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Challenges in small ruminant breeding programs and resulting investment priorities in Ethiopia

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Summary

Ethiopia has a large population of small ruminants and diversity, which contribute substantially to the livelihood and income of the rural poor and the country at large. However, the sector is faced with various challenges. Productivity per animal and flock off-take are very low. Reasons attributed for the apparent low productivity are: absence of well-planned/appropriate breeding programs, lack of technical capacity, inadequate and poor quality feeds, diseases leading to high lamb mortality, and underdeveloped markets in terms of infrastructure and market information. Furthermore, sheep and goats used to receive little policy or investment attention. Genetic improvement of small ruminants could contribute to reversing the productivity gap. In the past the government of Ethiopia has placed much emphasis on importing exotic genetics and crossbreeding with local stock as a strategy for genetic improvement. However, this has not led to a significant productivity improvement and the programs have generally been unsustainable. Currently, there is a change in approach and a recognition that there is value in building genetic improvement on the local genetic resources that are well adapted to the diverse agro ecologies and production environments in the country. Community-based breeding programs (CBBPs), which focus on indigenous stock and consider farmers' needs, views, decisions, and active participation, from inception through to implementation, have been identified as a program of choice. The Ethiopian government and the private sector need to invest in strategic areas around CBBPs to make the program work for the poor and be sustainable in low input system.

Keywords: sheep and goat, breeding programs, investment priorities

Introduction

In Ethiopia sheep and goats are mostly kept by smallholders and the rural poor, including women headed households. The sheep and goat populations are estimated at 30.7 and 30.2 million, respectively (CSA, 2017). Sheep and Goats contribute substantially to the livelihoods of smallholder households as a source of income, food, and raw materials (skins). They also serve as a means of risk mitigation during crop failures, savings and investments in addition to other socioeconomic and cultural functions.

Agriculture provides sustenance for more than 80% of the population and accounts for 41% of GDP and 83% of total exports (NBE, 2011). Based on 2008/09 data, the livestock sector contributes up to 25% of agricultural GDP (45% if the value of ploughing services is accounted

for) and 11% (23% if cross border trade is fully accounted) of total Ethiopian foreign exchange earnings (Behnke & Fitaweke 2011). The high stock number, however, is not leading to higher exports or export earnings for live animals or meat. Ethiopia's annual exports of cattle and sheep meat were valued at USD 79.13 million in 2012 (ECRA, 2012), while Botswana with a much lower stock number was able to reach USD 150 million export earnings from beef alone (FAO, 2012). The low export level in Ethiopia could possibly be strong local demand leading to higher prices, relatively low meat output and differences in efficiency of meat production systems.

Sheep meat production grew by 2% per year on average between 2005 and 2011, but has been relatively unstable. From 68,000t in 2005, production reached 85,000 t in 2011, except in 2008 when it decreased by 4.2% compared to 2007. It recovered in 2009 and has been growing since. The average annual growth rate in sheep meat production is expected to be at 6% between 2013 and 2016 to keep up with a rise in sheep meat consumption and exports. For goat meat, low carcass yield in 2007 and 2008 led to a low production level. Goat meat production grew by an average of 2%/year between 2005 and 2011, reaching 51,000 t in 2011. Carcass yield is expected to revert to its historical levels, hovering around 8.4 kg/animal. Thus, goat meat production is expected to grow annually by 4% on average for the 2012–2016 period, reaching 61,000 t in 2016 as a result of strong demand for goat meat in the domestic and export markets (Legese & Fadiga, 2014).

As can be seen the small ruminant industry in Ethiopia contributes substantially to the livelihood of the rural poor and the country at large but is faced with various challenges. Productivity per animal and flock off-take are low. For example, recent estimates of the average annual off-take rate from sheep and goat flocks for the years 2008 to 2010 indicate values between 30% and 38% (Legese & Fadiga, 2014). Productivity is low for a range of reasons: high kid mortality, low growth rates, poor nutritional status resulting in infertility and long kidding intervals and disease prevalence. Controlled breeding is rare and there is limited culling of poorly performing does and breeding males.

Genetic improvement of the small ruminants could contribute to reversing the challenges the sector faces. However, research and development investment in the sector and the attention given to the sector in general is very minimal. The little investments made in genetic improvement have generally focussed on importation of exotic genetics and crossbreeding with the local stock, which were generally unsustainable and expensive failures. The Government of Ethiopia recognizes the need for change in approach and community-based breeding programs have now been identified as strategies of choice. This paper highlights approaches in genetic improvement of small ruminants and identifies investment priorities with focus on CBBPs.

Small ruminant Breeding programs in Ethiopia

The approaches to small ruminant breeding programs in Ethiopia are three:

- crossbreeding and distribution of crossbreed rams from stations/ ranches;
- selective breeding involving central nucleus schemes; and
- the recent community-based breeding programs.

The small ruminant breeding strategies adopted in Ethiopia over the last few decades largely focused on importing exotic breeds for cross-breeding and since the early 1960s substantial efforts have been made (Tibbo, 2006). These have included importing exotic sheep breeds such as Bleu du Maine, Merino, Rambouillet, Romney, Hampshire, Corriedale, Dorper

and Awassi sheep, and Saanen, Anglo-Nubian, Toggenburg and Boar goats. These introductions and crossbreeding were implemented by different government (research organizations and universities), non-government institution (example FARM AFRICA) and projects (examples CADU and ESGPIP). However, these genetic improvement programs produced no significant effects on sheep and goat productivity or on farmers' and pastoralists' livelihoods and the national economy at large (Gizaw *et al.,* 2011).

The major limitations in the livestock cross-breeding programs in Ethiopia has been the lack of a clear and documented breeding and distribution strategy. There has been very little consideration of the needs of the farmers and pastoralists, their perceptions, and indigenous practices. Additionally, they have had limited or no participation in the design and implementation of the breeding programs. Furthermore, the breeding programs lacked breeding schemes to sustain cross-breeding at the nucleus centres and at the village level (Gizaw *et al.,* 2010). The distribution of the improved genotypes of these programs was indiscriminate and unplanned, resulting in failure of the breeding programs and threatened to dilute the sheep and goat genetic diversity in the country.

The indigenous small ruminant genetic resources of Ethiopia have high within breed genetic variations (Abegaz, 2002; Kebede *et al.,* 2012) and desirable characteristics. However, there has been little effort to improve their genetic merit using the within breed genetic variation. The few sheep selective breeding programs initiated by the Institute of Agricultural Research in the 1980s, which included Afar and Horro sheep breeding programs, were limited to the formation of elite nucleus flocks and the programs have since been discontinued. There was no distribution scheme in place for the improved genotypes in the nucleus centers.

Currently, community-based breeding programs focusing on local genotypes is being advocated as the strategy of choice for genetic improvement of small ruminants (Sölkner *et al.,* 1998; Kosgey & Okeyo, 2007; Haile *et al.,* 2011). There are breeding programs underway for Menz, Horro, Bonga, Washera, Doyogena, Atsbi sheep and for Konso, Arsi and Abergelle local goats. Furthermore, a number of studies have been conducted to design suitable CBBPs for implementing selective breeding in smallholder farming systems in Ethiopia (Gizaw *et al.,* 2009; Haile *et al.,* 2011).

Breeding programs in Ethiopia are mainly funded either through government funding and/ or through short term development projects. There has generally been very little investment in the area of small ruminant breeding programs in Ethiopia, although such data is very difficult to get. The little investment made during the last few decades has been used in the establishment of centralized breeding programs mainly for crossbreeding programs. Private sector investment in small ruminant breeding is very limited. An example is the Yezerber sheep production and agro-processing farm in central Ethiopia which envisages the establishment of a sheep breeding and agro-processing plant / farm with a capacity to accommodate around 4000 head of animals per annum. Other less specialized programs also exist in the North West (for example in Metema area).

Community-based breeding programs

CBPP combines selection of breeding rams/bucks based on careful recording of important production parameters, such as body weight at 6 months, ewe lambing interval and ram lamb bodyweight and conformation at 12 months, with expert local opinion as to what constitutes a good ram/buck and communal use of selected rams/bucks. Farmers who wished to participate

are organized into sheep/goat breeding associations, many of which later evolve into formal cooperatives (Haile *et al.,* 2011).

The Ethiopian Government has accepted our approach as the strategy of choice for genetic improvement of small ruminants as explicitly indicated in the Ethiopia Livestock master plan. Consequently, the second Growth and Transformation Plan of the Ethiopian Government and the new World Bank Livestock and Fisheries sector transformation project are adopting CBBP.

Scale of operation of CBBPs

CBBPs have been established in a few countries around the globe but mainly as pilots. In Ethiopia we have established around 30 CBBPs each having around 60 households. As CBBP is a relatively new strategy for genetic improvement of small ruminants, the last few years have been spent on testing functionality of the strategy and we were trying to refine and customize the program to different agro-ecologies and production systems. We evaluated both biological and socio-economic performance of three CBBPs in Ethiopia and some of the results include the following:

- Sheep/goat farming, once a side activity for these farmers, is now their main business activity and the linchpin of their livelihoods.
- The best rams/bucks are now retained in the community for breeding instead of being sold for slaughter.
- 12,000 farming families have directly benefitted from CBBPs in Ethiopia.
- Farmers' sheep/goats have shown an improvement in performance, such as lamb growth rate, lambing interval, reduced mortality, and tend to attract higher prices in markets compared to sheep/goat from farmers who are not members of breeding groups.
- In three sites in Ethiopia, increased income from sheep production (average increase of 20%) and increased mutton consumption (now average of three sheep slaughtered per family per year compared to one sheep at the project start).
- Most of the newly established cooperatives have been able to build capital (e.g. Boka-Shuta cooperative has capital of about USD 60,000).
- CBBPs are currently being established in Uganda, Malawi and Tanzania, while nine other countries plan to introduce CBBP.

To make an impact CBBPs need to be implemented at scale. Our framework for the scale out is to use established CBBPs or set up new ones in strategically located sites along the breeding tract of the breeds we want to improve. These CBBPs would serve as production sites for improved rams/bucks which would be distributed to participating communities. Where appropriate, the distribution of improved genetics would be supported by artificial insemination.

How CBBPs could be made sustainable

Ideally, sustainable breeding programs:

- meet breeding objectives of individuals, communities and nations for which they were established;

- are self-sufficient (technically, economically and socially);
- are environmentally friendly (locally and globally).

An evaluation of Ethiopian sheep breeding programs suggests that sustainability largely depends on effective and well-functioning breeder cooperatives (Gutu *et al.,* 2015). Strengthening the financial capacity of cooperatives by linking them to better markets can contribute to the sustainability of these community-based approaches. Tailored training (on financial and technical management of breeding programs, etc.) can also form part of support offered to cooperatives.

Although cooperatives and associations can build strong institutional (and financial) capacity in the short run, they cannot be expected to run breeding programs without technical support from research and extension (Gutu *et al.,* 2015). Continuous technical and institutional support to cooperatives from national research and extension is crucial to their sustainability.

Investment priorities in CBBP

As has been alluded to, the Ethiopian government has been investing, though not to the level of other livestock species, in genetic improvement of small ruminants. Impacts from the earlier investments have not been to the level it should be. Investment in CBBPs are not as high as in other strategies, for example nucleus schemes. However, priority areas where government investment is needed are suggested as below:

- CBBPs require establishment of an association and we have found that legal cooperatives are necessities for sustainability of CBBPs (Gutu *et al.,* 2015). Therefore, establishment and capacitating of breeders cooperatives in the area of business management, genetic evaluation, and husbandry practices is extremely important.
- One key investment area could be in institutionalization of breeding programs (CBBP), Institution building requires investment (central database, computing infrastructure..). Available databases, for example, for dairy cattle could be explored to see if it could be used for small ruminants.
- Proper animal identification data recording and management are very crucial for CBBPs and for any breeding program for that matter. Enumerators could be employed with support from government who could assist in this exercise until the cooperatives become self-sufficient.
- Livestock breeders are in short supply in Ethiopia. Government needs to invest in capacity development of breeders at different level. The current initiative, with support from the Bill and Melinda Gates foundation that plans to train young Ethiopians at MSc level could contribute substantially to developing the sector.
- For dissemination of improved genetics and reproductive management cheap and clean reproductive technologies need to be available. Government needs to develop the capacity for mass synchronization and AI in small ruminants.
- Investment in infrastructure should be the responsibility of government. Development of handling yards for animals in cooperatives could be one example
- There has to be smooth coordination of activities among the different regional states and the federal government to avoid duplication of efforts and wise use of genetic resources.
- Transforming subsistence sheep and goat production to market oriented business is crucial. Therefore, government/private sector support in linking breeders cooperatives to input supply, breeding animal multiplication and dissemination as well as markets is needed.

Way forward

Small ruminant breeding program development is underway in Ethiopia. Breeding programs that involve producers has proved to be technically feasible, financially rewarding and is the choice of the Ethiopian government. Investment by the public and private sector in small ruminant breeding programs so far has been minimal and therefore this is an area that needs investment attention. It is recommended that the government invests in CBBPs than the often unsuccessful centralized nucleus schemes involving crossbreeding.

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