ADDIS ABABA UNIVERSITY
FACULTY OF VETERINARY MEDICENE

SHEKO CATTLE: DISTRIBUTION, MANAGEMENT AND PERFORMANCE IN BENCH-MAJI ZONE OF SNNPRS

BY

ELIAS BAYOU

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DEBRE ZEIT, ETHIOPIA

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A thesis submitted to the school of Graduate Studies of Addis Ababa University in partial fulfillment of the requirement for the degree Master of Science in Tropical Animal Health and Production

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Board of Examiners	Signatures
Professor Shiban Kahr	______________________
Dr Adugna Tolera	______________________
Dr Tesfaye Kumsa	______________________

Advisors	Signature
Dr. Kelay Belihu	__________________

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXES

LIST OF ABBREVIATIONS

AFC	Age at First Calving
BL	Beginning of Lactation
BMZRDMD	Bench Maji Zone Rural Development Main Department
CI	Calving Interval
CSA	Central Statistics Authority (Ethiopia)
DAGRIS	Domestic Animals Genetic Resource Information System
EL	End of Lactation
ESAP	Ethiopian Society of Animal Production
GL	Gestation Length
HH	House hold
LGP	Length of Growing Period
ML	Middle of Lactation
MoA	Ministry of Agriculture
N	Number of Observations
NS	Not Significant
NSPC	Number of Services per Conception
PA	Peasant Association
SD	Standard Deviation
SNNPRS	Southern Nations Nationalities and Peoples Regional State

ACKNOWLEDGMENTS

First and for most, my gratitude goes to the almighty GOD that let me be flourishing in my life and enable to realize this research study. Next I would like to forward my deepest thanks and appreciation to the contribution of my advisor, Dr. Kelay Belihu (PHD), for his logical guidance, relevant advice and supervision, provision of literature materials, corrections and superstitions thought through out the study. .

I thank Mizan Teferi Agricultural Technical and Vocational, Educational Training (ATVET) College for its funding and support. Even though it is not possible to mention all of them here many instructors and individuals from academic and supportive stuff of Mizan ATVET College that have supported this study by providing reference materials and typing my paper with out whose efforts this paper would have not been in time highly appreciated.

I am also grateful to Ato Major Kassahun for his cooperation in writing the final thesis and editing the material by giving his precious time while I was in Debre Zeit. Finally, I am also pleased to acknowledge once again all respondents and enumerators who have taken part in data collection.

I am very grateful to my wife W/o Yideneku Legesse for fruitful cooperation and motivation in facilitating my study.

ABSTRACT

Retrospective and participatory studies were conducted from November 2007 to May 2008 to study the distribution, management and performance of Sheko cattle in lowland, mid land and highland agro ecological zones of Bench Maji Zone, South Western Ethiopia. 120 households owning Sheko cattle were selected from each agro ecological zone (lowland, midland and highland), which form a total of 360 households for the retrospective study. For participatory approach, a total of 9 groups, each of which was made of 10 households, were included (3 groups from each agro-ecology). Retrospective data on reproductive performance indicators (AFC, CI, and NSC), milk yield (daily milk yield and lactation length) and general information including the geographical distribution of Sheko cattle, herd size and composition, herd dynamics, housing practice, feed resource and feeding practice and breeding practice were collected from the households by questionnaire survey. In the participatory approach assessment of farmers group were carried out to obtain information on distinctive features, merits and demerits, geographical distribution of Sheko cattle, diseases affecting Sheko cattle and constraints associated with Sheko cattle. The results showed that the cattle are found mainly in Sheko Districts with relative sacristy in Debub Bench, Semien Bench and Shei Bench. The northern and southern limit approximates to Kaffa Zone and Sudanese boarder. All farmers house their animals during night and part of the day. Mating is natural and hand mating was practiced by 87.7% of the house holds. The overall mean value (N=360) of AFC, CI, NSC, and Lactation length were 55.13 months, 463.67 days, 1.35 and 10.66 months, respectively. There was significant variation between the three agroecologies in the average values of Daily milk yield at different stages of lactation, age at first calving and calving interval ($p<0.001$). Sheko cattle in the highland areas had the highest milk yield at all stages of lactation followed by those in the midland. Age at first calving and calving interval were shorter for Sheko cattle in the highland areas followed by those in the midland areas. Colostrums feeding were exercised on average for 4.05 days. New born calves stayed with their dam for an average of 7.38

days and they stayed at house until they start grazing in the 3rd month. The main supplementary feed sources to new born calves are green grasses (89.2%) and a combination of green grasses and legume pastures (10%). Almost all the respondents (99.2%) and the majority of them (76.4%) rear all female and male born to reach puberty, respectively, for breeding, if they show good growth. None of the respondents had separate housing for calves, rather share the family house. The reported distinct feature of Sheko as agreed by participatory groups were small body size, polled ness, folded eyelids, and humplessness ranked in that order showing no significant difference between the agro-ecologies ($p>0.05$). The most important merit of Sheko cattle as identified by the participatory groups were high milk yield and good traction power ranked in that order showing no statistically significant difference between the agroecologies. The groups in the participatory discussion agreed regardless of agroecology that the major areas where Sheko are distributed in Sheko, Sheibench, Semien Bench, Debub Bench and Kaffa and Shaka Zone ranked in that order. Among the diseases mentioned that affect Sheko cattle, lameness and anthrax were ranked as the 1st and 2nd important diseases. The most important constrains of Sheko cattle production were sparse distribution, absence of conservation efforts and declining interest of the community for Sheko cattle due to their aggressive behavior ranked in that order.

Key words: Cattle, Distribution, Management, Milk Yield, Reproductive Performance, Sheko

1. INTRODUCTION

The heterogeneity of Ethiopian topography, climate and cultural conditions makes it difficult to generalize about livestock production in the country and it gives a variety of seasons and natural vegetation (Beyene and Biruk, 1992). Based on the length of growing period (LGP), there are four agro-ecological zones namely arid, semi- arid, and sub humid and humid under which different types of livestock production system are practiced. The country's livestock resources are essential as sources of milk, meat, draught power and byproducts of great value. In addition, livestock also serves as a reserve of family wealth and as a mark of respectability and status in the community (Azage, 1981).

Ethiopia's cattle population is estimated to be about 44 million (Mitiku, 2004). It is the largest in Africa and among the top ten in the world. About 70% of the country's cattle population is to be found in highlands and 30% of the total in the lowlands (arid and semi-arid) and the midland (Workneh, 2001). Economically, cattle with their large number and diversity of products, contribute to the national economy than any other livestock species. However, there has been no development of the indigenous breeds for particular traits (Albero and Solomon, 1982a).

In general, productivity of the indigenous cattle is lower than that of the temperate exotic cattle. It is reported that under traditional management an average milk yield of 400-600 kg per lactation and slaughters weight of 250kg at about 4 years of age are attained. Under nutrition and malnutrition, poor genetic potential and disease are the major constraints to livestock productivity (Million, 1984). More than 90% of the feeding programs depend on grazing on natural pasture with scarcity of feed in drought years. The use of concentrates for cattle is generally limited as grains or feeds of high-energy contents are not at surplus (Beyene, 1984). Controlled breeding is not practiced and livestock are mainly left to fend for themselves. In addition, many local breeds have a poor ability to respond to improved inputs, which resulted in various levels of grades. There is no clear policy on animal breeding and there is limited AI service, which in turn hamper the success of cross breeding programs (MoA, 1984). There is also little attempt to analyze herd records to assist management and selection decisions.

Despite their poor potential for production traits, indigenous cattle breeds are known for their ability to withstand local environmental conditions such harsh climatic conditions (high ambient temperature), scarcity of feed and diseases. A total of 23 different cattle breeds are identified in Ethiopia that have adapted to the different environmental condition of the country. Among these breeds is Sheko, which is owned mainly by Sheko tribesmen who live in a very mountainous and rugged territory in Bench Maji Zone. The breed is known for its low performance and ability to survive and produce in tsetse infested areas (Workneh, 2001).

In spite of having this economically valuable trait, today the breed is endangered by zebu introgression (DAGRIS, 2004). Moreover, there are few works characterizing the production environment and morphological properties of the breed but detail study has never been carried out to know the milk yield and reproductive performance of the breed.

In view of all these, the objectives of this study were:

- To assess distribution of Sheko cattle and to determine its status and threats in its habitat;
- To assess and document the management practices associated with Sheko cattle for sustainable utilization of the breed;
- To study the milk yield and reproductive performance of highland, midland and lowland traditionally managed Sheko cattle in the study areas;
- To investigate the major constraints affecting the production of Sheko cattle and develop sustainable inventions for alleviating the constraints.

2. LITERATURE REVIEW

2.1. Origins, classification and distributions of Ethiopian cattle

2.1.1. Origin of Ethiopian cattle

The family of animals that includes all types of domestic cattle is known as the Bovina. There are three types of domestic cattle in the world namely *Bos taurus*, *Bos indicus* and *Bibos gaurus* and/or the *Bibos banteng*. The most numerous and important are the *Bos taurus* and *Bos indicus* breeds. Of less and only localized importance in south and south east Asia are breeds derived from the gaurus and /or the banteng (Payne, 1964).

The origin of the humped cattle (*B. indicus*) or zebu is more controversial. Evidence of their origin has been discussed by Payne (1970) and he concluded that the known facts appear to indicate that it originated in western Asia. According to Payne (1964), from the center of its origin in western Asia, hamitic long horn, short horn, and zebu type cattle were taken by migratory people into Africa and become ancestors of the vast majority of cattle breeds found in the continent. These three types of cattle crossbred at different times and in different ways to create the breed group known as Sanga, which is now found in east, central and South Africa (Epstein and Moson, 1984).

Around 4,750 to 4,500 BC, the peoples owning the hump-less short horn cattle (Brachyceros) migrate westwards along the Mediterranean littoral, southwestwards across the Sahara via the Tibestsi and Tassili highland areas and southwards up the Nile towards the highland areas of what are today Ethiopia and Kenya. Their descendants are known today as the West African dwarf short horn breeds. According to Faulkner and Epstein (1957), small numbers of cattle of short horn type were still to be found in Koalib hills in the Nuba Mountain of the Sudan in recent times. There is also some evidence that short horn type cattle were introduced independently into the horn of Africa, the east coast of

Africa and the offshore island, presumably by seafaring peoples from west Asia. The short horn hump-less cattle as described by Clark (1976) had penetrated to Ethiopia by the middle of the 2nd millennium B.C. Furthermore, Alberro and Hailemariam (1982b) stated that there are still shorthorns, hump-less cattle kept by the Sheko people in the mountainous territory on the Ethio-Sudanese boarder. Presently, Sheko is the only short horned hump-less cattle known in Africa.

According to Faulkner and Epstein (1957), the influx of hump-less longhorn cattle in Africa occurred some times in the 5 millennium B.C via Egypt and later they further spread southward reaching Ethiopia and other countries. There is even an assumption that the recent hump-less longhorn cattle of Africa like the N'Dama and Kuri were initially distributed well over in north and east Africa including Ethiopia. Additionally the existence of Kuri in Ethiopia has been reported recently.

There are two types of humped or zebu cattle: cervico-thoracic or neck humped and thoracic or chest humped. Neck humped zebu appear to be an intermediate type between hump-less and chest humped cattle (Slijper, 1951). Payne (1970) suggested that all neck humped zebu should be designated as 'Sanga' as this is the term used in Africa for these cattle. Neck and chest humped cattle were introduced into Africa in successive waves and at different times from different regions of Asia. Present evidence suggests that some neck humped cattle were introduced into Egypt via the land bridge from western Asia and across the sea from Arabia, via Somalia and Ethiopia. According to Epstein and Mason (1984), chest humped zebu were not introduced into Africa until about 1,500 years ago. It is likely, however, that there have been small-scale introduction over a long period. After the Arab invasion of Africa, the numbers imported probably increased quite rapidly. The first introductions would have had little influence on the composition of the herds of longhorn and shorthorn hump-less cattle in northeast and east Africa. Gradually, however, as more zebu (humped) cattle arrived, the herds changed with a predominance of crossbred neck humped or Sanga cattle. In east Africa the Sanga cattle have been displaced by zebu only in very recent times, and small number of Sanga cattle are still to be found in the present mainly zebu areas. Zebus appear to be more tolerant to Rinder-pest than sanga cattle, and are also better adapted to living in arid and semi-arid areas. They have, therefore, spread rapidly in the semi- arid and arid regions and wherever Rinder-pest has been endemic (Payne and Hodges, 1997). There was also crossbreeding of the zebu population with the already existing Sanga to result in crossbreds of Sanga and zebu type called Zenga (Payne and Hodges, 1997; Payne and Wilson, 1999).

According to Albero and Solomon (1982b), Ethiopia has received two zebu invasions, the first through Somalia brought by the Semitic people from Arabia in the 1st millennium BC and the second from north east Africa in the 4th century AD. Ethiopia appears to be the centre of origin and dispersal of Sanga cattle to other parts of Africa.

2.1.2. Classification and distribution of Ethiopian cattle breeds

Ethiopian cattle are classified into three categories based on their morphological features: Small East African Zebu, Large East African Zebu and Hump less Shorthorn (Table 1). Small East African Zebu and Large East African Zebu cattle are found distributed in the different parts of Ethiopia while Hump-less Shorthorns (Sheko cattle) are limited to Bench-Maji Zone of the Southern Nations, Nationalities and Peoples Regional State. Breeds/types of cattle included in East African Zebu category are Adwa, Ambo, Bale, Goffa, Guraghe, Hammer, Harar, Jem-Jem, Jijiga, Mursi and Smada. Those categorized under Long East African group are Anuak, Danakil, Raya-Azebo, Arsi, Boran, Murle, Arado, Fogera and Horro (Workneh *et al*., 2004).

Table 1. Classification of Ethiopian cattle breeds

Breed Group	Breeds	Distribution
Small East African Zebu	Adwa	Central Zone of the Tigray Region, Adwa
	Ambo	Western Shoa (Ambo, Addis Alem, Holetta
	Bale	Bale Highlands
	Goffa	North Omo (Goffa, Sawla)
	Guraghe	Guraghe and Hadiya areas, close to the tsetse-infested valleys.
	Hammer	South Omo Zone
	Harar	Highlands of Eastern and Western Hararghe
	Jem-Jem	Highlands of Jem-jam, Sidamo and Bale
	Jijiga	Somali Region, Jijiga area
	Mursi	South Omo Zone
	Ogaden Zebu	Somali Region, Ogaden area
	Smada	South Gondar Zone (Gayint, Smada) anda parts of North Wollo
Large East African Zebu	Anuak	Gambella Region and adjoining areas in south-western Ethiopia,
	Danakil	Northeastern Ethiopia (Tigrai, Wollo) and parts of Djibouti and Eritrea.
	Raya-Azebo	Parts of Tigray and Wello east of Lake Ashenge
	Arsi	Highlands of Arsi, Shewa, Bale, Sidamo and Hararghe
	Boran	In the Southern rangelands with the borana pastoralists
	Murle	Eastern Gambella, on the border with the sudan.
	Arado	Northern Tigray (Shire, Adwa, Agame) and the highlands of Eritrea.
	Fogera	The Fogera Plains around Lake Tana in South Gondar and adjoining areas of West Gojjam
	Horro	Highlands of western Ethiopia (East Wollega, West Shoa, and Illubabor)
Hump less Shorthorns	Sheko	Bench Maji Zone in southwestern Ethiopia

Source: Workneh *et al*., 2004

2.2. SHEKO CATTLE

2.2.1. Location, topography and climate of Sheko's habitat

Sheko District is found in Bench-Maji Zone of SNNPRG. The Zone is located at about 562km away from Addis Ababa in southwest direction at 6.5' N and 35.4' E. It is bounded by Yeky Wereda from south and west, Bench Wereda from north and Gurraferda Wereda from east (BMZRDMD, 2004).

The altitude of the area ranges from 1640 to 1750m above sea level. Undulating terrain is the main land feature and small hills and mountains are also present. The climate varies from wet humid during heavy rains between April and October with a relatively dry season in December, January and February. Average annual rainfall ranges from 400 to 2000mm and the average annual temperature is from 24-28^{0}C. Eighty percent of the area is lowland and 20% is midland (Takele, 2005).

The district covers 48,089ha area of land, of which cultivated land is about 1123ha, forest area 29248ha, grazing land 519ha, cultivable land 4,042ha, unusable land 2,084 ha, and settlement 965 ha. The vegetation comprises a moist evergreen forest. Bushes, shrubs and tickets are also present. Wanza (*Cordia africana),* Kerero (*Aningeria altissima*) and Tid (*Juniperous procera)* are among the dominant trees (BMZRDMD, 2004). Although Sheko District is noted for coffee production, it also produces cereals like maize and sorghum. Banana, avocado, papaya and mango are highly produced fruits in the area (Takele, 2005).

2.2.2. Distribution and herd structure

The Sheko cattle population is found in Sheko, Bench, Shei-Bench and sub district of Sheko adjacent to the Sudanese border of Bench- Maji zone. Mostly the breed is found in lowland areas. In the above mentioned districts and sub districts, the total cattle population were 161,612 (BMZRDMD, 2004) heads of which include 4,040 heads of cattle are Sheko breed. The Sheko cattle population constitutes 3,002 (74.3%) females and 1,038 (25.7%) males (Takele, 2005).

2.2.3. Production system

The livestock production system observed in Sheko's habitat is mixed crop-livestock farming system. Perennial crops like coffee are widely produced. Coffee is the principal cash crop. Smaller areas of land are also used for maize and sorghum production. Fruits like avocado, mango and banana are highly produced. Cattle are important as a source of food (milk, butter and meat), and also income through sales of live animals and animal products (Fasil, 2004).

There is a very limited scope for increased forage production from pasture. Free grazing is the main animal management system in the area, but a few farmers do supply other feed at home. Most of the farmers keep their animals out door during the night near their homestead. Some farmers have kraals made for their animals, whereas others keep animals together within the family house in a partially enclosed area (MoA, 1984).

2.2.4. Morphological characteristics

Sheko cattle have small body size and are compact animals. Most of the cows have very small or usually no hump and some have medium sized humps. They have a relatively large naval flap. They have short horns which are curved upwards, with many cows and bulls being polled (locally known as 'Goda'). The udder is well shaped and balanced (Takele, 2005). They have long whip like tails, most have straight and level backs. The dewlap is not well developing. The dominant coat color is light brown and black. White spots are also common.

On the average the chest girth, body length, height at withers, and pelvic width measurements for female population were 136.5, 110.2, 99.4 and 33.5 cm, respectively.

Face length, canon bone length, canon bone circumference, dewlap width, neck length, ear length and horn length were found to be 39.5, 12.8, 13.4, 12.6, 29.9, 16.6 and 14.8 cm, respectively. Female animals have medium naval flap that on the average measured 2.7 cm in width. The length of the teat averaged 3.4 cm and it is thick to the liking of the respondents since it makes the milking process easier. The average values for chest girth, body length, height at withers and pelvic width measurements for the male population found to be 141.2, 114.6, 103.6 and 32.8 cm, respectively. Face length, canon bone length, canon bone circumference, dewlap width, neck length, ear length and horn length averaged 40.8, 12.1, 14.8, 16.8, 30.2, 16.6, and 7.6 cm, respectively. Male animals have medium and slightly pendulous perpetual sheath averaged 7.6 cm in width (Takele, 2005).

The breed is believed to have some level of trypanotolerance (Sisay, 1996 and DAGRIS, 2004). According to Faulkner and Epstein (1957) this group of cattle may be the only remaining representative of humpless short horn cattle (brachyceros) type in east Africa.

2.2.5. Production and reproductive performance

Information on the productivity of the cattle is scanty. The main function of the cattle is meat, milk and manure. Traction and income are secondary. The Sheko cattle are said to be better milk producers in tsetse-infested zone, and have good grazing and browsing ability during critical periods of forage scarcity. It has been also reported that Sheko reproduce faster than other breeds of cattle in tsetse infested zone (Workneh A, 2001). On average, the age at first mating averaged 3 years and cows give their first calf at four years of age. The calving interval (CI) is affected by season of calving and parity of dam. Calving interval is shorter in the heavy rainy season. The average CI was found to be 1.5 years with the range of 1.4 years to 1.6 years. The average gestation length (GL) is 276.8 days. The mean body weights of calves were 20 kg at birth and 102kg at weaning. Breeding females give birth for an average of 8 calves during her reproductive life (Takele, 2005). Sheko cows has average total lactation milk off take of about 698.3 liters, lactation length of 9.9 months and daily milk off take of 2.3 liters per day. This level off take is much greater than the report of

Workneh and Row lands (2004) from extensive livestock breed survey done in Oromiya Regional State with overall average milk off take per day of 1.4 liters and the national average of 1.17 liters reported by CSA (1995).

2.2.6. Status of the Sheko cattle population

The total population of Sheko cattle in the entire breeding tract was estimated to be 4,040. This figure is far below from the previous estimate reported by DAGRIS (2004), which was 31 thousands (Takele, 2005).

The number of Sheko breed is decreasing from time to time and they are considered as endangered breeds. Only very few are remaining, which are owned by very few farmers in villages, which are not accessed by vehicles. The reasons for the decline in the population of Sheko are their energetic and aggressive behavior, which decreased their acceptance by the local community; the low male to female ratio in Sheko cattle population that might have exposed the animals for inbreeding and crossbreeding with bulls of other breeds; and the less attention given to conserve the breed (Alemu, 2002; Fasil, 2004).

2.2.7. Constraints of cattle production

Since the area is noted for coffee plantation there is an intense land use. All the land except the swampy land and hill-tops is planted. There is a very limited scope for increased forage production from pasture. Cattle are totally depending on the natural pasture. Improved pastures and fodder crops are very poor and natural pastures are overgrazed causing the growth of undesirable species. Seasonal feed deficiencies are common in dry season. Proper management, allocation of grazing area and conservation of feed is rarely practiced. All stocks are grazed together with no attempt to provide special treatment for different classes of the stock (MoA, 1984).

The occurrence of serious disease also limits production through increased mortality rates and effects on fertility, growth and production. Lack of equipment and transport for the field services, a weak tsetse and trypanosomosis control unit and shortage of adequate trained manpower are some of the problem associated with cattle health in the area (BMZRDMD, 2004). The major disease affecting cattle in the area is trypanosomosis, locally called “Gendi”. The disease appears all times of the year but it reaches peak point after rainy season (May- October). Blackleg and other diseases including babesiosis and pastuerellosis are also present in the area. There is heavy tick infestation especially in the lowland areas (Dawit, 1992).

3. MATERIALS AND METHODS

3.1. The study area

The study was conducted in Bench Maji Zone of the Southern Nations Nationalities and Peoples Regional State (SNNPRS). The Zone has 9 districts, which are further divided in to 214 peasant associations (BMZRDMD, 2004). The Zone has a human population of 418,000 of which 199,883 are males and 218117 are females (CSA, 2001). It also covers 19,326.55 km^2 area of land (Fasil, 2004). The altitude in the area ranges from 850 to 3000 meters above sea level. The soil is generally red brown with scattered tracts of red color. The annual average temperature ranges from 20 to 40^oC and the annual rainfall from 1200 to 2000 mm. The area is wet most of the year with a relatively dry season in January, February, March and May. The main rains occur in April and from June to September. Even though the area is known for coffee plantation, it has high livestock population consisting of 447,000 cattle, 73,700 sheep, 69, 200 goats, 9, 700 equine and 254, 300 chickens (BMZRDMD, 2004).

Agro-ecologically, the Zone consists of 52% lowland (500-1500 masl), 43% midland (1500-2300 masl) and 5% highland (>2300 masl) (BMZRDMD, 2004).

3.2. Study population

Sheko cattle owners and Sheko cattle found in the Bench Maji Zone represent the study population.

3.3. Study design

Retrospective and participatory methods of data collection were employed to investigate the milk yield and reproductive performances of Sheko cattle in the study area and also to determine the major constraints facing the breed in the area.

3.3.1. Sample size determination and sampling procedure

The sample size is determined by the formula recommended by Arsham (2007) for survey studies:

$$N=0.25/SE^2$$

With an assumption of taking 3% standard error as a base, a total of 100 households are required to be sampled from each district.

The nine districts in the Bench Maji Zone were classified into three agro-ecological zones (lowland, midland and highland), one district was selected purposely from each of the agro-ecological zones based on availability of Sheko cattle in the districts. Then three PA's, where the Sheko cattle population was the highest were selected purposively (Table 2).

Table 2. Districts and PA's selected for the study

Agro ecology	Districts	PA's
Highland	Sheko	Genja
	Semen Bench	Golla
	Debub Bench	Omakel
Midland	Sheko	Selale and Wosheka
	Semen Bench	Temenjayazhi
	Debub Bench	Janju
Lowland	Sheko	Geizmeret
	Semen Bench	Goritnamag and Gariken
	Debub Bench	Kitae

Then forty households were selected randomly from each PA, which made a total of 360 households. All Sheko cattle owned by the sampled households were included in the study.

3.3.2. Data collection

Questionnaire survey

A structured questionnaire format was prepared and pre-tested on few individuals for clarity of questions. Then one visit interview was carried out to collect data on socio-economic characteristics, farming system characteristics, livestock herd size and composition, Sheko cattle herd size and composition, herd dynamics (entries into and disposals from herd with reasons), housing practices, feed resources and feeding practices, Sheko cattle breeding practices (selection criteria, sources of information for selection, mating practices) and performances of Sheko cattle (daily milk yield, lactation length, age at first calving, calving interval, number of services per conception, mortalities per year (for each type of cattle in a herd) and births per year (sex ratio and number of single and twins births) (Annex-1)

Participatory approach

Farmers groups made of 10 households were organized in each peasant association which made a total of 9 groups. A pair wise ranking method was employed to collect data on the geographical distribution of Sheko cattle, distinctive morphological features of Sheko cattle, major diseases affecting Sheko cattle, merits of Sheko cattle and constraints associated with Sheko cattle production. At the beginning of the discussion, the objectives of the study were explained to the farmers. Data for each set of information was collected one by one. Then farmers were given the chance to list first the geographical areas where Sheko are found, the distinctive morphological features of Sheko cattle, merits of Sheko cattle, names or clinical signs of diseases affecting Sheko cattle and constraints associated with Sheko cattle production. The outcomes of this activity were listed horizontally and vertically and the farmers were given the chance to undertake a pair wise comparison of items listed horizontally and vertically. The results of the pair wise ranking were summarized by counting the number of times one item is preferred against any other item in the list. The item with the highest count was ranked first and the ranking continued accordingly.

3.3.3. Data analysis

Data originating from the questionnaire survey and the participatory method of study were stored in MS-Excel program. Means, standard errors, standard deviations were calculated using the descriptive statistics. Means were compared by one way ANOVA. Ranks were compared by Kruskal Wallis test. SPSS (release 11.05, 2002) was used to analyze the data.

4. RESULTS

4.1. Demographic and farming system characteristic

The average family size in the study households was about 7.5. The average age of the respondents in the study area was 47.71 years, ranging from 28 to 65 (N=360). The sex ratio of the respondents was 85.3% male and 14.7% female. In terms of educational status, 50% were illiterate, 41.1% had basic or elementary education and 8.9% reached secondary school. The average land holding per family was 1.5 hectares. The livestock herd size of the sampled households excluding chicken was 11.98 heads. From this cattle account for 43.3% followed by goats (27.8%) and sheep (21.6%) (Table 3):

Table 3. Livestock herd size and composition per household

Species	N	Minimum	Maximum	Mean	SD
Cattle	360	0	25	5.19	3.030
Sheep	360	0	10	2.63	3.027
Goats	360	0	34	3.33	3.749
Donkey	360	0	3	0.48	0.731
Horse	360	0	2	0.19	0.401
Mule	360	0	2	0.16	0.395
Poultry	360	0	21	6.49	4.869
Herd size	360	2	40	18.47	6.811

SD=Standard Deviation

The cattle herd was made of 1.99 cows (38.4%), 1.2 heifers (23.1%), 0.68 oxen (13.1%), 0.67 male calves (12.9%) and female calves (12.5%) (Table 4). The cattle herd size in the midland (6.18, SD=2.37) was higher than those of the highland (4.71, SD=1.78) and lowland (4.69, SD=4.18). There was a significant difference between midland and highland

($p<0.05$) and midland and lowland ($p<0.05$),however, showed no significant difference between highland and midland ($p>0.05$).

Table 4. Cattle herd size and composition per household

Cattle types	N	Mean	SD
Cows	360	1.99	1.10
Heifers	360	1.21	1.42
Oxen	360	0.68	0.62
Male calves	360	0.67	0.53
Female calves	360	0.65	0.65
Total	360	5.19	2.8

SD=Standard Deviation

The results of the analysis of the livestock cattle herd dynamics in the study areas is presented in Table 5. The disposal rates for cattle, sheep, goat, donkey, horse, mule, and poultry in the study areas in the last 10 years were 23.3%, 18.3%, 46.1%, 31.0%, 28.0%, 93.1% and 22.9%, respectively. The reason for disposal of cattle was selling (70.1%) followed by disease (25%) and predators (4.9%). Disease was the most important reason for disposal of sheep (81.3%) and donkeys (88%). Mules were disposed from the herd only by selling (100%).Additions to cattle herd in the last ten years was mainly due to on-farm rearing of animals (79.2%) and purchasing to some extent (20.8%).

The summary of objectives of cattle keeping in the studied farm households are summarized in Table 6. The main objectives of keeping Sheko cattle were for their draught power (53.1%) and milk production (44.2%). Income from sales of live cattle (47.5%), and insurance against financial problems (43.1%) were also among the secondary reasons for keeping Sheko cattle.

Table 5. Livestock herd dynamics and the reasons for additions or disposal from the herd

Livestock Species	Herd Size	Trend in the last 10 yrs			Reason for disposal				Reason for Increase	
		Disposal	Addition	Static	Disease	Selling	Predator	Consumption	Purchasing	Raising
Cattle	1870	23.3%	76.7%	-	25%	70.1%	4.9%	-	20.8%	79.2%
Sheep	946	18.3%	68.9%	12.8%	81.3%	10.3%	2.8%	5.6%	77.2%	32.8%
Goat	1200	46.1%	21.7%	32.2%	26.9%	53.9%	6.7%	12.5%	48.1%	51.9%
Donkey	171	31%	69%	-	88%	12%	-	-	63%	37%
Horse	69	28%	68%	4%	41.3%	58.7%	-	-	100%	-
Mule	57	93.1%	6.9%	-	-	100%	-	-	100%	-
Poultry	2337	22.9%	64.2%	12.9%	58 9%	34.8%	3.1%	3.2%	10.8%	89.2%

Table 6. Summary of the objectives of keeping Sheko cattle

Types of objectives	Rank of objectives								
	1	2	3	4	5	6	7	8	9
Milk	44.2	52.2	3.6	-	-	-	-	-	-
Draught	53.1	46.9	-	-	-	-	-	-	-
Income from sale of life cattle	2.8	0.8	47.5	48.9	-	-	-	-	-
Social values	-	-	-	-	97.8	2.2	-	-	-
Investment	-	-	5.8	5.3	2.2	80.8	5.6	-	0.3
Insurance against financial problem	-	-	43.1	45.8	-	11.1	0.0	-	-
Meat	-	-	-	-	-	-	-	93.6	6.4
Manure	-	-	-	-	-	5.6	92.2	-	2.2
Hide	-	-	-	-	-	0.3	2.2	6.4	91.1

The interviewed individuals in the study area reported that some 42 years back started keeping dairy cattle in their farm. All the households included in this study kept their animals mixed with people in their houses (100%).

The feeding practices for dairy cattle in the study area were totally based on grazing and stall feeding (crop residue + cut and carry). Supplementation with non-conventional feed resources such as left over of “chemo” (hot drink made of leaf of green coffee and spices) and “dekin” (forest tree fruit) and “attela” (local brewery byproduct) was also commonly practiced.

4.2. Sheko cattle characterization

4.2.1. Historical origin and distribution of Sheko cattle

Most of the respondents (80.8%) were not aware of the historical origin of the breed. Only 19.2% tended to associate origin of the cattle with that of the ethnic group maintaining the breed. The current possession of Sheko cattle within the selected households fell into three categories; purchasing (30.6%), on farm breeding (31.3%) and purchasing and farm breeding (38.1%).

4.2.2. Geographical distribution of Sheko cattle

Sheko district is still one of the major natural breeding tract of the breed. As per the respondents, Sheko breed of cattle is also found in three other districts; Sheibench, Debub Bench and Semien Bench of Bench Maji Zone with relative scarcity in these three districts and also on Sudanese boarder of Bench Maji Zone and in the adjoining areas of Kaffa and Shaka Zones. Agro-climatically, warm and humid climatic conditions were indicated as favorable environmental conditions by 94.1% of the respondents. Cold humid environment was also considered as favorable by the remaining respondents (5.9%).

4.2.3. Distinctive morphological features of Sheko cattle

All of the interviewed respondents reported the eye of Sheko cattle is characterized by predominantly by folded eyelids. In addition, majority of the farmers also indicated that Sheko cattle are polled (66.9%) while the characterize Sheko cattle to be stumpy (33.1%). Their face profiles were characterized as straight (78.9%), slightly convex (11.1%) and slightly concave (10%). All of the respondents agreed that Sheko cattle are small, compact, and short-bodied with straight and level backs. The hump size of Sheko cattle was described as small (67.2%) and medium (32.8%) and all the respondents agreed that the hump has a cervicothoracic location. Nearly all the respondents (95.3%) said that the ears are horizontally oriented, broad and short.

According to the response of the sampled households, the predominant coat color of Sheko is red (72.2%) followed by black and white (10.3%), black (3.9%), brown (4.2%), dun (3.6%), roan (3.3%) and white (2.5%). The coat color pattern of Sheko cattle was described as plain (80.5 %), patchy (11.4%) and spotted (8.1). The hair type was perceived as shiny

(70.8%) and coarse (29.2%) by the respondents. The udder of the female is well shaped (96.7%), possessing evenly placed teats.

About 82.8% of the households reported that the dewlap of the cattle is medium while the rest reported for small (17.2%). The naval flap was described as small (3.3%), medium (82.8%) and long (13.9%). Most of the farmers indicated that the neck of Sheko cattle is short (65.6%) while medium (28.6%) and long (5.8%) sizes were also mentioned by some farmers. The tail was characterized mainly as long (72.2%) and also medium (27.8 %) to some extent. Typical female and male Sheko cattle in its natural breeding tract are presented in Fig. 1.

4.2.4. Merits and demerits of Sheko cattle

The merits of Sheko cattle as mentioned by the interviewed households are presented in Table 5. The most important characteristics mentioned as merits were tolerance to disease especially to trypanosomes (93.6%), long lactation length (89.7%), good milking potential (88.9%), and better adaptation to heat stress (86.9%), good traction power (85.3%) and better adaptation to internal parasitic and tick infestations (82.5%). Other characteristics considered as merits of Sheko cattle include good mothering ability (79.4%), less selective feeding behavior (76.9%), attractive coat color appropriate for the local environment (75.8%), tolerance for biting flies (73.9%), shorter calving interval (67.5%) and better adaptation to the terrain of the area (65.3%).

On the other hand, Sheko were blamed for their aggressive behavior by nearly all the respondents (95.6%) and for their relatively high feed requirement by 87.2% of the farm households.

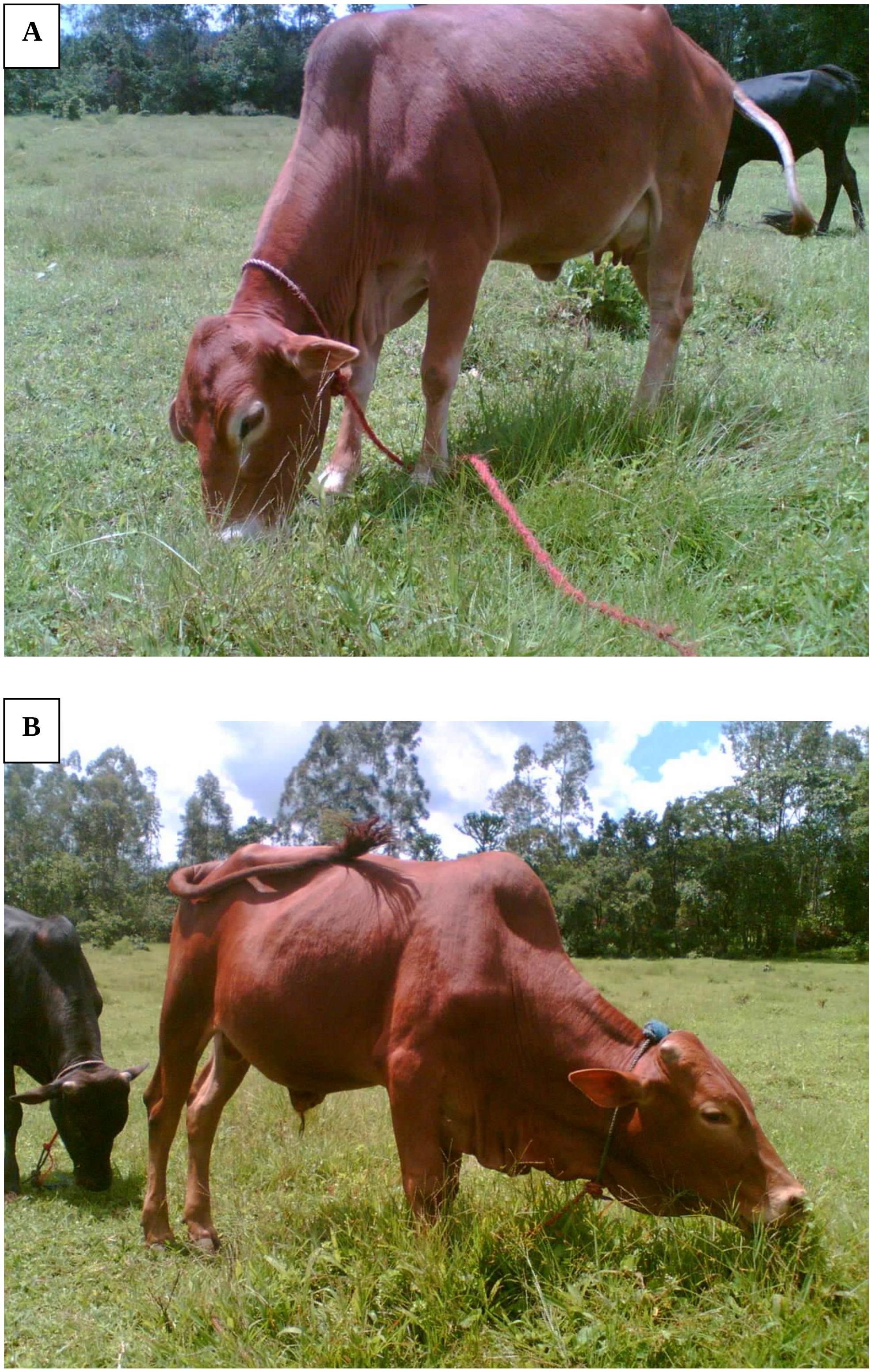

Figure 1. Pictures of female (A) and male (B) Sheko cattle

4.3. Status of Sheko cattle population and breeding practices

All the respondents (100%) in this study agreed that the Sheko population is decreasing from time to time. The major reason for the decrease in Sheko cattle population was the selective preference of farmers in the area for other breeds of cattle due to the polled ness of Sheko cattle, which makes them to be difficult to restrain (5.6%), their energetic and aggressive behavior (27.8%) and a combination of the two reasons (66.6%).

The respondents were interviewed about their plan of keeping Sheko cattle in the future. In their response, 53.1% had a plan to keep Sheko cattle while 46.9% lost interest to keep the breed. The reasons for the decision of farmers to keep or not were the merits and demerits of the breed, respectively. Those farmers who had a plan to keep Sheko cattle in the future use selection and cross breeding of within Sheko cattle population either on-farm (41.4%) or off-farm (58.6%). Means of introducing selected Sheko cattle off farm were by purchasing the animals themselves (22.8%), purchasing the daughters (75%) and using the son of the animals as breeding bulls (2.2%). On the other hand, those farmers who lost interest in Sheko cattle replace Sheko cattle by crossbreeding Sheko with other local breeds (39.6%) or substituting the Sheko herd with other breeds of cattle (60.4%).

The sources of information to select Sheko cattle for breeding included information gained from the local farmers (24.7%) and information gained from development agents (DA) (15.9%) and a combination of different sources of information (59.4%).

None of the farmers surveyed kept records by writing. However, all the farmers were attempting to memorize the performance of their animals indirectly for example by the amount of money they get from selling milk and the size of the milking equipment.

All of the respondents use different signs of estrus to identify Sheko cattle in heat. The farmers used different signs including bellowing, mounting on other cows, mucus discharge from vulva, reduction in feed intake, restlessness, aggressiveness, swelling of the vulva, warming of the body, lifting up the tail, frequent urination and reduction in milk yield. The reported mating practice in the study area was hand mating (87.2%) and random mating (12.8%). Whilst using hand mating, the respondents give due consideration to the quality of the bull in relation to draught power, milk and breeding efficiency. When using random mating, there was a chance for cows to mate with bull of other breeds. The average period of the use of Sheko breeding bulls was 4.53 years with the range of 1 to 8 years. More than half (60%) of the respondents had a plan to change bulls while the remaining did not (40%).

4.4. Sheko cattle health

Internal parasites (34.2 %) and Trypanosomes (15.8%) were the most important cattle health problems prioritized by the respondents. With the exception of trypanosomosis all the other diseases listed hereunder also affects Sheko cattle. The diseases reported as important are summarized in order of their importance in Table 7.

Table 7. Major health problems affecting cattle in the study area

Diseases	Frequency	Percentage
Poisoning (herbs)	2	0.8
Foot rot	4	1.7
Pasteurellosis	4	1.7
Anthrax	8	3.3
Inflammation of tongue	8	3.3
Rabies	8	3.3
Lumpy skin disease	10	4.2
Lameness	12	5.0
Babesiosis	14	5.8
Bloating	14	5.8
Mastitis	16	6.7
Blackleg	20	8.3
Trypanosomes	38	15.8
Internal parasites	82	34.2

Regarding resistance to diseases mentioned above, 100% of the respondents reported that Sheko cattle were less susceptible to trypanosomosis than other breeds. The interviewed respondents believed that there were differences in susceptibility to disease problems among the different age groups of Sheko cattle. From the different age groups, those animals below 1 year (64.7%) and greater than 10 years (24.7%) were reported to be highly susceptible for disease affecting Sheko cattle.

The surveyed farmers reported cattle health problems were managed by taking to local veterinary clinic (52.2%), traditional practices (20.9%) and a combination of the two (26.9%). Traditional practices used to manage health problems described by the respondents were the use of ethno- veterinary practices for the management of trypanosomes such as the use of vector repellants such as polishing the body of the animal with extracts of shrubs (*Maesa lanceolata*) and herbs (locally called "Echech"), sprinkling of old motor oil mixed with kerosene on the body of the animal, polishing the animal with tobacco leftover, sprinkling the body of the animal with cattle urine and smoking at homestead, drenching of the animal with mixed spices (garlic, ginger and black cumin) and branding. Modification of the husbandry practice including restricting the grazing hours to times when the biting flies are not active (early in the morning and late afternoon), herding animal under forest canopies and other shades to make flies less active and polishing animals' body with butter to make the skin slippery to biting flies.

Most of the farmers (84.2%) could get veterinary service provided by local government clinics readily. The type of veterinary services rendered included supply of drugs, vaccinations, trainings and advisory services. The rest farmers (15.8%) reported that they were not getting the necessary veterinary services due to inaccessibility to veterinary technicians.

4.5. Performance of Sheko cattle

The over all mean value and standard error of age at first calving, calving interval, number of survive per conception, lactation length and lactation yield are presented (Table 8). The overall mean values of daily milk yield were 3.40, 2.44 and 1.36 liters for the beginning, middle and end of lactation, respectively. There was significant variation between the agro-ecologies in average daily milk yield. In all stages of lactation the highest milk yield for Sheko cattle was observed in the highland followed by the values in the midland and lowland in that order. The average lactation length was 10.66 months and the difference between the agro-ecologies was not significant ($p>0.05$). The overall average age at first calving, calving interval and number of services per conception were 55.13 months, 463.67 days and 1.37, respectively. Both age at first calving and calving interval varied significantly between the agro-ecologies ($p<0.001$). The shortest age at first calving and calving interval were observed in the highland followed by the values for midland and lowland agro-ecologies in that order. The average number of services did not vary significantly between the highland, midland and lowland areas.

Table 8. Mean and standard errors of milk yield, lactation length, AFC, CI and NSPC of Sheko cattle in the study area

Variables	N	Mean (SE)			
		Highland	Midland	Lowland	Overall
Daily Milk Yield BL (liters)***	360	3.70 (0.08)a	3.45 (0.09)ab	3.04 (0.07)c	3.40 (0.05)
Daily Milk Yield ML (liters) ***	360	2.91 (0.08)a	2.35 (0.06)b	2.06 (0.07)c	2.44 (0.05)
Daily Milk Yield EL***	360	1.79 (0.06)a	1.34 (0.05)b	0.94 (0.04)c	1.36 (0.04)
Lactation Length (months) ^{NS}	360	10.91 (0.21)	10.72 (0.19)	10.34 (0.20)	10.66 (0.12)
Age at First Calving***	360	50.00 (0.70)a	54.65 (0.62)b	60.75 (0.77)c	55.13 (0.46)
Calving Interval ***	360	413.22 (6.60)a	456.73 (9.74)b	512.08 (11.23)c	463.67 (5.89)
NSPC^{NS}	360	1.33 (0.06)	1.38 (0.05)	1.41 (0.06)	1.37 (0.03)

N=Number of observations, BL= Beginning of Lactation, ML=Middle of Lactation, EL=End of Lactation, AFC=Age at First Calving, CI= Calving Interval, NSPC=Number of Services per Conception, ***=$p<0.001$, NS=Not Significant

4.6. Calf management

All of the respondents feed colostrums to new born calves. The average number of days colostrums is given to new calves was 4.05. New born calves stayed with their mother for 3 to 15 days, but the average number of days was 7.38. In about 48.9% of the households new born calves stay at house until they start grazing in the 3rd month, while 26.9%, 14.8%, 9.4% stayed for 2, 4 and 5 months, respectively.

All the respondents reported that new born calves are provided with supplementary feed till they start grazing. The type of supplemental feeds were green grasses (89.2%), mixture of clean fresh green grasses and legume pasture (10%), legumes (0.8%). The feeding pattern was once a day in the morning (22.5%), twice a day (morning and evening) (55%), and 3 times in a day (22.5%). Almost all the respondents (97.2%) rear all females born to reach puberty to maintain herd size and increase capital. Small proportion (2.8%) of the respondents did not rear all females born to reach puberty. Majority of the respondents (76.4%) reported that they rear all males born to reach puberty for breeding, if they show good growth performance. Weaning is not practiced in the entire selected farm households apparently to ensure milk let down by suckling. None of the respondents had separate housing for calves, rather share the family house.

4.7. Results of participatory methods

4.7.1. Morphological distinct features of Sheko Cattle

The results revealed that the first important morphological feature of Sheko cattle are their small body size (1.00) followed by their polled ness (1.89), folded eyelids (2.89), and humplessness (3.22). There was no significant difference in the agro-ecologies in their ranking of the distinct morphological features of Sheko cattle ($p>0.05$) (Table 9).

Table 9. Ranking of distinct morphological features of Sheko cattle (N=9)

Morphological features	Overall mean rank	SD
Small body size	1.00	0.00
Horizontally oriented, broad and short ears	4.33	0.50
Folded eyelid	2.89	0.60
Polled ness	1.89	0.33
Hump less	3.22	0.87

SD= Standard Deviation, N= Number of Groups

4.7.2. Merits of Sheko cattle

The results of pair wise ranking method of study to identify the most important merits of Sheko cattle are presented in Table 10. The first most important merit of Sheko cattle according to the participatory study was high milk yield, followed by good traction power, disease tolerance, short calving interval, longer lactation length, good maternal instinct and trypanotolerance in that order. There was no statistically significant difference in the ranking of the merits of Sheko cattle ($p>0.05$).

Table 10. Ranking of merits of Sheko cattle (N=9)

Merits	Overall mean rank	SD
High milk yield	1.00	0.00
Good traction power	2.00	0.00
Less selective in feeding	9.00	0.50
Disease tolerance in general	3.00	0.00
Body condition less affected by feed shortage	8.00	0.50
Adapted to the environment	6.11	0.60
Short calving interval	3.00	0.00
Tolerance to trypanosomosis	5.89	0.33
Tolerance to fly bites	7.11	0.60
Good mothering instinct	5.11	0.33
Longer lactation length	4.00	0.00
Tolerance to endoparasites	7.00	0.50
Suitable coat color for the environment	8.00	0.50

SD= Standard Deviation, N= Number of Groups

4.7.3. Distribution of Sheko cattle

The results of the participatory method of study showed that Sheko are distributed mainly in Sheko (1.00), Semien (1.78) and Shei Districts (2.78) and Shaka Zone (3.11) in that order. There was total agreement in people from the three agro-ecologies and involved in the participatory method in the description of the distribution of Sheko cattle ($p>0.05$) (Table 11).

Table 11. Ranking of the presence of Sheko cattle in different areas (N=9)

Areas	Overall mean rank	SD
Berro district	7.56	0.53
Sheko district	1.00	0.00
Shasha district	6.56	0.53
Shei Bench district	2.78	0.44
Semien Bench district	1.78	0.44
Sudan border of Bench Maji zone	4.78	0.44
Kaffa zone	4.33	1.41
Maji district	7.89	1.90
Shaka zone	3.11	0.78
Goldia District	5.83	0.41

SD= Standard Deviation, N= Number of Groups

4.7.4. Diseases affecting Sheko cattle

Farmers were given the opportunity to mention diseases affecting Sheko cattle and to rank them according to their importance. Accordingly, lameness (1.00), anthrax (1.78), blackleg (2.78) and toxicity (3.78) were the first four ranked as important. There were also a number of other diseases mentioned by the farmers in the participatory discussion which are listed in Table 12. There was no statistically significant difference in the perception of farmers from the three agro-ecologies regarding the ranking of the diseases ($p>0.05$)

Table 12. Ranking of the importance of diseases affecting Sheko cattle (N=9)

Diseases	Overall mean rank	SD
Anthrax	1.78	0.44
Babesiosis	9.56	0.73
Blackleg	2.78	0.44
Foot rot	7.56	0.73
Actinobacillosis	8.56	0.73
Endoparasites	11.75	0.50
Lameness	1.00	0.00
Lumpy Skin Disease	5.78	0.44
Mastitis	11.50	0.76
Pasteurellosis	4.78	0.44
Toxicity	3.78	0.44
Rabies	9.56	2.92
Tumors	7.44	1.24

SD= Standard Deviation, N= Number of Groups

4.7.5. Constraints of Sheko cattle production

The most important constraints of Sheko cattle production were their sparse distribution (1.00), absence of conservation efforts (2.00), declining interest of the community for Sheko cattle due to their aggressive behavior (3.83), inbreeding (4.56) and their polled ness which makes them difficult to restrain using rope. The details of the results are presented in Table 13.

Table 13. Ranking of the constraints of Sheko cattle production (N=9)

Constraints	Overall mean rank	SD
Polled ness of Sheko cattle	5.56	0.53
Aggressiveness of Sheko cattle	6.44	0.73
Inbreeding	4.56	0.53
Early castration of Sheko males	2.89	0.33
Sparse distribution of Sheko in many areas	1.00	0.00
Absence of conservation efforts	2.00	0.00
Declining interest of the Community for Sheko cattle	3.83	0.41

SD= Standard Deviation, N= Number of Groups

5. DISCUSSIONS

The farm households included in this study were not aware of the origin of Sheko breeds. But it has been reported that the short horn hump-less cattle as described by Clark (1976) entered into Ethiopia by the middle of the 2nd millennium B.C. Furthermore, Alberro and Hailemariam (1982b) stated that there are still shorthorns, hump less cattle kept by the Sheko people in the mountainous territory on the Ethio Sudanese boarder. Presently, Sheko is the only short horned hump-less cattle known in Africa. The peoples owning the hump-less short horn cattle (Brachyceros) migrate westwards along the Mediterranean littoral, southwestwards across the Sahara via the Tibestsi and Tassili highland areas and southwards up the Nile towards the highland areas of what are today Ethiopia and Kenya. Their descendants are known today as the West African dwarf short horn breeds. According to Faulkner and Epstein (1957), small numbers of cattle of short horn type were still to be found in Koalib hills in the Nuba Mountain of the Sudan in recent times.

There is in general a declining trend of the population of Sheko cattle in the study areas. The reasons for the decline in the population of Sheko are their energetic and aggressive behavior, which decreased their acceptance by the local community; there is lower male to female ratio in Sheko cattle population that might expose the animals for inbreeding and crossbreeding with bulls of other breeds and the less attention given to conserve the breed (Alemu, 2002; Fasil, 2004). Due to their aggressive behaviors, it is difficult to harness and control them by old persons, women, children and disabled persons. In addition, exercising early castration of bulls by some farmers in order to control their aggressive behavior seriously limits pure breeding of Sheko cattle (Takele, 2005).

Sheko cattle were believed to have some level of trypanotolerance adaptability to the effect of fly bites, internal parasite infestations and heat stress. The common disease reported in the study area includes trypanosomes, internal parasite, anthrax, black leg, mastitis, pasteurolossis, and lameness. Taking to veterinary services, traditional healers, herding animals under forest canopy and shed as well as modification of the husbandry practice were commonly used by farmers. This indicates that the long time Sheko resided in the areas enabled them develop adaptation for the local disease and climatic conditions. The ethno-veterinary practices of the farmers are also indicate the long standing exposure of the farmer to the challenge by tsetse and trypanosomosis and the local knowledge and skill developed by the farmers to control and reduce the impact of tsetse and trypanosomosis.

The most important merit of Sheko cattle as mentioned by the farmers were high milk yield and good traction power. This indicates that Sheko has been selected for its potential to yield more milk and perform better in traction than other breeds under the prevailing tsetse and trypanosomosis challenge in the areas. This high interest for selecting milk yield is common in many traditional Africa cattle owners, who keep cattle primarily for milk and secondarily to accumulate stock as a form of investment (De Leeuw and Wilson, 1987).

The average reported lactation length of Sheko cows was 10.66 months. This average value is greater than what was reported by DAD-IS (2000) (7 months). The pick milk yield found for Sheko cattle in this study (3.44 liters) is higher than the reports of Workneh and Rowland (2004) from extensive livestock breed survey done in Oromiya Regional State (1.4 litters per day). The average age at first calving (AFC) was 54.1 months. This value is similar to the report of DAD-IS (2000). But the AFC is longer than earlier reports in indigenous cattle. Merga (1988) reported average AFC of 37.3 months in stationed crossbred cattle. Mekonnen (1987) and Kassa and Amason (1986) obtained AFC of 41.5 and 45.2 months, respectively for Boran cattle on station condition. Similarly Yifat (2005) obtained 31.85 months and 32.38 months mean AFC for crossbred heifers in urban and rural smallholders. Enyew (1992) and Mekonnen and Goshu (1987) reported AFC of 32.8 and 38.8 months for Arsi and Fogera cattle, respectively under station management. Sheferaw, *et al* (2003) obtained 40.6 months for heifers in different dairy production system in central highland of Ethiopia. However, AFC in Sheko cattle was found to be less than what had been reported by Zewdu (2004) on Semen, Wogera Sanga and Fogera cattle in north western Ethiopia. Age at first calving varies largely due to many factors including breed, environment and management factors especially nutrition.

The 466.00 days calving interval for traditionally managed Sheko cattle, which is observed in the present study is higher than 438.9 days and 434.7 days reported by Merga (1985) and is in line with 459 days reported by Kiwuwa (1983) and lower than 484 days found by Gallal *et al*. (1981) for crossbreds in Ethiopia. The reported overage CI was also lower than what had been reported by Ababu (2002) for Boran cows at Abernossa Ranch, Zewdu (2004) for Semen, Wogera Sanga and Fogera cattle and Alganesh *et al*. (2003) on indigenous cattle of west Wellega. Bekele *et al*. (1991) and Sheferaw (2003) reported average CI of 475.1 and 551.82 days, respectively for the central highland of Ethiopia, which are longer than our finding. Similarly, Hailemariam *et al*. (1993) obtained 487 days CI at Abernossa Ranch. On the other hand CI estimated in the present study is higher than 351 to 397.5 days of CI reported by Nugussie *et al*. (1998).

The reported average number of service per conception (NSC) was 1.37, which is considered as quite satisfactory. This average value is lower than the 1.62 mean reports of Bekele *et al*. (1991) in central high lands of Ethiopia. This finding also disagrees with the 1.61 services per conception reported by Hailemariam *et al*. (1993) in Abernossa Ranch. Nugussie *et al*. (1998) obtains mean services per conception for cows at Asella which is higher than the present findings. Average NSC in Sheko cattle were found to be less than what had been reported by Sheferaw *et al*. (2003).

6. CONCLUSION AND RECOMMENDATIONS

The results of this study showed that Sheko cattle is characterized mainly by their small size, folded eyelid, horizontally oriented, broad and short ears and absence of hump and horn or stumpy horn, if present. Their distribution is limited to Sheko, SheiBench, Semien Bench, Debub Bench and Kaffa and Shaka Zone. Sheko cattle are preferred by the local people for their relative better milk yield and traction power under the prevailing environmental conditions specially the presence of tsetse and trypanosomosis and heat stress. Sheko are reared in the area based on grazing on natural pasture and stall feeding of crop residue and cut and carry. However, absence of Sheko by the community is declining due to their aggressive behavior and the difficulty to strain them due to their polled ness. Replacement of Sheko cattle is based mainly on off-farm sources and on-farm rearing. The milk yield and reproductive performance of Sheko cattle is in general poor but their performance under the prevailing environmental conditions is considered to be better than other cattle. In general Sheko cattle in the highland areas were better performing than those in midland and lowland areas. Sheko cattle are affected by diseases such as lameness, anthrax, blackleg and toxicity. The most important constraints of Sheko cattle production were their sparse distribution, absence of conservation efforts, aggressive behavior of Sheko cattle, declining interest of the community for Sheko cattle and inbreeding.

Based on the above conclusions the following are recommended:

- There should be a strategy and/or policy for breed conservation programs for Sheko cattle;
- The merits of the breed specially those related to trypanotolerance should be properly documented and used for future breeding programs;
- Aggressive temperament of the breed could be improved through early training of the animals on casting and tethering.
- Taking brief time of herding along tethering will also make the animal to get relief and softens its aggressive behavior.

- Simple improvement in the husbandry practice such as the use of suitable tether and casting techniques could improve decline interest of the community.
- To identify and work with those Sheko cattle keepers who have shown interest to maintain this particular breed.
- Strengthening the extension services on pure breeding of Sheko cattle.

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8. ANNEXES

Annex - A: The Questionnaire

I. Survey site (Location)

Region ______________________ Zone ___________________

Woreda ______________________ Kebele _________________

Altitude (masl)_________________

II. Socioeconomic and farming system Characteristics

1. Name of farm owner: _________________
2. Age of farm owner: _________________
3. Sex of farm owner: _________________
4. Educational status: _________________
5. Family size: _________________
6. Land holdings (ha) _________________

   Crop ______, Pasture ______, Fallow ______, Forest ______,

   Others ______
7. Livestock herd size and composition

Livestock Species	Herd Size	What is the trend in the last ten years (increase or decrease)	Reason for the change in the trend
Cattle			
Sheep			
Goats			
Donkey			
Horse			
Mule			
Camel			
Poultry			

8. Cattle herd size and composition

Cattle type	**Status**	**Number**			
		Indigenous	*Crossbred*	*Exotic*	*Total*
Cows	Pregnant non-lactating				
	Lactating non-pregnant				
	Lactating pregnant				
	Dry pregnant				
	Dry non-pregnant				
Heifers					
Bulls					
Male calves					
Female calves					
Steers					
Total					

9. What are the objectives of cattle keeping?

Milk: ___ Meat: ___ Draught: ___ Other (s): _____

10. When did you start keeping dairy cattle in your farm?

Breed of dairy cattle % of exotic blood	**Year of establishment**

11. How do you house your dairy cattle?

a) Separately in corral b) Mixed in corral c) Mixed in barn

d) Separately in barn c) In the farmer's house mixed with people

e) Other (specify)

12. What type of feeding do you practice for dairy cattle?

a) Based on only grazing

b) Based on only stall feeding (concentrate + hay and/or crop residue+ agro Industrial byproducts + cut and carry) please underline the combination

c) Based on grazing and stall feeding (concentrate + hay and/or crop residue + Agro industrial byproducts + cut and carry) please underline the combinations

d) Any other system (specify) Atella, Chemo (Spices) and Dekin

III. Dairy Cattle breeding practices

1. Would you please describe the distinctive morphological features of Sheko cattle?

2. Could you please describe the historical origin and distribution of Sheko cattle?

3. How did you acquire Sheko cattle (purchasing, on farm breeding etc)?

4. Would you please describe the agro-climatic conditions favoring Sheko cattle?

5. Would you please describe the geographical areas where Sheko cattle are distributed?

6. What are the merits (good things about) of Sheko cattle? (this may include Performance parameters, adaptation qualities, friendliness to the environment etc)

7. What are the demerits (bad things about) of Sheko cattle? (this may include

Performance parameters, adaptation qualities, friendliness to the environment etc)

8. From your long year's observation, what is happening to the Sheko cattle population in your area (decreasing, increasing, remains static)?

9. If it is decreasing what do you think are the major reasons?

10. Are you still planning to keep Sheko cattle in the future?

11. If yes or no, what is/are the reason (s)?

12. If yes, how do you maintain the Sheko herd in your farm? (selection and crossbreeding on farm, selection and crossbreeding off farm or any other means)

.

13. If not, how are you planning to replace the Sheko cattle in your farm? (Crossbreeding Sheko with local breeds in the area (please specify). substituting the Sheko herd with another breed (please specify), any other way (please specify).

14. If you are selecting Sheko cattle on farm or off - farm, what are the most important traits you consider? (Rank in order of their importance)

15. What is your source of information to know about the selection criteria you mentioned above?

16. Do you have any sort of morphological feature, which you think is associated with the trait of your interest? If yes, please specify.

17. If you are selecting animals off farm to replace your Sheko herd, how do you introduce these selected animals into your farm (purchasing the animals themselves,

purchasing the daughters or using the son of the animals as a breeding bull or others)?

18. If you are selecting animals on farm, do you breed animals that are closely related genetically?

19. If not, what are your reasons?

20. Do you keep the performance records of your Sheko cattle? If yes, how (writing or without writing (how?))

IV. Mating Practices

1. How do you detect a Sheko heifer or cow in heat?

2. If you are using heat signs, what are the most important heat signs you use to detect a Sheko heifer /cow in heat?

3. Are you using hand mating (where a cow is taken by the owner to a known bull) or random mating (where mating takes place in the field or on farm without the involvement of the owners)?

4. If you are using hand mating, are you concerned with the quality of the bull as a breeding animal?

5. If you are using random mating, is there any chance for you cows to be mate with bulls of other breeds?

6. When you use bulls for breeding, for how long have you used the bull(s) for breeding?

7. Do you have any plan of using another bull in the future?

a) Yes b) No If yes, when and why?

V. Sheko cattle health

1. What are the major health problems affecting cattle in general in your area? List in the order of importance.

2. Which of the diseases you mentioned above are also affecting Sheko cattle? List in the order of importance.

3. To which of the diseases mentioned in question no 1 is Sheko cattle less susceptible (resistant)?

4. Dou you see any difference in susceptibility to disease problems among the different age groups of Sheko cattle? If yes, which ones are highly susceptible for the diseases you mentioned above?

5. How do you manage cattle health problems?
   a) Taking to local veterinary clinic
   b) Taking to a traditional healer
   c) Any other way (specify)

6. If you are using traditional healers, which types of traditional practices are you using for each disease you mentioned above?

7. Do you get veterinary services easily in your area? If yes, specify the types of the services (supply of drugs, vaccinations, trainings etc)

VI. Performance of Sheko cattle

3. What was the age of your cows when they gave their first calf?

Cow ID/Name	Breed/level of exotic blood	Age at first calving

4. When your cows did give their recent birth? When your cows did gave birth before the recent birth?

Cow ID	Breed/level of exotic blood	Date/month/year of recent calving	Date/month/year of previous calving

5. If you use hand mating, how many times did you take your cow for service before it got pregnant last time?

Cow ID	Breed/level of exotic blood	Type of mating (AI, Bull or Both)	Number of services per conception

6. What is the average daily milk yield of your cows at the beginning, middle and end of lactation? And how long do you milk your cows?

Cow ID	Breed/level of exotic blood	Daily milk yield			Lactation length (months)
		Beginning	Middle	End	

VII. Calf management

1. Dou you feed new born calves with colostrums? If yes, for how long?

   Yes, Colostrums feeding is continued for four days after the birth of calf.

2. For how long new born calf stay with their mother?

3. For how long new born calf stay at house until they start grazing?

4. Do you provide supplementary feed to newborn calf till they start grazing?

   a) Yes b) No

5. If yes, mention the type of feed and form of feeding?

6. Do you rear all females born to reach puberty?

   a) Yes, explain reason

   b) No explain reason

   ____

   ____.

7. Do you rear all males born to reach puberty?

   a. Yes, explain reason

   b. No explain reason

8. When and why do you wean your calves?

   When: Why:

9. Do you rear all female calves to puberty? If not, why or what is the basis of selection to rear them to puberty?

10. Are you providing your calves with separate housing? If yes, is it protecting the calves from extremes of temperature and humidity?

VIII. Constraints and support services

1. What are the major constraints associated with Sheko cattle in your area?

2. Is there any sort of effort in your area to conserve Sheko cattle?

3. If yes, what types of efforts are being carried out? Who initiated and implement the efforts?

4. What do you think are the possible solution for the constraints mentioned above?

Annex - B: Participatory Approach

- The distinctive features of Sheko cattle:
- Comparison of the distinctive feature regarding relative use to identify precisely Sheko kettle:
- The Merits (good things about) of Sheko cattle with ranking:
- The demerits (bad things about) of Sheko cattle with ranking:
- The constraints associated with Sheko cattle:
- Comparison of the constraints associated with Sheko cattle:
- The geographical distribution of Sheko cattle:
- The history of origin of Sheko cattle:
- The major disease problems associated with Sheko Cattle:

9. CURRICULUM VITEA

Name: **Elias Bayou Bekele**

Profile

Sex: *Male*

Birth Date: *15 Nov., 1961 E.C.*

Birth Place: *Maji, Bench Maji Zone*

Age: *39*

Marital Status: *Married*

Education

1966-1971 E.C: Elementary school, Maji.

1973-1978E.C: Secondary school, Maji

1979-1980 E.C: Higher education at Awassa Junior Agriculture College

1994-1996 E.C: Higher education at Debub University

Professional experience

1981-1985 E.C: As a development agent in Arisi zone.

1986-1988E.C General manager of finance office in Maji zone, SNNRS.

1989. - 1993 E.C: As an expert of animal production in Maji district, SNNRS of Agriculture office.

1994. - 1996 E.C: As a student in Debub Universty for first degree.

1997 E.C. – up to now Vice dean of Mizan ATVET(Agricultural Technical, Vocational andEducational Training) College.

Languages

Amharic – Native.

English – Fluent.

Hobbies

Reading and Writing.

Researches.

Working with people.

Address:

Bench Maji Zone,

Mizan Teferi ,

Mobile Phone: 251-91-333 65 42

Office: 251-47-335 07 23

E-Mail eliasbayou@yahoo.com

10. SIGNED DECLARATION SHEET

I, the under signed, declare that this thesis is my original work and has not been presented for a degree in any university.

Name: Elias Bayou Bekele

Date of Submission:

This thesis has been submitted for examinations without approval as university advisor.

Dr. Kelay Belihu ; ______________________________