

SUDAN UNIVERSITY OF
SCIENCE & TECHNOLOGY
COLLEGE OF GRADUATE STUDIES



The Measurement of Nilotic Cattle in South Sudan

قياسات لأبقار النيلية في جنوب السودان

A Thesis Submitted in Partial Fulfillment for the Degree of
M.Sc in Animal Production

By:

Wilson James Fadlallah Gout

Supervisor:

Dr. Ahmed Khalil Ahmed

2015

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DEDICATION

To my parent who whole heartedly
contributed to my education ,to teachers
,doctors professors whose grew me up
in my studies ,till now.

ACKNOWLEDGMENTS

I am deeply indebted to my supervisor, Dr. Ahmed Khalil Ahmed for his good observation and his encouragement to me during the studies . and for the timely advice he offered to me both within and outside academic circles. I am thankful to Dr. Thomas James Loro for his helpful me in field and Mrs. Lavina Veko for her well-done assistance me in measurement in conducting this research. My heartfelt gratitude is to all the staff in department of animal production shambat Sudan university of science & technology .my appreciation to all owners of cattle those people were help me in the field in upper Nile state and centre equatorial state . My deepest thanks and appreciation goes to my wife, Changjwok William, for her patience and for taking care of our family during the period I was away. Great thanks to my parent for a good guardian and raising me up in my studies, my mum, and for her patience and understanding.

Last, but not the least, many thanks to all my family members for all the encouragement during my studies.

Abstract

The present work was conducted to measure external of body length for Nilotic cattle using external body measurements. A total of 36 South Sudanese indigenous Nilotic was used for the study. In two areas in south Sudan upper Nile state and centre equatorial state during November and December

Measurement of heart-girth measurement (chest circumference)is commonly used to estimate dairy heifer body weight from previously derived equations or tables .in this experiment ,variability of heart-girth measurements as they are taken in the field was analysed to determine the standard deviation within group of 36 nilotic cattle of various ages 3,4,5,7,9,11,and 14 years .standard deviations were 7.56,15.29,16.42,11.33,9.64and 14.84 respectably for stature ,chest circumference ,top line ,hump,horn, among 36 cattle.

Determination of live weight of animal is necessary to calculate the feed requirement, animal growth and estimation of animal's cash value as well as conducting breeding studies .field experiments and estimation of dressed carcass weight .

Key words: Body measurements, stature, chest circumference, top line , hump and horn, of Nilotic sanga cattle.

-ملخص البحث :

اجريت هذه الدراسة في جنوب السودان في ولايتي اعالي النيل والاستوائية الاوسطى لغرض القياسات على ابقار النيلية في فترة ما بين نوفمبر وديسمبر وشملت القياسات على (القائمة-المحيط الصدري - طول الحيوان -طول الجسم السنام - و القرون) في اعمار تتراوح ما بين 3-4-5-7-9-11 و14 سنة وكانت النتائج بالانحراف المعياري على نحو التالي 7.56-15.29- 16.42 - 11.33- 9.6 و 14.84. على التوالي الدراسة شملت 36 بقرة اناث والذكور.

يستحيل معرفة الاوزان الحيوانات لانها لها صلة بتربية الحيوان وتغذيتها في مناطق الرعي لصعوبة تنقل اجهزة الوزن لانها ثقيلة .وعدم تركز الرعاة في مكان واحد لانهم مرتحلون دائما.لذلك يمكن اخذ قياسات محددة مثل المحيط الصدري وطول جسم الحيوان لمعرفة اوزانها بأرطال.

ابقار النيلية تحدر من ابقار الزيبو الاسبوية ويتميز هذه الابقار بقرون طويلة وسنام وحجمها تكاد تكون صغيره .وهدف من اجراء القياسات لمعرفة اصلها وخصائصها المورفولوجية وهدف تربيتها من قبائل النيلية دينكا و نوير والشك .

مفاتيح الكلمات :-

قياسات جسم الحيوان(القائمة - المحيط الصدري - طول الحيوان -القرون - السنام لابقار النيلية

السائقا .

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Chapter one

1. Introduction:

South Sudan it's a newborn state during the independent from Sudan that why the relationship with Sudan still going forward in livestock since the last census in 2009 while the livestock of south Sudan include in that census, and Sudan it was the big country boarding south Sudan territory and the contact of their animals still related to livestock of south Sudan ,these animal are grazing natural grazing in open range conditions ,under these conditions it's very important to device for weighing to determining the changes of the live weight .

Determination of live weight of animal is necessary to calculate the feed requirement, animal growth and estimation of animal's cash value as well as conducting breeding studies .field experiments and estimation of dressed carcass weight (Pyne 1990).

Nilotic redirects or nilotes refers to related ethnic groups mainly in habitins the Nile valley, and parts of central Africa and east Africa ,who speak nilotic language ,large sub group of the nilo , the southern family these include the kalennin, Lou, dinka nuer ,shulluk ,atekon and the moa . Speaking peoples, all of which are clusters of several ethnic groups.

Nilotes from the majority of the population in the south Sudan ,an area that is believed to be their original point of dispersal .they also today constitute the second .largest group of peoples in habiting the African great lakes region (after the bantu peoples)with a notable presence in south western Ethiopia as well .

Nilotics cattle originated from Asia, at the first cattle introduced into Africa .further migrations resulted in heavy concentration of cattle in highlands of Ethiopia and Kenya,

Most of nilotes practice pastrolism, The purpose of keeping cattle is for prestige and their value in the social transactions such as marriages specially, a man who sells animals is unpopular because he reduces the ability to marry with in his social group.

The main livestock in southern Sudan can be broadly categorized as pastoralist and agro pastoralist .occupying relatively dry ,lowland areas in eastern equatoria the pastoralists include the Toposa ,Jie ,Murle and Nyangatom ,the agro pastoralist include Dinka ,Mundari and Nuer who occupy the flood plains of Bahar el Gazal ,lakes ,Jungle and upper Nile .

A second, smaller cluster of agro pastoralist live in the hills of eastern equatoria .although these communities access and use a variety of assets,the ownership of cattle is a common and overriding livelihood strategy .this section provides an

overview of pastoral and agro pastoral livelihoods in southern Sudan ,but in line with the thematic focus of the case of study .

The objective of this measurement is for study in Nilotic cattle to know the morphological characteristic of the animals in various parts (point) of bodies of animals. An animal's exterior and constitution are evaluated to estimate its live weight and to monitor the growth and development of young.

Four basic categories of measurement are taken height, length, girth, hump, and horn .in different ages in two different areas in south Sudan. The data obtained by these systematic measurements worked out using the ssps analysis methods.

Chapter two

2. Literature review:

2.1. Origin and current classification of African cattle:-

Despite the availability of information obtained by integrating archaeological, anthropological, historical, linguistic and genetic evidence, the origin of African cattle remains uncertain (Blench 1993). When the origin of African cattle is talked about, it becomes clear that the origin depends on the group to which the breed belongs. The original African cattle can be divided into two major categories, namely humpless (*Bos taurus*) and humped (*Bos indicus*). The former category is subdivided further into longhorn (*B. taurus longifrons*) and shorthorn (*B. taurus brachyceros*), while the latter category is subdivided into zebu proper and zebu crossbred-types. Position of the hump on the animal's back is also used to classify the zebu proper and zebu crossbred types into cervicothoracic-humped (Sanga) and thoracic-humped stocks (Epstein 1971). The Sanga is nowadays considered a separate group of cattle. As per the current classification of African cattle, four different groups can be distinguished namely *B. taurus*, *B. indicus*, Sanga and Sanga × zebu types. Rege (1999) termed the latter group 'zenga'. Additionally, there are more recent derivatives of African cattle; these have either resulted due to the close proximity of two or more indigenous populations, or from efforts to create composite commercial

breeds. Rege (1999), and Rege and Tawah (1999) gave clear examples of each of these groups in Africa.

In the past, it was widely accepted that cattle were domesticated elsewhere and subsequently introduced into Africa. The cradle of the world's domesticated cattle was thought to be in western Asia, where there is evidence that domestication took place between 8000 and 9000 years ago. It was believed that humpless longhorns were first introduced into Egypt from western Asia in approximately 5000 BC and humpless shorthorn in about 2500 BC (Epstein and Mason 1984). Epstein and Mason (1984) suggested that the various types of cattle were introduced at different times and by different routes. However, discovery of the remains of domesticated shorthorn cattle dating to approximately 5100 BC at Capéletti in Algeria (Roubet 1978) and at Uan Muhuggiag and Adra Bous in central Sahara (Smith 1980) cast doubt on the theory that cattle were domesticated before being introduced into Africa. It is now clear that shorthorn cattle were present in North Africa for several hundreds of years before the period given by Epstein and Mason (1984). Historically, humpless shorthorn cattle were found in almost all types of ecological zone with populations being recorded in Sudan, central Tanzania and the Mount Elgon area of Kenya. Rock paintings, provide evidence that humpless shorthorn cattle were found 2000 years ago in the Mount Elgon area

of Kenya (Payne 1970). Recently, genetic data have been found to support the hypothesis of an African centre of domestication (Bradley et al. 1996).

Semitic tribes introduced humped cattle into Africa from Arabia and Asia, in two different time periods. First, in around 1500 BC, long-horned zebu cattle were introduced; these supposedly met humpless longhorn cattle in Ethiopia and Somalia, and crossed to produce the cervico-thoracic humped cattle, also known as Sanga. The Sanga later spread into central and southern Africa. Secondly, in around 670 AD, short-horned zebu cattle were introduced via Ethiopia and Somalia (Epstein 1971). This second introduction, either led to a major replacement of Sanga cattle from eastern Africa, or to cross-breeding of this zebu population with the already existing Sanga to result in a Sanga × zebu type (zenga). Excavations in Kenya have shown that the Small and Large East African zebu breeds were multitudinous in parts of the Rift Valley by AD 1400 to AD 1500 (Posnansky 1962, cited in Payne 1970). The zebu cattle spread further westwards and southwards to become the dominant cattle within the area demarcated by latitude 20°N in the north (northern Sudan), the western rain forest barrier in the west and the river Zambezi, latitude 15°S in the south (Epstein 1971).

2.1. a. Zebu cattle breeds of eastern Africa:-

The zebu breed is represented by some 75 breeds in Africa, making it the largest single cattle type (Rege 1999). Approximately 61 of these zebu breeds are found in eastern Africa and neighbouring countries in southern-central Africa, while the rest are found in West Africa. Faulkner and Epstein (1957) coined the term 'East African Zebu', to embrace the substantial variation in the morphology of the shorthorn zebu of eastern and southern Africa. In this discussion, for reasons of simplicity, East African zebu cattle breeds have been divided into two groups, those found only in Kenya (Kenyan zebu cattle) and those found in the other East African countries (East African zebu cattle).

2.1. b. East African zebu cattle:

The term 'East African Zebu' is used to describe all the 'Shorthorn Zebu' of eastern and southern Africa (Rege and Tawah 1999). Based on their body sizes, the East African zebu breeds can be divided into two subgroups, the 'Small' and the 'Large'. The term 'Small East African Zebu' was suggested to portray the small frame of these animals and to avoid confusion with other types of East African cattle (Mason and Maule 1960). The Small East African zebu breeds are the majority, being represented by 49 breeds. The Large East African zebu is represented by 13 breeds, which are restricted to the relatively drier parts of Sudan, Eritrea, Ethiopia, Somalia, Kenya, Tanzania and Uganda. The isolations

imposed by tribal boundaries, whether physical and/or cultural, and those due to ecological restrictions are partially responsible for the genetic differentiation leading to the existence of different breeds and strains (Rege and Tawah 1999). However, variations in nomenclature associated with different tribes and ecologies do not, in themselves, imply genetic differences. For this reason, breeds or strains that have a common ancestry can be classified further, according to whether or not they occupy the same geographical area (e.g. a country) and/or a defined ecological zone within one or more countries. Rege and Tawah (1999) referred to these two classifications as clusters and groups, respectively.

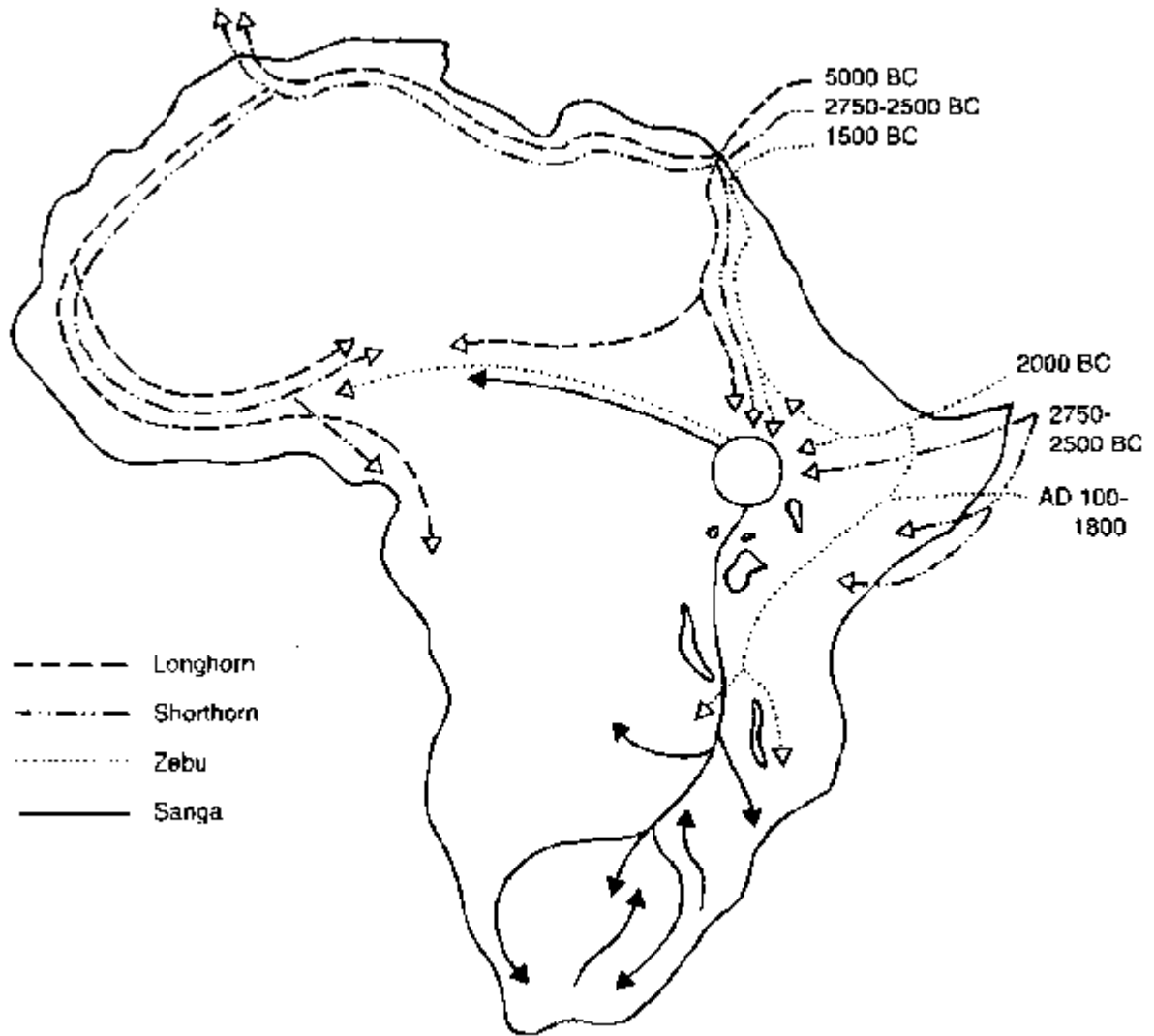
<http://www.ilri.org/InfoServ/Webpub/fulldocs/Zebucattle/2Background.html>

2.2. Bos Indicus cattle in Africa and worldwide:-

The African cattle population derives from three major introductions from Asia (Epstein, 1957; Faulkner and Epstein, 1957; Williamson and Payne, 1977; Oliver, 1983). The first cattle introduced into Africa, the humpless Hamitic longhorn (*Bos taurus longifrons*), arrived about 5000 BC. They were followed by the humpless shorthorn (*Bos taurus brachyceros*) about 2500 years later and the humped zebu (*Bos indicus*) in about 1500 B C. Most cattle followed the Nile Valley through Egypt or came through the Horn of Africa (Figure 1). Further migrations resulted in a heavy concentration of cattle in the highlands of

Ethiopia and Kenya, regarded today as one of the original sites of Africa's indigenous cattle. Interbreeding among these three types resulted in the Sanga, a so-called intermediate type because of the length of its horns and the location of its hump (Mason and Maule, 1960). The name Sanga was originally applied to the giant-horned Galla cattle: in the Oromo (formerly Galla) language of Ethiopia, Sanga means ox.

Possible migration routes of domestic cattle in Africa kj



Epstein 1957 et al, Williamson 1977 et al

2.3. Domestic breed in tropics:-

The great majority, but not all, of the indigenous tropical breeds of domestic oxen are zebu of one variety or another, that is, they are humped. It appears that the earliest ancestors of modern cattle were those domesticated in central Asia about 8000 B.C, and that a now extinct variety of Bovidae, which at about the same period in the history is known to have existed in India, also may have contributed. There is evidence that the cattle domesticated in south Turkmenistan were long-horn, and the variety of smaller, short-horned cattle of the *B.nomadicus* type was derived from them (Ewart, 1925). Domestic cattle had reached Babylon by 5,000 B.C and Egypt before 4,000 B.C.

There is evidence that in India, certainly from 3,000 B.C. There were two types of cattle; large, long-horned, humped variety and a smaller, short-horned type. There is nothing to indicate how the wild, humpless developed into the domesticated humped one; all we know is that the zebu carries traits of three varieties of the genus *Bos*, that it was developed in the Indus valley, was specialized in the Indian sub-continent and spread through southern Asia.

Oliver (1938) describes the characters of what he considered to be five basic types of the Indian zebu, the distribution of each being associated with human migration into and across the continent. The earliest appears to be the small, black, red and dun cattle found in many hilly tracts and forest areas

throughout india and which resemble the original *B.brachyceros* ,except that they are humped .the gir type ,which are domiciled in western india , are characterized by a prominent, convex broad forehead , but have the long head of the typical zebu with comparatively thick horns emerging from the side of the poll and run up and backwards .the large grey white type of cattle have what are now considered to be the typical zebu characteristic .there are two varieties ,the large ,broad-faced ,lyre –horned oxen ,reared along the aravalli hill range to the west ,and of which the kankrej breed is the outstanding example ,and the narrow –faced, short-horned type which are found through northern and central india and as far south as madras,of which the haryana and ongole are examples .the fifth type is expressed by abreed in the north-east Punjab known as the dhanni.

In south-east asia many of the cattle are humped but they are not entirely of zebu type, though it is possible that they have a common ancestry with the zebu cattle of india .burmese cattle for example ,do not possess a prominent dewlap ,sheath, drooping ears and other skin appendages ; while the kedah siam breed of Malaya is somewhat similar ,though it has drooping ears . in addition to the humped cattle there are numbers of wild or semi-wild cattle of other genera .the most important are gaur ,the gayal and the banteng . it is of some interest to note that anew genus ,known as the kouprey (*novibos* spp.)Has recently been discovered in the forests of Cambodia (Coolidge, 1955).

2.4.Part of measurement using the bellow

characteristic:-

2.4.1. Top line:-

The top line is the total length of the animal from front of pool to back of rump the top line is taken for two measurements, neck length and body length .these two measurements make up the total top line length.

2.4.1.a.Neck length :-

Actual neck length minus $\frac{1}{2}$ the body length .neck should be equal to half the body or half of $\frac{2}{3}$ top line .the neck should be $\frac{1}{3}$ the total length a well balanced cow will have a neck half the length of her body. Ideal range is $+.5,-.5$ inches .if the neck is too long the cow will very dairy and higher maintenance .easy to stress .her daughters will have long necks .long neck tend to over produce milk, making the maintenance high and she will be a slower breeder .if the neck is too short the cow will be wider in the shoulder (coarse) and milk production suffers .and a loss of femininity .or masculine features; long necks in the female are not symbolic of femininity .

2.4.1.b.Body length(2/3 top line):-

The 2/3 top line is composed of the rump length and the back neck length. Distance from the middle dip in vertebrate between the shoulder blades to back of rump .if the back is to long it affect the neck length and animal is out of balance . longe backs tend to be weak and will sway . most long backs have to small loin muscle .long back cause an irregular shaped loin muscle .the animal will break behind the top of shoulder to loin muscle .there will be a dip from rip cage to shoulder blade these breaks or dips are a structural defect and should not be tolerated.

(bovineengineering.comGeard fry).

2.4.2. Heart girth:-

The total distance around of the animals heart girth. The heart girth should be equal to the total top line or larger at 12 months of age. The large girth is needed for proper size for vital organs (heart, lungs, glands). The closer the heart girth is to the top line, the more efficient, adaptable and vigorous the animal is. If heart girth is larger than top line it is a plus. Insufficient heart is a high indicator of structural defects, allows front feet to toe out, hooked toe, more susceptible to stress and is a high maintenance animal. They do not perform well on grass. Reproduction suffers. Small heart girth is a structural defect and should not be tolerated.

2.4.3. Stature:-

It's the height of animal from ground to withers, or length of animal in front legs in hoof up to the wither.

(www.bovineengineering.com/linear)

2.5. Relation of measurement to weights of cattle:-

Inches ,was used to take the heart girth ,patella or round ,and body length measurements .the heart girth measurement was obtained by placing the tape around the animal at the point of smallest circumference just behind the forelegs ,it was pulled snugly about the animal ,tight enough to keep the hair down but not tight enough to indent the flesh .the hight at withers was determined with a metal caliper graduated in inches .the patella or round measurement was taken with the cloth tape ,measuring from the anterior external point of one patella ,the first fixed point ,posteriorly and horizontally about the muscles of the round to a corresponding point on the opposite patella ,the second fixed point .

All of these measurements were taken five times, the animal being moved between each measurement to a normal position .an average was taken as a representative figure .body length was measured using the cloth tape with the animal in a normal position .as the length from the pin bone to the prominence on the shoulder, located about one inch posterior to the point of shoulder .two

body length measurements were taken and averaged to obtain representative figure.

In addition, in 1941 data were obtained on the heart girth measurements and weights of 27 Aberdeen Angus heifers and cows of the university herd ranging in age from two to twelve years.

2.6. The origin of domestic animals of Africa:-

This work is curiously old-fashioned one to be published in the latter third of 20th century it is old-fashioned in language (wither, brisket, gaskin hock, thurl hook bone, pinborne, and stop for anatomical terms).

The zebu cattle is then discussed historically and morphologically; considering the great success of descendant of zebus in Africa, one would expect some introductory discussion of physiological adaptations to heat, but we find a short summary on this topic toward the end of the section on cattle. (In most section, physiology receives little or no attention) the anatomy of the humps of zebus and part-zebu cattle is described and figured in considerable detail, mixed cattle have the hump placed more interiorly and it tends also to be fatter and less muscular than the pure breed zebus. Epstein considers the hump of a zebu to be as much a result of artificial selection as is the fat-tailed sheep.

Epstein then treats in detail all of the known African breeds of cattle, present and past (the past being mostly Egyptian, as recorded pictorially under four phenotypes; humpless long horns, humpless short horns ,zebu, and Sanga .

These last are a crosses between zebus and non –humped cattle .the situation is complicated by the fact that two major introductions of zebu stock have occurred in the history of Africa ,once by or before 2000 B.c and again after A.O.670,following the invasion of Africa by Arabs .possibly in both instances ,but certainly in the later immigrations ,marked when relatively pure-breed zebu by the thoracic a position of the hump (as contrasted with a cervicothoracic position on a sanga),have spread widely across the central part of Africa south of the Sahara ,humpless cattle are now mostly limited to west Africa ,Egypt ,and the areas north of the Sahara , most of Africa’s famous large-horned cattle are sanga stock . Epstin 1979.

2.7. History of Cattle in Sudan:-

In the early 1990s, drought caused a dramatic decline in livestock raising in Sudan, following a period in the early 1980s when livestock provided all or a large part of the livelihood of more than 40 percent of the country's population. Livestock raising was overwhelmingly in the traditional sector, and, although initial steps had been taken to improve productivity and develop market orientation, for the modern monetized economy the sector represented largely a

potential asset. In 1983 Sudan's more than 50 million animals comprised the second largest national herd in Africa, next in size to that of Ethiopia. An FAO estimate in 1987 indicated that there were about 20.5 million cattle, 19 million sheep, 14 million goats, and 3 million camels. Other animals included 660,000 donkeys, 21,000 horses, a small number of pigs (kept by such non-Muslim peoples as the Nuba) and 32,000 chickens. By 1991 these numbers had been reduced by perhaps one-third by the drought of 1990-91; the August 1988 floods in the south, described as the worst in Sudan's history; and the ravages of civil war in the south. Poultry was raised mainly by farm families and villagers. A small modern sector consisted of limited government commercial operations and a few semi commercial private ventures.

Sudanese cattle are of two principal varieties: Baqqara and Nilotic. The Baqqara and two subvarieties constituted about 80 percent of the country's total number of cattle. This breed was found chiefly in the western savanna regions and in fewer, although significant, numbers farther to the east from Aali an Nil to Kassala in Ash Sharqi. The Nilotic, constituting approximately 20 percent of all cattle, were common in the eastern hill and plains areas of south-eastern Al Istiwai, which were free of the tsetse fly, and in those parts of the Bahr al Ghazal and Aali an Nil lying outside the tsetse-fly zone. Because of periodic rinderpest epidemics, the total number of cattle was relatively small until about 1930, when it stood at an estimated 2 million. A vaccination program begun

about that time and mass inoculations during the succeeding decades resulted in a great increase in numbers, which by 1970 had reached about 12 million. In the vast areas used by pastoral herders (estimated to be 80 million to 100 million hectares), cattle husbandry was conducted in an economic, cultural, and social context that had evolved over generations. This included an emphasis on increasing herd size as an investment for future family security. Small surpluses (usually bulls) were available for subsistence use, exchange, or sale for local consumption or export. Cattle were also used for marriage payments and among the Nilotes for rituals. Numbers of cattle also helped to establish or increase status and power in a social system in which cattle were the measure of wealth.

Most Nilotic cattle were kept by transhumant groups. Migrations, related to the wet and dry seasons, usually did not exceed 150 to 160 kilometers. The majority of the Baqqara strain of cattle belonged to the Baqqara Arabs. The latter were largely nomadic, but since at least the early 1900s had a settled base on which crop cultivation was practiced. The farmers, their relatives, or their agents moved the cattle over traditional migratory routes northward during the rainy season and southward to the area of the Bahr al Arab as the dry season progressed. Migrations in either direction might amount to 400 kilometers. The expansion of mechanized rainfed agriculture in the region used by the Baqqara, continued government efforts to enlarge the cultivated area, and pressures on the land from the growing population have gradually reduced grazing areas. At

the same time, traditional cultural forces have brought about a steady increase in cattle numbers. The result has been increasing overstocking and pasture depletion until the outbreak of civil war in 1983 and the devastating droughts of the 1980s and early 1990s decimated not only the Nilotic herds but livestock throughout Sudan. Many families and indeed whole ethnic groups who have traditionally survived on their cattle, sheep, goats, or camels, lost all of their herds and were forced to migrate to the Three Towns (Omdurman, Khartoum, and Khartoum North) in search of sustenance. (Sudanese .net)

(Sudanese .net)

2.8. Body measurements in Goat:-

Body measurements are used to describe animals and to predict body weights. Strong correlations were reported between different body measurements and body weight (Mukherjee, *et al.*, 1982 and Elimam and Ayderous, 2002). Information on body measurements of Sudanese goat breeds is relatively scarce. In Rashad area heart girth measurements (cm) for less than one year, one year, two years, three years and four years old Tagger goats were 54.2, 60.2, 63.1, 64.2 and 65.3. With regard to height at withers they were 51.6, 54.6, 55.8, 55.3 and 56.1, barrel circumference measurements were 65.3, 76.3, 72.3, 76.3 and 79.7cm. Back length measurements were 33.1, 36.4, 38.8, 39.2 and 40 cm, respectively. They were 12.7, 13.8, 13.8, 13.9 and 13.7 for ear length, 4.6, 5.8,

6.8, 6.7 and 7.7 for horn length and 9.1, 10, 9.1, 10.3 and 10 cm for tail length, respectively (Elbukhary, 1998).

Body measurements of different age groups of Nubian goats in Rahad area were estimated by Elimam *et al.* (2001) for age groups of less than one year, one year, two, three and four years. Heart girth (cm) was 49.5, 66.8, 71.2, 73.2 and 76.2, height at withers was 49.1, 64.7, 68.6, 76.7 and 76.4, respectively. Abdominal girth was 55.5, 76.3, 80.9, 82.6 and 89.8, and body length was 43.8, 56.4, 65.5, 64.6 and 70.3 cm, respectively.

Elimam and Ayderous (2002) studied body measurements for the same age groups in Shukaba area. Heart girth was 49.7, 60.9, 67.3, 72 and 77.1, height at withers was 53.3, 63.2, 65.1, 68.4 and 74.7, abdominal girth was 54.8, 69.6, 76.5, 81.7 and 85.9, and body length was 66.1, 84.4, 89.1, 95.4 and 102.7 cm respectively. In Kenana area, crossbred Nubian females were divided into one, two, three and four years age groups. Heart girth was 62.4, 64, 67 and 66.5, height at withers was 57.7, 58.9, 60.5 and 62.7, body length was 49.3, 50, 53.9 and 54.8, and ear length was 13.2, 15.5, 15.8 and 12.1 cm respectively (Khalifa, 2002). Nicolicin *et al.* (1959) reported that height at withers of the Carpathian goat was 62.3 cm (56–69).

Body weight predictions from body measurements avoid difficulties in possessing and operating weighing machines. Generally 50% of differences on birth and weaning weights were due to differences in body measurements (Mukherjee *et al.*, 1982). Regression equations utilizing body measurements

are used to predict body weight for Grey and Brown Bengal goats in India (Mukherjee *et al.*, 1982).

El Imam, M.E. and Ayderous, A. (2002). *et al*

2.9. Pastoralism;-

Generally has a mobile aspect, moving the herds in search of fresh pasture and water (in contrast to pastoral farming, in which non-nomadic farmers grow crops and improve pastures for their livestock).

Pastoralism is a successful strategy to support a population on less productive land ,and it adapts well to the environment .for example in savannas ,pastoralists and their animals gather when rain water is abundant and the pasture is rich ,then scatter during the drying of the savanna .

Pastoralists often use their herds to affect their environment .grazing herds on savannas can ensure the biodiversity of the savannas and prevent them from evolving into scrubland .pastoralists may also use fire to make ecosystem more suitable for their food animals .for instance ,the turkana people of northwest Kenya use fire to prevent the invasion of savanna by woody plant species ,biomass of the domesticated and wild animals was increased by a higher quality of grass.

(www.wikipedia.org/wiki)

2.10.Livestock in south Sudan:-

A livestock alert in south Sudan one year on from the outbreak of violence in south Sudan ,the country has developed into two Wolds ; the areas affected by conflict ,mostly in greater upper Nile ,and the areas less affected by it ,as of December 2014,greater equatoria and parts of greater bahar elghazal have shown good crop production ,robust market functioning ,and generally speaking minimal food insecurity .

The disruption of livestock movement patterns has taken place on two levels.

First, there has been large-scale and long distance displacement of livestock from the conflict .affected states into agricultural zones outside their traditional pastoral domains. Millions of heads of cattle have moved into greater equatoria ,greater bahar ghazal , and the north eastern tip of upper Nile state in the last 12 months.(FAO. 2014)

(FAO 2014)

2.10.1. Migrations of livestock in south Sudan:-

Normal livestock migrations in south Sudan adhere to seasonal patterns .during the rainy season, herds find pasture on high ground and then as the dry season arrives, they slowly follow the receding waters back to the toic, low grazing areas near water courses.

Driving large numbers of cattle across the country, and sometimes across international borders .requires herders to navigate through complex patchwork of tribal territories populated by both farming communities and other pastoralist.

(FAO 2014)

2.10.2. Charecterization of south Sudan zebu cattle:-

2.10.2.a. Nilotic cattle for example Murle cattle:-

Fairly long bodies with moderate depth; variability in coat colour (red, black, white, grey, dun and patterns of red and black); horns are of medium length and have a tendency to grow inwards and forwards at the tips; dewlap is of moderate size, the umbilical fold is poorly developed and the prepuce is seldom pendulous.

Epstein (1971) et, al

2.10.2. b –Reproductive characteristic:-

Age at first calving ranged int 26 month to 33 month ,while calving interval ranged from 12month to 16 month .

In equatorial state the animals are weaning the calve the cow it will be refuse to be mounting until after weaning its calve , the duration of weaning took around

6-8 month ,most animal are aggressive like wild animals ,that is the one obstacles in milking .

2.10.2.c. milk production :-

The production of milk is very low ranged from 3 lb -5 lb , that amount its different from season to another .the reduction of milk cause from the distance for grazing is very far and others reasons for this include the low genetic potential of indigenous breeds, poor husbandry and a variety of environmental factors, including high ambient temperature and humidity, seasonal shortages of feed and water, diseases and parasites e.g. tsetse fly.

(ilri)

Chapter three

3. Materials and methods:-

3.1- Experimental site:

The study was conducted in south Sudan in upper Nile state makal county payam wau shuluk . and centre equatorial state juba county payam rajaf during November and December in temperature vary between 21.6-34.3 Celsius in November 20.3-35.8 Celsius in December.

South Sudan has an equatorial climate, with high humidity and plenty of rainfall. The rainy season varies from region to region but generally falls between April and November. January and February are marked by their stifling heat and empty skies.

The climate of South Sudan varies but it is mainly tropical. Juba, the capital and largest city in South Sudan, has average yearly high temperature of 94.1°F (34.5°C) and an average yearly low temperature of 70.9°F (21.6°C). The most rainfall in South Sudan is between the months of April and October and the average yearly total for rainfall is 37.54 inches (953.7 mm).

3.1.a.Wau shuluk;-

Is one of the payam of makal county in upper Nile state in south Sudan, the distant from malakal town was almost about thirty kilometer from malakal town it's began a safety place for citizen displaced from malakal city and pinyikang county when crisis war raise up in December2013 in south Sudan, the livestock were found there was from part of makal county and pinyikang .the animal was randomly selected is 18 animal.

3.1. b.Rajaf payam :-

Is the one of centre equatorial state in south Sudan, it's was far from juba city about forty kilometer form juba capital, the animal were founded it was comes from different places joint in one place call dugdug ,the number of animal in one dugdug vary between 2500 -3000 head of animal, the number of animal were selected its 18 animals random selection .

3.2. Experimental animals:-

The animal was selected randomly about 36 animals' 29 females and 7 males, the measurement was measured in November and December spent one month, using promotional plastic tape measure for chest circumference, top line, and steel tape measure for measuring stature.

3.3. Body measuring:-

A measuring tape in centimetres was used to determine linear measurement for Live animal measurements were taken according to Brown et al.(1973) and Boggs and Merkel (1984). Each animal was restricted to make sure that it was standing up right on its four hooves with its head on the normal position .the surface under the animal was hard and leveled .measuring tape (cm) was used for all measure with exception of height at wither (stature) using steel tape .the external body measurement selected for this study were :-

- 1- **Stature (height at wither):-** from the levelled ground to the highest point of wither.
- 2- **Chest circumference (heart girth):-** measured around the chest
- 3- **Tope line:-**the total length of the animal starts from the end of tail to the head.
- 4- **Body length:-** from the shoulder point to pin bone.
- 5- **Hump:-** measured the length of hump using plastic tape.
- 6- **Horn: -** measured the length using plastic tape.

3.4. Data collection:-

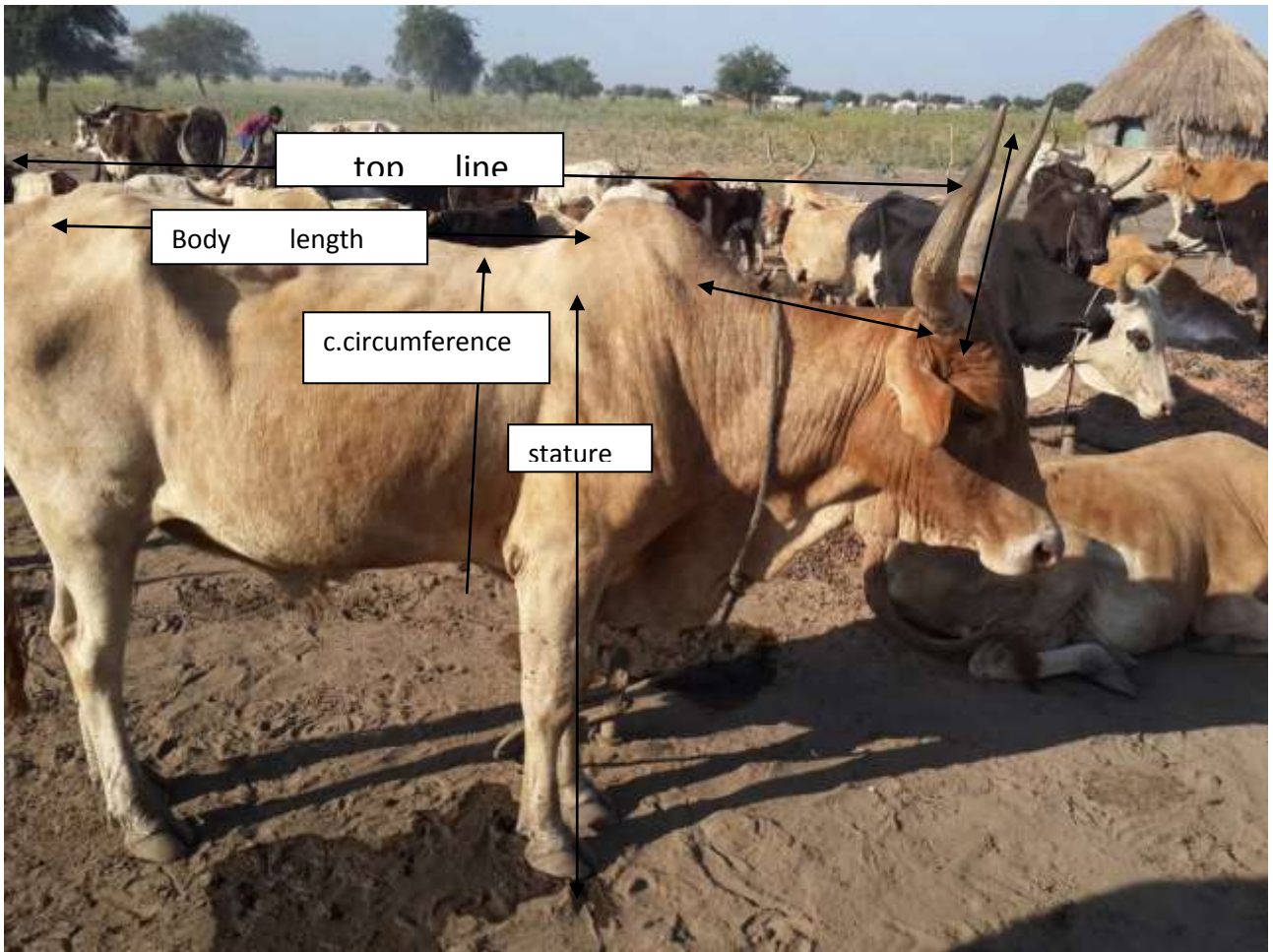
Data collection for 36 animal Nilotics cows were used for this study .data were collected for (stature, chest circumference, top line and body length) measure were taken in centimeter (cm). Using promotional plastic tape measure for chest circumference, top line, and steel tape measure for measuring stature.

3.5. Equepment tools:-

1-Steel tape.

2- Plastic tape.







(fao2014)

Chapter four

4. Result:

Statistical analysis

Data were examined using ANOVA Analysis System to give means, standard deviation, and standard error of means.

Results

Live animal measurements

Tables shows overall external body measurements of Nilotic cattle :

Table 1. Live animal measurements of Nilotic cattle 3years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	7	117.86	3.89	1.47	113-124
Chest circumference, (cm)	„	156.43	4.82	1.82	146-161
Top line(cm)	„	157.86	14.26	5.39	134-182
Body length(cm)	„	112.57	12.97	4.9	99-139
Hump (cm)	„	36.85	5.45	2.06	31-45
Horn (cm)	„	30.42	9.36	3.53	15-42

Curve (1) indicates the relationship for animal aged 3years for means, standard deviation, standard error of means:

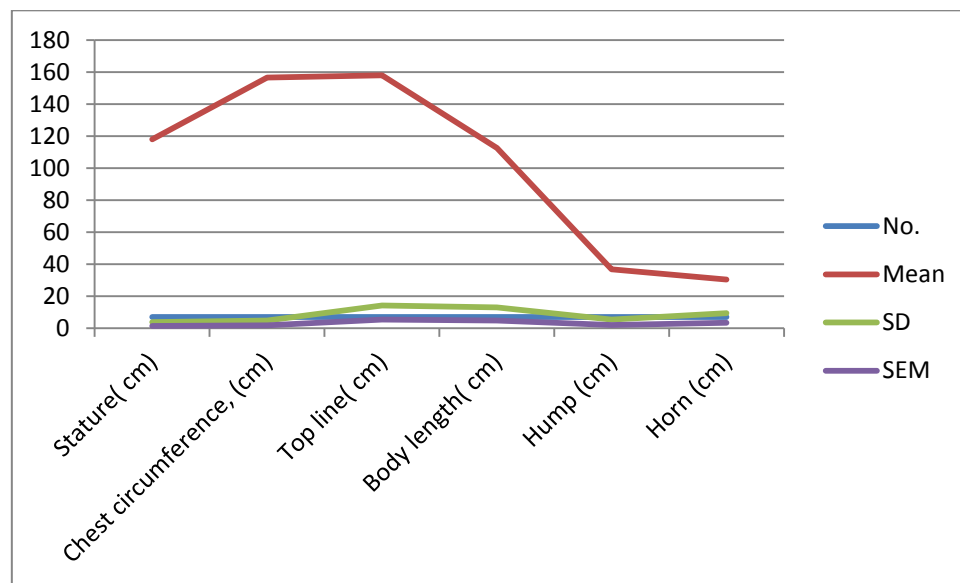


Table 2. Live animal measurements of Nilotic cattle 4 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	9	119.89	8.22	2.74	102-129
Chest circumference, (cm)	„	163.56	9.96	3.32	155-189
Top line(cm)	„	154.11	14.58	4.86	136-175
Body length(cm)	„	111.44	9.63	3.21	103-128
Hump (cm)	„	36.11	8.53	2.84	24-50
Horn (cm)	„	35.22	21.87	7.29	00-82

Curve(2) indicate the relationship for animal aged 4 years for means ,SD and

SEM:

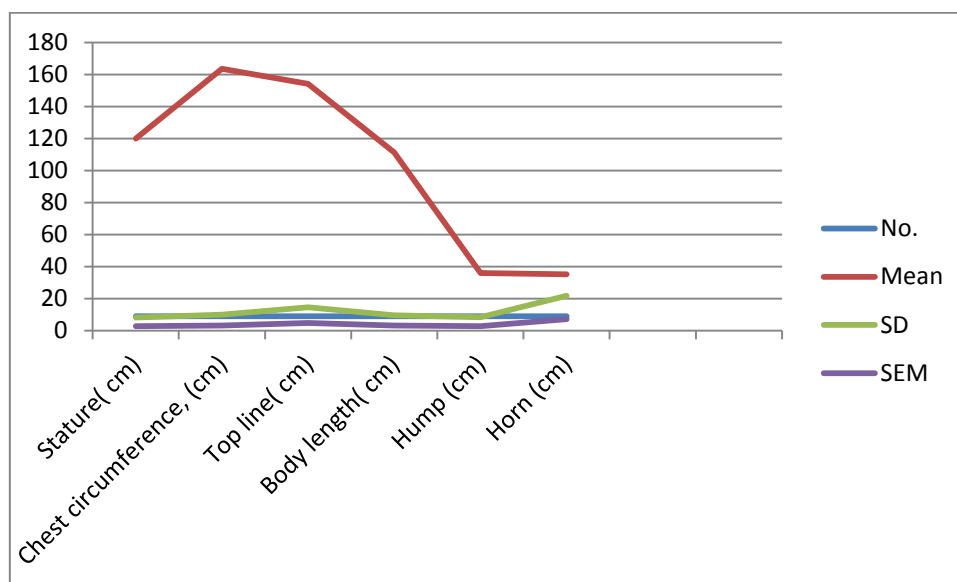


Table 3. Live animal measurements of nilotic cattle 5 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	4	121.25	7.18	3.59	112-129
Chest circumference, (cm)	..	170.25	12.12	6.06	162-188
Top line(cm)	..	171.50	4.04	2.02	166-175
Body length(cm)	..	120.50	3.87	1.93	117-126
Hump (cm)	..	43.75	7.88	3.94	35-53
Horn (cm)	..	37.75	5.73	2.86	31-45

Curve(3) indicate the relationship for animal aged 5 years for means ,SD and SEM ;

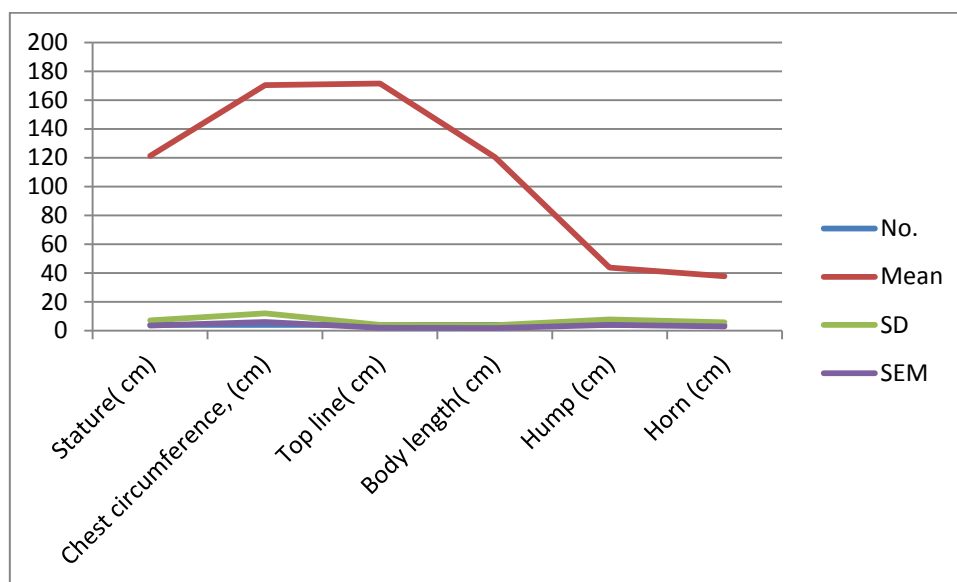


Table 4. Live animal measurements of Nilotic cattle 7 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	10	120.90	8.51	2.69	107-137
Chest circumference, (cm)	„	176.20	14.39	4.55	158-195
Top line(cm)	„	176.20	9.81	3.10	156-186
Body length(cm)	„	123.00	8.86	2.80	104-133
Hump (cm)	„	42.70	5.96	1.88	33-52
Horn (cm)	„	37.70	17.21	5.44	00-67

Curve (4) animal aged 7years

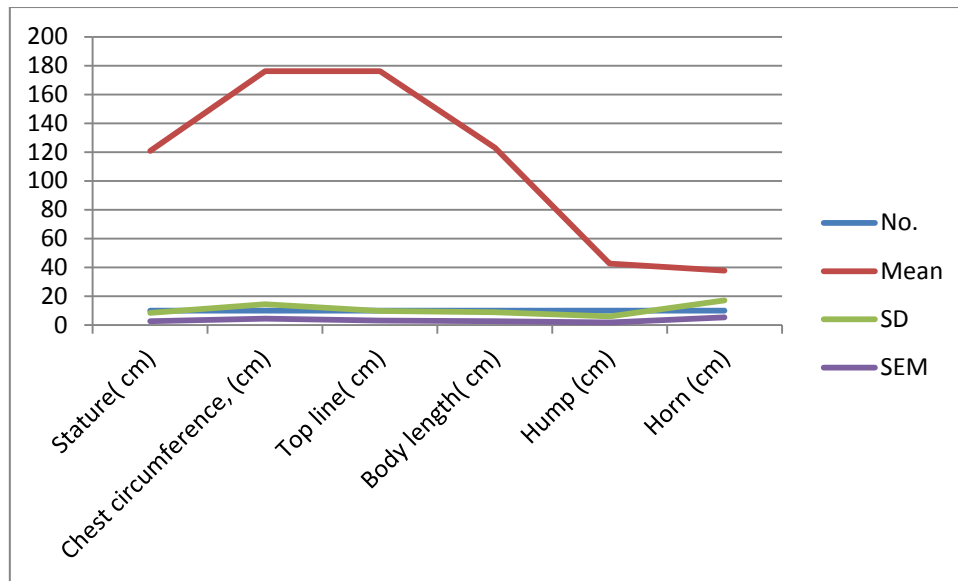


Table 5. Live animal measurements of nilotic cattle 9 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	4	129.25	5.12	2.56	124-135
Chest circumference, (cm)	„	181.50	20.14	10.07	159-199
Top line(cm)	„	186	15.31	7.65	166-198
Body length(cm)	„	130.75	11.61	5.80	115-140
Hump (cm)	„	31.00	21.33	10.66	00-48
Horn (cm)	„	42.75	3.86	1.93	39-48

Curve for table (5) animal aged 9years

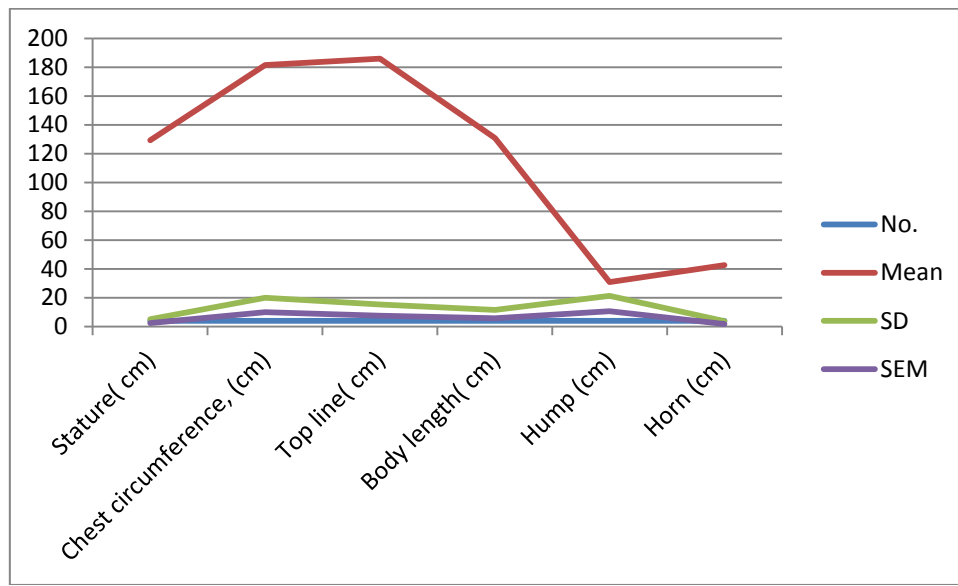


Table. 6 Live animal measurements of nilotic cattle 11 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	1	132	.	.	132-132
Chest circumference, (cm)	„	195	.	.	195-195
Top line(cm)	„	178	.	.	178-178
Body length(cm)	„	120	.	.	120-120
Hump (cm)	„	39	.	.	39-39
Horn (cm)	„	34	.	.	34

Table 7. Live animal measurements of nilotic cattle 14 years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	1	125	.	.	125-125
Chest circumference, (cm)	„	193	.	.	193-193
Top line(cm)	„	186	.	.	186-186
Body length(cm)	„	127	.	.	127-127
Hump (cm)	„	45	.	.	45-45
Horn (cm)	„	46	.	.	46-46

Table 8. Live animal measurements of Nilotic Males

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	7	127.57	7.13	2.69	115-137
Chest circumference, (cm)	„	180.86	19.29	7.29	146-198
Top line(cm)	„	174.86	16.32	6.16	153-198
Body length(cm)	„	123.71	13.82	5.22	102-139
Hump (cm)	„	42.85	7.66	2.89	34-53
Horn (cm)	„	35.57	16.59	6.27	00-48

Curve(8) for measurement of Nilotic male.

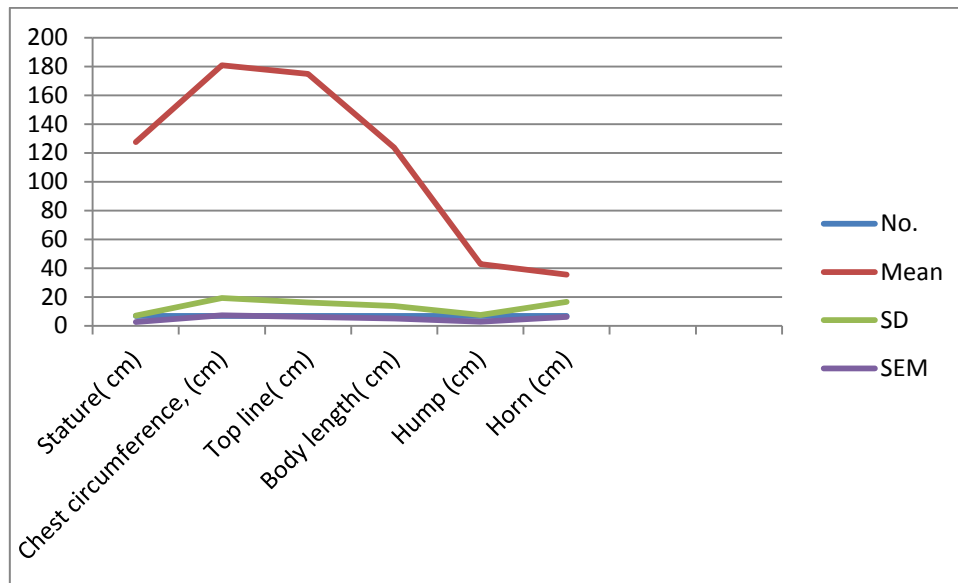


Table 9. Live animal measurements of Total Nilotic females

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	29	119.97	6.99	1.29	102-135
Chest circumference, (cm)	„	167.52	13.29	2.46	155-199
Top line(cm)	„	166.34	16.29	3.02	134-198
Body length(cm)	„	117.48	10.57	1.96	99-140
Hump (cm)	„	37.68	9.91	1.84	00-52
Horn (cm)	„	36.55	14.70	2.73	00-82

Curve (9) indicate the average of female measurement for 29 Nilotic cow .

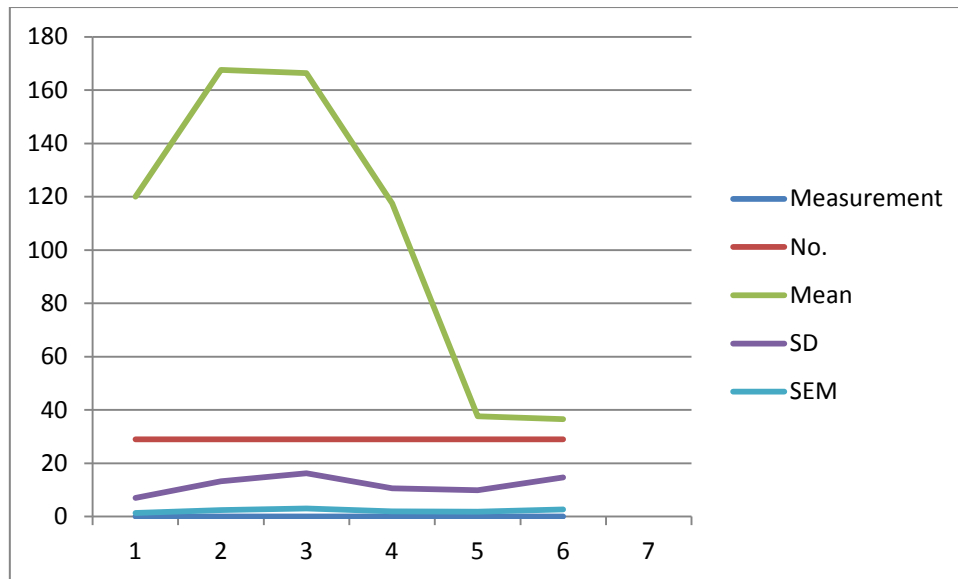
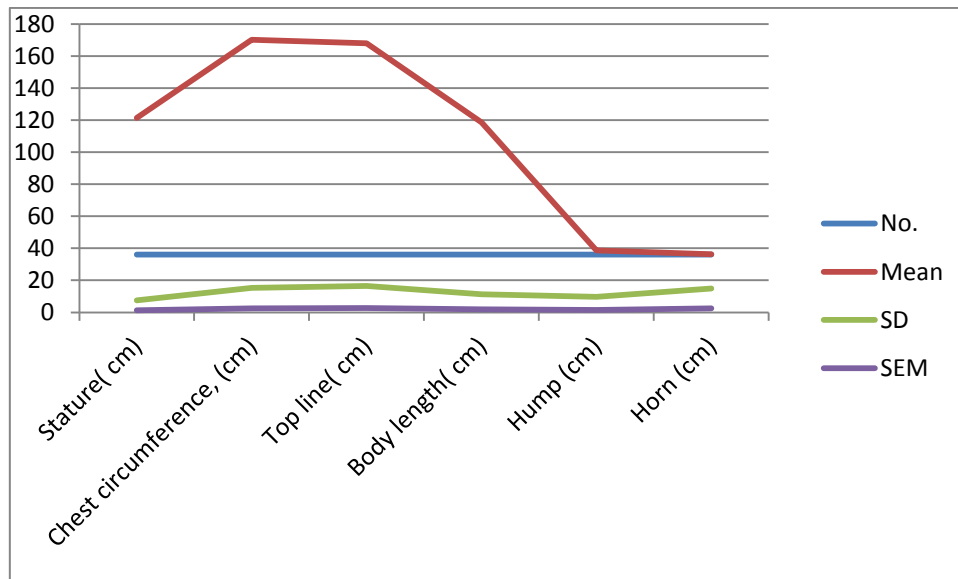


Table 10. Live animal measurements of Total Nilotic cattle years

Measurement	No.	Mean	SD	SEM	Range
Stature(cm)	36	121.44	7.56	1.26	102-137
Chest circumference, (cm)	„	170.11	15.29	2.54	146-199
Top line(cm)	„	168.00	16.42	2.73	134-198
Body length(cm)	„	118.69	11.33	1.88	99-140
Hump (cm)	„	38.69	9.64	1.60	00-53
Horn (cm)	„	36.36	14.84	2.47	00-82

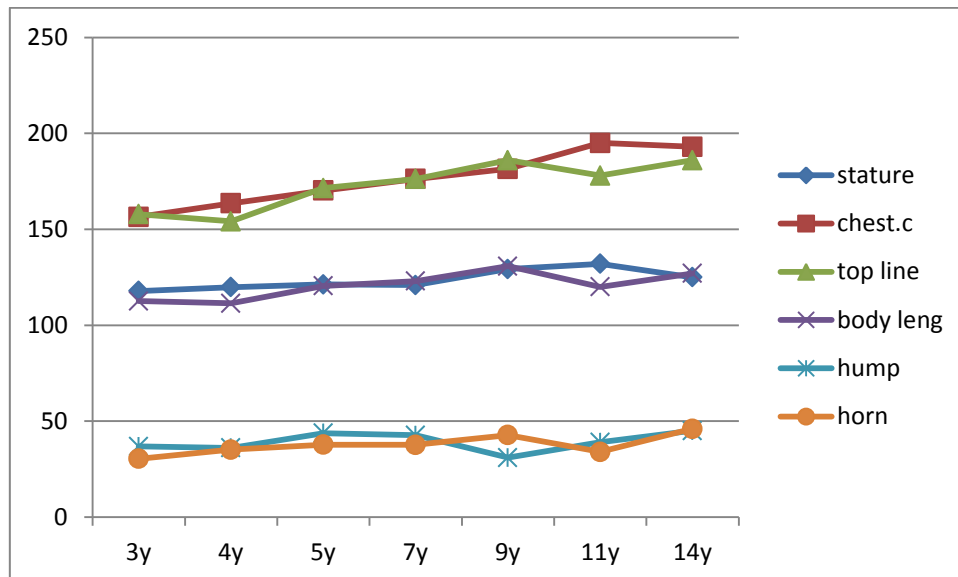
Curve indicate the relation of means, standard deviation and standard error of means for total of Nilotic external measurement. Curve no (10)



Total of measurement in different ages for stature, chest circumference, top line, body length, hump and horn table (11)

age	top		body			
	stature	chest.c	line	leng	hump	Horn
3y	117.86	156.43	157.86	112.57	36.85	30.42
4y	119.89	163.56	154.11	111.44	36.11	35.22
5y	121.25	170.25	171.5	120.5	43.75	37.75
7y	120.9	176.2	176.2	123	42.7	37.7
9y	129.25	181.5	186	130.75	31	42.75
11y	132	195	178	120	39	34
14y	125	193	186	127	45	46

Curve (11) indicate the averages of stature, chest .c, top line, body length, hump and the horn.



Chapter five

5. Discussion :

The measurement of various parts (point)of the bodies in animals .an animal's exterior and constitution are evaluated to estimate its live weight and monitor the growth and development of the young .

six basic categories of measurement are taken ;stature ,chest circumference (heart girth),top line ,body length , hump and horn are indicate the proportion of the Nilotic cattle measurement and i found the figures above mentioned in the result .

The measurement has been done are measured before animal grazing in the areas are nominating ,with special measuring (steel tape) for length of stature ,and the(plastic tape)for chest circumference ,top line hump and horn.

The data obtained by these systematic measurements, worked out using anova analysis method, permit comparisons to made among the members of a group of animals of same or different ages in different regions under different grazing.

The result were found of means is 121.44, 170.11, 168, 118.69, 38.69, and 36.36 respectively.

Standard deviation is 7.56, 15.29, 16.42, 11.33, 9.64, and 14.84 respectively

Standard error of mean is 1.26, 2.54, 2.73, 1.88, 1.6 and 2.47 respectively

6. Conclusion:-

Although all the linear measurements discussed above gives an average of the nilotics cattle external body measurement to be put in study and developed to more studies. Weight and body measurement it's important for animal nutrition and growth. the animal behaviour in nilotic cattle its semi wild because of the movement of animal in the forest and their contact of wild animal .

7. Recommendation:-

- When possible, choose measurements that are little affected by the animal's posture.
- Standardize the position of all animals that are to be compared.
- When you measure horn be careful for the animal or select the quite animals or better to measure after slaughter.
- Nilotic cattle it's an aggressive animals it can fight any kind so be careful.
- Be patient and wait for an animal to stand correctly.

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Pictures of Nilotic animal in south Sudan





Nyijak (red ,white colour in shuluk language)



Dung(Manure)drying for burning at night against flies



Nguk (brown) colour in dinka language



Yar (white)colour in dinka language





Part of animal in wau shuluk payam



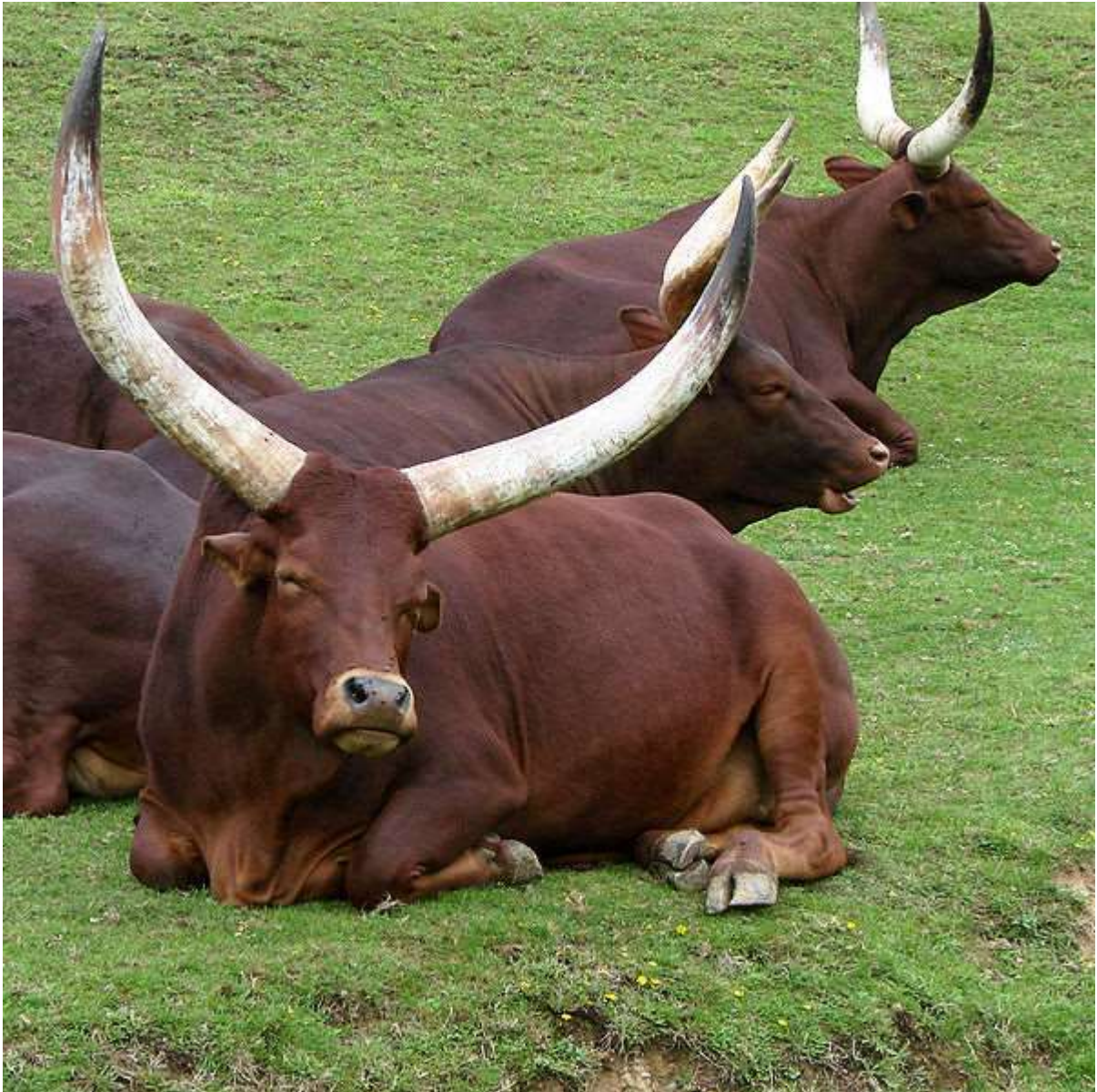




Dudug its agroup of animal in an area about 2500-3000 head of cattle in one place .







Original zebu cattle asia