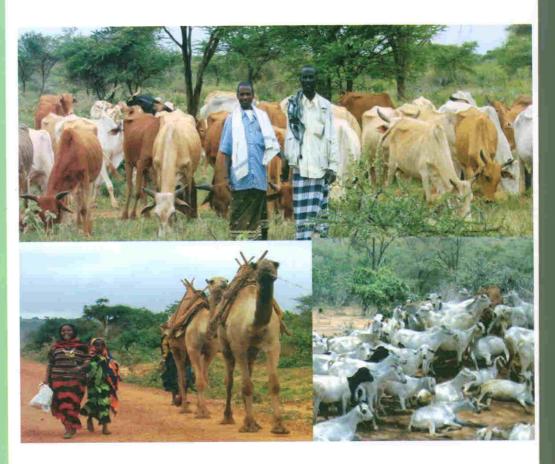# ESAP Proceedings

Indigenous Peoples and Animal Agriculture in Ethiopia: Exploiting the Potential and Reducing Limitations

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Success and Failure of Small Ruminant Breeding Programmes In Relation to Indigenous Knowledge, Genotype and Local Environment in the Sub-Saharan African Countries (SSA)

Yosef Tadesse and Sanjoy Kumar Pal

School of Animal and Range Sciences, College of Agriculture, Haramaya University, Post Box: 138, Haramaya, Ethiopia

Abstract

This study is concentrated on assessing status of small ruminant breeding program and identifying the different constraints in SSA. In many pervious small ruminant breeding projects in the region, conclusive emphases have not been given for different constraints that hinder small ruminant improvement program. Breed improvement in sub-Saharan African countries is multifaceted besides components of breeding program. Hence it is important to relate their performance to the environmental limitations, indigenous knowledge, and production systems. The sub-Saharan African countries are gifted with numerous genotypes. But there potential are not exploited in the region. In addition there was no conclusive study on the status of small ruminant breeding program in SSA. Hence for the purpose of this study different literature and recent materials have been used. As observed in this study SSA countries should look at what is available locally and even crossbreeding of indigenous breeds should be considered before going for importations. This study indicates that in recent years crossing of indigenous breeds is observed in eastern and southern region of the continent. Local breed will have a potential to improve productivity of small ruminant animals. Interaction between genotype and environment is also another constraint for breed improvement. In addition to that enough individual farmers/herders should combine to establish a substantial, effective flock, large size population (small size population is constraint of animal improvement in SSA). Indigenous knowledge should be respected and integrated with modern management approaches beside others. Breeding goals are influenced by socio-cultural norms, aesthetic preferences, religious considerations and behavioural traits. Thus, working with communities as a breeding programme should be considered as one of the ways to ensure for the success of small ruminant development programmes and government, international institute in SSA countries should support long term livestock breeding strategies for the benefit of the nations and people.

Keyword: Indigenous knowledge; Breeding program; Small ruminant

Introduction

Small ruminants easily fit into the smallholder production system, as they require low initial capital investment and low operational cost. They also give quick returns because of short generation interval and high level of prolificacy. They are less costly to acquire and maintain, and can often thrive on harsher terrain. At the same time, they provide products for cash sale when a need arises, and provide the household with much needed protein.

Even though, population growth, urbanization and income growth in developing countries as predicted by (Delgado *et al.*, 1999) are quelling a massive increase in demand for food of animal origin the contrary was happened in SSA. According to the most recent report on the

state of food insecurity in the world, there are now about one billion undernourished people and one-third of them are from Sub-Saharan African countries (FAO 2009). One of the causes of this undernourishment is lack of protein source of animal origin.

To improve the living standard of small scale poor farmers and to meet the demands of human population in the region, contribution from sustainable increase in small ruminant production would be desirable in the future. The breeding goal reflects the combination of traits that the breeder aims at improving through selection. The breeding goals of livestock keepers are often multi-faceted (Kohler-Rollefson, 2000; Rege et al., 2001; Bebe et al., 2003) and go well beyond increasing animal productivity. The multifaceted breeding goals of livestock keepers were overlooked in many small ruminant breed improvement programme in the SSA countries in the past (Blench, 1999; McCorkle, 1999; Rege et al., 2001). Especially less emphasis has been given to indigenous knowledge and interaction of breed and local environment. In addition there is no comprehensive study on the status of small ruminant breeding program. Therefore, the aim of this review is to assess constraints and status of small ruminant breeding program in sub-Saharan African countries.

Strategies for Genetic Improvement of Sub-Saharan Small Ruminant

Conventionally, two main pathways have been considered for the genetic improvement of livestock (i) selection with in breeds and (ii) selection between breeds (or strains). There are many factors that determine the success of a breeding program. These include design and implementation issues. The potential of indigenous livestock breeds besides the usual cross breeding in sub-Saharan countries must be developed. Studies made on indigenous sheep breeds revealed significant between and within breed variation for growth and indicated feasibility for productivity improvement of indigenous sheep breeds through genetic means (Abegaz, 2002; Tibbo, 2006). Other studies (Inter-cooperation, 2000; Kebede, 2000) also indicated that local breeds may be able to compete with improved breeds, even with regard to productivity. In the context of "sustainable livelihood" approaches to development (Anderson, 2000) explained that local livestock is an important contributor to rural welfare and poverty alleviation.

There are two path ways of genetic improvement in livestock i.e. between breeds and within breed. Within-breed selection is a strategy of genetic improvement usually carried out in individual population. It is possible to utilize numerous genotypes from sub-Saharan African countries. What is required is knowledge of their relative merits and appropriate exploitation of these merits. Some study (Philipsson et al., 2006) explained that in many sub Saharan region the value of indigenous breeds, indigenous knowledge of producers and the requirement of long-term strategies that any development of a breeding programme must comply with to be sustainable have largely been neglected.

Selection between breeds can achieve dramatic and rapid genetic change when there are large genetic differences between breeds (population) in trait of performance (Smith, 1996). Some study (Solomon and Tesfaye, 2009) suggested that it is appropriate to made a decision on different cross breeding strategies in different farmers using a mixed pure and crossbreed

structure with ecological and socio-economic considerations when designing a breeding programme. In this regard (Philipsson *et al.*, 2006) described that the choice of breeding method, pure breeding alone or also using crossbreeding, is perhaps the most important decision to be made when designing a breeding programme. In the following sections components of breeding program in designing a breeding program will be presented and aspects on developing improvement programmes at breed level will be dealt with.

Component of Breeding Program

Successful genetic improvement requires breeding program to have (at least) the following components: i) describe the production system ii) setting of breeding goal or objectives. iii) A system to record data on selection candidates IV) Methods and tools to estimate the genetic merit (breeding value) of selection candidates. This step is called the "breeding value estimation". V) A system to select the animals that become parents of the next generation, and mate them to produce the next generation VI) Monitor the breeding programme. vii) A structure of product development and dissemination in to the multipliers and commercial producers. viii) Mating or cross breeding (Dekkeral *et.* 2004; Philipsson *et al.*, 2006).

Success and Failures of Small Ruminant Breeding Program

Successes of Small Ruminant Breeding Programs

There are a number of successful small ruminant breeding program in different part of SSA countries like FARM-Africa's Dairy Goat and Animal Health (DGAH) Project in the 1990s' in Kenya (Farm Africa 2004), the indigenous Djallonke breed of sheep is used in a community-based livestock improvement and conservation initiative in Côte d'Ivoire (Yapi-Gnoare, 2000), Community based breeding program for Bongo, Horro, Menz and Afar local sheep breed in Ethiopia (Takele *et al.*, 2010).

Failures of Small Ruminant Breeding Programs

Inappropriate "improvement" schemes may be introduced or adopted to SSA countries and it can be one of the causes of failure. In this regard it is possible to mention many failures in small ruminant breeding program in SSA. For instance, the Horro Sheep Breeding and Improvement in Ethiopia (OADB 2001), Sahelian sheep breeds (Peul and Touabire) improvement project in northern and southern Senegal in 1973 (Fall, 2000), Menz sheep genetic improvement project in Ethiopia (Solomon and Tesfaye, 2009), crossbred of Dorper and Boar with the local small ruminant population in a harsh environment cannot improve overall efficiency due to high mortality rates in Malawi (MGLDP, 1992) and others. In the following sections, the possible grounds for success and failure of different small ruminant breeding program in sub-Saharan African countries will be discussed.

Discussion

In the current study, the published results on within and between breed breeding program was summarized in different breeding design. The number of publication was small especially for within-breed improvement in the early 1970s' and 80s'.This is because most of the development program using within breed breeding program is a recent awakening and if any few to report. Except few countries, most SSA countries have started small ruminant improvement in the 1960s'.During these time different cross breed were imported from European countries to exploit heterosis and upgrade the performance of local breed. Almost all breeding programs were initiated and implemented in research station or government livestock ranches. Besides, breeding objectives and goals were set by breeders from top to bottom without the participation of the farmers/herders. Therefore, there is a lot to learn from SSA small ruminant breeding program. The aspects determining different failure and success and other pertinent issues are discussed under the following heading.

Livestock Development Policy

Small ruminant breeding programmes should be seen in the context of long-term development programmes contributing to both more food and other livestock commodities produced and to improved resource utilization and livelihood of the livestock owners (Mueller, 2006). As observed in this study some of the small ruminant breeding programs are failed because of absence of long term strategy, poor government station management and absence of breeding policy (Okeyo, 1997; Fall, 2000; Solomon and Tesfaye, 2009). In this regard (Tibbo. 2006) explained that, one of the most important limiting factors in setting up of breeding programmes has been lack of an institution who oversees these activities.

Environment, Production System and Indigenous Knowledge

Environment

Survival under local ecological conditions is often a primary goal (Kohler-Rollefson, 2000) with risk avoidance often being of paramount importance.

Production System and Indigenous Knowledge

For the success of breeding program in SSA the available production system should be considered. In this regard (Ahuya and Okeyo 2004) described that production systems determine and affect the viability of breeding program when inappropriate blood level of cross breed animals distributed to the farmers. Survival under local ecological conditions is often a primary goal (Kohler-Rollefson, 2000) with risk avoidance often being of paramount importance. Breeding goals are also influenced by socio-cultural norms, aesthetic preferences (for example, color and color distribution and physical structure of the earliest exotic sheep breed imported (Corrie dale) in Ethiopia were not preferable by the farmers), religious considerations (white sheep are preferred for the Muslim festival of Tabaski (Niger), and behavioural traits such as docility, good maternal ability, the ability to walk long distances,

tolerance to water scarcity, and loyalty to the owner (Blench, 1999; McCorkle, 1999; Rege *et al*, 2001). Even religion can influence breeding objectives. McCorkle (1999) indicated the case of Bodi agro-pastoralists of Ethiopia who carefully breed cattle of many coat colours for certain rituals. However, it is important to stress that the breeding goals and strategies of pastoralists are not static but generally evolve in response to changes in local ecological conditions, production systems, pastoralists' preferences, local knowledge, and market opportunities (McCorkle, 1999; Bebe *et al*, 2003).

Market

To be sustainable the breeding programme must be market-oriented, i.e., demand-driven, yet considering the multi-purpose use of the animals and the long-term benefits to the farmer (Philipsson *et al*., 2006).

Infrastructure and Government Support

As (Fall 2000) explained although there were exceptions, many selection and multiplication programmes in SSA funded by central governments had ceased operation, mainly because of lack of funds and manpower. One often over-looked assumption is the required integration of all activities constituting a breeding programme. This applies both at the government level and at the practical coordination at farmers' level (Okeyo 1997). Another potential problem in developing countries is lack of or inadequate number of people with appropriate training or incentives to successfully run a breeding programme (Philipsson *et al*., 2006; Ojango *et al*., 2010).

Role and Meeting the Need of Farmers

Experience shows that it is extremely important that farmers get involved early in the process to ensure that their needs are taken into account and that they provide the support needed for the programme to work (Ojango 2010; Wurzinger 2010).

Matching Genotypes with the Environment

As (Fall, 2000) explained successful matching of genotypes with environments assumes availability of a wide range-of genotypes. The sub-Saharan region is endowed with numerous genotypes. What is required is knowledge of their relative merits and appropriate exploitation of these merits.

Conclusion

For successful small ruminant breeding programme it is important to understand components of breeding programme. Breed improvement in sub-Saharan African countries is multifaceted. As observed in the current study local breed will have a potential to improve productivity of small ruminant animals. Improved breeding strategies and development of business skills are effective in improving livelihoods of resource poor farm families. It is possible to conclude that working with communities as a breeding programme can be one of the ways to ensure for the

success of small ruminant breeding programmes. It also helps to ensure that indigenous knowledge is respected and integrated with modern management approaches. Community and farmer monitoring of the results of breeding programmes are essential to measure success and achieve understanding among community members of any required adjustments.

For sustainable breeding program all inputs such as feed, veterinary service and others should be implemented should implement together. Government, international institute in SSA countries should consider incorporating (crossing between) indigenous breed in small ruminant breeding program besides exotic breeds. Government and other stakeholders should support long term livestock breeding strategies for the benefit of people and the nation.

References

Ahuya C.O. and Okeyo A. M. 2004. Sustainable genetic improvement of goat meat and milk Production in Kenya: A case of the Meru and Tharaka-Nithi Dairy and Animal Healthcare community-based Breeding Programme.

Anderson, S. 2000. Livelihoods and animal genetic resources: how can people's conservation Contribute to poverty reduction? Paper presented at the International Conference and Workshop on Local Livestock Breeds for Sustainable Rural Livelihoods, held in Udaipur and Sadri, India, 1–4 November 2000. Cited by Kohler-Rollefson, I. (2001)

Bebe, B. O., Udo, H. M. 1. Rowlands, G. J., and Thorpe, W. (2003). Smallholder Dairy Systems In the Kenya Highlands: Breed Preferences and Breeding Practices. Livestock Production Science 82: 117-127.

Dekkers JCM, Gibson JP, Piter Bijma and JAM van Arendonk 2004. Design and optimisation of Animal breeding Programmes, Iowa State University cited on 26th January, 2009 from http://www.anslab.iastate.edu/Class/AnS652X/chapter1.pdf

Fall A. 2000.Peul, Touabire and Djallonke sheep breeding programmes in Senegal. ICAR, Workshop on developing breeding strategies for lower input animal production environments. Bella, Italy, 22 to 25 September 1999.ICAR Technical Series No. 3. 331-338.

Farm Africa, 2004.Farm Africa's dairy goat development programme. Ethiopia 2004. The project has, to date, been partially successful. Although a considerable amount has been achieved in difficult circumstances, (file:///Y|/DFID_Original/Eval Report/ev_s562.htm (1 of 3) [27/07/2004 15:18:42]).　·

Intercooperation. 2000. Capitalizing on experience. Indo-Swiss Cooperation in Livestock Development in India. Bern. Cited by Kohler-Rollefson, I. (2001).

Kebede, W.A. 2000. Do smallholder farmers benefit more from cross-bred (Somali x Anglo-Nubian) than from indigenous goats? University of Göttingen. (Ph.D. thesis). Cited by Kohler-Rollefson, I. (2001).

Kohler-Rollefson, (2000). Management of Animal Genetic Diversity at Community Level. GTZ, Eschborn.

Mueller, J.P., 2006. Breeding and conservation programs with local communities. FAOWAAP Expert meeting "Sustainable Utilization of Animal Genetic Resources", Ferentillo, Italy, 2-4 July 2006. Technical communication No PA 489.

OADB, 2001. OADB (Oromia Agricultural Development Bureau). Project proposal on Establishment of Horro cattle breeding and improvement centre. Livestock breeding centers co-ordination and pastoral development department. January 2001, Finfinne, Ethiopia.

Ojango J.M.K., Ahuya C., Okeyo A.M. and Rege J.E.O, 2010. The FARM-Africa dairy goat Improvement project in Kenya: A case study

Okeyo, A.M. 1997. Challenges in goat improvement in developing rural economies of Eastern

Africa, with special reference to Kenya. In: Ahuya, C.O. and van Houton, H. (Eds), Goat development in East Africa. Proceedings of a workshop held at Isaac Walton Inn, Embu, Kenya, 8–11 December l997.FARM-Africa, Nairobi, Kenya. pp. 55–66.

Philipsson, J., Rege, J.E.O. & Maw, O. 2006. Sustainable breeding programmes for tropical Farming systems. In: ILRI-SLU 2006. Animal Genetics Training Resource, CD- Version 2, Eds J.M. Ojango, B. Malmo's & O. Maw. ILRI (International Livestock Research Institute), Nairobi, Kenya, and SLU (Swedish University of Agricultural Sciences), Uppsala, Sweden.

Rege, J. E. O., Kahi, A., Okomo-Adhiambo, M., Nwacharo, J., and Hanotte, O. (2001). Zebu Cattle of Kenya: Uses, Performance, Farmer Preferences, Measures of Genetic Diversity and Options for Improved Use. Animal Genetic Resources Research 1, International Livestock Research Institute (ILRI), Nairobi, Kenya.

Solomon Abegaz, 2002. Genetic evaluation of production, reproduction and survival in a flock of Ethiopian Horro sheep. PhD thesis. Faculty of Natural and Agricultural Sciences, Department of Animal, Wildlife and Grassland Sciences, University of the Free State, Bloemfontein. 117 pp.

Solomon Gizaw and Tesfaye Getachew 2009. The Awassi x Menz Sheep Crossbreeding Project in Ethiopia: Achievements, Challenges and Lessons Learned (http: www.esgpip.com/Proceedings.html).

Tadelle Mirkena, G. Duguma, Aynalem Haile, Markos Tibbo, A.M. Okeyo, M. Wurzinger, J. Sölkner 2010. Genetics of Adaptation in Domestic Farm Animals: A Review Livestock Science132, 1-12.

Tibbo, M. 2006. Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopian highlands. PhD dissertation. Department of Animal Breeding and Genetics, Faculty for Veterinary Medicine and Animal Sciences, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden.

Wurzinger, M. 2010. Designing community-based breeding strategies for smallholders. Proceedings of the 10th International Conference on Goats, Mar Hotel, Recife, Pernambuco, Brazil, 19–23 September 2010.

Yapi-Gnoaré, C.V., 2000. The open nucleus breeding programme of the Djallonke sheep in Côte D'Ivôire. In: Proceedings of the Workshop on Developing Breeding Strategies for Lower Input Animal Production Environments held 22–25 September 1999, Bella, Italy. Galal, S., Boyazoglu, J. & Hammond, K. (Eds.). ICAR Technical Series 3. pp. 283–292.