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Research Article

Farmers' Perceptions to Community-Based Breeding Programs: A Case Study for Doyogena Sheep in Ethiopia

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Abstract

Background and Objective: In 2012/13 the Doyogena sheep Community-Based Breeding Program (CBBP) have been adopted to improve Doyogena sheep. The present study aims to investigate the attitudes, opinions and perceptions of smallholder farmers on the Community-Based Breeding Programs (CBBPs). **Materials and Methods:** The survey data were collected from 236 households of 118 CBBPs participant farmers and 118 non-participant sheep-keeping farmers. The survey data were analyzed using an index and SPSS. **Results:** The evaluation result revealed that CBBP is acceptable and workable in the community. After the intervention of CBBP, a greater number of sheep were sold and participant farmers realized a high average annual income. The direct participation of smallholder farmers in CBBP is on an increasing trend. There was evidence of improvement in the growth performance of lambs, twinning rate, decrease in lamb mortality and shorting of lambing interval. **Conclusion:** It can be concluded that the genetic improvement of Doyogena sheep under CBBPs was successful and the program satisfies the farmers. Therefore, there is an opportunity to out scaled the new sites and strengthen the existing sites for further improvements.

Key words: Breeding program, doyogena sheep, farmer satisfaction, traits, non-participants, participants farmers, challenges

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

In developed countries, national breeding programs have been implemented by well-organized breeder associations with full support from the state in a developed infrastructure and high-level capacity to run the breeding programs. Such breeding programs are successful in data recording and processing and the evaluation of the best candidates for optimal breeding. However, adopting such breeding programs in developing countries was not successful due to poor infrastructure and a lack of support from the government. A new approach to Community-Based Breeding Programs (CBBPs) has recently emerged as an encouraging sheep genetic improvement option¹⁻³. Such programs have been successfully implemented for small ruminants using indigenous genetic resources of smallholder farmers in countries like Burkina Faso, Iran, Malawi, South Africa, Sudan, Tanzania, Uganda and Mongolia^{2,3}.

In Ethiopia, CBBPs were implemented to improve local sheep breeds of Bonga, Menz, Afar and Horro. After promising results reported from the firstly established sites of Bonga, Menz, and Horro, CBBP was expanded to Atsbi District, Doyogena District, Abergele District, Konso Zones and a few other sites, in different parts of the country with the support of International Centre for Agricultural Research in the Dry Areas (ICARDA), Federal government and their respective regional governments⁴.

In 2012/13 CBBPs were adapted to the Doyogena District to improve Doyogena sheep. The Doyogena sheep is found in the Kembata Tembaro Zone of Southern Ethiopia. Earlier studies showed that this sheep was known by a different name. Different works of literature reported, that the sheep population found in the Kembata Tembaro Zone was categorized under the Arsi-Bale breed and named by Adilo or Kembeta area sheep population. In the study of Deribe *et al.*⁵, the Doyogena sheep was named by the Wolayta sheep ecotype cited. Later in 2013, a team of researchers from Areka Agricultural Research Centre (AARC) partnership with ICARDA conducted a value chain analysis of Doyogena sheep. Doyogena district is the main source of Doyogena sheep. Accordingly, CBBP was established after the detailed characterization of this sheep⁶.

After the implementation of CBBP, exploring the satisfaction of smallholder farmers with the implemented CBBP operation seemed of value. It was evident that farmers have tremendous practical knowledge on livestock keeping gathered over a long period and transmitted from ancestors. It has been found that this knowledge coupled with scientific rearing of livestock results in faster improvement of livestock

productivity. Unfortunately, there have been virtually limited studies to understand smallholder farmer satisfaction with CBBP. The previous study has shown that evaluating the smallholder farmers' satisfaction with the operation of any sheep improvement program has resulted in the success of such a program⁷. Accordingly, the present study has been planned to explore the perception of a farmer on the ongoing Doyogena sheep CBBP.

MATERIALS AND METHODS

Description of study area: The study was carried out in the Doyogena District of southern Ethiopia from October, 2013-June, 2019. Doyogena sheep CBBP has been undertaken the located at 7°20'N latitude and 37°50'E longitude of Kembata Tembaro Zone, found at a distance of 258 km to the Southwest of Addis Ababa. The altitude of the District ranges from 1900-2800 meters above sea level (m.a.s.l).

Animal management: Sheep flocks in this study were managed by CBBP members. At the time of this study, there are 4211 sheep recorded in the record book. CBBP cooperatives are licensed and formally registered. All animals were identified with a plastic ear tag. Each CBBP cooperative has a code of identification number. The ear tag contains a cooperative code, animal ID and year of birth. All the data were recorded in a recording book. The content of the recording book includes baseline record, lamb record and ewe's record. Newly joined animals were recorded in baseline-recorded format. The data recorded in the recording book contain the owner's name, animal ID, dam ID, sire ID, birth weight, birth date, birth type, animal sex, parity, coat colour, weaning weight, 6-month weight, nine-month, mating date and post-partum weight.

Feeding: The main feed sources for animals included *Enset*/false banana (*Ensete ventricosum*) products of *Amicho*, corm, crop residue, improved forage/grass, kitchen leftover and purchased concentrates. Flocks graze with tethering on the small private land. Feeding in the daytime and housing at night-time practised often one big house was constructed from bamboo or locally available materials and shelter for sheep was constructed inside one main house.

Veterinary service: Free veterinary service was provided for CBBP participant farmers. Sheep are de-wormed for internal parasites two times a year in January and June. In addition, sheep were given ivermectin for external parasite control, when external parasite infestation is observed (as per the

need). Vaccination against the blackleg, contagious caprine pleuropneumonia and foot and mouth disease (Orf) has been given once a year for pasteurellosis, pneumonia and Peste des Petits Ruminants (PPR) paste despotisms ruminants vaccination was given twice a year. Animals were treated with different broad-spectrum antibiotics usually carried before and after the rains.

Cooperative administration: Each CBBP cooperative has four committees, namely: The main committee, control committee, price determiner committee and selection committee. The committees are responsible for the effective functioning of the program. For each breeder cooperative, one data enumerator and 2 health professionals were employed.

Selection strategy followed: Selection of breeding rams takes place separately for each CBBP cooperative on a programmed date, 2 times per year. The researcher identifies the candidate breeding rams, based on the performance data recorded by the enumerators. Before 2016, the selection was done based on the previously quantified selection criteria of the overall excellence of animal phenotype. From 2017 onwards, the selection was done based on candidate animal estimated breeding value (EBVs) and the candidate's phenotypic soundness. In the first stage, candidate ram's pre-selection and ranking take place based on three-month weight. In the second stage breeding rams were again ranked based on their 6-month weight EBVs. Top 10% of the superior breeding rams (1st ranked) were retained for service. Second ranked were sold for breeding purposes to other communities. The third-ranked were either castrated to be fattened or marketed to prevent unwanted mating.

Selected best breeding rams serve not more than one year because the rams become big in size and aggressive. Breeding rams holder members sign an agreement with the cooperative commitment when they receive the breeding rams. Rams holders handle the breeding rams efficiently. After one year of service, the breeding rams were sold to other areas of the region.

Source of survey data: The survey was conducted in both participant and non-participant communities. The non-participant farmers were selected from the five breeder cooperatives and three neighbouring sheep-keeping communities (Lemi seticho, Wasera/Eutugae and Gamora Gewada). The non-participants were initially (first stage) purposely selected based on their (i) Experience in sheep rearing as active sheep owners, (ii) Proximity with participant

farmers, (iii) Understanding of sheep breeding and the (iv) Knowledge about the ongoing CBBP in that community. In the second stage, both non-participants and participant farmers, as per sample size, were selected randomly. Sample sizes of farmers in the survey were drawn according to Kotrlik *et al.*⁸, as:

$$no = \frac{z^2 \times p \times q}{d^2}$$

$$n_1 = \frac{no}{1 + \frac{no}{N}}$$

Where:

- no = Desired sample size
- n₁ = Finite population correction factors
- N = Is total population
- Z = Standard normal deviation (1.96 for 95% confidence level)
- d = Is degree of accuracy desired (0.05)
- p = 0.11 (proportion of population to be included in sample i.e., 11%)
- q = Is 1-P = (0.89)

$$no = \frac{1.96^2 \times 0.11 \times 0.89}{0.05^2} = 150$$

When the above formula is applied:

$$n_1 = \frac{150}{1 + \frac{150}{565}} = 118$$

From both groups of participant and non-participant farmers 118 farmers were sampled.

The details of the farmers selected for the survey was shown in Table 1. The survey was conducted through: (i) Individual interviews, (ii) Focus Group Discussion (FGD) and (iii) Key informant interviews. A semi-structured questionnaire was prepared and pre-tested before going to the actual interview. Afterwards, some changes were made to the respondent's opinions.

The questionnaires were administered to the randomly selected households by the researcher of Areka Agricultural Research Centre (AARC) and by a team of enumerators. Information through questionnaires from the members was gathered regarding their satisfaction with CBBP, participation and, perception of CBBP, trends in improvement, perception

Table 1: Details of farmers selected for the survey

Kebeles/Cooperative	Total number of households	Total number of participants	Number of participants surveyed	Number of non-participants surveyed
Ancha Sedicho	821	154	24	10
Begedamu geteme	681	66	23	10
Hawora Arara	485	159	24	10
Murasa Weyeramo	664	91	23	10
Serera Bukata	565	95	23	10
Lemi Seticho	789	Nil	Nil	23
Gemora Gewada	922	Nil	Nil	22
Wasera Eutugae	617	Nil	Nil	23
Total			118	118

of economic importance, perception of breeding ram selection and breeding ram management, awareness development and challenges faced in running the program. Similarly, non-participant information related to their view about CBBP was considered.

To support the individual interview, focus group discussions were held with a group comprising of 6-8 members of experienced elders in each cooperative. Discussions were done by using a prepared checklist. The discussion was focused on farmers' perception of the breeding programs, how ram selection is going, ram use, the level of ownership of the programs by the communities and challenges faced in running the programs. Besides, key informant interviews had been conducted with the District office of marketing and cooperative office and the District office of livestock and fishery. Discussions were done mainly to assess their knowledge and linkage with the cooperatives. Key informants were asked with a well-prepared checklist. The interview also included local administrations and development agents.

Statistical analysis of survey data: The survey data were analyzed through descriptive statistics (frequencies, percentages, cross-tabulation and means) to generate summaries and tables for the participant and non-participant farmers using SPSS software (<https://getintopc.com/software/analytics/ibm-spss-statistics-2013-free-download-1111050/>). The statistical significance tests were used to see if there was significant variation between participant farmers of the breeding cooperatives and non-participant sheep keepers as well as among participant farmers of the breeder cooperatives. The variables tested were perceptions of CBBP, knowledge of CBBP and improvement difference. The index was calculated to provide rankings of improvement in growth performance, lamb survival, twinning rate, lambing interval, age at first lambing and flock size. A Chi-square test was employed to see the associations between participants and non-participant farmers. In addition, the Mann-Whitney U test was

conducted to test for significant differences between participant and non-participant farmers for variables of market participation and the number of animals sold.

RESULTS

Participation of the community in CBBP: Initially, the program was started with 148 male-headed and 24 female-headed households. Currently, 611 households directly participated in the breeding programs (Table 2).

Farmer's perception of CBBP: About 99.1% of participant farmers revealed that they are happy with the implementation of CBBP for the genetic improvement of their sheep (Table 3). In addition, the FGD result displayed that, farmers were satisfied by the introduction of CBBP in their respective areas. During the survey and FGD, non-member farmers were asked about their interest to join or form a new cooperative. The result indicated that about 94.8% of non-member farmers showed interest to join the breeder cooperative or establishing new breeder cooperatives. We did not find noticeable challenges that can hinder non-participant farmers to become a member of the breeder cooperatives or establishing a new cooperative except some farmers raise the economic problems to pay membership share.

Farmer perception of inbreeding: The farmers' perception of the inbreeding problem was captured through questionnaires and FGD. The results revealed that the majority of the farmers are familiar with inbreeding. There is a significant knowledge difference between the member and non-member farmers. Participant farmers are aware of inbreeding with its effect and solution. Due to continuous follow-up and training, they could capture better knowledge about the effect of inbreeding and measurements taken to reduce it. On the other hand, non-participant farmers are aware of inbreeding, however, they do not take any measure to solve the problem, as they believe inbreeding is not a major problem for animal

Table 2: Community participation in the CBBP

Cooperatives	Members at the beginning of CBBP		Dropouts report		New entry		Current number of members		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
Ancha Sedicho	53	7	NA	NA	85	11	138	18	156
Hawora Arara	28	14	NA	NA	113	25	141	39	180
Serera Bukata	35	6	NA	NA	55	18	90	24	114
Begedamo Getemi	14	2	NA	NA	43	8	56	10	66
Murasa Weyeramo	22	3	NA	NA	59	14	81	17	98
Total							506	108	614

NA: Not available

Table 3: Percentage of participants and non-participant farmers by their agreement on sheep genetic improvement through selection

Agreement on the selection of best breeding rams for sheep breed improvement	Percentage		Chi-square	p-value
	Participants farmers	Non-participants		
Strongly agree	(64) 54.23	(57) 48.3	3.54	0.314
Agree	(54) 45.76	(58) 49.1		
Not sure	0	(2) 1.6		
Disagree	0	0.8		

Table 4: Participant farmers' ranking on improvement in breed productivity through a community-based breeding program

Parameters	N	Index	Rank
Growth performance	120	0.26	1
Lamb survival	109	0.22	2
Twining rate	111	0.2	3
Lambing interval	95	0.12	4
Age at first lambing	68	0.11	5
Flock size	86	0.09	6

Table 5: Mean income from marketed sheep by farmers

Owner groups	Number of the animals sold	Animal age groups	Average prices	Mann-Whitney U test p-value
Participant	107	Adult ram	3207 (630)	0.000
	2	Adult ewe	1525 (106)	
	3	A young female (post-weaning to one year)	923 (254)	
	6	young male (post-weaning to one year)	930 (309)	
Total	118	Total	3004 (878.4)	
Non-participant	57	Adult ram	2222.6 (986)	
	14	Adult ewe	1931 (1009)	
	26	A young female (post-weaning to one year)	1168 (522.4)	
	21	Young male (post-weaning to one year)	1474 (741)	
Total	118	Total	1822.4 (963)	

Figures in parenthesis represent standard deviation and mean incomes are in Ethiopian Birr

productivity. In the breeder cooperatives, breeding rams had been assigned out of their location and service was allowed for only one year. At the time of breeding ram's allocation, the researcher, data collector and cooperative committee take care to avoid mating between relatives. Unselected rams were either castrated or sold.

Farmer perception of improved performance traits: The improvement in the Doyogena sheep productivity after the launching of CBBP, based on participant farmers' ranking, was presented in Table 4. The results showed that there was an improvement, after the start of the CBBP, in growth, survival of lambs, twining rate, lambing interval, age at first lambing and flock size of Doyogena sheep and these traits were ranked as

I, II, III, IV, V and VI, respectively, by the farmers. The growth performances in terms of body size and lamb survival of sheep were ranked as II and I in improvement in this breed, respectively.

Farmers' perception of income from sales of sheep: The mean annual income comparison from the sale of different categories of sheep by participants and non-participant respondents was presented in Table 5. The difference in average annual income from the sale of sheep between the two groups of farmers (participants and non-participants) sold was statistically significant. The total average income was 3004.49 Ethiopian Birr/head by participant farmers whereas it was 1822.45 Ethiopian Birr by non-participants. The majority

Table 6: Numbers of sheep sold in one year by CBBP members and non-members

Sheep flock size	N	Median	Mann-Whitney U test p-value
CBBP Participant farmers	118	4	0.000
CBBP Nonparticipant farmers	118	2	
Total	236	3	

Table 7: Participant farmer's response by their interest to use selected sires for service

Participant farmer response	Frequency	Percent	Chi-square	p-value
Below one year	96	98.0	119.05	0.000
1-2 year	2	2.0		
2-3 year	0	0		
More than three year	0	0		

of participant farmers sold adult breeding rams at a good price for breeding purposes. Non-participant farmers marketed all age groups of sheep while, participant farmers retain ewes and young females for the breeding purpose (Table 5).

Number of sheep sold: The number of sheep's head sold by the participant and non-participant farmers was presented in Table 6. The difference in the number of sheep sold by these two groups of farmers is statistically significant. A participant farmer sold 4 head of sheep per year while non-participants sold 2 head of sheep per year.

This variation could be again explained by an increase in the flock size and performance difference between a flock of participants and non-participant farmers.

Farmer perception of the selection process, management and use of breeding rams: Candidates' ram selection and ranking were made by estimated breeding values. Breeding ram's prices were set per kilograms body weight (1 kg = 100 ETB). Based on EBV all recorded best breeding rams were grouped into three. First-ranked superior rams were retained in the community. Second-ranked breeding rams were distributed to different parts of the country. Third-ranked were either sold or castrated to protect against unwanted mating. The EBV selection method worked well in all cooperatives.

After one year of service, the breeding ram was sold as breeding animals to other areas of the region. When the rams are sold, the benefit, which is the profit margin after deducting the initial price of rams, is shared between members who managed the breeding ram and the cooperative. Hence, ram holder member benefits (2/3) from the sale of breeding ram. During the survey, members who previously kept rams were asked about their satisfaction with this 2/3 of price sharing and their future interest to keep the breeding rams. About 90.4% of respondents still showed interest to manage the breeding sire, although most members complained about the sires becoming difficult to manage because of their big size

and aggressive behaviour. This caused keeping the best rams for a long time difficult. Consequently, 98% of respondents were not interested to keep rams for more than one year (Table 7).

Breeding rams were used in the herd for 1 year. Results from the survey revealed that averages of 32 ewes from 10 participant farmers were allocated to one breeding sire. The demand for breeding rams from different zones and other non-governmental organizations was an increasing trend. Over the last 6 years, the breeders' cooperative sold more than 800 breeding rams to neighbouring zones.

Farmer's perception of training and support: Training and support are essential for the success of CBBP⁵. Accordingly, different forms of training were organized by ICARDA in partnership with AARC. Focused training was given to the cooperative committee, cooperative members, data collectors and health professionals. Seedlings of high-value feed (oat, vetch) were distributed to interested members. The training was provided on the utilization of forage legumes and the use of alternative feed resources. Sheep fattening strategies, mass synchronization and artificial insemination (AI) were introduced. Different forms of workshops were organized by ICARDA and AARC. A large partitioned tin roof shed/shelter is constructed by ICARDA for three breeder cooperatives and it is being used for candidate breeding ram selection (Fig. 1).

Some success stories of some participant farmers: W/ro Turunesh Abera is a 32-year-old woman. After the introduction of CBBP, she joined CBBP in her Kebele. Her house is around the constructed tin-roofed holding yard and she lives with her husband. Her family depends on only 0.25 hectares of backyard land. Her household depends mainly on *enset* and sheep production. When CBBP started, she joined with only two ewes. Currently, she owns nine sheep (4 ewes, 2 castrated rams and 3 lambs). In her house, she had no stool and chairs before she joined the CBBP. Her husband had a long-time dream to travel to South Africa. After she joined CBBP, she



Fig. 1: Tin roof shed/shelter at Hawora site

contributed best breeding rams to the cooperatives. She got training on sheep production (health, feeding and management). Since CBBP started, she sold seven breeding rams. In the first-round breeding ram selection, she sold one breeding ram with the price of ETB 2800. For the following round i.e. second (one ram), third (one ram), fourth (one ram), fifth (one ram) and sixth round (two breeding rams), she sold with a price of Ethiopian Birr (ETB) 1500, 2300, 3200, 2600 and 5400, respectively. In addition, she keeps one cooperative breeding ram in her home and earns two-thirds of the profit share. Based on the cooperative's rule she earned ETB 1200 from one ram. In sum, she got ETB 19,000 from 7 breeding ram sell and one cooperative breeding sire profit share. She used this money to send her husband to South Africa (ETB 9800). In addition, she bought 12 stools and chairs for her home. Now she has ETB 5400 on her hand. She plans to construct a tin-roofed house. She told us that she never had triplet and quadruplet lamb births before CBBP. Since the selection program started, triplet and quadruplet births are common in her home. W/ro Turunesh Abera believes she is now able to grow with CBBP.

Another member Ato Degu Ageno joined CBBP (Murasa Weyeramo cooperative) when the program was established. Before he joined the sheep breeders' cooperative, he had no cattle at all in his home, but he had 3 sheep. He sold his ram to the local market at a minimal price. After he joined CBBP, he has shown improvement in his household. He believes that after CBBP his income increased. Currently, he owns 9 sheep (3 pre-selected breeding rams, 2 ewes, 2 post-weaning lambs and 2 pre-weaning lambs). So far, he contributed 15 breeding rams aim to distribute to other communities and four third-ranked animals aim to castrate for feeding trials. In addition, he keeps 2 cooperative breeding rams twice around. He sold 15 breeding rams for a price of 46,700 ET. Birr. From third-ranked animal sell and two breeding sire profit shares, he

earns ETB 7,400 and 2100 respectively. In addition, he sold old ewes at a price of ET. Birr 2700. The total amount of money he got was 58,900 ET. Birr. He used this money to buy one dairy Holstein Frisian cow with 30,000 ET. Birr and one ox with 10,000 ET. Birr. With the remaining money, he opened one small shop in his village. He also constructed a tin-roofed house with this money. He believes CBBP is his support to grow.

The other person is Ato Abera Adore. He was asked about his benefit from CBBP and the change he observed in newborn lambs. His life has changed because of an increase in his income due to interventions in CBBP. He has been working closely with AARC and he applies the researcher's recommendation to improve his livelihood. Before he joined the sheep breeders' cooperative, he had only 1 sheep. After he joined the breeding program, he bought three breeding sheep. At the time of this study, he had seven sheep (3 ewes i.e., 2 of them are advanced pregnant, 2-castrated rams and 2 lambs). Since CBBP's establishment, he contributed more than 24 breeding rams. At first, he sold four breeding rams to the cooperative at ETB 10,000. In the second, third, fourth, fifth, sixth round, he sold 4, 3, 4, 4 and 5 rams with the price of ETB 10,000, 9,000, 12,000, 10,800 and 17,000, respectively. In sum, he got 68,800 ETB from 24 rams sold. He believes sheep hurt cattle when they are kept together. As a result, he used the first three-ram sale to construct separate houses. He built quality tin-roofed sheep holding houses for his sheep. He used the money to build another house in his yard. He also built a bamboo fence for his house. In addition, he used the money to buy a milking cow. Currently, his family can drink milk and his income has increased due to CBBP.

Challenges to CBBP intervention: The major reported challenges were presented in Table 8. Lack of transparency and management, financial related problems, Problems

Table 8: Major challenges of CBBP interventions

Challenges	1st	2nd	3rd	4th	Index	Rank
Lack of transparency and management	33	17	8	11	0.36	1
Financial related problem	29	15	9	2	0.31	2
Problem-relate to breeding ram selection and management	11	7	10	25	0.19	3
Lack of training and facility	7	10	4	2	0.11	4

related to breeding ram selection and management and lack of training and facility were ranked as first, second, third and fourth constraints.

Financial-related problem: One critical problem reported from all cooperatives is the lack of audits. Three years ago, two cooperatives were audited and benefits had been shared with members. However, it was evident from the discussion that auditing was not done afterwards. The other three cooperatives had not been audited so far. Discussion with District marketing and cooperative officers revealed that improper file management is one major reason to delay their auditing. In the same connection, the lack of financial skill in the committee had been raised during the discussion. This caused difficulty in auditing a timely. The reason might be the poor educational background of the financial committee. Training on financial record keeping and support need to be provided from the district office of marketing and cooperative.

Lack of transparency and management: The problem existed in all cooperatives but it was very critical for non-audited cooperatives. It was related to a weak linkage with the district office of the cooperative. The Poor commitment of the elected committee to a regular meeting and weak leadership were reported during the discussion.

Problem related to breeding ram selection and management: The challenge of young and fast-growing lambs being sold for cash needs, is reported by the discussants and key informants. This caused keeping the best rams in the CBBP difficult. Accordingly, the researcher from AARC discussed with the cooperative committee to use their revolving fund available on their account to buy young lambs before they are sold in the market. However, lack of sufficient financial capital was reported as a problem by the cooperatives.

Lack of training and facility: Lack of training and awareness was reported from newly joined members. In this regard, awareness creation needs to be done about the program. Another problem reported by two cooperatives was the lack of a tin-roofed sheep holding yard. Large sheep holding tin-roofed yards were built for three cooperatives by ICARDA.

DISCUSSION

Generally, the ongoing CBBP encourages the beneficiary farmers. The initial 172 member smallholder farmers were currently increased to 611 member households. Since the formation of breeder cooperatives, members of the community were continuously joining the breeder cooperatives. There was no report of dropouts from membership in the whole breeder cooperatives unlike the reported dropouts from CBBP membership in Horro, Menz and Atsbi Wenberta CBBP sites as cited by Areb *et al.*⁹. This is due to the achievements of participating farmers that attraction of other farmers and membership has increased over time. The implication of community participation in CBBP is discussed by Mirkena *et al.*⁴. When farmers participate in the whole process of the flock improvement program, the breeding program becomes successful and farmer adoption is very high^{3,10,11}. However, failure of CBBP was reported from Afar sheep due to the unsuitable nature of pastoralists' livestock production¹².

A higher proportion of farmers agree on the requirement of selection for sheep genetic improvement. Farmers have also interest in large-scale fattening programs apart from breeding ram production. Non-member farmers show interest to establish new breeder cooperatives. This indicated that these farmers were ready to establish the breeder and fattening cooperatives in the future and thus more work needs to be done by the district office of marketing and cooperatives, district office of agriculture and Areka Agricultural Research Centre. Farmers know the importance of best breeding ram selection. The interview and discussion with participant farmers showed that participant farmers are aware of inbreeding and its negative effect. The main effect of inbreeding mentioned by participant farmers was poor growth rate, the tendency to abnormality, poor reproductive performance and delayed puberty⁴.

Participant farmers agreed that there were observed improvements in productive and reproductive traits across selection years. The growth performance traits were the first improved trait compared with the other traits. Improvement of growth performance traits was expected because the selection was done based on a six-month weight trait. The second improved trait was lamb survival. Integrated selective

breeding, feeding and health intervention activity might contribute to a recognizable significant increase in lamb survival and flock productivity. Similarly, Mirkena *et al.*⁴ and Weldemariam *et al.*¹² documented the positive impact of CBBP in improving smallholder livelihoods through performance traits improvements. The current study showed that participant farmers earn more income from selling sheep compared to non-participant farmers. Gizaw *et al.*¹³ and Haile *et al.*¹⁴ reported similar results. The discussion with participant farmers revealed that the number of sales of sheep per year improved after CBBP interventions.

Respondent's farmers verified the overall improvements in their animal performance through CBBP, this study showed that the ongoing Doyogena sheep CBBP were fruitful and the farmer's participation is high. However, there is a challenge in the transparency of the cooperatives committee, problems related to breeding ram selection and management and capacity building. Therefore, the committees of cooperatives are made functional, strengthened and made more transparent. Farmer perception should be changed toward the chief objective of the breeding program, improving the genetic potential of the breed. The financial-related problem, Problem-related with the breeding ram selection and management and lack of training and facility, respectively should be solved in collaboration with the District office of agriculture and the office of the cooperative. It was also learned from key informant interviews that all cooperatives are legally registered. However, awareness/training to newly joined members concerning the CBBP principle along with other aspects of improvement in feeding and management needs to be organized on a sustainable basis.

The implications of this study were to expand the CBBP breed improvement strategy to further performance traits improvement for Doyogena sheep. The participation of farmers in the CBBP and the benefits obtained from the ongoing CBBP suggest strengthening the existing breeder cooperatives and out scaled to new other sites.

CONCLUSION

CBBP is acceptable and workable in the comment. Member farmers obtained significantly better prices from the sale of sheep and they sold a greater number of animals compared with non-member farmers. The participation of farmers in CBBP is an increasing trend since its establishment. Improving capital for each cooperative and easy access to credit services will enable the members to retain young and fast-growing lambs until selection age and their sale will be prevented and finally making the breeder cooperatives

self-sustained breeder cooperatives. The linkage between different CBBP teams and stakeholders should be improved.

SIGNIFICANCE STATEMENT

Over several years community-based breeding programs have been followed to improve sheep genetic resources. The current assessment result ascertains that community-based breeding programs become an attractive option to achieve genetic improvement and there is the possibility to scale up to other sites to improve indigenous Ethiopian sheep breeds. Therefore this study will help the researcher, non-governmental organizations and policy-maker to learn the effect of CBPP on the livelihood of poor smallholder sheep producers. The programs have been successfully implemented for small ruminants using the indigenous genetic resources of smallholder farmers.

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