female ratio of 1:1.8. This type of sex structure is common in most livestock production systems in Africa, where the principal function of the herd is milk production (Pullan, 1979). In Makueni and Kitui, the ratio of males to females was 1:1.1 and 1:1.4, respectively indicating a proportionately larger number of male animals. This is expected in systems where the main function of the herd is to supply milk and draught power (de Leeuw and Wilson, 1987).

The number of adult breeding bulls in each herd gave a mating ratio of one bull to under 10 breeding females: 1:2.1 in Makueni; 1:2.4 in Kitui; 1:4.8 in Taita-Taveta; and 1:7.2 in Kajiado. Similar ratios have also been observed in Ethiopia and Sudan (Wilson and Clarke, 1975; Mukasa-Mugerwa, 1981). The need for draught animals in Makueni, Kitui and Taita-Taveta accounts for this high bull ratio while in Kajiado it may arise from the need to guard against unexpected losses of breeding bulls as a result of prolonged droughts due to the aridity of the district.

Adult animals, over three years of age, formed the highest proportion in the herds surveyed (49.2 percent in Makueni, 66.3 percent in Kitui, 54.3 percent in Taita-Taveta and 56.7 percent in Kajiado), with the majority being mature females (Table 4). This high percentage of mature females is essential where the main objective of the household is to ensure an adequate year-round supply of milk and allow for growth in animal numbers. High mortality rates approaching 20 percent among immature animals in the study area may explain the low proportion of young animals in the herds surveyed.

Breeding and nutrition management

Both straight- and crossbreeding, using natural uncontrolled mating (Table 5), were practised. Farmers sourced breeding bulls from their own or neighbours' herds (Table 5). Under communal grazing, controlled mating is impossible. Crossbreeding is done between SEAZ and Simmental, Freisian, and Sahiwal breeds to improve milk and beef production. However, farmers interviewed indicated that crossbreds did not compare favourably with the SEAZ in fitness traits.

No distinct calving season was observed (Table 5). This was expected under natural uncontrolled mating. The strategy is to encourage non-seasonal calving to ensure year round supply of milk and calves. This is common with most communities found in tropical Africa (Wilson and Clarke, 1975, de Leeuw and Wilson, 1987). However, due to the effect of climate on pastures, there is usually a tendency for more calvings between March to May and November to December.

Inhabitants of the study area generally select animals for breeding. However, there was a preference for the selection of male animals only in Kitui and Kajiado and both males and females in Makueni and Taita Taveta (Table 5). Farmers in the study area do not keep written records but rely on their memory. This is a common situation in developing countries (e.g. Nuru and Dennis',

Table 4. Age and sex structure of cattle herds in the study area (%).

	District			
Age – sex structure	Makueni	Kitui	Taita-Taveta	Kajiado
Males	46.9	41.8	36.0	36.1
Adult males (> 3yrs)	13.9	18.0	8.4	5.4
Adult castrates (> 3yrs)	6.2	5.2	5.6	11.9
Young intact males (1-3yrs)	9.6	8.9	11.8	5.7
Young castrates (1-3yrs)	1.0	0.8	2.6	4.2
Immature (0-1yrs)	16.0	8.9	7.7	8.8
Females:	53.1	58.2	64.0	63.9
Mature (> 3yrs)	29.0	43.1	40.3	39.3
Young (1-3yrs)	12.1	8.1	14.0	12.1
Immature (0-1yrs)	12.0	7.0	9.6	12.4
Average herd size (numbers)	5.2	7.9	22.3	53.9

1976). Under on-farm conditions, lack of performance recording is a major handicap to breed improvement.

Qualitative and quantitative traits were used for selecting breeding animals (Table 6). However, selection criteria differed between and within districts in ranking. Milk production, body size and coat colour formed the selection criteria for breeding animals in Makueni, Taita Taveta and Kajiado. In Kitui, milk production, coat colour and horn shape and size were traits of importance. In Taita Taveta, fertility and in Kajiado horn shape and size were additional traits used to select animals for breeding. Farmers favoured high milk producing animals as this ensured self-sufficiency both for the calf and the family, while larger bodied animals fetched better market prices. Brighter coloured coats were preferred as these are considered not to attract tsetse flies and thus act as a natural control against trypanosomosis. The preference for horn shape and size in Kitui and Kajiado was for socio-cultural reasons.

The average age at culling (AAC) breeding animals was 7.2 years and 11.3 years for male and female animals, respectively (Table 7). Significant differences were observed for the latter ($P<0.05$) between: Kitui and Makueni, Kitui and Taita Taveta and Kitui and Kajiado. Generally, there was some culling of bulls. However, cows were maintained in the herds up to the end of their reproductive life. This is attributed to the important functions cows play in the households, the low replacement potential due to high calf mortality and the need to reduce risk by holding onto surviving adult female animals.

Livestock production is based on natural pastures under a continuous grazing system (Table 7). Tethering, practised to a small extent in the Kitui District, is done during the planting and harvesting when farming activities are at their peak and herding labour is scarce. Feeds are conserved in the form of crop residues (cereal straws) in Makueni, Kitui and Kajiado and also as hay in the Kitui District (Table 7). Supplementation using concentrates and mineral licks is rare due to the additional cost involved which farmers are either not willing or able to incur (Table 7). However, animals exploit natural salt deposits within the grazing fields or at watering points.

Table 5. Proportion of respondents (%) for each breeding management system.

Breeding management	Districts			
1. Breeding system	Makueni	Kitui	Taita-Taveta	Kajiado
Straightbreeding	77.6	79.7	55.1	26.7
Crossbreeding	10.2	15.6	26.5	58.3
Both straight- and crossbreeding	12.2	4.7	18.3	15.0
2. Mating system				
Natural uncontrolled	88.9	66.7	63.0	82.7
Natural controlled	11.1	28.6	37.0	17.3
Artificial insemination (A.I.)	-	4.8	-	-
3. Source of breeding bulls				
Own herd	88.9	57.1	57.7	97.7
Neighbours' herd	11.1	42.7	42.3	2.2
4. Calving season				
Wet	11.4	49.2	36.5	27.4
Dry	4.2	15.9	23.1	12.9
Year round	84.4	34.9	40.4	59.7
5. General selection of breeding animals				
Yes	90.0	42.0	77.6	93.6
No	10.0	58.0	22.4	6.4
6. Selection based on sex				
Male animals only	37.3	67.7	12.5	49.1
Female animals only	2.3	6.5	20.8	25.4
Both sexes	60.4	25.8	66.7	25.9

Age at first parturition and calving interval

The mean age at first calving (AFC) was 4.5 years, but there were substantial differences between districts: Makueni (4.3 ± 0.14) *vs* Kitui (5.3 ± 0.14) ($P<0.001$), Makueni *vs* Kajiado (4.4 ± 0.14) ($P<0.001$), Taita-Taveta (4.0 ± 0.16) *vs* Kajiado ($P<0.05$) and Taita-Taveta *vs* Kitui ($P<0.001$). These results show the expected patterns in which conditions in Kitui (nutrition stress) and Kajiado (nutrition stress and trekking long distances in search of pastures and water) are associated with delayed AFC (Ward *et al.*, 1988).

The mean calving interval (CI) was 16 months with significant differences being observed between districts: Makueni (14.9 ± 0.93) *vs* Taita-Taveta (18.5 ± 0.92) ($P<0.01$), Kitui (16.7 ± 0.79) *vs* Kajiado (13.9 ± 0.81) ($P<0.05$) and Taita-Taveta *vs* Kajiado ($P<0.001$). The observed differences in calving intervals between Kajiado and the other districts (e.g. Kitui and Taita Taveta), is in line with short lactation lengths observed among Kajiado herds, a result linked to the fact that Maasai wean their calves early. This facilitates early return to oestrus and thus conception.

Table 6. Proportion of respondents ranking each trait as 1, 2, 3, etc.

		Basis of selection of breeding animals							
District	Rank	Body size	Milk Prodn.	Coat colour	Horn shape	Fertility	Other qualt.	Others	Total
Makueni	1	21.9	9.4	0.6	-	-	5.9	1.1	39.0
	2	5.3	4.7	8.9	-	-	6.5	2.3	27.8
	3	1.8	7.7	3.6	-	-	2.3	4.1	19.5
	4	3.0	0.6	2.3	-	-	-	3.0	8.9
	5	0.6	0.6	1.8	-	-	0.6	1.1	4.7
	Total	32.6	23.0	17.2	-	-	15.3	11.6	100
Kitui	1	-	6.0	-	8.4	-	7.3	6.1	27.7
	2	-	2.4	-	4.3	-	2.4	1.2	10.3
	3	-	-	2.4	-	-	-	-	2.4
	4	-	-	12.1	6.1	-	3.6	-	21.7
	5	-	2.4	19.3	9.6	-	3.6	2.4	37.3
	Total	-	10.9	33.8	28.4	-	16.9	9.7	100
T/Taveta	1	16.4	20.2	2.2	-	0.8	-	4.4	44.0
	2	10.5	9.7	5.2	-	7.5	-	0.8	33.6
	3	3.7	1.5	3.0	-	7.4	-	0.8	16.4
	4	-	-	1.5	-	1.5	-	1.4	4.4
	5	-	-	-	-	0.8	-	0.8	1.5
	Total	30.6	31.4	11.9	-	18.0	-	8.2	100
Kajiado	1	8.2	15.2	2.0	2.6	-	-	3.1	31.1
	2	11.2	9.2	2.6	-	-	-	2.5	25.3
	3	3.6	1.5	7.1	3.0	-	-	1.5	16.8
	4	1.0	-	3.6	11.1	-	-	1.0	16.8
	5	-	-	7.1	2.1	-	-	1.0	10.1
	Total	24.0	25.9	22.4	18.8	-	-	9.1	100.0

Note: Other qualt.= other qualitative traits which include extended dewlap, long neck, long tail, long prepuce, long navel flap

Others = 1. Makueni = Horn shape and size, fertility
2. Kitui = Fertility and body size
3. T/Taveta = Horn shape and size and other qualitative traits
4. Kajiado = Fertility and other qualitative trait

Figure 2. Maasai zebu, commonly found in Kajiado District.

Average lactation length

The average lactation length (LL) was 235 days (Table 7) with significant differences ($P<0.05$) observed between the following districts: Makueni (9.8 ± 0.32 months or 294 days) *vs* Kitui (8.0 ± 0.41 months or 240 days); Makueni *vs* Taita Taveta (6.7 ± 0.47 months or 202 days); Kitui *vs* Taita Taveta; Kitui *vs* Kajiado (6.8 ± 0.32 months or 205 days) and Makueni *vs* Kajiado Districts. The short LL observed in Taita Taveta is related to the practice of partial / restricted suckling, as the calf is separated from its dam for part of the day during grazing. This encourages early return to oestrus after parturition. The inhabitants of Makueni, Kitui and Kajiado prolong the lactation lengths by continuously milking the dams and suckling their calves. The SEAZ cattle strains analysed in this study showed short or very short lactation lengths. The SEAZ strains studied are found in the arid and semi arid lands, areas characterized by nutritional and climatic stress and are kept by resource poor farmers. These factors account for the short lactation lengths of the SEAZ cattle of the study area.

Milk production

The daily milk yield averaged 1.6 litres with significant differences observed between districts, and hence strains, at the start and peak of lactation (Table 8). For the former, differences were observed between Makueni and Kitui; Makueni and Taita Taveta and between Kajiado and Taita Taveta, and for the latter between Taita Taveta and Kitui and between Taita Taveta and Makueni. The study area is characterized by overgrazed poor quality forage resources, climatic stress and low levels of disease and breeding management. Semenye (1987) observed that the lactation curve of the Maasai Zebu responds to forage availability regardless of the month of lactation. In spite of the low

Table 7. Age at culling of breeding animals (years) and nutrition management[a)]

	District			
	Makueni	Kitui	Taita-Taveta	Kajiado
Breeding management				
1. Age at culling breeding animals				
Males	6.7 ± 0.52	6.9 ± 0.49	7.3 ± 0.53	8.0 ± 0.46
Females	11.1 ± 0.55	12.6 ± 0.45	10.6 ± 0.497	10.9 ± 0.44
Nutrition management				
1. Type of feeds available on the farm				
Natural pastures	53.1	27.7	-	88.5
Sown pastures	6.3	3.0	-	11.5
Both natural and sown pastures	40.5	69.2	-	-
2. The common grazing system				
Continuous	98.9	56.9	-	96.2
Continuous and tethering	1.1	43.1	-	3.8
3. Feed conservation				
Yes	100.0	85.0	-	100.0
No	0.0	15.0	-	0.0
4. Type of feeds conserved				
Hay	-	15.0	-	-
Crop residues	100.0	30.0	-	100.0
Hay and crop residues	-	55.0	-	-
5. Supplementation of animals				
Yes	33.8	24.2		19.0
No	66.2	75.8		81.0

[a)]Figures in the table are percentage of respondents in each district expressing each level of a particular attribute (of nutrition management)

milk production levels in Zebu cattle, high within-breed variation in milk production has been observed with certain strains or individuals within the SEAZ type of cattle having very high milk production levels (Galukande *et al*., 1962). Farmers interviewed also observed this. In their opinion, Zebu cattle are capable of high milk yields. However, this high level of milk production has declined as a result of inbreeding and poor feeding. It is, however, possible to identify farmers with high milk producing animals. There is a need to identify such animals which can form the basis for breed improvement programmes.

Research and development

The SEAZ cattle have received limited national attention and no genuine and systematic attempts have been made for their improvement, in spite of its numerical importance and adaptability to stressful environmental conditions including disease resistance. Considering the importance of using well adapted breeds in the tropics to meet food requirements, a breeding and genetic improvement programme for the SEAZ cattle has recently been established by the Kenya Agricultural Research Institute. A total of 124 SEAZ cattle (eight bulls and 116 heifers) has been procured from Kitui and Kajiado districts with the objective of studying this valuable germplasm and formulating selection criteria for its genetic improvement as a dual purpose breed for milk and beef production in the marginal areas of Kenya.

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Table 8. Average milk yields (litres) for Zebu cattle in the study area.

	Districts surveyed			
	Makueni	Kitui	Taita Taveta	Kajiado
1. Daily milk yields				
Lactation start	2.8 ± 0.23	1.9 ± 0.16	1.8 ± 0.18	2.3 ± 0.23
Lactation peak	3.1 ± 0.27	3.2 ± 0.23	2.4 ± 0.25	3.1 ± 0.27
Lactation end	1.0 ± 0.11	1.0 ± 0.10	0.7 ± 0.11	0.9 ± 0.10
2. Adjusted mean daily yields	1.6	1.7	1.4	1.8
3. Lactation milk yields	464.5	410.4	276.7	362.9
4. Annualized milk yields	380.1	299.0	181.6	316.4
5. Amount of milk potentially produced by Zebu cows (annualized)	83 545 980	56 808 100	23 698 800	239 957 760

Annualized milk yield = (actual lactation milk yield * 365)/calving interval

[5]Based on the proportion (%) of mature (breedable) cows as obtained from the herd structures (Table 4 as follows: Makueni = 29.0; Kitui = 43.1; T/Taveta = 40.3; Kajiado = 39.3. These were used to get the population of adult breedable females in each district). The Zebu cattle population figures Makueni = 219 800; Kitui = 190 000; T/Taveta = 130 500 and Kajiado = 758 400 (MOALD, 1995)

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