The Awassi × Menz Sheep Crossbreeding Project in Ethiopia: Achievements, Challenges and Lessons Learned

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Project Background

A Menz sheep genetic improvement project was initiated in 1967. The breeding strategy adopted was crossbreeding of the local Menz sheep with exotic wool sheep breeds. The breeding goal was to improve the mutton and wool production of Menz sheep. Coarse fleece produced from Menz sheep is widely used by Menz sheep producers to weave carpet and traditional blankets called Zitet and Banna. The project also planned to supply finer and longer wool fiber produced from crossbred sheep to the Debre Birhan Blanket Factory.

The sheep crossbreeding project started with various exotic wool breeds. Initially, 50 Corriedale, six Hampshire and six Romney exotic rams were introduced. However, the exotic breeds were later abandoned because they were not accepted by the farmers as the breeds did not meet farmers’ phenotypic preferences for horns and tails. In 1980, the Awassi breed, which has a similar phenotypic appearance to the local sheep, was introduced from Israel and has been well accepted by producers. The Awassi crossbreeding project operates at the Debre Birhan and Amed Guya Sheep Multiplication Ranches.

The Debre Birhan Agricultural Research Center is also involved in an Awassi crossbreeding project. A major component of the research project is evaluation and development of crossbred dissemination schemes discussed later in this paper.

Crossbreeding Scheme

The Awassi × Menz crossbreeding scheme involves importation of pure Awassi rams, production of Awassi × Menz crossbred rams in multiplication ranches, distribution of 6-month-old rams to villagers and upgrading of the village flocks to 75% Awassi. Lately, importation and maintenance of a small flock of pure Awassi rams and ewes to multiply the pure stock has been tried. The breeding scheme is presented in Figure 1.

Crossbreeding in multiplication centers

There has been a continuous importation of purebred Awassi rams and ewes since 1980 totaling 45 ram lambs and ewe lambs. One of the major achievements of the project is that the multiplication ranches have managed to maintain the small purebred flock with a total of 67 breeding rams and ewes at Debre Birhan and 13 at Amed Guya ranches by the end of 2004. However, the above figures show that flock buildup is very slow. The small flock sizes, particularly at the Amed Guya ranch, indicate that mating of related
individuals is unavoidable leading to inbreeding depression. The rates of inbreeding per generation derived from the number of breeding males and females (BoA, 2001) are 6.1% at Debre Birhan and 32.5% at Amed Guya. These rates are well beyond the acceptable level of 1.0%, particularly at Amed Guya. These facts show that maintenance of pure stocks with a small population size is a challenging task.

Figure 1. Schematic presentation of the Awassi × Menz crossbreeding scheme in multiplication ranches and village flocks.

The crossbreeding plan followed in multiplication ranches to produce crossbred rams with the desired blood levels requires a prolonged time (see Figure 1). Thus, output per year is expected to be low given the limited resources in the ranches. For instance, the Debre Birhan Multiplication Center has managed to produce and disseminate about 4,208 ¾ Awassi × ¼ Menz crossbred rams during the period of 1970 to 2000 (DBSBMC, 2006) and Amed Guya Center multiplied and distributed 355 during the period of 1996 to 1999 (BoA, 2001). This level of output could be considered low given the level of dissemination of crossbred rams aspired to at the inception of the project (see dissemination range in Figure 2). This should indicate the need for a reappraisal of the breeding plan and the overall crossbreeding scheme followed.
The multiplication ranches have been closed from 2004 to 2007 due to an outbreak of a respiratory disease (Maedi-visna). The catastrophe resulted in high mortality and disposal by slaughtering of animals that tested positive for Maedi-visna. However, the ranches managed to preserve the purebred Awassi flocks with great effort. Exotic diseases and biosecurity are other challenges associated with the importation of exotic germplasm that should be considered.

**Dissemination Strategy**

The Bureau of Agriculture and Rural Development is responsible for the dissemination of crossbred rams to villages. An achievement that merits mentioning again is that the Debre Birhan Multiplication Center has disseminated 4,208 crossbred rams for improving village flocks between through the Bureau of Agriculture. The impact of this dissemination effort has not been formally assessed. An informal survey to assess the status of rams distributed to farmers was carried out in 1997 by the Debre Birhan Agricultural Research Center in collaboration with district agricultural extension workers in major target dissemination zones of North Shoa and South Wollo in the Amhara state.

The following have been observed and learned from the survey:

- The dissemination strategy is in such a way that a ram is sold to selected farmers on an individual basis. Earlier attempts to distribute rams to farmer cooperatives were abandoned because the cooperatives were disbanded.
- Individual ownership and use of rams could lead to underutilization of the rams for breeding given that each farmer owns only few breeding ewes.
- Individual ownership (unlike collective ownership) made it easy for farmers to sell the rams for quick-profit benefits rather than long-term genetic improvements.
- Rams are provided at highly subsidized prices, so the profit margin from the immediate sale of the rams is tempting to farmers.
- We found that almost all rams distributed for breeding purpose in North Shoa and South Wollo were used for other purposes. The rams were either already sold or castrated for fattening.

It was noticed that the major drawbacks of the dissemination scheme followed were lack of farmers’ awareness on the long-term nature of benefits from genetic improvements, lack of follow-up and feedback on distributed rams, inappropriate site and farmer selection, and that individual farmers were not liable for the rams provided at subsidy. There has also been loose institutional links between agricultural bureaus, multiplication ranches and research institutions. Research institutions play a role in the dissemination of information through demonstration, education and training. In addition, experimental results could lead to a reappraisal of dissemination strategies adopted.

The Awassi × Menz crossbreeding goal appears to be improvement of the wool-producing sheep breeds of the country such as Menz and Wollo sheep. However, as shown in Figure 2, the dissemination range does not consider the breed types, their merits/limitations and the ecology. It can be argued that this indiscriminate spreading of
the available crossbred rams to a wide range of locations has resulted in the dilution of the project efforts and its very low success. Such a dissemination strategy could also lead to indiscriminate crossing out of the adapted indigenous genetic resources.

![Map of Ethiopia showing the distribution of crossbred rams.](image)

Figure 2. Numbers and locations in Ethiopia of Awassi × Menz crossbred rams disseminated from Debre Birhan Sheep Breeding and Multiplication Center.

**Experiences from a model dissemination scheme**

Results of the informal survey to evaluate the crossbred ram dissemination strategy followed by the Bureau of Agriculture and sheep multiplication ranches has led to the design of crossbred ram dissemination scheme in a pilot project by the Debre Birhan Agricultural Research Center. Project objectives were to evaluate the performance of crossbred sheep under farmers’ management and evaluate the proposed crossbred ram dissemination scheme. The pilot project was launched in 1998 in three locations: South Wollo (Chiro kebele), North Shoa in Menz-Gera district and Angolelana-Asagirt district, Amhara state. This paper focuses on the experiences from South Wollo.

**Approaches**

**Stakeholder participation**

Participation of stakeholders in the design and implementation of development projects is the key to the success of development projects, particularly in traditional societies with diverse production objectives. To this end, meetings were held at the outset with farmers
and livestock development workers on the project concept. It was important to discuss with farmers that genetic improvement is a long-term venture and that project benefits may not be realized immediately. The farmers were appreciative of this fact since sheep rearing is their major enterprise. Ideally, farmers should participate in projects with the understanding that they will benefit in the long-run. However, projects should address farmers’ immediate concerns as well. The current project addressed such immediate issues as flock health problems and technical knowledge by providing deworming and vaccination services and advice on animal breeding.

**Site and farmer selection**
Indiscriminate dissemination of crossbred animals disregarding ecological and farmers’ socio-economic considerations has been one of the major drawbacks of livestock crossbreeding projects in developing regions. In the current project, the selected site (Chiro kebele in South Wollo) is located in the second largest sheep production zone in Amhara. The area is characterized by unreliable crop production; thus sheep production is the major source of farm livelihood. The project district, villages and farmers were selected in consultation with zonal livestock development workers. Farmers were briefed on the bylaws of the project, and only farmers willing to abide by the rules were selected.

**Communal use of breeding rams**
Individual ownership and use of crossbred rams distributed in previous disseminations was found to be inefficient. In the current project, farmers were organized into groups of 3-4 households based on neighborhood and use of a common grazing area. One crossbred ram (¾ Awassi × ¼ Menz) was lent to each group. The group farmers were responsible for use and care of the ram. There was no payment for the ram, but an alternative method would be that farmers refund the cost in installments.

Breeding rams were rotated both within group and among groups of farmers. Within group, rams were rotated among member farmers for nighttime mating. In order to avoid mating between relatives (thus minimizing inbreeding depression) and also to widen the gene pool, rams were also rotated among groups across villages.

**Breeding plan and operational aspects**
The breeding plan followed was as described in Figure 1. It takes five generations of repeated backcrossing to achieve the desired blood level of ¾ Awassi × ¼ Menz in the village breeding scheme. Ram lambs unwanted for breeding (local rams and crossbred rams having less than 75% Awassi inheritance) were castrated or disposed of before breeding age to avoid indiscriminate mating, while crossbred ewe lambs were backcrossed to ¾ Awassi × ¼ Menz rams. It is planned that once the desired blood level is reached in the flock, there could be **inse** matings (i.e., matings between ¾ Awassi × ¼ Menz rams and ewes) to produce a self-replacing flock.

Project follow-up included a quarterly visit by the research team, continuous monitoring by an enumerator, and record keeping. The enumerator was recruited from among the participating farmers and trained. He is responsible for facilitating communal ram use, record keeping, and assisting farmers in technical aspects in consultation with the
research team. Record keeping includes data on pedigree, birth weight, growth, reproduction and off-take.

Achievements

*A model community-based sheep crossbreeding*
A model community-based crossbreeding village has been established. The model scheme can be adopted to scale up the Awassi crossbreeding program and other crossbreeding programs in similar situations. Participating and beneficiary farmers increased from 28 in 1998 to 133 in 2000. There have been very limited replenishment of breeding rams from the project; farmers have started to breed their own replacement rams with high Awassi blood levels up to 65.6%.

*Breeder farmers have been created.*
An important component in the success of animal breeding programs is a range of sociological factors, including the human-animal relationships that distinguish between livestock users, keepers, producers and breeders (developed livestock industries). Neidhardt et al. (1996) pointed out that the application of breeding programs at the livestock user level will fail until the farmer has reached the level of a livestock breeder. Farmers in developing regions are generally classified as livestock users with little input and skills, keeping livestock as a secondary enterprise. Farmers participating in the Awassi project are being transformed to the breeder level, producing genetic material.

The project farmers have acquired animal breeding skills, and their perceptions and attitudes towards livestock breeding have changed. They actively collaborate on record keeping. Input use such as supplementary feeding has increased. They keep different crossbreds (Awassi and Corriedale) identifying their merits and demerits and utilizing them accordingly. They can now estimate exotic blood levels of crossbred animals, select or buy at high prices (up to 700 ETB) rams with high exotic blood for breeding, and are willing to dispose of rams unwanted for breeding.

Impact of the project

*Contribution as a ram source*
Some of the farmers in the project villages are producing crossbred rams with a high Awassi blood level for sale as genetic material. The villages can thus be further developed as Awassi crossbred ram sources to supplement production of crossbred rams by Debre Birhan and Amed Guya Sheep Breeding and Multiplication Centers. Crossbred rams produced in the project villages have been disseminated to other villages, districts (through SIDA), and private sheep ranches. The village has served as a demonstration for neighboring farmers, who have become interested to pay large sums for crossbred breeding rams, and for other districts.

The project villages have also managed to maintain a different exotic germplasm, Corriedale sheep, which had been introduced into the country but later abandoned by the Multiplication Centers because of farmers’ phenotypic preferences. Corriedale is a dual-
purpose sheep producing fine wool, which is used by the project farmers to weave warm clothing locally known as *gabi*.

**Contributions to farm livelihoods**
The role of sheep rearing as a source of livelihood has increased in the villages. Farmers’ cash income has increased. For instance, farmers in the model village sold 450 breeding rams 2005 and 2008 earning 122,700 ETB. Income from sheep sales has also contributed to increase in other livestock such draft oxen, milking cows, and transport animals.

**Performance of crossbreds**
It has been widely argued that crossbreeding with improved exotic breeds may not be a suitable breeding strategy for developing regions. Failures of crossbreeding projects in these regions are commonly attributed to low survival and performance of the exotic genotype under such conditions. In the current project, adaptive and productive traits were recorded to investigate whether the low success of the Awassi crossbred sheep project is due to biological reasons or inappropriate dissemination schemes. On-farm performance levels of crossbreds with different levels of exotic blood have been established. It was found that crossbreds have survived (Table 1), reproduced (Table 2) and performed well under village conditions (Figure 3), which is comparable to performances under on-station management (Solomon, 2000).

Table 1. Percentage pre-weaning (up to 90 days), up to 6-month and up to yearling (365 days) mortality of local and crossbred lambs under village management

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Number</th>
<th>Mortality (%)</th>
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<tr>
<td></td>
<td></td>
<td>Up to weaning</td>
<td>Up to 6-month</td>
<td>Up to yearling</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>848</td>
<td>3.8</td>
<td>6.8</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Awassi crossbred</td>
<td>782</td>
<td>2.0</td>
<td>5.6</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>Corriedale crossbred</td>
<td>359</td>
<td>1.4</td>
<td>3.3</td>
<td>9.4</td>
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</tr>
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</table>

Table 2. Reproductive performance of local and crossbred sheep under village management

<table>
<thead>
<tr>
<th></th>
<th>Lambing interval (days)</th>
<th>Age at first lambing (days)</th>
<th>Ewe postpartum weight (kg)</th>
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<tbody>
<tr>
<td>Local</td>
<td>228</td>
<td>662</td>
<td>26.0</td>
</tr>
<tr>
<td>Awassi crossbred</td>
<td>252</td>
<td>669</td>
<td>32.0</td>
</tr>
<tr>
<td>Corriedale crossbred</td>
<td>238</td>
<td>655</td>
<td>31.4</td>
</tr>
</tbody>
</table>
Challenges and Lessons Learned

The crossbreeding strategy adopted

The planned crossbreeding strategy was to upgrade the local village flocks to a 75% Awassi blood level. A substantial upgrading of the local flocks has been achieved. However, the crossbred population was found to be of varying Awassi blood level. This indicates that the strategy adopted needs to be relaxed. Crossbreeding programs involving crosses with specific breed combination are difficult to sustain at the farmer level and a range of blood levels should be envisaged (Aboul-Naga, 2000), but performance of the different blood levels needs to be investigated. The target blood level of 75% Awassi has also not been met. This is mainly due to the crossbreeding strategy followed, which inherently requires many generations of backcrossing. Secondly, the crossbreeding structure was such that the high grade crossbred rams were to be supplied from the research or multiplication centers. Structures that heavily rely on government institutions are less sustainable. However, in the current project, the farmers have been less reliant on government ram supplies and have produced their own crossbred rams. Nonetheless, the rams produced on-farm were of lower grade (less than 65.6% Awassi), which further prolonged the number of backcrossings required to attain the desired Awassi blood level. A supply of high grade Awassi rams from research or multiplication centers needs to resume in order to accelerate the grading-up of the model village flocks.

Alternative breeding options need to be considered.

A protracted upgrading strategy with the ultimate goal of creating a self-replacing high grade population may not be feasible for a wider application in the commercial flocks. Such a strategy may be feasible for villages at an advanced breeder stage (such as the pilot project villages in Chiro kebele) specializing in breeding ram production, albeit with varying blood levels. In general, the whole Awassi crossbreeding project including the
breeding plan in multiplication centers may need to be reviewed. Production of crossbred rams in the centers does not appear to be efficient and maintenance of the pure Awassi population is challenging. Thus, a sustainable breeding strategy such as formation of a self-replacing synthetic population using Awassi and Menz breeds need to be considered. This also provides a simple crossbreeding strategy that requires no special mating arrangements in the commercial village flocks.

**Production and breeding objectives vary among groups of farmers.**
For instance, the project villages opted for grading up their flocks, while some groups of farmers preferred to produce crossbred lambs for sale either because of socio-economic circumstances (immediate cash needs) or lack of skill. Thus, different crossbreeding strategies should be employed according to farmer needs and perceptions.

**A mixed pure- and crossbreeding structure**
A mixed purebred and crossbreeding flock structure could be considered. This mainly involves maintaining a purebred flock and assigning a portion of the ewes for crossbreeding. The crossbreeding strategy suitable for such a structure is terminal crossing; the crossbred lambs are sold as prime lambs for fattening elsewhere or fattened on-farm, and no crossbred population is maintained in the flock except the ram. Such a strategy was also observed among some of the project farmers. The strategy is possible if the sheep industry is structured into ram producers and mutton sheep producers. Currently such a structure is emerging in the Awassi crossbreeding area; the project farmers and multiplication centers could serve as ram sources. Terminal crossing is the simplest crossbreeding strategy that can be applied in village flocks in developing regions. This strategy is also suitable for conserving the adapted indigenous sheep resources.

**Ecological and socio-economic considerations**
The crossbreeding project is most successful in South Wollo (Chiro kebele) compared with North Shoa locations, particularly the Menz region. Evaluations in the three locations showed that crossbreds in the Menz region have the lowest performance (DBARC, 1998). Furthermore, the project could not be well established in Menz region. This indicates that ecological and farmers’ sociological and economic circumstances need to be considered when planning crossbreeding projects. Of particular concern is that ecological zonation for production of purebreds and crossbreeding should be envisaged.

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References


BoA (Bureau of Agriculture, Amhara region) and ARARI, 2001. The control and management of MAedi-visna in Debre Birhan and Amed Guya sheep breeding and multiplication centers and their surroundings and the implication of the disease in the country.


DBSBMC (Debre Birhan Sheep Breeding and Multiplication Center), 2006. Synthesis report, up to August 1999 Eth. Cal.

