

SMALL RUMINANT RESEARCH AND DEVELOPMENT IN ETHIOPIA

Solomon Abegaz and Solomon Gizaw

Ethiopian Institute of Agricultural Research
LIVES Project, ILRI

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Outline

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- Supply of Small ruminants
- Performance of indigenous sheep and goats
- Research and development activities
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- Conclusion

Introduction

- Low-input low-output systems are common
- Recent developments require production to be market oriented
- Indigenous breeds are naturally selected for adaptation
- There is a need to look into their ability to meet market requirements profitably
- Efficiency of production need also to be addressed to make production not only profitable but also environmentally acceptable
- Efficient animals produce less pollutant gas (GHGs) per unit product

Production system and population

- Three major production systems exist
 - Mixed crop livestock
 - Pastoral
 - Agro pastoral

(Peri-urban and urban type also exist)
- Livestock are kept under extensive type of management
- Sheep and goats are important components in all systems
- More than 50 million sheep and goats
- 14 traditional breeds, 9 breeds of sheep
- 11 (12) traditional breeds, 8 breeds of goats

Supply of small ruminants

- Off-take 35% for sheep and 38% for goats
- More than 17 million sheep and goats
 - Available for home consumption
 - Available for market
- Home consumption estimates from case studies 14% of off-take for sheep and 8 -15 % for goats
- All types of animals are available for market
 - Age, sex, condition, size
 - Young male are dominant
- There is no grading though prices may vary

Performance of the indigenous sheep and goats

- Formula to estimate dressing percentage for horro sheep
$$DP=27.42+0.56BW$$
- Carcass of 7.7, 10.4, 13.3 and 14.5 can be obtained from sheep of 20, 25, 30 and 32 kg.
- In most cases domestic and export market requirements are similar in terms of size but breeds may vary
- Most local breeds achieve this size at about one year of age



Table 1. Growth performance of some indigenous sheep and goats

| Species | Brd/Pop | Age | Sex | BW (kg) |
|----------------|------------------|-------------------|-------------|----------------|
| Sheep | Horro | 12 month | Both | 24.0 |
| | BHS | 12 month | Both | 23.8 |
| | Afar | 12 month | Both | 24.5 |
| | Menz | 12 month | Both | 17.4 |
| Goats | SES | 2PPI | Male | 19.77 |
| | Afar | >16 Mo. | Male | 24.7 |
| | Arsi-Bale | 18 month | | 19.56 |

Table 2. Body and carcass weight, and dressing percentage of some Ethiopian sheep and goats

| Species | Breed | Sex | Age | BW (kg) | CW(kg) | DP% |
|----------------|------------------|-------------|--------------------|----------------|---------------|-------------|
| Sheep | Horro | Male | Unspec. | 19.7 | 7.5 | 37.9 |
| | BHS | Male | > 1 year | 40.5 | 18.7 | 46.1 |
| Goats | Afar | Male | 16-17 mo | 24.7 | 9.8 | 39.5 |
| | CHG | Male | Unspec. | 19.44 | 8.3 | 42.5 |
| | LES | Male | Unspec. | 21.16 | 9.2 | 43.7 |
| | Arsi-Bale | Male | Unspec. | 21.0 | 9.5 | 45.4 |

Research and development activities

- Sheep research and development in Ethiopia date back to the early 1960's while goat research has started by mid 70's
- More research focus on sheep than goats
- Research has gone through various stages of transformation
 - Strategy/agenda, approaches, methodologies and organizational structure
 - Breeding programs have shifted from central nucleus schemes, where breeding objectives are set by researchers, to village-based breeding
 - Pure breeding and crossbreeding were the major pathways

Research and development activities contd..

- **Characterization & conservation of genetic resources**
- Identification, classification and description of sheep and genetic resources began in the 1970's
 - Fat-tailed (Arsi-Bale sheep), thin-tailed (Horro sheep) and coarse-woolled sheep (Menz and Tikur sheep)
 - Afar goat
- A comprehensive characterization followed:
 - Phenotypic characterization of Ethiopian Eritrean Goats-Farm Africa
 - Genetic characterization of the goats by the early years of the millennium
 - Amhara regional morphological characterization on sheep
 - National morphological and genetic characterization identified 14 sheep breeds
 - Conservation priorities set, for sheep but had no consequences on the national genetic resources conservation program

Research and development activities contd..

- Several characterizations followed at district levels
- District level characterization also led to misclassifications and misnomers
- Characterization also included:
 - Performance levels of some breeds on-station and on-farm
 - Characterization of production systems
 - Genetic parameter estimation for few sheep breeds (menz, horro, Awassi, Afar, BHS) and one goat breed (Arsi-Bale)
 - Research on conservation may not be intentional, but includes
 - On-station flock maintenance and characterization
 - Community-based breeding programs

• Genetic improvement programs-sheep

- Definition of breeding objectives for several breeds – A major research undertaking by MSc projects
- Central nucleus selective breeding programs

| Breed | Selection criteria | Institution | Current status |
|---------|---|---|--|
| Afar | Post-weaning weight gain | Werer Agricultural Research Centre | Initial program discontinued; reinitiated in 2011 |
| BHS | Post-weaning weight gain | Werer Agricultural Research Centre | Discontinued; flock established by SoRPARI but no selection activity |
| Horro | Yearling weight | Bako Agricultural Research Centre; | Continuing |
| Washera | Pre-weaning weight gain and litter size | Andasa Agricultural Research Centre | Discontinued |
| Menz | Yearling weight | Debre Birhan Agricultural Research Centre | Continuing |

Crossbreeding programs

- Early crossbreeding programs:
 - at CADU with the introduction of several exotic wool sheep breeds (Blue De Maine, Merino, Corriedale and Hampshire) in the late 1960's
 - The Menz crossbreeding program started in 1967 using Corriedale, Hampshire and Romney Marsh as sire breeds.
 - ALL failed due to several factors including designs for dissemination
- Awassi crossbreeding program:
 - Impact on farming community limited
 - Research on village crossbreeding design showed crossbreeding can be effective if well designed and followed up

Adjusted mean birth weights, 120-day (weaning) weights and wool production for different genotypes

| Adjusted means | Genotype | | |
|--------------------------|----------|------------|------------|
| | Menz | 50% Awassi | 75% Awassi |
| Birth weight | 2.4 | 3.0 | 3.8 |
| Weaning weight | 15.6 | 17.6 | 21.5 |
| Wool Production (kg/ewe) | 0.60 | 0.98 | 1.33 |

Source: Sisay *et al* (1988).

Summary of ewe production of local and different crossbreds

| Breed group | Non-pregnant ewes (%) | Lambs Weaned/ewe | Lamb weight | | |
|----------------|-----------------------|------------------|-------------|----------|-------------|
| | | | Birth | 120 days | 120days/dam |
| Local | 9.5 | 0.98 | 2.8 | 13.5 | 13.2 |
| 25% exotic | 14.8 | 0.85 | 3.1 | 15.7 | 16.8 |
| F1 H/M, C | 13.0 | 0.83 | 3.3 | 16.6 | 15.9 |
| F1 BDM | 17.3 | 0.91 | 3.6 | 16.1 | 16.5 |
| 50% several | 10.5 | 0.91 | 4.4 | 20.1 | 17.9 |
| 75% H/M, C | 19.1 | 0.81 | 4.1 | 20.7 | 19.7 |
| 75% BDM | 34.7 | 0.82 | 4.2 | 19.0 | 16.6 |
| 75% several | 35.7 | 0.66 | 4.0 | 19.0 | 15.3 |
| 87.5 % several | 59.9 | 0.43 | 4.3 | 21.1 | 10.9 |

H/M=Hampshire/Merino C=Corriedale BDM=Bleu de Maine

Source: Brännäng *et al.* (1987).

| Variable | | Menz | Awassi crossbred | Correidale crossbred |
|--|----------------|------|------------------|----------------------|
| Initial body weight | Unsupplemented | 13.3 | 14.8 | 13.4 |
| | Supplemented | 12.6 | 14.6 | 13.0 |
| Average daily gain (g) | Unsupplemented | 21 | 33 | 37 |
| | Supplemented | 68 | 118 | 113 |
| Final body weight | Unsupplemented | 17.5 | 21.3 | 20.5 |
| | Supplemented | 25.8 | 37.5 | 34.9 |
| Final weights of crossbreds related to purebreds | Unsupplemented | 100 | 122 | 117 |
| | Supplemented | 100 | 145 | 135 |

Source: Sisay et al. (1991).

- Dorper crossbreeding program:

- The recent national crossbreeding program, well designed
- Yet facing similar fate as previous programs
- Effort to maintain the nationally coordinated program need follow up

Community-based breeding programs

- Research on design of community-based programs has been a focus recently
 - A focus of international and national research institutes
 - Detailed characterization of village breeding practices
 - Participatory definition of breeding objectives
 - Alternative village breeding schemes
 - Fragmentation of efforts are observed
 - Approach adopted by the Livestock master Plan

Goat improvement research and development

| Period | Breeds involved | Institute | Objective | Type of activity |
|-----------|--|---|---|--|
| 1975/1982 | Afar , Central Highland goats, Saanen | IAR, Melka Werer and Holleta RS | Study the production performance of Afar and highland goats and their crosses with Saanen Breed | Characterization and cross breeding with Sannen |
| 1988-1997 | Somali, Hararghe Highland , Anglo-Nubian | FARM Africa, Alemaya University, Awassa College of Agriculture, Ministry of Agriculture | Improve the socioeconomic and nutritional status of women and children in the highlands of Ethiopia | Production of crossbred goats and distribution to women in the highlands of Hararghe and areas surrounding Hawassa |
| 1992-2015 | Arsi-Bale and Boran goats | Oromia Agricultural Research Institute, Adami Tulu RS | To characterize the production Performance of Arsi-Bale and Boran Goats | Generate baseline information on production and reproduction performance |

Goat improvement research and development contd..

| Period | Breeds involved | Institute | Objective | Type of activity |
|--------|---|---|--|--|
| 1998* | Arsi-Bale, Somali and Toggenburg goats | Alemaya University; Awassa College of Agriculture; Langston University, | Food security and income generation Through improved Goat production And extension Services involving women's Groups | Training of academic staff; formation of women's groups and distribution of local goats on credit |
| 1998* | Somali goats; Arsi-Bale goats, Anglo-Nubian goats | FARM Africa, MOA and NGOs | To improve family welfare in small scale Mixed farming systems by improving the productivity of goats managed by women through increased income and milk Consumption | Established women groups; feed development; distributed local goats on credit; produced and distributed crossbred goats; trained development agents, establishment of buck station |

Goat improvement research and development contd..

| Period | Breeds involved | Institute | Objective | Type of activity |
|-----------|--|---|---|--|
| 2006-2011 | Arsi Bale, Abergelle, Somali, Crosses of Boer goat | Ethiopian Sheep and Goat Productivity Improvement program | To sustainably increase the productivity of small ruminants in Ethiopia to improve food and economic Security | Training and enhancing Technical services; Technology transfer; Genotype improvement and animal health Interventions |
| | | | | |

Current research on sheep breeding (National system)

| Project | Component | Activities | Institutes |
|---|-----------|--|--------------|
| Project 1: Improving productivity of indigenous sheep through selective breeding and improved management | | | |
| | Breeding | Establishing and upgrading elite nucleus flocks of Menz sheep | ARARI |
| | Breeding | Development of 50% Awassi x Menz synthetic sheep breed | ARARI |
| | Breeding | Developing community-based pure-breeding scheme and model breeding villages for Menz sheep | ARARI |
| | Breeding | Establishing and upgrading elite nucleus flocks of Afar sheep | EIAR (Werer) |
| | Breeding | Developing community-based pure-breeding scheme and model breeding villages for Afar sheep | EIAR (Werer) |
| | Breeding | Analysis of community breeding objectives and practices for sheep production in Fentale district (Phase I) | ORARI |
| | Breeding | On-farm productive and reproductive performance evaluation of sheep in Fentale area (Phase II) | ORARI |
| Project 2: Development of cross-breeding schemes and production packages for Dorper sheep | | | |
| | Breeding | Maintenance, multiplication and distribution of purebred Dorper and 50% Dorper X local sheep | ARARI |
| | Breeding | Maintenance, multiplication and distribution of purebred Dorper and 50% Dorper X Afar | EIAR (Werer) |
| | Breeding | Evaluation of village Dorper crossbreeding schemes | EIAR (Werer) |
| | Breeding | Evaluation of the performance of 25% and 37.5% Dorper x Afar/BHS crossbred sheep | EIAR (Werer) |
| | Breeding | Maintenance, multiplication and distribution of purebred Dorper and 50% Dorper x BHS sheep | SoRPARI |

Thoughts on breeding research strategies

- Focusing breeding research along the value chain
- Research on small ruminant development strategies
- Research on breeding strategy and design of breeding programs
- Effective organization of small ruminant improvement research

The way forward

- Market oriented production is on the making
- Significant improvement in the slaughter and reproducing generation is required
 - Reproducing generation: improved survival and reproduction.
 - Slaughter generation : improved survival and growth
- Hasten the period of marketing
 - Creep feeding
 - Stratified production to move animals shortly after weaning to finishing
 - Leguminous hay that can be produced in environmentally friendly way
 - Genetic improvement for productivity and efficiency

The way forward contd...

- Sufficient within breed genetic and phenotypic variation for productivity
- Easily measurable linear characters can be considered in selection
- Efficiency – use of Kleiber ratio, sheep tail thickness, and tail inner diameter.
- Niche areas crossbreeding can be considered e.g. Afar X Dorper comparable performance to Dorper
- The overall improvement contributes to sustainable utilization and conservation