

**BASIC  
RECOMMENDED  
FARMING  
PRACTICES**

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## INTRODUCTION

A majority of the farmers in Nebbi district practice subsistence farming which heavily rely heavily on indigenous knowledge and technologies (IKT). What was found during the Nebbi Development Area Network member organizations assessment that household members are have less than 50% adoption rate of improved agronomic and livestock management practices like wise only 50% are food secure.

During a feedback meeting it was resolved that food security promotion should be high on the agenda for the network. In this vein, AFARD looks at food security from four angles: availability, access, affordability and adequacy of food at all times for the beneficiary household.

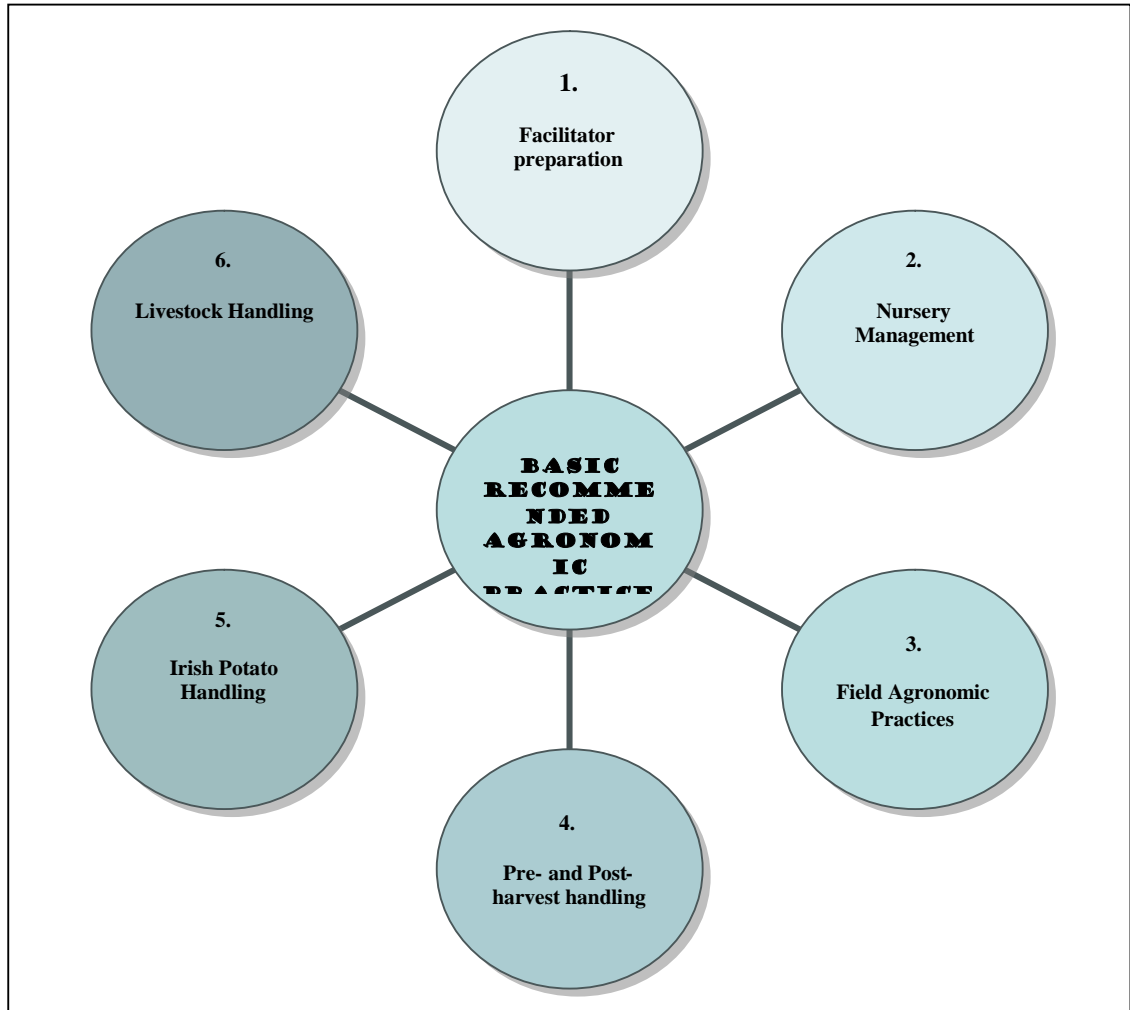
The availability of food to the household is based, first on the capacity of the household to produce own food, then secondly, on the capacity to buy from external sources. The provision of improved crop seeds and animal breeds is one way of increasing food production. However, these new technologies have peculiarities about them that must be explained to the farmers if they are to get optimum yields. These explanations take place during training that are practical, organized on the farmer group fields and conducted at the time when the knowledge gained will be immediately transferred into the farmers' fields.

This manual lays down the technicalities of provision of such farmer-based extension services. We believe that:

1. Farmers know farming very well especially with regards to their technologies.
2. Farmers are still committed to farming and in the short-run will still be more actively engaged in farming.
3. The current practice of extension services delivery by government staffs especially is non-responsive to local needs because of compromised professional ethics and lean outreach pivoted in contact farmers.
4. Greater and effective outreach is best built on a group approach where already formed groups involved in farming (alone or with other activities) are partnered with. By working through the groups as Technology Development and Diffusion Sites (TDDS), more people will be reached at a lesser cost.
5. Technology Development and Diffusion (TDD) should build on what the people know and are willing to invest in. New innovations should therefore be adapted to suit such practices and diffused at a pace that the communities are able to handle.

### Structure of the Manual

The manual is generally composed of five parts as shown below.



## 1.0 BASIC PREPARATION BY THE FACILITATOR

In order for the training to achieve its intended purpose, the Facilitator needs to prepare well and do things correctly during the training. The following are some reminders.

### 1.1 Before the training

- 1- Ensure that the farmers get the information about the training in time so that they are able to consult their members and give you a feedback. 2 weeks are sufficient
- 2- Make a visit to the sites where practical demonstrations will be carried out for the purpose of ensuring that it is suitable for the purpose. If the owner of the demonstration plot/livestock unit is expected to play certain roles during the demonstration, ensure that he is well briefed and knows his roles exactly.
- 3- As you visit, the sites, endeavor to know more about the people you will be training, i.e., in addition to the information already available with AFARD.
- 4- Ensure all demonstration materials are procured in time. All equipments must be tested to ensure they are in good working condition.
- 5- Farmers have limited time, therefore ensure you arrive early at the venue of the training so that training actually starts at the agreed time. You should never be a cause of delays.

### 1.2 During the training

- 1- During the training, establish a good rapport; create a friendly atmosphere between you and the participants.
- 2- Sufficiently introduce purpose of the training, what they (together with you) will learn during the training and the roles they are expected to play.
- 3- It does not harm to get their expectations and fears about the training which should be adequately addressed.
- 4- Remember that farmers have a wealth of experience that can be tapped for the benefit of other members. Encourage them to share their knowledge gained from other training as well as their experiential knowledge. You should also be aware that not all existing information may necessarily be correct. Incorrect information about a subject may actually act as a block against new information. However unless the farmers feel free to share such knowledge and preconceptions with the rest of the members, they will continue to harbour them and this will affect the internalization of the new knowledge.
- 5- Demonstrations succeed by exploiting all the senses of the participants. Therefore in addition to explanations of how and why, show them the how and then let them do the how for themselves. Of all the senses that you exploit to pass forth your knowledge, the doing by the farmers is the most important.
- 6- Wrap up with what you and the group will be looking for during monitoring and evaluation, a plan for way forward

## 2.0: NURSERY MANAGEMENT

Session objectives	At the end of the session the members of the groups are able to: <ol style="list-style-type: none"> <li>1. Make a nursery bed</li> <li>2. Care for seedlings up to the time of transplanting into the main field</li> </ol>
Topics	<ol style="list-style-type: none"> <li>1. What is a seed bed</li> <li>2. Why is the seed bed necessary</li> <li>3. How to make a good seed bed</li> <li>4. How to care for seedlings in the seed bed</li> </ol>
Time	6 hours
Requirements	Hoes, poles, sisal string, grasses, stones, tap measure, sand and seeds.

As a basic principle in this training, always start by asking the participants what they already know about the topic. From their answers you will be able to identify knowledge gaps that you promptly fill. Demonstrations will then be used to allow the participants physically apply the knowledge they are gaining.

### 2.1 Defining the Nursery bed

A nursery seed bed is a medium for the growth of seeds/planting materials. We use nursery beds because; some plants require careful attention in the early stages and can only be provided in the nursery, nursery helps young seedling escape harsh field conditions, using nursery caters for uniformity in the main field when transplanted and the garden looks impressive than directly sown seedling, nursery provides avenue for early planting of large number of seedling even during drought and as young seedlings occupy less space, nursery use saves space and reduces labor

### 2.2 Factors considered when sitting a nursery bed.

A nursery seed bed should be sited near a clean water point as this will reduce the burden of looking for water because the seedling requires watering at least twice a day. The area should be fertile enough to reduce the work load of transporting good soils from afar for potting. The nursery should be sited on a slightly sloppy area to facilitate proper drainage without much erosion. Accessibility of the nursery point also has to be considered for easy movement of inputs and if possible be sited near the main field to reduce chances of causing injuries to the seedlings.

### 2.3 Nursery seed bed preparation and planting

Clear the site and remove all the trashes and grasses, measure at least a width of 120 cm and length of 5m. Sink the point to a depth of 10 cm and pour gravel/stone at the base to facilitate proper drainage. Then bring top soils (possibly forest soils) and 1/3 should be sand to facilitate drainage and provide good temperature for germination of the seeds. Make a fine seed bed as the seeds are small in sizes for easy germination. The distance between each bed is 1m to facilitate easy movement within the bed.

Planting; with a stick, make some opening on the seed bed to a depth of 2 inches at a spacing of 15 cm by continuous. This should be against the length of the bed. Mix the seeds with twice its volume of sand to facilitate even distribution during planting and provide good temperature for seed

germination. Pour the seeds in the opening and cover the top slightly for easy emergence of the germinating seed. After planting, cover the bed with some grass to provide moisture and reduce weed emergence in the bed, leave it over night and water the following morning to minimize seed movement.

#### **2.4 Nursery seed bed management practices, and potting**

After the seeds emerge, raise the grass up and thin to leave some gaps between the seedling, this is to avoid competitions for nutrient water and light due to over crowding which can cause etiolation and damping off. When the seedlings emerge possibly after 5-7 days leave it for 12 days buy pots, then put them in pots with fertile soil, never handle the seedling by the color as this will destroy the tissues and expose the seedlings to infections instead, hold the seedling by the tips when potting and construct shade for the potted seedlings. Keep the pots weed free and using watering can, water the seedlings every day in the morning and evening except on chilly days. Depending on intensity of pests and diseases in the bed, spray the seedlings regularly against foliar pests and disease, use Diathane-M45 and other broad spectrum chemical like Agrozeb. Hardening off the seedlings is equally very important to prepare the seedlings for the rough field conditions hence avoiding shock to the seedlings in the main field. This should be done two weeks to transplanting. Before transplanting is done make sure you prepare the main field in advance, make the planting holes so that seedlings do not suffer in the field. Handle the seedlings with care, remove the potting material slowly, trim the roots, reduce the number of leaves to enhance start off and put the seedling together with potting soil in the hole and cover it with top soil first just to the color and water. Transplanting is done in the morning and evening and not during mid-day hours as the sunshine will shock the transplanted seedlings. Transplanting should be done at least within 45 days from planting



### 3.0 FIELD AGRONOMIC PRACTICES

Session objectives	By the end of this session participants can identify what type of field to plant their crops in and can explain how to take good care for the crops till they are ready for harvesting
Topics	<ol style="list-style-type: none"> <li>1. Site selection</li> <li>2. Planting</li> <li>3. Pre-harvest best practices</li> </ol>
Time	4 hours
Requirements	Flip charts and markers, Hoes, string, polythene bag, Grasses, Banana leaves, A knife/ pruning saw, Samples of most common weeds that attacks the crops, Tobacco leaves, Garlic gloves, omo, parafine, Diathane M45, Agrozeb. Pest plants in the field. Sprayer pump.

#### 3.1 Field site selection/soil type (10 minutes)

Preferably, site fields in fertile area with good loam soil, deep, friable and free draining to avoid water logging conditions. This will provide for good health of the plants in the field. Do not plant in fields used for the same crop in the previous season as this will lead to low yield due to existence of similar pests and diseases and reduced plant nutrients in the soil.

#### 3.2 Early land opening, early planting and proper plant spacing.

At, at least 30cm deep, rectangular shaped land should be opened early enough i.e. 6 weeks before planting time. This will allow the field to decompose such that by the time of planting, the field shall have gained more fertility for the seedling to come up with vigor and have good yield. Early planting; planting should be done early enough to enable plants benefit from nitrogen flash, make the plant establish it self faster to tolerate drought, weeds and have early harvesting of the crop. Proper spacing is encouraged to facilitate easy weeding, easy movement for spraying and other operations in the field like field monitoring and also so that plants get enough nutrients, light and good air circulation between the plants as a result of reduced competition. The spacing for these crops are; Cassava 1m x 1m, Irish on ridges of 60cm x 30cm (seeds on the ridges) Simsim 30cm x 10 cm, Onions 90cm x 10cm, Tomato 90cm x 45cm, Cabbage 90cm x 60cm and Egg plants 60cm x 30cm. 500gms of seeds of tomato and onion for one acre each, 112gms of seeds for cabbage and 100gms of seed for Egg plants.

#### 3.3 Mulching

Cover the field with any mulching material, it can be black polythen paper, seedless grass to avoid germinating or any plant leaves. Mulching will help suppress weeds by cutting light to the weeds, maintain good moisture in the field for the crop, after decomposition add nutrients in the soil, act as a trap crop to pests that may be in the field, moderate the soil temperature and prevent soil erosion by reducing the speed of running water.

### **3.4 Debudging**

This is the removal of excessive unwanted buds of especially tomato plants in the field to reduce over bearing on the plants and produce good quality fruits, to create space for proper air circulation between the plant in the field and to make plants in a better position to have equal chances of light absorption. With sharp knife or your hand cut the buds while making sure you don't tear the stem of the plant as this will create entrance for disease causing organism.

### **3.5 Weed control**

Make sure you keep your fields weed free to avoid competition with the plant for nutrients, light and water and to have good quality produce. Understand the biology of weeds in the field, and weed before they produce their seeds as weeding after they have produced their seeds will make them persistent in the field. Control weeds by hand pulling, mulching, crop rotation, early planting to escape weed incidences, deep ploughing using hoes to remove the deep roots, and one can further use selective herbicides for killing the weeds in the fields. The frequency of weeding depends on the type of weeds and existence of weeds in the field.

### **3.6 Pests and disease control**

Frequent field monitoring/visits, is very important as it helps you to detect outbreak of any pest or disease in the field and take recommended actions to save the situation before it worsens. Most common pests of such crops are; for Simsim wire worms, insects. Diseases like Gall Madge tend to affect simsim. Irish pests include curt worms, potato weevils, Aphides. Diseases are late and early blight. Cassava pests includes cassava mites, mankey, squiral, mosaic virius Onion thripts, cut worms, wire worms and Aphides and diseases like purple botch, downymilddew, smudge whose prevalence is high during rainy/ humid periods.

Cultural operation including crop rotation, field sanitation, soil sterilization, routine use of resistant varieties, rouging, burning and burring of affected crops, use of clean seeds, time of planting (timely and early planting), pruning, thinning, improved soil and water management.

Broad spectrum chemical like Diathen M45 and Agrozeb can be used for controlling foliar pests and diseases in the field. Local pesticides can also be made for controlling pests in the fields. For instance use of tobacco leaves. First get clean apparatus/materials for making the pesticide. These

include a basin, a mortar and its pestle, spoon, a dry stick, a jerrican of water, a small bowl, a cup of worm water, a piece of cloth for squeezing, ten tobacco leaves and a sachet of omo.

### **The process of making it**

- 1- Crash ten well dried tobacco leaves, grind/ pound to a fine powder using the mortar.
- 2- Pour the fine powder into a small bowl.
- 3- And add worm water to a size that can be squeezed and leave for ten minutes so that the chemical substance is dissolved in the water.
- 4- Squeeze it out after the ten minutes into a basin.
- 5- Add 20 liters of water to the solution and stir well using a dry stick.
- 6- Add 2 tea spoon full of detergent (omo) and stir well. This will make it stick well on crops.
- 7- Leave the solution for over night and spray in the morning.

### **The use of Garlic gloves; the process of making it;**

- 1- Get 20 small garlic gloves
- 2- Peel them to leave the inner fresh part for easy pounding.
- 3- Pound it well to make it soft.
- 4- Put the pound garlic into a small container that can be covered.
- 5- Pour paraffin in to the container just to cover the pound garlic. The paraffin will help to extract the chemical from the garlic substance.
- 6- Leave the mixture to stay for two days (24 hrs) for it to gain strength.
- 7- After the 2 days pour the mixture in a basin and add 5 liters of water stir well and sieve to remove the residues.
- 8- After sieving, add 2 tea spoonful of omo stir well and spray immediately. The omo is to make the pesticide stick well on the crop to which it is sprayed.

### **The spraying techniques are as follows;**

Make 20 liters of the pesticide to be used in an acre. Apply in the morning when the pest are still active on the crops and escape strong sun heat in the later hours that may make the chemical volatilize and have less impact on the pest. Do not spray when it is about to rain because rain will wash the pesticide, in case wind gets you spraying, spray against the direction of the wind for better coverage on the crops otherwise if you spray in the direction of wind, the sprays will be spilling away and you will not have covered your plant well with the pesticide.

## **3.7 Weed control**

### **3.7.1 Identification of common weeds**

- Different types of weeds affecting sesame and Irish potato e.g. wandering jew, nut grass, *Biden pilosa*. etc
- Weed growth characteristics; some weeds are climb crops while twining on the stem, some are runners while others grow erect with faster growth rate than the crops.
- Type of crop loses resulting from effects of weed. Quality lose, reduction in yields, adds production cost, competition for nutrients, water and light.

### **3.7.2 Weed control measures**

Make sure you keep your fields weed free to avoid competition with the plant for nutrients, light and water and to have good quality produce. Understand the biology of weeds in the field mode of the root, how it can be spread and weed before they produce their seeds as weeding after they have produced their seeds will make them persistent in the field. Control weeds by hand pulling, mulching, crop rotation, early planting to escape weed incidences, deep ploughing using hoes to remove the deep roots, and one can further use selective herbicides for killing the weeds in the fields. The frequency of weeding depends on the type of weeds and existence of weeds in the field.

### **3.8 Disease management in crop fields.**

#### **3.8.1 Disease management criteria**

- Disease pathogen development and environment relationship.
- Identification of common diseases of sesame, cassava and Irish.
- Causes of disease spread, signs and symptoms of the different crop diseases.

Type of damage and crop loses resulting from disease infection; wilting of plants in the field, spots on the leaves, drying of leaves, yellowing of leaves, stunted growth, lesions on the leaves, falling of leave etc.

#### **3.8.2 Disease control methods**

Frequent field monitoring/ visit to enable realize the presence of diseases in the field so that appropriate method is employed to control the diseases. Cultural operation including crop rotation to destroy the life cycle of the disease in the field and also avoid having same host plants in the field, field sanitation to keep the field free of diseases, soil sterilization, , routine use of resistant varieties, rouging, burning and burring of crop residues, use of clean seeds, time of planting(timely and delayed planting in the case of late blight in Irish potato), pruning thinning, improve soil and water management constitute the disease control methods.

-Chemical disease control (different type of chemical for specific disease). Such chemicals includes; Diathan M45, Agrozeb which are broad spectrum chemicals.

## 4.0 GENERAL PRE- AND POST HARVEST HANDLING

Session objectives	At the end of the training the participants shall be able to: 1. Explain and identify Irish potato maturity signs and time for harvesting 2. Explain the pre-harvesting techniques for Irish potato 3. Explain the improved steps for the storage of both eating and seed Irish potato
Topics	1. Pre-harvest handling operations 2. Storage of eating potato 3. Storage of seed potato
Time	60 minutes
Requirements	Flip charts, cards and markers, Pictures portraying causes of the deferent post harvest loses, Pest infected seeds, Samples of post-harvest chemicals (malathion) dust. Neem leaves, ash, Photo showing well constructed store.

### 4.1 Post- harvest loses

#### 4.1.1 Why proper post-harvest handling

To avoid unnecessary loses, to have food all year round and have good quality seeds both for sell and planting in the subsequent season.

#### 4.1.2 Types of pos-harvest loses

30 minutes

Questioning and answering, lectures, demonstration

Pest infected seeds.

Types of post- harvest lose identified and discussed.

Loss in quality; due to poor drying e.g. on the ground, animal passing their excreta on the produce, rough handling causing bruises and cracks, pests boring into the seeds. Loss in weight as a result of pest destruction; Nutritional losses as storage pest sacks the food value in the seeds. Loss in size/quantity of produce as a result of spillage during transportation, extravagant consumptions and destruction by animals due to poor drying techniques exposing the produce to animals.

#### 4.1.3 Causes of post harvest loses

30 minutes

Demonstration, questioning and answering, discussion

Pictures portraying causes of the deferent post harvest loses.

Causes of post harvest lose identified discussed and explained to the participants.

Poor transportation; use of torn up sacks and over loading produce in basket causing spillage during transportation of the produce whether from field to store or from store to market. Poor processing; drying the produce on the ground which destroys the quality of the seeds, seeds keep on absorbing moisture from the ground, roaming animals feeding and passing their excreta on the produce hence reducing the quality of the produce. Winnowing during strong wind which can cause loss in quantity. Poor storage; storing produce in a leaking store, having rodents in the store which feeds on the produce while leaving their excreta on the produce changing the color and causing bad smell on the produce, stores without proper ventilation which blocks circulation of air into the store leading to accumulation of heat causing formation of hot spot and eventually of produce.

#### **4.1.4 Reduction of post-harvest loses.**

45 minutes

Demonstration, questioning and answering, discussions, lecturette

Samples of post-harvest chemicals (malathion) dust.

Neem leaves, ash.

Methods of reducing post harvest loses discussed and understood by the participants.

Chemicals for reducing pests in the store shown to the participant.

Proper processing and drying of produce; drying produce on mats, tauplin and raised platforms while preventing roaming animals from accessing the produce to avoid them feeding and passing their excreta on to the produce.

Proper storage of produce; produce in sacks be put a distance from the wall and raised above the ground to avoid produce absorbing moisture. Stores with proper ventilations to allow an easy air circulation into the store to avoid too much heat accumulation that can lead to formation of hot spot and eventually rotting of the produce in the store. The use of chemicals in preventing post harvest loses; chemicals like malathaon dust, landine, actelic dust can be used to prevent pest attack in the store. The chemical is mixed together with the produce in a balanced proportion. The chemical repels the pest out of the produce. Rodenticides are can also be used to prevent rodent and rat poisons used to prevent rats from invading the store to destruction. Natural/traditional methods; use of neem powder, 5kg into 90kgs of the produce and sacks can be soaked in a solution made by putting 10kgs neem leaves in 100 litters of water for at least 12 hrs, fresh neem leaves can also be put in the sacks; at the base pour the seeds, in the middle add seeds and on top and covered it to repel the pests. one can use ashes mix it with the produce 5kgs in 90kgs of the produce.

## **4.2 Post-harvest handling of Irish potato.**

### **4.2.1 Post harvest handling structures.**

30 minutes

Demonstration, questioning and answering and discussions.

Photo showing well constructed store.

Qualities of a good store identified and discussed.

The different post-harvest structures identified discussed and understood by the participant.

Store construction; stores should be well sited close to home stead and have good locking systems to avoid theft, well ventilated and with slate on the for free air circulation in the store, should have rat guards to prevent rats from entering the store, the walls should be smooth to avoid pest hiding in the cracks, the roof should be leak proof to prevent rain water entering the store, the areas around the store should be maintained clean to avoid fire hazards on the store. Raised plat forms and solar driers can be constructed for proper and clean drying of produce. Granaries and silos can also be constructed for storing produces.

#### **4.2.2 Irish store management**

10 minutes

Questioning and answering, discussions

Store management practices identified, discussed and well understood by the participants

Store hygiene; stores should be clean to avoid too much dust that can harbor pest and also affect the quality of the seeds by changing the color. Labor management; duty roster be prepared for the groups for the routine operations in the store.

#### **4.2.3 Chemical application**

20minutes

Demonstration, lecturette, questioning and answering.

Samples of the chemicals (Malathion dust).

The chemicals and techniques of applying the chemicals identified and demonstrated to the participants.

After the first application, then time when you see the dust disappears and signs of pests on the Irish seeds dusten the Irish again with the chemical. It can be Malathion dust, actellic dust or dimethoate dust depending on which one is available and cheaper for the groups to acquire. The volume to be applied can be 10gs per shelve and make sure the seeds are well covered/mixed with the chemical so that it is effective. Take some precautions while applying the chemical, be economical in the application to avoid wastage, avoid inhaling cover your mouth and the nose with a piece of cloth, shat the doors and windows to prevent wind during the application, wash your hands immediately after applying the chemical.

#### **4.2.4 Irish seed sprouting suppression**

20 minutes

Demonstration, discussions, questioning and answering. The chemical (Birgin).

Curing duration and Irish seed sprouting suppression techniques including the chemicals are identified and known by the participants.

The Irish can be kept for at least 3-4 month and depending on how well the it is being taken care of, can go beyond without sprouting. The sprouting can be suppressed; one by controlling the heat in the curing house, letting in fresh air at night to cool the heat that might have accumulated during the day will help avoid

sprouting and two, use of the chemical propham (birgin) as sprouting inhibit ant is necessary. But integration of both practices is much better.

#### **4.2.5 Routine operations**

30 minutes

Demonstration, questioning and answering, discussions.

These routine practices includes; opening of the ventilator at night to allow fresh in the store and closing during the day to prevent worm air entering the store, daily checking of the store to detect presence of pest and take actions immediately to prevent spreading, spreading of the seeds so that to create free movement of the heat generated as the seeds are packed together, sorting of affected seeds to avoid dissemination to other seeds and cleaning the store regularly to keep store free of pathogens.

#### **4.2.6 Record keeping.**

20 minutes

Discussion

questioning and answering.

The important records that should be kept are identified and discussed together with the participants  
Records of application of chemicals, the type of the chemicals being applied, when it is applied and what quantity applied, amount of seeds sold and other expenses that may be incurred.

#### **4.3 Marketing of the Irish.**

30 minutes

Questioning and answering, discussion and lecturette

-Importance of group pooling identified and discussed.

-Strategy for group pooling developed.

##### **4.3.1 Seed quality**

Sort out the seeds in their different sizes and put them separately, make sure the seeds are clean, free of defects and infections.

##### **4.3.2 Group marketing/pooling**

Groups should keep and pool their Irish potato to be sold at a later date when prices are higher in the market so that they get good income. Pooling their Irish will increase the chance of attracting good buyers, increase their bargaining power, so that any lose is shared by all the groups as a single group loses wholesomely.



## 5.0 IRISH SPECIFIC PRE-HARVEST HANDLING

Session objectives	At the end of the training the participants shall be able to: <ol style="list-style-type: none"> <li>1. Explain and identify Irish potato maturity signs and time for harvesting</li> <li>2. Explain the pre-harvesting techniques for Irish potato</li> <li>3. Explain the improved steps for the storage of both eating and seed Irish potato</li> </ol>
Topics	<ul style="list-style-type: none"> <li>• Crop maturity detection</li> <li>• Pulling of Irish potato tops</li> <li>• Harvesting and harvesting cost</li> <li>• Seed selection, storage structure, and stores management</li> </ul>
Time	60 minutes
Requirements	Flip charts, cards and markers, Pictures portraying causes of the deferent post harvest loses, Pest infected seeds, Samples of post-harvest chemicals. Neem leaves, ash, Photo showing well constructed store.

### 5.1 Crop maturity date detection

- Signs of maturity; yellowing of plants, maturity period (at least 90 days from date of planting)
- Relationship between time of harvesting and field records; record of date of planting tells you the time of pulling of the top of the plants. At least 2 weeks before harvesting time to give time for it to mature fully, as it will make the seed coat harden and reduce the water content in the seed.

### 5.2 Pulling of the Irish potato tops

- Techniques of pulling tops; cutting can be done using knives or slashers but for safety use sharp knives. The knives should be clean to prevent the spread of diseases from crops like Tomato, egg plants etc which share the same disease with Irish. cutting should be done at the base of the plant so that it is easy to cover the top with soil. This will also reduce the chances of pathogens entering in the plants.
- Reasons for pulling off the tops of plants; the reasons are 2 fold, first, to make the seeds harden so that it can not be damaged easily during handling. And secondly, to reduce the water content and increase the shelf life of the seeds for a longer storage.
- Replacement of soils over tubers after pulling tops; this is to reduce greening due to exposer to the sun shine and prevent entrance of tuber moth which can destroy the seed.

### 5.3 Harvesting and harvesting expenses

- Steps in harvesting of Irish potato; make sure you remove the soil on top of the plant using your hand to expose the seeds so that it is easy to be removed without causing damages to the seeds.

- Then use of clean tools during harvesting to avoid spreading diseases that might have been got from similar crops after using the tools e.g. tomato, Egg plants etc.
- Prevention of bruises on tubers; make sure you don't bruise the seeds by carefully removing the seeds using forked hoe or for safety use your hand since planting has been done on ridges with light soil and can easily be pulled off the soil with hands.
- Need for extra labour and ready store; this is to make work easier to delay of the plants in the field especially after pulling of the tops and ready store for storing the seeds because without proper storage the seeds can not be kept for long as will be expected.

#### **5.4 Seed selection, storage structure, and store management**

- Type of tubers for food; big sized tubers, normal color (red for the our case or the victoria type) but also depends on the variety. Should not have defects; bruises and cracks which can provide passage for pathogens. The textures; the seeds should of good texture i.e., be smooth and not rough for economic values.
- Type of tubers for seed; seeds should be of a chicken Egg sizes, of normal color( red), there should be no defects like bruises and cracks to avoid entrance of pathogen and the textures should be smooth and not rough as roughness is a sign of infection.
- Site selection for store construction; the site should be in a well drained land and should be orientated in such a way fresh night air enters freely
- Construction materials and dimensions: Nails, bamboos, ridges, poles, thatching grass, sisal strings and equipments like Panga, hammer, saw, axes may be used during the construction. The size of the store depends on the amount of potato the group is likely to get, but 4m long x 2.5m wide recommended for the groups. The ventilators are put at 30cm above the ground in an orientation to night fresh air. The slate inside the store are put at 30cm distance at least up to 3 slate on top are recommended in the store.
- Temperature control and use of chemicals that suppresses sprouting (delayed breaking of dormancy): For the seeds to remain dormant, the temperature must kept low by opening and closing the ventilators that are left for fresh air to enter into the store. And the use of the chemicals propham (Birgin) to suppress sprouting of the seeds.
- Routine management requirements; at least daily checking for the health of the seeds, opening at night for fresh cool air and closing during the day of the ventilators, spreading of the seeds to aid further fresh air circulation and sorting of affected seed in the store is necessary

## 6.0 LIVESTOCK (GOAT) MANAGEMENT

Session objectives	At the end of the training the participants shall be able to: 1.
Topics	•
Time	60 minutes
Requirements	Flip charts, cards and markers,

### LIVESTOCK PRODUCTION

Thematic focus	Topic	Sub-total
Goat keeping	- Introduction	- Types of domestic animals - Animal husbandry principles (8) - Importance of goat keeping. - Goat production systems - Goat breeds - Attractive properties of goats
	Breeding, Raising and selection	- Breeding goats, breeding billy goats, symptoms of being in heat, servicing, Gestation, birth, Dystocide, raising newborn kids, weaning the young animals, selection, judging the exterior, selection for reproduction, selection for meat production, Cross breeding.
	- Housing	- Reasons for housing goat - Construction of goat houses - Requirements for the Installation
	Nutrition and feeding	- Supplying the essential requirements - Feeding practices - Feed supplements - Hay and silage making
	- Disease control (Health, disease and parasites)	- factors effecting health - A health goat - Diagnosis of a sick goat - common Diseases - Infection Disease - Diseases due to feeding mistakes - Internal parasites - External parasites - Vaccinations and injections
	Record keeping	- Servicing list and kidding records - Records on individual goats and billy goats.

	- Routine work	<ul style="list-style-type: none"> <li>- determining age of a goat</li> <li>- weighing goats</li> <li>- body scoring</li> <li>- catching and restraining a goat</li> <li>- feet examination</li> <li>- dipping/spraying</li> <li>- injecting goats</li> <li>- Castration</li> <li>- Disbudding</li> <li>- Culling</li> <li>- Record keeping</li> <li>- Identification</li> <li>- Layout of pens</li> <li>- Food and water supply</li> <li>- - Fencing</li> </ul>
	Marketing	<ul style="list-style-type: none"> <li>- Goat products</li> <li>- Prices</li> <li>- Place</li> <li>- Promotion</li> <li>- Customer</li> <li>- Competition</li> </ul>
	Managerial ability	<ul style="list-style-type: none"> <li>- Goat keeping as a business</li> <li>- Business functions</li> </ul>

**TRAINING ON GOAT KEEPING:**

**SESSION 1: INTRODUCTION**

**SESSION OBJECTIVES:** By the end of the session, participants will be able to:

- (i) Mention the 8 principles of Animals husbandry and explain the importance of goat keeping.
- (ii) Identify the most suitable goat production system (s) for the management of improved billy goats and local female goats in their area.
- (iii) Explain why it is important to improve on the quality of local goats through cross breeding with improved billy goats.

**Contents:**

- Types of domestic Animals
- Principles of Animal husbandry
- Importance of goat keeping
- Goat production systems
- Goat breeds (The East African goats and improved meat breeds).
- Attractive properties of goats

**Methods:** Brainstorming, Questions and answers, Discussion, Lecture

**Materials:** Flip charts, markers pens, masking tape Exercise books, pens

Time: 30 minutes

**Procedure:**

Ask participants to mention all the domestic animals they know of

Mention and explain the 8 principles of Animal husbandry to them

Discuss with participants the importance of goat keeping

Introduce the different goat production systems and discuss them with particulars

Mention the different East African goats and improved goats. Explain to participants their characteristics.

Discuss the attractive properties of goats.

**Notes:**

- 1- Domestic animals are many and varied. They include both Livestock and poultry. Some examples are cattle, sheep, goats, pigs, chicken, Guinea pigs. They are kept for different purposes.
- 2- There are 8 animal husbandry principle. These are:
  - (a) Breeding, raising and selection
  - (b) Nutrition and feeding
  - (c) Housing
  - (d) Disease control (Health, Disease, parasite)
  - (e) Record keeping
  - (f) Routine work
  - (g) Marketing
  - (h) Managerial ability.
- 3- Importance of goat keeping include the following:
  - They serve as bank account which can be drawn up on when cash money is needed
  - They are used as gifts to strengthen relationship
  - They are used as sacrificial animals
  - Goat provide milk and meat which are high grade food stuffs (for own consumption or sale).
  - Goats provide other products like skins, blood. These can be sold to raise money
  - Goats cost less per animals compared to cattle. This is why many people are involved in goat keeping
  - The loss of a goat is less costly than the loss of say a cow.
- 4- The number of goats kept is a helpful factor that indicates the type of system to be employed.

The systems include:

- (a) subsistence system
- (b) Extensive system
- (c) Intensive system

5- Goat breeds include both the East African goats (local goats) and improved breeds.

The main East African goat is a small, very hardy animal.

The adult female weights up to a maximum of about 25kg and is kept mainly for meat production. It has some resistance to trypanosomiasis. It has a twinning percentage of less than 10% and may produce generally 2 kids each year or even 3 kids in 2 years. They are generally kept under a combination of the subsistence and Extensive system of goat management. Breeding is uncontrolled.

The improved breeds include both the milk types and meat types. Under the Food security project the focus is on meat types. Printing is for the heavy breeds like the Boer that cause fast improvement in growth.

The Boer original from south Africa. They are heavy breeds males weigh 130kg and female 80kg when mature main colour is white with red on shoulder or head

Animals have short hair goat. Has prominent horns and drooping ears. The Boer is a very fertile goat. Over 50% of births are twins. Kids weigh 3-5kg and can reach 40-50kg by six months. Carcass yield is 48-60%.

6- Attractive properties of goats include the following

- The goat is a small animal. Its value is not high. Therefore keeping goats is not very risky.
- It is easier to find feed for small animals
- Even children can control goats
- The goat is a quick maturing animal
- Goats can maintain themselves well in poor and dry areas, where other ruminants do not succeed.

## **SESSION 2: HOUSING**

**SESSION Objective:** By the end of the session, participants will be able to:

- (i) Explain why it is important to house animals
- (ii)
- (iii) Identify the factors to take into consideration before constructing a goat house.
- (iv) Demonstrate how a goat house is constructed, according to the recommended specifications.
- (v) Mention the requirements needed for installation in a goat house.

### **Contents:**

- Reasons for housing goats
- Construction of goat houses
- Requirements for the installation

**Methods:** Brainstorming, Questions and answers, Discussions, Demonstration, Lecture

**Materials:** Flip charts, marker pens, masking tape, Exercise books, pens

**Time:** 45 minutes

**Procedure:**

- Brainstorming on why it is important to house goats and discuss the responses
- Mention the factors to take into consideration before constructing a goat house
- Demonstrate how a goat house should be constructed (for the improved billy goats).
- Emphasize on the necessity to stick to the recommended dimensions.
- Ask participants what could be necessary to be installed in a goat house
- Discuss and make additions or subtractions.

**Notes:**

1. There are many reasons for housing goats. Some of the reasons include the following
  - (a) Climate control (to avoid house being too droughty or too damp so that animals remain in good health).
  - (b) To control breeding and closely monitor the health of animals and the level of nutrition.
  - (c) For safety (to prevent theft, losses due to predators)
  - (d) To make collection of manure easier.
2. When constructing goat houses, the following should be taken into considerations
  - We should invest in quality
  - Whether individual or group housing
  - Whether animals will be tethered
  - Permanent or partial stall
3. A typical goat house. Should have floor space for bucks of 2.8 sq m/ buck
4. Goats need to be separated during kidding, raising feeding and watering also require special facilities.  
There should be in place feed troughs, water troughs, feed racks for hay and mineral licks.

**SESSION 3: NUTRITION AND FEEDING**

**Session Objective:** By the end of the session, participants will be able to:

- (i) Mention all the essential nutrients required by goats and explain their importance.
- (j) Explain the different feeding practices
- (k) Identify the best way of feed supplementation to their goats
- (l) Demonstrate how to make hay and silage

**Contents:**

- Supplying the essential requirements
- Feeding practices
- Feed supplements
- Hay and silage making

**Methods:** Brainstorming, Questions and answers, Lecture, Discussion, Demonstration

**Materials:** Flip charts, marker pens, masking tape, Exercise books, pens bone ash, lodsed salt, Termite clay powder, Okra, Water, Sorghum stalk, Mollases, hoe, empty drum.

Time: 120 minutes

**Procedure:**

Inform participants that goats are essentially browsers and their digestive system is on adaptation to droughts.

Mention the 5 essential requirements for goats and explain the importance of each.  
Discuss the different feeding practices and identify the most suitable one(s).

Explain the importance of feed supplementation and discuss the best way by which participants will be doing it.

Demonstrate how to make hay and silage.

**Notes:**

1. Goats are essentially browsers and can do well where other animals like sheep cannot survive. Their number is full of micro organism and these help them convert poor quality fibre into usable nutrient. Their digestion system is adapted to drought. By ltking leaves, they eat extra protein. Hence at the end of the dry season, they are better than sheep and cattle in condition.

Pregnant and milking nannies need extra feeding

2. The essential requirements are water, Energy, protein, minerals and vitamins.  
Goats need to drink enough water in order to eat a lot of feed.  
A goat needs 3-8 litres of water per day, which must be given at least once a day at regular times.

Goats need energy giving foods in order to keep their body functions and temperature normal and so that they remain active.

They also need energy for growth, building up body fats as for essential body function.

Strongly enough, the goat's minimal protein requirement is provided by its own digestive system. It provides enough for the goat to keep alive high protein content all year especially fore example leucaena, sesbania, pigeon pea.

Leguminous crops like soya and groundnuts are rich in protein. Also wastes like soya bean meat, groundnut meat.

Goats cannot do without minerals. Minerals regulate and maintain body function. They also strengthen teed and bones lack of minerals lead to poor appetite, dull goat, poor growth and reduced fertility.

A good first draws from its own reserve without showing any signs. Always avoid the problem by supplying varied diets. Excess minerals salt is bad. Examples of some of the important minerals are sodium chloride, calcium phosphorus, Iron and Iodine.



Vitamins are normally present and no supplement is needed. Vitamin A is the only one that may be in short supply and can bring about eye disorders, skin ailments, breathing and digestive problems.

Milking and pregnant animals need more Vitamin A than animals raised for meat.

Carotene content of feed declines sharply in storage and this explains why there is a shortage during the dry season.

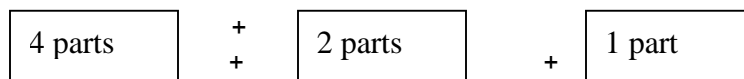
Feeding practices include the following:

- (i) Leaving goats free to find their own food  
More nutritious grasses may be introduced to improve quality of rangeland.
- (ii) Goats are on free range but extra food like fruits, vegetables, Cassava, sweet potatoes, leaves, legumes etc. given.
- (iii) Feeding goat completely manually  
Feed is cut taken to animals  
Concentrates may be supplemented  
Amount of feed given depends on body size, level of activity, what is producing (meat or milk)  
A goat needs roughage too.  
On average a goat needs 4kg of green matter, 1kg of hay and 0.5kg of concentrates per day.  
The feed may be hanged. or chopped.

3. Supplementation of feed can be done in any of the following ways:

- Feeding Leguminous trees/shrubs
- Feeding industrial by products e.g. cotton seed cake, groundnuts cake.
- Feeding concentrates (70% grain, 15% cotton seed cake, 15% meat and bone meal).
- Feeding molasses
- Feeding poultry manure
- Feeding fish meal
- Feeding Urea
- Feeding molasses/Urea mixture.
- Providing salt lick

How to make salt lick locally



Bone powder

salt

Termite Clay powder

4 parts of Bone powder is mixed with 2 packet of common salt and 1 part of Termite Clay powder water is poured into the mixture. Juice from Okra is then added. The mixture is stirred and left to set and dry.

#### 4. Hay and Silage making:

##### Hay making:

- Grass is cut before the heads mature and left on the ground for 3 to 4 days. It is turned several times to speed drying. Once dried, it can be made into a "stack" which should be well thatched or it can be stored in a shed.

- Silage making:

Grass is cut and heaped on ground, put into a pit put in a slope or have walls built around it, then later covered polythene thus there are three types of silos. These are:

- (i) Stack silos
- (ii) Pit silos
- (iii) Bunker silos

It is important the amount of oxygen trapped should be control to reduce chances of oxidation. This is consolidating the storage well when the silo is being build. Maize is a good crop for making silage. Once a silo has been filled, it should be protected from water by pulling a heavy gauge polythene on it. 15 cm depth of soil should be put on it to weigh it down and exude air.

Forage low in sugars e.g. grass or sorghum should have molasses added. (Maize does not need molasses).

Forage high in moisture content should be wilted for ½ a day before ensiling.

### **SESSION 4: DISEASES CONTROL (HEALTH, DISEASE PARASITES)**

Session Objective: By the end of the session, participants will be able to:

Identify the common disease conditions in their areas, their causes, and explain how the disease conditions can be controlled.

#### Contents:

Factors affecting health

A healthy goat

Diagnosis of a sick goat

Common Diseases

Infectious diseases

Diseases due to feeding mistakes

Internal parasites

External parasites

Vaccinations and injections

Methods: Brainstorming, Lecture, Questions and answers, Discussion, Demonstration

Materials: Flip charts, marker pens, masking tape, exercise books, pens, Syringe, needles, Assorted drugs.

Time: 30 minutes

Procedure:

Inform the participants it is better to prevent diseases from acquiring other waiting until they occur, then attempt to heal. Discuss with them the factors that may affect health.

- Brainstorm on the characteristics of healthy and sick goats.
- Explain some common diseases of goats and in the areas of the participants. Discuss their causes and possible control measures.
- Differentiate between infectious diseases and disease due to feeding mistakes
- Discuss the common external parasites in the areas and how they can be controlled
- Explain the importance of vaccinations and injections.

**Note:**

1- some useful measures to prevent disease occurrence include the following:

- Avoiding having damp, windy stalls. This predispose goats to lung infections.
- Avoiding having a filthy stall. This leads to the build up of bacteria and parasites that may cause various diseases.
- Avoid feeding animals insufficiently. It weakens them.
- Avoid increase management of pastures. It leads to building up of parasites
- Sacrifice at time by slaughter
- When in doubt about any diagnosis, always contact a veterinary staff as soon as possible

2- A health goat has characteristics that include the following:

- Walks energetically, has bright eyes and chews cud.
- Has a smooth and shiny coat
- Has pink mucous membrane of eye, mouth, nose, vulva
- Has good appetite for food and water
- Has firm round dropping
- Has good blood circulation, breathing and urination
- Has a heart beat of 70-80 times per minute (for ones have 38.5C. (Mature goats). Young ones have 39.0 C.

3- A sick goat has characteristics that include the following:

- Looks different form the head
- Condition changes (acule)

NB: for chronic disease it may not be easy to defect they take long.

4 Infections diseases include the following:

PPR, CCPP, Pasturellosis, Anthrax, Ecthyma, Brocellosis mastitis.

5 Diseases due to feeding mistakes include the following:

Bloat, diarrhea and mineral deficiencies.

6 Internal parasites are mainly worms. They are found in lungs, stomach, intestines and liver. They are of two types that is the Flat worms and round worms. Some control measures against them are the following:

- Avoid continuous grazing
- Pasture should be managed well by practicing rotational grazing and treatments
- Alternating grazing of cattle with goats
- Deworming mothers and kids (some medicinal plants are also useful)

7 External parasites include the following:

Flies, mosquitoes, lice, mites ticks. They cause great initiate apart from being carriers of many disease causing organisms. They can be controlled by use of Aconicides insecticides.

Locally some people use crushed Neem leaves mixed in burnt engine oil for controlling them. Other used crushed sisal and rub onto the animals for controlling them.

8 Vaccinations and treatments are important for controlling many disease conditions. They should be practiced.

### **SESSION 5 ROUTINE WORK:**

Session Objectives: By the end of the session, participants will be able to explain why certain activities need to be carried out routinely in goat keeping.

Contents:

- Determining age of a goat
- Weighing goats
- Body scoring
- Catching and restraining a goat
- Feet examination
- Tick control (dipping/spraying, hand picking ticks)
- Injecting goats
- Castration
- Disbudding
- Culling record keeping
- Identification
- Layout of pens
- Food and water supply
- Fencing

Methods: Brainstorming, Questions and answers, Discussions, Demonstrations, Lecture

**Materials:** Flip charts, marker pens, masking tape, Exercise books, pens

Time: 30 mins.

**Procedures:**

- Ask participants to list down all routine work they perform in goat keeping
- Discuss each of them one by one
- Inform them of the modern way of doing it if they are to undertake goat keeping as a Business.
- Make additions/subtraction where necessary.

**Notes:**

The routine work performed in goat keeping include the following:

- (i) Determining age of a goat  
It is done by examining teeth  
It can guide in determining the time when to die dispose off a goat.
- (ii) Weighting goats
  - Useful for knowing when to sell or breedPlat form scales or spring balance can be use for weighing the goats
- (iii) Body scoring:  
This is done to assess physical conditions
- (iv) Catching and restraining a goat  
This can be done through bribing with food or water. If this fails, drive the goat into a pen and catch.
- (v) Feet examination:  
This is done to check if they are dirty or over grown  
The hoof can be cleaned and trimmed if over grown
- (vi) Dipping/spraying  
This is done to kill external parasites  
Local materials like neem mixed with burn oil and sisal are said to be useful too.
- (vii) Injecting goats  
This is done to control or cure diseases  
The injection can be given intramuscularly, sub continuously or intravenously.
- (viii) Castration:  
Males not wonted for breeding are castrated before 4 months age with a Burdizzo or within one month will on elastrator. Alternatively the testes can be surgically removed.
- (ix) Disbudding  
Disbudding prevents horn growth, and is beneficial as horns can cause considerable damage  
A hot disbudding iron or a caustic stic/paste can be use
- (x) Calling
- (xi) It is done to dispose off those that are not worth keeping. This cold be because of:
- (xii) Poor health, poor udders, disease, injuries, poor fertility, non breeders, excess animals, old age, breeding fault, etc. they are therefore selected and disposed off.
- (xiii) Records keeping  
It is a management tool and must be simple enough

- It included nanny's date of birth and pedigree (names of parents), kid's date of birth, sex, weight and notes of any birth problems.
- (xiv) It can also include individual or flock problem
- (xv) Identification  
Goats should be marked using any of these methods:  
Tahooing, Exrtagging, Earmarking, fire and breeze branding. This is done to make it easier to know which goat belongs to who.
- (xvi) Farm layout and pens:  
The area where the animals are being kept must be planned very carefully and pens constructed properly to save time.  
Crushes are important for catching animals, dipping/spraying, foot treatment, giving injections, weighing, clipping.
- (xvii) Food and water supplies  
Use racks for feed  
Buckets or bowls can be use fore water
- (xviii) Fencing  
Can use any materials  
Goats jump. Fences must therefore be at least 1 ½ metres high

## **SESSION 6: BREEDING, RAISING AND SELECTION**

Session Objective: By the end of the session, participants will be able to:

- (i) Explain how local goats can be improved through cross-breeding.
- (ii) Identify and explain best practices in raising new born kids.
- (iii) Explain how selection for meat production is achieved.

Contents:

- Breeding goats
- Breeding billy goats
- Symptoms of being in heat
- Servicing
- Gestation
- Birth
- Dystocia
- Raising new born kids
- Weaning the young
- Caring for the young animals
- Selection
- Judging the Exterior
- Selection for reproduction
- Selection for meat reproduction
- Cross breeding

Methods: Brainstorming, Questions and answer, Discussions, Lecture

Materials: Flip charts, Marker pens, Masking pens, Exercise Books, Pens

Time: 3 hours

Procedure:

- Ask participants to explain the best age for breeding goats and how the age is determined
- Explain that the best method is by determining body weight (at least  $\frac{3}{4}$  of mature body weight, depending on the breed).
- Explain the symptoms of being in heat and when servicing should be done.
- Mention gestation period and how birth happens with associated complications
- Discuss and explain how new born kids should be raised in the best way.
- Find out the traditional practices and introduce new best practices
- Mention when new born kids should be weaned, especially for meat production
- Explain the importance of selection, especially for meat production and how it is carried out
- Explain how to judge the exterior of a goat
- Explain how selection for reproduction and meat production is done.
- Discuss the importance of improving local goats and how it is best done.
- Mention one of the best goat breeds that can be utilized in achieving the Cross-breeding programme (Boer Billy goats).
- Summaries

Note:

**1. Goat Breeding:**

A good reproduction is of immediate importance to goat keeping. This means the capacity of a group of goats to produce many young in a year

Goats can have up to 3 litters in 2 years at worst

The best is to have 2 litters in a year. The gestation period is on average 150-156 days.

2- Breeding goats: (Nannies).

A female will be sexually mature and ready to mate at 5-6 months old. However, the female should not be bred before she is 1-1  $\frac{1}{2}$  years old. This is because her growth rate may be arrested. The energy required for her growth is divided between her and the young one inside her.

This can also be prevented by male weaning anti mating apron or castrated before 4 months old with a burdizzo or within 1 month with an elastration.

In mating goats, we look at weight but not age.

Goats should only be mated when they have reached  $\frac{3}{4}$  of normal mature weight of that particular breed. Good nutrition and proper care are necessary for the mature weight to be reached soon. If a goat is not in good health, she will get in heat less regularly. Hence difficulty in controlling mating by goat keeper. There should be timely treatment be planned and plenty of food must be available during gestation period.

**2. Breeding billy goats:**

At about 4 months old, a billy kid will be sexually mature. It should be ensured that testicles have dropped in place to ensure sufficient sperm production.

However, it must be ensured that the billy goat is not allowed for breeding until it has reached  $\frac{3}{4}$  of normal mature body weight or roughly 1- 1  $\frac{1}{2}$  years old.

One billy goat can serve 10-20 female goats or even 30-40 female goats. However the billy goat should not be over exhausted by being offered too many females. This can lead to a decline in the quantity of service. The billy goat must be healthy at all times and not too fat. If too fat rotting desire declines and quality of sperm decreases.

### 3. Hornless males:

In hornless breeds, Intersexes can occur. The goats look like males but are completely infertile. Their sex change during development in the womb. Usually they are females which have become males female sexual organs do not develop. Male sexual organs develop incompletely.

### 4 Symptoms of being in heat:

Sexual excitement in females is controlled by harmonies and they will only mate when on heat. Average length of time between heats is 18-21 days

It may even be 17-21 days longer or short cycles may occur. There are breed and individual difference at different stages of a goat's life.

If a goat keeper wants to decide himself when a goat should be serviced, he/she should look at the following sign:

- Swollen red vulva
- Mucus discharge from vulva
- Tail flicking or shaking (also when a hand is placed in the Ivins of the goat)
- Mounting other goats
- Seeking bucks
- Provocative urination in the presence of a buck

If a billy goat is nearby, the indications are often more clear. By placing a billy goat in the pen next to the goat, one can easily see which goat wants to be covered. She will stand as close as possible to the billy goat.

NB: A search billy goat can be used to find which goat is in heat

One should tie a piece of cloth around the belly of the search goat so that it does not outsmart him or her.

### 6 Servicing a goat

A billy goat which freely walks among the goats will service the goat which are in heat exactly at the night time during the heat and often several times. Kids can be expected all year round.

For certain reasons births of kids should be limited to certain period of the year.

So servicing should be limited to certain period. Possible reasons can be to avoid merging of work peaks or avoiding unfavourable scales



Service should be done 12 hours after indication of heat. It can be repeated after 6 hours it is not necessary later as the quality of sperm decrease. If a goat is pregnant it will not come on heat any more. If not, it will come on heat after 17-21 days. Attention should be put to note any signs of heat in those goats which have been serviced.

### **7. Influencing Reproduction:**

There are two systems which are the following

- (a) Permanently separating billy goats and female goat.  
A female goat can only be brought to the billy goat  
When she is on heat. Heat is determined by the goat keeper. If he/she misses to note, it is too bad.
- (b) Billy goats and goats to be serviced are kept together only goats which should not be serviced are kept separate from the billy goat.
- (c) These to be service are kept the whole day with the billy goat or even at night
- (d) The disadvantage is that one can never be sure which goat has been serviced or not.

### **8. Gestation:**

Gestation period is 145-150 day (many go up to 156 days even, depending on conditions)

A goat should not be disturbed, to avoid abortion

Extra feed should be given during the last 6 week

(for example plenty of protein and minerals)

Weaning should be done slightly over 3 months for meat breeds

### **9. Birth:**

Udder and vulva swell before birth

On the day of birth, goat becomes restless. She stand and lies down, alternating she does not eat or drink.

The udder is tense. She sniffs at kids in the neighbourhood

Goat isolates itself and stands for instance at a corner. Vaginal secretion hangs as a lung thread usually the goat lies down but standing births is also possible contractions increase in number and intensify. Opening in cervix and vagina wider at birth. Kids is surrounded by two bladders (membranes) they are squeezed out first. They help in stretching and widening birth openings. They should not be punctured.

In normal birth fore legs and head appear first (still covered by the layers). The rest of the bodies appear later.

Birth must take place in clear surroundings. It takes a couple of hours.

### **10 Care after Birth:**

Little ones can start grazing with the herd after one day. Close monitoring must be done.

The umbilical cord and membrane both break after kid has been born. The umbilical cord should not be cut but pulled until constricted and gets cut off. If necessary, the mother should be helped to remove the membrane.

The nose and mouth of the kid should be checked to ensure that they are not covered by a membrane or failed with mucus.

- They can be removed with water to avoid suffocation
- If there is difficulty in breathing, it can be stimulated by immersing the head in cold water. A little salt in the water can dissolve the mucus remaining in the nose
- If the animal remains little, its hind legs should be grasped and it is whirled around a few times. This stimulates blood circulation and breathing
- It should be noted that there are exceptional situations. Generally one will always not need to resolve to these.
- It should be checked if there are more kids
- It is important that the kid must drink colostrum as soon as possible. It is rich in antibodies and protects kids against a number of diseases. If teats are blocked, colostrums should be given using stomach tubes
- In case of navel infection disinfectant should be used for healing. This could be tincture of Iodine, Iysoform, chloramphenicol or Creoline.
- Hygiene is important. Any moisture, mucus must be cleaned
- The afterbirth usually comes out within 12 hours
- For 2-4 weeks afterbirth, some fluid will be excreted from the uterus. Fluid changes from red to brown to clear. If it does not become clear, there is infection in the uterus infection can be cured using antibiotics internal disinfection of the uterus using a salt water solution is also possible.

### **11 Difficult birth:**

If a goat has been showing signs of wanting to give birth for a long time and she has strong continuous contractions but no kids are born, one must intervene. The kid may be lying in a wrong position. Someone with experience must insert his/her hand and correct the position

In normal birth, fore legs and head come first in breech birth, hind legs or folded hind legs or turned head come first.

It must also be ruled that controlled breeding is at times done by use of artificial insemination or Embryo transfer. Some non-pregnant animals may never come back on heat.

A goat may be given good level of nutrition (Flushing) before mating to stimulate it to shed more eggs from ovaries and can increase number of kids born per litter.

### **12. False pregnancy**

Some goats may show all signs of pregnancy but may only produce large quantity of fluid at kidding. This is called false or phantom pregnancy. Such nannies may be remated but should be called if false pregnancies re-occur

### **13 Prolapse of vagina:**

In the one month before kidding, some older goats may prolapse due to stress, over feeding of bulky feeds in late pregnancy or because of large kids or litter.

A goat can be placed on her back with legs high up held by an assistant and the vagina pushed back. Alternatively a prolapse retainer can be used and only removed at birth.

#### **14. Raising and selection:**

This means taking care of the new born kids until they are sexually mature

New born kids should be allowed to drink colostrums which are rich in antibodies. These are absorbed well in digestive tract with the first 24 hours. After that, it is not possible as they are broken down.

Incase on animal rejects kid, the orphan should be rubbed with the after birth of another animal which I has given birth. It will accept the kid.

A kid which has not had milk on a particular day stands listlessly alone, has raised hair on an arched back and stairs straight a head.

Goats milk is best for supplementing feed. Second choice is cow's milk made from milk powder milk must be at 40 C. A bottle or bowl can be used.

Several days after birth, a kid should have access to fresh roughage e.g. grass, herbs, hay. Ti takes in useful bacterial which ensures that the digestive tract becomes adapted to digestion of roughage. At first it only nibbles.

Weaning is done at 3 months for milk goats and slightly late for meat production, plenty of clean water must be available at weaning period

High quality feed should be given in the care of young animals

The best grazing areas should be for them and their mothers. Reduce chances of worm infestation

#### **15. Selection:**

Carry out proper selection

The reason for selection is to improve properly of a group of goats.

The properties for reproduction are: Reproduction, growth (meat production and or milk production).

Note that a goat that does well for all the properties does not exist. A goat keeper always tries to get goats which are most suited to the local circumstances and requirement. To achieve this, goat keepers select goats with desirable properties from the and nose the goats for breeding. Otherwise goats from the herd and nose the goats for breeding otherwise goats can be bought from outside in order to improved in properties of the herd.

#### **16. Factors influencing properties of a goat**

(a) Environmental factors

(b) In addition to genetic factors, the following also affect.

(c) Climate, feed (quality, availability, hygiene, housing and general care.

(d) Animal factors

(e) Age, sex, in heat or , in gestation or gestation or giving milk

- At selection compare animals living under some condition with same animal factors.

c. Selection procedure

Compare animals within the group and those of neighbors

Note that the more the animals, the more difficult it is to carry out selection.

**17. Selection Goats:**

The main selection goats are the following

- (i) Improvement of Reproduction
- (ii) Improvement of milk yield
- (iii) Improvement of meal production (growth).

**18. Judging the Exterior**

- Look for good legs
- A deep and wide chest gives more room for the organs and indicates that they are well developed.
- The animal can also eat more and therefore produce more.
- A good and proportional general development should be looked for. The goat should be shiny. The sexual organs should be well placed and developed.
- It is good to take some measurements like the height, circumference of other just behind the forelegs and the length of the back.

**19. Judging age of an unknown goat**

This is done by checking the teeth

Up to 1 year of age, a goat has only milk teeth which are changed the following years. Age is determined by number of teeth which have changed. hence.

At 1 ½ years 1 pair has changed

At 2 years 2 pairs have changed

At 2 ½ years 3 pairs has changed.

At 3 ½ years all 4 pairs changed

After teeth have changed, they start weaning. The extent of the wear is an indication of the age of the animals. It also depends on the kind of feed; when all teeth are replaced, the goat is said to 'full mouthed' and when all teeth are worn, the goat is said to be 'broken mouthed'

**20 Selection for Reproduction**

The things to be looked at are serving results e.g. time between litters, number of kids born per litter, number of kids that die and survive

Together these give number of successfully weaned kids/goat year.

All the above mentioned data should be recorded and the results evaluated for each individual goat

Drawing conclusion

Goats that do not do well should be replaced as soon as possible

**21. Putting selection into practice:**

- Replace goats that do not do well and this can be done in two ways

- (i) By buying goats from a reliable sources. Judge the exterior and ask for history
- (ii) The young from own best goats can be kept

If the overall number of kids born per goat for the whole herd is low, it cannot be due to poor condition on the Farm. It may be due to the billy goat. A neighbours billy goat could be borrowed.

Billy goats should be regularly replaced with new billy goat to avoid in breeding

Billy goats should be bought from breeders who pay attention to factors important to one, at selection.

In selection for meat production one should know if his/her clients prefer lean or fat meat putting on meat takes place in young animals and putting on fats in older animals

All young animals should be weighed for example at 3 months, 6 months. This gives information about growth.

Growth can be judged in two ways

- (a) By assessing how rapid the growth of an animals is.
- (b) By determining the maximum weight reached e.g. 1 ½ years old.

If feed is limiting factors, rapidly growing animals should be selected. One should not sell his/her best (rapidly growing) animals. These should be kept for future breeding animals.

- if feed is not limiting, selection should be carried not on the basis of maximum weight achieves
- selection for Fatty meat is done by giving excess energy rich feed. Amount of fat is judged from slaughtered animals other than living ones
- sisters or brothers of animals with good results should be reserved for breeding

## **22- Castration of young billy goats:**

It is not really necessary to castrate, even though one wants to use the animals for meat production In case one wishes, he/she should castrate before 3 months.

The best is at 2-3 days. Clean instruments should be used.

## **23. Cross-Breeding:**

- This is the use of other improved breeds to cross local goat in order to improved hereditary properties and achieve certain results.
- One should be careful. This is because the new breeds may not be well adapted to local condition as the results may be minimal or worse.
- The animals with which a cross is made may be more susceptible to certain locally occurring diseases or need better feed than is locally available
- First the results of others in the area should be looked at (those who have tried the same cross.
- One should not get discouraged if the first results are not those desired. But one should always remember that BREEDING GOATS IS AND ENJOYABLE PROFFESION.

## **SESSION 7: RECORS KEEPING**

Session Objective:

By the end of the session, participants will be able to:

- (i) Explain the importance of records
- (ii) Identify the different types of records that may be kept

Contents:

- Servicing list and kidding records
- Records on individual goats and billy goats

Methods: Questions and answers, Discussions, Lecture

Materials: Flip charts, Masking tape, Markers, Exercise books, Pens

Time: 30 minutes

Procedure:

Ask participants what record keeping is and why records are important

Discuss the responses and make addition or subtractions

Introduce to the participants some kinds of records that they may keep in goat management like the servicing list and kidding record, individual goat card and individual billy goat card.

Discuss the various types of records and ask if participants have understood them well.

Summaries.

Note:

- Records of production enables one to select goats properly and improve livestock
- Records also eases administrator
- Goat should be marked in order to recognize them easily e.g. by tattoring, making pattern of incisions or ears tagging.

4. types of records includes the following:

(a) servicing list and kidding Records

Goat No. or name	Date of giving birth	No. of kids	Sex of kids	No. weaned	Remarks

(b) Servicing list (when servicing is controlled)

Goat No.	Billy goat No.	Date serviced	Date giving birth		No. of kids	Sex of kids	No. weaned	Remarks
			Due	Red				

(c) Individual goat card

Goat No.	Date of birth	Breed e.g. local
No. of Father	No. of mother	

Litter No.	Serviced by billy goat No.	Date littering	Litter size M+F	Weaned M+F	Remarks
1					
2					
3					
4					
5					
Diseases:					
Remarks:					

d. Individual billy goat card

Billy goat No.	Date of birth	Breed:
No. of Father	No. of mother	

Offspring:

Date serviced	Goat No.	Date litter	Litter size M+F	Weaned M+F	Remarks
Diseases:					
Remarks:					

**SESSION 8: MARKETING**

Session Objective: By the end of the session, participants will be able to:

- (i) Identify the different goat products that can be marketed
- (ii) Identify and explain the different factors to take into consideration when marketing goats or their products.

Contents:

Goat products  
Price  
Place

Promotion  
Customers  
Competition

Methods: Brainstorming, Questions and answers, Discussions  
Materials: Flip charts, Masking tape, Markers, Exercise books, Pens  
Time: 30 minutes

Procedure:

Ask participants to mention the different products from goats that they know of  
Write them down and makes addition or subtraction  
Later ask them what factors one has got to consider when marketing goats or their products  
Discuss the responses and ask participants if they have understood well.  
Make a summary

Notes:

- Goat products are many and include mil, meat, blood, bones skin, manure. Proper markets must be identified for these in order to maximize profit
- factors to take into consideration when identifying markets are the 4P+2C – That is products, place, price promotion, customer and competition.

## **SESSION 9: MANAGERIAL ABILITY**

Session Objective: By the end of the session, participants will be able to:

- (i) Explain why proper management is important in order to make the Business of goat keeping a success.

Contents: Finance  
Marketing  
Production/operations  
Personnel or Human Resource

Methods: Brainstorming, Lectures, Discussion

Materials: Flip charts, Masking tape, Markers, Exercise books, Pens

Time: 30 minutes

Procedure:

-Introduce the topic  
-Inform participants that Goat keeping is a business and therefore profit must be maximized. This therefore calls for proper planning, organization and management



-By managing well it means the 4 Business functions must be managed well ask them what the Business functions are

-Discuss them

-Ask if all have understood well

-Makes a summary.

Notes:

1 Goat keeping is a Business that must make profit.

Fore maximum profit, the business must be planned well, organized well and managed well

By managing well, it means the 4 Business function must be managed well. The four Business functions are:

- (i) Finance
- (ii) Marketing
- (iii) Production/operations
- (iv) Personnel/Human Resource.