DO WE NEED IMPORTING EXOTIC BREEDS TO IMPROVE PERFORMANCES OF THE INDIGENOUS ANIMALS? A REVIEW ON BOER GOATS' IMPACT IN ETHIOPIA.

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ABSTRACT: Published literatures were used to review the impact of the Boer goat crossbreeding programs on performances of the indigenous goats in Ethiopia. Growth, reproduction, production and adaptability performances were assessed. The overall growth rate of the Boer goats and their crosses in Ethiopia was generally low as compared to their native areas. Boer kids had better birth weight (3.05–3.50 kg) than their crosses (2.39–3.00 kg) however, this dominancy was not observed at the later ages. The maximum reported litter size at birth for the Boer (1.76) and Central Highland goats (1.75) was comparable while the value of their crosses was lower. Extremely low conception (37.64%), low kidding (21.94%) and high abortion (15.01%) of the Boer were reported while the performance of local goats for conception, kidding and abortion was 54.38%, 47.50%, and 5.62% respectively. Their crosses performed better in conception (73.86%), kidding (60.23%) and abortion (9.09%). Meat production and carcass characteristics of local goats were better than the Boer crosses on poor nutrition, while Boer crosses outstand as the level of supplementation increases. Survival of Boer and the crossbreeds was quite low and below expected, which indicated their sub-optimal adaptability to Ethiopian environment. Therefore, unless it is practiced in a high intensive farming where the health management and supplementation of feeding is appropriate, using Boer goats crossing or replacement cannot help in achieving the required results. At the small holders' level, achieving stable genetic improvement without harming the diversity (options like within breed selection) need to be considered.

Keywords: Adaptation, Boer, Crossbreeding, Ethiopia, Growth, Reproduction

INTRODUCTION

Ethiopian goats

Ethiopia possesses diverse indigenous goat genetic resources (12 populations categorized into 8 breeds) (EBI, 2016) with large population size (52.5 million heads) (CSA, 2020) distributed in all agro-ecological areas of the country. Their small size, early maturity and adaptation to different climates

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together with their requirement of small initial investment allows indigenous goat to easily integrate into different farming systems (Adane and Girma, 2008). Goat production in Ethiopia has a significant contribution to the livelihood of small holder farmers, pastoralists and agro-pastoralists in particular, and to the national export earnings in general. In Ethiopia, indigenous goats are used as a sources of meat, milk, cash, skins, manure etc. (Adane and Girma, 2008; Gizaw, 2009).

Regardless of the aforementioned importance and their quality to adapt to harsh production environments, their productivity is relatively low in comparison to the temperate breeds. For example, Gizaw (2009) reported the moderate prolificacy (dominantly single born kids) of Ethiopian Highland goats. However, Erasmus et al. (1985) reported the improved Boer goat as the most productive and prolific breed with lambs born as 7.6% single, 56.5% twins, 33.2% triplets, 2.4% quadruplets and 0.4% quintuplets. On the other hand, Deribe and Taye (2013) reported birth weight of 2.01 kg, 9.02 kg weaning weight, 20.61 kg yearling weight of Central Highland goats in Sekota. For the improved Boer goats, higher weaning weight of 34.95 kg was reported by Scheltema (1994). Therefore, due to the lower growth and reproductive performance of the Ethiopian indigenous goat genetic resources, due consideration need to be given towards the improvement of their genetic makeup which in turn maximizes productivity and production at individual and national level.

Genetic improvement

Productivity can be maximized by improving both genotype and/or the production environment (Falconer, 1989). The production environment can be improved through improvements of feeds and nutrition, health follow-ups, and different management practices (von Kaufmann and Peters, 1990). On the other hand, the genetic makeup can be improved either through within breed selection or crossbreeding with high performing exotic breeds, while total substitution of local genotypes with exotics can also be attempted (Solomon and Kasahun, 2008).

Genetic improvement through within breed selection is a time-consuming process, with up to <5% genetic progress per generation (McDowell, 1972, 1988), while it can provide stable genetic gain, adaptation, and maintain diversity (conservation). The other route, crossbreeding, can lead to rapid improvement by enhancing the genetic performance. Both ways have their own merits and demerits depending on the available information including the awareness, within and among breed variations, and set up of the breeding objectives. When there is low within breed variation or heritability of a desired trait, crossbreeding or replacement of the local animals could be considered (Falconer, 1989). However, it is important to evaluate available genotypes before a decision is made to introduce exotic breeds (genotypes). Breeds adapted to environments similar to where they were to be introduced may have better chance of survival and productivity (Solomon and Kasahun, 2008). On the other hand, in case of higher within breed genetic variation it is important to consider selection based genetic improvement programs.

Crossbreeding attempts in Ethiopia

Over the past few decades, several goat breeds including Anglo-Nubian, Saanen, and Toggenburg goats have been introduced to Ethiopia under different projects (Abebe, 2022; Solomon et al., 2014). Most of these goat breeds were introduced under donor driven projects. All projects were initiated for improving the milk and carcass yield keeping in mind the effects of heterosis (FARM Africa, 1996; Kasahun and Solomon, 2008).

Melka Werer and Holleta research centers attempted to study the production performance (growth and milk production) of Saanen goats and their crosses with Afar and Highland goats respectively. Accordingly, 50% and 25% crossbreds were disseminated to farmers in their respective areas. However, the activities were discontinued before any evaluation had been done at on-farm level on the disseminated genotypes (Solomon et al., 2014).

Similarly, a study aimed to the production of crossbred goats of Somali and Hararghe highland goats with Anglo-Nubian to benefit women in the highlands of Hararghe and areas surrounding Hawassa had resulted in the distribution of 900 F1 crossbreeds. However, it was ended due to lack of efficient exit strategy: during the termination of the project, the work was not transferred to a responsible organization which can handle and monitor the activities (Solomon et al., 2014).

The introduction of Toggenburg goats to cross with Arsi-Bale and Somali goats at Hawassa and Haramaya University for the purpose of teaching had achieved its educational goals and finally the project ended its activities by distributing indigenous goats to some of the established women's group around the area (Solomon et al., 2014).

The above mentioned and others crossbreeding plans in Ethiopia were unsuccessful towards maintaining stable genetic improvement and change in the livelihood of the smallholder farmers (Abebe, 2022). This failure was mainly due to little or no consideration of smallholder farmers' needs, opinions, active participation, decisions, and local practices (Abebe, 2022). Similarly, lack of baseline production data, poorly managed institutional synergies, in addition to the insufficient and poor-quality feeds and forages, disease and parasite incidence, poor veterinary services, and a lack of infrastructure as well as the termination and weakness of goat genetic improvement projects were among the major reasons for crossbreeding failure (Abebe, 2022).

Boer goats were also imported to Ethiopia by the Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP) aiming a sustainable increase in small ruminant productivity. The ESGPIP was a USAID-funded project operating with a goal to sustainably increase sheep and goat productivity in Ethiopia to consequently enhance economic and food securities by addressing a large number of factors, including human and institutional capacity building, applied research and technology transfer and introduction of improved genotypes (Yami and Merkel, 2008). The project imported Boer goats and Dorper sheep from South Africa into Ethiopia in 2007 which was the first ever importation of these

animals into the country. These animals were aimed to form the backbone of a crossbreeding program designed to utilize the fast growth rate and larger carcass of these animals with the native adaptability and toughness of local breeds. The resulting crossbreds were aimed to be able to supply the export market with the desired frame size and carcass characteristics (American Institute for Goat Research). The Boer goat, developed in South Africa through crossing with different breeds, is a meat breed but milk and skin are also important products. Boer goats are also known for their fertility and fast growth (Casey and Van Niekerk, 1988). It has been reported that Boer goats can improve growth, reproduction and survival performances of many indigenous breeds (Erasmus, 2000).

The overall objective of the current review was to summarize the major achievements and miscarriage of the genetic improvement of the Ethiopian indigenous goat genetic resources through crossbreeding with Boer goats. The specific objectives were to review the effect of crossing indigenous goat genetic resources with Boer goats on the adaptability, growth, production and reproduction performances, and to give a country wide picture which can be useful in decision making for the future genetic improvement efforts that also need to consider maintaining the diversity of indigenous genetic resources.

MATERIALS AND METHODS

This review mainly considers the published reports following the implementation of the Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP), which was funded by the United States Agency for International Development (USAID). Hawassa, Mekelle and Haramaya universities and the national and regional research institutions were the collaborators of the project by allowing a breeding, evaluation and dissemination centers. Most of the selected centers /sites fall within the lowland and midland agro-ecologies with comparatively higher temperature. Majority of the studied goats receive intensive management with sizeable concentrate supplementation based on their body weights.

RESULTS

Evaluating the performances of the pure and cross-bred goats include the assessment of their growth, reproductive and survival /adaptability performances in different locations. Better performance of a breed with better adaptation can meet the expected goals of the crossbreeding program.

Growth performances

Least square means with their respective standard errors (LSM ± SE) of the growth traits of Boer goats and their crosses with different Ethiopian indigenous goat breeds at different locations of the country are presented in Table 1 and 2.

Table 1. On-station live body weights of Boer goats and their crosses with different indigenous goat breeds of Ethiopia at different age stages.

Location	Genotype	Birth Weight (kg)	Weaning Weight (kg)	6 Months Weight (kg)	Yearling Weight (kg)	Source
Adamitulu	Boer	3.50±0.08	12.53±0.41	15.44±0.64	30.53±1.59	Debele et al. 2016
Ataye	Boer	3.05±0.06	10.87±0.36	12.47±0.51	18.30±0.88	Mustefa et al. 2019a
Ataye	B x CHG 50%	2.62±0.04	8.80±0.22	11.15±0.31	16.73±0.48	Mustefa et al. 2019a
Sirinka	B x CHG 50%	2.78±0.03	10.50±0.21	14.06±0.26	19.93±0.37	Deribe et al. 2015
Sirinka	B x CHG 75%	2.67±0.05	9.48±0.35	12.86±0.48	19.35±1.01	Deribe et al. 2015
Sirinka	B x CHG 50%	2.58±0.02	9.60±0.16			Tesema et al. 2017
Sirinka	B x CHG 75%	2.70±0.05	9.74±0.34			Tesema et al. 2017
Abergelle	B x ABR 50%	2.90±0.09	15.30±0.39	19.60±0.47	27.85±0.53	Belay et al. 2014
Haramaya	B x HIG 50%	2.50±0.10	10.00±0.30	14.50		Teklebrhan 2018
Haramaya	B x SOM 50%	3.00±0.10	11.00±0.10	15.50		Teklebrhan 2018
Konso	B x WOG 50%	2.82	11.61	16.18	29.18	Dea et al. 2019
Dilla	B x ARB 50%	2.84±0.08	21.10±0.72			Debele et al. 2015
Sirinka	B x CHG 50% F1	2.54±0.02	9.77±0.16	13.6±0.19		Tesema et al. 2021
Sirinka	B x CHG 50% F2	2.55±0.03	9.99±0.24	14.1±0.28		Tesema et al. 2021
Sirinka	B x CHG 50% F3	2.39±0.05	9.39±0.48	14.5±0.51		Tesema et al. 2021

B= Boer, CHG= Central Highland Goats, ABR= Abergelle, HIG= Highland Goats, SOM= Somali Goats, WOG= Woyto-Guji Goats, ARB= Arsi-Bale Goats, kg= Kilo grams.

The body weight of the pure Boer kid from birth to yearling age was reported to be higher in Adamitulu than Ataye site. Comparable birth weights of the crosses were reported in the different sites

studied, while high variabilities were seen for their weaning weights. Extremely high weaning weight (21.1 kg) was reported from the crosses of Boer goats with Arsi-Bale goats in Dilla site while the lowest (8.8 kg) was seen in the crosses of Boer with Central Highland goats in Ataye site. Similarly, the Ataye site also produced crosses with the lowest body weight at six months' (11.15 kg) and yearling age (16.73 kg). On the other hand, the Boer by Abergelle crosses dominate the body weight at six months' age. Similarly, the Boer by Woyto-Guji crosses had the highest yearling weight. In line with the above results, highest pre-weaning average daily body weight gains (175.83 grams) was observed in Dilla from the crosses of Boer with Arsi-Bale goats. The crosses of Boer with Abergelle and Woyto-Guji goats also produced relatively higher pre-weaning weight gain (103 and 97.73 grams respectively). The reports from Ataye site regarding the pre-and post-weaning daily weight gain were the lowest among the others.

Table 2. On-station average daily body weight gains of Boer goats and their crosses with different indigenous goat breeds of Ethiopia.

Location	Genotype	Average Daily Body Weight Gains			Source
		Birth –Weaning (g)	Weaning – 6 Months (g)	6 Months – Yearling (g)	
Ataye	Boer	83.94±3.76	25.57±3.29	27.62±2.69	Mustefa et al. 2019a
Ataye	B x CHG 50%	67.05±2.26	31.46±2.00	28.40±1.46	Mustefa et al. 2019a
Sirinka	B x CHG 50%	85.17±2.26	34.94±1.76	31.85±1.79	Deribe et al. 2015
Sirinka	B x CHG 75%	75.36±3.79	32.84±3.24	36.11±4.86	Deribe et al. 2015
Sirinka	B x CHG 50%	77.20±1.80			Tesema et al. 2017
Sirinka	B x CHG 75%	78.00±3.60			Tesema et al. 2017
Abergelle	B x ABR 50%	103.00±2.98	93.70±2.50	69.20±1.40	Belay et al. 2014
Konso	B x WOG 50%	97.73			Dea et al. 2019
Dilla	B x ARB 50%	175.83 ± 6.00			Debele et al. 2015
Sirinka	B x CHG 50% F1	79.63±1.75	40.21±1.44		Tesema et al. 2021
Sirinka	B x CHG 50% F2	82.11±2.52	30.84±1.77		Tesema et al. 2021
Sirinka	B x CHG 50% F3	77.87±5.10	41.87±4.49		Tesema et al. 2021

B= Boer, CHG= Central Highland Goats, ABR= Abergelle, WOG= Woyto-Guji Goats, ARB= Arsi-Bale Goats, g=grams.

Reproduction performances

Percent reproductive performances of the pure Boer, indigenous and their crosses at different locations of the country are presented in Table 3. Among the pure Boer, those from Adamitulu site were more fertile (with average litter size at birth (LSB) of 1.76) than those from Ataye site with LSB of 1.5. Among the others, Central Highland goats (CHG) in Sirinka site produced higher kids per birth (1.75). Values of litter at birth were lower for the crosses. Breed wise comparisons in the same study area (Ataye site) showed extremely low conception and kidding rate of the pure Boer does. Similarly, abortion rate was lower for the indigenous CHG breed, while highest barren and abortion rates were seen in the pure Boer does. Age at first mating and kidding of the 50% crosses of Boer with Woyto-Guji was 8.10±1.27 and 12.91±1.22 months respectively (Dea et al., 2019).

Table 3. On-station reproductive performances of Boer goats and their crosses with different indigenous goat breeds of Ethiopia.

Location	Genotype	LSB	Conception %	Kidding %	Abortion %	Source
Adamitulu	Boer	1.76				Debele et al. 2016
Ataye	Boer	1.50±0.01	37.64	21.94	15.01	Mustefa et al. 2019b
Ataye	CHG	1.50±0.00	54.38	47.50	5.62	Mustefa et al. 2019b
Ataye	B x CHG 50%	1.50±0.01	73.86	60.23	9.09	Mustefa et al. 2019b
Sirinka	B x CHG 50%	1.62±0.03				Tesema et al. 2017
Sirinka	CHG	1.75±0.02				Tesema et al. 2017
Konso	B x WOG 50%	1.26				Dea et al. 2019
Sirinka	B x CHG 50% F1	1.48±0.03				Tesema et al. 2020
Sirinka	B x CHG 50% F2	1.62±0.06				Tesema et al. 2020
Sirinka	CHG	1.58±0.03				Tesema et al. 2020

B= Boer, CHG= Central Highland Goats, WOG= Woyto-Guji Goats, LSB= Litter size at birth.

Meat, milk and carcass characteristics

Alongside the growth and reproductive performances, some production traits including meat and carcass characteristics were also among the important traits in evaluating a breed. Accordingly, the dressing percentage was evaluated for both the local Arsi-Bale and its F1 crosses with Boer. Similar value of 41.1% dressing percentage was obtained (Mohammed et al., 2012) under low-quality basal grass hay diet. The rib eye measurements were not significantly different for both the locals and 50% crosses with 11.6 and 15.1 cm^2 respectively (Tesema et al., 2018). Similar proportional yield as percentage of empty body weight was also obtained from the two genotypes (Tesema et al., 2018).

With uniform management condition (600 grams of concentrate supplementation for 90 days after the age of nine months) 34.2 kg vs 25.5 kg slaughter body weight, 17.6 kg vs 11.8 kg hot carcass weight, and 51.7% vs 46.2% dressing percentages were obtained from the 50% crosses of Boer vs the local CHG respectively (Tesema et al., 2018). The study by Tilahun et al. (2013) in Sirinka agricultural research center also showed 27.6 kg vs 20.4 kg slaughter body weight, 12.8 kg vs 9.0 kg hot carcass weight, 44.4% vs 42.8% dressing percentage obtained from the 50% crosses of Boer vs the local CHG respectively.

The Boer crossbreds' average daily milk yield was also evaluated and compared with the indigenous Central Highland goats in Sirinka. Accordingly, the Boer by Central Highland crossbreds had higher average daily milk yield (0.41±0.03 kg) than the local Central Highland goats (0.28±0.02 kg) (Tesema et al., 2020).

Adaptability

Kid survival and mortality rates of a breed can show the adaptability performance of the breed to the given environment. Accordingly, pure Boer and 50% F1 crosses with CHG perform 56% and 54% pre-weaning kid survival respectively, while the values were 33% and 44% for the yearling age survival in Ataye site (Mustefa et al., 2019b). Higher mortality rates of 48% and 41% were also reported in South

Omo and Konso areas respectively for the crossbreeds of Boer with Woyto-Guji goats (Molla, 2016; Dea et al., 2019).

DISCUSSIONS

Growth performances

Considerable pre and post-weaning growth rates are among the main requirements in improving productivity of a given population. The Boer goats are known for their significant growth rates; Kids weigh 3–5 kg at birth and can reach 40–50 kg at six months of age. Mature male and female Boer goats weigh up to 130 and 80 kg, respectively, with most animals weighing 75 – 90 kg and 50 – 60 kg for males and females, respectively (Casey and Van Niekerk, 1988). However, summary of the results on the on-station growth performances in the Ethiopian condition were unable to proof such achievements (Table 1). The growth rate of the Boer goats and their crosses is generally low in comparison to the expectation.

Comparing locations, Boer goats from Adamitulu had higher body weights at different stages than their counterparts from Ataye site which might be due to the differences in management condition. Among the different indigenous breeds which are crossed with the exotic Boer goats, Abergelle and Woyo-Guji goats produces heavier crossbreeds in most of the reported body weights. The availability of green feed, better management might be some of the environmental factors favoring these breeds, while breed complementarity or nicking effect had its own role in the genetic makeup of the crossbreeds. The overall lowest results were reported in Ataye site of Debre Berhan Agricultural Research Center, which might be due to the less attention given to the management practices or adaptation problems.

Daily body weight gain of Boer goats was reported to be one of the outstanding performances they show (Van Niekerk and Casey, 1988). The reports of Van Niekerk and Casey (1988) show body weight gains of 200 and 176 grams per day under favorable nutritional condition and the extensive subtropical condition respectively. However, none of the current results from Ethiopia come close to this figure.

Comparatively highest weight gains were reported at the pre-weaning stage than the post weaning stages which can be linked directly to dams' milk production performance. The lower weight gains at the post weaning stages show their failure to perform at the given environments.

Relative to the different locations and genotypes, the 50% crosses of Boer with Abergelle and Woyto-Guji goats gained more weight than the others while, outstanding performance was reported in Dilla (Table 2) from 24 kids only. On the other hand, reports of Tesema et al. (2018) show better weight gain and feed conversion ratio results by increasing concentrate supplementation in the indigenous CHG and 50% crosses of Boer. According to the report of Tesema et al. (2018), significant difference between the crosses and locals was not observed in daily weight gain as the concentrate supplementation increase up to 600 grams per day, while, some numerical differences exist (117 and 93.3 grams for the crosses and locals respectively). Therefore, improving management and supplementing the indigenous goats is economical comparing to the crossbreeds as the indigenous Central Highland goats adapts the environment better than the Boer goats (Tesema et al., 2018). Realizing the expected higher growth performances of Boer goats in their native environment, the overall reported weights and weight gains of the crosses at different age stages in Ethiopia were worse due to the sub-optimal adaptability of the breed to the local environment.

Reproduction performances

Reproductive qualification may be considered as one of the most important benchmark related to adaptation (Erasmus, 2000). Reproductive performances can be measured and expressed in terms of kidding and weaning rate, kidding interval, and litter size at birth and at weaning (Greyling, 1988). From such perspective, the Boer goat was recognized as a most productive and prolific breeder (Erasmus, 2000). However, current reports did not find a way to confirm this.

The overall Boer conception and kidding rates were lower while the abortion rates were higher enough comparing them with the local CHG and its F1 crosses (Table 3). This might be due to change in the

production environment which is in line with the reports of Devendra and Burns (1983) who shows the excellent accommodation and adaptation ability of the indigenous goat breeds in a fluctuating environment. This was further supported by other studies. Reproduction performances can be altered by the genotype of a given breed and the production environment where the animals are reared, however, it is vulnerable to the later (Greyling, 2000). Numerous factors can considerably affect the production environment including the seasonal availability of feed /nutrient, temperature fluctuations and changes in management systems (Riera, 1982). Additionally, due to the low heritability of reproductive traits, massive genetic transmission may not be expected from an exotic breed towards the indigenous breeds.

Higher litter size at birth (1.76) was reported for the pure Boer goat in Adamitulu area than Ataye site which might be directly linked to the management differences and suitability of the area for Boer goat. On the other hand, the value was lower for their crosses. Therefore, the crossbreeds cannot be a good choice for a breeding program which aims at increasing twinning rate. Despite their lower litter size at birth, the crossbreeds had comparatively higher conception and kidding percentages. The reports of Mustefa et al. (2019b) show highest barren and abortion rate of the pure Boer goats in Ataye which can restrict the genetic improvement program. The short age at first mating and kidding of the Boer by Woyto-Guji crosses reported by Dea et al. (2019) in Konso hints the better performance of the breed in feed available and good management area.

Meat, milk and carcass characteristics

The observed comparable dressing percentages (Mohammed et al., 2012) and rib eye measurements (Tesema et al., 2018) between the locals and Boer crosses can have generalized us that the use of local goats for meat production and carcass characteristics can be more economical on poor nutrition (grazing only). However, superiority of the Boer crosses was observed as the level of supplementation increases (Tesema et al., 2018). Therefore, better meat, milk and carcass characteristics of Boer or Boer

crossbred goats was not and cannot be achieved by lower quality diets which might be due to the high nutrient use of the exotic breed or its crosses for maintenance (Tilahun et al., 2013). This indicates Boer goats or their crosses cannot perform to their full extent at smallholder level where quality feed is not available.

Adaptability

Survivability performance results showed us that the overall kid survival of the pure Boer as well as their crossbreeds with indigenous goats at different age stages was quite low as compared to their native area, which indicates their sub-optimal adaptability to Ethiopian environment (Mustefa et al., 2019b; Dea et al., 2019). These reports were in contrary with the report of Cameron et al. (2001) which states the high demand of the Boer goats for crossbreeding purpose due to their desirable genetic traits for meat production and hardiness to several diseases in the United States of America.

Heart water was the major disease which affects the pure and crosses of the Boer with indigenous goat breeds while pyogenic infection/caseous lymphadenitis, and wart/orf diseases were also among the other common diseases reported in the country (Molla, 2016; Debele et al., 2016). Similarly, Hunduma et al. (2010) also reported respiratory problems, gastrointestinal parasites, local abscess, diarrhea, and orf as the major health problems for the Boer goats in Adami-tulu with high prevalence of 42.2 %. The reports of Alemnew et al. (2020) picks Agalactia as the primary health problem which causes about 49% of the mortality of Boer goats in Ataye site. The possible reason for Agalactia might be poor mothering ability, pendulous udders and/ or adaptability problems (Alemnew et al., 2020).

In the reports of Terefe et al. (2012), most of the imported Boer goats in Adamitulu area were infected with two or more types of parasite (Eimeria, Strongyle-type and Strongyloides species). The results indicate that internal parasites are likely to be one of the major problems that influence the efficient utilization of production potential of the goats. In addition to addressing the common diseases reported above, efficient and effective control and prevention mechanisms for heart water should be focused for

better use of the imported Boer goats in some selected parts of Ethiopia (mostly for commercial and education purpose).

CONCLUSION AND RECOMMENDATION

The reviewed documents showed high mortality and low survival of the imported Boer goats, and questioned the adaptability of the breed and its crosses in Ethiopia. The poor survival, growth and reproductive performances of the breed, in addition to being a threat in maintaining diversity of indigenous breeds, can lead us to choosing a more sustainable genetic improvement mechanism. In such situation, addressing the need for sustainable genetic improvement of goats can only be achieved through within breed selection. As per the reports of EBI (2016) the biggest threat to the conservation of the Ethiopian indigenous breeds is uncontrolled crossbreeding. Therefore, in addition to the failure of achieving their objectives (improvement), this exotic goat breed has also a negative impact in maintaining the diversity of the indigenous genetic resources. Unless it is practiced in a high intensive farming where the health management and supplementation of feeding is appropriate, using Boer goats crossing or replacement cannot help in achieving the required results in meat production. Therefore, achieving the improvement without harming the diversity need to be considered in on farm situation of Ethiopia. This can be attained through the within breed selection-based genetic improvement program which nowadays is broadly exercised and known as Community Based Breeding Program (CBBP).

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