

Evaluation of community-based sheep breeding programs in Ethiopia

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Acronyms

ADA	Austrian Development Agency
AnGR	Animal genetic resources
BOKU	University of Natural Resources and Life Sciences (Austria)
CBBP	Community based breeding program
DBRC	Debre Birhan Agricultural Research Centre
ETB	Ethiopian Birr
ICARDA	International Centre for Agricultural Research in the Dry Areas
FAO	Food and Agricultural Organization
ILRI	International Livestock Research Institute
NARS	National Agricultural Research System
PRA	Participatory rural appraisal

Background

Livestock hugely contribute to rural livelihoods and to agriculture as a whole across the developing countries. Livestock are kept by households across all wealth groups, but poorer households more often tend to have livestock in their asset portfolios than wealthier households (FAO, 2012). By virtue of their lower capital and feed requirements and shorter generation intervals than larger ruminants, sheep are suitable livestock assets to poor farmers. Particularly, indigenous breeds are widespread and important to the subsistent and social livelihoods of a large human population in developing countries (Kosgey et al., 2004). As such, animal genetic resources (AnGR) play important role in sustaining the livelihoods of poor farmers and the benefits from improvement in AnGR are highly likely to reach the poor farmers. However, the most important AnGR to the poor are local breeds that have important adaptation traits to unfavourable environments and that are able to thrive under low input production systems (Anderson, 2003).

Over the years, several approaches have been followed to improve sheep genetic resources. Kosgey et al. (2006) summarized breeding practices that were implemented in developing countries together with their pitfalls. One strategy was to replicate developed country approaches. This generally had little success due lacking infrastructure and technical capacities in developing countries. Centralized breeding scheme, usually run by governments, was the other approach attempted in developing countries. This approach is top-down and did not engage intended users, the smallholder farmers, and hence failed to provide sustainable solutions. Crossbreeding improved commercial breeds with local breeds, a more widely implemented approach, also tended to erode the adaptive traits of low-input production systems.

Community-based breeding programs have emerged as a viable option to bring about genetic gains that improve sheep productivity and ultimately enhance smallholder farmers' livelihoods. Such community-based breeding programs (CBBP) can be described as a system of genetic resources and ecosystem management in which the livestock keepers are responsible for the decisions on identification, priority setting and the implementation of activities in conservation and sustainable use of the livestock (Rege, 2003; Tesfahun et al., 2008).

CBBP were first implemented in Ethiopia by ICARDA, ILRI, the University of Natural Resources and Life Sciences (BOKU), and national research institutes through an Austrian Development Agency (ADA) funded project from 2007 to 2011. Breeding programs were implemented in four sites (Bonga, Horro, Menz, and Afar) across four regional states of Ethiopia. After the end of the project, the more successful breeding programs in Menz, Horro, Bonga continued under the CGIAR Research Program on Livestock and Fish and expanded to two new sites, Doyogana and Atsbi (for sheep) and one Abergelle (for goats).

ICARDA, the lead institute for the breeding scheme, commissioned an evaluation of the programs at the three old sheep sites established from 2010. Two evaluation criteria, broadly socio-economic and technical, were used to evaluate the programs in all sites. Description of the breeding programs, methodology used, and findings are presented in this report.

Methodology

The CBBP implementation areas

The target areas for evaluation were Bonga, Horro and Menz – each of whom has a distinct named regional sheep breed. Bonga is located in the southwest, Horro is located in the west and Menz is in the north-central highlands. In all the sites, CBBP is underway in two communities, each organized as sheep-breeding cooperatives. In all areas, agriculture is the mainstay of the community and mixed low-input crop-livestock farming system is practised. Sheep production has always been an integral part of the traditional subsistence mixed crop-livestock production system in these areas (Edea, 2008; Gizaw et al., 2014). Sheep are a source of cash to meet households' basic needs and to supplement crop production. Bonga and Horro sheep are characterized as a fat long-tailed breed, and are highly valued for their meat production. The Menz breed is raised for its coarse wool, used to weave traditional blankets and carpets, as well as for meat (Mirkena et al., 2012). Bonga and Horro receive relatively higher rainfall and are seen as surplus-producing parts of Ethiopia. Menz is less suitable for crop production due to low and erratic rainfall and frosts and farmers largely depend on sheep farming for their livelihoods (Gizaw et al., 2014). Some farmers, including members of the CBBP, in this area are food insecure and fall under the government food safety net program implying the potential of sheep to improve farmers' access to food. All three sites are located in areas where there is little market infrastructure and few linkages to markets in urban areas.

Sources of data, sampling method and data management

This evaluation used data from both primary and secondary sources. Tools used to collect primary data included participatory rural appraisals (PRA), key informant interviews, informal discussions and interviews with sample farmers. Secondary data included biological data collected by the project, and publications and reports of the project.

PRA were conducted with sheep-breeding cooperatives in each site to collect data on overall management of the CBBP and the cooperatives. Participants consisted of 10-12 farmers, including men and women. The main points of discussion focused on learning how cooperatives run best-ram selection, management of the revolving fund, gender equity, level of ownership of the program by the communities, farmers' perception of the breeding program and its perceived impacts, and group dynamics and challenges faced in running the program. Informal discussions were held with non-members of the cooperatives to understand their knowledge, attitudes and perceptions about the CBBP. Separate discussions were held with women members of the cooperatives. Key informant interviews were conducted with district livestock agency staff to learn if they were knowledgeable about the ongoing breeding program, how the breeding programs fit with district livestock development priorities, the level of cooperation between the district and the project, support given to the cooperatives and opportunities to scale-up the program.

A survey using an informal questionnaire was also conducted in all three project sites. The survey was conducted in the two sheep breeding communities as well as in two sheep-keeping communities not involved in community-based sheep breeding program for comparison purposes. Simple random sampling was used to draw 40 sample farmers from each of the two populations and hence the survey was administered on a sample of 80 farmers in each of the project sites. This gave a total sample size of 240 with the two populations represented with equal number (120) of sample farmers.

Descriptive statistics were used to analyse primary data collected through the survey. Particularly, measures of central tendency, bivariate analysis and frequency distributions were used in the analysis. Statistical significance tests were used to see if there was significant variation between members of the breeding cooperatives and non-members as well as within members of the cooperatives. The variables tested were flock size, market participation, consumption, income, flock management, and other related variables.

Table 1 summary of tools used in the evaluation work

Data collection tool used	Projects sites where the tool was used	Number of participants/ farmers interviewed
Survey questionnaire	All three sites	120 CBBP participants and 120 CBBP non-participants
PRA	Two in Menz, One in Bonga, and two in Horro	<ul style="list-style-type: none"> ▪ 10 participants (5 men and 5 women) Menz ▪ 12 participants (6 men and 6 women) in Bonga ▪ 10 participants (7 men and 3 women) in Horro
Secondary data – recorded Biological data	Not applicable	Not applicable
Key informant interview	Conducted in Menz (Mehal Meda) and Horro	<ul style="list-style-type: none"> ▪ Two staff members of district level livestock agency Menz ▪ Three staff members of district cooperative promotion and livestock agency in Horro
Informal discussion with members of community	All project sites	
Observations	All project areas	Not applicable
Discussion with project staff	At ICARDA Addis Ababa and at research institutes in each region	The discussion was both formal and informal over the evaluation period. Could not be quantified.
Report review	Not applicable	Not applicable

Findings

Findings are presented in the following subsections. Key issues discussed include the approach followed and interventions made, institutionalization of breeding cooperatives, management of the cooperatives and their resources, farmer participation in the CBBP, sustainability and scaling-up, government support and involvement of the extension system, achievements and challenges, and descriptive analysis of survey data.

Community based breeding programs: approach and interventions

The CBBP for indigenous sheep in Ethiopia were started after detailed and comprehensive studies. Comprehensive characterization of the production system and market analysis in various agro-ecological zones were initially conducted and results were widely communicated (For example: Edea, 2008; Getachew et al., 2010; Terfa et al., 2013). Findings from these studies and the participatory research with farmers revealed shortages of breeding rams, inbreeding, and negative selections as some of the problems in sheep breeding practice. Addressing these problems was, therefore, part of the objectives of the breeding programs.

Breeding objectives and selection traits were defined based on findings of studies on trait preferences by using stated and revealed preference analyses as well as live animal ranking experiments (see Mirkena, 2010; Duguma et al., 2011; Terfa et al., 2013). Target farmers were part of the research process as it was evident from discussion with farmers during field visit. Defining the breeding objective and designing the CBBP was, therefore, participatory. The target selection traits of the breeding program varied across the regions. The following traits were targeted in each site:

1. Six months weight (kg) for body size across all breeds.
2. Number of lambs born per year for all ewes bred for twinning for Bonga and Horro breeds.
3. Proportion of lambs weaned per year for all ewes bred for lamb survival for all breeds.
4. Additionally colour, horn and tail type of the animal were important attributes in the communities and sheep with undesired attributes were independently culled when selecting candidate rams.

Translating the research findings into practice involved some arrangements and interventions in order to overcome technical and infrastructural limitations and to pursue a workable approach in the prevailing production systems. Organization of farmers as sheep breeding communities had to consider practicalities in the smallholder system. Accordingly, this breeding program considered sheep from a given community as one flock, as sheep owned per household are quite low. Target farmers were selected based on sharing communal grazing land, neighbourhood, flock size owned, and their willingness to participate. The breeding program is based on selection of best breeding rams from sheep flocks of all participating farmers. The other important arrangement was collaboration between ICARDA/ILRI and national research systems to give technical support to the sheep-breeding communities. Agricultural research centres in the respective regions give technical backup and monitored the operations of the breeding program while ICARDA/ILRI supported and followed-up the overall program.

Farmers usually sell off fast-growing rams that are potentially 'best' breeding ram and this resulted in negative selection (Gizaw et al., 2014). Enabling farmers to adopt better breeding practices, through financial support and awareness creation, was part of the interventions. Revolving funds were given to the sheep-breeding cooperatives to buy best rams selected by the cooperatives and keep them for optimum service periods. One enumerator was employed for each sheep-breeding community for record-keeping. These enumerators live within the community and closely follow-up

the breeding program. This is indispensable to run CBBP where most farmers are illiterate. Other interventions included construction of sheds as stores and candidate rams holding yards.



Figure 1: Tin-roofed holding yard for candidate rams in Bonga

Complementary interventions were part of the program. Support on animal health service, generic veterinary drugs and vaccination were given to all cooperatives. Farmers believe that veterinary interventions should be an important component of the program as they have limited access to health services. Development of feed resources was also among the complementary interventions. Forage development was carried out in Horro and Menz.

Institutional and organizational aspects and enabling environment

Institutionalization of the CBBP

The target communities of smallholder farmers are the main implementers of the CBBP with technical support from ICARDA/ILRI and national agricultural research systems. Institutionalization of the CBBP in a sensible and practical way is key for sustainability of the CBBP and to attain potential genetic gain in the long run.

This section presents major issues in the area of institutional/organizational aspect of the breeding cooperatives, best ram selection and management, management of the cooperatives, members' perception about the cooperative and the breeding program, and challenges of running the sheep breeding cooperatives.

Sheep breeding cooperatives

It was evident from discussion with members of the cooperatives and key informant interviews with the project staff that most current members of the cooperatives were involved in the research process. At the start of the project, farmers were organized into sheep-breeding associations. Participants in the associations were selected based on their interest to participate and other criteria mentioned earlier. Farmers believe their involvement helped them to have clear ideas on the breeding objectives and that their preferences were considered. After a few years of the sheep breed improvement program, most of the associations in Menz and Bonga are now formal cooperatives registered by the government.

Formally registered cooperatives have by-laws and a formal organizational structure. Three groups of committees manage the cooperatives: a main committee with a chair, a procurement committee, and a control committee. The cooperatives in Horro and Menz have similar organizational structures while they have two additional committees in Bonga, namely a credit and savings and a capacity building committee. The committees are believed to be responsible for effective functioning of the sheep-breeding cooperatives and roles and responsibilities are shared among the committees.

However, except for the main committee, the procurement, the control, credit and capacity-building committees are not active in most of the cooperatives. This leaves some holes in the management of the cooperatives as checks and balance among the different committees would be less likely. Particularly, the members of the cooperative were concerned over the financial management and transparency in ram selection and benefit-sharing. As such, active engagement of all committees, mainly control committees, would be helpful.

It was also learned that formally-registered cooperatives are governed by their by-laws and members abide by the rules. Better management of the cooperatives and financial resources, better selection and management of breeding rams was observed among the legally-registered cooperatives in Bonga and Menz compared to cooperatives in Horro. The government is keen to organize farmers and to support cooperatives. Formally-registered cooperatives have access to free auditing services from district cooperative promotion offices and financial record-keeping training and support. Major problems were observed in cooperatives that are not legally-registered and do not have by-laws in Horro. In these cooperatives, complaints among members regarding mismanagement of cooperative resources including breeding rams were common.

Record-keeping and best ram selection and management

In all CBBP sites, one enumerator is employed to record specified biological data of the sheep flocks owned by members of the cooperatives. The national research institutes in the respective sites support and follow-up proper functioning of the cooperatives and record-keeping practices of the enumerator. The data routinely collected by the enumerators is periodically (at least once a month) compiled and entered in excel sheets or Data Recording and Management Systems (DREMS) when internet connection allows by the national agricultural research systems. ICARDA staff have access to the electronic data.

Selection of breeding rams usually takes place on scheduled dates, 2-3 times a year. The main role of the scientists in selection of breeding rams is identifying candidate rams, based on the performance as related to breeding objectives, using biological data recorded by the enumerators. The initial ranking of the rams is done based on the recorded information. The final decision on which ones to keep, however, is made by best ram selection *ad hoc* committee and members also comment on ranks given. Prices are set by the committee and paid to owners of the selected rams. When the program started, there had been the challenge of young and fast growing lambs being sold for cash needs. This caused keeping the best rams in the communities difficult. As a result the ADA supported project made a revolving fund available to buy young lambs before they are sold in the market. The selected best rams would serve for about two years as originally agreed.

The price-setting method worked well in all areas, but there were still a few farmers in Horro and Menz who would not agree and not sell their animals. Most farmers, however, believe that the best ram is a product of the genetic gains the cooperative achieved and owners should sell to the cooperative. Cooperatives would usually set prices based on local market and add some premium for selected rams not to lose the best rams. This also had its challenge as farmers want to get their

rams chosen and started to question the neutrality of the *ad hoc* committees for ram selection in all project sites. In most of the sites, members had concerns over lack of transparency of committees in selecting best rams and setting prices. Part of this problem emanates from the nature of live animal price setting system in the country where prices are set after long bargaining between buyers and sellers. One way to objectively set prices for breeding rams may be to use weighing scales and setting prices per kilograms. This approach had been started in Bonga when they sell breeding rams to buyers other than the cooperative, but it was not fully effective while this evaluation tool place. This would be more reasonable if the farmers are willing to pay premium prices for breeding rams compared with meat animals.

Frequency of selection of breeding rams largely depends on the availability of candidate rams, cash for purchase, and researcher commitment in giving technical support. In Horro and Menz, it was evident from discussion with farmers that a shortage of breeding rams was a problem in the cooperatives and this was related to the frequency of ram selection. Lack of adequate financial capital to buy breeding rams was reported as the main problem related to frequency of selection in both sites. In Menz, rams apparently serve for up to 3.5 years instead of 2 years initially agreed upon due to shortage of capital. Seasonal high demand for breeding rams during the rainy season when there is better pasture and when ewes show oestrus was among reasons for the shortage of breeding rams. Supply of breeding rams from members to the cooperatives was partly affected by delayed selection by researchers, this was particularly the case in Horro. Members of the cooperatives are resource poor smallholder farmers and partly rely on cash income from sales of sheep. When they need cash, they cannot postpone sales for longer period. More importantly, members could not afford to lose prices their rams would fetch during peak seasons mainly during festive periods. Therefore, more should be done to address the shortage of breeding rams by undertaking timely selection of breeding rams with existing resources. It is also worth mentioning that 'cooperatives' in Horro believe follow-up and commitment from the respective research institutes is inadequate. It was learned from the discussion with members that researchers in Horro would often schedule selection of breeding rams, but then not show-up. Consequently, farmers would rarely delay sales of rams and wait until the researchers undertake selection.

In Horro (and Menz-Molale), retaining potential best rams for breeding by the cooperatives is given inadequate attention and hence the effect on potential genetic gain is obvious. The strategy followed by cooperatives in Bonga is an important lesson. Cooperatives in Bonga would buy all rams, both selected and unselected, from members of the cooperative. They would also buy from members if they wish to sell before selection of breeding rams takes place. Then unselected rams would be castrated and kept for fattening and the benefits from sales of castrated rams are shared between the members and the cooperative. This approach helped in addressing the shortage of candidate rams and helped to retain best rams for breeding. The problem with this approach is that it needs adequate financial capital.

Cooperatives follow similar approaches to ensure effective use and management of selected breeding rams across all sites. Members of the cooperatives are sub-grouped into ram users group and they are responsible for management of the breeding ram that gives service within the group. On ownership and benefit from breeding rams, Horro and Menz follow a similar approach while a different approach is used in Bonga. In Horro and Menz, the breeding ram completely belongs to the cooperative once it is chosen and bought by the cooperative. Hence, benefits from the sale of breeding rams after service years, often castrated and fattened, accrues to the cooperatives. In Bonga, purchased rams, both selected (after two service years) and unselected, would be castrated (and fattened) and kept by the members who sold those rams. When these rams are sold, the benefit, which is the profit margin after deducting the initial price of rams, is shared equally between members and the cooperative. Despite the fact that it requires adequate financial capital, the

approach used in Bonga has innovative ways to ensure better management of rams and benefits to members. The opportunity is given to members to sell rams when they wish, but they still own 50% of the value added after sell. This improved members reliance on the cooperative and strengthened feelings of ownership of the breeding program. The downside with Bonga's approach is that significant parts of the benefit goes to members from whom rams would be selected as the selected rams fetch significantly higher price. It was evident during discussions (both formal and informal) that members had concerns over the benefit-sharing mechanisms.

Financial management of the cooperatives

Resources owned by the cooperatives are the revolving fund, the breeding rams, and castrated rams among others. The revolving fund was provided by the ADA funded project and was aimed to revolve in the community to purchase breeding rams. The cooperatives make profit from the sale of rams after service, which adds to cooperatives' capital. Ideally, transparent and responsible management systems need to be in place to build members' trust in the cooperatives' and wise allocation of resources. Effective utilization of the revolving fund and revenue from other sources is crucial for sustainability of the breeding program.

The revolving fund is used by all cooperatives to purchase selected breeding rams. Cooperatives' financial capital is therefore invested in breeding rams. As such, management of the cooperatives' capital is hugely about management of breeding rams during and after service. Some cooperatives have made significant progress and accumulated capital using the revolving fund. A very good example are the two cooperatives in Bonga. They are legally registered and their annual income and expenses is audited on an annual basis. The cooperatives also have bank accounts and they receive free auditing services and technical support on management of cooperatives from the district level cooperative promotion office and staff based in the communities. These cooperatives have been audited twice in Bonga and found to make profits – that were shared among members. In Bonga, there was a huge sense of ownership of the process and members abide by their by-laws. Transactions of the cooperatives are recorded in a formal ledger. Generally, there is standard management of financial and other resources of the cooperatives in Bonga.

Cooperatives in Menz are also legally registered and have bank accounts. However, more could have been done in terms of auditing and reporting to members. Members were concerned about the transparency of financial management of the cooperative. There is no tradition of reporting progress to members and decision making on resources is not participatory. The committee complains that members are not interested to meet on regular basis and so they did not get the chance to report. Interestingly, the members admitted that they only meet when staff of the national research institutes schedule meetings. Though in few cases, there have also been incidents of members selling breeding rams owned by the cooperatives which is against the principle of the program.

Horro is rather different where the breeding associations are neither legally registered nor do the members abide by common agreements made at the beginning of the program. The two associations have a committee but no bank account and a very limited amount of cash that is kept in the hands of individuals - often committee members. In recent times, members of the Association in Lakku-Igu (Horro) also started selling a number of breeding rams that belong to the cooperatives. About 15 castrated and fattened rams were sold by members without the consent of the association in a year time. The association had started discussion with those members but no measure was taken. Consequently, shortage of breeding rams was reported as a problem in running the breeding program. As the association is not legally registered, they hardly get support from the district cooperative promotion office and support to protect cooperatives' assets. Discussion with the district cooperative promotion office revealed that legalizing the associations is possible though

some criteria need to be met. One of the main requirements is that the cooperatives need to have land on which they would run the breeding program. However, the breeding approach followed by the cooperative and their objectives and nature are different. The office is keen to expand cooperatives and to give support and protection. Apparently, explaining the approach and objectives of CBBP and convincing the office to help overcome the challenge to meet the requirement.

Generally, resources of the cooperatives are managed better and protected when the cooperatives are legally registered and have by-laws. Particularly, free auditing services and technical support from the cooperatives promotion office can then be exploited. Therefore, it is wise to look for opportunities around and cooperate with support providing government institution where there is common interest.

Farmers' participation in the program

Beneficiaries of the CBBP are continuously participating in the breed improvement program since the formation of the associations/cooperatives. Achievements of participating farmers have also attracted other farmers, and members of the sheep breeders cooperatives are growing. The numbers of participating farmers is growing fast in Bonga, particularly. There were a few dropouts in Horro and Menz and the number of dropouts ranged from 5 to 7 in each community. Reasons for dropouts in Horro included death of whole flock due to diseases. Another reason was the perception among farmers that sheep were dying because they were ear tagged. Members of the cooperative in Horro believed that ear tags used at the beginning infected ears, and were not appropriate. Corrective measures, changing the ear tag, were taken after the problem had been identified and members are now effectively using it. In Menz, the main reason for the dropouts was that members were not obeying by-laws, e.g. they did not castrate the unselected rams or did not use the selected rams. In Menz, there was a belief that putting sheep on a weighing scale could affect their welfare. Despite the fact that dropouts are quite small, reasons for dropouts are interesting. More could have been done to prevent these dropouts by e.g. a closer follow-up to avoid ear infections and awareness creation to avoid wrong perceptions by farmers.

Table 2. Summary of community participation in the CBBP since its establishment

Sites	cooperatives	Members of the cooperatives			
		At the beginning	Now	Dropouts	Joined- new
Menz	Mehal-Meda	63 (11 female)	59 (10 female)	6 (1 female)	2 (both male)
	Molale	60 (15 female)	58 (14 female)	2 (1 female)	-
Horro	Gitilo	60 (5 female)	81(17 female)	7 (all male)	28 (12 female)
	Lakku-Igu				
Bonga	Boka-shuta	47 (6 female)	248 (25 female)	-	201

The project focused on sheep breed improvement and did not take any gendered approach. As a consequence, women are barely represented in the membership or leadership of the cooperatives. Separate discussion with women members and wives revealed that women are loaded by domestic work and, because they are mostly uneducated, they will not be considered for leadership positions in the committees. This CBBP could have benefited many rural women if gender equity had been considered. Nonetheless, some women members of the cooperatives who were involved in the CBBP have made impressive progress. Below is a case of a woman beneficiary of the CBBP in Bonga. The amount of money she made from breeding rams was very significant.

W/ro Ayelech Yerbusho is a 50 year old widowed woman. She is responsible to feed a family of five. She is landless with only 0.25 hectare of backyard land. Her household depends mainly on livestock for its livelihood. She owns 9 sheep (4 ewes, 4 ram lambs and 1 ewe lamb), two cows and one heifer. She had no ox for ploughing before she joined the sheep breeders' cooperative and the household used to depend on purchased crops for household consumption.

She is among those farmers who contributed a best ram for breeding to the cooperatives. Initially, she sold one breeding ram to the cooperative at a price of ETB 600. Based on the cooperative's rule she had to keep the ram and share 50% of the profit from that ram when sold. This ram was sold to another community for breeding purpose at ETB 4,500. Then, she made a profit of ETB 1,950 from this ram. In sum, she got ETB 2,550 from this ram.



In the second round, she sold two rams to the cooperative at ETB 1,500. She looked after these rams for some time and the cooperative sold these rams to another community at ETB 4,000 each. Therefore, she made ETB 4,750, including the initial sale from the second batch of rams. The total amount of money W/ro Ayelech made from sale of 3 rams was ETB 7,300. She used this money to buy an ox with the help of her son. She and her son are now using this ox for ploughing. W/ro Ayelech believes she is now able to grow and harvest crops and the family is well-nourished.

Government support and involvement of the extension system

This CBBP is a collaboration between ICARDA, ILRI and national research institutes. National scientists facilitate implementation and field work with close supervision and technical support from ICARDA/ILRI. Enumerators in each community undertake the performance-recording tasks. Involvement of the extension system in the process was limited to the initial stage of the program implementation. As such, the extension system is aware of the program but was not fully involved. The district level livestock agencies, particularly in Menz (Mehal Meda), have made an effort to learn from the program and to replicate it in other areas. In Menz (Molale) and Bonga, from discussion with members of the cooperatives it was found that there is very poor cooperation with the district offices of agriculture (the livestock extension system) in terms of giving technical support to the cooperatives. At times requests for support from the cooperatives is not seriously taken by the office of agriculture in Bonga. More could have been done in engaging the extension system to establish a better cooperation. Involvement of the livestock extension system could have helped extension staff to acquire technical skill and knowledge through training and working with breeders. This could also help the CBBP in terms of promoting the technology during scaling out and scaling up.

Government commitment and support is essential for sustainability (Haile et al., 2011). Despite the poor technical support from district agricultural offices, district level livestock agencies appreciate the breeding program and government bodies have given land for shed construction for the CBBP. District cooperative promotion offices also provided free auditing services and follow-up the status of cooperatives when they are legally registered. More importantly, there should be some level of understanding between local government priorities in livestock development extension and implementers of breeding programs. A conflicting approach to sheep breed improvement was observed between regional/zonal government and Debre Berhan research centre (DBRC). The regional/zonal government is keen to distribute Awassi sheep while DBRC and the district level livestock agency are defending the improvement of Menz sheep by the CBBP – arguing that the Awassi sheep are poorly adapted. Discussion with farmers also revealed that some farmers had tried

Awassi sheep and found them to be less adaptable to poor feed supply and disease than the local Menz breed. On the contrary, improvement of Bonga sheep breed based on CBBP is completely accepted by the local (regional) government. The regional government has allocated a budget to support the CBBP and enumerators of the CBBP have become permanent staff of the research system. More work needs to be done in other project areas to involve and convince local governments.

Sustainability and scaling-up of the CBBP

Sustainability of the CBBP largely depends on effective and well-functioning breeders' cooperatives. As such, institutional capacity of the cooperatives is crucial. As indicated before, most of the cooperatives have a legal entity and functioning structures for management. However, more is needed to ensure effective management. Specifically, management of breeding rams and financial resources and effective functioning of some committees and members in the process need further work. The cooperatives exist to make benefit from the process and they have seen that they can benefit. Yet, they are constrained by limited financial capacity and they see a possibility to maximize benefit from the breeding program if linkages to better markets are facilitated. Strengthening the financial capacity of the cooperatives by linking them to better markets could contribute to sustainability of the CBBP. Even though these cooperatives build strong institutional (and financial) capacity in the short run, they could hardly run the breeding program without technical support as hiring their own experts is less likely in near future. Therefore, continuous technical support to the cooperatives is crucial for sustainability of the program considering the skill needed to run a breeding program.

Members of the cooperatives also thought they could not sustain the program without external support. Some of the reasons advanced were the lack of adequate skill and capital, poor educational background, animal health problems, lack of support from the extension system, and poor capacity to find market by the cooperatives. It is essential that the implementing organizations design strategic support mechanisms and provide technical and institutional backing.

Scaling-up of the CBBP has already started in some project sites. There is a scaling-up effort in Menz by the district level livestock agency in Mehal Meda. It is being implemented in one village. A further, more organized, scaling-up effort was underway at 17 village groups consisting of 749 men and 273 women. The Debre Birhan research centre gave training to 16 development agents in the villages and about 12,272 sheep had been ear-tagged. The problem is that data are not being collected and there is a shortage of ear tags and hence monitoring of the scaling-up effort will be difficult. In Bonga, the regional government has started organising cooperatives and started scaling-up the CBBP. In Bonga there are 16 breeders cooperatives legally formed and functional. Some of these cooperatives have already undertaken a few rounds of selection. The scaling-up process is being undertaken by Bonga Agricultural research centre with support from the cooperative promotion office to organize farmers. Given the skill and technical knowledge required to implement the breeding program it is reasonable to scale up the CBBP by the research centre. It is equally important to consider the limited capacity of the research centre if the scaling up is considered to reach wider area. This activity is not the mandate of research centres. Therefore, it is important to design a well-thought scaling-up strategy. One possible option for the research centre is to work with a manageable number of breeders' cooperatives and help them to supply breeding rams to other communities. The livestock extension system could help with distribution of breeding rams and in giving technical support to ram users.

Results from the formal survey comparing members and non-members

Distribution of CBBP participants and non-participants by median flock size is shown in Table 3. Comparison of sheep flock size owned by the two populations indicated that CBBP participants had larger flock sizes and the difference was significant for all three project sites. A remarkably huge difference was observed in Bonga. The variation in flock size could likely be attributed to the improvements in reproduction of sheep as it was evident from discussion with beneficiaries that the shortage of breeding rams had been solved by the CBBP. Better sheep husbandry practices in CBBP flocks due to training and continuous follow-up from implementers could also have impacted the flock size. It is also important to understand that the initial flock size required to be a member of the breeding cooperatives (associations at the beginning) was at least four animals. Therefore, the larger flock size owned by CBBP participants could be due to various factors suggesting cautious interpretation of these results.

Table 3. Sheep flock size owned by CBBP participants and non-participants

Descriptions	Sites	CBBP	Median	p-value for Mann-Whitney U test
Flock size	Bonga	Participant	11.5	0.000
		Non participant	5	
	Horro	Participant	13	0.06
		Non participant	9.5	
	Menz	Participant	17	0.05
		Non participant	13.5	
	All sites	Participant	13	0.000
		Non participant	8	

Distribution of CBBP participants and non-participants by their perception about twinning of ewes in their flocks is presented in Table 4. Compared with ewes in the flocks of non-participants, ewes in the flocks of most of CBBP participants (47.5%) would mostly give birth to twins. This variation in twinning rate could partly explain the variation in flock size between the two populations, at least in Horro and Bonga. The percentage of members of the CBBP in Bonga (72.5%) and Horro (65%) reporting mostly twin births of their ewes was much higher than for the ewes owned by non-participants (52.5% and 20% In Bonga and Horro, respectively). In Menz, where twinning was not chosen as a selection trait, a large majority of the farmers (both CBBP participant and non-participants, albeit with slight variation) reported that their ewes would give mostly single birth. The recorded performance data was used to compare farmers' response with actual data. The records in Bonga for example, indicate that litter size has improved from 1.53 when the program was started to the current value of 1.62.

Table 4. Distribution of CBBP participants and non-participants by twinning rate of ewes in their flock

District	CBBP member	Ewes in the flock give birth (% of sample respondents)					
		Always twin	Mostly twin	Rarely twin	Mostly single	Always single	Rarely triple
Bonga	Yes	15.0	72.5	7.5	2.5	0.0	2.5
	No	0.0	52.5	12.5	27.5	0.0	7.5
Menz	Yes	0.0	5.0	12.5	0.0	80.0	2.5
	No	0.0	0.0	7.5	0.0	90.0	2.5
Horro	Yes	10.0	65.0	22.5	2.5	0.0	0.0
	No	0.0	20.0	45.0	27.5	2.5	5.0
Total	Yes	8.3	47.5	14.2	1.7	26.7	1.7
	No	0.0	24.2	21.7	18.3	30.8	5.0

Body size of sheep was the top-ranked trait of sheep in the three project sites (Mirkena et al., 2012) and was, therefore, a target trait for improvement. During the individual farm household survey, members of the breeding cooperatives were asked about changes they observed in new-born lambs. About 96% of respondents thought body size of new-born lambs in their sheep flock showed improvement (Table 5). It was also evident from the discussions with members of the breeding cooperatives as well as informal discussions with non-members that there is a visible improvement in body size of sheep owned by CBBP members. The growing interest to join the breeding cooperatives and the demand for breeding rams also suggests tangible improvements made by the CBBP. Result from analysis of biological data also revealed that good progress was achieved in performance at six months of age. For example, average genetic gain of 0.4kg was achieved per year for Bonga.

Table 5. Percentage of CBBP participants by changes in the body size of new- born sheep through the CBBP

Body size of lambs in your flock through CBBP	Frequency	Percent
Showed improvement	115	95.8
Showed no change	5	4.2
Decreased in body size	-	-

The potential impact of the CBBP on farmers' market participation and sheep meat consumption was also explored. Market participation of CBBP participants measured by the number of sales per year was higher than non-participants and the variation was statistically significant (Table 6). The comparatively higher market participation by members of the CBBP could be attributed to the observed variation in flock size and performance of sheep kept by members of the CBBP.

Slaughtering sheep for household consumption is also more common among CBBP and the variation was statistically significant. This variation could be again explained by the flock size and performance difference reported. Discussion with members of CBBP participants also revealed that farmers, particularly in Menz and Horro, would slaughter sheep for consumption during important (religious) festivities. It is also important to take into account the fact that initial selection of CBBP participants had favoured better off households as only farmers with a sheep flock size of greater than or equal to four were considered for membership.

Table 6. Number of sheep sold and consumed during the last year by CBBP members and non-members

Number of sheep	CBBP	Median	p-value for Mann-Whitney U test
Sold in a year	Participant	5	0.004
	Non participant	3	
Slaughtered for consumption in a year	Participant	3	0.000
	Non participant	1	

Change in mutton consumption by CBBP participant households was further explored and the result is given in Table 7. The majority of CBBP participants (53%) reported that consumption of mutton in the household had increased after the introduction of CBBP but there was a considerable proportion of households with no change in mutton consumption. A possible explanation for increased mutton consumption could be that the breeding program resulted in increased productivity and hence income from sheep production and consumption of mutton increased.

Table 7. Distribution of CBBP participants by consumption of mutton after the start of the breeding program (N=114)

Consumption of mutton in the household after the program	Frequency	Percent
Increased	60	52.6
No change	46	40.4
Decreased	8	7
Total	114 ^a	100

Farmers' market participation is important to maximize the benefit from genetic gains. Sheep fattening is one possible area of farmers' involvement in sheep value chains, in addition to production. This evaluation explored sheep fattening practices of CBBP participant and non-participants and results are shown in Table 8. In all the sites, farmers would practice sheep fattening only sometimes, though a larger proportion of CBBP practiced fattening compared with non-participants. Sheep fattening is less common in Horro compared with the other two project sites. It is comparatively widely practised in Bonga and most CBBP participants had started fattening of sheep. This is likely due to the availability of feed in Bonga compared with Menz, for example. More could be done to create enabling environments and market linkages so that more farmers would participate in sheep fattening. Addressing the problem of critical feed shortage in Menz and diseases prevalence in Horro would help to engage farmers in fattening practice.

Table 8. Percentage distribution of CBBP participants and non-participants by sheep fattening practice

District	CBBP	Practice sheep fattening		
		Always	Sometimes	Not started yet
Horro	Participant	22.5	50.0	27.5
	Non-participant	10.0	45.0	45.0
Menz	Participant	17.5	67.5	15.0
	Non-participant	20.0	52.5	27.5
Bonga	Participant	17.5	75.0	7.5
	Non-participant	2.5	65.0	32.5
Total	Participant	19.2	64.2	16.7
	Non-participant	10.8	54.2	35.0

A comparison of annual mean income from sheep production by CBBP participants and non-participants is presented in Table 9. Participants of the CBBP earned Ethiopian Birr 3,100 per household, per year, on average, while non-participants earned 2,486. The difference in average annual income from sheep keeping across sites was statistically significant. The difference between CBBP participants and non-participants was statistically significant in Bonga and Menz, but not in Horro. It was also confirmed by the PRA work with CBBP participants that income from sheep keeping has improved. The positive impact of the CBBP on farmers' income explains the huge interest of non-members to join the breeding cooperatives. However, interpretation of the figures should be carefully considered as these income data were recorded from farmers' memory recall. In the CBBPs biological data are being recorded but no financial records are kept.

Table 9. CBBP participants' and non-participants' mean annual income from sales of sheep

Site	CBBP	Mean annual income from sheep	p-value for Mann-Whitney U test
Bonga	Participants	2697(2080.47) ^a	0.03
	Non-participants	1637(1561.01)	
Horro	Participants	2488(2277.05)	0.25
	Non-participants	2233(3272.54)	
Menz	Participants	4116(2512.31)	0.02
	Non-participants	3587(4685.40)	
Total	Participants	3100(2408.98)	0.000
	Non-participants	2486(3489.12)	

^a figures in the parenthesis are standard deviations; Mean incomes are in Ethiopian Birr

The role of household members in sheep husbandry practice was analysed for CBBP participants and the results are given in Table 10. As the sheep production system is traditional and practiced by smallholder farmers, involvement of hired labour in sheep husbandry is very uncommon. Responsibilities of household members in sheep keeping seemed to be shared between men and women. Feeding, watering and, barn cleaning were mainly the role of female members of the households while provision of feed and water appeared to be practiced by all members of the households. Male members dominated marketing of sheep (buying in replacement stock and taking animals to market for sale) and activities related to health management. Thus, gender based division

of labour in sheep keeping is common among CBBP participants. A related question is how decisions over utilizing benefits from sheep production are made (see next section).

Table 10. Distribution of members of households by their role in sheep husbandry practice for CBBP participants, in percentage

Role of	Activities					
	Shelter or barn construction	Cleaning of barn or shelter	Provision of feed and water	Purchasing drugs/taking to animal health clinic	Purchase of replacement stock	Take to market for sell
Husband	65.7	2.5	10.4	64.4	82.5	52.9
Wife	4.8	59.6	19.8	7.6	2.9	6.7
Wife and husband	17.5	25.2	53.5	25.4	11.7	34.5
Sons	14.1	30.2	58.7	10.1	5.6	26.9
Daughters	-	52.8	50.9	-	-	-
Hired labour	10.6	0.8	-	-	-	-
All family members	6.1	4.2	7.8	1.6	-	10.9

During the PRA exercise, women members of the CBBP and wives reported that they usually decide on income from sheep production together with their husbands. The result from the descriptive statistics also revealed that wives and husbands jointly decide on income from sales of sheep (Table 11). This may suggest that investment in improving sheep productivity has a potential to promote decision-making power of women. The use of income from sheep production by women showed interesting results. Women mainly spend the income on basic need requirements for the household and themselves. Apparently, the CBBP has contributed to empower rural women and in supporting households to feed themselves. During PRA exercise in Menz, it was learned that women would have discretionary power over income from chicken production but jointly decide on income from sheep production with their husband. The reason was that sheep are strategic farm enterprise for food security of the households and income from sheep is used mainly to buy food items.

Table 11. Distribution of household members by decision power over income from sheep keeping

Description	Percentage
Who decides on income from sell of sheep	
Both husband and wife	71.7
Wife	5.3
Husband	20.4
sons	1.8
Daughters	-
All family members	1.8
Women spend income from sales of sheep to	
Buy food items	77.1
Buy clothes for herself	74.6
Buy clothes for her children	69.4
Buy furniture	0.8
Buy other mother lamb	0.8
Buy seed and/or fertilizer	1.7

Challenges in CBBP were further explored in the survey in order to verify findings from the PRA. Challenges vary across the three sites and could generally be grouped into: CBBP management

issues and lack of inputs (Table 12). A critical problem in Horro is disease prevalence and about 75% of respondents believed disease is a challenge. In Bonga disease is also a challenge to 23% of the sample members of the breeding cooperatives. Feed shortage is another factor of production reported as a challenge by about 38 % and 31 % of members of the breeding cooperatives in Menz and Horro, respectively. Feed shortage was not reported as a challenge in Bonga, which receives rainfall in 8 out of 12 months of the year, and where land is not scarce.

Challenges related to management of the CBBP were reported in all three sites, but seemed critical in Horro. About 38% of the members of the cooperatives in Horro reported lack of transparency in benefit sharing as a problem in their cooperatives. The problem was also reported in Menz (19%) and Bonga (17.5%). Cooperatives in Horro had not been audited and benefits had not been shared to members. In Menz, cooperatives had not been audited, but they were legally registered, unlike Horro, and hence they have some sort of legal protection. A rather striking result was the lack of transparency in best ram selection and price setting across project sites. It seemed more critical in Horro and Bonga. A significant proportion of members of the breeding cooperatives in Horro (40%) and Bonga (33%) believed there was lack of transparency in best ram selection and price setting. It was evident from discussion with members of the breeding cooperatives that members in Horro and Menz believe selected rams were overvalued. In Bonga, selection of a ram from members accrues further benefit; the ram will either be sold to other areas and fetch as much as Birr 5,000 or will be castrated and sold ensuring 50% marginal benefit of the ram. As such, members are keen to get their rams selected. Members believe the selection committee are biased due to the considerable benefit from the selected rams, particularly when the rams would be sold for breeding purpose to other areas/communities. Transparency is a key issue to build trust in the cooperatives and the leadership and to meet the core objectives of the CBBP. It is important to either devise some mechanism to objectively select breeding rams and set prices or to improve the existing system. Poor commitment from management committees and selling selected breeding rams by members was also reported as a challenge in Menz. In Horro, selling of selected rams by members was also reported. This would suggest the need for extra effort to bring the cooperatives to the right track.

Table 12. Percentage distribution of respondents by challenges in CBBP

Challenges in CBBP	Districts		
	Horro	Menz	Bonga
Disease	74.5	9.5	22.5
Feed shortage	37.5	31.2	0
Lack of transparency in benefit sharing	37.5	18.7	17.5
Lack of transparency in ram selection and price setting	40	12.5	33
Members selling selected ram	7.5	12.4	0
Poor commitment from committees	0	15.6	0

Percentages do not add up to 100 as respondents could give two or more responses.

Achievements and challenges of the CBBP

The CBBP has evolved from formation of sheep breeding communities to formal breeders cooperatives up to commercializing breeding rams – something quite new in the country. PRA was conducted to discuss the key successes of the CBBP and to learn how the CBBP is working in smallholder and low-input production systems. Below are some of major achievements and challenges as identified through PRA, field observation, and discussion with district level livestock agency and research staff.

Achievements of the ongoing CBBP

Formation of well-functioning cooperatives: the project has supported formation of sheep breeding cooperatives to implement the breeding programs. The cooperatives have received financial, training and technical support from their respective research institutes, ICARDA and ILRI. All cooperatives are implementing the breeding programs and are benefiting from genetic gains achieved through the CBBP. There are many lessons to be learned from comparing the cooperatives across sites and it is important to build on these lessons and share the experiences among other cooperatives.

Awareness about inbreeding and need for breeding rams: the PRA exercise with the farmers revealed that farmers would rarely keep rams for breeding purpose prior to the implementation of the CBBP. They are now aware of the importance of breeding rams and they believe breeding rams are as important as breeding ewes. Members of the cooperatives totally depend on selected breeding rams. Farmers are aware of inbreeding even before the CBBP started and communities in all project sites use similar terminology to describe it. However, there had been neither adequate knowledge nor effort made to curb the problem. Farmers believe they now have better knowledge about inbreeding and measures to be taken to reduce it. They either castrate or sell unselected rams from their flocks to avoid inbreeding. Farmers rotate the selected breeding rams among the ram users group and avoid mating between relatives. The efforts to reduce inbreeding by farmers were observed across all cooperatives.

Retaining best rams in the community: Prior to formation of the CBBP, farmers would usually sell fast growing rams and shortage of breeding rams was a problem. They believe this shortage of breeding rams had affected lambing interval of ewes. The community now managed to keep the best rams for breeding purpose in the community up to optimum service year (up to 3 year in Menz and Horro and below two years in Bonga). This was due to the revolving fund given to the cooperatives which helped them to buy and retain best rams for breeding purpose.

Better performance of sheep: this is major area of achievement of the CBBP that farmers appreciated. Improvement in body size of newborn lambs, lambing interval, twinning rate and change in coat colour towards uniform and preferred colour are the improvements predominantly observed by farmers in the CBBP. In Menz, discussion with farmers revealed that better wool yield is achieved. Ewes in the flock now conceive on regular basis and give birth usually two times a year, except in Menz where farmers believe feed shortage affects the reproductive rate. The newborn lambs are attractive and grow fast. Body conformation, appearance and other preferred traits of lambs born from beneficiaries of the CBBP flocks are observed to be superior to those from other farmers. This was evident from the PRA and is indicated by other farmers' growing interest to use rams from the cooperatives (through exchange, purchase, or getting access to rams). It was also learned from the PRA exercise that sheep from beneficiaries of the CBBP usually fetch higher prices in the market compared to other farmers' sheep. However, these findings need to be taken

cautiously as better management practice due to training, access to health service and continuous follow-up from the project might also have affected the price received.



Figure 2. A ewe with a twin in Bonga

Demand for breeding rams: it is evident from formal discussion with members and informal discussion with non-members of the cooperatives that demand for rams has increased. Non-members usually request to buy rams from members of the cooperatives for breeding purpose. Even unselected rams from the cooperatives fetch better price compared with other rams in the market. An exceptional price difference was observed in Bonga where a breeding ram could fetch as much as Birr 5,000 while the price for others (including fattened) rams in the market in that area is hardly above Birr 2,000. Despite this price variation, the premium that buyers are willing to pay for both breeding and other rams from the cooperatives is an empirical question. Members also receive requests from non-members for exchange of rams. An interesting observation related to demand for breeding rams was the huge interest from non-members to be a member of the cooperatives in all project sites. This is also interesting given the challenge to organize farmers and convince them to accept the modalities at the beginning. These all suggest that the CBBP has brought some tangible changes in sheep production in the communities. Informal discussion with non-members in Horro and Menz revealed that health and other support given by the project also attracted non-members.

Commercialization of breeding rams: an important progress in the CBBP is the effort made to commercialize breeding rams. Sheep-breeders cooperatives in Bonga have made significant effort to promote breeding rams. Breeding rams (and CBBPs) from Bonga were presented on regional and national agricultural fairs as best livestock technology. The Bonga sheep cooperatives have supplied breeding rams to different areas of the region as well as other parts of the country. Buyers of breeding rams include research centres from other areas of the country, district and zonal agricultural offices and NGOs. It is unknown if these rams would perform as they do in Bonga under different production environments, specifically in areas where there is feed shortage compared to the good feed availability in Bonga. Unsuitability of these rams could negatively affect position of Bonga cooperatives as supplier of breeding ram in the long run. Maintaining the current growing demand for the breeding rams also need further work, mainly in the areas of ensuring consistency of the quality of the product they supply (breeding rams) and promotion of the breeding rams.



Figure 3. Breeding rams for sale and sold rams loaded on a lorry to be transported to Ambo area

Challenges of the CBBP

During the PRA some challenges were also identified.

Disease and poor animal health services: disease is a major challenge across all project sites and farmers have limited access to appropriate animal health services. Sheep diseases are not identified and diseased sheep are usually undiagnosed. The problems of disease are more severe in Horro, and particularly younger sheep are quite vulnerable. Deaths of selected breeding rams were also identified as a challenge in Menz.

Shortage of feed: feed supply in all areas refers to availability of grass and natural vegetation and, in some cases, supplementary feed. The shortage of feed is critical in Menz due to the recurrent prolonged dry season and frequent occurrence of frost. In Horro feed shortage is also a major bottleneck.

Poor market access: due to the relative remoteness of the CBBP sites, poor access to market is a common problem. Farmers believe access to better markets where there is better price for sheep, particularly to urban areas, is important for profitable fattening practice.

Selling selected breeding rams: selling best rams, selected for breeding purpose, was reported among the challenges of the CBBP in Horro and Menz. Farmers believe this is one of the reasons for shortage of breeding ram in these areas.

Poor cooperation with district extension system: in some sites, Bonga and Menz, the cooperatives believe extension staff are not supportive and there is a need for a better cooperation with the agricultural extension system.

Delaying selection of breeding rams: the collaborating researchers in Horro would not undertake timely selection of breeding rams and members of the cooperatives would usually sell potentially best rams in the market.

Mating of ewes owned by members by unselected rams: rams from non-member neighbours still mix with and may mate the ewes of members of the breeding cooperatives in Menz and Horro. Farmers are concerned about this as control is not possible in areas where members and non-members share grazing land. As the non-members show interest to join the cooperatives, the cooperatives have a plan to include these farmers. The problem is that, in Menz for example, farmers are unable and/or unwilling to pay the initial fee to join the cooperatives.

Discussion and conclusions

This study evaluated the CBBP in Ethiopia based on broad socioeconomic and technical criteria. The evaluation looked into the implementation of the CBBP, organizational issues, participation of farmers, impacts of the program, gender aspects, as well as future sustainability and scaling-up.

The breeding program was participatory from the outset and traits preferred by the community were considered in defining breeding objectives. Understanding preferred traits of sheep by farmers is helpful in matching genotypes with prevailing socioeconomic conditions and the production environment. The breeding program was started by laying a foundation for sustainability as only a breeding program that takes into account the breeding goals of smallholders would be widely accepted and be sustained in low input production system.

Collaboration between ICARDA, ILRI and national institutes and the organization of smallholder farmers into breeder associations at the start, which developed into formal cooperatives at two sites, played an important role to overcome technical, institutional, and infrastructural limitations. The interventions made to give complementary support, particularly employment of enumerators, was essential as a vast majority of farmers are illiterate. Formation of breeders' cooperatives, understanding farmer preferences and interventions helped the breeding program to overcome challenges related to small flock size, performance recording and multiple production goals of smallholder farmers also helped to achieve genetic gains through CBBP.

Despite the approach followed to overcome limitations under smallholder low-input production system, other challenges limit the impact of CBBP to maximize genetic gains. Particularly, disease prevalence (critical in Horro) and feed shortages (critical in Menz) have compromised the benefits. Poor access to markets also limited benefits from sheep keeping. Therefore, complementary interventions are equally important to enhance farmers' livelihoods from sheep genetic resources. Such interventions might be beyond the capacity of the breeding program. However, collaborating with government to further scale-up the CBBP could be possible so that the impact will be more visible and help to influence policy makers. The challenges that go beyond CBBP will be addressed through the value addition and smart marketing programs of ICARDA and the partners.

Scaling-up began in Bonga and the south regional government had allocated a budget for this specific purpose. In Menz there was an effort but it was not well organized and not welcomed by the regional government. This suggests there needs to be an understanding between the CBBP implementers and regional governments on how CBBP contribute to local government priorities. There is also a need to have a clear scaling-up strategy taking into account local specific conditions. The scaling-up effort in Bonga aiming to reach the wider region is being undertaken by Bonga research centre. Given the institutional capacity of the centre it might be difficult, if not impossible, to reach the wider region. The move to set up breeding ram markets and commercialization might be more sensible. It is equally important to consider the adaptability of Bonga sheep to other areas before wider scale distribution of breeding rams to different parts of the region/country.

Formation of cooperatives with a well-functioning organizational structure and the very participatory nature of the CBBP for inception would contribute to sustainability of the breeding program. However, given the skills, institutional capacity, and infrastructure required to run the breeding program it may not be possible for the cooperatives to run and sustain the program without external support. The collaborating national research institutes are also being supported by ICARDA and ILRI to run the breeding programs. The financial, social and economic feasibility of the breeding program also needs to be assessed for sustainability if the cooperatives have to run and sustain the breeding program themselves. It is, therefore, imperative to have a clear exit strategy to ensure sustainability of the breeding program.

Recommendations

Based on the points and challenges raised, the following actions are recommended.

- **Enhance organizational capacity of cooperatives and monitoring system of national research institutes:** more training and better cooperation with district cooperative promotion offices would help to strengthen the organizational capacity of cooperatives. Tailored training on financial management and record-keeping are needed, particularly in Menz and Horro. More importantly, the monitoring system of research institutes and technical back-up needs to be enhanced. Better monitoring system should also ensure flow of information among ICARDA, ILRI, national researchers and the cooperatives.
- **Facilitate women's participation:** ensure women's participation in the CBBP so that they could benefit from the program. It is also important to represent women in the leadership to help them address their interests.
- **Improve transparency of the leadership committees to members:** progress made and challenges encountered in running the CBBP needs to be communicated to members. Particularly, a tradition to periodically report income/losses and auditing should be embraced by all cooperatives. Equally important for better follow of information is members' active participation in meetings and other assignments of the cooperatives.
- **Support in market linkage and value addition practices:** this would help to maximize the benefit from genetic gains to enhance farmers' livelihoods from sheep. Linking farmers to urban markets in central areas where there is better demand and price for mutton would help farmers realize the potential benefits from sheep. Farmers' access to better markets would also encourage them to practice value addition in sheep. Organized farmers in well-structured cooperative makes market linkage and introduction of new practice easier.
- **Ensure farmers access to other services:** creating enabling environments is vital to attain a possible benefit from CBBP and improve farmers' welfare. Organized farmers as sheep breeders would increase the economies of scale and bargaining power of farmers. Hence, similar to the linkage to output markets, linkage to input market (feed supply and health service) would be easier for cooperatives as the scale would minimize cost and attract suppliers.
- **Incorporate socioeconomic data into biological data collection:** collection of socioeconomic data would be possible at the same cost using the already employed enumerators.
- **Enhance collaboration and understanding among stakeholders:** a better understanding of the CBBP approach and the role of local genetic resources would help sell the technology to government bodies. Commitment from national researchers also needs to be enhanced and they need to own the process. Building the capacity of the cooperatives so that they could own the process themselves is an alternative. Yet in the short run, it would be wiser to improve research institutes' support and commitment to the program. Arranging experience-sharing among regional governments and breeder cooperatives would help to share better practices. This is helpful to show the impact of political willingness on the CBBP and the benefits that could be realized.

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Annex 1: Survey questionnaire

Participant Introduction and Information Statement

Greet the farmer in local language and explain the following information sheet to him/her. Community based sheep breeding program supported by ICARDA/ILRI and the national agricultural research systems has been underway in this area for few years. The program aimed at improving sheep productivity and to enhancing farmers' livelihoods from sheep production. We now want to evaluate the impact of the program in order to identify lessons learnt, achievements made and limitations. The results of this evaluation will help to inform project management to work towards optimizing the potential from sheep production. We are collecting data related to sheep production and management from farmers for this study. We would like to ask you some questions related to the practice of sheep production and management. Your information will be kept confidential and only be used for this study. If you latter wish to discard your data from the study, you could contact us and discard your data from the study. We very much appreciate your cooperation.

Continue to interview, if the farmer is willing to participate!

Enumerator's name : _____

Date : _____

Start time: _____

Ending time: _____

Questionnaire code: _____

I. General

1. District _____ kebele (community) _____
2. Age of the household head _____ sex _____
3. Total land size _____ hectare;
 1. own pasture ('kalo') land _____ hectare
4. Family size _____ male _____ female _____

5. Flock structure

Sheep category	Number sold over last 12 months	Number died over last 12 month due to diseases	Number lost due to predation	Number currently owned
Ewe				
Ram				
Ewe lambs				
Ram lambs				

6. Ewes in your flock before the breeding program

1. Always give twin birth
 2. Mostly give twin birth
 3. Rarely give twin birth
 4. Mostly give single birth
 5. Always give single birth
 6. Rarely give triple birth
 7. Rarely give quadruple birth.
7. Ewes in your flock after the breeding program
1. Always give twin birth
 2. Mostly give twin birth
 3. Rarely give twin birth
 4. Mostly give single birth
 5. Always give single birth
 6. Rarely give triple birth
 7. Rarely give quadruple birth.
8. Lambing interval of your ewes before the breeding program _____ (every) months.
 9. Lambing interval of your ewes after the breeding program _____ (every) months.
 10. Do you know inbreeding problem in sheep? 1. Yes 2. No
 11. If yes, what the symptoms _____
 12. Did you observe inbreeding problem in your sheep flock? 1. Yes 2. No
 1. If yes, how sever is the problem?
 1. Very Critical
 2. Critical
 3. Bearable
 4. Easily manageable
 13. How long does it take for the ram born in your flock to mature and be ready for market? _____ months.
 14. Do you think negative selection is a problem among sheep flock in this area?
 1. Yes
 2. No
 3. Not sure
 15. Do you think negative selection has impacted performance of productivity in your own sheep flock? 1. Yes 2. No 3. Not sure
 16. What would you usually do with the 'best' ram born in your flock?
 1. Sell them soon before they mature (less than one year)
 2. Keep them for breeding for about three years
 3. Keep them for breeding for more than three years
 4. Keep them for fattening for some time
 5. Others _____
 17. Do you have breeding ram in your flock? 1. Yes 2. No
 18. How long would you keep breeding ram in your flock until you sell them? _____ years
 19. Do you usually give supplementary feed to your sheep? 1. Yes 2. No
 20. If yes, do you give different supplementary feed for different categories of your sheep (ewes, lambs, rams)? 1. Yes 2. No
 21. Was there someone who could read and write in your household over the last five year?
 1. Yes
 2. No

II. Technical and management - practice and progress

1. How long have you been a member of this cooperative? _____ years.
2. Flock structure before and after the breeding program

Average flock size before the breeding program		Average flock size after the breeding program	
Sheep category	Number owned	Sheep category	Number owned
Ewes		Ewes	
Ewe lamb		Ewe lamb	
Rams		Rams	
Ram lambs		Ram lambs	

3. Are your new born lambs ear tagged:
 1. Always 2. Mostly 3. Rarely 4. Not at all
4. Number of sheep ear tagged in your sheep flock _____
5. Do you have separate housing for sheep? 1. Yes 2. No
6. Do you keep younger lambs with the flock over night? 1. Yes 2. No
7. How often would you keep record performance of sheep born in the flock (characteristics and pedigree)? 1. Always 2. Most of the time 3. Rarely 4. Not at all
8. Do you keep record of expenditures on and income from sheep keeping?
 1. Yes, always 2. Yes, most of the time 3. Yes, rarely 4. Not at all
9. If you don't keep the record, what is the reason?
 1. I don't see the benefit 4. All household members cannot read and write
 2. It is time taking 5. Other reasons _____
 3. The format is too complex to use
10. Do you see improvement in lambing interval between after and before the sheep breeding program was started among ewes in your sheep flock?
 1. Yes 2. No 3. I don't know
11. If yes, do you believe that is due to the sheep breeding program based on best ram selection implemented over the last five year in this community?
 1. Yes 2. No 3. Not sure
12. How often did you use the best breeding rams selected by the cooperative (committee) over the last five years?
 1. Always
 2. Sometimes
 3. Very rarely
13. If you did not use the breeding ram always, what was the reason?
 1. We only share the grazing land during some seasons of the year
 2. The best rams are very far from me and had rare access
 3. I did not think it would make significant difference
 4. Other reasons
14. How much do you agree or disagree if I say that best rams selection is crucial for sheep breed improvement?
 1. Strongly agree
 2. Agree
 3. Neutral
 4. Disagree
 5. Strongly disagree
15. Does cooperative approach to improve sheep breed suit the locally established social norm? 1. Yes 2. No

16. Is cooperative approach to improve sheep breed problematic when it comes to working in a group? 1. Yes 2. No
17. Is cooperative approach to improve sheep breed waste of time as it involves meetings? 1. Yes 2. No
18. Is cooperative approach to improve sheep breed workable and widely acceptable in this community? 1. Yes 2. No
19. Body size of new born sheep in your flock after breeding program:
 1. showed improvement
 2. Showed no change
 3. Decreased in body size
20. Number of twin born lambs in your sheep flock per year after the breeding program:
 1. Increased
 2. No change
 3. Decreased
21. Wool yield from your sheep flock after the breeding program(for **Menz** only) :
 1. Increased
 2. Showed no change
 3. Decreased
22. Mothering ability of ewes in your flock after the breeding program:
 1. showed improvement
 2. showed no change
 3. Deteriorated

III. Marketing , value addition practice and benefits

1. When would you usually sell your sheep?
 1. Any time they are matured for sell
 2. Any time when need arise
 3. Targeting festive seasons (Christmas, Easter, new year)
 4. Others _____
2. What are the key reasons you sell you sheep for?
 1. _____
 2. _____
 3. _____
3. Which sheep category would you usually target when you have to sell?
 1. Breeding ram 2. Ewes 3. Ram (matured for meat/market) 4. Ram lambs (young)
 5. Ewe lambs (young) 6. Old ewes
4. Do you practice sheep fattening before selling the unselected rams?
 1. Yes, always 3. Not started yet
 2. Yes, sometimes
5. Do you buy in some sheep to your flock for fattening purpose? 1. Yes 2. No
6. Do you usually castrate ram in your sheep flock at younger age for fattening purpose?
 1. Yes 2. No
7. Do you think number of sheep sold from your sheep stock increased over the last five years? 1. Yes 2. No 3. Not sure
8. At what age do you usually sell unselected rams? _____ years
9. Average price your unselected rams fetched in market over the last five years _____ Birr. Maximum _____ Birr; Minimum _____ Birr
10. Average price your breeding rams (after serving for two years) fetched in market after the project _____ Birr. Maximum _____ Birr; Minimum _____ Birr

11. What would you say about income gained from sell of sheep and sheep products over last five years?
 1. Improved significantly
 2. No change
 3. Decreased
12. If your income from sheep keeping increased over the last five years, it is
 1. completely due to improvement in the sheep breed
 2. Partly due to improvement in the breed
 3. Just due to increase in demand and price of sheep over years
 4. Not easy to tell
 5. Other reasons _____
13. Have you ever slaughtered sheep from the flock for household consumption over the last years? 1. Yes 2. No
 1. If yes, how many sheep in a year time? _____ sheep.
14. Consumption of sheep meat in the household after the program:
 1. Increased 2. Decreased 3. No change
15. If increased, why consumption has increased? _____
16. If decreased, why consumption has decreased? _____
17. Financial benefit from breeding ram over the last five years

year	Number of selected breeding ram	Expenditures			Price when sold to the cooperative	Price when sold after two years service(Birr)
		Feed	Medication	Labour		
1						
2						
3						
4						
5						

18. Financial benefit from sheep other than selected rams over the last two years.

Years	Number of unselected rams sold	Income from sell of rams	Number of sold ewes	Income from sell of ewes	Expenditures		
						Medication	
2013/14							
2014/15							

IV. Technical support and Gender

1. Have you ever been trained on sheep husbandry and management? 1. Yes 2. No
2. If yes, by whom? 1. researchers 2. District extension 3. ICARDA/ILRI 4. NGO(other)
3. Have you been trained on selection of best rams for breeding? 1. Yes 2. No
4. Have you been trained on record-keeping of characteristics of your sheep (new born) over the last five years?
1. Yes 2. No
5. Have you been trained on financial record-keeping (related to livestock management) over the last five years? 1. Yes 2. No
6. Role and responsibility of household members on sheep keeping and marketing: Identify key activity and then look at decision maker.

Activity /ownership	Responsible (A)
Who owns sheep in this household?	
Who participated in sheep husbandry training, if any?	
Who is member of the cooperative?	
Shelter construction	
Cleaning house/barn-if have one	
Provision of feed and water	
Purchasing of drugs/take to animal health clinic	
Purchasing of replacement/starting stock	
Purchasing of sheep for fattening, if you do.	
Decide to sell	
Decide where to sell	
Take to market	
Decide on income from sell of sheep- fattened and from stock	

(A) 1= husband, 2= wife, 3= both wife and husband, 4= sons, 5= daughters, 6= relatives, 7= hired labour.

7. Can the wife use part of income from sell of sheep? 1. Yes 2. No
8. Women spend income from sell of sheep on:
 1. Buy food items
 2. Buy clothes herself
 3. Buy clothes for children
 4. Others_____

V. Sustainability

1. How many months of a year would you share communal grazing land? _____months.
2. Do you have problem to access breeding ram in months when you don't have access to the breeding ram? 1. Yes 2. No
3. Do you believe the cooperative could sustain without external support? 1. Yes 2. No
4. Do you know that the cooperative is supposed to sustain and operate without external support? 1. Yes 2. No
5. Are you satisfied with the leadership of the committee? 1. Yes 2. No
6. Do you believe the committee (or member of the cooperative) have gained adequate skill to select best rams? 1. Yes 2. No 3. I don't know
7. Have you been involved in any of the committees at any one time since its formation? 1. Yes 2. No

8. Would you continue to be a member of the breeding cooperative if technical and financial support stops? 1. Yes 2. No
9. How is the use of communal grazing land for sheep over time in this area?
 1. Becoming very common
 2. Becoming less common
 3. There is no change
10. Do you think the cooperative would sustain and continue to benefit its members if uses of common grazing land become less common? 1. Yes 2. No
11. Is there any time of the year when you don't have access to the breeding rams?
 1. Yes
 2. No
12. Would you take your ewe to the member of the cooperative who keeps the breeding ram when you don't use communal grazing land (don't have access to)? 1. Yes 2. No

VI. Challenges in CBBP

1. Mention some challenges to participate in CBBP.
2. All other challenges

Annex 2: Survey Questionnaire for CBBP evaluation – Non-participants questionnaire

Participant Introduction and Information Statement

Greet the farmer in local language and explain the following information sheet to him/her.

Community based sheep breeding program supported by ICARDA/ILRI and the national agricultural research systems has been underway in this area for few years. The program aimed at improving sheep productivity and enhancing farmers' livelihoods from sheep production. We now want to evaluate the impact of the program in order to identify lessons learnt, achievements made and limitations. The results of this evaluation will help to inform project management to work towards optimizing the potential from sheep production. We are collecting data related to sheep production and management from farmers for this study. We would like to ask you some questions related to the practice of sheep production and management. Your information will be kept confidential and only be used for this study. If you latter wish to discard your data from the study, you could contact us and discard your data from the study. We very much appreciate your cooperation.

Continue to interview, if the farmer is willing to participate!

Enumerator's name : _____

Date : _____

Start time: _____

Ending time: _____

Questionnaire code: _____

VII. General – demographic, management practice and attitude towards sheep breeding cooperatives

1. District _____ kebele (community) _____
2. Age of the household head _____ sex _____
3. Total land size _____ hectare; own pasture land ('kalo') _____ hectare
4. Family size _____ male _____ female _____; number of educated (read and write) household members _____
5. Flock structure

Sheep category	Number sold over last 12 months	Number died over last 12 month due to diseases	Number lost due to predation	Number currently owned
Ewe				
Ram				
Ewe lambs				
Ram lambs				

6. Ewes in your flock

1. Always give twin birth
2. Mostly give twin birth
3. Rarely give twin birth
4. Mostly give single birth
5. Always give single birth
6. Rarely give triple birth
7. Rarely give quadruple birth.
7. Average lambing interval of your ewes (every) _____ months.
8. Do you observe inbreeding problem in your sheep flock? 1. Yes 2. No
9. If yes, how sever is the problem?
 1. Very Critical
 2. Critical
 3. Bearable
 4. Easily manageable
10. How long does it take for rams born in your flock to mature and be ready for the market? _____ months.
11. Do you think negative selection is a problem among sheep flock in this area?
 1. Yes
 2. No
 3. Not sure
12. Do you think negative selection has impacted performance of productivity in your own sheep flock? 1. Yes 2. No 3. Not sure
13. What would you usually do with the ram born in your flock?
 6. Sell them soon they mature (less than one year)
 7. Keep them for breeding for about three years
 8. Keep them for breeding form more than three year
 9. Keep them for fattening for some time
 10. Others _____
14. Do you keep breeding ram in your flock? 1. Yes 2. No
15. If yes, how would you choose breeding ram?
 1. _____
 2. _____
16. If yes, how long would you keep breeding ram in your flock until you sell them? _____ years
17. Do you usually give supplementary feed to your sheep? 1. Yes 2. No
18. Do you keep record of expenditures on and income from sheep keeping?
 1. Yes, always
 2. Yes, most of the time
 3. Yes, rarely
 4. Not at all
19. Are you aware of sheep breeding cooperatives in this district? 1. Yes 2. No
20. If yes, how did you hear about?
 1. From friends/neighbour
 2. From kebele development agent
 3. At *idir* meeting
 4. Saw the breeding cooperative

5. Others _____
21. How much do you agree or disagree if I say that sheep flocks of the cooperative members are superior to their counterpart kept by other farmers.
 1. Strongly agree
 2. Agree
 3. Neutral
 4. Disagree
 5. Strongly disagree
 22. Do you think improving local sheep breed through best ram selection would bring significant change in sheep productivity and performance? 1. Yes 2. No
 23. Do you think your ewes usually have access to the selected ram by the breeding cooperative and hence mating is likely?
 1. Yes
 2. No
 3. Not sure
 24. Did you see some of your lambs sharing (physical) characteristics of the best rams of the cooperative? 1. Yes 2. No
 25. Do you share communal grazing land with the sheep breeding cooperative?
 1. Yes
 2. No
 26. If yes to 25, how many months of a year would you keep your sheep on your own pasture and could not get access to the best ram from the cooperative? _____ months.
 27. Would you take your ewes to the best selected ram in your neighbour for mating?
 1. Yes
 2. No
 28. If you are given a chance to buy best selected ram by the breeding cooperative would you be willing to pay higher premium and get the best selected ram?
 1. Yes
 2. No
 3. Not sure
 29. If you are given technical support by agricultural extension systems, will you be interested in forming similar sheep breeding cooperative? 1. Yes 2. No 3. Not sure
 30. Do you have separate housing for sheep? 1. Yes 2. No
 31. Do you keep younger lambs with the flock over night? 1. Yes 2. No
 32. How much do you agree or disagree if I say that best rams selection is crucial for sheep breed improvement?
 1. Strongly agree
 2. Agree
 3. Neutral
 4. Disagree
 5. Strongly disagree
 33. Is cooperative approach to improve sheep breed does not suit the locally established social norm? 1. Yes 2. No
 34. Is cooperative approach to improve sheep breed problematic when it comes to working in a group? 1. Yes 2. No
 35. Is cooperative approach to improve sheep breed waste of time as it involves meetings?
 1. Yes
 2. No
 36. Is cooperative approach to improve sheep breed workable and widely acceptable in this community? 1. Yes 2. No

VIII. Marketing , value addition practice and benefits

1. When would you usually sell your sheep?
 1. Any time they are matured
 2. Any time need arise
 3. Targeting festive seasons (Christmas, Easter, new year)
2. What are the key reasons you sell you sheep for?
 1. _____
 2. _____
 3. _____

3. Which sheep category would you usually target when you have to sell?
 1. Ram 2. Ewes 3. Ram lambs (matured for sell) 4. Ewe lamb (matured for market)
4. Which sheep category would you target for sell when need arise?
 1. Ram 2. Ewes 3. Ram lambs (matured for sell) 4. Ewe lamb (matured for market)
5. At what age would you usually sell your rams? _____ years.
6. Do you practice sheep fattening before selling rams?
 3. Yes, always 3. Not started yet
 4. Yes, sometimes
7. Do you buy in some sheep to your flock for fattening purpose? 1. Yes 2. No
8. Do you usually castrate ram in your flock at younger age for fattening purpose?
 1. Yes 2. No
9. Do you think number of sheep sold from your sheep stock increased over the last five years? 1. Yes 2. No 3. Not sure
10. Average price your rams fetched in market over the last three years _____ Birr.
11. What would you say about income gained from sell of sheep and sheep products over last five years?
 1. Improved significantly
 2. No change
 3. Decreased
12. Have you ever slaughtered sheep from the flock for household consumption over the last years? 1. Yes 2. No
 1. If yes, how many sheep per years? _____ sheep.
13. Do you think consumption of sheep meat in the household has increased over the last five years? 1. Yes 2. No 3. Not sure
14. Financial benefit from sheep over the last two years:

Years	Number of rams sold	Income from sell of rams	Number of sold ewes	Income from sell of ewes	Expenditures		
					Feed	Medication	labour
2013/14							
2014/15							

IX. Technical support and Gender

1. Have you ever been trained on sheep husbandry and management? 1. Yes 2. No
2. If yes, by whom? 1. Researchers 2. District extension 3. ICARDA 4. NGO(other)
3. Have you been trained on financial record-keeping (related to livestock management) over the last five years? 1. Yes 2. No
4. Role and responsibility of household members on sheep keeping and marketing: Identify key activity and then look at decision maker.

Activity /ownership	Responsible (A)
Who owns sheep in this household?	
Who participated in sheep husbandry training, if any?	
Shelter construction	
Cleaning house/barn-if have one	
Provision of feed and water	
Purchasing of drugs/take to animal health clinic	
Purchasing of replacement/starting stock	
Purchasing of sheep for fattening, if you do.	
Decide to sell	
Decide where to sell	

Take to market	
Decide on income from sell of sheep- fattened and from stock	

(A) 1= husband, 2= wife, 3= both wife and husband, 4= sons, 5= daughters, 6= relatives,
7= hired labour.

5. Can the wife use part of income from sell of sheep? 1. Yes 2. No
6. Women spend income from sell of sheep on:
 1. Buy food items
 2. Buy clothes herself
 3. Buy clothes for children
 4. Others _____

Annex 3: Checklist for PRA to evaluate CBBP in three different agro-ecological zones of Ethiopia

- I. About the sheep breeding cooperative
 1. District _____village/kebele_____
 2. Why and how did you form the cooperative?
 3. Years in operation as formal cooperative (and as association)_____
 4. Number of members of the cooperative (current)____ Male____ Female____, changes over years.
 5. Reason for new members joining the cooperative?
 6. Total drop-outs _____ male _____ female _____
 7. Reasons for drop-outs, male and female separately.
 8. Proportion of female and male headed households who supplied best breeding rams?
 9. How would set the price for best rams for the owners?
 10. Benefits you gained from the cooperative (ram sharing, cash income, access to other support service due formation of the cooperative, experience sharing, better market, etc)? How income is distributed or capitalized to cooperatives asset.

- II. Leadership
 1. How many committees do you have (management structure, role of each, how they are supporting each other)?
 2. How leadership committee are usually elected?
 3. Number of committee members (for each)_____Male _____Female_____
 4. Has change in leadership ever happened in the cooperative?
 5. How many times leadership role rotated among members since its establishment and criteria to be elected? Who set the criteria?
 6. How do you manage the revolving fund (book keeping, participatory decision, conflict of interest, responsibility among committee members...etc)?
 7. How do you (mainly the committee members) assign responsibilities? Are there circumstances when particular responsibility is usually shared?

- III. Technical issues- Selection and management of rams for service
 1. What criterion do you use to select best rams? Women's preference considered?
 2. (Average) number of active rams usually selected and included in best rams for breeding service and number of ewes usually served (from how many rams, how much ewes would they serve in the community)?
 3. Proportion of candidate rams selected for best breeding ram (what drives this? Impact on newly formed cooperative)-Mainly BONGA.
 4. How many rounds did you conduct selection of best rams to serve the cooperative/community? _____ rounds.
 5. Who keep the best rams, who/how you decide, benefit of keeping?
 6. How would you ensure better management of the best rams?
 7. How would you share ram among members?
 8. How members would access the breeding ram during wet season, when sheep are not sharing grazing land?
 9. What governs rams sharing practice in the cooperative?
 10. How long would the selected rams serve (serving rams' age on average)?
 11. Have you ever changed any principles in your by-laws, if you have one? Gender issues considered in by-laws?
 12. If yes, was it in consultation with the researchers and cooperative members?

13. Do you think some of the principles in your by-law are impediment to progress and smooth functioning of the cooperative (may be due to social norms in your area)?
 14. Would you attempt to protect non members of the cooperative from using your selected rams?
 15. Is unselected ram from non members mating your ewes?
 16. Had any of rams selected (and bought) by the committee been found to be unacceptable by cooperative members? Or any complain?
 17. Do you communicate progress and developments (including data and feedback about acceptance and functionality of the breeding program) in the cooperative regularly with the researchers? At what time intervals or how many times in a year or month?
 18. Do you share information to and work with the district extension system? Is it on regular base?
- IV. Achievements and progress- based on farmers' perception and experience about the CBBP.
1. How the community perceived the role of breeding ram before establishment of this cooperative and CBBP- inbreeding, negatives selection ...etc?
 2. Compare performance of sheep flock before and after the sheep breeding cooperative (body size, mothering ability (lamb survival to weaning-lambs weaned per year), twinning (prolificacy), tail type, coat colour, wool yield, lambing interval, libido).
 3. Do you believe your breeding cooperative is successful in meeting the breeding objectives set at the beginning of the program?
 4. Do you see better management (value addition, supplementary feed, health, housing etc) of sheep by your members compared to non members (also before and after the project)? Also between male and female?
 5. Do you think the selected rams from improved breed would fetch higher premium compared to the other local breeds?
 6. Have you sold any of your breeding rams to other community (or individual) for breeding purpose? The price difference between breeding rams and other rams?
 7. How is the attitude of (non member) neighbouring communities towards this cooperative?
 8. Do you see non members (as individual as well as in informal association) of the cooperative attempting to improve their sheep management and productivity through keeping best ram for breeding or asking the cooperative to buy breeding rams?
 9. Is there sharing of experience among members? Between members and non members (formally or informally)?
 10. Government support and attempt to replicate similar breeding.
 11. Access to animal health services(and disease prevalence), availability(knowhow to make) of supplementary feed, market issues, technical support from DAs on this specific sheep breeding ...? Difference between male and female?
- V. Capacity building, institutionalization, and sustainability
1. Is your breeding cooperative registered by government?
 2. How communities in this area (including members) perceived the breeding cooperative?
 3. Do the committee members and the cooperative members meet regularly (difference b/n male and male)? Do they keep minute of the meeting and share to members (and researchers)?
 4. Have you (committee members) ever received any training on cooperative management, record-keeping, and do you share knowledge gained to members? If yes, by whom, how many times? Gender issues (responsibility of HH members versus who took training).
 5. What supports do you get from district extension system?

6. How many rounds did this cooperative get a revolving fund from ICARDA/ILRI?
 7. Would you have to be always supported by the researchers to select the best rams?
 8. Do you think, the committee could select the best ram by its own and maintain management and functioning of the cooperative without technical support from outside (researchers, Government and ICARDA/ILRI)?
 9. Have you used the revolving fund? What do you do with the revolving fund?
 10. Do you think the committee is using the revolving fund for the intended purpose?
 11. Do you think the continuation of the cooperative after its formation was necessarily due to external support?
 12. If the CBBP supported by ICARDA/ILRI and national researchers phases out, what will happen to this breeding cooperative? Until what stage you need support?
- VI. Challenges encountered (which are solved and which ones need further work)
- Does it vary between men and women?

Annex 4: Checklist for District Agriculture office and cooperative promotion office.

1. Knowledge about the breeding cooperative.
 - a. Specific locations
 - b. Year of establishment
 - c. Objectives of the cooperative
 - d. Direct and indirect benefits
 - e. How district agriculture office work with the cooperative
2. In what ways has the community based breeding scheme contributed towards the district level livestock development interventions?
3. Possibility to make the breeding scheme part of the extension service and likelihood to scale-up the pilot sheep-breeding program.
4. Comments on the different characteristics and applicability (at scale) of the breeding scheme.
5. Has this sheep breeding scheme been part of innovations (experiences) visited by farmers from other district or experts from (other) offices of agriculture?
6. What contributions do you think the breeding scheme has made in improving farmers' livelihood (thoughts, perceptions and attitudes)?
7. Challenges encountered and opportunities to sustain established breeding schemes (and scale up to other areas).

Checklist for Research institutes/CBBP/committee to evaluate CBBP in Ethiopia

1. Number of dropouts and new members in each site since formation of the cooperatives (association where applicable) - annual data (since formation). Key reasons, why gender difference, if any?
2. Specific technical supports given to the breeding cooperatives including revolving fund (how many rounds, how used etc).
3. Is breed improvement (sheep as a target commodity) one of the focus areas of the centre (research institute)?
4. Frequency and content of communication between the research institute and district office of agriculture (and DAs).)? Is the approach (CBBP) your priority?
5. Total number of breeding rams selected over five years (yearly) and income gained by selling breeding rams and culled (fattened) rams. *This is for all cooperatives!*
6. Raw data of sheep characteristics.
7. Challenges encountered and opportunities to sustain established breeding schemes (and scale up to other areas).