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Alternative Breeding Scenarios for Abergelle Goat Breed Suited to Arid Climate in Ethiopia

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Introduction

The economic significance of goats in Ethiopia include small initial investment requirement, high survival rate during drought conditions, higher off-take and complementary feeding habit (ESGPP, 2009). These invite improving goat production and productivity in the country via designing appropriate community based breeding program (CBBP). Recent works on simulation study of pure breeding program of goat has presented various alternatives to the conventional CBBP of goats in Ethiopia (Temesgen et al., unpublished). In their works, the authors indicated that consideration of both dam line selection and systematic expansion of the one tier CBBP to two tier resulted in both higher predicted annual genetic gains and discounted profitability than the conventional one. However, the advantage of considering dam line selection on top of two tiers breeding program was not investigated. By its nature, the two tier CBBP could have two anticipated advantages: address emerging demands of the goat keepers to participate in the program and reduce high risk of inbreeding. Therefore, the objective of this work was to compare consideration of dam line selection in two tier CBBP of Abergelle (AB) goat to the dam line selection in one tier breeding program.

Materials and Methods

Description of the study area and breed

The simulation study on AB was made basing two villages namely, *Dingur* and *Blaku*. Detailed descriptions of the study areas are found on Alubel (2015) and detailed description of Abergelle goat breed is found in ESGPP (2009).

Breeding scenarios

Dam line selection in one tier (dam line) and dam line selection in two tier (two tier) CBBP were compared. Description of the scenarios are available in Temesgen et al. (unpublished). Six month weight (6mw) survival to six months (SUR) and average daily milk yield (ADM) were the identified selection criteria. All input parameters were prepared following the menu driven modeling software known as ZPLAN+ (<https://service.vit.de/zplanplus/>).

Results and Discussion

Annual genetic gain

Predicted annual genetic gains (PAGGs) in 6mw, ADM and SURV are given in Table 1 for AB from the two scenarios. The PAGGs of the selection criteria from two tier were higher than the PAGGs from dam

line selection. The increments of PAGGs from two tier were about 50% in ADG and SURV and about 4% in 6mw over dam line selection. Higher PAGGs from two tier CBBP were associated with the shorter generation intervals. The shorter generation interval in this scenario, in turn, is associated with intensive use of early selected bucks compared to the other scenario.

Discounted breeding costs and profits

Discounted breeding costs and profits (EURO) together with the monetary genetic gain for both scenarios are given in Figure 1 for AB goat breed in Ethiopia.

Table 1. Predicted annual genetic gains in six month weight ($\Delta 6mw$), average daily milk yield (ΔADM) and survival to six months ($\Delta SURV$) of Abergelle goat breed from the two scenarios.

Scenarios	$\Delta 6mw$ (kg)	ΔADM (ml)	$\Delta SURV$ (%)	GI (year)	SI
Dam line selection	0.213	0.617	0.008	2.86	0.696
Two tier CBBP	0.222	3.695	0.048	2.610	0.619

GI= generation interval; SI=selection intensity.

The total return is higher in dam line selection compared to two tier CBBP. On the other hand discounted variable costs per animal were smaller in two tier CBBP compared to dam line selection. The smaller discounted variable costs in two tier CBBP is associated with larger number of animals in this scenario compared to the dam line selection since variable costs tend to decrease with increased number of breeding animal in a given breeding program. Even though both breeding scenarios were profitable, profitability from dam line selection was higher than that from two tier CBBP. Monetary genetic gain (mGG) is a measure of the average superiority of the progenies of the selected animals (Mirkena et al., 2012). And the mGG is obtained as the sum of the products of genetic gain in a component breeding objective trait and its corresponding economic value (Gizaw et al., 2014). The mGG was higher for two tier CBBP than dam line selection which was associated with the higher genetic gains of breeding objective traits in the in two tier CBBP where the economic values of the breeding objective traits remain constant.



Figure 1. Discounted total return (Total return), variable cost (total cost), profit and monetary genetic gain from different scenarios in Abergelle goat breed in Ethiopia.

Conclusions and Implications

In our present work, we suggest consideration of dam line selection on top of systematic expansion of one tier breeding program to two tiers. Therefore, community based breeding program of Abergelle goat in the arid agro-pastoral production system should be two tier, where the dam line selection, say 20% culling, would be the implicit activity.

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