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Current Status and Future Prospects of the Endangered Sheko Breed of Cattle (African Bos Taurus) in Ethiopia: A Review Paper

Tatek Woldu ^α & Abegaz Beyene ^ο

Abstract- Sheko breed is one of the Ethiopian indigenous cattle breeds which represents the last remnants of Africa's original *Bos taurus* cattle that were probably the first to be domesticated in eastern Africa. The geographical distribution of Sheko cattle is mainly restricted to Bench Maji Zone and partly in the adjoining parts of Kaffa and Shaka Zones of south west Ethiopia. The breed is valued for its milk yield, adaptation and exhibit superior trypanotolerance than any other indigenous cattle populations found in Ethiopia. Despite the unique characters and attributes of the breed, there is a shrinkage in effective population size of the breed. The population estimate of the breed by the year 1999 was about 31,000, However, another estimates by the year 2007 indicated that the population size declined to 4040 a more recent estimates reported the population of the breed as low as 2400 heads. Strong physique and aggressive temperament of Sheko cattle for the herders as well as indiscriminate crossbreeding and replacement mainly with thoracic-humped zebu cattle were among the reasons for declining trend of the breed. Different phenotypic and genetic studies revealed that Sheko breed is characterized by high levels of genetic diversity and several unique alleles which are vital for future conservation and sustainable utilization of genetic resources. Although this unique breed is currently facing a clear risk of extinction there are no organized and visible efforts targeted for saving the breed from extinction. In addition, information is lacking on productive and reproductive performance of the breed. The current Artificial Insemination service and introduction of Borana cattle breed by the office of ministry of agriculture and rural development into the home area of sheko breed will exacerbate the extinction of the breed. Finally, it is recommended to generate information on productive and reproductive potential of the breed under different management system and designing In situ conservation schemes within their production environments.

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I. INTRODUCTION

Sheko is among the recognized cattle breeds in Ethiopia (DAGRIS, 2007) the breed represents the last remnants of Africa's original *Bos taurus* cattle which were probably the first to be domesticated in eastern Africa (Hanotte et al., 2000). These cattle were first reported in 1929 from South-western Ethiopia, and later in 1982 (Albero and Haile-Mariam 1982), at present

some of the Sheko cattle manifest small humps that they inherited from zebu introgression. These cattle are generally smaller in body size and have shorter or no horns than the Humpless Longhorns, which made them much easier to manage. They also appear to have been deliberately developed for milk production (Rege, 1999).

The breed is valued for its milk yield, adaptation to humid tsetse infested environment and trypanotolerance (Lemecha, et al. 2006). Sheko is restricted to the humid Sheko and Bench districts in Southwest Ethiopia where they are maintained by a small number of local farmers. Sheko breed possesses unique genetic traits that may be useful in confronting new tropical diseases and unpredictable changes in environment conditions in the future. Characters related to disease resistance and adaptation to extreme environments could prove fundamental to food security for the present and future human generations (Dadi et al. 2009) Sheko exhibit superior trypanotolerance than other indigenous cattle populations found in Ethiopia (Lemecha, et al. 2006), implicating the genetic potential of this breed to perform cost-effectively in humid tsetse infested habitats where thoracic humped cattle may not survive in the absence of veterinary intervention.

Despite the unique characters and attributes of the breed, there is a shrinkage in effective population size of the breed from time to time. Different research findings (Taye et al 2007'; Dadi et al. 2009) indicated that there is a high tendency of replacing the sheko breed with other types of breed as a reason of high feed intake as well as aggressive nature of this breed than the others. This breed reflects historical and cultural identity of local communities and represents a unique component of the global domestic animal biodiversity that deserve priority for further research and conservation. The objective of this paper is to illustrate the current status of the breed in terms of population, genetic diversity and other productive performance of the breed and forward possible workable recommendations for conservation and sustainable utilization of this unique genetic resource.

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II. ORIGIN, POPULATION SIZE AND GENETIC DIVERSITY

a) Origin

Despite recent evidence for possible presence of an African centre of domestication (Grigson 1991; Bradley *et al* 1996; Hanotte *et al.* 2002), archaeological evidence indicates that the first cattle on the African continent were of taurine origin introduced from Asia, through the Nile Valley in Egypt, or via the Horn of Africa (Epstein 1971). They occupied most of the areas surrounding the present day Saharan desert and the Abyssinian region. They also expanded to the humid habitat of the West African coast, with the present trypanotolerant breeds, and on the East part of the continent down to the Mount Elgon area at the Kenyan–Ugandan border (Epstein 1971). However, the taurine breed distribution pattern was deeply modified with the massive importation of zebu cattle to the continent, mainly after 700 ad, and later with the rinderpest epidemics affecting more especially taurine cattle (Epstein 1971; Blench 1993). Today the Abyssinian region, and to an extent, the Lake Victoria region are the cradle of the largest number of African zebu breeds and have the highest density of zebu populations on the continent (Rege & Bester 1998). Only one breed is still

classified as taurine in the region, the Sheko, but several others are still considered as crossbred populations and classified as sanga (Felius 1995; Rege *et al.* 1996). Studies on mitochondrial DNA show that these breeds still have a taurine mitochondrial DNA (Bradley *et al.* 1996).

b) Population Size and Genetic Diversity

The geographical distribution of Sheko cattle is mainly restricted to Bench Maji Zone and partly in the adjoining parts of Kaffa and Shaka Zones of south west Ethiopia (Taye *et al* 2007). The population estimate of the breed by the year 1999 was about 31,000 (rege, 1999), However, another estimates indicated that the population size declined to 4040 (Taye *et al* 2007) a recenet estimates reported by Dadi, *et al* (2009) reveled that the population of the breed become as low as 2400 heads. A secondary data collected by the authers of this review by the year 2011 from office of south bench distric ministry of agriculture office revealed that the population size of the breed was around 1967 heads of which 562, 231, 421, 651, and 102 were heifers, bulls, oxen, cows and calf respectively. The populatio estimates reported so far at diffrent periods clearly indicate the sharply declining trend in the total population size of the breed (Fig 1).

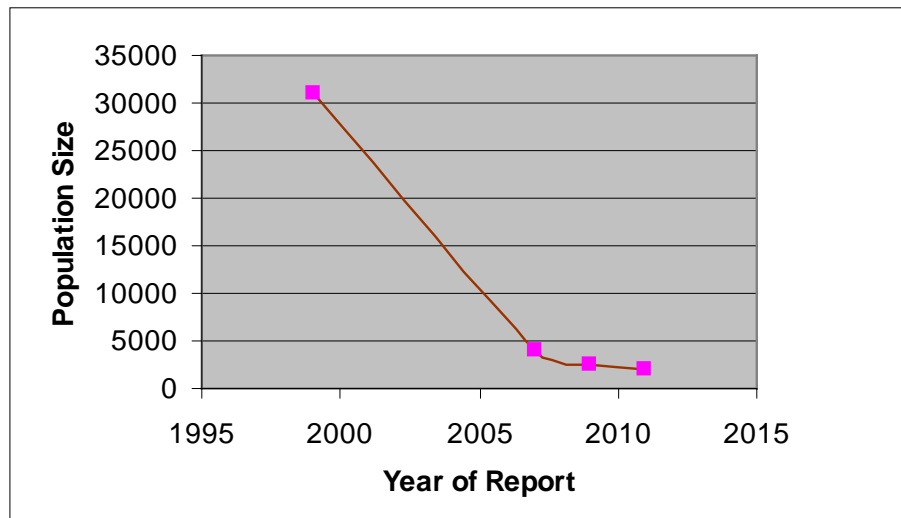


Fig 1 : Population size of sheko cattle breed reported at different years

Diffrent reasons were mentioned for the declining population trend of the breed, the most prominat reason mentioned was by Takele *et al* (2010) who contend that due to the high feed requirements of Sheko cattle, which cannot match with ever increasing feed shortage because of expansion of farm land to feed the rapidly growing population, sheko breed is less preferred to other local breeds by herders. Moreover, due to the strong physique and aggressive temperament of Sheko cattle, especially older individuals face difficulties in practicing tethered feeding

which is now becoming the most common feeding strategy since there is shrinkage of grazing land. As a result, Farmers are compelled to continuously replace the breed with other local humped zebu cattle. Another reason mentioned by Dadi *et al* (2009) for the reduction in population size is indiscriminate crossbreeding and replacement mainly with thoracic-humped zebu cattle.

Effect of the recent decline in population size of sheko cattle on genetic diversity and bottleneck has been investigated by Dadi *et al* (2009). It is well known that genetic bottlenecks can increase demographic

stochasticity, rate of inbreeding and loss of genetic variation, thereby increasing the probability of population extinction. The same study revealed that there is no evidence for genetic bottleneck in sheko breed and the mean number of alleles detected at the population level was 6.93, a value that falls within the range of mean number of alleles (MNA) reported in various other African cattle breeds 5.1 – 7.9 (Rege, J.E.O. *et al.* 2001) Levels of heterozygosities were also comparable to results reported in this literature. Reduction in population size among Sheko cattle seems not to have had a negative impact on its genetic diversity. Other study by Dadi *et al.* (2008) also revealed that Sheko breed is characterized by high levels of genetic diversity and several unique alleles (*CSFM60*: 91bp; *MM12*: 137bp, 139bp; *BM2113*: 122bp; *MB1824*: 185bp; *ILSTS006*: 299bp) which may be vital for future breed conservation in spite of demographic population contraction in recent years.

Different molecular characterization studies have been conducted on indigenous breeds of Ethiopia (Fedlu *et al.*, 2007; Dadi *et al.* 2009). For instance genetic variability assessment between and within breed of five indigenous Ethiopian cattle (Horro, Sheko, Arsi, Abigar and Guraghe highland) using RAPD markers indicated that sheko breed formed a distinct cluster whereas the remaining breeds formed another cluster (Fedlu *et al.*, 2007).

The study further indicated that the higher diversity value observed in Sheko may be due to the divergent breed group of the breed when the other four breeds share some Zebu type background. Moreover, the Sheko is believed to have a different and longer evolutionary history (Epstein, 1971), perhaps associated with a different pattern of natural selection for adaptation under harsh environmental conditions of the warm and humid climate of southwestern Ethiopia and continual exposure for Trypanosomosis. The same study reported the minimum genetic distance of Sheko breed with Abigar (a Sanga type being a cross of Zebu and taurine) than the other indigenous breeds depicting the fact that both sharing a taurine ancestor and a possible interbreeding of the breeds as they share a common border in their habitat. A more recent study on genetic differentiation, population structure and levels of admixture among Ethiopian cattle populations by using analysis of microsatellite markers indicated that the overall estimate of population differentiation is low due to high level of inbreeding within populations. Similarly, low magnitudes of genetic distances were observed between all possible pairs of Ethiopian cattle populations. The lowest and highest genetic distances were observed between the Arsi and Ambo populations and between the Sheko and Sanga populations respectively. The dendrogram constructed for the 11 Ethiopian cattle populations by the same authors showed two main separate clusters composed of two

genetic groups; one group had only Sheko, while the other group contained all the other Ethiopian cattle populations, irrespective of their morphological classifications. All the phylogenetic studies undertaken so far on Ethiopian cattle population categorized Sheko breed as a distinct group from the rest of the population and indicated the breed as the original short horn taurine cattle of east Africa.

Sheko breed which is locally named as "*Godda*" (meaning hornless or polled) by the local community has been recognized as one of Africa's "Big Five" vintage cows having great potential to form the genetic backbone for future survival (ILRI, 2007). This unique breed is currently facing a clear risk of extinction due to rapid shrinkage of population size (Taye *et al.* 2007), admixing with other local breed (Dadi *et al.* 2009) and nearly elimination of specific allele on Y chromosome which indicates taurine origin in African indigenous cattle (Hanotte *et al.* 2000).

III. PHENOTYPIC CHARACTERISTICS AND PRODUCTIVE PERFORMANCE

Detailed studies and characterization on productive and reproductive performance of the breed is not yet conducted. However, there are few and scanty surveys and monitoring research activities undertaken so far (Alberro, and Haile-Mariam, 1982; Ayalew *et al.*, 2001; Taye *et al.*, 2007). Different color patterns were reported for the breed and the coat color is predominantly red in plain (75%), patchy (15%) or spotted (9%) (Werkeneh, *et al.* 2001) other study (Taye *et al.*, 2007) indicated the color is dominated by glossy red hair coat while Alberro, M and Haile-Mariam, (1982) reported the dominant color as Brown or black and white. The studies revealed that, lack of uniformity in color pattern and presence of possible admixture of the breed with other local cattle population. All of the studies undertaken so far clearly indicated that majority of the sheko population is polled and having a small or no hump (Table 1).

The productive and reproductive performance of the breed is summarized on table 3. A survey by Taye *et al.*, (2007) revealed that Average age at puberty for male and female population is 41.6 and 42.1 months, respectively and average age at first calving and mean calving interval is 54.1 and 15.6 month, respectively. The same survey revealed that average lactation milk yield is 698.3 liter with associated average lactation length of 9.9 month, nearly, 22.1 and 7.8 percent of the sampled Sheko cows were reported to produce on average more than 1000 and 1400 liter of milk per lactation, respectively. Sheko oxen on average start draught work at 3.4 ± 0.81 year and have an average draught work life of 8.5 ± 2.67 year. Moreover, majority of herders reported as Sheko oxen surpass their Zebu counterparts in draught stamina and speed (Taye *et al.*, 2007). Ayalew

(2001) reported height at withers for adults, 105 cm; body length, 102 cm; heart girth, 136.7 cm, and live weight 179 kg.

At present there is no active research and development work targeted towards conservation of the endangered sheko breed. An observation made by the writers of this review during the year 2011 at Bech maji zone indicated that there is awareness by the district beuro of agriculture and rural development on the

declining population trend of the breed although there is no clear plan and action to be implemented by concerned stakeholders. On the contrary, the current efforts on provision of AI service in the home land of sheko breed by ministry of agriculture and introduction of Borana breed and distribution to farmers with a subsidized cost in some selected districts of bench maji zone are the major treats and challenges identified for conservation of the breed.

Table 1 : Phenotypic description of Sheko Cattle as reported by different Authors

Color Description	The coat color is predominantly red in plain (75%), patchy (15%) or spotted (9%) pattern.	Workneh, A. 2001
	They are dominated by glossy red hair coat. Brown or black and white color.	Taye, T. et al, 2007 Alberro, M.; Haile-Mariam, S. 1982
Horn description	Many are polled or with small jersey-like horns.	Alberro, M.; Haile-Mariam, S. 1982
	predominantly polled (84.8 and 89.9% in male and female population, respectively)	Taye, T. et al, 2007
Hump description	Without or with small hump.	Alberro, M.; Haile-Mariam, S. 1982
	Most of them are humpless; some bulls and a few cows have small and cervico-thoracic hump,	Workneh, A. 2001
	Most of them have reduced type cervico-thoracic hump.	Taye, T. et al, 2007

Table 2 : Summary of Sheko Breed performance reported by different authors

Traits	Values/descriptions	Source
Average age at puberty for male (Months)	41.6	Taye, T. et al, 2007
Average age at puberty for female (Months)	42.1	Taye, T. et al, 2007
Average age at parturition (months)	36 - 48	Alberro, M.; Haile-Mariam, S. 1982
	54.1	Taye, T. et al, 2007
Average calving interval	15.6	Taye, T. et al, 2007
Average daily Milk Yield (lit)	1-2	Alberro, M.; Haile-Mariam, S. 1982
Average lactation milk yield	698.3	Taye, T. et al, 2007
Average lactation length (months)	9.9	Taye, T. et al, 2007
	6 – 8	Alberro, M.; Haile-Mariam, S. 1982
Adult live weight Female (Kg)	188.4	Workneh, A. 2001
Adult live weight Male (Kg)	208.3	Workneh, A. 2001
Adult live weight overall(Kg)	194.4	Workneh, A. 2001

IV. TRYPANOTOLERANCE OF SHEKO BREED

Trypanosomosis is one of the major impediments to livestock development and agricultural production in Ethiopia contributing negatively to the overall development in general and to food self-reliance efforts of the nation in particular. While tsetse-borne trypanosomosis is excluding some 180,000–200,000 km² of agriculturally suitable land in the west and southwest of the country, 14 million head of cattle, an equivalent number of small ruminants, nearly 7 million equines and 1.8 million camels are at the risk of contracting trypanosomosis at any one time (Langridge, 1976; MoARD, 2004).

A comparative study on the response of four indigenous cattle breeds of Ethiopia, namely Abigar,

Horro, Sheko and Gurage, to natural challenge of trypanosomosis in the Ghibe valley revealed that Sheko breed has manifested very high overall average packed cell volume (PCV) values, the lowest mean trypanosome prevalence rate and the least number of trypanocidal treatments and lower mortality rate as compared to the other studied breeds (Lemecha et al, 2006). Reproductive performance of the four breeds was also studied. The results showed that the Sheko had more calves than other breeds, slightly higher birth weights, and the highest calving rate of 51%. The Abigar breed exhibited the worst reproductive performance with only 1 calf in the study time, less aggressive sexual behavior, and the lowest calving rate of 3% due to high tsetse challenge (Lemecha et al 2006). The Good reproductive

performance under trypanosomosis challenge is also considered to be strong indicator of trypanotolerance.

V. CONCLUSION AND RECOMMENDATIONS

The following conclusion and recommendations can be drawn from the review :

- From the research reports so far it is possible to conclude that the effective population size of the breed is declining from time to time and the breed can be designated as critically endangered.
- Genetic and phenotypic studies undertaken on Ethiopian indigenous cattle population described the unique genetic make up of the breed which makes it different from the rest of the breeds.
- The future for livestock production in tsetse infested areas of Ethiopia has never been brighter. This ability to take unproductive land and make it productive, through trypanotolerant livestock, will help to ensure sustainable agriculture for generations to come. The current evidences showed that sheko breed is a better choice in areas with high level of tsetse infestation.
- The current effort of introducing AI service and distributing borana cattle to the native areas of sheko population will aggravate the rate of admixture with other breed and exacerbates the extinction of the breed.
- All the concerned stakeholders in the area including, bureau of agriculture and rural development, Bonga research center , Jimma University and institute of biodiversity conservation should design an *in situ* conservation schemes to conserve the breed in its own native environment.
- The potential of the breed for milk and meat production under different management conditions should be evaluated and improvement program should be implemented.

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