

*Full Length Research Paper*

# **Evaluation of improved sheep breeds in pastoral areas of Yabello district, Southern Oromia, Ethiopia**

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This study was conducted at Yabello district of Borana zone with the objectives of evaluating the productive performance of the 25% Dorper crossbred and the local blackhead Somali sheep under agro pastoralists' conditions, creating awareness, improving pastoralists' knowledge and skill. The training was given to the selected pastoralists, development agents, and experts on the importance and management of the improved sheep. A total of four F1 50% Dorper crossbred were provided for the two established Pastoralists' Research Groups (PRGs). Both quantitative and qualitative data were collected using appropriate methods. The quantitative data were analyzed using simple descriptive statistics and an independent sample t-test while qualitative were analyzed using pairwise ranking and narration methods. The result of the study indicated that 25% Dorper crossbred ram were significantly higher in birth weight, weight at 6 months, and yearling (marketable) weight at 12 months compared to the local blackhead Somali sheep. Moreover, Dorper crossbred had better marketability, weight, meat, drought, and disease resistance compared to their counterparts. As a result, all concerned parties should make 25% Dorper crosses more popular and scaled up in order to improve the productive performance of the local blackhead Somali sheep in the study areas.

**Key words:** Dorper, evaluation, blackhead Somali.

## **INTRODUCTION**

Ethiopia is among few African countries endowed with a huge sheep genetic resource. It has been estimated to have a population size of 65 million cattle, 51 million goats and 40 million sheep, of which 99.8% are indigenous type (CSA, 2020). The total population of the sheep in pastoral areas accounts approximately for 53% of the total Ethiopian sheep population (CSA, 2017). Sheep are adaptable to arid and semi-arid conditions and provide mutton for their keepers. In Ethiopia, small

ruminants in general and sheep, in particular, are kept mainly for immediate cash or income generation, meat, saving, asset, manure, skin, and wool production (Abebe et al., 2020). Sheep account for 19 and 95% of the total livestock and small ruminant live animal export, respectively (Hailemariam et al., 2013). The lowland sheep and goat breeds of Ethiopia are highly demanded by the neighboring and Middle East countries. Lowland breeds are more preferred by exporters compared to

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highland breeds (Asegede et al., 2015).

Despite its contribution to the country and small scale pastoralists, the productive performance of the indigenous sheep breed is low due to diseases, water and feed shortage, market problem, lack of extension support, and lack of improved breed (Belete et al., 2015). Thus, improving local breeds crossing with exotic breeds plays a paramount to meet the ever-increasing demand for meat without threatening the existence of indigenous breeds. This requires appropriate research design and implementing a suitable breeding strategy to improve the productivity and conservation of the indigenous breed (Gizaw et al., 2013).

### Statement of the problem

The dominant type of sheep kept in Borana pastoral areas is fat-rumped and fatty-tailed black-headed Somali. Because of their fatty tailed and low lean to fatty ratio, black-headed Somali sheep are not demanded by local and national markets (Desiso et al., 2018). Moreover, the majority of the local sheep breeds are slaughtered and marketed at round yearling age, when their body weight is 18 to 25 kg. However, export markets demand lambs that weigh up to 30 to 35 kg at yearling age (Yibrah, 2008).

Evaluation of improved Dorper sheep was conducted in a station at Yabello Pastoral and Dryland Agricultural Research Center for the last five consecutive years (2012-2016). The result of the evaluation of study show that the overall average birth weight and yearling weight of Dorper crossbred ram were 3.09 and 26.5 kg, respectively (Tessema et al., 2020). However, this research was only conducted on a station and was not conducted under small scale pastoralists' farm condition. Therefore, the present study is aimed to reduce this research gap and conduct research under pastoralists' farm condition with the following specific objectives.

### Objectives of the study

- (1) To demonstrate and evaluate the productive performances of the 25% Dorper crossbred sheep under pastoralists' farm condition.
- (2) To create awareness on newly introduced Dorper sheep in the study area.
- (3) To improve pastoralists' knowledge and skill with regard to crossbreeding and management.

## MATERIALS AND METHODS

### Description of the study area

The study was conducted at Yabello district, Dherito kebele, Borana Zone, Southern Oromia, Ethiopia. Yabello district is located at 575 km south of Addis Ababa, along Addis-Nairobi road. The district has

an area of 5557 km<sup>2</sup> and is located between 3°8'46"-10°09'04 North Latitude and 3°18'03"-43°04'24" East Longitude. The elevation of the area ranges from 1000 to 1700 m.a.s level. The district has a bimodal pattern of rainfall, with the long rainy season between March and May and the short rainy season between September and November. Spatial and temporal variability in both the quantity and distribution of rainfall renders the area semi-arid, with an average annual rainfall ranging from 400 mm in the south to 600 mm in the north. The average annual temperature varies from 19 to 24°C per annum (Coppock, 1994). Livestock production is the key component of the farming system in the study area, and it contributes to the subsistence requirement of the population among others, in terms of milk, milk products, and meat, particularly from small ruminants (BZoFEDO, 2016) (Figure 1).

### Research design

#### Site and pastoralists selection

The activity was carried out in the Dherito peasant association, Yabello district of Borana zone. The site was selected purposively with the collaboration of district pastoral development offices based on its potentiality for sheep production and accessibility. Two Pastoral Research Groups (PRGs) consisting of 15 members per group were established.

Four F1 (50% Dorper cross rams) were provided to each established pastoralist research groups and used as a sire line, while local ewes were utilized as a dam line. Dental information was utilized to estimate the age of the demonstration stock ewes with 1st and 2nd parity, and age less than 2 years old were incorporated. All local and F1 Dorper rams used for mating were between 0.75 and 1.5 years old, as sire, and were treated equally in terms of management and feed type under the same pastoral farm conditions.

#### Mating procedure

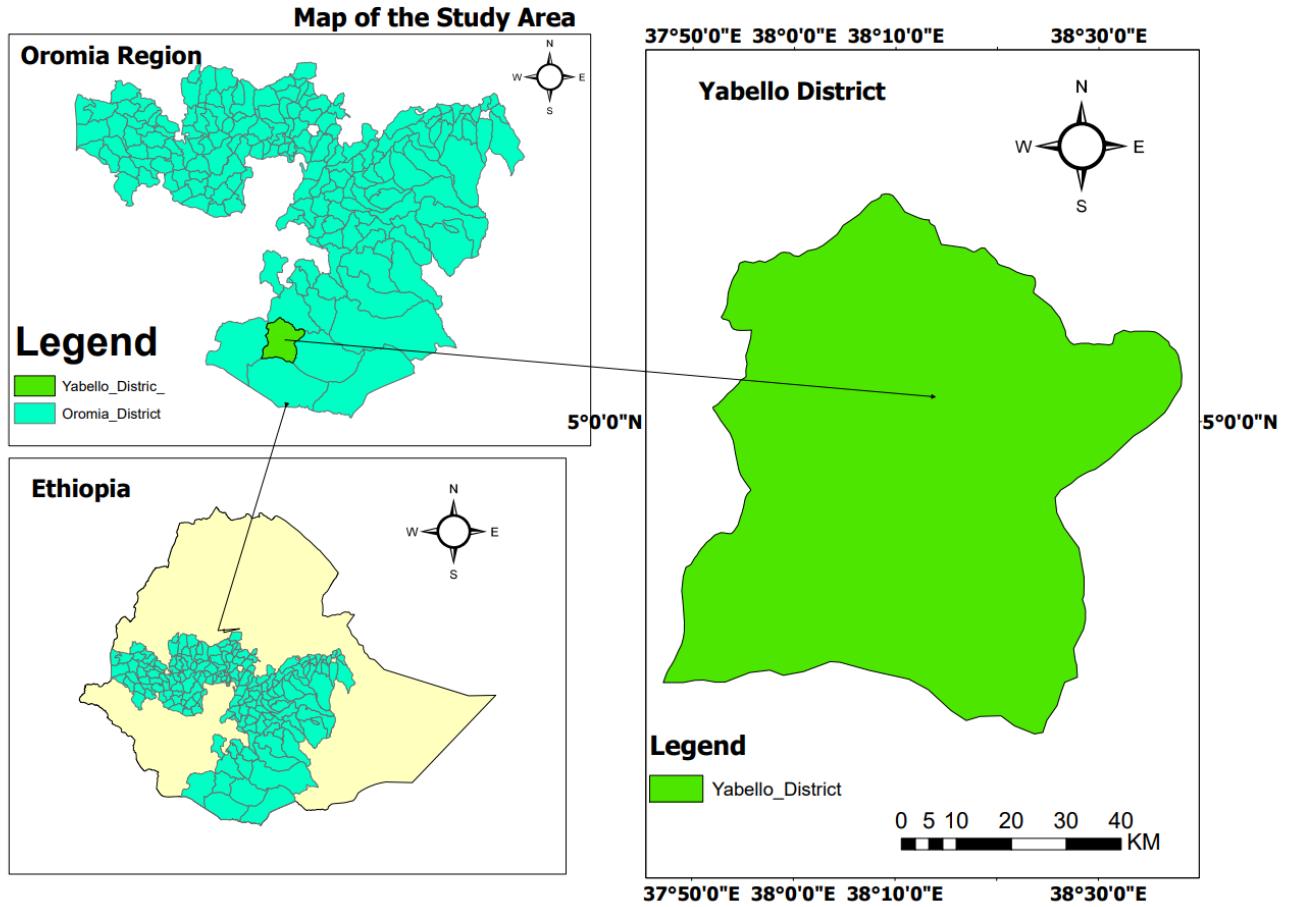
The blackhead ewes were herded separately from the breeding rams. During mating, ewes kept together with their respective sire groups. Ram services system was used during grazing hours. 50% Dorper crossbred (male) mated with pure local sheep (female) produced crossbred male and female lambs (Figure 2). The rams gave mating service to the local sheep of the Pastoralists Research Group established in the selected Dherito kebele (Gebreyowhens et al., 2017).

#### Training

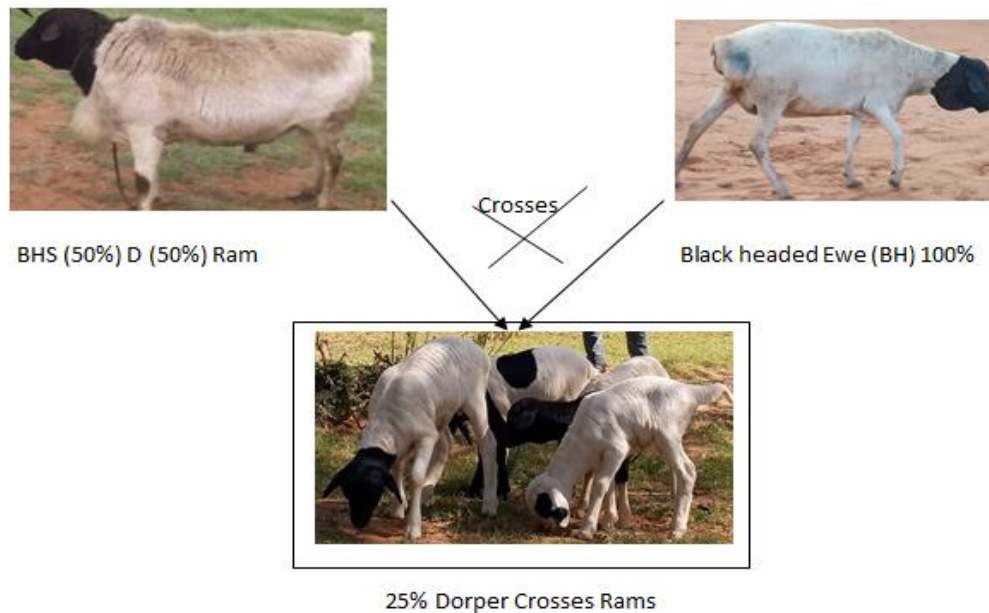
The training was given to the selected stakeholders (pastoralists, development agents, and subject matter specialists) before the start of the research on the selection, growth, production system of crossbreeding, and health management of improved sheep. Accordingly, a total of 36 out of which 28, 4, and 4 pastoralists, subject matter specialists, and development agents have participated in training, respectively, for the six consecutive days. Finally, close supervision and monitoring were made through joint action of stakeholders.

#### Data collection

Both quantitative and qualitative data were collected. Quantitative data collected during the research activities were initial birth weight, weight at six months, yearling weight using spring balance with accuracy to the nearest of 0.5 kg, and the total number of



**Figure 1.** Map of the Study area.  
Source: BZoFEDO,2016.



**Figure 2.** Mating procedure of 50% Dorper crosses with local blackhead Somali sheep.  
Source: Authors

**Table 1.** Productive performance of Dorper crosses and blackhead Somali sheep.

Parameter	Breed type	N	Mean±SE	Std. Deviation	Minimum	Maximum
Initial birth weight of the ram	Crossbred	8	3.11±0.13	0.36815	2.50	3.50
	Blackhead Somali	8	1.40±0.08	0.23970	0.90	1.70
Weight of the ram at 6 month	Crossbred	8	27.8±0.90	2.56738	23.00	30.00
	Blackhead Somali	8	24.33±0.44	1.24090	22.70	26.50
Yearling (Marketable weight) of the ram at 12 months	Crossbred	8	34.9±0.46	1.30055	32.50	36.50
	Blackhead Somali	8	29.35±0.89	2.51453	25.50	32.50

Source: Authors.

pastoralists who participated in the training. On the other hand, qualitative data collected were selection criteria of pastoralists, change in the level of knowledge and skill of pastoralists, and awareness created throughout the research activities.

#### Method of data collection

Quantitative data like growth, reproductive, and survival data, the total number of pastoralists who participated in the training and the number of stakeholders who participated were collected using checklists and datasheet tools. On the other hand, qualitative data such as selection criteria of pastoralists concerning the traits of sheep, change in the level of knowledge and skill of pastoralists, and awareness created were collected through a simple yes or no question survey and Focus Group Discussion (FRG).

#### Method of data analysis

Quantitative data such as birth weight, six months weight, yearling weight, number of pastoralists who participated in the training, and Pastoralists Research Group (PRG) were analyzed using SPSS (Statistical Package for Social Science version 20). Pair-wise ranking method was employed to summarize pastoralists' selection criteria (traits) concerning sheep as suggested by Haile et al. (2013). A simple knowledge test was used to compare pastoralists' knowledge levels before and after the demonstration period related to crossbred ram. Moreover, an independent sample t-test was employed to explore the mean differences between 25% crossbred and the local (blackhead Somali) sheep in initial birth weight, weight at 6 months, and marketable weight at 12 months of the ram. An alpha level of 0.05 was used. All groups were normally distributed. Variances were not homogenous.

## RESULTS AND DISCUSSION

### Productive performance of Dorper crosses and blackhead Somali sheep

#### Initial birth weight

The result of the descriptive statistics showed that the overall mean of initial birth weight of the ram was 3.11±0.13 and 1.40±0.08, with a standard deviation of 0.36815 and 0.23970 for 25% Dorper crossbred and blackhead Somali sheep, respectively. Moreover, the

minimum and maximum initial birth weights were 2.50 and 3.50 for 25% Dorper crossbred and 0.70 and 1.7 for blackhead Somali sheep, respectively (Table 1). The result of an independent t-test indicated that there is a statistically significant mean difference between 25% Dorper crossbred and blackhead Somali sheep, in initial birth weight,  $t(14) = 10.99$ ,  $p < 0.01$  (Table 2). In line with these findings, other authors reported that the Dorper crosses were significantly heavier at birth than the local sheep (Lakew et al., 2014; Belete et al., 2015; Ayele et al., 2015).

#### Weight of the ram at 6 months

The result of the study revealed that the overall mean of weight at six months were 27.8±0.90 and 24.33±0.44 with the standard deviation of 2.56738 and 1.24090 for 25% Dorper crossbred and blackhead Somali sheep, respectively. While the minimum and maximum weights at six months were 23 and 30 kg for 25% Dorper crossbred and 22.7 and 26.5 kg for blackhead Somali sheep (Table 1). The result of an independent t-test indicated that there is a statistically significant mean difference between 25% Dorper crossbred ram and blackhead Somali sheep in weight at six months,  $t(14) = 3.43$ ,  $p < 0.01$  (Table 2). The implication is that 25% Dorper crossbred ram is significantly heavier at the age of six months compared to their counter parts. The result of this study was higher than the findings of Lakew et al. (2014) who reported lambs born in dry season at six months to be 20.5 ± 0.34 kg in eastern Amhara region, Ethiopia. This could be justified by the fact that the availability of different feeds and Dorper consumes all types of feed that helps to adapt well to a wide range of environmental conditions.

#### Yearling weight

The result of the present study revealed that the overall mean of yearling weight was 34.9±0.46 and 29.35±0.89 with the standard deviation of 1.30 and 2.51 for 25%

**Table 2.** Result of independent sample t-test.

Variable		Levene's test for equality of variances		t-test for equality of means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Initial birth weight of the ram	Equal variances assumed	2.11	0.17	10.99***	14.00	0.00	1.71	0.16
Weight of the ram at 6 month	Equal variances assumed	3.02	0.10	3.43***	14.00	0.00	3.46	1.01
Yearling (Marketable weight ) of the ram at 12 months	Equal variances not assumed	7.57	0.02	5.55***	10.50	0.00	5.55	1.00

\*\*\*Indicate significant level at 1% probability level.

Source: Authors

Dorper crossbred and blackhead Somali sheep, respectively. The minimum and maximum yearling weights were 32.50 and 36.50 for 25% Dorper crossbred and 25.50 and 32.50 blackhead Somali sheep, respectively (Table 1). Finally, the result of an independent sample t-test showed that there was a statistically significant mean difference between 25% Dorper crossbred and the blackhead Somali sheep in yearling (marketable weight) at 12 months  $t(10.50)=5.55$ ,  $p<0.01$  in the study area (Table 2). This implies that the 25% Dorper crossbreds ram was significantly heavier in yearling weight compared to the local Blackhead Somali sheep under pastoral farm condition. The result of this study is consistent with the findings of Belete et al. (2015) who found that the yearling weights of dorper crosses were 31.29 and 30.47 kg in Woliata and Siltie, respectively.

### Pastoralists' evaluation and selection criteria of sheep

Farmers and pastoralists have extensive and well-developed knowledge and skill in selecting sheep, ram sharing, and management traits based on phenotypic appearance and recalled pedigree, although the mating system is generally

uncontrolled. A total of 16 pastoralists, 5 of whom are women, were involved in the selection of sheep traits. Pastoralists were encouraged to set their selection criteria concerning the traits of sheep. Researchers have served in facilitation and technical capacities. As a result, the pastoralists established disease resistance, drought tolerance, marketability, meat, weight, and tail type as criteria. According to the pair-wise ranking result, marketability is the first important trait that agro-pastoralists perceived for selecting both the crossbred and blackhead Somali sheep followed by weight and meat (Table 3).

Based on the important traits selected, 25% Dorper crossbred ranked first in terms of its marketability, weight gain, and meat. Moreover, 25% of Dorper crossbreds are thin-tailed, better disease and drought-tolerant compared to the local sheep. In general, according to the pastoralists, the Dorper 25% cross performed better than the local (blackhead Somali sheep) in terms of all the criteria (traits) set by the pastoralists (Table 4).

### Pastoralists' feedback and their knowledge level before and after intervention

Knowledge of a specific agricultural activity

influences one's perception of technology as well as his or her immediate application of new knowledge of the same technology to currently perceived production problems (Desiso et al., 2018). For this study, a simple yes/no question was designed, and pastoralists were asked to rate their level of knowledge before and after the intervention period. On both occasions, agro pastoralists were asked the same questions. The questions were asked during the training period before starting and after the research activity. According to the findings, prior to the demonstration of improved Dorper sheep, only 8.3and 16.7% of pastoralists knew about crossbreeding, the importance of Dorper, and record keeping, respectively, and 16.7% of them knew the scientific management and husbandry practices of sheep. However, following the intervention, all pastoralists responded because they knew about crossbreeding, the importance of Dorper, the importance of record keeping, and the scientific management and husbandry practices of sheep (Table 5). This meant that pastoralists' knowledge and skills had improved following the intervention as a result of the training, awareness raised, and their participation in the research from start to finish as Pastoralists' Research Groups (PRGs).

**Table 3.** Pair-wise ranking matrix result to sheep traits at Dherito Kebele, 2019/2020.

Code No.	Traits	Disease resistance	Drought tolerance	Marketability	Meat	Weight	Tail type	Frequency	Rank
1	Disease resistance		1	3	4	5	1	2	4 <sup>th</sup>
2	Drought tolerance			3	4	5	2	1	5 <sup>th</sup>
3	Marketability				3	3	3	5	1 <sup>st</sup>
4	Meat					5	4	3	3 <sup>rd</sup>
5	Weight						5	4	2 <sup>nd</sup>
6	Tail type							0	6 <sup>th</sup>

Source: Authors

**Table 4.** Rank of sheep breed based on pastoralists' selection criteria.

No.	Breed	Rank	Reasons
1	Local	2 <sup>nd</sup>	Fatty tail, not demanded by the local market, low meat quality (Fatty and Whitish color) & long yearling age
2	Dorper Crossbred 25%	1 <sup>st</sup>	Thin tailed, highly demanded by the local market, high quality of meat (Red color)

Source: Authors

**Table 5.** Pastoralists' Knowledge level before and after intervention.

Statement	Before trial		After trial	
	Yes (%)	No (%)	Yes (%)	No (%)
Had information about crossbreeding	1 (8.3)	11 (91.7)	12 (100)	0 (0)
Know about importance of Dorper	1 (8.3)	11 (91.7)	12 (100)	0 (0)
Know about record keeping	1 (8.3)	11 (91.7)	12 (100)	0 (0)
Know the management and husbandry practices of sheep in a scientific way	2 (16.7)	10 (83.3)	12 (100)	0 (0)

Source: Authors.

## CONCLUSION AND RECOMMENDATIONS

On-farm demonstration and evaluation of improved technologies are very important in the transfer of technology. In general, the result of the study indicated that 25% Dorper crossbred ram were significantly higher in birth weight, weight at

6 months, and yearling (marketable) weight at 12 months compared to the local blackhead Somali sheep. Furthermore, Dorper crossbreds outperformed their counterparts in terms of marketability, weight, meat, drought resistance, and disease resistance. As a result, all concerned parties should make 25% of Dorper crosses more

popular and scaled up in order to improve the productive performance of the local blackhead Somali sheep in the study areas.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of

interests.

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