Herd Improvement through Community-Based Breeding

Solution Holder is **Adeniyi Adediran** and can be contacted through **a.adeniyi@cgiar.org**

Summary

Poor genetics, and diseases are the most limiting factors for improved small ruminant production in Africa. Naturally selected, traditional goats and sheep exhibit useful adaptation to environmental stress and partial resistance to common diseases but are often lower in meat and milk production compared with improved breeds. One of the challenges of breed improvement in traditional smallholder systems is the mixed sex and age herd structure, which makes it difficult to identify and propagate specific male parents. Smallholder farmers usually do not maintain breeding records. This makes tracking genetic progress difficult and increases inbreeding. Attempts to improve the performance of local herds through crossbreeding with exotic breeds offers mixed results because offspring too often lack needed adaptation. These challenges underscore the need for more participatory community-based breeding backstopped by experienced animal technicians.

Technical Description

Heritable traits of interest in goats and sheep include birth weight, daily weight gain, weaning weight, mature weight, milk yield, percentage of twin births, and feed conversion efficiency. The community-based approach to breed improvement builds upon these traits of interest relying upon hardy stock performance. These programs are best established through collaboration between government, community and funding institutions and consists of nucleus and base herds. A nucleus herd contains at least two hundred selected ewes (female sheep) and does (female goats); and 8 to 10 recognizably superior rams (male sheep) or bucks (male goats), although many such programs are much larger, numbering into the thousands. A committee of community members selects the best young rams and bucks. Lead members manage these selected rams and bucks with mating based on phenotypic attributes. This pairing occurs within the base population of the best female stock. Breeding progress is supported through various performance measurements, often relying on ZPLAN software (first developed by the University of Hohenheim, Germany, and now applied to many local breeding efforts). These efforts must then be linked to feeding, health and marketing.

Uses

Community-based breeding finds application across the tropics including with swine (in Vietnam), llamas (in Bolivia) and many countries with goats and sheep. Notable success is achieved in Africa with goats (Malawi and Uganda) and sheep (Ethiopia). Efforts are championed in Africa by both the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Livestock Research Institute (ILRI). An important role of the TAAT Small Livestock Compact and the TAAT Clearinghouse is to incorporate this practical breeding approach into the activities of country projects and within bank loans. Farmers within these programs provide animals with desirable traits to form the nucleus or base herds.

Composition

The nucleus herd comprises performance-tested stock. The breeder rams and bucks are assessed for three to five years and then matched with females from the base herd under the supervision of a management committee that breeds animals, arranges payment for breeding services, maintains performance records and monitors housing, feeding, herd health. Where needed, animal scientists provide specialist services related to breed characterization, rotation of breeding males, and data collection, analysis and interpretation of breeding success. Males are typically selected for their size, coat color, growth rate, mating ability and temperment. Females are selected for their appearance, coat color, mothering ability, age at first birthing, birthing intervals, and twining (having more than one offsping at once). Sheep may be further selected for their fleece and goats for their milk.

Means of application

Starting a program requires that target sites be identified, breeding stock characterized and ranked, and breeding objectives defined based upon different livelihood strategies and economic opportunities. Breeding operations require that elite animals be identified, recording systems be established and data be collected based upon a breeding plan. Maintenance of elite males used for mating is compared to natural breeding within members’ flocks. This approach creates an enabling environment for goat and sheep enterprise that strengthens institutional relations, local cooperatives, and market linkages.

Agroecologies	Dryland area, Highlands, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Burkina Faso, Cameroon, Ethiopia, Kenya, Mali, Nigeria, Senegal, South Sudan, Tanzania, Uganda, Zimbabwe.
Available in	Burkina Faso, Cameroon, Ethiopia, Kenya, Mali, Nigeria, Senegal, South Sudan, Tanzania, Uganda, Zimbabwe.

Solution Forms	Genetics.
Solution Applications	Livestock Production.
Agricultural Commodities	Small livestock.
Target Beneficiaries	Youth, Women, Commercial farmers, Small-scale farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

The breeding program must consider technical, social, economic, and cultural aspects of small ruminant production, including market demands. From the design stage, the community should be involved in setting breeding goals, selection of elite stock and the management of the breeding flock. The community assumes ownership of the breeding plan, assuring compliance with all associated rearing practices, including the castration of males not meeting breeding criteria, and compliance with recommended land management practices. Members should be aware that relatively small incremental gains in the near-term result in real improvement over time.

Production Costs

The cost of establishing a community-based breeding program is relatively high and requires expertise outside of the community itself. For this reason, initial investment is required from government or donors. The bulk of the funding for establishing and operating a large community-based breeding program comes from donors and the public sector. Scientists and development specialists provide the expertise to design the program, data collation and analysis, and calculation of breeding gains, while local extensionists and community leaders oversee implementation. The overheads and operational costs of such a program can run into tens of thousand dollars annually. The community works with scientists to improve the indigenous animal breeds; and over time is expected to provide in-kind support and adhere to the program by contributing additional superior livestock, identifying local traits of interest and providing payment of enumerators and service providers.

Customer Segmentation

Herd improvement through community-based breeding is pertinent for pastoralists with large flocks and farmers with a small number of goat and sheep.

Potential Profitability

These breeding programs improve desirable traits of economic and environmental importance to both pastoralists and mixed farmers. Noticeable indicators include growth in herd size and incremental body weight. Data from Ethiopia suggest that membership in a breeding program increases family income by about 15% and allows three-fold increased slaughter for home consumption. Revenues may also be directed toward fattening activities that further increase incomes.

Licensing Requirements

There are no licensing requirements for access to this breeding technology.

Innovation as Public Good

Herd improvement through community-based breeding is as a Regional Public Good by ICARDA and ILRI, two CGIAR Centers.

Solution Images

Herds are improved through breeding the best males and female based upon desired traits

Institutions