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Breeding practices of Indigenous Draft cattle in North Shoa zone, Amhara region, Ethiopia

AlmazBekele*, GetachewKassa†, TewodrosEshete‡, KasahunBekele‡
**WolaitaSodo University, Department of Animal and Range Science, P. O. Box 138, WolaitaSodo, Ethiopia*
†DebereBerhan University, Department of Biotechnology, P.O.Box 445, Debereberhan, Ethiopia
‡DebereBerhan University, Department of Animal science, P.O.Box 445, Debereberhan, Ethiopia
Corresponding Author: AlmazBekele

Abstract: *The study was conducted North Shoa Zone,Amhara Regional State with the objectives of documenting breeding practice of indigenous draft cattle. The data were collected through semi structured questionnaire, group discussions and field observation. A total of 490 households were randomly selected and interviewed by using pre-tested questioner. Statistical package for social science (SPSS 16) were used to analyze the collected data. The main purpose of keeping cattle was for drought power source (86.9) for farming activity followed by milk production (4.4%), cash income (6.1%), meat production (2.8%) and manure production (2.2%). The result revealed that majority of respondent (65.5%) select indigenous cattle based on draught power. Breeding was predominated by Natural and controlling (60.9%) and most of(67.6 %) of respondents used local bull. The main source of bull (60.0%) for mating was neighbor's bull. In general indigenous cattle in the study areas were mainly selected and kept for drought power and practice traditional castration method to control the mating system. The Government and the non-government sector should support the farmers and plan to improve the indigenous draft cattle based on the trait preference of farmers.*

Key words: - *Castration, Mating control, Trait preference*

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I. Introduction

The livestock population census showed that Ethiopia has about 58.7 million heads of cattle. The majorities (98.59%) of the cattle populations are local breeds, which are found in rural areas under subsistence type of farming system and the remaining are crossbreed and exotic breeds that accounted for about 1.22 percent and 0.19 percent, respectively (CSA, 2015/16). The Ethiopian economy is highly dependent on agriculture which is predominated by working animals and cattle play a key role in crop production. It is estimated that about 20 % of the farmers engaged exclusively crop production, 2% in livestock production and a majority of about 78% involved in crop-livestock mixed production systems (Tegeng and Crawford, 2000). Cattle are very important livestock species in the traditional mixed crop livestock production systems of Ethiopia by providing mainly draught power, followed by milk, meat usually when they retire and manure for fuel than for maintaining soil fertility (Belay et al 2012).In mixed farming system cattle are kept to source of draft power for crop production (Andualem, 2016). The valuing of output from draft is not easy like valuing of milk and meat production. About 80% of Ethiopian farmers use animal traction to plough their fields and draught power makes a measurable contribution to agricultural output. The value of the animal draught power input into arable production is about a quarter (26.4%) of the value of annual crop production. Based on these figures, nearly a third (31%) of the total gross value of livestock output is represented by the value of animal draught power as an input into crop cultivation, an estimated 21.500 billion EB in 2008-09. Including the value of ploughing services, livestock provided 45% of agricultural GDP in 2008-09 (Benke, 2011).

Indigenous cattle are best adapted to local environment and best suited to work. Even though there is no structured breeding program at farmer level small holder farmers select and castrate best male for farming activity (Addisu and Melese, 2016). Information on breeding practice of the small holder farmer is important for consideration for local draft cattle improvement programs. There is lack of information on local draft cattle breeding practice and the trait preference of small holder farmers in the study area. Therefore the objective of this study was to assess existing breeding practices of indigenous draft cattle and farmer trait preference in the study area.

II. Materials And Methods

Description of study area

The study was carried out in the North Shoa Administrative Zones of Amhara Regional State. The area is situated approximately between 38°40` 2`` to 40°6` 36``E longitude 68°43` 46`` to 10° 43' 35``latitude and 38º 28' E and 40º 5' E longitude. The zone has a total surface area of about 16,193.6 square kilometers, comprising the highland masses in the west and the lowlands in the east. The topography of the area is characterized by flat to undulating and hilly landscapes, with contrasting tropical, sub-tropical and temperate climates.

Sampling techniques and sample size

The study area has three agro ecological zones (high land, mid land and lowland) two districts from each agro ecological zone were selected for the present study. From the total of 22 districts and 5 town administrations, 6 districts (Minjarshenkora, Bassonaworena, Efratanagidim, Ankober, Moretnajiru and Menzgeramidir) were purposely selected based on the distribution of cattle population and agro ecological zones. A total of 490 households were selected by a simple random sampling technique for individual interviews. One focus group discussion was held in each district.

Study design and Data collection

The study design was formal survey based on focus group discussion and individual interview using semi structured questionnaire. Elders, village leaders and individuals endowed with extensive knowledge on socio economic situation and cattle breeding systems were selected in consultation with local agricultural extension for focus group discussions.

Data analysis

Simple descriptive statistics was used to summarize the collected data by using SPSS 17.0 software.

III. Result and Discussion

Livestock holding

The overall mean of livestock holding per house hold in the study area was 4.06 ± 0.1, 8.38 ± 0.5, 3.92 ± 0.2, 5.49 ± 0.3, 1.41 ± 0.1, 0.20 ± 0.1 and 0.58 ± 0.1 for cattle, sheep, goat, chicken, donkey, mule and horse respectively. The higher numbers of animals in most districts were sheep followed by chicken (Table 1). The average numbers of sheep in the study area were (4.00 ± 0.5, 14.75 ± 1.2, 13.03 ± 1.2, 4.42 ± 0.5, 3.75 ± 0.6 and 4.18 ± 0.8 in Minjarshenkora, Bassonaworena, Menzgeramidir, Ankober, Moretnajiru and Efratanagidm respectively. The current result of overall average sheep (8.38 ± 0.5) is lower than the result reported by Dereje (2015) which was 9.73 ± 1.34 in BakoTibe and 9.60 ± 5.11 in GobuSayo among the sample population, Ayantuet al. (2012) in Horro district in Fantale districts of Oromia region report the average cattle number per household 14.7 ± 0.55. The average number of sheep in Bassaonaworena (14.75±1.2) and Menzegeramidir (13.03±1.2) and the number of goat in Minjarshenkora (7.44±1.1) and Moretnajiru (7.29±0.6) was higher ($p<0.001$) as compared to other districts. This might be due to the geographical differences where Bassaonaworena and Menzegeramidir are highland and relatively cold which is favorable for sheep production whereas Minjarshenkora and Moretnajiru are lowland which is conducive for goat production.

Table 1. Livestock holding

	Districts						
Livestock	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
Cattle	4.76±0.3	5.01±0.2	3.48±0.2	3.85±0.2	3.81±0.2	3.43±0.2	4.06±0.1
Sheep	4.00±0.5	14.75±1.2	13.03±1.2	4.42±0.5	3.75±0.6	4.18±0.8	8.38±0.5
Goat	7.44±1.1	4.33±0.4	1.87±0.4	3.42±0.4	7.29±0.6	1.82±0.4	3.92±0.2
Chicken	9.20±0.9	5.15±0.4	3.33±0.3	5.31±0.4	4.20±0.4	6.25±0.9	5.49±0.3
Donkey	1.83±0.1	1.60±0.1	1.30±0.1	1.38±0.1	1.83±0.1	0.57±0.1	1.41±0.1
Mule	0	0	0.66±0.1	1.00±0.0	0	0.03±0.0	0.20±0.1
Horse	0	1.15±0.1	1.00±0.2	1.38±0.3	1.10±0.1	0	0.58±0.1

Purpose of keeping

According to focus group discussion, most respondents reported, indigenous cattle play a key role in day-to-day life of farmers. This study revealed that, the purpose of keeping indigenous cattle was draft power source, milk production, and meat production, manure, hide and skin and cash income sources. Dereje (2015) reported similar finding in BakoTibe and GobuSayo district which was used for traction, milk production, income generation, manure (to increase soil fertility), trashing of crop, social status and meat. Like in most mid-highland parts of Ethiopia where mixed farming is practiced cattle are mainly kept for drought power source. The result in Table 2 revealed that majority of respondents (86.9%) used indigenous cattle for source of power

(draught power). These results were similar with the result of Jirenga (2007) which was conducted at Danno district of west shoa zone and Ayantuet al. (2012) conducted in Horro district of HorroguduruWellega zone. Derejeet al. (2012) also report the use of cattle as sources of draught power is more important (17.1 to 20.0%) in the high and mid altitude areas than in lowland areas of North and South Wollo zone. In the contrary in the low land (pastoral and Agro-pastoral) areas cattle are mainly kept for milk production. The finding of Endashawet al. (2012) indicated that the main purpose of keeping Mursi cattle in Salamago district in south west Ethiopia was for milk production than draught power. In this study draught power got high rank among the reasons for keeping cattle in mixed production system. This appears due to the fact that oxen are used in different agricultural operations. The use of cattle as a source of draft power was very high because majority of the farmers used oxen for land preparation. Functions like source of meat for consumption ranked relatively low among the reasons of keeping indigenous cattle. This could be mainly because cattle are slaughtered during specific occasions and functions such as weddings, funerals, religious festivity and cultural festivals when rare slaughter of animals is conducted outside these days. For home consumption the majority of households preferred to slaughter small ruminants and chickens or to purchased beef from local butcheries rather than to slaughter cattle. Similarly Derejeet al. (2012) also report that many households prefer to slaughter sheep (highlands) and goats (lowlands) except during socio-cultural ceremonies such as wedding and funerals.

Table 2. Purpose of Keeping Indigenous/Local Cattle

	Districts						
Importance of local cattle	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
First importance							
Power source	95.0	83.3	61.7	88.3	93.3	100	86.9
Milk production	3.3	3.3	18.3	1.7	0	0	4.4
Meat production	1.7	0	0	0	0	0	2.8
Manure	0	13.3	0	0	0	0	2.2
Cash income	0	0	20.0	10	6.7	0	6.1
Hide and skin	9.1	0	0	5.0	3.3	0	0.3

Trait preference

The result in Table 3 indicated that power (65.5%)was used the major selection criterion. Most respondents (54.2%, 61.7%, 65.0%, 100%, 39.7% and 71.7 %) in Minjarshenkora, Bassonaworena, Menzgeramidir, Ankober, Moretnajiru and Efratanagidim respectively used the power of animal as selection criteria of indigenous draft cattle.According to focus group discussion, Colour, shape, height, size, frame and age of animals were also used as the main selection criteria for indigenous draft cattle. Larger animals can perform more work. Body size is used as selection criteria for breeding and thereby to have good-working animals.Most farmers need draft cattle which can tolerate the local management and environment and which can perform more work. In the study area record keeping is not practiced for all traits of interest. It might be due to lack of awareness on the importance and basics of record keeping for selection and improvement. However the smallholder farmers' trait preference is power source, the practice of genetic improvement of local indigenous cattle for power source is not considered by the government and other stockholders.

Table 3. Selection criteria's of indigenous draft cattle

	Districts						
Variables	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
Selection criteria							
Meat production	1.7	0	8.3	0	0	0	2.8
Tolerance	22.0	0	10.0	0	19	0	8.4
Milk production	22.0	31.7	3.3	0	13.8	15.0	14.3
Power	54.2	61.7	65.0	100	39.7	71.7	65.5
Low price	0	0	10.0	0	3.4	0	2.2
Low in feed consumption	0	0	0	0	0	13.3	0.3
Height	0	6.7	1.7	0	24.1	0	5.5

Breeding system

The breeding method that reported in the study area was mostly natural controlled mating (60.9%), by using local bull and improved bull and AI also practiced in the highland parts of the area (7.2%). Based on the reports of focus group discussion, in most areas controlled mating was practiced and heat detection is carried out by the bull and cows in heat are usually mated several times during each heat period controlled by the farmers. Natural uncontrolled mating (31.9%) also practiced in the study area and high in Minjarshenkora (66.7) and low in Bassonaworanaworeda (5%). In the contrary Derejeet al. (2012) report natural uncontrolled mating more than 95% in North and South wollo zone and shortage of grazing pasture, labor and lack of awareness were mentioned as the main reasons for prevalence of uncontrolled breeding practice.Uncontrolled mating is serious

obstacle for genetic improvement.According to the result in Table 4, most respondents in Minjarshenkora (100%), Menzgeramidir (55.0%), Ankober (73.3%), Moretnajiru (60.0%) and Efratanagidim (93.3) commonly used local bull for mating their local cows however 56.7 % of Bassonaworena sampled farmers used improved bull. In general, 67.6 % of respondents used local bull followed by 16.6% of both Local bull and improved bull and 15.8% them used only improved bull. The main sources of bull (60.0%) for breeding/ matting purpose were neighbor's bull and 25 % of the respondent used their own bull for breeding purpose. According to the focus group discussion, smallholder farmers mostly rely on use of communal bulls of unknown pedigree. In all studied areas, respondents reported that there is no improved breed for traction purpose at individual and government level. Most of (70.9%) the respondent used natural and controlled method of synchronization. The sign of heat in Minjarshenkora, Bassonaworena, Menzgeramidir, Ankober, Moretnajiru and Efratanagidim (56.6, 90, 66.7, 88.1, 73.3 and 70%) were clearly seen respectively.

Table 4. Breed and Breeding system of indigenous draft cattle

	Districts						
Variables	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
Mating system							
Mating local with local	100	26.7	55.0	73.3	60.0	93.3	67.6
Crossing with other breed	0	56.7	16.7	6.7	6.7	6.7	15.8
Both	0	16.7	28.3	20	33.3	0	16.6
Source of bull for breeding							
Owner	27.3	15.0	38.3	62.7	13.3	25.0	30.0
Neighbors	72.7	85	56.7	37.3	73.3	60.0	64.1
Credit	0	0	0	0	3.3	0	0.6
Government	0	0	5.0	0	10	15.0	5.1
Method of mating							
Natural without controlling	66.7	5.0	36.7	30.5	40.0	14.5	31.9
Natural and controlling	33.3	86.7	63.3	69.5	38.3	70.9	60.9
Artificial insemination	0	8.3	0	0	21.7	14.5	7.2
Visibility of heat sign							
Clearly seen	56.6	90	66.7	88.1	73.3	70.0	74.4
Partially seen	15.1	10	25.0	11.9	18.3	11.7	15.3
Not seen	1.9	0	8.3	0	0	6.7	2.8
Not known	26.4	0	0	0	8.3	11.7	7.4

Sign of heat and time of mating

The current result shows that 37.3%of respondents mate their cow immediately when they show the sign of heat. Most respondents (71.2%) in Ankober district were mate their cows immediately when the cow show sign of heat but respondents in Minjarshekora (42.9%) mate their cows after two days of the cow show sign of heat. Untimely and uncontrolled (29.0%), timely and uncontrolled (28.4%), timely and controlled (8.7%), help by people (31.0%) and using artificial techniques (2.9%) were the most mechanisms of mating in the study areas. As the result revealed in Table 5 most respondents control the mating mechanism through the technical help of people to avoid unwanted mating. According to the respondents report 68.6% and 20.3% of cows give birth at any time and dry season respectively (Table 5). Similarly calvings were reported to occur throughout the year in Wollo Zone (Dereje et al., 2012). The year-round calvings allow continual production of milk for home consumption although feed availability is seasonal and it reduces the overall cattle productivity like calf survival ability, milk production and reproductive performance of the cow) (Dereje et al., 2012).

Table 5 Time of mating and heat

	Districts						
Variables	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
Time of mating when the cow shows the sign of heat							
Immediately	44.9	1.7	35.0	71.2	55.2	18.3	37.3
Within half a day	4.1	43.3	5.0	0	29.3	31.7	19.4
Within a day	8.2	55.0	56.7	13.6	15.5	46.7	33.5
After two days	42.9	0	3.3	15.3	0	3.3	9.8
Controlling mechanisms of mating							
Untimely and uncontrolled	43.8	0	31.7	13.6	39.7	48.3	29.0
Timely and uncontrolled	43.8	0	60.0	16.9	41.4	11.7	28.4
Timely and controlled	0	0	8.3	1.7	0	40.0	8.7
Help by people	12.5	96.7	0	67.8	5.2	0	31.0
Artificial way	0	3.3	0	17.1	13.8	0	2.9
Time of cows giving birth							

Wet season	11.8	1.7	31.7	0	13.3	8.3	11.1
Dry season	19.8	46.7	8.3	0	30.0	16.7	20.3
Any time (wet/dry season)	68.6	51.7	60.0	100	56.7	75.0	68.6

Castration practice and Method of castration

Castration is common breeding management practice for male animals. Most (88.0%) of respondents castrate their oxen and 87.6 % of them castrate traditionally and the rest (12.4%) castrate in modern ways (Table 6). Oxen are less aggressive and best suited to work than bulls. Addisu and Melese (2016) also report as farmers practice castration as a means of culling of unproductive animal and preserve energy for work. The materials used for castration in Minjarshenkora, Bassonaworena, Menzgeramidir, Ankober, Moretnajiru and Efratanagidim (94.1%, 96.0%, 85.6%, 100%, 100% and 98.3 %) respectively were stone and wood. Respondents in Minjarshenkora (71.9%), Bassonaworena (76.7%), Menzgeramidir (61.7%), Ankober (81.7%), Moretnajiru (57.1%) and Efratanagidim (75.0%) provide special feed (unusual feed) for their castrated oxen. The same result was reported in Moretnajiru (96.7%) Siadebrnawayu (68.1%), Bassonaworena (100%) and Menzgeramidir (84.6%) used supplementary feed for their castrated cattle. Concentrate mix, Atella, fodder crops, wheat bran, noug cake, wheat bran and noug cake mix, conserved hay and grass pea were used as supplementary feed in the study areas even though the degree of using those feed resources as supplementary feed was different. As the result revealed in Table 6, majority of the respondents in all studied areas were not used concentrate mix, fodder crops and grass pea as supplementary feed but "atella", wheat bran and Noug cake mix and conserved hay were commonly use in most studied areas.

Table 6. Castration practice and feeding of castrated ox

	Districts						
Variables	Minjarshenkora	Bassonaworena	Menzgeramidir	Ankober	Moretnajiru	Efratanagidim	Total
Use Castration	86.4	81.7	85.0	100	94.9	80.0	88.0
No castration	13.6	18.3	15.0	0	5.1	20.0	12.0
Method of castration							
Traditional	92.2	96.0	88.2	98.3	64.3	86.7	87.6
Modern	7.8	4.0	11.8	1.7	35.7	13.3	12.4
Materials used for castration							
Stone and wood	94.1	96.0	85.6	100	100	98.3	95.7
Iron	0	0	2.0	0	0	1.7	0.6
Burdizo	5.9	4.0	12.4	0	0	0	3.7
Management for castrated ox							
Supplementary feed	71.9	76.7	61.7	81.7	57.1	75.0	70.7
No supplementation	28.1	23.3	38.3	18.3	42.9	25.0	29.3
Type of feed provide for castrated ox							
Green grass	12.2	0	12.0	36.0	0	22.2	17.9
Roughage with "attela "	31.7	25.0	64.0	64.0	91.7	77.8	60.7
Industrial by product	56.1	75.0	24.0	0	8.3	0	21.4

IV. Conclusions

Draft power is the foremost purpose of keeping cattle and producers primarily select their cattle based on their power. Cattle owners in north Shoa zone usually have control over breeding practice of their cattle and mating is most often natural and controlled. Smallholder farmers practice traditional castration as a method of controlling unwanted mating and have docile ox for farming activity. Improvement of indigenous draft cattle should get anattention by governmental and nongovernmental organizations in consideration of the major trait preference of smallholder farmer which is draft power.

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