

Status of Ethiopian indigenous Sheko cattle breed and the need for participatory breed management plan

Takele Taye^{1*}, Workneh Ayalew^{2†} and B.P. Hegde³

¹Wolaita Soddo Agricultural Technical Vocational Education and Training College, PO Box 120, Wolaita Soddo, Ethiopia.

²International Livestock Research Institute (ILRI), PO Box 5689, Addis Ababa, Ethiopia.

³Haramaya University, PO Box 138, Dire Dawa, Ethiopia.

Abstract

Sheko is the only surviving taurine of the Abyssinian region, and is in danger of extinction mainly due to interbreeding with neighboring Zebu breeds and scarcity of pure Sheko breeding bulls. This study was undertaken to study current status of Sheko cattle breed and husbandry practices in southwestern Ethiopia between August 2004 and February 2005. The survey revealed that farmers do not recognize special characteristics and desirable qualities of the breed, notably its tolerance to endemic diseases, the relative high milk yield, long lactation period, stamina for traction, less selective feeding behavior and maintaining good body condition at times of feed scarcity. The breed's voracious feeding habit and aggressive temperament, however, are noted by farmers as undesirable traits. To reverse the declining population trend and to lay the elements of sustainable use, a breed management plan consisting of establishing *in situ* breeding station, organizing a Sheko cattle owners' society, establishing breed studs in its breeding tract, promoting niche market and improving the husbandry practices, were proposed.

Keywords: Breed management plan, breed status, Ethiopia, desirable qualities, Sheko cattle

Introduction

Sheko cattle breed is the only surviving indigenous taurine breed of the Abyssinian region (Hanotte *et al.*, 2000), and is one of the 23 recognized cattle breeds in Ethiopia. Recent genetic studies on some Ethiopian cattle breeds revealed that the Sheko is distantly related to Sanga cattle breeds in Ethiopia (Dadi *et*

* Current address: The Norwegian University of Life Sciences, P. O. Box 193, NO-1432 Aas, Norway. Corresponding Author: Email: takele_taye@yahoo.com [Takele Taye]

† Current address: National Agricultural Research Institute, Livestock Program P O Box 1639, Lae, 411 MP, Papua New Guinea. Email: Workneh.ayalew@nari.org.pg.

al., 2008) The breed is known to have evolved in the tsetse belt of southwestern Ethiopia under natural selection and patronage of the Sheko people and other ethnic groups that inhabited its breeding tract (Takele, 2005). Although the breed has been referred to in the literature as Sheko (Epstein, 1971; Alberro and Haile-Mariam, 1982; Mason, 1988), the various ethnic groups maintaining the breed use different names that are now considered as synonyms (Takele, 2005; Takele *et al.*, 2007).

Sheko's unique evolutionary history, status and trypanotolerance have attracted research attention (Hanotte *et al.*, 2000; Lemecha *et al.*, 2006; ILRI, 2006; Dadi *et al.*, 2008). The long held view that the breed is endangered by extinction (Epstein, 1971; Alberro and Haile-Mariam, 1982) was corroborated by molecular genetic evidence that showed about 90 percent of the sampled Sheko bulls have had their specific *taurine* allele replaced by *indicine* allele confirming an alarming introgression of Zebu genes (Hanotte *et al.*, 2000). A more recent breed survey (Takele, 2005) confirmed that pure Sheko bulls are rare in the home area of the breed and the Sheko cattle keepers have either chose to or been forced to use Zebu bulls to mate Sheko cows. Moreover, the heterozygosity level observed in Sheko cattle was lower than expected; indicating problem of inbreeding, and the total number of alleles found in Sheko cattle was the least compared to other contemporary Ethiopian breeds (Dadi *et al.*, 2008). In recognition of this current scenario on status of the breed, this study was undertaken to outline a participatory breed management strategy to rescue the breed and promote its sustainable utilization in its home area and beyond.

Materials and Methods

The study area and population

This study canvassed the known current geographical distribution of Sheko breed of cattle in Bench Maji Zone of southwestern Ethiopia, as identified through consultation with local administration and agricultural extension officers, key informants (cattle traders, village chiefs, elders) and researchers. The breeding tract covers a total of 23,000 km² divided into nine districts and two major agro-ecological zones (lowland and mid-highland). The existing true-to-type Sheko cattle were also identified, located and enumerated through extensive consultation with Sheko cattle owners.

Methods of data collection and analysis

The breed survey was conducted between August 2004 and February 2005. Sets of open-ended questions were used to guide focus group discussions with key informants, local agricultural extension staffs and knowledgeable elders. The discussions covered origin and evolution of cattle in the area; existing cattle breed types, special attributes of cattle breeds and trait preferences. A semi-structured questionnaire was also administered on 129 Sheko owning farmers in 35 villages identified by the focus group discussions to collect data on cattle husbandry practices and desirable and undesirable traits of Sheko cattle. This was also supported by extensive field observations by the lead author. Further details about study methods were described in Takele *et al.* (2007). Descriptive statistics of SAS (1999) was applied to analyze the data and generate summary statistics.

Results

Population trend and breed status

The total population of true Sheko cattle were enumerated to be about 4000 heads (Takele, 2005), which accounted for only two percent of the total cattle population in the known breeding tract of Sheko. Even this number was noted to be on decline in recent years which confirmed the widely held notion that Sheko breed is indeed endangered. Focus group discussions also revealed that Sheko cattle have grown smaller in body size, with narrower belly and hindquarters. Key informants reported that elite Sheko cows used to be milked up to 15 litres per day when feed supplies were abundant, although such figures are difficult to verify. What is certain is the relatively high milk producing capacity of the Sheko in the hot and humid climate of the home area.

Desirable and undesirable traits of Sheko cattle

Desirable and undesirable traits of Sheko cattle as identified by the respondents are summarized in Table 1. In addition, the focus group discussion suggested better feed conversion efficiency, longevity, fertility, and good mothering ability of the Sheko compared to other cattle breeds in adjacent areas. Faster growth rate, larger body size and larger teats than the comparators were also noted as useful traits to improve milk production of the Sheko breed. Some key informants also reported that unlike their horned zebu counterparts the polled Sheko do not have difficulty to move around in dense forest for grazing. On the other hand, their occasional aggressive temperament and voracious feed-

ing habits, particularly during the dry season, were mentioned as undesirable traits.

Sheko cattle owners also identified special desirable adaptive attributes of the Sheko cattle against common stressor variables (Table 2). Most of the Sheko cattle owners had rated the Sheko cattle within high to moderate adaptation categories to these stressors compared to the zebu cattle in the region, although such preliminary indicators need to be substantiated through further studies.

Table 1. Frequency of desirable and undesirable traits of Sheko cattle

Traits	Frequency	Percent
Desirable traits		
Relatively high milk yield	74	46.2
Disease tolerance	15	9.4
Draught stamina	12	7.5
Less selective feeding behavior	11	6.9
Attractive look	10	6.2
Ability to maintaining good body condition	7	4.4
Short inter-calving period	5	3.1
Long lactation period	4	2.5
Undesirable traits		
Aggressive temperament	15	9.4
Voracious feeding habit	7	4.4

Table 2. Sheko cattle owners' perception on relative adaptive attributes of Sheko cattle compared to zebu type cattle

Stressor variable	N	Relative adaptation (%)		
		High	Medium	Low
Heat load	129	61.3	27.1	11.6
Feed scarcity	129	45.7	24.8	29.5
Tick infestation	129	41.1	48.8	10.1
Internal parasite infestation	129	40.3	49.6	10.1
Annoyance by biting flies	124	39.5	52.4	8.1

Constraints to Sheko cattle management

Sheko cattle keepers identified major constraints that contributed to the decline of Sheko cattle. These were later considered along with those reported by other stakeholders in developing a suitable breed management plan.

Shrinkage of grazing land: Focus group discussions and key informants reported that communal pastures that supply the bulk of feed resource are on decline due to expansion of crop fields in the face of rapid human population growth. Consequently, Sheko cattle keepers increasingly resort to tethered feeding. Average cattle herd size is therefore declining, which also discouraged maintenance of Sheko breeding bulls and encouraged communal use of available (non-descript) breeding bulls.

Polledness and aggressive behavior of the breed: Nearly 90 percent of the sampled Sheko cows and 85 percent of bulls were found to be polled. Normally farmers tether their cattle by the horns; polled cattle are tethered either by the neck or leg, which are less preferred to horn tethering as they do not provide secure tethering. In fact such animals often break the tether and damage crop fields to the detriment of communities' social relations. Some of the respondents also mentioned that polled animals have less attractive look as they lack the preferred grace that cattle have with their horns. Large size and strong physique of the breed also make tethering difficult especially by children and women. Some respondents, however, reported that Sheko cattle can better identify their owners and better respond to good care than the zebu type cattle or their crosses.

Scarcity of Sheko breeding bulls: Interviews, focus group discussions and observations on sampled cattle herds indicated that true Sheko breeding bulls are indeed scarce in the study area. The majority of small cattle herds do not keep breeding bulls, and the remaining few farmers mostly keep non-Sheko bulls. This is being exacerbated by the declining availability of grazing pastures. As young Sheko bulls are either disposed of or castrated at early age owing to their aggressive temperament, the smaller and more versatile zebu bulls and their derivative have become more prevalent in the breeding tract. Farmers that do not keep bulls are, therefore, forced to use any breeding bulls from their neighbourhood irrespective of the breed identity.

Misapprehension of importance and status of the Sheko cattle: Local, regional and national stakeholders have lagged behind to appreciate the relative importance of the breed and current breed status. Even the gradual recognition of these challenges did not lead to active interventions. There has also been lack of empirical evidence on population size and structure to invoke further research.

Lack of active intervention on the breed: The only significant effort made was the set up of Sheko cattle genetic improvement program at Bege breeding ranch outside of the breeding tract of Sheko cattle. Unfortunately, the ranch did not have functional link with the surrounding communities. That perhaps led to complete demolition of the ranch and its breeding stock during the political instability that ensued following the violent change of government in Ethiopia in 1991. No significant effort was made to re-establish the ranch, and even the recovered breeding animals were not put back into any breeding scheme. However, a collaborative research and development project has been undertaken by the International Livestock Research Institute (ILRI) and the Ethiopian Institute of Agricultural Research (EIAR) to evaluate trypanotolerance attributes of the Sheko cattle along with three other cattle breeds in the Ghibe valley. Similarly ILRI and the Southern Ethiopia Agricultural Research Institute (SARI) are considering a participatory breed improvement plan in the home area of the breed.

Proposed breed management plan

Based on findings of this study, an active breed management plan is suggested to rescue this unique breed and promote its sustainable utilization. The plan has the following eight elements:

Census and monitoring of Sheko cattle population: This is essential to precisely monitor population size and herd age structure to provide vital information for breed improvement. The unique attributes and current status of the Sheko breed justify a specific breed census in its current breeding tract. If specific breed census is not realistic, the regular agricultural censuses conducted by the Central Statistical Authority (CSA) can be adapted to generate breed level data on the Sheko cattle, with budget provisions to meet incremental costs. The minimum task needed is to identify enumerated cattle by breed type, such as Sheko, non-Sheko and cross so that census tabulations can be done by breed type. This is consistent with the Global Plan of Action for Animal Genetic Resources adopted by the community of nations with the Interlaken Declaration (FAO, 2007).

Targeted publicity of Sheko breed: The general public in and outside the natural habitat of the breed (where the breed can have potential market niche) should be targeted to publicize special merits of the breed, such as its trypanotolerance, adaptation to warm and humid environments and its desirable

dairy qualities. Components of the breed management plan should also be widely communicated to relevant stakeholders using appropriate media.

Improving husbandry practices: Tools such as nose rings could be used to tame aggressive Sheko bulls and oxen in the area. Traditionally farmers use ear rings for the same purpose and this practice needs to be closely examined for its effectiveness. One of the major problems is the tie ropes do not last long, thus rope made of high quality material can be considered as an option and provided at subsidized cost until the status of the breed improves. Breaking and training of animals at younger age and alternating herding with tethering can soften aggressive behavior of the breed. Specific interventions are needed to improve feed supplies and sustain existing grazing lands to increase average herd sizes. Larger herd sizes increase the likelihood of selection and maintenance of breeding studs in the villages. Some communities need more accessible watering points and natural mineral licks to fully utilize potential of the Sheko breed.

Creating market opportunities for the breed outside of its home tract: The breed has potential for high marketability in large parts of south-west-ern Ethiopia constrained by medium to high tsetse and trypanosomosis challenges. Government-sponsored schemes of resettling smallholder farmers from densely populated highlands into underutilized fertile and sparsely populated valleys of south-western Ethiopia have recently created demand for adapted breeding cattle for which the Sheko cattle is the best alternative. Dairy and draught qualities of the breed may be worth investigating even for other agro-ecologies. The extension services and the national research systems need to support this effort until market interests gain momentum. Given the threat the breed is facing an incentive system whereby an owner who manages to get a Sheko calf (sired by a Sheko bull) can be rewarded needs to be put in place. This would make the use of proposed studs efficient and make owners to work against indiscriminate mating (Zander *et al.*, 2008).

Establishing *in situ* breeding station: The provincial administration has had plans to set up *in situ* pure breeding station either in the Sheko or Bench district. This plan should be supported and incorporated as part of this breed management plan with active participation of local stakeholders. The station can then supply elite breeding bulls and heifers to interested Sheko breeders initially in the home area and eventually to others as well. However, this plan may be constrained by shortage of budget as such a plan naturally should have a long timeframe. Such public institutions may also need support from other

stakeholders to sustain operations of the station. Therefore this plan needs to be supported by satellite breeding schemes run by smallholder breeders.

Establishing smallholder stud breeders: To urgently overcome the prevailing scarcity of Sheko bulls, selected villages can be supported to establish voluntary stud breeders' groups. Use of the stud bull will be based on a commonly agreed payment mainly to cover bull management costs. This decentralized breeding scheme can also alleviate occasional problems of cattle theft. This scheme therefore can be managed together with the planned *in-situ* Sheko breeding station.

Address indiscriminate use of non-descript and zebu bulls: Through provision of Sheko bulls, indiscriminate use of non-descript and zebu bulls can be discouraged. Castration of young Sheko bulls should also be discouraged through active publicity. Farmers should be provided with better market opportunities to sell young Sheko breeding bulls. This can be also supported through provision of semen using the functioning network of artificial insemination service.

Organization of Sheko cattle breeders' society: A small group of interested Sheko cattle owners can initiate such an organization to provide the social platform for promoting the breed. Technical guidance can then be provided on setting standards to register the true Sheko cattle and to create opportunities for marketing of breeding stock in and outside of the breeding tract. The society together with concerned bodies can develop incentives for farmers participating in genetic improvement of the Sheko cattle.

Developing artificial insemination program for Sheko

Enhanced use of cryopreserved Sheko bull semen at the National Artificial Insemination Center (NAIC) particularly in the Sheko home area as part of the ongoing artificial insemination service can help alleviate the limitations in pure breeding of Sheko cattle. At the same time, semen can be collected from known Sheko bulls in same area for cryopreservation and further use. However, care has to be taken to minimize the rate of inbreeding which might result from excessive use of few bulls.

Discussions

Superior trypanotolerance attributes and better fertility of the Shoko cattle (Lemecha *et al.*, 2006) coupled with desirable dairy and traction qualities

(Takele, 2005; Takele *et al.*, 2007) can be used to selectively promote the breed and avert further decline of the breed population. However, Sheko cattle keepers are neither well aware of these opportunities nor the precarious status of the breed.

Mwacharo and Drucker (2005) and Zewdu *et al.* (2006) have shown the challenges associated with small herd sizes and suggested that group-breeding schemes can overcome structural limitations of institutionalizing selective breeding. It is therefore suggested that implementation of the suggested management plan should be initiated sooner to avert further declines in the surviving Sheko cattle population and when many communities can clearly identify true-to-type Sheko cows and bulls.

As Wollny (2003) and Scarpa *et al.* (2003) have pointed out, any breed conservation plan should be based on validated superior economic benefits of the breed. Direct and indirect incentives to breed maintenance should also be based on expected economic benefits to society. According to Lund (2002) incentives can encourage the owners to keep breeding stock under good management which enhances maintenance of the breed. This may, therefore, require establishment of Sheko breed conservation fund.

Köhler–Rollefson (2003) recommended active publicity as a vehicle to disseminate knowledge on special qualities and value of the breed. This is a useful strategy to harness the community support and to sensitize the public sector.

Formation of breeders' society for Sheko cattle will ensure farmers' participation to identify elite animals, create market opportunities, initiate herd registration, and to take the lead in conservation activities (Hegde, 2005). To achieve this, the society has to be an independent and legally recognized organization with executive powers. This requires mobilization of resources and leadership development through capacity building (Köhler–Rollefson, 2003).

Artificial insemination can be used to support conservation measures for the maintenance of threatened breeds (William and Amanda, 1999). This can be therefore adopted to conserve and increase the population size of the Sheko breed.

Conclusion

The endangered Sheko breed can be rescued and developed through active breed management plan with full participation of a range of stakeholders in-

cluding Sheko cattle owners, agricultural extension staff, administration officials, conservationists and researchers. The plan should primarily address commonly identified constraints to Sheko cattle maintenance while harnessing breed promotion opportunities based on special qualities of the breed. The emerging large market opportunity for trypanotolerant cattle can be targeted to promote Sheko breed outside its natural habitat in parts of southwestern Ethiopia.

Acknowledgements

Sheko cattle keeping communities in the study area contributed their their knowledge and time for the purposes of this study. The Ministry of Agriculture and Rural Development and the International Livestock Research Institute (ILRI) provided financial support to cover parts of the cost of this study.

References

- Alberro, M., Haile-Mariam, S. 1982. The indigenous cattle of Ethiopia. Part I. *FAO World Anim. Rev.* 41: 2–10.
- Dadi, H., Tibbo, M., Takahashi, Y., Nomura, K., Hanada, H. and Amano, T. 2008. Mi-crosatellite analysis reveals high genetic diversity but low genetic structure in Ethiopian indigenous cattle populations. *Animal Genetics*. 39: 425–431.
- Epstein, H. 1971. The origin of the domestic animals of Africa. Volumes I and II. Afri-cana Publishing Corporation. New York (USA).
- FAO. 2007. *The Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration*. Rome.
- Hanotte, O., Tawah, C. L., Bradley, D. G., Okomo, M., Verjee, Y., Ochieng, J. and Rege, J. E. O. 2000. Geographic distribution and frequency of a taurine *Bos taurus* and an indicine *Bos indicus* Y specific allele amongst sub-Saharan African cattle breeds. *Molecular Ecology* 9: 387–396.
- Hegde, B.P. 2005. Cattle breeding strategy to improve milk production in Ethiopia. Alemaya University. Unpublished manuscript.
- ILRI, 2006. Safeguarding Livestock Diversity: The Time is Now. Annual Report 2006. International Livestock Research Institute.
- Köhler-Rollefson, I. 2003. Community-based management of animal genetic resources-with special reference to pastoralists. In: Proceedings of Community-based man-

- agement of animal genetic resources. Workshop held in Mbabane, Swaziland, 7-11 May 2001. FAO, Rome, Italy. pp 13–25.
- Lemecha, H., Mulatu, W., Hussien, I., Rege, E., Tekle, T., Abdicho, S. and Ayalew, W. 2006. Response of four indigenous cattle breeds to natural tsetse and trypanosomosis challenge in the Ghibe valley of Ethiopia. *Vet. Parasitol.* 141:165–176.
- Lund, V. 2002. Ethics and animal welfare in organic animal husbandry an interdisciplinary approach. Doctoral thesis, Swedish University of Agricultural Sciences. 179pp
- Mason, I.L. 1988. A World dictionary of livestock breed types and varieties. 348p. Wallingford, Oxon (UK): C.A.B. International.
- Mwacharo J.M. and Drucker A.G. 2005. Production Objectives and Management Strategies of Livestock Keepers in South-East Kenya: Implications for a Breeding Program. *Trop. Anim. Health Prod.* 37: 635–652.
- SAS, 1999. (Statistical Analysis System). Institute Inc. SAS/ STAT User's Guide, Version 8, Cary, NC: SAS Institute Inc., 1999. 3884p.
- Scarpa, R, Ruto, E.S.K., Kristjanson, P., Radeny, M., Drucker, A.G., Rege, J.E.O. 2003. Valuing indigenous cattle breeds in Kenya: an empirical comparison of stated and revealed preference value estimates- Analysis. *Ecological Economics* 45: 409–426.
- Takele Taye. 2005. On-farm phenotypic characterization of Sheko breed of cattle and their habitat in Bench Maji Zone, Ethiopia. MSc Thesis, Alemaya University, Ethiopia. 105pp + xv
- Takele Taye, Workneh Ayalew and Hegde, B.P. 2007. On-farm characterization of Sheko breed of cattle in southwestern Ethiopia. *Ethiop. J. Anim. Prod.* 7(1): 89–105.
- William V. H. and Amanda R. P. 1999. Role of reproductive technologies and genetic resource banks in animal conservation. *Rev. Reprod.* 4: 143–150.
- Wollny, C.B.A. 2003. The need to conserve farm animal genetic resources in Africa: should policy makers be concerned? Commentary. *Ecological Economics* 45: 341–351.
- Zander, K. K., Drucker, A., and Holm-Mueller, K. 2008. Costing the conservation of animal genetic resources: The case of Borana cattle in Ethiopia and Kenya. *J. Arid Environ.* 73(4-5): 550–556

Zewdu Wuletaw, Workneh Ayalew and Johan Sölkner. 2006. Breeding scheme based on analysis of community breeding objectives for cattle in north-western Ethiopia. *Ethiop. J. Anim. Prod.* 6(2): 53–66.
Takele Taye, et al.
