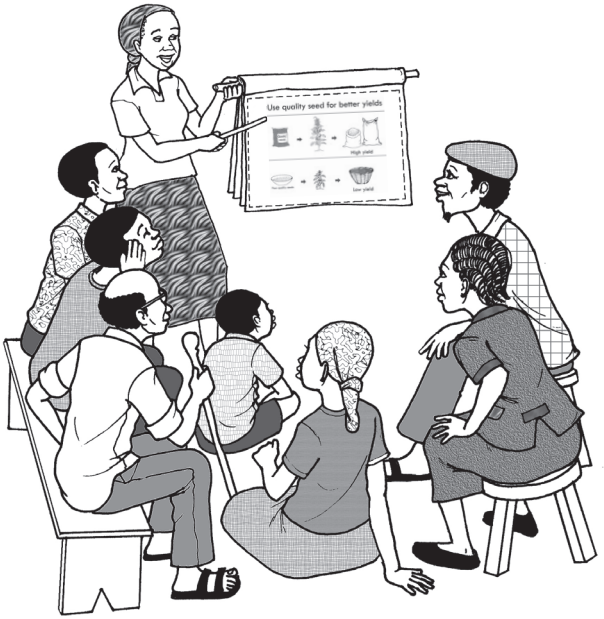
Green Amaranthus
(Amaranthus dubius)
Seed Growing
Module Training Set



FACILITATOR'S GUIDE

This guide will help you use the **Green Amaranthus Seed Growing Module Training Set.** The set is designed to encourage group discussion as well as provide information on the production techniques of green amaranthus. As the facilitator, read through and familiarize yourself with the entire guide before facilitating any discussion for the first time.

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Using Visual Aids and Participatory Learning

We know that people learn better if they are actively engaged in the learning process. Studies have shown that we remember only 20% of the information we hear and 40% of the information we see and hear. However, when we see ideas represented visually and also actively engage with the information through discussion, debates, role-plays or other participatory teaching methods, learners retain 80% or more of the information that is presented to them.

Clearly as instructors, it is worth the time and effort to create participatory, multi-sensory presentations. The **Green Amaranthus Seed Growing Module Training Set** is a tool designed to assist you in this effort. There is no one way to use it. We are always interested in improving our product, so if you have suggestions, comments, or questions please contact us.

This facilitator's guide is written in English but depending on your audience, you may need to make your presentation in the local language. Read through the guide and consider how you translate concepts into the local language.

PART 1. TRAINING CHECKLIST

Make sure you can answer YES to each question before beginning the session.

- Did you gather background information about the group you are going to train?
- Did you review the facilitator's guide and charts?
- Do you understand the key issues to cover for each chart?
- Does the venue have enough seats and space?
- Do you have all the materials you need for the activities and discussions?

Outline of a training session:

1. Welcome and introductions (5 minutes)
2. Review of the session objectives (5 minutes)
3. Large group presentation and discussion of the charts in the training module (Approximately 5 minutes per chart)
4. Ice breaker (5 minutes)
5. Break into small groups and answer the following: (20 minutes)
   - What are 3 things I learnt today?
   - What is 1 action I will take as a result of this training?
   - What questions do I still have about the topic?
6. Sharing of small group discussions in the large group (10 minutes)
7. Summarize and conclude the session (15 minutes)

PART 2. OBJECTIVES FOR THE TRAINING

By the end of this training, participants will have learnt:

- The benefits of using quality seed
- To conduct a germination test
- To select a good site for green amaranthus seed growing
- To prepare quality seed for planting
- To prepare and apply fertilizer/manure
- To plant green amaranthus seed
- When and how to weed
- To manage pests and diseases
- To carry out proper harvesting of green amaranthus seed
- To process green amaranthus seed

PART 3. HOW TO USE THE TRAINING SET

- Show the first chart to the participants.
- Read the title of the chart.
- Ask participants to explain what they know about the topic and what they understand from the visual.
- Reinforce accurate information given and correct wrong information.
- Read the tagline on the chart if there is one.
- Ask participants if they have any questions about what has been discussed.
- Go to the next chart.

PART 4. THE DISCUSSION SESSION

A) INTRODUCTION-SEED PRODUCTION

If you want to grow green amaranthus seed as a business, you should consider:

- Profitability compared to other seed crops
- Capital and skills required
- Available market and current weather conditions
- Registration process by the seed certified agencies

Seed production rules

Farmer-seed field registration process

As a seed grower, you must ensure the following:

- Apply and register with an official seed certification agency e.g. National Seed Certification Services (NSCS).
- The certification agency will review your application and send you a reply.
- Prepare a field map showing the location of the seed crop field.
- Use seed of a known variety with well defined descriptors (unique/different characteristics from other varieties and distinguished from the rest of the varieties which can be obtained from an official agency like a research station - NaCRRI, Namulonge.
- Register the field crop for inspection within the recommended time as per seed regulations.
- All contract seed producers must be linked to registered seed companies e.g Simlaw, Vistoria and East African.

Field inspection

As a seed grower, you must register your crop for inspection. The inspection will look into the following:

- Previous cropping history
- Isolation distance from other crops of same species
- True to type of the crop variety grown
- Pests: insect pests, diseases and environmental pollution/ contaminations
- Proper crop husbandry practices

Farmers trained in basic knowledge in seed production and technologies qualify for registration as seed growers.

Suggested time for conducting field inspection

Time	Proposed stage of inspection	Factors assessed during inspection
First	At vegetative stage through flowering	• Rouge out other crop varieties, off-types, plants of other crop species, diseased and weak plants. • Assess variety purity as specified in the crop descriptor • Check for presence of noxious weeds.
Second	At maturity of the crop and before harvesting	• Assess variety purity as specified in the crop descriptor including morphological characteristics such as colour of seeds and pods. • Check disease incidence and pest infestation at maturity of the seed crop. • Check general conditions of the seed crop including estimated expected yield.
Additional	At any time or stage of crop growth	• Assess any other aspect that needs to be corrected following previous inspection, e.g. confirm rouging if done as required, follow-up on the disease or pest situation, correction of isolation.

PART 4: THE DISCUSSION SESSION

B) SEED PRODUCTION CHART SET

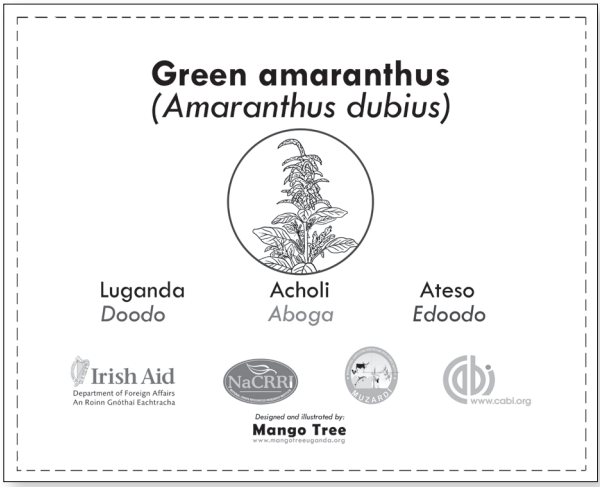

CHART 1: Logo chart*

Green amaranthus is known by different names across the country. In Luganda *Doodo*, in Achol *Aboga/Obuga*, and Ateso *Edoodo*. The scientific name for green amatharus is ***Amaranthus dubius.***

Green amaranthus leaves are usually picked when green and eaten as a vegetable.

**** This is a logo chart.***

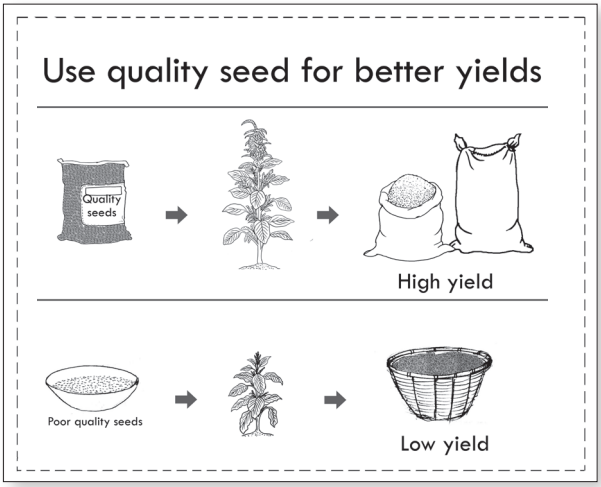

CHART 2: Use quality seed for better yields

Use quality seeds of a recommended variety. Quality seeds are a fundamental requirement for good production. Home processed seed can also be of good quality if it is well processed and stored. Using quality seeds ensures:

- Lower seeding rate
- Higher seedling emergence, usually above 85%
- Vigorous seedlings
- More uniform plant stand
- Faster growth rate
- Better resistance to pests and diseases
- Uniformity in maturity
- The plant is more tolerant to drought

Quality seed should be of uniform size, colour and shape. It should also be free of foreign matter such as weed seed, chaff and should be pest and disease free.

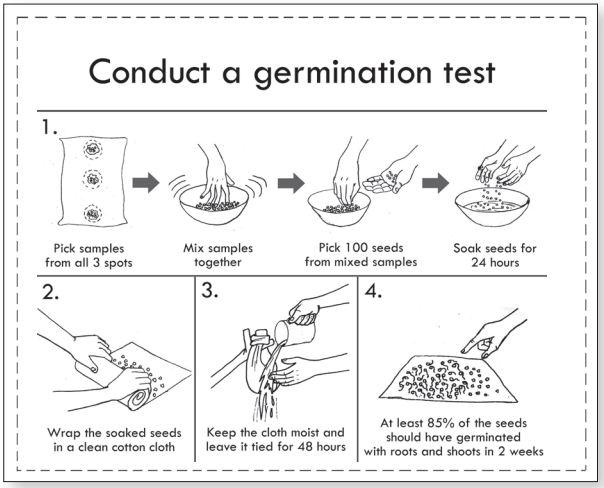

CHART 3: Conduct a germination test

Before sowing, test seed for viability and germination potential by conducting a quick germination test. Follow the steps below:

- Get representative samples of seeds from the top, middle and bottom of the seed bag.
- Mix the sample seeds and count 100 seeds to use for the test (for small seed quantities, farmers can count 20 seeds).
- Put the seeds in a container of water for 24 hours.
- Drain off the water and wrap the seeds in the soaked cotton cloth to create a bag holding the seeds.
- Tie the cloth bag to a stick. Tilt the stick to encourage drainage from the cloth bag. Keep the cloth moist by watering 3 times a day. Leave it tied for 48 hours.
- Untie the cloth bag and count the number of seeds that have fully germinated (both the shoot and roots have emerged).
- If 85 of the 100 seeds or 17 of the 20 seeds or more have both the shoot and roots emerged within 2 weeks, then it is quality seed which can be used for planting.
- If the percentage is slightly less than 85 of the 100 seeds, increase the seed rate at planting. If the percentage is less than 40%, discard the seed. Do not use the seed because it will have poor yields.

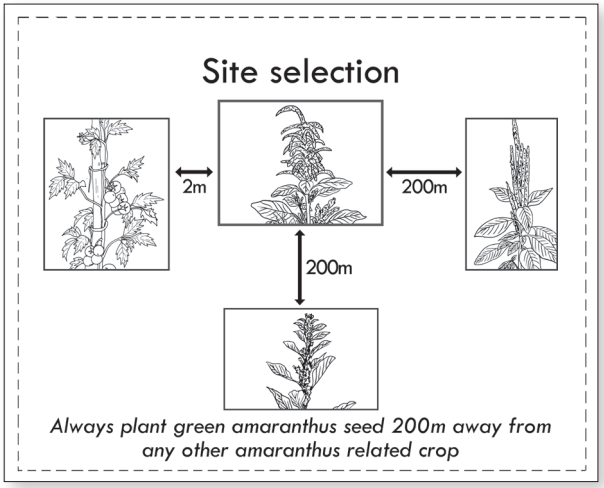

CHART 4: Site selection

- An open field is recommended as it will promote maximum flowering and fruiting.
- The field should be at least 200 meters away from any solanum or green amaranthus relative crop. Isolation can be achieved by planting crops at different times to avoid an overlap of the flowering periods.
- The site should not have tree shades because some trees have caterpillars and they can damage the green amaranthus plants. Green amaranthus also needs enough sunshine to grow. Shaded plants will be stunted.
- Green amaranthus seed grows well on flatland, lowland and upland if terracing and raising of beds is practiced to control soil erosion.
- In lowlands, dig channels to drain or divert excessive water. Green amaranthus grows well in lowlands (wetlands) during the dry season in well drained soils.
- Loam soils are the best soils for growing seed. The soils should be fertile or fertilizer/manure should be added.
- Seed producers must ensure the seed crop is inspected during the vegetative stage through flowering, at maturity of the crop, and before harvesting. This can also happen at any time or stage of crop growth.

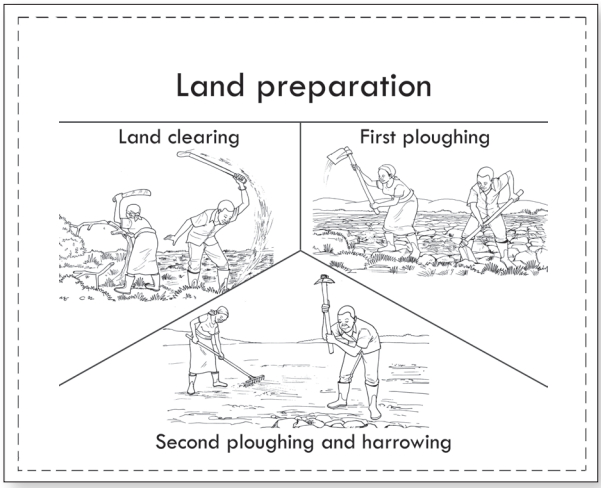

CHART 5: Land preparation

- Land preparation starts with clearing or cutting of all the tall grasses, removing trees including stumps, cutting down bushes, and removing stones and other obstacles from the field. This is done to ease the ploughing processes and all other farming activities.
- Do not burn the bushes because burning exposes the soil to erosion and also reduces soil fertility due to loss of nutrients.
- After clearing the land, plough the field for the first time and ensure that the soil has very small debris.
- If the field has perennial weeds, spray with glyphosate herbicide such as weedmaster or round up. Remember to contact an agriculture extension worker for guidance on herbicide.
- A second ploughing is followed by harrowing until the soil makes fine tilth (very small particles).

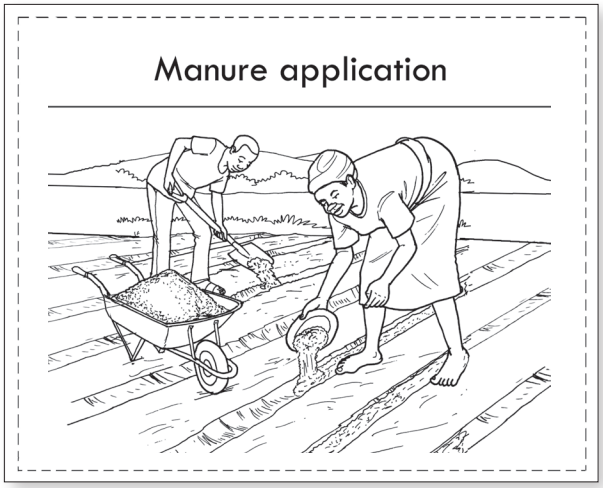

CHART 6: Manure application

All african indigenous vegetables need manure/fertilizers for vigorous plants, resistance to pests and diseases and high yields.

Farm yard manure is a low-cost alternative to inorganic fertilizers, and it still helps farmers to achieve higher yields.

Farm yard manure is made from animal dung from either cow, goat or from chicken droppings. If a farmer already has a kraal, it is an easy and cost effective way to use animal dung to make manure and use it in the garden.

It is good practice for farmers to always collect their animal dung and heap it so there is always enough available to make manure.

How to make and apply farmyard manure:

1. Collect animal dung from the kraal.
2. Heap the dung in small, knee-height piles. It can be heaped directly in the garden during the dry season when there are no plants or it can be stored in a flat area closer to the kraal.
3. Leave it to properly decompose as this will give the best results.
4. Before applying the manure, mix it with soil.

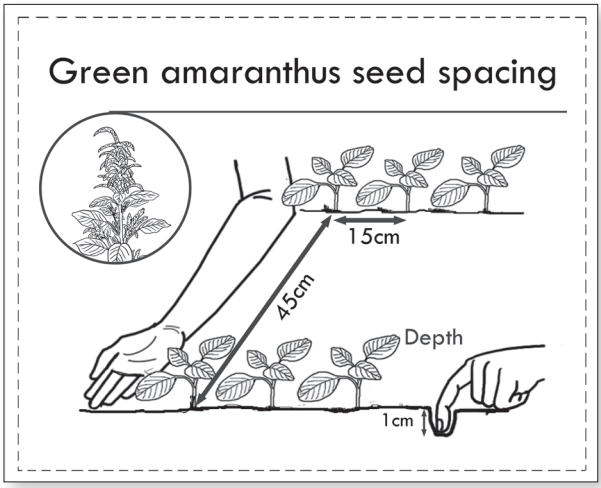

CHART 7: Green amaranthus seed spacing

- Green amaranthus grown for seed production should be planted at a wider spacing compared to that grown for leafy production.
- Spacing for seed production should be 45cm between the rows and 15cm between the individual plants.
- Proper spacing is important because it will ensure maximum growth and productivity.
- Thinning should be done 2-3 weeks after after germination. The frequency of thinning depends on whether germination is low or high. In case of low germination, gaps filling should be done.

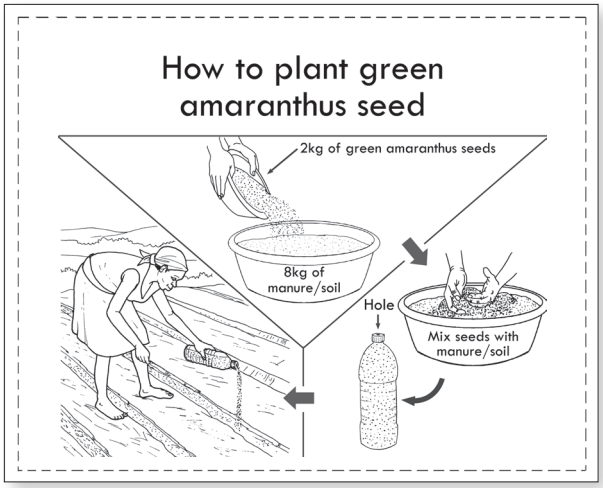

CHART 8: How to plant green amaranthus seed

The seeds of green amaranthus are very small and the farmer risks pouring too many seeds in the same spot during planting. This can result in crowding of plants which will reduce the yields.

To avoid this, the farmer can use the following method:

1. Take 2kgs of green amaranthus seeds and 8kgs of well decomposed and dry soil/manure to plant 1 acre. Fresh manure will destroy the seed so only use well decomposed dry manure mixed with soil, as this will not destroy the seeds.
2. Mix the seeds with the soil/manure in a big basin.
3. Put the mixture in a large mineral water bottle and make a hole in the bottle top.

Planting in lines:

- Use a string to make rows. Spacing between rows should be 45cm.
- Use a stick to make a 1cm deep farrow following the string.
- Plant the seeds in this farrow and cover with light soil.

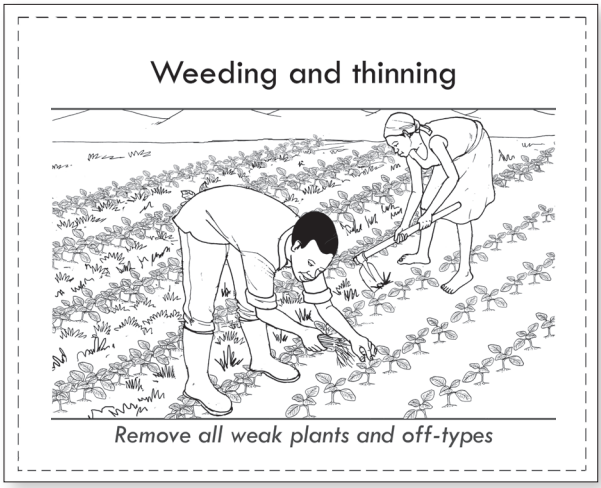

CHART 9: Weeding and thinning

- Timely weeding ensures that the specific field certification standards for weeds in the field and for processed seeds are achieved.

Note: *Pure seed should not be mixed with weed.*

- Timely weeding will lead to increases in the yield.
- Timely weeding minimizes competition for food and light between weeds and green amaranthus. It will give green amaranthus better conditions to grow.
- Weeding also reduces pest and disease infestation at the early stages which will lead to increased yields.
- Weeding should be done as soon as weeds emerge and before the flowering of weeds. This will reduce the risk of weeds spreading.
- Thinning is done at the time of weeding. During thinning the less vigorous, off-types or relatives and diseased plants are removed. The good quality thinned plants can be sold or consumed at home.
- Rouging of off-types should be done at flowering and at fruiting (early maturity) when its easy to identify the off-types.

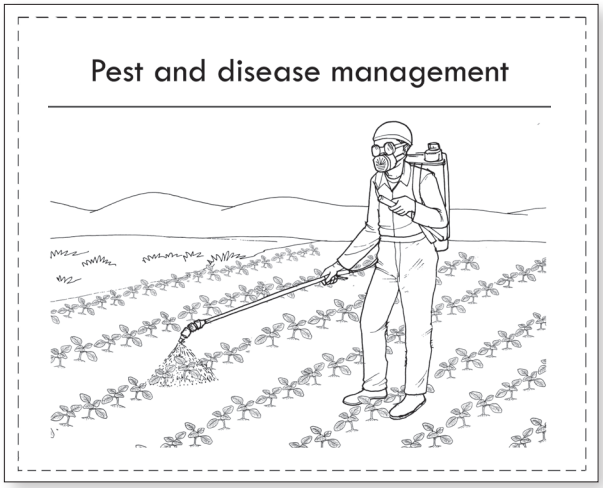

CHART 10: Pest and disease managment

- Pest and disease management should be a continous effort by the farmer to ensure early intervention in case of an outbreak.
- Both organic and inorganic pesticides can be used to control pests and diseases.
- It is recommended to always seek advise from an agriculture extension worker on pest and disease identification and management.

Note: *The farmer should monitor the field to ensure quick action is taken in case of break out of pests and diseases. The farmer must also mulch.*

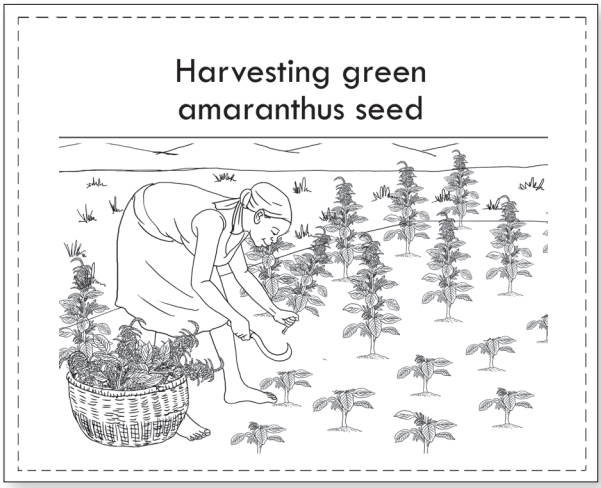

CHART 11: Harvesting green amaranthus seed

- Harvesting green amaranthus seed starts at 15 weeks after planting. The number of fruits produced per plant depend on the size of the plant.
- Keep the seeds on the vine until they have fully matured. When mature, the fruits will fall easily when shaken. Harvest only the mature fruits for seed and avoid seeds that are diseased or rotting.
- Premature harvesting causes shrinkage of seed, loss in germination vigour and difficulty in harvesting and processing.
- Delayed harvesting causes loss in seed quality, damage by pests, rain damage, and secondary disease infestation.
- It is recommended to hand pick seeds since there is uneven maturity of fruits and seed for most indigenous vegetables. When a small area is to be harvested, extra care is necessary.
- Store harvested fruit in a cool place on a mat to avoid contamination by soil.

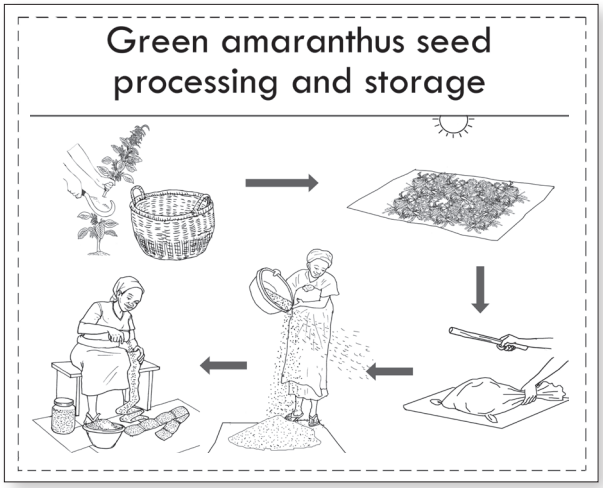

CHART 12: Green amaranthus seed processing and storage

Follow the steps below to harvest green amaranthus seed:

Step 1: Identify mature seeds by shaking the finger and the seeds will fall easily. Cut the whole plant from the bottom with a sickle.

Step 2: Place the harvested fingers/plants on a clean tarpaulin and place under direct sunlight. Check if seed is dry by rubbing between palms. If seed sticks on your palm then need further drying, if it does not stick then it is dry. Alternatively use a moisture meter.

Step 3: Pack the dry fingers into a light pack and hit the pack gently until the seed separates from the husks.

Step 4: Thresh to remove chaff using clean containers.

To determine if seeds are properly dry, pinch with fingers or use the salt method to determine the moisture content as follows:

- Get 20g (3 bottle tops) of salt and 160g (handful) of seeds.
- Mix the two together and put in a glass bottle or polythene bag and tie.

- Shake vigorously for 2 minutes.
- Allow to settle for 15 – 30 minutes.
- If the walls of the container or polythene bag become foggy or cloudy, then the moisture content is still more than 15%.
- Continue drying the seeds.

Step 5: Clean and package seed in a cool, well ventilated and dry place.

- Well stored seed will maintain the quality in size and a high germination capacity with vigour until it is required for use.
- The main factors determining the storage life of seed are the moisture content and temperature.
- Seed may be treated to protect it against infestation by insects and infection by seed-borne and/or soil-borne disease causing microorganisms (plant pathogens) prior to and during germination and seedling establishment.This operation is referred to as seed dressing or seed treatment. The ideal chemical for seed treatment should be:
  - Highly effective against pathogenic organisms
  - Relatively non-toxic to plants
  - Harmless to humans and livestock even if misused
  - Stable for a relatively long period of time during seed storage
  - Easy to use
  - Cost effective

Packaging, labelling and sealing

- Packaging material should be durable, free from defects and allow seed to retain viability.
- Treated seeds are packaged in clean bags and containers of various sizes according to the customers demand.

- Seeds of all classes must bear the official label on to each bag or container, which shows the lot number, type of crop, name of variety, class of seed, germination and purity levels and the packing date.
- Containers should be fastened or sealed according to national requirements.

Note: *Poor methods of processing contribute to rapid seed detoriation for example beating of harvested fruits and storing them on wet floor.*

Facilitator's Notes

How to make compost manure

Materials:

Dry materials: Sorghum, maize, millet straws, bean, soybean, groundnut haulms, napier grass

Green materials: Weeds, hedge trimmings and food peelings

Animal wastes: Cow dung, poultry litter, goat and sheep droppings

Covers: Top soil, wood, plastic sheeting, carpet scraps and dry grass

Mixer: Water and a turn stick

1. Prepare a pit of reasonable depth. It can be any length depending on the amount of materials available.
2. Lay twigs or chopped dry materials at the bottom.
3. Add compost materials in layers, alternating moist and dry. Moist ingredients: food scraps, tea bags and seaweed. Dry materials: straw, leaves, sawdust pellets and wood ashes.
4. Add manure, green manure (napier grass and grass clippings) or any nitrogen source.
5. Keep compost moist. Water occasionally, or let rain do the job.
6. Cover with anything you have - wood, plastic sheeting, carpet scraps, topsoil or dry grass/straw to keep it moist, but not soaked and sodden.
7. Turn every few weeks give the pile a quick turn with a pitchfork or shovel.
8. Once your compost pile is established, add new materials by mixing them in, rather than by adding them in layers. Mixing or turning the compost pile is key to aerating the composting materials and speeding the process to completion.

Note: *If you want to buy a composter rather than build your own compost pile, you may consider buying a rotating compost tumbler which makes it easy to mix the compost regularly.*

References:

Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA-2012); Production of Quality Seed of African Indigenous Vegetables - ***Training Manual***

National Agricultural Research Organisation; Nakati (Solanum aethiopicum) - ***Seed Production Brochure***.

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