

Research Article

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Agro-pastoralist trait preference, constraints, and perceptions on Boer x Woyito Guji crossbreed goats in Hammer district of South Omo Zone, Ethiopia

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The study was conducted to identify agro-pastoralist traits preferences, constraints and perceptions of Boer woyto-guji crossbreed kids born with buck mobilization project at Hammer District, South Omo zone. A total of fifteen projects benefited participants through buck mobilization and experience in goat rearing were involved of which 86.7% and 13.3% were male and female participants, respectively. Information on traits preferred, goat husbandry management, and breeding practices perceived by agro-pastoral communities was collected using a questionnaire and data was analyzed using descriptive statistics. In two phases the fifteen participants contributed 92 dry local females with an average of 6.13 (ranging from 4 to 12). From the contributed 68 (74%) goats served and only 55(60%) were tested positive for pregnancy due to different reasons. The agro-pastoralist preferences of the crossbreed kids were assessed and their responses were collected by interviewing. About 66.7%, 86.7%, and 93.3% of them asserted that cross kids were below their local goats on disease resistance, feed shortage, and water shortage tolerance, respectively. Results revealed that quantitative yield traits, phenotypic appearance, and temperament of the crossbreeds were accepted (100%) with a very good preference rate. The participants were asked to mention their preference for crossbreed with their drawbacks and cited fast growth, color, ear and horn type, good conformation or body size of the kids were good traits while docile behavior which can predispose to predators, high feed consumption, low resistance of disease, water and feed shortage as weak traits. From the questionnaire, the pastorals replied that the

crossbreed kids live with other local kids together (100%) in the barn. The most important challenges mentioned and perceived by the pastorals in the buck mobilization were improper selection of breeding doe which led to abortion or stillbirth of doe, dystocia, death of crossbreed kids, eaten by predators in pastures, short duration of the buck with doe's and false mating of doe. Lack of training and awareness creation, diseases, and poor extension linkage are also cited as constraints. It is concluded that, to overcome the identified constraints it needs appropriate strategies on various interventions such as provision of theoretical and practical ongoing training, utilization of buck mobilization program through the formation of cooperation and use of production packages for the implementation and sustainable utilization of improved breeds.

Key words: *Agro-pastoralists, trait preferences, buck mobilization, constraints, crossbreed goats*

INTRODUCTION

In Ethiopia, small ruminant breeding are characterized by keeping of indigenous animals extensively on natural pastures where their nutritional requirement are not met. The animals nutrition is entirely met by using natural pastures and other sources of feed. In developing countries with traditional farming systems, due to poor production of indigenous breeds and scant nutrition, solutions must be targeted on genetic improvements such as genetic selection and crossbreeding, designing new feed strategies through improving farming systems (Gokdal, 2013). In the country, Sheep and goats are reared in huge geographical areas, different socio-economic and cultural practices and a range of farming diversity in southern Ethiopia and they play a vast role in the livelihood of rural farming. As reported by Farm Africa (1996), the Woyto-Guji goats (*Capra hircus* L.), also synonymically or called by their indigenous name as Woyto, Guji and Konso are part of Rift Valley or Small East African family goats of Ethiopia. The sub-types and races of these goats are related to the Arsi Bale goats and they are distributed in North and South Omo, Sidama and parts of wolayta. These goats are mostly kept by pastoral ethnic groups of Bena, Tsemay, Hammer, Malle, Dasenech, Bumie and Guji and by a few agricultural groups of Konso and Gardula. These areas are known to be endemic trypanosomiasis particularly in Gelo valley to South of Lake Abaya and the western Ghenale catchment area. Information on the productivity of Woyto-Guji (WG) goats is, however, limited. First-hand reports by FARM AFRICA indicate that the average kids' number per breeding female lifetime of woyto-guji goats is 4.3. Among the birth types reported, about 83% were single, 16% twin and 1% were triple births. On-farm productivity monitoring of woyto-guji goat is currently in progress in pastoral areas of the South Omo zone (Bena-Tsemay District) by Jinka Agricultural Research Center (Demerew & Aschenaki, 2023).

Indigenous breeds have typical adaptive features like tolerance of diseases, water scarcity, and better capacity of utilizing limited and poor quality feeds; this makes them survive and be productive in the prevalent environment (Baker & Gray, 2004; Kosgey & Okeyo, 2007) and by crossing with improved breeds these traits can be exploited. However, indigenous breeds have low genetic potential for economically important traits; and the genetic improvement strategies are based on the replacement or crossing of indigenous breeds with exotic breeds. These attempts do not meet the country's demand this is accomplished by importing exotic breeds from another country. To overcome the problem pure blood Boer goat which is very productive within a short period is crossed with indigenous breeds to produce genetically superior crossbreeds. Among all superior traits better body weight and early growth are the most essential traits. To improve the genetic potential of a given breed, the selection of a breed is the first and most important step. However, the improvement of breeds in selection is a slow process. Crossbreeding was encouraged and promoted by using indigenous breeds as dams and exotic breeds as sires. In the country, Boer goats are imported from South Africa with the aim of improving the indigenous goat's market weight. This meat goat breed is serving as a sire line for up-grading of indigenous meat goat breeds (Demerew & Aschenaki, 2023; Zeleke et al., 2022). Crossing of local goats with Boer buck and distribution of crossbreeds (50% to 75%) genotypes has been in progress with the initiative of the Ethiopian Sheep and Goat Productivity

Improvement Project (ESGPP) and currently Jinka Agricultural Research Center (JARC) has disseminating crossbreed bucks to pastorals and agro-pastoralists to improve the weight gain performance of indigenous breeds. In this program, crossbreeds were disseminated to the agro-pastoral areas for mating for two months and they were mobilized. Little information was available on constraints and perception of agro-pastoralist on crossbreeds in the disseminated district. Therefore, this study aimed to identify agro-pastoralist traits preferences, constraints, and perceptions on Boer-WG crossbreeds' kids born with buck mobilization project at Hammer District, South Omo Zone.

MATERIALS AND METHODS

Description of the study area

Hammer district is one of the administrative divisions in South Omo Zone in South-Western Ethiopia. The district is the homeland of the Hammer people who practice pastoralism and agro-pastoralism systems. The district has a total land area of 5, 742 km² and located 4°50'50"47' N and 36°15'36"90 ' East, and bordering Kenya to the South; Bena-Tsemay district to the North; Borana zone to the East and Dasenech, Nyangatom and Selamago district to the West. It was found less than 500 to 2000 m.a.s.l. The area is characterized by semi-arid and arid climatic conditions with mean annual rainfall increasing from the extreme South lower part of 350 mm to the upper part ranging to 838 mm. The rainfall pattern is bimodal with a long season from April to June and small rains in September and October. The area has erratic and variable rainfall with high temperature ranging from 26-35°C. The vegetation cover of the area is a mixture of *Acacia*, *Boswellia* and *Commiphora* woody species and short grass types with varying densities of woody vegetation (Alemayehu & Tezera, 2002).

Sampling and data collection methods

Based on the purposive sampling technique, three peasant associations (PA's) who participated in buck mobilization were selected and data was collected via interview using a questionnaire. From each of three of the selected PA's participants of the buck mobilization were selected purposively and data was collected via interview using a questionnaire. A questionnaire was prepared in English and translated into the local language to gather relevant information on the perception of Boer x woyto-guji crossbreed kids, the problems encountered on buck mobilization and kid survival in the area. Apart from collecting information from households using the questionnaire, group discussions were made with participants in the area. Identification of different trait preferences was done in a participatory manner. Households were provided with lists of parameters (disease resistance, growth rate, phenotypic appearance, mothering ability, coat color, ear type, and temperament, feed and water shortage tolerance) and asked to choose the trait preference and their perception of it. In addition, the households were also asked to add additional traits that they preferred other than the ones listed above.

Breeding program and buck mobilization arrangement

Buck utilization practices

The selected area was delineated for cross breeding purposes and not contacted with neighbor PA's to protect other indigenous goats from genetic dilution and erosion. Buck mobilization is a process of organizing herders/associations into groups (5 to 6) and giving a buck (for 25 to 30 does) for a long or short period, either by agreement or by purchase. The contributed female goats from the herders stayed in one place until the end of their breeding period (Figure 1). Understanding and agreement was made with participants, to sell their male crossbreed with less than 50% blood level for terminal marketing. There are different utilization arrangements of improved bucks by the herders. In the first arrangement, the buck is sold to an individual goat keeper, based on the size of the local female goat population; it will require better management skills and capabilities. This herder can give service of buck to other herders of the village under different terms of agreement. However, due to the shortage of bucks in the source

farm, this individual buck provision was not possible. Another method is the use of improved buck through buck mobilization, which is currently widely practiced at the Jinka Agricultural Research Center (JARC). Buck mobilization, which has brought successful results for crossbreeding at JARC and elsewhere is by organizing herders into groups. This arrangement mainly deals with the dissemination of improved Boer bucks to organized groups and cooperatives. It includes the use and handling of bucks, the selection of female goats and pregnant doe and kids' management practices.



Figure 1. On-farm buck mobilization for providing mating services to the village and the kids born in the village

During mating, the buck and does browse freely and they too have full access to water every day. In this situation, the goat keepers have to follow up the goat and record every day which goats have come to heat and mate. This helps to identify the served goats and return them to their owners to reduce the workload. During the buck's stay in the grouped does, in addition to free grazing, 300-400 grams of nutritious feed (concentrate) is provided daily in the morning and evening.

Data analysis

Proportions of responses to a particular variable were analyzed using descriptive statistics using the Statistical Package for Social Sciences (SPSS) version 23.

RESULTS AND DISCUSSION

Household characteristics of the participants

Table 1. The household characteristics of the respondents

Descriptor	Number	Percentage
Sex		
Male	13	86.7
Female	2	13.3
Marital status		
Married	15	100
Education status		
Illiterate	15	100
Family size		
1-3	4	26.67
4-6	8	53.33
More than 6	3	20

The household characteristics of respondents are shown in Table 1. Among the fifteen participants in buck mobilization in the three PAs, females comprised two (13.3%) and the rest 13 were males. According to the survey all (100%) the participants were illiterate but were selected based on their technology acceptance in the area better than others. The majority of the households have a family size between 4 to 6. The education level of the households is expected to advance their capacity to gain, process, and use of relevant information related to the adoption of new technology with the full package. Education is supposed to have a direct and positive influence on the intensity of the acceptance level. Thus, the lower educational background obtained in the study area compared to other studies might be a reason for the poor adoption of improved technologies (Holst, 1999).

Average livestock holding

The average livestock holding is shown in Table 2. The average (Mean± SD) livestock holding showed that cattle, goat, sheep, donkey, and poultry with 47.40±38.28, 44.27±38.46, 33.40±33.72, 3.60±5.33, and 6.93±2.60, respectively. It showed that the mean livestock holding was higher than other country indigenous breed livestock holdings. In the most lowland areas of pastoral and agro-pastoral the numbers of livestock's particularly goats are high and this may ascribed to their cultural values and deliberated as sources of wealth and social functions and play many roles for their keepers (Getaneh, 2023). The other reason for a high number of livestock in the areas is that the environment is suitable for adaptability of the animals which is line with the report of Demerew et al. (2019).

Table 2. Livestock holding per household in the sampled households

Livestock type	Holding (Mean± SD)
Cattle	47.40±38.28 (6-130)
Goats	44.27±38.46 (14-160)
Sheep	33.40±33.72 (7-140)
Donkey	3.60±5.33 (0-15)
Poultry	6.93±2.60 (3-12)

SD = Standard Deviation

Households' selection and animal management

In two phases a total of 15 participant households were selected and they contributed 92 dry local females with an average of 6.13 (ranging from 4 to 12) (Table 3).

Table 3. Total data of the goats (cross and local) with participants in the district

Participants no.	Goats contribute (no.)	Goats mated	pregnant	Aborted does no.	Death of doe with dystocia (in no.)	Total kids born	Death of cross kid after birth	Kids alive at survey time
1	6	5	5	1	1	2		2
2	6	6	6		1	3	1	2
3	6	6	6		2	4		4
4	6	6	6	1	2	3	1	2
5	4	4	4		1	1		1
6	12	4	4		1	3	2	1
7	6	3	3	3		-		-
8	5	2	2	1		1		1
9	6	6				-		-
10	7	1				-		-
11	5	5	5	2	1	2		2
12	6	6	6	4		2		2
13	6	6				-		-
14	6	3	3			-		-
15	5	5	5	1		-		-
Total	92	68	55	14	9	21	4	17
%			80.9	25.5	16.4			

From the contributed goats 68 (74%) goats mated and only 55 (60%) tested positive for pregnancy due to different reasons. From these doe's 21 kids were born (4 dead after born and 17 alive). Researchers tagged and identified 17 kids and 11 pregnant does from the late mating.

Preference for crossbreed goats

Even though the kids were at their early stage of growth, the agro-pastoralists preference for the cross kids was assessed and their response to traits is shown in Table 4. In the surveyed area most agro-pastoralists when asked about their preference said that they prefer to rear crossbreed goats with traits of fast-growing, attractive body appearance (ear and horn type), attractive body color and temperament, good conformation or big frame body size tolerance to drought and diseases and unselective browsers and all respondents (100%) accepted with very good preference rate (Figure 2). Most participants preferred Boer crossbreed goats than indigenous goats due to their body size. Likewise, many other goat keepers have been interested in introducing Boer crossbreed into their flocks for crossing with their local goats to preserve their physical attractiveness. The main drawbacks of the crossbreed (mentioned as bad traits) mentioned by participants were the docile behavior of the kids which can predispose them to predators, high feed consumption compared to local, and low resistance to disease, water and feed shortage.

According to Tekleyohannes et al. (2012), the indigenous goat in the areas are primarily kept for their socio-economics purpose followed by socio-cultural functions, and these showed that the appearance with white red color, ear type and other external traits of the Boer goats was preferable than local goats type. A high proportion of participants confirm their preference for crossbreeds' goats for their better productive and adaptive traits. The surveyed participants' perceptions are in line with the observations by Demerew & Aschenaki (2023) that about 73.4% of agro-pastoralists in Bena-Tsema district greatly give high value for Boer crossbreeds for their sound production performance and better environmental adaptation as their local breeds. Other similar results were also reported by many authors, about 80% of farmers in the Raya Kobo district and about 57.1% of the respondents in the Amhara Sayint district revealed strong attention for crossbreeding reported by Zeleke et al. (2022). Although the pastoral and agro-pastoral was preferred to Boer crossbreed breeds they confirmed that the crossbreeds had poor tolerance to feed shortages and endemic diseases. About 66.7% of them said that their disease resistance is below their local kids. Based on the ESGPIP guideline (2009), the Boer goat was developed in an environment where tick-borne diseases were not a problem indicating the Boer goat has a low level of resistance to heartwater (*Cowdria*) which is caused by tick-born disease.

According to the Tindano et al. (2017), crossbreeds are better in body size while indigenous breeds are more advantageous in resistance to diseases and harsh environments. In the surveyed area few agro-pastoralists argue that indigenous breeds are better than crossbreeds and are preferred by them because they cope with difficult challenges of the production environment and have well adaptable traits and the capacity to produce with the least management. In the survey, it was seen that the kids were staying together with other local kids and exposed to external parasites which can make and contract them to different tick-borne diseases with locals. Agro-pastoralist also mentioned that crossbreeds are well known for their fast growth performance and high market demand whereas local goats are well recognized for their tolerance of different diseases and endurance under harsh environmental conditions including low-value feed, poor access to water but have retarded growth and low market demand. As reported in previous studies, participants' perceptions in this study also agreed that crossbreeding with better production performance and adaptability. In general success of crossbreeding and sustainability of indigenous goat genetic improvement is determined through prominent awareness creation of participants and active coordination of the concerned bodies.



Figure 2. At the same time born cross kids (50%) and local kids

It is well known that water shortage in pastoral areas is the main challenge for crossbreeds and 93.3% of respondents indicated that crossbreeds had poor tolerance to water shortage compared to their local breed. On traits of feed shortage tolerance, about 86.7% of the participants responded that below their local goats. They said that the kids have large abdomens and the milk of their parents was not enough for them, so in the future, the milk production performance of the doe should be given attention for selection of the doe for crossing.

Table 4. Trait preferences of Boer-WG crossbreed goats

Traits/characters	Acceptance level N (%)			
	Very good	Good	Equal with local	Below local
Disease resistance	-	-	5 (33.3)	10 (66.7)
Growth rate	15 (100)	-	-	-
Phenotypic Appearance (general body)	14 (93.3)	1 (6.7)	-	-
Color preference	15 (100)	-	-	-
Ear type	15 (100)	-	-	-
Temperament	15 (100)	-	-	-
Feed shortage tolerance	-	-	2 (13.3)	13 (86.7)
Water shortage tolerance	-	-	1 (6.7)	14 (93.3)

N = participant number, % = percentage

Management of crossbreed kids

From the questionnaire, the pastorals replied that the crossbreed kids live with other local kids together (100%) in the barn. The management of cross kids (50 and 25%) was not different; it was like the local kids were kept together in the barn until their parents back from grazing. Even though the pastorals were aware of more management need for cross kids, they didn't apply it, due to the low number of kids in individual pastorals for separate management and labor problems as mentioned by the group discussion. Goats' management practices are easily done by irrespective of any family members who have economically active and available labor in the households. Therefore, the family size in a large flock is a very important factor that governs the household's decision in the use of flock management. Earlier reports showed that if crossbreed and indigenous animals were kept at similar management crossbreed did not perform better than indigenous breeds (Ayalew et al., 2003). Therefore, crossbreeding is more suitable when animals are managed intensively (feeding and housing indoors) and they may express their genetic potential (Zonabend et al., 2017).

Major problems associated with crossbreeding (buck mobilization)

The main problems observed and raised by participants at pastoral areas associated with buck mobilization were the poor body condition of the breeding does which is related to selection problems; death of doe at kidding/parturition due to their small size and lack of assistance from animal health. As a result, about 9 (16.4%) does die during kidding. The problem in the contribution of females who were not fitted for the criteria for the buck mobilization work happened due to the pastorals reluctance on the technology to mate their best-performing doe

and the expert/researchers selection problem. The other reason mentioned was the shallow demonstration of the technology. False mating and a short period of the mating period also aggravated the problem. As a result, it was not possible to get the desirable expectation because the time between the goats coming to heat and the bucks staying with them was not matched which led and facilitated the does to mate with local bucks. It has been mentioned that small-sized goats prone to birth problems (dystocia) when they are selected for breeding. Dystocia is the inability to give birth because the mother's uterus is narrow during kidding (Figure 2). On the other hand, when there is good feeding and pasture and the season is also good, it is necessary to identify the right time to be mating and to make the time to kidding to the season of good browsing and crop surplus production. This will reduce unnecessary maternal deaths and injuries. It was found that in this survey those goats that had no experience of giving birth before were exposed to death and the kids were eaten by wild animals in pastures. It has been observed that the lack of understanding of the agro-pastoralist regarding goat selection was also a problem. The participants agreed that the deaths of kids and does were due to misunderstanding during doe selection which has a small frame size. After the problem happened, the respondent's intention on the size of their local doe for the bearing of the Boer or cross buck was positive and if large frame size females were selected, they could bear better without assistance. Abortion or stillbirth of doe was experienced in different cases that happened at the time and as a result, 14 (25.5%) pregnant females were prone to abortion. The main reasons as mentioned by the herdsmen and animal health experts were pneumonia and consumption of poisonous plants in the area. Insufficiency of milk for kids, external parasites and diseases were also the main challenges assessed during the survey.



Figure 3. The skin of kids that died in kidding (left) and kid with miss-mothering (right)

As the birth weight of crossbreed kids is usually at least 1 kg higher than that of local kids may face birth problems, so they require special observation and monitoring when they are about to give birth. If they need help during kid birth, it is better to call a local animal health expert to provide appropriate assistance. Since there is a possibility of miss-mothering of the kids that are born (Figure 3), monitor them when they are giving birth and make sure that the kids get the first milk immediately (within 12 hours). After the kid is born, if the dam's breast is closed and unable to release milk, take the necessary measures in consultation with a local animal health. Occasionally weak kids may be born, so hold and support them to breastfeed. During winter, goats can be affected by foot rot and some flu-like diseases (pneumonia), so clean their houses regularly so that they do not get dirty with urine and keep the kids warm. Most interviewed participants suggested that to sustain the crossbreeding program it needs attention on training and awareness creation for pastoralists, delivering veterinary services and drugs at affordable cost, developing improved forage that is adapted to the area and organized and legal marketing channels are required.

CONCLUSION

Crossbreeding aims to increase indigenous breeds productivity through introducing exotic breeds thereby it will be expected that crossbreed results have better productive performance. Participants perceive that crossbreed goats are commonly well known for their high growth rate, early marketability, and attractive body appearances. The main problems in buck mobilization were poor skill and lack of seriousness in the selection of doe for the breeding (the selected does are lower weight and small body size, some are at their first parturition); low awareness; a disease which was complicated with abortion and poor follow up particularly during pregnancy and parturition time and poor extension services. Poor supervision arrangements and subsidies to the organizational sector are also the main challenges. To achieve the deliberated result and continuous upgrading, the provision of training on theoretical and practical sessions regarding breeding management is required; and production packages are essential for the implementation and sustainable utilization of improved breeds. Further research on evaluating meat quality and carcass performance of crossbreed is required.

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AUTHOR CONTRIBUTIONS

Mr. Mekete Girma wrote the proposal, prepared the check list, reviewed and edited the manuscript, analyzed and wrote the manuscript. Mr. Demerew Getaneh collected data in the field, reviewed and edited the manuscript, formatted the manuscript according to the journal guidelines.

COMPETING INTERESTS

The authors declare that there is no conflict of interest & the manuscript has not been submitted for publication in other journals.

ETHICS APPROVAL

Not applicable

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