

How to tailor community based breeding programs for small ruminants to pastoral production systems

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Summary

The predominant small ruminant production system in Ethiopia is at the subsistence level with very low productivity despite a huge potential due to the large animal numbers and genetic diversity. Growing market demand both at local and export market and recent increased focus by the Ethiopian government considered as good opportunity to boost small ruminant productivity. Particularly local breeds in lowlands reared by pastoralists are highly preferred for export by slaughter houses and live animal exporters. Even though successful breeding programs and developed specialized breeds are available worldwide, importing and adopting large sized breeds and technologies has not been successful for the last four decades. Community based breeding programs, born from the previous lessons, have shown promising results in the highland smallholder system. However, flock mobility, very high temperature, frequent droughts and poor infrastructure in the pastoral system so far limits designing and implementation of community based breeding programs in pastoral areas. Tailoring these programs to fit the pastoral system considering its context need to be considered. Mapping of the mobility pattern, use of mobile extension and organized youth/community group to assist the breeding program during mobility are crucial.

Keywords: sheep, goat, pastoral system, low input, breeding program

Introduction

Small ruminants in developing countries contribute to food security, income generation and socio-cultural benefits. Ethiopia ranked 9th in the world in small ruminant population with 60.9 million heads (CSA, 2017). Sheep and goats are the main choice in the extreme highlands and very hot areas of Ethiopia as those areas are less suitable for crop production and larger animals. Small ruminant production in Ethiopia is at the subsistence level with very low productivity despite its huge potential given the large animal numbers and genetic diversity.

Recent study by Mottet et al., (2017) revealed that about 86% of the global livestock feed intake in dry matter consists of feed material that are not currently edible for humans which includes grazing forage, residues and by-products. About 57% of the land used for animal feed are not suitable for food production. These shows livestock played an integral role in food system. However, animals in developing countries are inefficient in the overall feed conversion ratio due to sub-optimal animal husbandry and breeding practices.

A modest yield improvement strategy using genetic selection, herd management and animal health interventions can significantly improve feed conversion ratio of livestock. Developing and implementing a sound breeding program is crucial to enhance productivity. Animal identification and recording, genetic analysis to choose best animals, a planned mating system and dissemination of genetic gain are the major components of a breeding program. Breed improvement is highly successful in developed countries due to strong national breeding program that coupled with high level of input, good technical capacity and infrastructure and good enabling situations (Sölkner et al., 1998; Mueller et al., 2015). Attempts to adopt such breeding programs in developing countries has not been successful for the last four decades due to many reasons (Getachew et al., 2015; Gizaw et al., 2014; Kosgey et al., 2006).

Continuous critical thinking of researchers worldwide has tailored a breeding program called the community based breeding program (CBBP), which works well under low-input system in developing countries (Haile et al., 2011; Mueller et al., 2015). However, setting up and implementation of any breeding program in pastoral areas of Ethiopia remain challenging due to mobility, high temperatures, recurrent droughts and poor infrastructure. This paper highlights context analysis of the pastoral system and suggest option to establish and implement CBBP under the challenging situations.

Challenges in adopting successful breeding program

Some remarkable results have been achieved by the developed world in well-designed organized breeding schemes. Breeding programs in the developed world have been favoured by resourceful environments and well-developed infrastructure and markets (Haile et al., 2011; Mueller et al., 2015).

Developing countries, impressed by the performance levels attained, have tried to achieve genetic improvement by importation of large and more productive breeds. These were tested on-station, multiplied and crossbred sires were distributed to smallholder farmers and pastoralists to improve their flock through crossbreeding (Awgichew and Gipson, 2008; Getachew et al., 2016). In addition, the establishment of central nucleus flocks in research centers has been used as an option to improve local breeds through selective breeding (Gizaw et al., 2013). However, more than four decades of efforts seems ineffective mainly due to:

- Lack of supportive infrastructure and capacity (Haile et al., 2011).
- No attention to continuous support of the breeding programs which led to high level of mortality in government farms mainly due to disease associated with confinement and poor logistics and infrastructure (Gizaw et al., 2013; Getachew et al., 2015).
- Poor efficiency in multiplication and dissemination (Gizaw and Getachew, 2009).
- Poor adaptation of crossbreds to low-input subsistence production system (Ayalew et al., 2003).
- Majority of sheep and goats are kept in small flocks which is less suitable for conventional breeding program.
- Introducing optimal selection and mating strategies is challenging due to continuous uncontrolled mating resulting in lambing distributed throughout the year (Gizaw et al., 2014).

CBBP in the highlands

To overcome these constraints, researchers worldwide have developed an alternative approach, the CBBP, which is better suited to low-input systems in developing countries. Communities take a leading role and fully participate in designing and implementation of the components of the breeding programs which are adapted to their specific conditions (Haile et al., 2011; Mueller et al., 2015). Sheep and goat CBBPs have been successfully established in the Ethiopian Highlands, which are characterized by sedentary mixed crop livestock system. Establishing animal identification, performance and pedigree recording systems, participatory sire selection and devising a working mechanism to maintain and use selected sires among communities under smallholder situation are considered a big achievement of CBBP. Furthermore, reasonable genetic gain in growth and reproductive traits has been achieved through CBBP (Gizaw et al., 2014; Haile et. al, unpublished data).

There is a growing interest of the Ethiopian government and the research community to repeat this success in the pastoral areas. This paper examines the specific challenges under pastoral conditions and presents ideas of how to adapt the modalities of CBBPs accordingly.

CBBP in pastoral system

Situation analysis

Pastoral areas in Ethiopia are characterized by herd mobility, high temperature, erratic weather conditions and recurrent droughts. These conditions limit the scope of interventions and lead to recurrent losses of valuable genetic resources. Breeding objectives are influenced by social and cultural factors, which makes it more difficult to identify them via conventional approaches (Gebreyesus et al., 2012; Haile et al., 2010).

There are very few experiences in implementing CBBP in pastoral communities (Mueller et al., 2016). An earlier attempt to implement CBBP in the pastoral system in the Afar region of Ethiopia was discontinued due to lack of progress and a failure of adapting the approach to the challenging circumstances. Establishing proper animal identification and recording schemes due to the high mobility is one of the major restrictions to run CBBP in pastoral areas. Adopting CBBPs to pastoral areas requires a contextual analysis of the system (Table 1).

Considerations for implementing CBBPs in pastoral areas

Participatory identification of breeding objectives

Gebreyesus et al., (2012) identified a high economic value for adaptation traits in agro-pastoral and pastoral system in addition to growth and body size. Therefore, identification of breeding objectives in pastoral areas needs to consider economic and non-economic interests of pastoralists. For example, a behavioral trait like alertness in females is considered an important trait which helps to lead the flock and protect it from predators (Gebreyesus et al., 2012). Grazing and walking ability, good body condition during drought time, mothering ability and other socio-cultural interests like animal associated with special person are important for

pastoralists.

Table 1. Challenges and opportunities of CBBP in pastoral areas.

Challenges	Opportunities
<ul style="list-style-type: none">• Mobility makes animal identification, data collection, animal treatment difficult.• Loss of valuable genetic resources due to recurrent drought and climate change.• High temperature and erratic weather conditions.• Lack of supportive infrastructure.• Poor health services leading to high mortality rates of about 30 %.• Negative selection	<ul style="list-style-type: none">• Relatively large flock size.• High dependency on livestock.• Sire sharing practices.• High demand of export market.• Potential for export and local market• Focus: pressure for intensification.• Indigenous knowledge of pastoralists in selection, animal identification, controlled mating.• Diverse, adaptive and reasonable milk yield. Goat milk and the processed butter are used as medicine in traditional treatment of sick people.

Mobile technicians/enumerators to support pastoralist

To cope with the mobility, data management systems and support staff needs to be mobile to undertake the following activities:

- Mapping of pastoralist and herd movement pattern is crucial. This includes movement period, distance they travel and way of movement (is the group members sharing breeding animal in permanent place move together or not).
- Mobile and strong extension system needs to be in place to facilitate input supply, health service, animal identification and pedigree recording, data collection and linking with market following their route.
- Establishment of an electronic data collection system supported by information technology to implement data collection.

Breeder cooperatives and organized youth groups to support the selection program

- Five to 8 groups each group with 3 to 6 members depending on the flock size need to be organized into breeder cooperatives. Breeder cooperatives facilitate enabling situations to run the breeding program.
- A strong organized youth/community group can engage in profit oriented breeding business. The group should have strong affiliation with the community possible be arose from the community. This group assists different breeder's cooperatives being a bridge between breeder's cooperative and external institutions.
- Government and other institutions should support this group at the beginning in developing investment plan, availing land, capacitate farm facilities and facilitate credit options to start the investment.
- Extension system should provide basic knowledge in breeding, animal management, feed

- development and health service.
- CBBP organization structure suggested for pastoral system is presented in Figure 1.

Figure 1. Community based breeding program organization structure suggested for pastoral system.

Organized youth/community need to have the following roles:

- Purchase candidate sires from pastoralists before movement and rear them until breeding time. Organize participatory selection event in collaboration with stakeholders engaged in CBBP.
- Selected sires should be sold back to the community flock. Breeder cooperatives within the pastoral community should be responsible to buy selected sires and arrange sire utilization among groups and between members within a group.
- Non-selected and culled males will be sold to the local or export market immediately or after value addition through fattening.
- Establish market linkage between pastoralists and feed suppliers, animal traders and consumers.
- Link pastoralists with extension service providers

Reducing the unemployment rate of youth has got high attention by the Ethiopian government and large funds are allocated to develop investment options. Therefore, the government and other institutions are very likely to support setting up youth groups to be engaged in profit oriented businesses. However, realizing CBBP in pastoral areas requires long term commitment and well-integrated activities among stakeholders working in pastoral areas.

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