CATTLE KEEPING PRACTICES OF THE ORMA PEOPLE

A HOUSEHOLD SURVEY IN TANA RIVER DISTRICT, KENYA

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KETRI-ILRI COLLABORATIVE STUDY

January 2000

ACKNOWLEDGEMENTS

The author wishes to acknowledge Dr Bernard Sacher for providing the funds to conduct the survey and to Dr Hans Wagner of FAO for his long-term interest in Orma cattle as well as being instrumental in securing the funding and facilitating communication with Dr Sacher.

I also acknowledge ILRI, in particular, Dr J. Rowlands and his staff for providing the project with the facilities within the Biometrics Unit and for their interest and encouragement throughout the study. Also, I acknowledge Dr E. Rege for proving the initial layout of this study. Dr S. Staal and Mr P.N. de Leeuw made useful comments on the questionnaire and the initial draft of this report. Their efforts are highly appreciated.

Many thanks go to the Director of KETRI for allowing me to participate in this project and Dr S. Nyamwaro for helping in drafting of the questionnaire. The helpful comments of Drs G. Murilla and C. Mwendia are also acknowledged.

Dr R. Dolan was instrumental in all stages of this study right from the literature review, planning the survey, and supervising both the field work and the writing up of this report.

The efforts of the District Veterinary Office in Tana River, in particular, Drs E. Ngarari and Agoi, and Mr M. Ijema are gratefully acknowledged. I also thank the Chief of Bilisa location for his hospitality and Mr H. Alushula for helping with the data collection.

Last but not least, many thanks go to all the Orma pastoralists in Tana River District for their hospitality and for offering their valuable time to answer our questions.

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SUMMARY

Trypanosomosis, a disease mainly transmitted by tsetse flies, is widespread throughout the humid and sub-humid areas of Africa. For centuries the disease has taken its toll on cattle and people living in tsetse-infested areas. In Kenya, 25% of the country's total landmass is tsetse infested. This land supports over half of the country's national cattle herd.

The Kenya Trypanosomiasis Research Institute (KETRI) has conducted a series of studies over the last 20 years on the Orma Boran, an indigenous cattle breed kept by the Orma tribe in Tana River district in the Coast province of Kenya. Field studies on Galana Ranch, Coast province, Nguruman, Kajiado district, and some laboratory based studies at their Nairobi headquarters have shown this breed to be less susceptible to trypanosomosis than other Kenyan cattle. The current study aimed to provide information on the Orma pastoralists and their cattle in their own environment of the Tana River district.

A household survey was conducted in 12 locations of Tana River district. A total of 48 household heads were interviewed and data collected on body weight for 407 cattle and milk yield for 164 cows. The household heads interviewed, despite having minimal formal education, were very knowledgeable cattle keepers. They selected their cattle for breeding or commercial purposes primarily on the basis of their milk yield and body size. There was a marked degree of sedentarisation amongst the Orma people in the areas studied. On average, the household heads had resided in their current villages for 25 years. The average herd size of these pastoralists was 156 head of cattle, some of which remained close to the villages. The larger proportion of the cattle was herded by young men away from the villages in *fora* herds and living in temporary *manyattas*.

The mean live weight of mature cows was 250kg, mean calf weight at eight months was 78kg. The average daily milk off-take was 1.6 litres per cow. The mean yearly expenditure per household on trypanocidal drugs was Kshs 15,575, but this varied greatly depending on the tsetse challenge in any particular area.

The Tana delta area, which is heavily infested by four species of tsetse fly, was used by the majority of the households as dry season grazing for their cattle.

1.0 INTRODUCTION

The indigenous cattle of Africa are the product of generations of natural selection in the face of drought and disease. Trypanosomosis, a haemoparasitic disease transmitted by tsetse flies, is widespread throughout much of sub Saharan Africa and has taken its toll on cattle in tsetse infested areas over the centuries. Cattle breeds with varying degrees of resistance to the disease have thus evolved, and the term trypanotolerance is used to describe livestock that exhibit some degree of natural resistance to trypanosomosis. The term is generally associated with *Bos taurus* cattle in West Africa; N'Dama cattle in particular exhibit a highly developed trypanotolerance which has been the subject of many research investigations. In contrast, trypanotolerance amongst East African breeds, although reported as early as 1913, has largely been ignored.

Large areas of East Africa are tsetse infested, and it is only in this century that drugs or tsetse control have afforded some protection from the disease. It is not surprising then to find that natural selection for resistance to trypanosomosis has also occurred amongst the indigenous Zebu cattle of East Africa. The Boran type cattle of the Orma people in the Tana River district of Kenya is an indigenous *Bos indicus* breed which, is superior to other *Bos indicus* cattle under high tsetse challenge (Njogu *et al*., 1985; Dolan *et al*., 1994).

The Orma Boran cattle have been studied by the Kenya Trypanosomiasis Research Institute (KETRI) on Galana Ranch in the Coastal province of Kenya. The 1.7 million acre ranch borders the grazing lands of the Orma people to the east and north and Tsavo National Park to the west. Much of the ranch is heavily infested with tsetse flies. It has been the practice for many years on Galana Ranch to purchase steers for fattening from the Orma tribe. The home bred cattle on the ranch are also Borans but these originated from the Laikipia district in the Kenya Highlands. There, in the absence of trypanosomosis, they had undergone 70 years of selection for beef production, and are known as the improved Kenya Boran.

Differences between these two types of Boran cattle under tsetse challenge were first recognised on Galana Ranch in the earlier 1980s (Njogu *et al*., 1985). Studies have been conducted comparing both steers and breeding animals. In all cases it has been found that the Orma cattle do better than the improved Kenya Borans under tsetse challenge. They become infected with trypanosomes, the parasites which cause trypanosomosis, less often, and once detected parasitaemic, they are less likely to suffer from severe anaemia and in some cases, they recover without treatment (Dolan, 1998). Infection and mortality rates from the disease in the Orma are approximately half those observed in the Kenya Borans. Under both prophylactic and treatment regimes, the Orma cattle require fewer drugs. However, the Kenya Borans are a better beef animal. They generally grow faster and reach a heavier mature body size than the Orma Borans; although, this trend is reversed under high tsetse challenge.

In 1983 KETRI embarked on an ambitious breeding and selection programme aimed at improving the beef production characteristics of the Orma Boran while at the same time maintaining their level of trypanotolerance. A breeding herd of 200 Orma cows was established and to date over 1,000 calves have been born. Data have been collected to provide estimates of various genetic parameters, thereby increasing our understanding of the disease and its impact on production, and providing guidelines for improved selection programmes.

The growing human population in Kenya has given rise to an increased demand for livestock products. However, the climatic conditions and the disease constraints are such that improved exotic breeds cannot be maintained in many areas. Increasing livestock production through the use of improved indigenous breeds is an important option. The Orma breeding programme has produced calves with improved birth and weaning weights, and bulls which reach 400kg by four years of age. These bulls are now being sold to farmers in other tsetse infested areas of Kenya.

KETRI, with the support of the Overseas Development Administration of the UK, convened a workshop in February 1997 to discuss the future of the herd on

Galana Ranch. The workshop was attended by the Director of OAU/IBAR, representatives from the biodiversity programmes of ILRI, and FAO (Rome). In summary, the workshop recommended:

- conservation of the breed through utilisation,
- a survey of the Orma tribe and their cattle keeping practices in the Tana River district,
- assessment of these cattle in other tsetse infested areas of Kenya and,
- characterisation of the breed for milk yield.

Following the workshop, funds were secured from a private donor through the Animal Genetic Resources Group of the Animal Production and Health Division, FAO Livestock Biodiversity programme, to carry out a survey of cattle numbers and practices amongst the Orma pastoralists in their Kenya homeland the Tana River district. These funds allowed the establishment of this joint ILRI/KETRI project. This report presents the results of a household survey carried out in Tana River district between February and March 1999 to assess the cattle-keeping practices of the Orma people and the productivity of the Orma Boran cattle.

2.0 WHO ARE THE ORMA?

2.1 Introduction

This chapter explores briefly the history and culture of the Orma people. The information presented here is drawn from the literature as well as the author's experiences during the household survey in Tana River district.

2.2 History of the Orma people

The Orma are descendants of the Oromo people of Borana province in Ethiopia. They belong to the Eastern Cushitic group and speak Orma. Some Orma also understand Somali, Borana and Swahili. The Orma are currently estimated to be about 45,500[1], most of whom are Muslims, having converted into Islam in the 1940s.

Available ethnographic evidence is not clear on the migratory routes taken by the Orma to Tana River district, their present-day homeland. They probably originated from Dirre in southern Ethiopia where they practised nomadic pastoralism. During the 16th century, they moved southwards to Moyale and then to the Lorian Swamp (Turton, 1976). On arrival at the Lorian Swamp, the Orma split into two groups; one group went to Aji on their way to Kismayu and the other proceeded down to Tana River (Figure 1). The arrival of the Orma in Tana River area led to a retreat of the Bantu-speaking peoples towards the Sabaki river and the Somali, northwards towards the Juba river.

At the beginning of the 19th century, the Somali, in an apparent bid to recapture their lost territory, invaded, conquered and almost annihilated the Orma. Most of them were taken captive and enslaved in Somalia until around 1930. These Orma returned to the Tana River district, and are nowadays referred to as Wardei. Their culture and language are essentially Somali. However, the Wardei insist that their ethnic identity is Orma.

[1]This figure was obtained from the Internet.

Ensminger (1996) divides the Orma people into three major groups on the basis of the ecology and river systems that define their homeland. These categories are: the Hirman, in the arid north bordering Garissa district, the Galole, in the intermediate section of Tana River district, and the Chaffa, in the south along the Tana River delta.

2.3 Culture of the Orma people

The Orma are predominantly pastoralists who keep cattle, sheep and goats. In the semi-arid hinterland of the Tana River district, the Orma also keep camels and donkeys. A growing minority are involved in farming, primarily for subsistence (Kelly, 1990).

Cattle are central to the Orma culture. They are paid as bride price from the groom's family and also slaughtered at weddings and funerals. All life focuses on the welfare of cattle. Rice, their main staple, is mainly supplemented with milk and occasionally with meat. Some Orma also eat maize, beans and fish. Tea is their favourite beverage. The milk is supplied by the large stock, while the small stock supply most of the meat.

Most of the household goods in Orma houses are made from wood and doum palm (*Hyphaena coriacea*). These include stools, water and milk containers, food-serving bowls, drinking vessels, ladles and "books" inscribed with texts from the Koran. The doum palm leaves are also weaved into mats which, at times, are used to cover houses, floors of houses, beds, and for saddle-padding camels and donkeys.

The houses are of two shapes, hemispherical and beehive. Beehive-shaped houses belong to the Orma while the hemispherical houses belong to the Wardei. In both cases houses are constructed by women. Both designs are constructed from pliable saplings of *Danisa* trees to form a frame that is then covered with doum palm leaf fibre or grass mat at times. The hemispherical houses are, in general, smaller and roughly constructed compared to the neatly erected Orma houses. A typical hemispherical house is about two metres high; a

bee-hive house is usually about six metres in height. In both designs, the entrances measure about four feet high and two feet wide, so that one has to bend to enter the house. The door is usually made of a tuft of soft threads weaved from the bark of the *Karadri* tree. Apart from those belonging to the newly weds, the houses are usually partitioned with a mat into a bedroom and a sitting room. The bed is an elevated wooden rack covered with a traditional cowhide. The sitting room is simply furnished with a mat and one or two low wooden stools, mainly for non-Muslim visitors.

The houses are grouped into *manyattas* (villages). The m*anyattas* are usually circular and are laid out to include enclosures for calves and the small stock. There are two types of *manyattas* - sedentary and temporary - as dictated by the nomadic lifestyle. Sedentary *manyattas* are usually (but not always) located near the town centres while temporary *manyattas* are located in the bush. In general, the Wardei *manyattas* are more mobile than the Orma *manyattas*. A typical sedentary *manyatta* comprises of several household heads who may not necessarily be related, their wives and children some of whom attend school. The married sons build at the periphery of their fathers' compounds. In each sedentary *manyatta* there is a herd of lactating cows that supplies the household with milk. A temporary *manyatta*, on the other hand, is a highly mobile cattle camp consisting of the *fora* herd and a few herdsmen.

The Orma attire is simple: men wrap a *kikoi* (skirt) around the waist topped by either a shirt or a T-shirt. Most men wear a head-scarf and carry a walking stick that signifies social dignity and status. On Fridays, the Muslim day of prayer, they put on a *kanzu* (robe) over the casual wear. Women, on the other hand, wrap themselves with a multi-coloured *leso* (sheet) and cover the head with a veil. Married women also wear a black head-dress. Both sexes use sandals.

As in many African communities, labour among the Orma is divided along gender lines, the focus here being on livestock production. Across the board, men are the heads and managers of the household; they direct all aspects of household life. Women are house-keepers; they construct the houses, take care of the children, cook, fetch water and firewood, milk the cows, churn butter from the

cream, fashion the milk vessels and sometimes even help with the herding. Teenage and unmarried men (the equivalent of Maasai morans) live in the bush herding cattle. Young boys and girls herd the calves and the small stock around the sedentary homestead. They also make bonfires in the evening for the cattle. Adolescent girls help their mothers in the house. Girls are usually married at 14 years.

2.4 Governance amongst the Orma

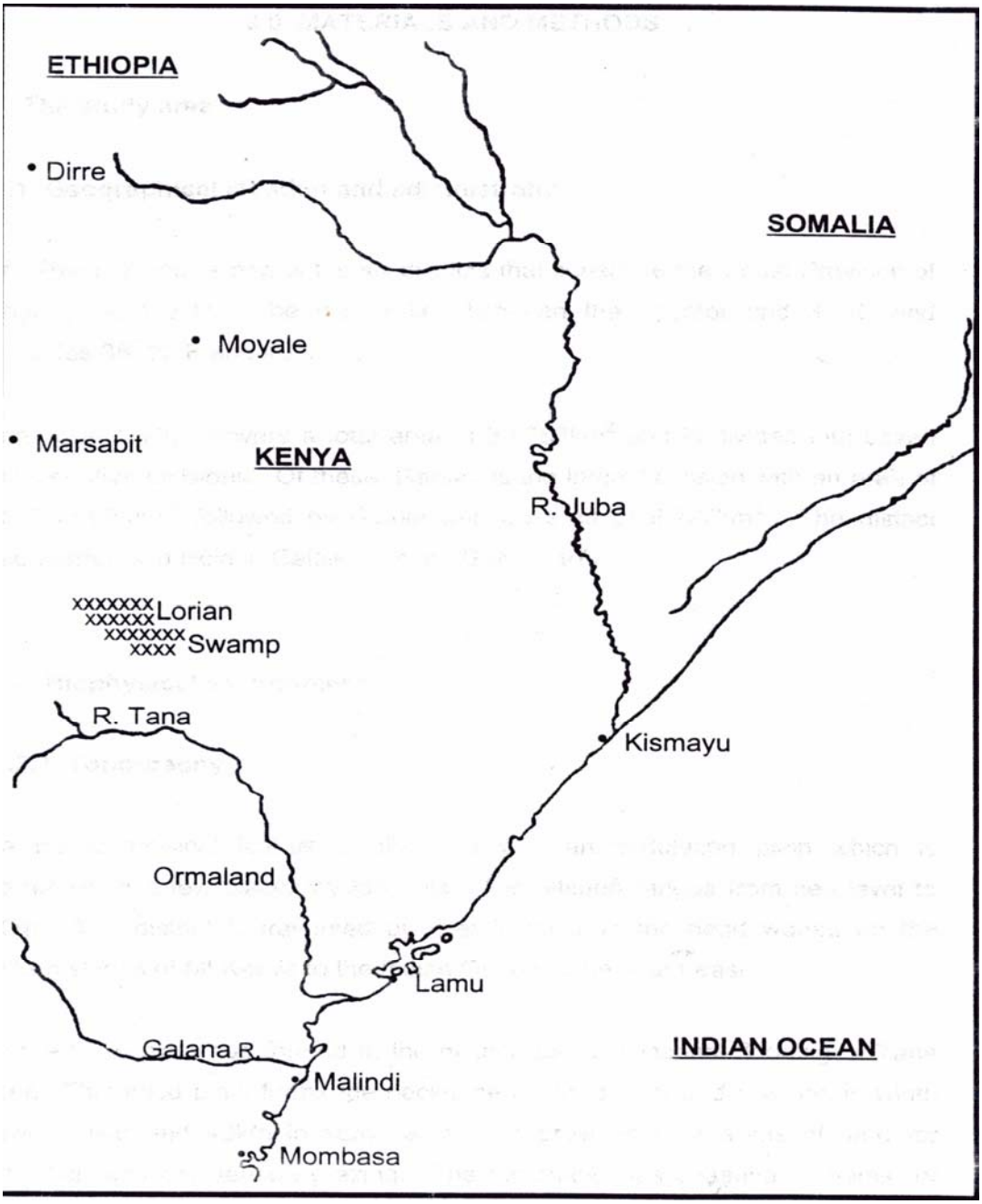
According to Baxter (1954), little has been written about the social and political institutions of the Orma. However, he explains that the Orma are split into two exogamous sections. Each section is further divided into clans. The regulation of marriages seems to be the most relevant aspect of the clan distinctions. In this, a man who is a member of any of the clans of one section must marry into one of the clans of the other section. A particular clan may have a particular role to play through some of its members, such as their presence at a wedding ceremony or their participation in legal and other social transactions.

Traditionally, Orma chiefs (*hayu*) were chosen two at a time, and held their positions of authority for a period of eight years. They were selected by members of the *gada* (or age set), and their principal public duty was to preside over assemblies. Their personal duty was to lead unimpeachable private lives. The office of the chief was not necessarily coveted as it entailed many restrictions, the chief often being nothing more than the chairman of the council of elders (Werner, 1914; Krapf, 1860). Each chief and sub-chief had four divisional elders who acted as assistants and judges for presiding over minor cases. Cases of a more serious nature were sent to the senior chief (Ensminger, 1996). No office of rain-maker or of medicine-man existed, but there were certain men respected as "holy" and considered to have special powers.

Today, the government appointment of chiefs has eliminated the function of the *gada* system along with its ritual and political offices. However, the chiefs today still retain many of their moral authority and leadership principles (Braaksma, 1994). The *mangudo* (council of elders) still maintains a large amount of power

and play a key part in the Orma model of social organisation within the complex framework of traditional, Islamic and national law.

Figure 1. Possible migratory routes of the Orma people to their present-day homeland in Tana River district



3.0 MATERIALS AND METHODS

3.1 The study area

3.1.1 Geographical location and administration

Tana River district is one of the six districts that constitute the Coast province of Kenya (Figure 2). The district lies between the equator and 3^{o} S, and longitudes $38^{o}30'$ E and $40^{o}15'$ E.

Tana River district covers a total area of 38,782km^2 and is divided into seven administrative divisions. Of these, Garsen is the largest division with an area of about 15,624km^2 followed by Galole with an area of 9,427km^2. The district headquarters is in Hola, in Galole division (GoK, 1997).

3.1.2 Biophysical environment

3.1.2.1 Topography

The major physical feature in the district is an undulating plain which is interrupted in a few places by low hills. The altitude ranges from sea level to 200m. The district is traversed by river Tana from the head waters on the eastern slopes of Mt Kenya to the Indian Ocean in the south-east.

A large flood plain has formed in the district due to seasonal flooding of Tana River. This flood plain forms the backbone of the district and varies in width between two and 4km in some areas. It provides vast areas of land for cultivation and dry season grazing. The hinterland has seasonal streams (or lagas) that support wet season grazing. As the Tana River enters the Indian Ocean, it forms a delta that covers the lower part of Garsen division and the entire Kipini division. From the air, the Tana delta gives a scenic beauty of vast wetlands that harbour abundant marine as well as terrestrial flora and fauna.

3.1.2.2 Climate

Tana River district receives low and erratic convectional rainfall. The mean annual rainfall varies between 300 and 500mm. Rainfall is bimodal; the long rains come in April and May and the short rains in October and November.

November is the wettest month. Due to the convectional type of rainfall, the coastline is wetter than the hinterland, with up to 1250mm of rain annually.

Generally, the district is hot and dry. The mean annual temperature is about 30^{o}C. February, March, September and October are the hottest months of the year, when temperatures rise beyond 35^{o}C.

3.1.2.3 Soils

The soils are generally montimorilonitic (black cotton) with clay loam and alluvial deposits along the Tana delta. In the hinterland, the soils are generally sandy.

3.1.2.4 Vegetation

Tana River district lies in the coastal lowland zone (Jaetzold and Schmidt, 1983). This zone comprises of four agro-ecological zones as shown in Table 1. The natural vegetation varies according to the rainfall pattern. In the wetter coastal belt, the vegetation is dominated by Palm, *Combretum spp.* and *Pennisetum spp.* thicket. Further inland this thicket gives way to a narrow corridor of *Hyphaena spp.* and *Eragrostis spp.* open grassland which, in turn, gives way to *Acacia spp.*, *Balanites spp.* and *Themeda spp.* scrubland that covers much of the district.

Table 1. Characteristics of the agro-ecological zones of Tana River district

Zone	Characteristics	Distribution
Coastal lowland zone 3	Coconut-Cassava zone with a medium cropping season and intermediate rains	Kipini division
Coastal lowland zone 4	Cashewnut-Cassava zone with a medium to short cropping season and intermediate rains	Kipini division
Coastal lowland zone 5	Livestock-Millet zone with a short to very short cropping season followed by intermediate rains	Lower part of Garsen division
Coastal lowland zone 6	Lowland Ranching zone with bimodal rainfall	All other divisions apart from Kipini

Source: Jaetzold and Schmidt (1983)

3.1.3 Population

The population of Tana River district was estimated at 181,000 people in the 1999 population census distributed (Table 2).

Table 2. Human population and number of households in each division of Tana River district

Division	Population	Number of households	Population density (persons/sq. km)
Galole	34,948	7,214	4
Garsen	51,592	10,000	4
Bura	28,848	6,173	6
Madogo	21,731	4,414	12
Kipini	16,243	3,055	19
Wenje	12,686	2,557	23
Bangale	14,853	2,764	2
Total	180,901	36,177	5

Source: Central Bureau of Statistics (2001)

There are two major tribes in Tana River district; the Orma (and its sub-tribe, the Wardei) and the Pokomo. The Pokomo, in contrast to the Orma, are small-scale farmers who live along the Tana River. The smaller indigenous tribes include the Marakote, the Giriama, the Bajuni and the Arabs at the coast. Non-indigenous tribes include the Kamba, the Kikuyu, the Meru and the Luo. A majority of the latter group of tribes run small-scale businesses in the town centres.

3.1.4 Economic activities

Tana River district is one of the least developed districts in Kenya (IFAD, 1990). The reasons for this date back to the colonial government and its view toward the Northern Frontier District (NFD) of which Tana was a part (Braaksma, 1994). About 96% of Tana River district lies in the coastal lowland zone six (IFAD, 1990), which is characterised by low and erratic rainfall, averaging between 300-500mm annually. Accordingly, the major part of the district is only suitable for pastoral livestock production. A 1999 Pan African Rinderpest/Contagious Bovine Pleuropneumonia (CBPP) vaccination campaign report indicates that about 200,000 head of cattle (estimated at 80-90% of the total herd) were presented for vaccination in 1998 (Table 3).

Table 3. Number of cattle vaccinated in each division of Tana River district during the Pan African Rinderpest/CBPP vaccination campaign in 1998

Division	Number of cattle vaccinated
Garsen	120,210
Galole	38,324
Bura	30,038
Wenje	15,132
Madogo	3,243
Bangale	1,115
Kipini	27
Total	208,089

Source: Pan African Rinderspest/CBPP Vaccination Campaign Report (1999)

Small-scale crop production is also practised along the river flood plain mainly by the Pokomo. The main crops grown are maize, bananas, and mangoes. Other minor economic activities include fishing and small-scale businesses in the town centres. The district has a high potential for rice and coconut production and, to a lesser extent, eco-tourism in the vast wetlands along the coastal belt.

3.2 Survey design

The survey was confined to the lower Tana delta because this area has a high concentration of Orma villages and the majority of cattle population. The lower Tana delta covers three administrative divisions, namely Kipini, Garsen and Wenje. The remoteness of the district and scarcity of information on the location of the villages made it difficult to plan the survey. The initial aim was to visit two Orma villages in each location depending on accessibility and to interview two household heads per village. However, because of the effects of the 1998 'El Nino' rains, three locations, Ozi, Semikaro and Kipao in Garsen division were totally inaccessible by road (Figure 3). Also, some villages were so big that interviewing two household heads per village would have grossly misrepresented the situation on the ground. To overcome this problem, more household heads were interviewed in the bigger villages. More villages were visited in large

locations such as Assa. Wema location in Garsen division was exclusively inhabited by the agrarian Pokomo and was therefore not surveyed.

3.3 Data collection, processing and analysis

The household head was the main interviewee. Due to lack of a suitable sampling frame, purposive sampling was done, whereby the Chief[1] was asked to give the names of four Orma pastoralists in two villages under his jurisdiction. The selected pastoralists were then visited and interviewed using a semi-structured questionnaire that had previously been pre-tested and adjusted. The questionnaire covered topics on household characteristics; herding, watering and disease management practices; breeding management; milk production, consumption and marketing; cattle marketing, and sources of herding labour (Appendix 1). Interviews were conducted in Orma and Somali languages through an interpreter. A total of 48 household heads were interviewed during the survey.

In order to assess the productivity of the Orma Boran, the heart girth was taken using a weighband. Body condition was scored as 'poor', 'fair' and 'good' based on the protrusion of the ribs. The age of adult animals was estimated on the basis of time to teeth eruption following Carles and Lampkin (1975) (Appendix 2). The herd owner was also asked to ascertain the age of the animal and to provide information of the reproductive status of the cows. Prior to the household survey, the author had developed a linear relationship between heart girth and actual body weight for the Orma breeding herd at Galana ranch. This relationship was used to estimate the actual body weight for the village cattle.

Milk offtake for both morning and evening milking sessions was determined using a calibrated plastic measuring jar. On extraction, the milk was carried to the data collector, measured to an accuracy of 50ml, recorded and returned to the milker. The date, name of milker, time of milking and the age of the calf were recorded. The age of the calf was ascertained from the herd owner. The questionnaire,

[1]Or the Assistant Chief or Headman where the Chief was absent.

weight and milk data were entered into the computer and descriptive statistics determined.

Figure 2. Map of Kenya showing the location of Tana River district

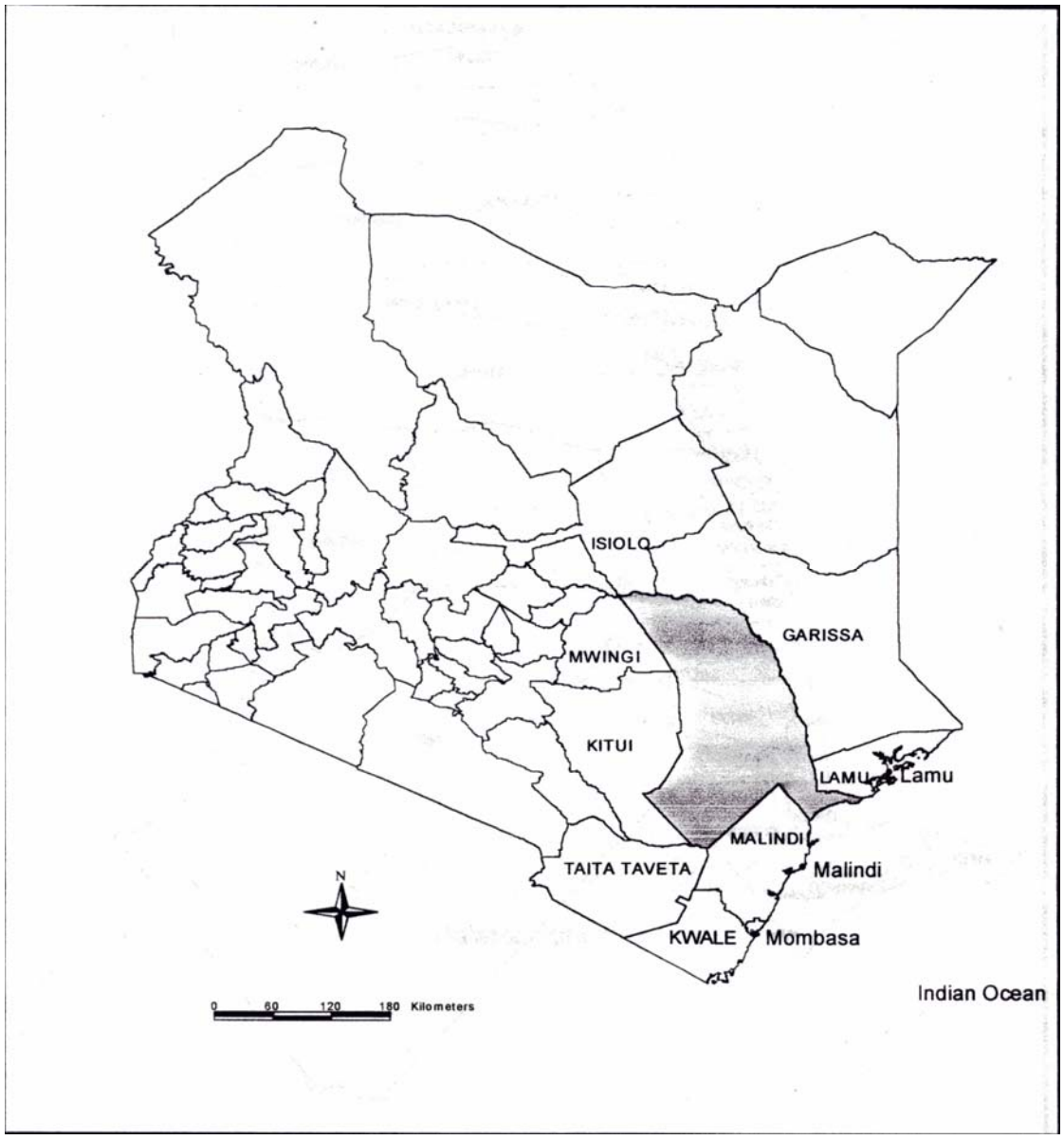
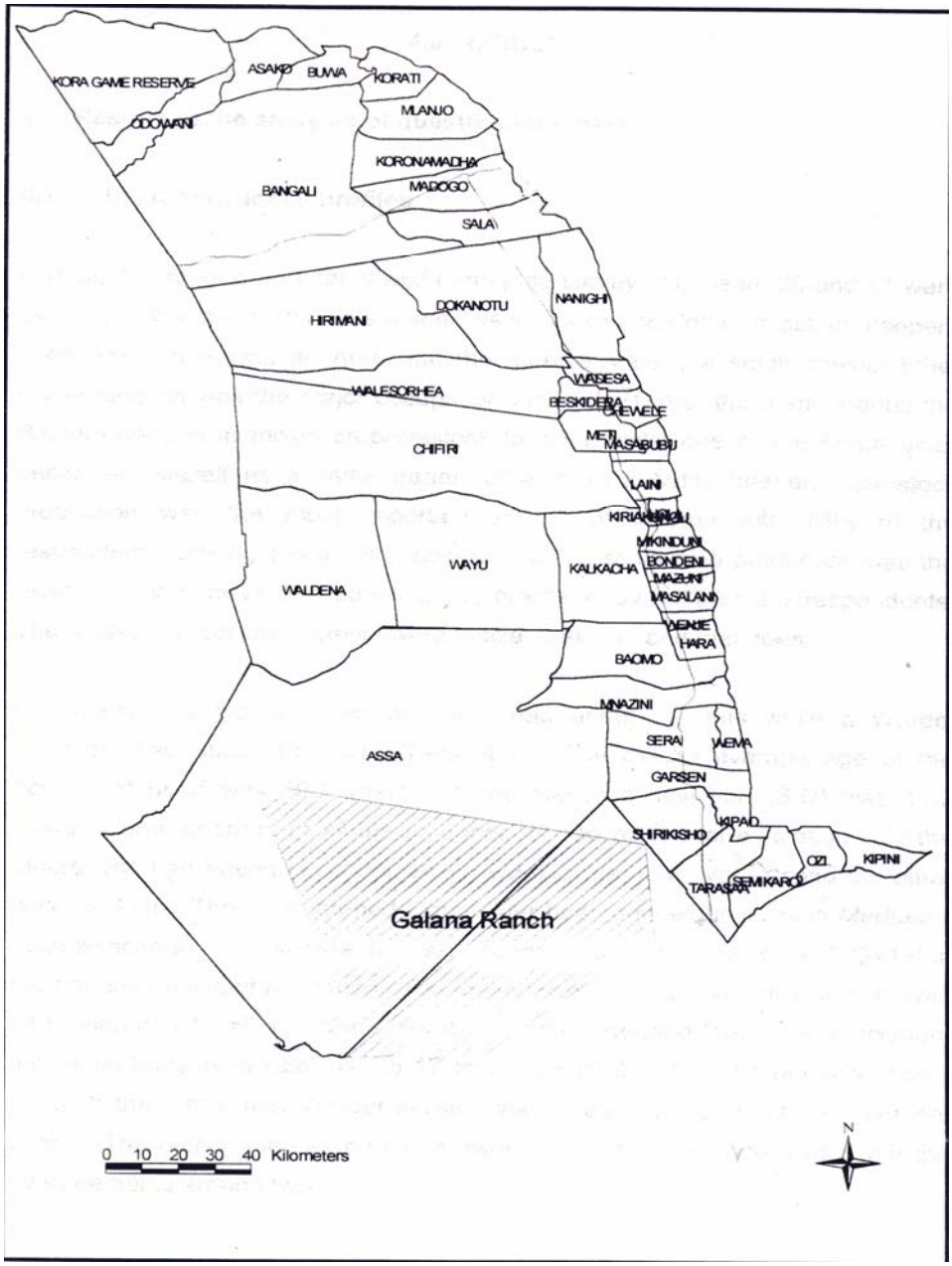


Figure 3. Map of Tana River district showing the survey area



4.0 RESULTS

4.1 Socio-economic characteristics of respondents

4.1.1 Household social profiles

In total, 48 elders were interviewed during the survey. Of these, 25 and 21 were Orma and Wardei pastoralists respectively. Of the two other livestock keepers interviewed, one was an Arab and the other a Bajuni, a small coastal tribe. Cattle keeping was the major occupation for all but two of the respondents; the Bajuni engaged in mixed crop/livestock farming, whilst one of the Orma elders described himself as a cattle trader rather than a cattle keeper. Livestock production was the most important source of income with 74% of the respondents ranking it in the first position. Small-scale crop production was the most common minor occupation, being practised by 44% of the respondents. The most common crops grown were maize, bananas and mangoes.

On average, a typical Orma *manyatta* had about 90 huts while a Wardei *manyatta* had about 130 huts (Table 4). The overall average age of the household head was 59.4 years with a standard deviation (S.D) of 11.2 years. Three-quarters of all the respondents had no formal education. Of the elders who had attended school, seven were Orma, four Wardei, and the other was an Arab. The most learned Orma elder had spent eight years in *Madrassa* (Islamic school). On average, the respondents had spent 25.9 years (S.D=13) in their present place of residence. The mean family size for the entire sample was 14.6 persons (S.D=5.6). When members of the extended family were included, the mean household size rose to 17.1 persons (S.D=7.1). The household size for both the Orma and Wardei families was equal, having about 14 members each. The elders interviewed had between one and four wives each, with the average being around two.

4.1.2 Cattle ownership

Most of the pastoralists were reluctant to give the exact number of cattle under their ownership. They indicated that counting the cattle was likely to bring them bad luck. Livestock were counted only in preparation for *zaka* (tithe). The

number of cattle reported here is therefore an underestimate. These numbers, however, give a rough estimate of cattle ownership in the survey area.

The number of cattle owned by all the 48 households ranged from 10 to 500 head (Table 4). The Wardei pastoralists had slightly larger herds than their Orma counterparts. The average herd size for the Wardei was 192 head, while that of the Orma was 124 head. The per capita cattle herd size was 8.8 and 13.7 for the Orma and Wardei households respectively. The mean number of lactating cows per household was 12.

Table 4. Characteristics of the Orma and Wardei households

	Orma households				Wardei households				Overall
Variable	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**	**mean****
No. of huts in a village	25	90	74.3	8-300	21	130	129.3	5-368	102.9
Age of hh head (yrs)	25	59.1	13.6	32-87	21	60.4	8.2	50-80	59.4
Hh head's years of formal schooling	25	1.4	2.5	0-8	21	1.1	2.5	0-8	1.3
Years of residence	25	27.6	14.6	6-72	21	23.2	8.6	1-35	25.9
Wives	24	1.9	0.9	1-3	21	2.2	1.0	1-4	2.1
Children	24	11.5	5.8	5-32	21	10.9	3.6	5-17	11.5
Extended family	17	2.2	1.5	1-6	10	2.8	2.5	1-9	2.5
Household size*	16	16.8	7.4	8-36	10	16.5	6.1	10-26	17.1
Lactating cows	25	10	7.0	2-28	20	16	13.3	4-50	12.2
Cattle	24	124.3	140.6	10-500	21	192.2	145.3	43-500	155.6

Source: Survey Results (1999)

*Including members of the extended family; **Overall mean for all 48 households

4.1.3 Herding practices

The movement of cattle in and out of the Tana delta corresponds to the rainfall pattern. The wet season is characterised by floods along the delta. In a typical year, the cattle are in the delta from January to March after which they start moving into the plains as the wet season begins in April. The cattle then move to the plains and remain there till June. The duration of stay depends on the amount of rainfall received in the area and in the central highlands, which influences the level of flooding. In July, the herds start moving back into the delta where they stay until the onset of the short rains in October. They remain in the plains until the end of the year.

The migration of cattle in and out of the delta emphasises the importance of the Tana River delta to the pastoralists. However, this movement is usually beset with a number of problems. One, during migration, the cattle graze on crops belonging to the Pokomo, which has been a major source of tension between the two communities. Second, and perhaps the most important factor to the pastoralists, the movement of cattle into the delta exposes them to varying degrees of tsetse challenge and trypanosomosis risk, thereby causing substantial losses and necessitating heavy use of trypanocidal drugs. Lastly, the incessant migration in and out of the delta may lead to the spread of certain notifiable diseases such as rinderpest, CBPP and Foot and Mouth Disease (FMD).

4.1.4 Watering practices

As expected, the Tana river was reported to be the major source of water for livestock in the areas surveyed. In the drier parts of Garsen division, particularly Assa and Kone, water was obtained from natural levees and shallow wells. A typical well consisted of a shallow hole about four metres deep and two metres in diameter dug out along the sandy dry riverbeds. The water was drawn out of the well by three to six people, mostly women and girls, in a relay using plastic containers. The number of people in the relay was dependent on the depth of the well. The water thus drawn was eventually emptied into a nearby water trough for livestock or carted home on donkeys for domestic use.

The majority (38%) of respondents watered their cattle either *ad libitum* or twice or three times a day (Table 5).

Table 5. Frequency of watering cattle during the dry season

Frequency of watering	% of respondents who reported the frequency
Ad libitum	37.5
Twice/three times per day	35.4
Once per day	18.8
Total	100

Source: Survey Results (1999)

4.1.5 Parasite prevention practices

All respondents indicated that tsetse flies were a problem; 47 of the 48 respondents reported problems with ticks and helminths as well (Table 6). The majority of respondents controlled tick and helminths but none of them practised tsetse control. Thirty-six respondents either hand-washed their animals with acaricides or plucked off the ticks by hand. The rest either dipped or sprayed, or cleared the bush to control the ticks. Forty-two respondents used anthelmintics to control helminths. The control of tick and helminthosis was done strategically whenever the animal was heavily infested.

Table 6. Percentage of respondents whose cattle experienced the problems of ticks, tsetse and helminths, and the proportion of respondents who controlled them

Problematic vector/parasite	% of respondents who reported the problem	% of respondents who controlled the vector/parasite
Tsetse	100	21.3
Ticks	97.9	89.4
Helminths	97.9	91.5

Source: Survey Results (1999)

The pastoralists indicated that they used smoke to repel biting flies and mosquitoes. The fire was made every evening by boys and girls of seven to ten years from dry cow dung. Apart from repelling biting flies, the fire was believed

to improve both the meat flavour and keeping quality of carcasses from cattle that had been exposed to fire. The fire was also said to guide stray animals back home. This practice of lighting fire for the cattle was totally absent in the dry Assa location where it was reported that there are no biting flies and mosquitoes.

4.1.6 Disease management

Trypanosomosis was reported to be the most important disease in the survey area, with all but one respondent ranking it amongst the three most important diseases (Table 7). Other important diseases reported included CBPP, tick-borne diseases and anthrax. The minor diseases mentioned included rinderpest, FMD, black quarter, photosensitivity and anaplasmosis.

Table 7. Number of respondents who ranked various livestock diseases in the first, second and third positions

Disease	Rank			Total
	1st position	2nd position	3rd position	
Trypanosomosis	41	5	1	47
CBPP	4	10	9	23
Anthrax	1	10	3	14
Tick-borne diseases	1	12	3	16
FMD	0	5	8	13
Total	47	42	24	

Source: Survey Results (1999)

Thirty-six farmers said that trypanosomosis was important because of its prevalence[1] in their locality (Table 8). In addition, three other farmers indicated that trypanosomosis was important because it caused high mortality in cattle. Other minor bases of ranking included the fact that trypanosomosis was both difficult and expensive to treat.

Novidium® and Berenil® were the trypanocidal drugs most frequently used by farmers (Table 9). Samorin® and Ethidium® were less frequently used.

[1]The term 'prevalence' as used here should not be interpreted in the scientific sense.

According to the farmers, Samorin® was used for prophylaxis during months of high tsetse challenge, especially when the animals were just about to migrate from the hinterland into the Tana River delta. Both Berenil® and Novidium® were used in the curative treatment of trypanosomosis. Terramycin® and Adamycin® were the most frequently used antibiotics in the survey area.

Table 8. Number of respondents who ranked various livestock diseases on the basis of prevalence and mortality

Disease	Basis of ranking		Total
	Prevalence	Mortality	
Trypanosomosis	36	4	40
CBPP	16	3	19
Anthrax	14	1	15
Tick-borne diseases	11	2	13
FMD	13	0	13

Source: Survey Results (1999)

The pastoralists reported three forms of bovine trypanosomosis: chronic, acute and a "normal" form that clears soon after treatment. The acute form, which they referred to as *buku* in both Orma and Somali languages, is the haemorrhagic form of trypanosomosis caused by *Trypanosoma vivax*. The pastoralists indicated that its signs closely resemble those of anthrax, namely, bloody diarrhoea and bleeding from all orifices and the skin, particularly on the injured spots followed by sudden death.

Table 9. Common trypanocidal drugs used in the survey area and the percentage of farmers who reported them

Drug	% of respondents who used the drug
Novidium®	93.8
Berenil®	93.8
Samorin®	54.2
Ethidium®	10.4

Source: Survey Results (1999)

The respondents indicated that they used between two and 10mls of trypanocidal drugs for the young and adult animals respectively. Unconfirmed reports from

the local Veterinary Officer indicated that the pastoralists usually under-dose in order to cut down on drug costs.

The respondents treated an average of 23 and 68 animals per month during periods of low and high tsetse challenge respectively. This corresponded to 15% and 45% of the herd during periods of low and high tsetse challenge respectively. On average, respondents spent Kshs 30,405 on veterinary drugs during the year prior to the survey. Out of this amount, Kshs 15,575 had been used on trypanocidal drugs alone. This figure translates to Kshs 100 or two Berenil treatments per adult animal (approx. 300kg live weight) per year.

Two-thirds of the respondents described several traditional methods for treating various livestock diseases. These included the use of drugs made from tree barks, leaves, roots and berries; drenching animals with fish soup and sheep fat, reading the Koran and praying. The latter two methods were used when all the remedies failed, especially for anthrax and haemorrhagic *T. vivax* cases. Details of these traditional methods are given in Appendix 3.

4.1.7 Breeding management

All the 48 respondents kept Orma Boran cattle. They indicated that the Somali cattle -the only alternative available - were smaller in size, had low milk yield and could not withstand the same level of exposure to tsetse challenge that the Orma cattle can. Most (88%) of the respondents had inherited the cattle from their parents. Three elders had earned their cattle as payment in kind for herding. Only one elder had bought part of his herd while another one had been loaned the cattle by someone else.

Calves in the temporary *manyattas* were weaned at an average age of eight months, four months earlier than those in the sedentary *manyattas*, probably because of more frequent and thorough milk extraction in the sedentary than in the temporary *manyattas*. About 92% of the respondents castrated the males. The average age of a bull at castration was 3.3 years (range=1.5-5). In order to get more insight into the breeding practice, farmers were asked to give the proportion of castrates in the herd at any given time. Over 70% of the

respondents indicated that they castrated between 60% and 90% of the males in the herd.

Table 10. Percentage of farmers who castrate different proportions of males in their herd

Percentage of males in farmers' herd that were castrated	% of respondents who reported the proportion
80% and above	39.6
60-70%	37.5
Less than 50%	8.4
Missing responses	14.6
Total	100

Source: Survey Results (1999)

The pastoralists indicated that they used different criteria to decide on whether or not to castrate a particular animal. For instance, all the 44 elders who answered this question indicated that they castrated all the males in the herd that were either small in size or whose dams had a history of poor milk yield. In addition to the size of the animal and dam performance, another 37 farmers considered the health of the weaner while 32 other pastoralists also considered coat colour as important (Table 11).

Table 11. Criteria used in making decisions on castration

Trait	Number of respondents who considered the trait
Size	44
Performance (milk yield)	44
Health	37
Physical appearance	32

Source: Survey Results (1999)

Most of the pastoralists indicated that they preferred white and light grey to black and brown coat colours on cattle. The reasons given for this preference include: (i) black or brown animals are more frequently bitten by tsetse flies compared to white or light grey ones. To emphasise this point, one elder claimed that black or brown cattle have to be more frequently treated for trypanosomosis than white

cattle. (ii) white or light grey cattle are hardier and therefore able to walk for long distances during seasonal migration; and (iii) white cattle are better milkers than darker cattle.

The choice of a good bull or cow was primarily based on the animal's body size and milk yield. This was reported by 98% and 96% of the respondents respectively (Table 12). Big-bodied animals were said to fetch higher market prices compared to smaller animals. Other factors that were considered when choosing a good animal included coat colour, height, horns, the health of the animal, udder, teats, tail, skin, dewlap, and absence of abnormalities. About 81% of the farmers indicated that they liked cattle with long horns (about 1.5 ft) that are curved inwards like those of a buffalo. However, others claimed that polled cows had high potential for milk production. Long tails were more preferred than shorter ones; a long tail was believed to be an indicator of a good milker and a high likelihood of a cow giving birth to female calves.

Table 12. Number of respondents and the traits considered when selecting a good bull/cow

Trait	Bull	Cow
	Number of respondents who considered this trait	Number of respondents who considered this trait
Size/weight	47	47
Coat colour	41	41
Horns	35	34
Legs	18	18
Height	39	40
General health	25	24
Udder	--	24
Milk yield	--	46
Normal teats	--	25
Normal eyes	16	16
Long tail	6	6
Smooth skin	5	4
Others	8	7

Source: Survey Results (1999)

Poor animals (i.e., low milkers, lame, poor body condition, etc) were castrated, sold, slaughtered or sometimes mated with better animals to produce good

offspring. In rare cases, poor animals were used as 'beasts of burden' (Table 13).

Table 13. Percentage of respondents who castrate, sell, slaughter, mate or use poor cattle as 'beasts of burden'

Fate of poor cattle in respondents' herd	% of respondents who reported the practice
Sold	89.6
Castrated	72.9
Slaughtered at home	12.5
Others	8.4

Source: Survey Results (1999)

4.1.8 Marketing of Orma cattle

During the year preceding the survey, a total of 412 animals were bought by 19 respondents (Table 14). About 93% of the traded animals were weaner males 240 of which had been bought by a single elder for fattening for sale. The mean buying price was roughly equal for the three classes of cattle traded. Most (92%) of the cattle were bought locally from pastoralists in the neighbourhood; the rest were purchased from cattle traders.

Table 14. Number and prices of cattle bought during the year preceding the survey

Class of cattle	Number purchased	Mean price per animal (Kshs)
Weaner males	384	4,269
Heifers	20	4,700
Weaner females	8	4,300
Total	412	

Source: Survey Results (1999)

Forty-one respondents had sold a total of 726 animals over the year preceding the survey (Table 15). As in Table 14, majority of the animals traded were weaner males. However, more weaner males were sold than bought during the year. Heifers fetched a higher price than all the other classes of cattle traded. About 93% of the respondents sold cattle to traders who eventually took them to

Malindi for slaughter; the rest sold cattle to local butchers. Heifers were sold locally to other pastoralists.

Table 15. Number and prices of cattle sold during the year prior to the survey

Class of cattle	Number sold	Mean price per animal (Kshs)
Weaner males	411	4,993
Dry cows	151	7,1512
Steers	79	8,638
Bulls	74	10,393
Heifers	8	11,200
Weaner females	1	5,000
Calves	2	2,000
Total	726	

Source: Survey Results (1999)

4.1.9 Sources of herding labour

On average, each household in the survey area had four herdsmen (range=1-15). In general, each household had an equal number of hired and family herdsmen. Hired labour was paid in kind on yearly basis. Thirty respondents exchanged a cow for labour, four elders gave a weaner male while three others gave two female goats. One farmer gave Kshs 1,200 and all the milk produced by the lactating cows that were herded by the hired labourer. This form of remuneration has enabled poor pastoralists to build up cattle herds and accumulate wealth.

4.2 Milk extraction

4.2.1 Milk offtake

The Orma pastoralists milk their cows to provide milk for the household but not at the expense of the calf. As such, not all the milk was extracted at milking. Dams with calves younger than four months had their two teats extracted for human consumption while the other two were left to the calf. On the other hand, dams

with calves older than four months had all the four teats extracted for human consumption. Even then the milker made sure that she spared enough milk for the calf. This practice was common during the evening milking session. Calves were herded separately from their dams. Each calf had a name similar to that of its dam. At milking the calf was called from the pen and let to stimulate the "milk let-down" for about three minutes. In cases where the calf had died another one was used to stimulate the "milk let-down". Milking was done every morning and evening, usually by women. A total of 164 complete[1] milk recordings were made during the survey. One of these records was from a cow with a calf of over one year. This record was considered to be an outlier and was thus omitted from the analyses. Fifty-three of the 164 milk records were for cows from villages away from the Tana River delta, mainly in Assa location; the rest were for cows from villages around the delta. The mean daily milk extracted for human consumption for the 163 cows was 1.6 litres (S.D=0.7). The highest offtake was 5.6 litres recorded from a cow belonging to a Wardei. The mean milk offtake for cows from villages around the delta was 1.8 litres compared with 1.0 litres for cows from villages that were away from the delta, probably due to the availability of better pastures in the delta. Over 60% of the milking cows had calves aged between four and seven months (Table 16).

Table 16. Number and percentage of cows milked within various age classes of the calf

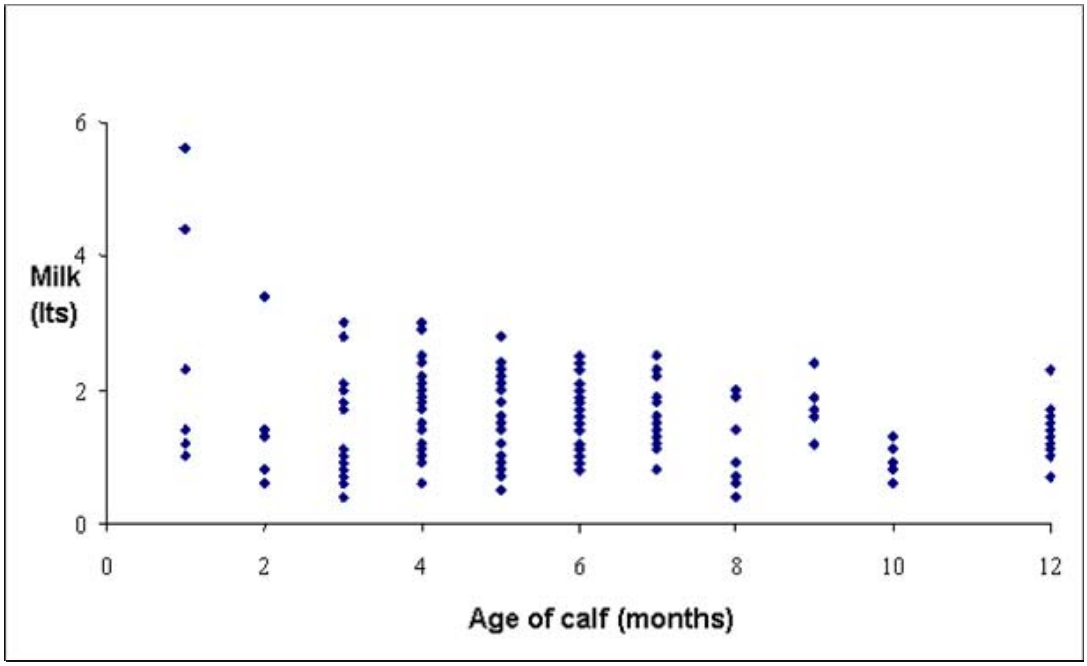
Age class of calf (months)	Number of cows milked	Percentage
1-3	30	18
4-6	89	54
7-9	27	16
10-12	17	10
Total	163	100

Source: Survey Results (1999)

Figure 4 shows the shape of the lactation curve for milk extracted for human consumption. In the first two months of lactation, the curve is somehow elevated but falls gradually with increase in the age of the calf.

[1]A complete milk record was one that had figures for both morning and evening milking sessions.

Figure 4. Variation in milk offtake



Source: Survey Results (1999)

4.2.2 Milk consumption and marketing

Each of the surveyed household kept an average of 12 lactating cows (range=1-50). Taking the average daily milk offtake of 1.6 litres for each lactating cow, each household had 19.5 litres of milk available for human consumption. Of this amount, an average of nine litres was consumed at home daily. Using a mean of 17 household members (Table 4), this gave an average of half a litre of milk/day/member. Friends and/or relatives received a mean of 1.2 litres/day. About 60% of the respondents had surplus milk for sale. A mean of 2.8 litres/household/day was sold at an average price of Kshs 15.60 per litre. Milk was sold when either fresh (93.5%) or sour (6.5%) during the dry and wet seasons. About 61% of those with surplus milk sold it to individuals at the market place and 19% sold to neighbours and hotels/restaurants around the town centres. In all cases, the women marketed the milk. On average, the milk market was 3.6 km away.

4.3 Body weights

Out of the 407 body weight recordings made during the survey, 55 records were for bulls, 140 for cows and 210 for calves. The other two records were omitted from the analyses because they did not have an age entry. A majority of the animals were in 'good' body condition indicated by the degree of rib protrusion (Table 17). There were no bulls in the 'poor' body condition category.

Table 17. Number of animals in the 'poor', 'fair' and 'good' body condition categories

Class	Body condition score			Total
	1 (poor)	2 (fair)	3 (good)	
Bull	-	12	43	55
Cow	8	43	89	140
Calf	37	82	91	210
Total	45	137	213	405

Source: Survey Results (1999)

The calculated mean body weight for the three classes of animals are as shown in Table 18. Bulls had a lower mean body weight compared to the cows, probably because most of them were weaners[1].

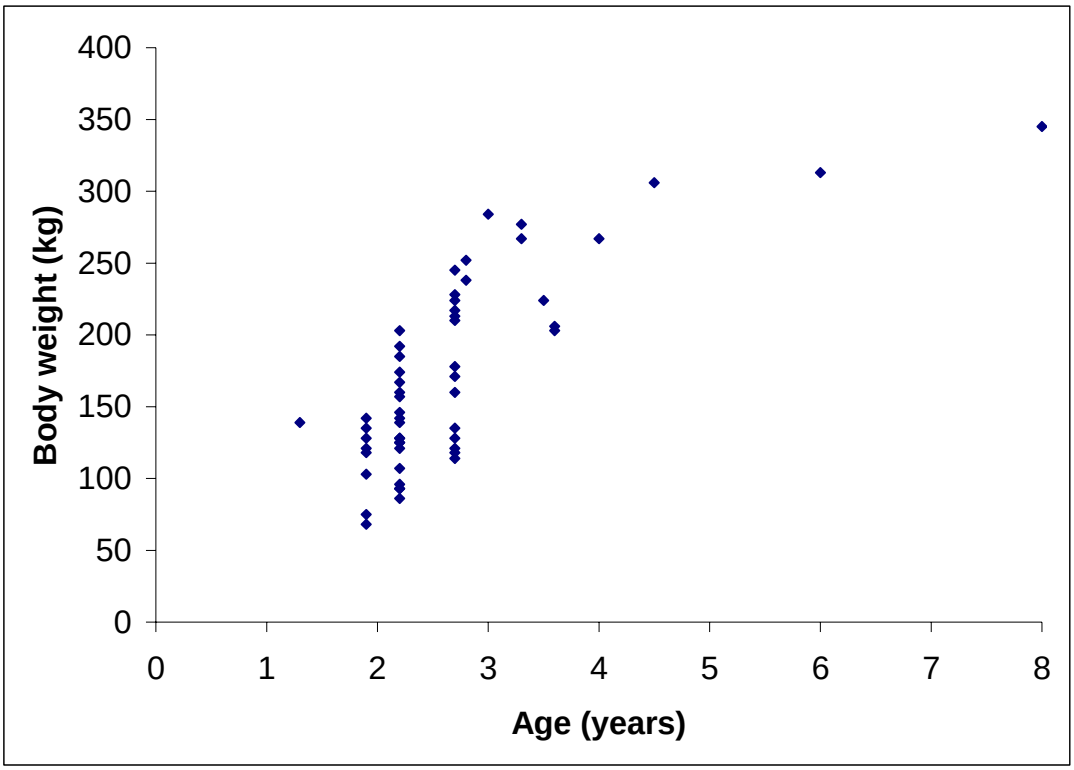
Table 18. Calculated mean body weight and age for the bull, cow and calf classes

Class	**Weight (kg)**		**Age (yrs)**	
	Mean	Range	Mean	Range
Bull	172	68-345	2.7	1.3-8
Cow	250	140-319	3.9	1-5
Calf	74	36-123	7.7mths	2-12mths

Source: Survey Results (1999)

Figures 5, 6 and 7 show the distribution of body weight for the bull, cow and calf classes.

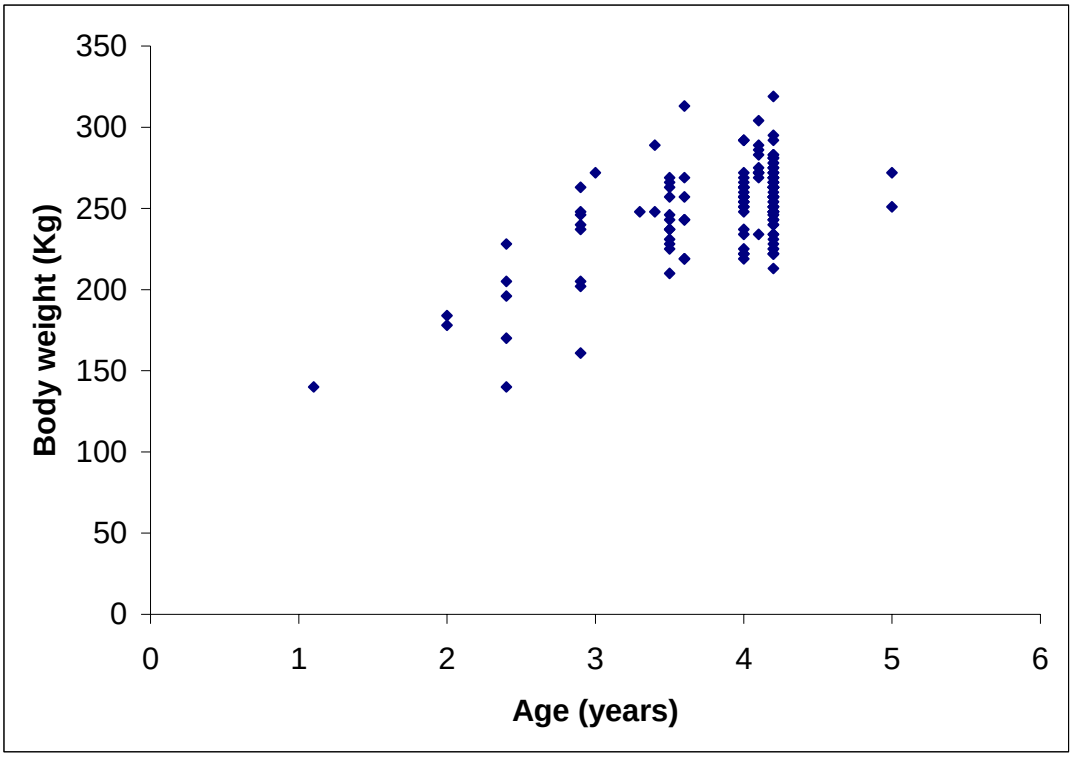
Figure 5. Variation in weaner/bull weight



Source: Survey Results (1999)

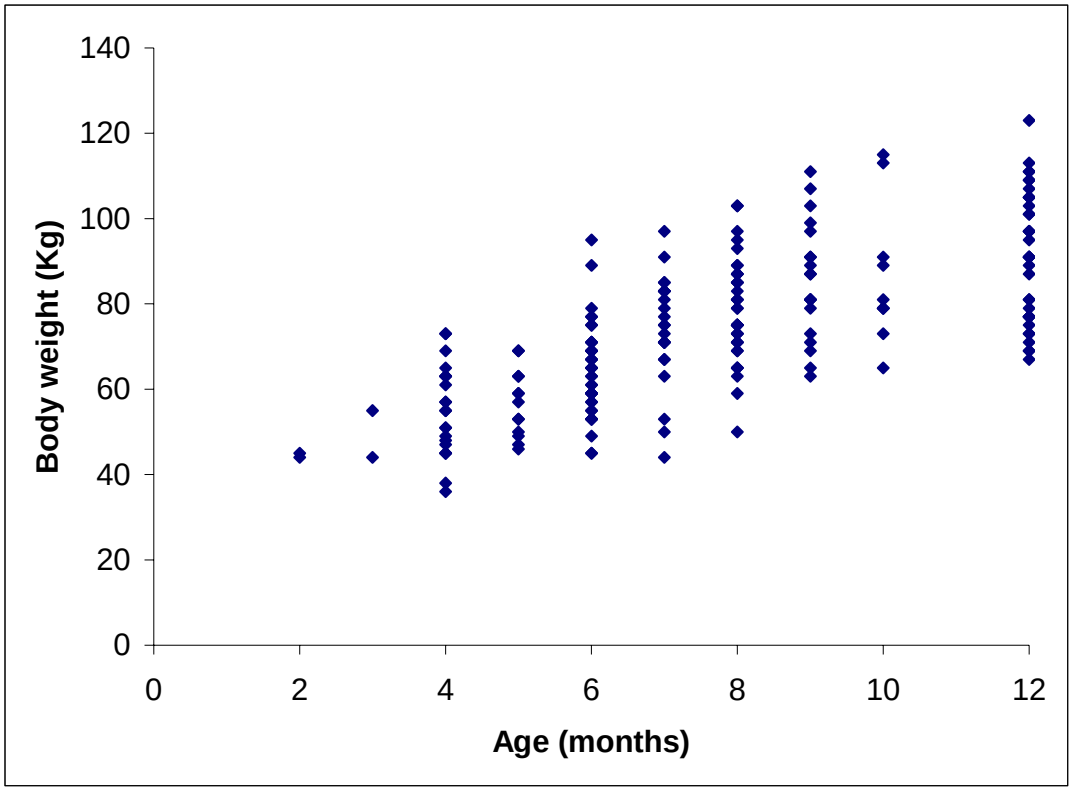
[1]Older bulls were too aggressive to handle.

Figure 6. Variation in cow weight



Source: Survey Results (1999)

Figure 7. Variation in calf weight



Source: Survey Results (1999)

5.0 DISCUSSION AND CONCLUSIONS

Pastoralists are people who derive most of their livelihood from livestock. To the pastoralist, livestock provide the basic needs for life and play an important role in economic, social and religious functions. The rationale of pastoral production is to accumulate large and diversified herds of livestock to hedge against the risk of drought and/or disease epidemics. As such, the main objective in the pastoral production system is to increase the milk yield while maintaining an appropriate herd structure to meet the family's daily needs. The decisions made by the pastoralist are always geared towards optimising the livestock output within a complex framework of social, economic and environmental constraints.

The Orma pastoralists, the subject of this study, live in the remote and hostile Tana River district of coastal Kenya. Tana River district is one of the largest districts in Kenya and it inhabits about 181,000 people (CBS, 2001). It has been classified as the third poorest district in Kenya, with an absolute household poverty incidence of 61.6% after Samburu (69.8%) and Mandera (65%) (Mwabu *et al*., 1999). The Orma people comprise one of the smallest pastoral groups in Kenya. As such, they have received little attention from the outside world in comparison to some of Kenya's other pastoral tribes such as the Maasai, the Samburu or the Turkana. Up until the 1930s neither their numbers nor the true extent of their lands was known to the colonial administration. This was probably because at that time Tana River district was considered a "closed district" due to Somali and inter-tribal conflicts, remoteness and inaccessibility (Braaksma, 1994). Since independence in 1964, however, the Kenya government has made efforts to incorporate them into mainstream Kenyan society by providing basic social infrastructure such as schools, health facilities and roads. However, few Orma have entered the tertiary education system and become integrated into either the commercial or political life of the country. Nomadic pastoralism still remains the Orma people's way of life although some of them are settling down to a sedentary lifestyle.

The Orma people, like most other pastoral communities, live in villages called *manyattas.* The only difference is that among the Orma, neighbours are chosen

according to friendship rather than kinship ties. The size of the *manyattas* is determined by the number of families residing in that *manyatta* and the number of members of each family. This study found an average family size of 14.6 and 17.1 members for the nuclear and extended family respectively. This is more than twice the national average of 5.1 persons per family (GoK, 2000). Large family sizes are desirable in a pastoral setting because they provide cheap labour for herding. This study found that a majority of the households sampled utilised family members to herd livestock. Large family sizes can, however, jeopardise household food security in marginal areas, especially in times of drought and/or disease epidemic, thus causing it to rely on relief food aid. The inhabitants of Tana River district in particular have for a long time depended on relief food as a "strategy" for household food security partly due to adverse climatic conditions and partly as a result of their laxity.

As is common with other pastoral communities like the Turkana and the Maasai, livestock, particularly cattle, are central to the Orma lifestyle. The Orma people pride themselves on their cattle keeping abilities. All their efforts are geared towards welfare of their stock. Cattle are the essential stock in the pastoral life of the Orma. The cattle belong to the man who is also the household head. The man controls all aspects of household life, including diagnosis and treatment of livestock diseases in his herd. The cattle are split into *manyatta* and *fora* herds. The *fora* herd is usually larger than the *manyatta* one but the ratio between them varies depending on the family's livestock wealth. The Orma cattle migrate in and out of the Tana River delta depending on the seasonal fluctuation of rainfall. Rainfall dictates the level of flooding as well as the availability of pasture in the hinterland (mainly Assa location). Although the delta provides abundant pastures for dry season grazing, the area is heavily infested with tsetse flies, which limits intensive exploitation. Ironically, the presence of tsetse flies protects the fragile delta ecosystem from over-grazing.

The most common livestock disease vectors and parasites reported included ticks, tsetse flies and helminths while the most common cattle diseases reported were trypanosomosis, CBPP and anthrax. Various methods were used in vector/parasite control such as dipping, spraying, and bush clearing. These

remedies were complemented by traditional methods such as smoking, use of fish soup and sheep fat and the reading of the Koran. Trypanosomosis was managed by use of various trypanocidal drugs such as Veriben®, Berenil®, Novidium® and Samorin®.

The Orma cattle have been a favourite subject for research in the last 10 years or so. Studies have shown that the Orma Boran is superior in its response to tsetse challenge when compared to other Boran cattle (Njogu *et al*., 1985). This superiority has been confirmed to be genetic (Dolan *et al*., 1987; Dolan, 1998). The current study has reviewed the history of the Orma people and provided confirmation that their cattle have been existing under conditions of intense natural tsetse challenge over several centuries, first in the Borana province of Ethiopia and then in the tsetse infested Tana River delta.

Although the Orma cattle have been shown to be trypanotolerant they do succumb to trypanosomosis under intense tsetse challenge. This necessitates the use of trypanocidal drugs to keep them productive. This study found that each household interviewed spent an average of Kshs 15,575 on trypanocidal drugs during the year prior to the survey. This figure is equivalent to Kshs 100 or two Berenil® treatments per adult animal (approx. 300kg live weight) per year. While this figure seems to be low at face value, it constitutes a huge financial cost to the pastoralists if one considers the fact they treat between 15% and 45% of the herd (of 156 cattle on average for the homestead herd) during periods of low and high tsetse challenge respectively. Such huge costs compound the fragility of livestock production in marginal areas, thus aggravating household food insecurity and poverty.

The optimisation decision of pastoral production system entails the selection of the livestock breeds that give highest returns without compromising the aesthetic value of the breed. The Orma pastoralists interviewed in this study selected a good cow or bull primarily on the basis of body size and milk yield. Other factors considered included coat colour (where white colour was more preferred to grey, brown or black), size and shape of horns, size and shape of udder, teats, size of tail and dewlap and absence of abnormalities. The emphasis on selection for

body size is geared towards attracting a high market price. High milk yield is necessary to meet the household subsistence needs. Most of the other factors were mainly aimed at satisfying the Orma's strong cultural inclination for aesthetic value.

Milk was also sold whenever there was surplus for sale. The sale of milk and milk products from the pastoral areas has received little attention, probably because it lacks importance externally and possibly because of the inherent difficulties involved in quantifying production, consumption and sale (Roderick, 1995). Sikana *et al*., (1993) describe three ways that milk is utilised in most African pastoral communities. These are (a) allowing calves to consume all the milk, (b) extraction of a portion of the milk for consumption within the household only, and, (c) the sale of surplus milk. These observations are confirmed in this study in that during milking, some milk was left for the suckling calf while extracted milk was either consumed in the household or sold in the local market.

Much of the attention of pastoral livestock marketing strategies has been focused on the supply of animals for meat to external markets. Internal marketing of livestock for monetary gain has been observed amongst the pastoralists only as a secondary activity (Roderick, 1995). This study observed a flourishing trade in weaners between the cattle owners themselves and cattle traders from Malindi, the only major market outlet. The prices were slightly higher for females compared to those for the males.

Much of the data available on the productivity of the Orma cattle are from ranch-based research; there are no data on these cattle under traditional management system. The results of this study can then only be compared to the data on Orma cattle on Galana Ranch and to those of other breeds of cattle under village/traditional management systems. De Leeuw (1990) in a survey of several traditional cattle production systems in sub-Saharan Africa reported average calf weights of 82kg at 12 months of age. In this study, bulls and cows of over three years weighed 269 and 256kg respectively while eight-month old calves weighed 78kg. Dolan (1998) has also reported weaning weights of 107kg for eight-month old Orma calves on Galana Ranch. Bekure *et al*. (1991) and Roderick (1995)

respectively reported one and 1.1 litres of milk per cow per day for the Maasai Boran in Kajiado district of Kenya. This study found an average of 1.6 litres/cow/day, which compares well with that of Maasai cattle.

Although the purposive sampling technique employed in this study renders the results ungeneralisable to all the pastoralists in Tana River district, the results of this study give important baseline information on an otherwise unexplored district. The results of the survey indicate that the Orma pastoralists are an efficient and knowledgeable cattle keeping people, well aware of the realities of the commercial world and of the important economic traits of their cattle. They are well informed of the nature of the disease constraints in their area and treat their cattle with the appropriate drugs.

Despite the lack of adequate comparative data on the productivity of the Orma Boran, this study indicates that the growth rates of Orma cattle under traditional management are lower than that under ranch management but possibly higher than that of other indigenous breeds in sub-Saharan Africa. However, further work on productivity under traditional management is required to confirm this observation.

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APPENDICES

Appendix I: Questionnaire for the household survey

1 Background information

1.1 Division [_____]
1.2 Location [_____]
1.3 Sub-location [_____]
1.5 Village [_____]
1.6 Date of interview [_____/____/99]
1.7 Place of interview [____] 1=Homestead 2=Fora (Satellite camp)
GPS READING [_____]
1.8 Approximate number of manyattas (huts) [_____]
1.9 Name of household head [_____]
1.10 Tribe [_____] 1=Orma 2=Wardei
1.11 Respondent's name [_____]
1.12 Relationship of the respondent to the household head [_____]
1=himself 2 = wife 3= son 4 = daughter 5 = brother 6=sister 7= other (specify) [_____]

2 Characteristics of the household head
2.1 Major occupation [_____]
2.2 Minor occupation [_____]
2.3 Indicate the following:-

Age (yrs)	Years of formal schooling	Years spent in this settlement

2.4 Rank the sources of income for the household in order of importance
[___] [___] [___] [___] [___]

1=Livestock 2=Off-farm employment 3=Crops 4=Remmittances 5=Other (specify)_____

3 Livestock inventory
A: Homestead herd

3.1 Give the movement of animals in and out of the homestead herd over the last one year.

Class	No. at Jan99		Born	Died	Cause of death	Lost	Stolen	Loaned		Given out as			Received as		Home consumption	Sold	Purchased	More (M) or less (L) in Jan99	No. at Jan 98
	Home	Fora						in	out	Zaka	Gift	Dowry	Gift	Dowry					
Dry cows																			
Lactating cows																			
Heifers																			
Bulls																			
Steers																			
Weaner males																			
Weaner females																			
Calves																			
Sheep																			
Goats																			
Camels																			
Donkeys																			

Main causes of death:
1=trypanosomosis 2=CBPP 3=Rinderpest 4=other (specify) _____

B: Fora herd

3.2 Give the movement of animals in and out of the fora herd over the last one year.

Class	No. at Jan99	Born	Dead	Cause of death	Lost	Stolen	Loaned		Sold	Given out as			Home consumption	Received as		Purchased	More (M) in Jan99 or Less (L)?	No. at Jan 98
							in	Out		Zaka	Gift	Dowry		Dowry	Gift			
Dry cows																		
Lactating cows																		
Heifers																		
Bulls																		
Steers																		
Weaner males																		
Weaner females																		
Calves																		
Sheep																		
Goats																		
Camels																		
Donkeys																		

Main causes of death:
1=trypanosomosis 2=CBPP 3=Rinderpest 4=other (specify) _____

4 Herding practices

4.1 In which months of the year are the animals in the delta? _____

4.2 In which months of the year are the animals in the plains? _____

5 Watering practices

5.1 How many times do you water your animals during the dry season?

	Times per week	Source(s) of water
Cattle		
Sheep		
Goats		
Camels		
Donkeys		

Source of water: 1=Tana River 2=Surface dams 3=Oasis 4=Other (specify) _____

6 Parasite prevention practices

6.1 Give the following information:

	Do your cattle have problems of? 1=YES 2=NO	Do you control? 1=YES 2=NO	*How?	Frequency
Ticks				
Tsetse				
Worms				
Other_____				

* 1=Dipping 2=Spraying 3=Hand-washing 4=De-worming 5=Other (specify)_____

7 Disease management

7.1 Do you have problems with livestock diseases? [_____] 1=YES 2=NO

7.2 If YES, please list the most common livestock diseases in your area in order of importance. State the basis of your ranking.

Disease	Rank	Basis of ranking

7.3 Which drugs do you use to treat/prevent the diseases you have mentioned above?

Disease	Treatment	Drug	Animal	Dose	No. treated/month at	
					High challenge	Low challenge

Treatment: 1=curative 2=preventive Animal: 1=adult 2=weaner 3=calf

7.4 Approximately how much money did you spend on drugs last year? Kshs [_____]

7.5 Do you know of any traditional veterinary methods? [____] 1=YES 2=NO

7.6 If YES, which one(s) and what disease(s) do they treat?

Method	Disease treated	Is the method being used nowadays? 1=YES 2=NO	By you? 1=YES 2=NO

8 Breeding management

8.1 Do you have?

Breed	1=YES 2=NO	How long?	Source	Grazing areas	Why?	Purpose for keeping this breed
Orma boran						
Somali boran						
Other _____						

Source: 1=inheritance 2=purchase 3=gift 4=dowry 5=loan 6=other (specify) _____
Grazing areas: 1=delta 2=plains 3=other (specify)_____
Purpose for keeping the breed: 1=breeding 2=trade 3=other (specify) _____

8.2 Which breed is best for:

Characteristic	Breed
Breeding (producing calves)	
Milking	
Fattening (meat)	
Health*	

8.3 *If health is different between the breeds, in what aspects? _____
8.4 Do you castrate weaner males? [_____] 1=YES 2=NO
8.5 If YES, at what age do you castrate them? [_____] months.
8.6 What proportion of weaner males do you castrate? [_____]

8.7 What qualities do you look for in a weaner male before you make a decision on whether to castrate or not?

Characteristics	
Size/ weight	
Coat colour	
Dam performance	
Health	
Other (specify) _____	

8.8 Do other families in your neighbourhood also look for similar bull characteristics? [_____] 1=YES 2=NO
8.9 Are the bulls usually separated from the dams during grazing? [_____] 1=YES 2=NO 3=Part of the time
8.10 Do you select your breeding herd? [_____] 1=YES 2=NO
8.11 If YES, what do you look for in a bull/cow?

Trait	Bull	Cow
Size		
Best coat colour (Y/N)?		
Coat colour		
Horns (Y/N)?		
Shape		
Size		
Legs (Y/N)?		
Height (Y/N)?		
Height		
Health (Y/N)?		
Disease		
Udder (Y/N)?		
Shape		
Size		
Milk production (Y/N)?		
Good yield		
Yield		
No. of calves per lifetime		
Other		

8.12 What do you do with poor bulls/cows? _____

8.13 At what age do you usually wean:

(i) the male calves? At [_____] months.

(ii) the female calves? At [_____] months.

8.14 (To be measured and filled in a separate data sheet)

(i) Heartgirth of a male weaner [_____] cm at _____ months

(ii) Heart girth of a female weaner [_____] cm at _____ months

9 Milk production

9.1 How many cows in your herd are currently in milk? [_____] cows.

9.2 **(To be measured and filled in a separate data sheet)**

Session		
Morning	Evening	Total output (lts)

10 Milk consumption

10.1 How much milk is consumed in the household? [_____] units.

Unit: 1=Cup ____lts 2=Gourd _____lts 3=other _____lts

10.2 Indicate the average amount of milk consumed daily by an individual member of the family.

	Units of fresh milk consumed per day	Units of sour milk consumed per day
(i) child under 3 years		
(ii) child under 8 years		
(iii) adolescent (9-14 yrs)		
(iv) a youth (15-21 yrs)		
(v) an adult (>21 yrs)		

10.3 How much milk is given to friends and/or relatives per day? [_____] units.

Unit: 1=Cup ____lts 2=Gourd _____lts 3=other _____lts

10.4 Do you sell any milk products? 1=YES 2=NO

10.5 If YES, which ones and how much of each do you sell per day, to who and at what price?

Milk type	Buyer	Units sold/day	Price/unit	Distance to selling point	Season
Fresh milk					
Sour milk					
Butter					
Ghee					
Other					

Buyer: 1=individuals at market 2=Hotels/restaurants 3=neighbours 4=milk traders 5=other (specify) _____
Unit: 1=Cup ____lts 2=Gourd _____lts 3=other _____lts
Season: 1=dry 2=wet 3=both

11 Marketing of Orma cattle

11.1 Give the following information about cattle purchases over the last one year.

Kind of animal	No. purchased	Price/animal	Seller
Dry cows			
Lactating cows			
Heifers			
Bulls			
Steers			
Weaner males			
Weaner females			
Calves			

Seller: 1=Cattle traders 2=Local pastoralists 3=Other (specify) _____

11.2 What do you look for when buying a cow/bull?

Trait	Bull	Cow
Body size/weight		
Coat colour		
Best colour		
Horns		
Size		
Shape		
Legs		
Height		
Udder		
Shape		
Size		
Other		

11.3 Give the following information about cattle sales over the last one year.

Class of cattle	No. sold	Price/animal	Buyer
Dry cows			
Lactating cows			
Heifers			
Bulls			
Steers			
Weaner males			
Weaner females			
Calves			

Buyer: 1=Local butchers 2=Cattle traders 3=Local pastoralists 4=Other (specify) _____

11.4 What characteristics do you look for when making a decision to sell of the animal? _____

12 Household characteristics

12.1 Give the following details about the members of your homestead.

- No of wives, no of children per wife, education, major occupation

12.2 Do you live with other people who are not part of your immediate family? [_____] 1=YES 2=NO

12.3 If YES, give the details: No of males/females, age, education, major occupation, relationship with hh head.

13 Labour supply for herding purposes

13.1 Please indicate the sources of labour for herding the different classes of cattle.

Class of cattle	Herder 1					Herder 2				
	Sex	Age	Hire/hhm	Tribe	Pay	Sex	Age	Hire/hhm	Tribe	Pay
Dry cows										
Lactating cows										
Bulls										
Weaners										
Calves										
Goats										
Sheep										
Camels										

Appendix II: Determination of the age of Orma Boran cattle on the basis of teeth eruption

Nature of incisors[a]				Age in weeks		
				Female	Male	
					Steer	Bull
M	M	M	M	-	-	-
	M	M	M	104	100	99
½	M	M	M	112	108	107
¾	M	M	M	118	114	113
P	M	M	M	123	117	115
P		M	M	132	128	126
P	½	M	M	140	135	134
P	¾	M	M	145	140	138
P	P	M	M	151	145	143
P	P		M	160	152	150
P	P	½	M	172	158	150
P	P	¾	M	176	162	160
P	P	P	M	183	168	167
P	P	P		190	175	174
P	P	P	½	210	190	190
P	P	P	¾	215	195	195
P	P	P	P	≥220	≥200	≥200

Adapted from Carles and Lampkin (1975)
[a]Examined from the centre of the lower jaw
N.B. M=milk tooth P=permanent tooth

Appendix III: Ethnoveterinary methods known to pastoralists for the management of livestock diseases in the survey area

Tree	Part used	Method of preparation and dosage	Disease/ condition treated	Used nowadays?
Korobo	Leaves	Smoke	Trypanosomosis	NO
Durte	Leaves	Smoke	Trypanosomosis	NO
Garass	Leaves	Smoke	Trypanosomosis	NO
Dolit	Stem	Ground in water; given 1 glass per adult	Worms	YES: Also used for humans
Dede	Leaves and bark	Boiled in water; given 3 litres per adult	Placenta retention	YES
Mander	Leaves and bark	Boiled in water: given 3 litres per adult	Placenta retention	YES
Tira	Roots	Pounded, mixed with water, left overnight; given 1 glass per adult	Diarrhoea, Coughing and fever in calves	NO
Hantate	Roots	Ground and boiled in water; given 3-4 glasses per adult	Anthrax, Black quarter	NO
Ohia	Leaves	Pounded, left overnight; given 1 glass per adult	Diarrhoea, Coughing	NO
Ohia	Leaves	Burnt	The smoke chases away mosquitoes and biting flies	YES
Hargesa	Leaves	Pounded, mixed with water; given 1 glass per calf	Diarrhoea, Coughing in calves	NO
Karchacha	Roots	--	Diarrhoea, dysentery, Black quarter, CBPP and coughs	NO
Tuka	Leaves	Dried, ground in water; given 4 cups	Trypanosomosis	NO
Kukube	Fruits and leaves	Ground, mixed with water and special salt; given 2 glasses per adult	Trypanosomosis Dysentery in calves	NO
Kore	Roots	Boiled in water; given 1 glass per adult	Haemorrhagic *T. vivax*	NO
Elelo	Leaves	Boiled in water; given 1 glass per adult	Haemorrhagic *T. vivax*	NO
Mlela	Roots	Boiled in water; given 3 glasses per adult	Trypanosomosis	NO
Kajibu	Leaves	Dipped in water overnight; given 1 glass per adult	Trypanosomosis	NO
Ade	Roots	Ground, boiled; given 4 litres per adult	Fever and when milk yield decreases	NO
Coffee	Berries	Roasted, ground and boiled in water. Cooled for 24 hrs until brick red in colour. Add 5 tablets of Novidium, 20 capsules of 250mg tetracyclin and 40cc teramycin. Dose: 3cc per adult and 1 cc per calf for 3 months	CBPP Haemorrhagic *T. vivax* Normal trypanosomosis	YES
Tuse	Roots	Boiled; mixed with sheep fat; given 5 glasses per adult	Anthrax	NO

Other methods				
Bleeding from the jugular vein			Trypanosomosis	NO
Sheep fat		Given 1 glass per adult for 7 days	Trypanosomosis	NO
Fish soup			Worms	NO
Ghee		2 glasses per adult	Trypanosomosis	YES
Reading Koran			*T. vivax* and anthrax	YES