



Best practices for selective breeding for improved livestock productivity

Module 3 Act



REGIONAL PASTORAL LIVELIHOODS
RESILIENCE PROJECT (KENYA)



ILRI
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LIVESTOCK RESEARCH
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Best practices for selective breeding for improved livestock productivity

Module 3 Act

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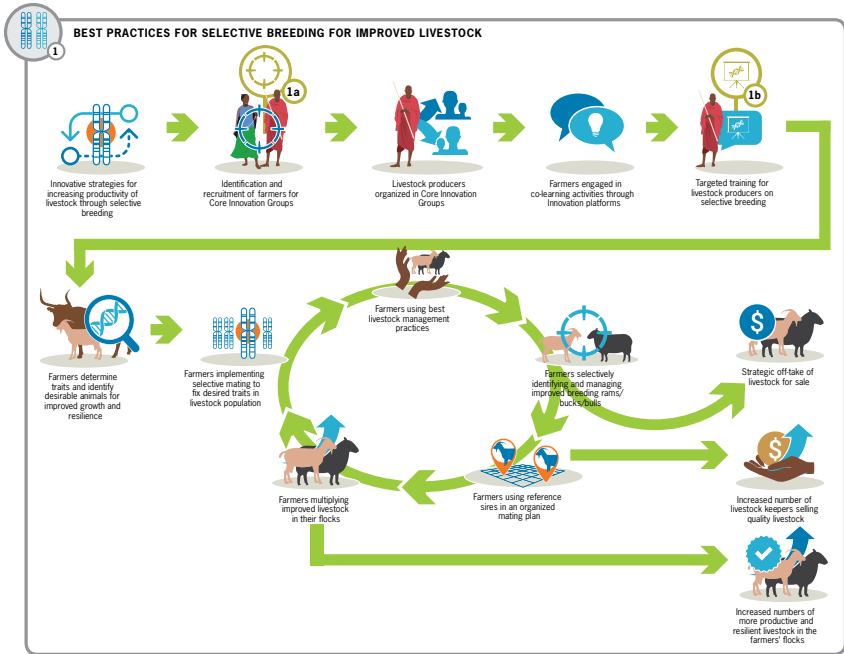
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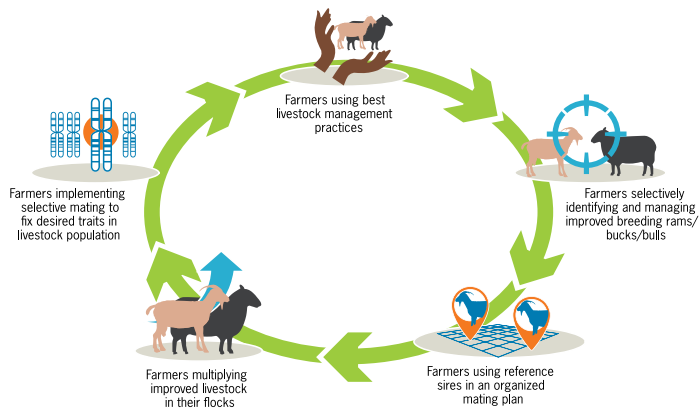
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The impact pathway



This module focuses on this section of the Impact Pathway:



Module 3

Act

This module is intended for use by extension personnel who are seeking to introduce innovative strategies for improving livestock productivity in a predetermined area.

Activities in this module are recommended following those in **Module 2: ENGAGE**.



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Foreword

This is the third in a series of modules developed to be used by livestock practitioners and development partners seeking to Improve livestock productivity in pastoral communities through better herd management. The main focus of these modules is to add value to the sustainable production, management and marketing of sheep and goats in pastoral systems using community focused interventions.

Community-based core innovation groups (CIG) form the backbone of the entire intervention. The CIG are common interest group platforms through which producers learn and practice improved herd management, through adoption of selected technologies and mutual sharing of knowledge and skills. It is also through the CIGs that the technology spreads among other producers and communities.

Through adoption of the practices presented in these modules, it is anticipated that the quality of animals, meat and milk products from local breeds of small ruminants raised in pastoral systems will improve, resulting in increased resilience, improved incomes and improved nutritional status of pastoral households.



Introduction

Pastoral livestock keepers occupy areas with medium to low potential for crop productivity hence rely on livestock as their main source of livelihood. In these systems sheep and goats complement other livestock in using available feed resources and provide both tangible and intangible benefits. The intangible benefits of the animals in the different communities are rarely understood.

Flock sizes in pastoral communities are governed through a communal hierarchy that ensures all households have access to animal resources. However, changes in land use patterns, climatic conditions and social structures have resulted in greater fragility in livestock production by pastoralists. When designing interventions to provide nutritional benefits to households, enhance food security and reduce rural poverty, **engage** select community members willing to adopt change and share lessons learnt as outlined in Modules 1 and Module 2.

A community-based breeding program (CBBP) approach uses participatory methods that involve all actors engaged in in rearing the livestock.

Main advantages of CBBP (Mueller et al. 2015)

- Breeding flocks are located within the production environment
- Potential genotype–environment interactions are minimized.
- Farmers participate directly hence have better ownership of the project.
- Farmers are the decision makers, hence have responsibility for change targeted
- Targeted breed selected is economically important to farmers
- Available feed resources in community are used
- The CBBP is self-administered by the community with some external support
- Capacity to run CBBP is developed within communities owning the animal resources

Begin with the end in mind

The anticipated products from the CBBP are



Strategic off-take of livestock for sale



Increased number of livestock keepers selling quality livestock



Increased numbers of more productive and resilient livestock in the farmers' flocks



SECTION A

Determine the goal for keeping sheep and goats

A.1

Describe the existing production environment and livestock resources



Community group activity

- **Describe existing production** environment and livestock resources present in the community
- **Determine the different roles** provided by sheep and goats for the different gender groups
- **Determine community norms** related to ownership, entry, exit, access and use of the sheep and goat resources
- **Identify key traits of value** by different gender groups within the communities.

➔ **Objective: Obtain consensus on the general picture of the pastoral production environment**

ACTIVITY:

1. Review in a community meeting the results from information collated on households through the baseline household survey outlined in Module 1 - Enquire
 - General household characteristics: household size, composition, leadership roles by gender groups
 - General information on species of animals reared by the community
 - Characteristics of the sheep and goat flocks reared in terms of flock size owned per household, breeds of sheep/ goats kept, animal type and flock structure
 - Information on different sources of water for animals reared
2. Implement mapping exercise with community members to determine:
 - Annual rainfall pattern
 - Annual pattern for reproduction within flocks

Use proportional piling methods to generate charts using a calendar as presented below:

Month	J	F	M	A	M	J	J	A	S	O	N	D	Number of Producers
Sheep / Goats													
Months of the year when there is most rainfall													
Months when there is good pasture available													
Months when lambs / kids are dropped													

In order to get openly provided information that is accurate, especially from the women, it is important to separate the community members participating in the discussion into separate gendered groups. The facilitator should therefore divide group discussion participants into two, one group with only men and the other with only women. From these two gendered groups, generate information in sections A2 to A4. The information generated should be evaluated to determine critical differences in responses by gender that need to be incorporated in the small ruminant improvement program.

A.2

Determine the different roles of the sheep and goats for different gender groups

Use the table below to obtain information on the roles of sheep and goats within the community

Breed / Type Of Sheep Or Goat	Number of farmers keeping these breeds	Why do you keep this species and breed? (Consumption, income, prestige, ceremonies, inputs etc)	Who uses it most for the given function? (HH, men, women, children)



A.3

Determine community norms related to ownership, access and use of the sheep and goat resources as presented by different gender groups

Within the community group meetings, ask the members to indicate who makes the decisions when it comes to the *acquisition/disposal/replacement* of sheep and goats in the household. Use a table to document the number of members providing different responses as illustrated below:

Suppose you want to sell or buy sheep or goats, who makes the decision on animals to be purchased or sold—men, women or both

Breed / type of sheep or goat	Within the household, who makes the decision to buy/ sell an animal		
	Men	Women	Both
Sheep			
Goats			

Obtain information that will enable a better understanding of the main opportunities and challenges experienced by the communities when it comes to sheep and goat production and how these influence the choice of breeds to rear (eg feeds/ fodder, diseases/ healthcare, mortality etc)

Constraint/ Opportunity	Rank, its Importance on production (1-5)	Which breed and animal category is most affected?	How do you manage to reduce the impact of the challenge?

A.4

Identify key characteristics of value by different gender groups within the communities.

	Sheep		Goats	
	Example traits of importance	Rank (1-5) 1= very important, 5=not so important	Example trait of importance	Rank (1-5) 1= very important, 5=not so important
1	Milk production			
2	Meat production			
3	Body size and frame of animal			
4	Ability to resist diseases			
5	Feed requirements <ul style="list-style-type: none"> • Ability to graze on natural pastures • Ability to manage with limited feed 			
6	Ability to walk long distance for water/ grazing			
7	Hide / skin			

Collaboratively agree on objectives for interventions in flocks

The objective determined by the community will impact the whole scheme.

Keep it Simple to be Sustainable (KiSS)

The initial objectives could be:

- To improve management of range resources
- To control the sizes of the community flocks

Provide regular training to communities on

- Why adopt community based breeding
- Effects of inbreeding in populations
- Best-bet animal management practices
- Benefits of controlled breeding
- Benefits of strategic animal offtake



Farmers using best
livestock management
practices



SECTION B

Determine what to measure and how to monitor progress

B.1

Review the methods of identifying animals provided in Module 2-Engage



Ensure the community groups are very clear on the following:

- Why measuring and monitoring animals is important
- What traits need to be monitored
- How to measure different traits
- Where and how to store information
- What feedback information is relevant
- How often to expect feedback on their livestock

Monitoring progress in flocks using records

Emphasize the importance of documenting information on livestock productivity, and the use of the information documented



Definition: Livestock record keeping is the systematic documentation of events and measurements of performance parameters on animals and activities related to animal management that are later on used to make decisions.

Importance of livestock records for livestock keepers

The keeping of records on animals within flocks is important for many reasons both for the livestock keepers, the larger community and service providers. For the livestock keepers, keeping records is especially important for the following reasons:

- To uniquely identify individual animals in their flock
- To enable monitoring of individual animal performance in specific traits
- To enable the evaluation of animals in the population in order to identify and select better performing animals to be parents of the next generation
- To enable planning for mating of animals and avoid inbreeding in the flock
- To facilitate rational labour allocation for managing flocks
- To facilitate planning for feed resources and movement of animal groups
- To monitor diseases, vaccination and treatment schedules for different animals
- To plan for marketing animals and better bargaining for prices of products in targeted markets



Types of records to keep

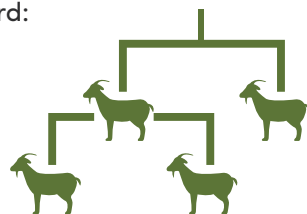


1. Pedigree information (Identification, parents and breed-type)
2. Breeding information (Reproduction and mating)
3. Productivity information (Growth performance, Milk production)
4. Grazing and Feed information
5. Disease and treatment information
6. Flock structure and animal movement

1. Pedigree information

Obtaining pedigree information is a key component of planning for future flock productivity. **It is really important to avoid inbreeding within flocks.** Make sure you record:

- the unique identifier of an animal,
- its parents (sire and dam),
- the breed-type of the parents,
- and information on the physical characteristics of the animal.



2. Breeding information

Recording breeding information is critical in monitoring the productive efficiency of the flock. It also facilitates decisions on selective mating and culling in flocks. Breeding records are used to determine flock fertility, mating efficiency and the productive lifespan of different categories of animals.

Main types of records for breeding include:

- **Dates of all services** provided for female animals. This allows calculation of the number of services per conception (service rate).

- **Dates when animals give birth.** This allows the breeder to calculate the age of first lambing/ kidding and the period between successive lambing events.



- **Details at birthing** of new animals. This type of information includes the number of animals born, type of birth (assisted/normal) and fate of offspring born (alive / dead)

3. Productivity information

Through measuring and monitoring the performance of animals within the flocks, the livestock keepers are able to make the best decisions related to the desired productivity of their flocks. In pastoral communities, the livestock keepers can use this information to plan for strategic offtake of animals prior to seasons of drought when feed resources are a great challenge.

Information to be recorded includes:

i) Weights of animals at different ages, and the date on which the weight is taken. These include: *Birth weight, Weight at weaning, Weight at 9 months, Weight at sale*



ii) Milk production:

The amount of milk extracted from the different animals and the amount used for household consumption and for sale needs to be monitored. Better producing animals should be selected strategically



Note: The farmers are taught on how to measure weight of their sheep/ goats using a hand scale and a modified hides/skins in Module 2

4. Grazing and feed information

The movement of animals in different grazing areas and any supplementary feed provided for different categories of animals should be noted. It is particularly important to note the dates on which different groups of animals are moved, and the reason for moving the different animal groups.



In case the community has produced any specialized forages for the animals, this should be documented and information on its use reported.

5. Disease and treatment information

Any diseases affecting animals should be noted and vaccination and treatment provided documented. This information is also useful to determine critical inputs and services required in pastoral flocks through mainline government and private sector actors.

Events and dates of occurrence should be documented as they occur. These include:



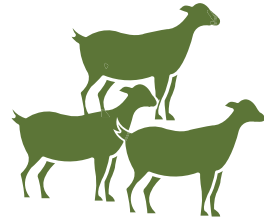
- What disease and on which date
- Any medication/ treatment provided in response to the disease
- Types and dates of Vaccinations
- Prophylactic measures in flocks e.g. dipping/spraying against specific organisms
- Use of anthelmintics in flocks (dates and types used)

6. Flock structure and animal movements

The existing structure of the flock, and movements of different categories of animals into and out of the flock needs to be recorded. This information together with information on seasonal changes is useful for understanding animal movement patterns, and in deriving performance indicators of the flock.

Information to be noted includes:

- Species and breed of animals reared
- Existing flock structure
- Any new animals in the flock in preceding six months and how they entered the flock (birth, bought)
- Any animals sold from flock in the last six months, their age and features that determined their sale
- Dates / seasons when the animals were purchased, born or sold from flocks
- Reasons for animal sales



B.3

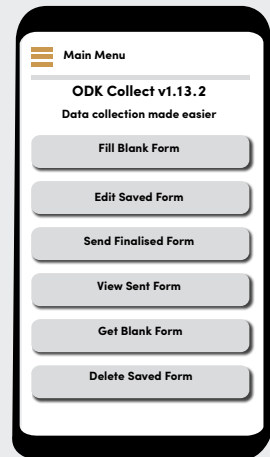
Tools to support animal recording

The collection of accurate and timely data from pastoral systems can be implemented by extension personnel in conjunction with the pastoralists using paperless tools available through mobile telephones.

Examples of such tools have been developed by ILRI using the **Open Data Kit (ODK)** (<https://opendatakit.org/>) data platform. The Tools developed in ODK are available through android based mobile phones and can be adapted for different users to collate data as required

1. Monitoring performance (<https://hdl.handle.net/10568/115776>)
2. Monitoring flock dynamics (<https://hdl.handle.net/10568/115778>).

The tools provide a mechanism through which critical flock information is documented electronically. This information is then analysed and feedback information generated for the livestock keepers and different stakeholders in the sheep and goat value chain.



Farmers selectively identifying and managing improved breeding rams/ bucks/bulls



SECTION C

Implementing selective breeding in pastoral flocks



Ensure the community groups understand

- Why using select sires for mating is important for their flocks
- Why a mating strategy needs to be designed
- Why it is important to follow the strategy designed
- Why selected male and female animals should be retained within flocks and not disposed

C.1

Select male animals to be used to drive change in the population (reference sires)

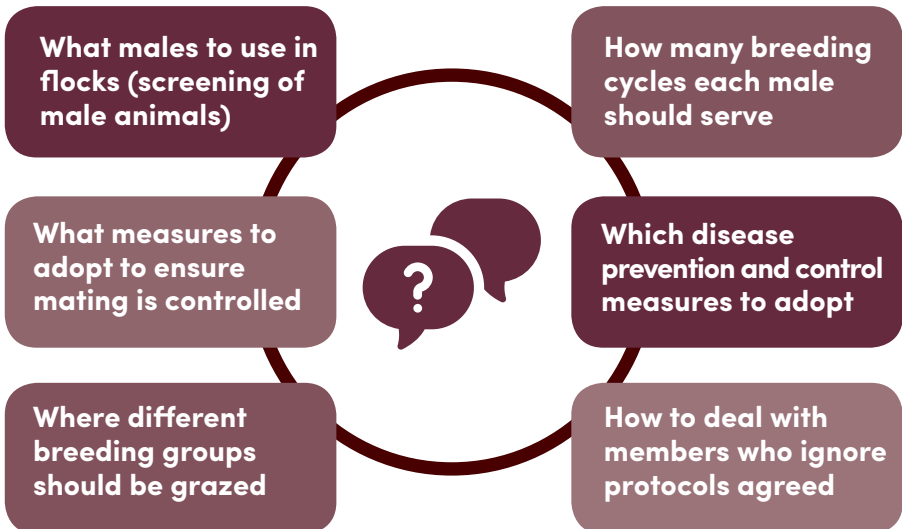


Farmers using reference sires in an organized mating plan

Selection of male animals has a huge impact on future productivity. This is because in one mating season, whereas female animals produce only one or two offspring at a time, the male will contribute to a large number of offspring depending on the technology adopted. In sheep and goat populations where natural mating is used, one male animal in good condition can sire up to 50 offspring in one season.

Selection of male animals to be parents of the next generation must be given due attention by the community. When the quality of rams/bucks in a community is low the community should be advised to source breeding males from elsewhere such as from a government station or from commercial breeders.

Practices to be determined by community members



Selection of male animals can be implemented in two stages (Haile et al. 2011):

Stage

1

Screen young males at 4 to 6 months of age
Castrate animals with undesirable characteristics

Stage

2

Select breeding rams at 12 months of age
Select based on traits determined by community (e.g. weight and conformation)

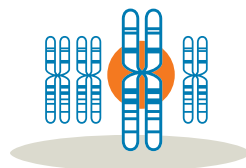
C.2

Develop the mating strategy to use for selected animals

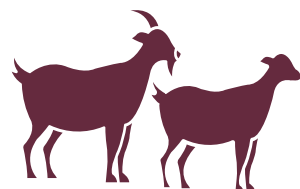
A mating strategy should be developed and agreed to by the community. The initial strategy should be simple to implement, integrating relevant existing indigenous breeding practices.

As the breeding program evolves, the community should be encouraged to adopt the practice of:

- **Direct mating of select top males (reference sires) with pre-selected superior females already present in their flocks**
- **Allocation of other selected males to groups of female animals.**



Farmers implementing selective mating to fix desired traits in livestock population



Community meeting for planning the mating strategy

1. Community members agree on criteria for identifying superior females to be mated to the pre-selected reference sires
2. Community members determine and agree on a fee, if required, for mating other females to the reference sires
3. Community assigns responsibilities to individuals who will
 - Conduct planned mating with reference sires
 - Manage the mating ratio (sire: dam) and control inbreeding
 - Schedule animal health management
 - Ensure flocks are adequately separated to facilitate planned mating



Mating in flocks

The overall goal of the community based breeding programmes is to ensure that animals reared in the community are both productive and resilient and can help improve the livelihoods of the pastoralist. Male and female animals that are used for breeding need to be well managed for optimal reproductive performance within the changing environments of the arid areas.

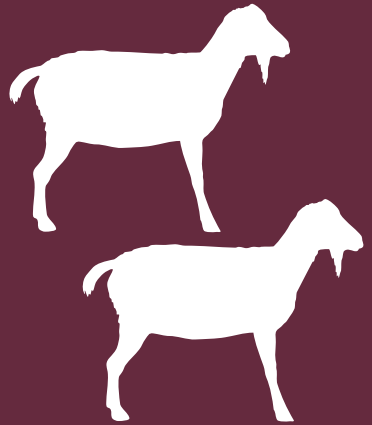
Planning mating of female animals

- Aim to have females in good body condition rather than focus on the age of the animal at first mating.
- Oestrus in mature animals is repeated every **16-17 days (sheep)** - lasting **24-36 hours**, and **19-23 days (goats)** -lasting **34 to 38 hours**.
- Only mate animals that are in good condition and are more than Nine months of age.
- Gestation/ pregnancy period for sheep and goats ranges between **144-152 days (5 months)**.
- Well managed animals come back into heat within one month after lambing / kidding, however in the arid areas, it is advisable to give the animals at least a **3 month interval** following lambing/ kidding prior to mating again.
- Livestock keepers should aim for lambing/ kidding once a year or approximately every 10 months –i.e 3 times in 2 years.



Training on identification of female animals in heat

Train farmers to identify females that are in heat. Heat or oestrus is the period when the female will accept to be mated by a male. Farmers should observe animals twice a day, in the morning and evening. Indicators that a female is on heat is to observe females that are allowing other animals to mount them. Farmers can use males not earmarked for breeding to help detect females in heat. These males should have an "apron". Females detected to be in oestrus should be marked and separated. Arrangements should then be made so that they can be mated by males that have been selected.



Note: Teach the pastoralists about the reproductive cycle of sheep and goats, and how to use this information to plan when to expect lambing or kidding.

Activity	
45 days before breeding	<p>Rams/ bucks:</p> <ul style="list-style-type: none"> • Select bucks to use for mating • Conduct a breeding soundness examination of selected males • This includes the examination of teeth, eyes, feet, legs, sheath and testicles
	<p>Ewes/ does:</p> <ul style="list-style-type: none"> • Select females to be mated and prepare them for mating through feeding to ensure good body condition • Vaccinate and deworm animals as required
	<ul style="list-style-type: none"> • Determine male: female ratio for mating (eg 1: 20)
	<ul style="list-style-type: none"> • Select and group females to be allocated to different males (use coloured paint to separate groups)
Breeding (30-60 days)	<ul style="list-style-type: none"> • Separate females and allocate to desired males
	<ul style="list-style-type: none"> • Observe mating by noting mounted females
	<ul style="list-style-type: none"> • Note females that fail to be mounted and allocate different males if necessary
	<ul style="list-style-type: none"> • Ensure animals are well fed and avoid injuries
Gestation (150 days)	<ul style="list-style-type: none"> • Separate males from female animals
	<ul style="list-style-type: none"> • Monitor flocks and ensure females are provided with good grazing grounds

Lambing/ kidding (60 days)

- One month prior to expected lambing/ kidding, carefully monitor and manage pregnant animals in environment where it is easy to provide support and assistance at lambing/kidding
- Be available to provide assistance in case of problems at birth
- Keep ewes/does with lambs/kids in a separate area for at least three days prior to sending out to grazing fields
- Observe animals with lamb/ kids daily
- Deworm, dock lambs and castrate male lambs/ kids not earmarked for breeding

Weaning 90- 100 days after lambing/ kidding

- In the Arid lands, Lambs/ kids should be weaned when they are > 3 months old, weigh at least 2.5 times their birth weight and are able to graze for themselves
- Vaccinate lambs/ kids
- Separate young animals from mothers

The livestock keepers should be reminded to use tools to control mating by male animals (aprons) and marking pens to identify which males mated with which female as outlined in Module 2 (Engage)

Culling animals in flocks



Culling: Sometimes the livestock keepers have to make decisions to remove certain animals from their flocks in order to maintain a certain flock size that is easier to manage. Sometime they may also remove animals that are not very productive from the flock.

Prior to culling female animals, the livestock owner should evaluate and examine animals in the flock and determine what criteria will result in the removal of undesirable animals. **The livestock keeper should ensure that the problem is with the animal, and not with the type of management provided for the animals!**

Criteria for culling female animals

1. **Challenges with fertility:** Failure to become pregnant when mated more than 3 times, inability to carry a pregnancy to term, frequent still-births.
2. **Challenges with health:** Poor condition, unable to go out and graze with larger flock due to constant health challenges.
3. **Poor temperament and mothering ability:** Unable to care for young animals, constant hostility to other animals.



Results



Strategic off-take of livestock for sale



Increased number of livestock keepers selling quality livestock



Increased numbers of more productive and resilient livestock in the farmers' flocks

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