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Full Length Research Paper

Phenotypic characterization and production system of Bonga cattle in Its production environment of Kaffa Zone, Southwest Ethiopia

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The study was conducted at Southern Nation Nationalities and Peoples Regional state, Kaffa administrative Zone of Chena and Gesha woredas on phenotypic characterization and its production system of Bonga cattle. Discussions with key informants, field study on morphological characteristics, survey with structured questionnaires, linear body measurements and secondary data were sources of data. Totally 138 households were selected to interview by using structured questionnaires and Morphological measurements were collected from 372 female and 76 male totally 448 mature cattle used randomly. The production system in the study area was mixed crop-livestock production system. Bonga bull reach for drought power was at the age of 3.53 ± 0.66 year. Analyzed data showed that the average age at first mating for male was 3.55 ± 0.07 and for female 3.94 ± 0.09. The overall mean age at first calving (AFC) of Bonga breeding female was 4.96 ± 0.09 years. The average reproductive lifespan of Bonga breeding male and female was 4.51± 0.16 and 16.05 ± 0.42 years respectively. Large body size was the first ranked trait for both male and female to select breeding male and female. The overall mean and standard error of linear measurements of the breed in cm was 111.25 ± 0.44, 101.24 ± 0.29, 136.09 ± 0.51, 16.54 ± 0.09, 21.66 ± 0.33, 38.31 ±v0.12 and 28.93 ± 0.12 for Body length, Height at wither, Chest girth, Ear length, Horn length, Muzzle circumference and Hock circumference respectively.

Key words: Phenotypic, characterization, Bonga cattle, breed, description, measurement and Kaffa.

INTRODUCTION

In Ethiopia, there are 32 recognized indigenous cattle breeds. New breeds are incorporating in to database in recent years. Five cattle breeds currently recorded for SNNPR (Southern Nation Nationality People Region) are Gofa, Gurage, Hammer, Mursi and Sheko (DAGRIS, 2007).

Among livestock species, cattle have significant contributions to the livelihood of the farmers. They serve as a source of draught power for the rural farming population, supply farm families with milk, meat, manure, serve as source of cash income and play significant role in the social and cultural values of the society. Cattle contribute nearly all the draught power for agricultural production at smallholder level in Ethiopia (Melaku, 2011). Cattle are also used to generate critical cash in times of scarcity, provide collateral for local informal credit and serve other socio-cultural functions in Ethiopia (Ulfina et al, 2005). Some uses for cattle breeds are: Gurage for draft power and milk production even in the tsetse infested area and Horro for milk and meat production and for draft power purposes (Rege and Tawah, 1999). Sheko for meat and work even endangered by interbred with Zebu cattle and Abigar for milk and meat and different types of work (DAGRIS, 2007).

However, there is little attention given for well-developed decision making and policy intervention on exploratory and especially for advanced cattle characterization approach. Domesticated livestock is as source of food. Its increasing demand requires the conservation of diversity among indigenous livestock genetic reserves that are capable to readily respond various environments for next human generations and handle unpredictable future.

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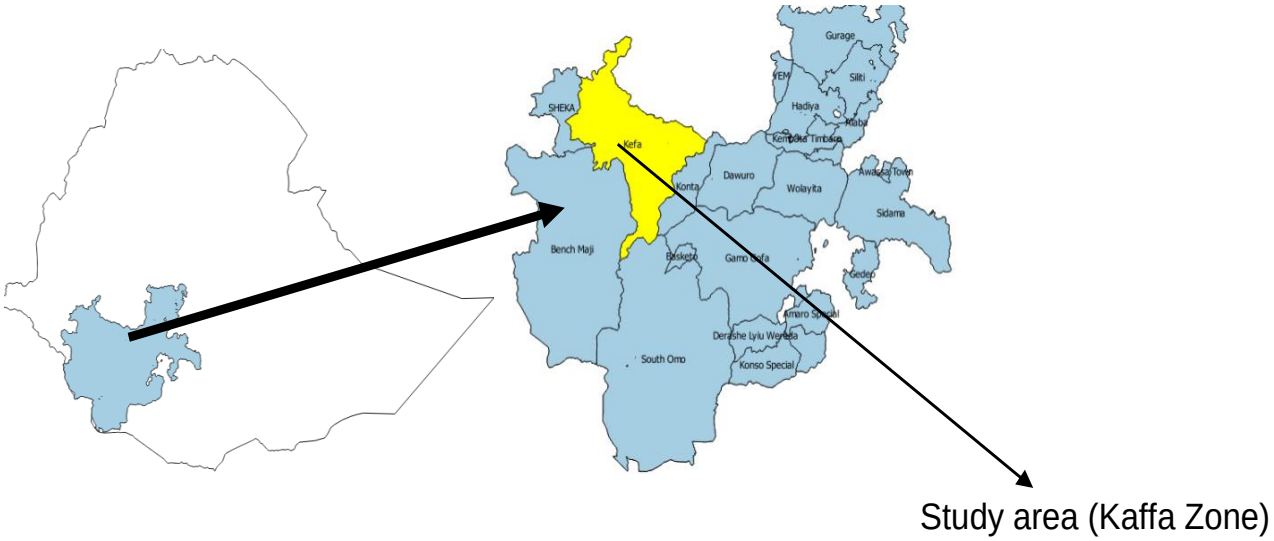

A, Ethiopia, B. SNNPR (South Nation Nationalities and Peoples Region)

Figure 1. Map of study area.

Maintaining genetic diversity is an insurance against future adverse conditions (Dackson, 2008). Recently, loss of genetic diversity within indigenous livestock breeds has been a major concern. It is estimated that 35% of mammalian breeds are at risk of extinction, and that approximately two breeds of livestock lost each week (FAO, 2000).

Management and conservation of animal genetic resources require assessment of genetic diversity. Because it is difficult to design appropriate breeding programs for breeds that have not been adequately characterized either phenotypic/ or genetically. Exploratory or primary characterization approach is prior important confirmatory or advanced characterization approach in breed identification and classification in ways that farming communities can relate to (FAO, 2012).

Morphological descriptions have been used to evaluate breeding goals, to assess type and function and to estimate the animals' value as potential breeding stock (Mwacharo et al., 2006). In order to ensure proper conservation and utilization of indigenous breeds, it is necessary to evaluate phenotypic and genetic variation that exists within and among breeds. A large proportion of indigenous livestock populations in the developing countries have yet to be characterized or evaluated at phenotypic and genetic levels (Hanotte and Jianlin, 2005). Although Bonga cattle population plays a major role in the sustainability of livelihoods for its owners, there is no any published information concerning the characteristics of this breed. The lack of information on the physical and molecular characteristics hinders the development programs for improving the breed. As a result the studies was mainly focused on to find out basic information on the origin, population statistics, ecology, production system, utilization, physical and adaptive features, production characteristics, preferable traits and categorize the breed as conserved, endangered or extinct.

MATERIALS AND METHODS

Descriptive of study area

The study was conducted at Southern Nations Nationalities and Peoples Regional state, Kaffa administrative Zone of Chena and Gesha woreda. It is situated in the South Western part of Ethiopia (7º 34´N latitude and 37º 6´E Longitude). It is 467 km far from Addis Ababa to south west part of Ethiopia (Figure 1). The area has one major rainy season that extends from May to October and the dry season lasts from October to April (Edea, 2008). The annual precipitation of the region is about 2300mm with mean maximum and minimum temperatures of about 24ºC and 12ºC, respectively (Denboba, 2005).

Specifically description of Chena woreda was altitude range 1851 – 1900 masl (mean above sea level) and the area of forest coverage was 1447 hectare. Mean annual rain fall was 1190 mm and mean annual temperature was 21.5 ºC. Average land size of Chena woreda at household level was 1.8 hectare and main type of soil were clay, loam and sandy (CARDO, 2016).

Also description of Gesha woreda was altitude range 1900 – 2600 masl (mean above sea level) and average annual rain fall range was 1200 – 1700 mm and

(A) Bonga cow (B) Bonga Bull

Figure 2. Mature Bonga cattle.

maximum and minimum temperature was 23^0C and 18^0C respectively. Forest coverage of the area was 9347.435 ha and soil type is loam (GARDO, 2016).

Data collection and analysis

Before deciding on the survey areas, discussions were held with zonal experts of the rural and agricultural development office and staff members about the objectives of the study, to know the current production system and area dominated by pure Bonga cattle breed with in Kaffa zone. After selection of districts also further discussion was held with each woreda/districts rural and agricultural development office to select kebele or PAs. As a result, Abeta and Didifa kebele from Gesha woreda and Dahira, Agaro and Kulish kebele from Chena woreda were selected based on cattle production system, cattle population size, physical appearance of cattle and accessibility of the area to do it.

Totally 138 households were selected to interview by using structured questionnaires about socio - economic data, reproduction and production characteristic, feed and feeding system, traits preference, constraint for production, housing and husbandry practice.

Morphological measurements were collected from 372 female and 76 male totally 448 mature cattle used randomly. Such morphological data included age, sex, coat color and pattern, horn color, horn shape and orientation, muzzle color, eyelid and hoof color, ear shape and orientation, hair type and length, hump size, hump position and shape, tail length, rump profile, facial and backline profile, navel and perpetual sheath and also linear measurements was collected like body length, chest/heart girth, height at wither, horn length, ear length, muzzle circumference and hock circumference.

Index was calculated to provide ranking for trait preference and criteria to select breeding males and females. Index was calculated as Index = sum of (7x number of households ranked first + 6x number of households ranked second + 5x number of households ranked third +4x number of households ranked fourth + 3 x number of house hold ranked fifth +2 x number of house hold ranked sixth + 1x number of house hold ranked seventh) given for each variable source divided by sum of (7x number of households ranked first + 6x number of households ranked second + 5x number of households ranked third +4x number of households ranked fourth +3 x number of house hold ranked fifth + 2x number of house hold ranked sixth + 1x number of house hold ranked seventh) for all traits of trait preference.

RESULT AND DISCUSSION

Origin, distribution and production system of Bonga cattle

According to elder people of the study area Bonga cattle found at northern, western and northwest part of Kaffa zone was originated from around Horro Guduru of Wollega (Figure 2). Similarly cattle found at southern, southeast and southwest parts were originated from Bench especially Shey Bench district. In addition during focus group discussion in Gesha district of Didifa kebele elder cattle owners said that cattle originated at Bita district Guma site and those Abeta kebele elder people explained that based on their previous history their cattle

was originated at Gesha district of Ombocha site of Kaffa zone. Those ideas indicate that further study on the origin of Bonga cattle will be necessary. Based on respondents cattle found in Bench Maji, Sheka, Horro Guduru Wollega and Jimma zones were related breeds with Bonga cattle. It needs further study in DNA based characterization beyond phenotypic characterization. Native speakers of Kaffa zone calls their cattle as *mimo* and background of this name was unable to speak, knows anything, guided by human, reliable (dependable), use forever and honest for human.

The production system in the study area was mixed crop-livestock production system. According to survey result 48.9% respondents replied that their farming system was both crop and livestock production for a source of income and for food purpose equally but 41.1 and 9.9% respondents mainly depend on crop production and livestock production respectively. Topography of the study area was up and down and most parts were covered by protected forest which leads to limited land holding at house hold level which accounts on average 2.35 ± 0.15 ha. On average from the total land holding 1.63 ± 0.13 ha and 0.73 ± 0.05 ha was used for cultivation and grazing respectively. Types of grazing land in the area were open grass land, shrub covered, stone covered, swampy and tree covered grazing land. All individuals were using grazing by tethering of their cattle within private land that is shared by cultivation land because of there was no communal land except few parts of swampy area for extensive grazing. In swampy area snails are available which is intermediate host of Fashola that affect most cattle liver. In addition to grazing of pasture land crop by product and kitchen leftover are also source of feed in study area. During dry season there is shortage of feed in the study area and ways of overcoming the problem was using crop residue (like teff straw, barely straw, maize Stover, wheat straw), herding rather than tethering, grazing at swampy area and browsing different plants leaf and stem (like *Yudo, Mogn Abeba, Grawa, nopo, Mogecho, Yamesho and Yimbro*), grazing with in forest area, grazing around water side etc. permanent river and spring were major sources of water. Cattle have substantial contribution to the economy of their owners; both in terms of supporting crop production through drought power and manure and as source of food for their family either direct food source or source of income. In this area bull that reach for drought power was at the age of 3.53 ± 0.66 years and their average work life time was 7.87 ± 0.30 years. This result was slightly longer with Sheko oxen which was on average start draught work at 3.4 ± 0.81 year and has an average draught work life of 8.5 ± 2.67 years (Tatek and Abegaz, 2013). Bonga bull was castrated after the age of 4 years. The possible reasons were for the purpose of fattening, to make docile, to control mating, to use draft purpose effectively, to increase selling price and to increase feed intake.

Status of Bonga cattle in the study area

The total cattle population for the country is estimated to be about 56.71 million. From total cattle population 98.66% indigenous, 1.19% hybrid and 0.14% was cross breeds (CSA, 2014/15). Out of this total cattle population, the female cattle constitute about 55.45% and the remaining 44.55% are male cattle (CSA, 2014/15). More over cattle population of South Nation Nationalities and peoples Regional state are 11,215,636 whereas specifically for Kaffa Zone 931,307 cattle, 420,378 Sheep, 255,210 goats, 70,169 horses, 11,860 mules, 1,924 donkeys, 877,634 poultry, 166,080 beehives and 450 camels (CSA, 2014/2015). Whereas from 138 sampled livestock owners for interview there were 1,283 cattle, 385 Sheep, 169 goats, 473 poultry, 73 horses, 8 mules, 7 donkeys and no Camel. Based on survey result the average of livestock per household were 8.97 cattle, 2.48 goats, 3.81 sheep, 4.26 chicken, 0.87 donkeys, 1.46 horses and 1.14 mules. Only for participated individuals for interview herd structure was breeding female 448 (34.91%), replacement female 200 (15.58%), breeding male 189 (14.73%), male not used for breeding 114 (8.88%), steer 62 (4.83%), female calve 133 (10.36%) and male calve 128 (9.97%). The number of breeding female is relatively high in proportion whereas steer%age was small due to use as source of income by selling as beef. Given the estimated cattle population data in the study area, the population of Bonga breed is in increasing trend over time as noted from Kaffa elder cattle owners in all the study sites during interviewing and focus group discussions. The possible reasons reported for this trend were mainly using their cattle for drought power purpose, major source of income and are mode of saving system. At the current time the breed was conserved in good manner.

Reproduction performance

Different reproductive data was collected to identify reproductive performance and to compare with other indigenous cattle breeds. These data include age at first mating for male and female, age at first calving (AFC), calving interval (CI) and reproductive life span (RLS) for male, female and maximum calf crops (MCC). Analyzed data showed that the average age at first mating for male was 3.55 ± 0.07 and for female 3.94 ± 0.09. Similarly Mursi male cattle have almost similar average age at first

Table 1. Summary of reproduction performance of Bonga breed.

Character	Midland (Chena) Mean ± SE	Highland (Gesha) Mean ± SE	Overall mean ± SE
First mating for male (years)	3.61 ± 0.088	3.43 ±.130	3.55 ±0.073
First matting for female (years)	4.07 ±0.112	3.65 ± 0.155	3.94 ± 0.092
first calving (years)	5.08 ± 0.112	4.68 ±0.151	4.96 ± 0.091
Reproductive lifetime for male (years)	4.72 ± 0.19	4.05 ± 0.29	4.51± 0.16
Reproductive lifetime for female (years)	15.41 ±0.477	17.31 ± 0.790	16.05 ± 0.419
calving interval (years)	1.82 ±0.061	1.67 ±0.070	1.77 ± 0.047
Maximum calf number	9.11 ±0.265	10.02 ± 0.395	9.39 ± 0.222

matting which is 3.6 years but female Mursi cattle have shorter mean age at first breeding which is 3.4 years (Endashaw and Tadelle, 2015). However, the current finding is slightly longer than Sheko breeding female and male that is 3.5 years and 3.2 years respectively Takele (2005) and age at first service (AFS) of male Horro cattle was 3.47 ± 0.39 years and age at first mating (AFM) of female Horro cattle was 3.73±0.51years (Dereje, 2015). And also the result is slightly shorter than the mean reported age at sexual maturity for Horro male 3.88 years and Horro female 4.03 years (Mekonnen et al., 2012) and 3.96 years reported for male and 4.46 years reported for female Horro breed in Danno district (Jiregna, 2007). Differently Bonga breed have shorter age at first mating than the average age at sexual maturity of breeding male and female of Boran cattle which was 4.6 and 3.9 years for lowland and 4.2 and 3.7 years for mid-highland area respectively (Dejene, 2014).

The overall mean age at first calving (AFC) of Bonga breeding female was 4.96 ± 0.09 years. The study shows that Bonga breed have slightly similar age at first calving (AFC) with female Horro cattle which was 4.98±0.68 years (Dereje, 2015). Differently it indicates that Bonga breed have slightly longer AFC than mean age at first calving (AFC) for Horro breeding female which was 4.84years (Mekonnen et al., 2012), Sheko breed which was 4.5 years (Takele, 2005), Raya Senga cattle which was 4.42 years (Dereje, 2005) and Mursi cattle which was 4.6 years (Endashaw and Tadelle, 2015). This AFC difference may be due to poor heat detection of breeding female because they are tethering at private grazing land.

The overall mean calving interval of Bonga breed was 1.77 ± 0.05 years. This result was slightly in accordance with Horro breed reported by Mekonnen et al., (2012) which was 1.76 ± 0.3 years and the CI of Horro cow was estimated to be 1.88±0.49 years (Dereje,2015) but longer than mean calving interval of mursi cattle 1.2 years (Endashaw and Tadelle, 2015).

The average reproductive lifespan of Bonga breeding male and female was 4.51± 0.16 years and 16.05 ± 0.42 years. Bonga breed have longer breeding lifespan than Mean reproductive lifespan for Horro breeding male and female was 3.72±0.10 and 13.67±0.31 years (Mekonnen et al., 2012). The reproductive life time of the breeding male and female for Boran cattle was 9.86 and 11.5 years in the lowland, and 7.68 and 10.9 years in mid highland areas, respectively (Dejene, 2014) and cow reproductive lifespan for Mursi cattle was 14.2 years (Endashaw and Tadelle, 2015).

The average maximum calf crop of the breed was 9.39 ±0.22. The number of calf crop was higher than Horro breed which is 5.92 ±1.42 calves (Table 1) (Dereje, 2015).

Breeding system of Bonga cattle

Almost all respondents were applicable of natural matting system of pure breed. Up to 30.5% respondents use controlled natural matting by selecting preferred bulls from themselves or from neighbors. Some respondents use Artificial Insemination (AI) and/or AI with Estrous synchronization (ES). This result was in accordance with Ebadu (2016) that his survey from Kaffa and Bench Maji zones on efficiency and effectiveness of synchronization indicate that most of the time local breeds are bred by using natural system where as their cross breed use AI and AI with ES to get better productive calf. In the area unplanned breeding program was done which result year round calving season. Similarly for Horro breed over 92% of the respondents practiced natural, unplanned and uncontrolled mating system (Mekonnen et al., 2012). Major heat detection method for their tethered female cattle were discharge from vulva, bellowing, restlessness, tail swing, reduction of milk production, mounting on others, decrease feed intake and enlargement of vulva. Some respondents miss these heat detection methods that result long time at first calving and calving interval which leads the reduction of calf crop. This result is in agreement with Mekonen et.al (2012) for Horro cattle which were 92.7% respondents apply pure breeding system.

From most of important preferred traits criteria to select breeding bull was large body size and followed others which index calculation was 0.46 (Table 2).

In addition to the above motioned traits also libido, erect horn and long tail. Similarly criteria to select breeding female according to index ranking was large

Table 2. Index ranking of traits to select breeding bull.

Traits	Score			Index	Rank
	1st	2nd	3rd		
large body size	58	32	9	0.62	1
growth rate	9	1	2	0.08	4
red coat color	19	15	2	0.22	3
Temperament	2	6	0	0.04	5
long neck	1	0	0	0.007	7
Erect hump size	1	1	1	0.01	6
Sum	136	56	15	0.98	

Table 3. Index ranking of traits to select breeding female.

	Score				
Traits	**1st**	**2nd**	**3rd**	**Index**	**Rank**
large body size	34	18	4	0.24	1
milk production	28	6	3	0.17	2
Dairy conformation	10	12	1	0.09	6
udder and teat size	12	11	4	0.10	4
large navel	3	8	0	0.04	8
growth rate	5	2	0	0.03	9
mothering ability	5	6	0	0.05	7
breeding efficiency	27	1	1	0.14	3
Temperament	3	2	3	0.03	10
Others*	11	9	7	0.10	5
Sum	138	75	23		

* Like color, tail length, horn length…….

Table 4. Summary of Bonga cattle breed milk production.

Stage of production	Midland (Chena) Mean ± SE	Highland (Gesha) Mean ± SE	Overall Mean ± SE
Lactation length	8.4 ± 0.31 month	8.5 ± 0.54 month	8.4 ± 0.26 month
First stage	1.8 ± 0.07 L	2.3 ± 0.09 L	1.9 ± 0.06 L
Second stage	1 ± 0.06 L	1.3 ± 0.07 L	1.1± 0.04 L
Third stage	0.5 ± 0.05 L	0.8 ± 0.08 L	0.6 ± 0.05 L

body size followed by milk production, breeding efficiency, udder and teat size, dairy conformation, mothering ability, large navel, growth rate and temperament (Table 3).

Culling is applicable by farmers due to old age, reproductive failure, reduction of production performance, health problem, small in size, emerge horn at early age, cattle having thin leg, need for some cash for household use and need for slaughter.

Milk production performance

The average lactation period per cow at country level is estimated to be about six months, and average milk yield per cow per day is about 1.35 liters (CSA, 2014/15).The overall mean daily milk production for (first, second and third stage) and lactation length for Bonga breed were illustrated in the Table 4. The overall mean lactation length was 8.42 ± 0.27 month and daily milk production for three trimester were 1.98 ± 0.06 liter, 1.11 ± 0.04 liter and 0.63 ± 0.05 liter for first stage, second stage and third stage respectively. This study indicate that Bonga breed have short lactation length but higher daily milk yield than the overall mean reported daily milk yield and lactation length of Horro cattle which was 1.65 liters and 9.57months, respectively (Mekonnen et al., 2012) and also the overall daily milk yield for Bonga cattle is higher than the report from extensive livestock breed survey done in Oromia Regional State with overall average daily milk yield of 1.4 liters (Workneh and Rowlands, 2004). Similarly the current study was slightly higher than the

reported on-farm daily milk yield of 1.8 and 1.9 liters per day for Raya Sanga and Wello highland zebu cattle (Dereje, 2005). The reports show that the breed have lower daily milk yield than Sheko breed which was 2.35

Table 5. Index ranking value of trait preference.

Trait	Score							index	rank
	1st	2nd	3rd	4th	5th	6th	7th		
Breeding efficiency	39	35	20	16	2	1	0	0.21	2
Milk yield	42	51	29	4	0	0	0	0.25	1
Growth rate	6	14	28	26	5	0	0	0.12	5
Draught power	5	20	16	31	26	11	4	0.15	3
Adaptation of environment	24	4	20	18	24	9	3	0.15	4
Coat color	0	0	7	6	9	27	25	0.05	7
Fat yield	15	2	2	2	8	15	20	0.07	6
Sum	131	126	122	103	74	63	52		

liter per day (Tatek and Abegaz, 2013) and Average daily milk yield (2.1 litres) and lactation length (7.8 months) of Mursi cattle in the two locations were similar (Endashaw and Tadelle, 2015).

In the study area cattle are milked twice per day at the evening and early morning but also some respondents replied that they milked at the afternoon for 2 – 3 months of calving. Similarly cattle were mainly milked twice per day which is 94.7% and only 5.3% cattle are milked thrice per day for the first 2 - 3 weeks under a liter of milk in Kaffa and Bench Maji zones (Ebadu, 2016). Milk is used as house hold consumption but its products like butter and cheese were used as income source. The possible reason of high milk production may be frequency of milking time especially at first stage of milking and management for lactating cow. Especially for Gesha district according to result milk production was higher than Chena district, Horro cattle, Raya Sanga and Wello highland zebu cattle.

Trait preference for Bonga cattle in the study area

Cattle owners clearly ranked their preferred traits for their cattle. The most important traits were milk yield, breeding efficiency, draught power, and adaptation of the environment, growth rate, fat yield and coat color. Their respective index values were illustrated in Table 5.

Bonga cattle owners prefer red coat color for their cattle. The reason for their preference was related with market preference, attraction and not attacked by black flies. Similarly the main coat colors preferred by the Horro community were red, patchy red brown and light red (Mekonnen et al., 2012).

Husbandry practice

In the study area all family members have the responsibility for husbandry practice of cattle. Selling and purchasing of cattle were mainly held by husbands whereas milking was done by wives. Sanitation, herding, taking care for sick animal, provide supplementary feed and watering were done by all family members. Cattle are not housed day and night especially for Gesha district except for newly born calf and lactating cows. They keep their cattle in the garden by rotating on the cultivation land to use manure as source of fertilizer. Whereas major respondents share their house for their cattle in the case of Chena district and mention the purpose for the sake of protecting from adverse environmental condition, protecting from thieves and simple to handle.

Morphological description of Bonga cattle breed

Qualitative body description

Qualitative body description of Bonga cattle population show variable coat colour pattern and colour types among individual cattle (Figure 3). The most commonly observed coat colour patterns were plain (58.4%), patchy (21.1%) and spotted (20.4%) with different colour combinations and were similar in the two study locations and sex. The dominant plain coat color of Bonga breed was red, black, light red, fawn and grayish respectively. Patchy and spotted coat color pattern were white with red, black with white, black with red, white with fawn and /or their combination.

The variable coat colour probably helps the breed to adapt the very hostile environment through avoiding effects of radiation and heat stress (Olson et al., 2003) and some colours do not attract the tsetse fly, preventing it landing and this averts the fly biting the animal (Makokha et al., 2006).

Morphological characteristics of Bonga cattle breed include 50.8% pigmented body skin color and 48.8% has no pigmented (Table 6) and characterized by majorly shiny and smooth hair type which accounts 84% with 11.9% dull curl type. Similarly hair length of the breed was 94.8% long which is more than 2 mm length and 5.2% medium means 1 - 2 mm length. The possible reason for long hair type may be for the purpose of adapting the cold environment especially at night because they are living outside the house for day and night and rainy weather condition for more than eight month within a year.

Figure 3. Coat color pattern and coat color type of Bonga cattle.

Table 6. Morphological description of Bonga cattle.

Morphological description	Pigmented (%)	No pigment (%)
Body skin color	50.8	48.8
Muzzle color	36.2	63.6
Hoof color	36.4	63.4
Eyelid color	11.7	87.9

(a). downward (b) mixed (c) upward (d) forward

Figure 4. Horn orientation and shape of Bonga cattle.

Almost all of the cattle are horned and 79.8% were brown colored and 18.9% were black colored horn. Horn orientation of the breed was mainly forward type 53.7% followed by upward 34.2%, tip pointing lateral 9.7%, downward 1.3%, backward 0.4% and mixed type was 0.2% (Figure 4). Whereas horn shape was mainly characterized by curved type 64% followed by straight 33.7%, lyre shape 0.9% and mixed shape 0.2%.

The cattle breed is also characterized by its thoracic hump, which is distinctive characteristic feature of zebu cattle. Most (97.5%) of the cattle in the population possess an erect hump, while 2.5% have a laterally drooped hump. The hump size of the cattle was variable; most of the animals 51% possess a small hump, whereas the rest (43.6 and 5.2%) have medium and large hump respectively. Male cattle majorly characterized by large and medium hump size but female cattle posses' small hump.

An Ear orientation of the breed was mainly lateral type which accounts 92.8% and erects 6.7%. Similarly ear shape was 73.9% straight and 26.1% was round.

The other morphological characteristic was dewlap size. The analyzed data show that 5.2% large size, 54.4% medium and 38% small size of dewlap. According to owners perception cattle having large size of dewlap indicate more productive and better market preference.

Morphological description of the breed's profile was facial, backline and rump percentage of each profile type was illustrated in Table 7. Facial and backline profile of Bonga breed is mainly straight type and rump profile is majorly roofy.

Table 7. Profile characteristics of Bonga breed.

Profile characteristics		Percentage
Facial	Concave	8.3
	Convex	0.4
	Straight	90.3
Backline	Straight	97.3
	Slope down	2.2
Rump	Fat	3.6
	Roofy	75.5
	Slopping	20.2

In the study area cattle having slope down backline profile and slopping rump profile was mainly lactating cow. It indicates special care should be given during feeding system for those lactating cow. On the other hand those having fat rump profile were mainly oxen which are used for draft power purpose and then source of beef production. According to owners explanation like dewlap size, navel flap for cows also indication of milk productivity. Cattle having large navel flap accounts 3.8%, medium navel flap 31.5%, small navel flap 50.5% and cows those having no visible navel flap accounts 12.6% for female cattle. Also for male Bonga cattle morphological characteristics of perpetual sheath was 22.7% large, 65.3% medium and 12% small. Analyzed data showed that tail length of the breed was 93% long and 6.7% medium.

Quantitative body measurements

The overall mean and standard error of quantitative measurements were displayed in Table 8 for male and female mature Bonga cattle.

Table 8 indicates that there is a variation of body measurements between the two districts of Kaffa zone. Cattle for Gesha district were higher in Body lengths, height at wither, muzzle circumference, chest girth and hock circumference. Whereas overall mean of ear length and horn length of Chena district cattle were higher than Gesha district.

Major constraints of cattle production in the study area

In any production system before starting any genetic improvement programs it is basic to identify the constraints that hinder the production and productivity of cattle (Dereje, 2015). According to respondents major constraints for production and productivity of Bonga cattle in ordered manner were feed shortage especially shortage of grazing land, shortage of improved breed, disease, thief, capital shortage and labor. In the study area there is no communal grazing land as a result private land was used by tethering their cattle. Now a day due to expansion of cultivation of land private grazing land becomes shrinking. Also cattle were kept day and night outside the home around home garden which cause for the problem of thief. Similarly the reports of Nibret and Basazenew (2012) indicated that shortage of animal feeds, grazing land, livestock health problems and low genetic potentials are the four front constraints for livestock developments in Ethiopia. Also Dereje (2015) has reported that feed shortage, disease, lack of improved breeds, lack of improved forage, lack of market access, shortage of water during dry season and lack of labor were ranked from higher to lower in the above order by respondents as factors that hindered for Horo cattle production in Bako tibo and Gobu Sayo districts.

Endashaw (2010) has also reported seasonal feed shortage, disease, parasites and drought as main cattle production challenges in Salamango district of south west Ethiopia. Solomon (2010) has indicated that in pastoral and agro pastoral area of Borana zone the main constraints to cattle production are recurrent drought, feed and water shortage, disease, market problem and genetic erosion.

Major diseases found in the study area which affect for cattle were trypanosomiasis, Foot and Mouth Disease, Lumpy Skin Disease, mastitis, pasturolosis, anthrax, black leg, respiratory disease, external parasite like tick, lice and leach, internal parasite like fasillosis and lung worm.

Conclusion

The production system of cattle in the study area was mixed crop-livestock production system and they have substantial contributions to the economy of their owners, both in terms of supporting crop production through drought power and manure and as source of food for their family either direct food source or source of income. Based on respondents cattle found in Bench Maji, Sheka, Horro Guduru Wellega and Jimma zones were related

Table 8. Overall mean and standard error of body measurements (cm) of Bonga cattle.

Measured trait	District								Grand mean Mean ± SE
	Gesha			Chena			Overall		
	Sex Mean ± SE			Sex Mean ± SE			Mean ± SE		
	Male	Female	Overall mean	Male	Female	Overall mean	Male	Female	
Body length	118.42 ± 3.16	113.20 ± 0.47	114.59 ± 0.49	111.05 ± 2.23	107.99 ± 0.39	108.50 ± 0.5	114.79 ± 1.99	110.52 ± 0.33	111.25 ± 0.44
Height at wither	108.35 ± 0.96	102.25 ± 0.36	103.31 ± 0.38	101.64 ± 0.87	98.84 ± 0.42	99.29 ± 0.39	105.04 ± 0.75	100.48 ± 0.29	101.24 ± 0.29
Chest girth	147.74 ± 1.26	136.65 ± 0.5	138.61 ± 0.55	138.32 ± 1.23	133.53 ± 0.65	133.70 ± 0.83	141.24 ± 2.16	135.04 ± 0.42	136.09 ± 0.51
Ear length	16.16 ± 0.28	16.05 ± 0.14	16.07 ± 0.13	16.81 ± 0.29	17.02 ± 0.14	16.98 ± 0.13	16.49 ± 0.20	16.55 ± 0.10	16.54 ± 0.09
Horn length	18.89 ±0 .91	20.83 ± 0.51	20.49 ± 0.45	20.19 ± 0.78	23.26 ± 0.54	22.76 ± 0.48	19.53 ± 0.60	22.10 ± 0.38	21.66 ± 033
Muzzle circumference	41.03 ± 0.47	37.99± 0.18	38.54 ± 0.19	40.22 ± 0.37	37.67 ± 0.15	38.09 ± 0.15	40.63 ± 0.30	37.83 ± 0.11	38.31 ±0.12
Hock circumference	32.14 ± 0.42	29.49 ± 0.16	29.93 ± 0.17	29.69 ± 0.45	27.64 ± 0.13	27.96 ± 0.14	30.91 ± 0.33	28.54 ± 0.11	28.93 ± 0.12

breeds with Bonga cattle. Cattle population data in the study have indicated that the populations of Bonga breed is in increasing trend over time as noted from Kaffa elder cattle owners in all the study sites during interviewing and focus group discussions. In the area unplanned mainly natural breeding program was done which result year round calving season. Some respondents miss heat detection which result long time at first calving and calving interval that leads the reduction of calf crops. Large body size was main selecting criteria for both male and female breeding cattle followed by other marketing (milk yield, reproductive trait and growth rate) and non-marketing (adaptability, drought power and coat color) traits. In the study area all family members having the responsibility for husbandry practice of cattle. There was a variation of body measurements between the two districts of Kaffa zone. Cattle for Gesha district were higher in Body lengths, height at wither, muzzle circumference, chest girth and hock circumference. Whereas overall mean of ear length and horn length of Chena district cattle were higher than Gesha district. Major constraints for production and productivity of Bonga cattle in ordered manner were shortage of grazing land, shortage of improved breed, disease, thief, capital shortage and labor.

Recommendation

Based on this phenotypic characterization and production system study the following activities are recommended to be done for the future.

- Molecular characterization should be done for detail information of the breed
- Body weight estimation formula should develop
- Further study the origin of the breed
- Planned selection Breeding program should be done
- Improve veterinary service in the area
- Develop Improved forage and feed treatment

REFERENCES

CARDO (2016). Agricultural and Rural Development Office of Chena woreda.

CSA (2014/2015). Federal Democratic Republic of Ethiopia, Central Statistical Agency (CSA) Agricultural Sample Survey. Addis Ababa, Ethiopia. Volume II report on livestock and livestock characteristics.

Dackson NZ (2008). Genetic Characterization of Zambian Indigenous Cattle Breeds. Blacksberg, Virginia.

DAGRIS (2007). Domestic Animal Genetic Resources Information System (DAGRIS). (eds. Kemp S, Mamo Y, Asrat B and Dessie T). International Livestock Research Institute, Addis Ababa, Ethiopia (available at http://dagris.ilri.cgiar.org).

Dereje Bekele Tola (2015). On farm phenotypic characterization of indigenous cattle and their production systems in bako tibe and gobu sayo districts of oromia region, ethiopia. msc thesis haramaya university, haramaya

Dereje T (2005). On-farm Phenotypic Characterization of Cattle Genetic Resources and their Production Systems in South and North Wello zones of Amhara Region, Ethiopia. An M.Sc Thesis presented to the School of Graduate Studies of Haramaya University, Haramaya, Ethiopia.

Dejene TG (2014). Assessment of dairy cattle husbandry and breeding management practices of lowland and mid-highland agro-ecologies of Borana zone. Journal of Animal and Veterinary Sciences2014; 2(3): 62-69 Published online April 30, 2014 (http://www.sciencepublishinggroup.com/j/avs) doi: 10.11648/j.avs.20140203.12. Oromia Agricultural Research Institute, Yabello Pastoral and Dry land Agriculture Research Center, Yabello, Ethiopia.

Denboba MA (2005). Forest conversion-soil degradation-farmers' perception nexus: Implications for sustainable land use in thesouthwest of Ethiopia.

Ecology and Development Series, № 26.
Ebadu A (2016). Assessment of Factors Affecting the Efficiency and Effectiveness of Synchronization Based Breed Improvement Schemes. Journal of Biology, Agriculture and Healthcare www.iiste.org ISSN 2224-3208 (Paper) ISSN 2225-093X (Online) 6(7), 2016.
Edea Z (2008). Characterization of Bonga and Horro indigenous sheep breeds of smallholders for designing community-based breeding strategies in Ethiopia. M.Sc. Thesis, Haramaya University, Ethiopia.
Endasheaw T, Tadelle D (2015). On-farm phenotypic characterization of Mursi cattle in its production environment in South Omo Zone South west Ethiopia.
Endashaw T (2010). Characterization of Mursi cattle breed in its production environment, in Salamago Wereda, Southwest Ethiopia. M.Sc. Thesis, Haramaya University, Haramaya.
FAO (2012). Food and Agriculture Organization of the United Nations (2012). Phenotypic characterization of animal genetic resources.
FAO Animal Production and Health Guidelines No. 11. Rome (available at http://www.fao.org/docrep/015/i2686e/i26).
FAO. Food and Agriculture Organization of the United Nations (2000). World watch list for domestic animal diversity. 3rd Edition. FAO, Rome, Italy.
GARDO (2016). Agricultural and Rural Development office of Gesha woreda.
Hannotte O, Jianlin H (2005). Genetic characterization of livestock populations and its use in conservation decision making. In: Ruane J and A Sannino, eds.pp. 89-96. the role of biotechnology in exploring and protecting genetic resources, Rome.
Jiregna D (2007). Characterization of cattle genetic resources in their production system context in Danno district, west Showa, Oromia, Ethiopia. An M.Sc Thesis presented to the School of Graduate Studies of Haramaya University, Haramaya, Ethiopia.
Makokha SN, Karugiab J, Staalc S, Kosura O (2006). Valuation of cow attributes by conjoint analysis: a case study in Western Kenya.In Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, August 12–18, 2006, Gold Coast, Australia (available at http://ageconsearch.umn.edu/bitstream/25752/1/cp060765.pdf) (accessed 22 July 2010).
Mekonnen HA, Dessie T, Mekasha Y (2012). On farm characterization of Horro cattle breed production systems in western Oromia, Ethiopia. Haramaya University, PO Box 138, Dire Dawa, Ethiopia.
Melaku T (2011). Oxenization versus Tractorization: Options and Constraints for Ethiopian Framing System Ethiopia. International Journal of Sustainable Agriculture 3 (1): 11-20, 2011 ISSN 2079-2107.
Mwacharo JM, Okeyo AM, Kamande GK, Rege JE (2006). The small EastAfrica shorthorn zebu cows in Kenya. I: Linear body measurements. Tropical Animal Production 38: 65 74.
Nibret M, Basaznew B (2012). Assessment of Livestock Research for Rural Development,Major Animal Production and Health Problems of Livestock Development in Lay Armacheho District. Northwestern Ethiopia American-Eurasian Journal of Relationship of live weight and linear body. Sci. Res., 7(3): 136- 141.
Olson TA, Lucena C, Chase CC, Hammond AC (2003). Evidence of a major gene influencing hair length and heat tolerance in Bos taurus cattle. J. Anim. Sci., 81: 80–90.
Solomon T (2010). On-Farm Phenotypic Characterization 0f Boran Cattle Breed in Dire District of Borana Zone, Oromia Region, Ethiopia. M.Sc. Thesis, Haramaya University.
Rege JEO, Tawah CL (1999). The state of African cattle genetic resources II. Geographical distribution, characteristics and uses of present-day breeds and strains. Anim. Genet. Resour. Inf. Bull., 26: 1–25.
Takele T (2005). On-Farm Phenotypic Characterization of Sheko Breed of Cattle and Their Habitat in Bench Maji zone, Ethiopia. An M.Sc Thesis presented to the School of Graduate Studies of Haramaya University, Haramaya, Ethiopia.
Tatek W, Abegaz B (2013). Current Status and Future Prospects of the Endangered Sheko Breed of Cattle (African Bos Taurus) in Ethiopia: A Review Paper. Global Journal of Science Frontier Research Agriculture and Veterinary.
Workneh A, Rowlands GJ (2004). Design, execution and analysis of the livestock breed survey in Oromia Regional State, Ethiopia. OADB (Oromia Agricultural Development Bureau), Addis Ababa, Ethiopia and ILRI (International Livestock Research Institute), Nairobi Kenya. 260p.
Ulfina G, Zelalem B, Jemal D, Gemeda D, Chala M, Jiregna D, Diriba G, Lemma G, Workneh A, Adam D (2005). Survey of cattle production and marketing practices in Danno District, western Ethiopia, using PRA tools. PRA Roport. (Inpress).