



**CGIAR**  
**GENDER EQUALITY AND**  
**INCLUSION**

# **Facilitator's Guide**

## **Cassava-Based Training**



Photo: Sarah Msita

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## INTRODUCTION

In many cassava-producing areas in Tanzania, production and processing practices are still largely traditional, despite the crop's potential for commercialization. Many cassava farmers are either unaware of improved technologies for production and processing or lack the capacity to adopt them. Most of them use only some and not all available technologies and practices that can increase the efficiency of producing and processing cassava. This reduces the prospect to maximize profit.

This training manual borrows from existing cassava training manuals and was developed to help Village Based Agricultural Advisors (VBAAAs) and Farmer Field Facilitators (FFFs) deliver training on cassava production and good agronomic practices (GAPs) to farmers whom they support in their areas. It helps to explain the step-by-step use of improved techniques and practices for cassava production, post-harvest handling, and processing.

The manual can also be used by extension agents to support the enhancement of value chain actors' knowledge related to operations that can increase productivity and profitability.

## SESSION 1: WELCOME AND INTRODUCTION

**Objective:** To know participants and their expectations

**Delivery method:** Brainstorming

**Duration:** 45 minutes

*Activity: Introductions*

1. Welcome participants to the workshop.
2. Ask participants to introduce themselves, including their name, and where they come from
3. Ask participants to give one expectation from the training.

## SESSION 2: REQUIREMENTS FOR CASSAVA PRODUCTION

*Learning objectives: At the end of the lesson, the learners will be able to;*

- Explain the rainfall requirements for successful cassava production
- Identify the ideal soil conditions for cassava cultivation
- Describe the basic management skills required at planting

**Duration:** 30 minutes

**Materials:** Flipchart, markers, notebooks, pen

*Activity: Group work on “requirements for cassava production”*

1. Ask participants: “what are the requirements for cassava production?”
2. Write a summary of their responses on a flip chart.
3. After the participants provide the responses, explain what the requirements for cassava production as provided in facilitator’s notes below to complement their answers.
4. Ask participants if there are any questions/clarifications.

## FACILITATOR'S NOTES

### *Requirements for cassava production<sup>1</sup>*

*For cassava production to be successful, the following requirements should be taken into consideration:*

**Rainfall** – *Cassava thrives in humid and moist areas with a minimum of 1000mm of rainfall annually, ideally with a relatively even distribution throughout the year. The most critical time is during the first 3 months after planting because the crop is at the establishment phase.*

**Soil** – *Cassava prefers well-drained, fertile soils, such as light sandy loam or loamy sand. The soil should be at least 30 cm deep, and good drainage is important because cassava is sensitive to waterlogging.*

**Management skills** – *Minimal skills are needed to select and cut planting materials and to place these in the soil. However, care should be taken to avoid the spread of diseases like cassava mosaic disease (CMD) and cassava brown streak disease (CBSD). Farmers in areas with CMD and/or CBSD infestation need to outsource clean planting materials from reliable sources such as registered seed multipliers and take care to avoid the use of cuttings contaminated by the disease. During the growing phase, cassava requires little or no pest and disease management but should receive timely attention on weed control.*

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<sup>1</sup> Hauser, S. et al. (2014) Cassava system cropping guide. Africa Soil Health Consortium, Nairobi

## SESSION 3: LAND (SITE) SELECTION

*Learning objectives:* At the end of the lesson, the learners will be able to:

- State the factors to consider in cassava site selection.
- Describe indicators of good soil for cassava site selection.

**Duration:** 30 minutes

**Materials:** Flipchart, Markers

*Activity: Group work*

1. Divide participants into groups.
2. Ask participants: What are the factors you considered in selecting your farm site for cassava production?
3. Ask each group to write their responses on a flip chart.
4. When all groups finish writing their responses on a flip chart, ask one volunteer from each group to present the key points of their responses and facilitate them.
5. After the presentations, explain the basic requirements for site selection by using the facilitator's notes below to complement their answers.
6. Ask participants if there are any questions/clarifications.

### FACILITATOR'S NOTES

#### LAND SELECTION<sup>2</sup>

*When selecting a field for cassava farming, prioritize flat or gently sloped terrain. The land which is flat or gently sloped reduces the risk of soil erosion and simplifies water management. Field accessibility is also important, so consider the ease of planting, weeding, and harvesting activities beforehand. When selecting the land for cassava growing, one should:*

- *Ensure it is fertile, as indicated by the presence of certain native plants or earthworm activity.*

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<sup>2</sup> <https://eos.com/blog/how-to-grow-cassava/>

- *Consider the crop rotation history to ensure a healthier environment for growing cassava.*
- *Avoid fields with a history of pest or disease infestations, as these can severely impact yields.*

*NB: When preparing for a new plantation, consider growing on the land that has been left fallow for 3–5 years, which allows the soil to regenerate and accumulate essential nutrients naturally.*

## SESSION 4: LAND PREPARATION AND TILLAGE

*Learning objectives:* At the end of the lesson, the learners will be able to:

- Describe different approaches to preparing land for growing cassava.
- Highlight the importance of land tillage

**Duration:** 30 minutes

**Materials:** Flipchart, Markers

*Activity:*

1. Explain to participants that land preparation approaches for growing cassava depend on the previous land use (refer to facilitator's notes below).
2. Ask participants to describe how they till their land for cassava production.
3. Compare their responses with the facilitator's notes. Add to their responses as appropriate
4. Ask participants if there are any questions/clarifications.

## **FACILITATOR'S NOTES**

### **LAND PREPARATION AND TILLAGE<sup>3</sup>**

#### **Land preparation**

*Preparing land for growing the crop involves different approaches depending on the previous land use:*

*For previously cultivated land, the primary goal is controlling weeds and creating a suitable seedbed.*

*For short fallow land, especially with legume cover crops like mucuna, farmers should incorporate the plant biomass into the soil or use it as mulch to improve soil organic matter.*

*For long-fallow land or mature secondary forest, farmers should first cut vegetation and use controlled burning to manage woody debris.*

*Where possible, cultivators should minimize clearing virgin forest areas for farms to preserve ecological balance.*

#### **Tillage**

*It is recommended that a multi-step tillage process is used for optimal root crop establishment, particularly in commercial cassava production. The most effective approach involves a combination of deep ploughing (15–30 cm), followed by harrowing and, finally, ridging. These steps help remove weeds, improve soil structure, increase aeration, and create the perfect growing medium for root development. For farms in sandy growing areas, lighter touch methods can work better, protecting soil structure while giving cassava cuttings the room they need to grow.*

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<sup>3</sup> Hauser, S. et al. (2014) Cassava system cropping guide. Africa Soil Health Consortium, Nairobi

## SESSION 5: SELECTION OF CASSAVA VARIETIES FOR PLANTING

*Learning objectives:* At the end of the lesson, the learners will be able to:

- List improved cassava varieties recommended for their respective regions
- State the importance of good planting material and its characteristics. Describe how to handle and cut cassava stems for planting.

**Duration:** 2 hours

**Materials:** Flipchart, Markers, Cassava Stems, Rope, Knife or Panga

*Activity:*

1. Divide the participants into groups.
2. Each group will identify the factors you considered as per the number indicated in each arrow.
  - Group 1: What factors did you consider when selecting cassava varieties?
  - Group 2: What do you think are the qualities of improved cassava varieties?
  - Group 3: What are the best practices in stem handling for increased cassava yield?
3. Ask the groups to write their discussion points in a short phrase/word on the flip chart
4. When each group finishes writing their points on the flip chart, the facilitator reads out the brief of discussion points.
5. Then, summarize the management of planting materials in terms of the qualities of improved cassava varieties, cassava stem handling, and preparing healthy cassava stems for planting (refer to facilitator's note below) to complement their answers.
6. Ask participants if they have questions and address them accordingly.

### FACILITATOR'S NOTES

*It is important to select the right variety, preferably improved ones that are high-yielding and disease-tolerant for enhanced productivity. Most cassava varieties in Tanzania are location-specific, so ensure you select the varieties recommended for your area.*

### ***Qualities of improved cassava varieties***

- *Grow fast and mature early*
- *Tolerate major diseases and pests.*
- *Give high root yields (fresh and dry).*
- *Meet end-users' quality needs.*
- *Store well in the ground for 12–15 months.*

### ***Cassava stem handling for increased yield***<sup>4</sup>

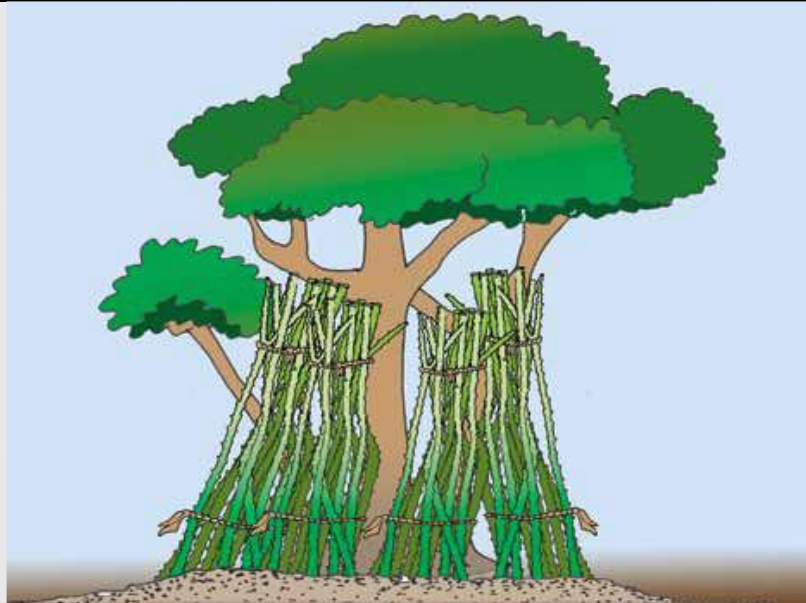
*Cassava is propagated by stem cuttings. These cuttings must be handled properly for good sprouting and establishment. This section presents the best practices in stem handling for increased yield.*

#### ***Preparing healthy cassava stems for planting***

- *Obtain stems for planting from mature plants 10–12 months old.*
- *Store under the shade for 2–5 days (never more than 2 weeks) before cutting and planting. This makes the stems sprout faster than when they are planted freshly cut from the field.*
- *Stems should be stored vertically on the soil under a shade. The distal end of the stems should touch the soil, which is moistened regularly, with the surroundings kept free from weeds.*

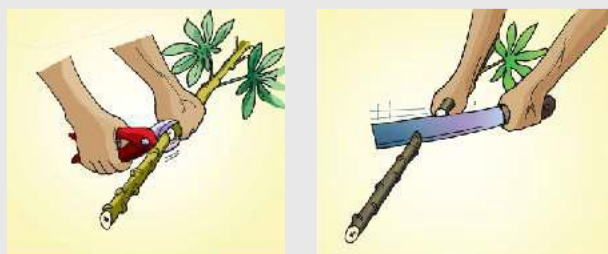
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<sup>4</sup>Adebayo B. Abass, Elifatio Towo, Ivor Mukuka, Richardson Okechukwu, Roger Ranaivoson, Gbassey Tarawali and Edward Kanju. 2014. Growing cassava: A training manual from production to postharvest. IITA, Ibadan, Nigeria.



*Figure 1: Stored cassava stems under the shade (Credit: Abass et al., 2014)*

- *Handle the stems with care so as not to destroy the nodes that may result in losses. Do not make sharp cut surfaces or keep stems in the open (leading to drying)*
- *Cut stems, with sharp tools, into 25-cm cuttings with 5–7 nodes*



*Figure 2. Cutting cassava stems with sharp tools (Credit: Atser et al., 2017)*

## SESSION 6: HOW TO PLANT CASSAVA CUTTINGS

*Learning objectives:* At the end of the lesson, the learners will be able to:

- Identify different cassava planting styles/techniques (How do you plant your cassava cuttings?)
- Demonstrate planting distance and calculate plant population
- Replace non-sprouted cuttings after initial planting (gap-filling)

**Duration:** 45 minutes

**Materials:** Cassava cuttings, rope

*Activity: Brainstorming*

1. Ask participants: “How do you plant your cassava cutting?”
2. Write a summary of their responses on a flip chart.
3. Describe cassava planting space and plant population per hectare and per acre
4. Ask participants, “what do you do when you find some of the cuttings have not sprouted?”
5. Explain to participants that cassava can also be intercropped with other crops and describe how to plant in sole and in intercrop (Refer to facilitator’s notes below).
6. Ask participants if there are any questions/clarifications.

### **FACILITATOR’S NOTES**

#### ***How to plant cassava cuttings***

- *Cassava cuttings can be planted in a slanting or angular position. In this case, the cuttings are buried in the soil with one-third above the soil surface. Ensure that the buds point upward. This is where the cuttings sprout.*
- *Plant the cuttings at a spacing of 1 m × 1 m on the crest of ridges. This will give a plant population of 10,000 stands/ha (about 4,000 stands/acre). Cassava can also be planted on flat land.*

- *Vertical or angular planting is recommended in areas of high rainfall*
- *Horizontal planting is better in dry areas.*

### ***Gap-filling or replacement of non-sprouted cuttings***

*After the initial planting, visit the field after 15–21 days to observe sprouting and plant growth and replace cuttings that have not sprouted. In growing cassava, it is common to encounter failures where some cuttings do not germinate or establish properly. This can significantly impact plant density and, consequently, yield. So, you'll need to replace these failures promptly to maintain optimal plant populations.*

*Take out and discard any cuttings that have not been sprouted two weeks after planting. For drought-related failures, hold off on replacing them until it rains. Replace failed cuttings only with healthy ones and insert them in new holes.*

### ***Intercropping cassava***

*Cassava can be intercropped with other crops.*

- *Cassava/legume intercrops have been found to make better use of the land and reduce soil erosion and the risk of crop loss.*
- *Cassava can also be intercropped with yam, sweet potato, beans, okra, and leafy vegetables.*
- *For sole crop cassava, plant on the top of the ridge or heap. When intercropped with beans, plant cassava on the top and maize on the side of the ridge.*

## SESSION 7: WEEDS AND WEED CONTROL

*Learning objectives:* At the end of the lesson, the learners will be able to:

- Identify weeds as the major constraints to cassava production.
- Identify methods of controlling weeds on a cassava farm

**Duration:** 40 minutes

**Materials:** Herbicides, gloves, mask

*Activity:*

1. Divide participants into groups.
2. Ask participants:
  - Do you think that weeds are a major problem in cassava?
  - How and at what stage do you control weeds in cassava?
  - Do you use any method other than hand weeding for weed control?
  - If yes, please tell about those methods of weeds control
3. Ask each group to write their responses on a flip chart.
4. When all groups finish writing their responses on a flip chart, ask one volunteer from each group to present the key points of their responses and facilitate them.
5. After the presentations, explain about weed control methods (refer to the facilitator's notes below) to complement their answers.
6. Ask participants if there are any questions/clarifications.

### ***FACILITATOR'S NOTES***

#### ***Weeds and weed control<sup>5</sup>***

*Weeds are among the major constraints to cassava production, and for cassava farmers to be successful, they must control weeds. Weed control in cassava can be done manually,*

<sup>5</sup>Godwin Atser, Alfred Dixon, Friday Ekeleme, David Chikoye, Kenton Dashiell, Teye Ayankanmi, Stefan Hauser, Mary Agada, Moses Okwusi, Grace Sokoya, Patience Olorunmaiye, Adeyemi Olojede, Usman Hughes, Peter Kulakow, Timilehin Osunde, and Emmanuel Adekoya. 2017. The ABC of weed management in cassava production in Nigeria , IITA, Ibadan, Nigeria. 26 pp.

*mechanically, culturally, or chemically (use of herbicides). Manual weed control involves the use of hand/hoe. Mechanical weed control entails the use of motorised weeder. Cultural methods such as the use of cover crops, hand hoe, correct spacing, tillage, and cassava variety also help in the control of weeds.*

### **Chemical weed control**

*This involves the use of herbicides, which may be pre-emergence or post-emergence. Pre-emergence herbicides are herbicides that are applied before the weeds emerge while post-emergence herbicides are those that are applied on the field after the weeds emerge.*

### **Pre-emergence weed control**

*Pre-emergence herbicides should be applied immediately after cassava is planted. The efficacy of any pre-emergence depends on good land preparation. For example, if perennial weeds are not killed during land preparation, a good pre-emergence herbicide may fail. (For maximum efficacy, pre-emergence herbicides should be applied on the day after planting or at most two days after planting.)*



Figure 3: Application of pre-emergence herbicide for weed control (Credit: Atser et al., 2017)

### **Post-emergence weed control**

*After applying pre-emergence herbicide, visit your farm weekly starting from 4 weeks after pre-emergence herbicide application. As soon as 30% of the weeds in the farm reach the 4– 6 leaf stage, apply the appropriate post-emergence herbicide as a spot treatment*

*using a spray shield. If these steps are properly carried out, cassava should form a canopy, and there may be no need for additional weeding until harvest. You can use any of the registered post-emergence herbicides (consult with your extension agent). (Include a list of herbicides highlighting their essential contents)*



*Figure 4. Application of post-emergence herbicide for weed control (credit: Atser et al., 2017)*

### ***Caution in using glyphosate as a post-emergence herbicide***

*Glyphosate as a post-emergence should be applied under the canopy of cassava with a spray guard fitted to the nozzle, provided the cassava is 8 weeks old or more. Care must be taken when using glyphosate. Please note that glyphosate can only be applied with a knapsack sprayer as directed spray. It cannot be applied in a cassava field with a tractor-mounted boom sprayer.*



*Figure 5. Applying post-emergence herbicides with a spray guard (credit: Atser et al., 2017)*

*If using mechanical or hand weeding, it is advised to visit the farms 2 weeks after planting to observe the emergence of weeds. As soon as a third of 30% of the weeds in the farm reach the 4– 6 leaf stage, begin to weed. Repeat this activity until cassava forms a canopy. The disadvantage here is the frequency involved and associated costs.*



*Figure 6. Hand-hoe weeding (credit: Abass et al., 2014)*

## SESSION 8: DISEASE MANAGEMENT IN CASSAVA FIELDS

*Learning objectives:* At the end of the lesson, the learners will be able to:

- Recognize cassava diseases of economic importance and how to manage them

**Duration:** 45 minutes

**Materials:** Printed cards showing diseases, a flipchart and marker

*Activity:*

1. Divide participants into groups.
2. Ask participants:
  - What are the major cassava diseases?
  - Do you think diseases reduce the cassava crop yield? If yes, please explain?
  - What methods can be used for effective disease management in cassava?
3. Ask each group to write their responses on a flip chart.
4. When all groups finish writing their responses on a flip chart, ask one volunteer from each group to present the key points of their responses and facilitate them.
5. After the presentations, explain about major diseases in cassava and integrated management strategies using facilitator's notes below to complement their answers.
6. Ask participants if there are any questions/clarifications.

### **Facilitator's notes**

#### ***Pest and disease management in cassava field***

*Pests and diseases can lead to significant yield reductions. Common cassava diseases of economic importance in Tanzania include Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD). For susceptible cassava varieties, CBSD can cause yield losses of up to 100%, while CMD causes leaf mottling and stunting, reducing the overall productivity of cassava plants. Severe CMD can also cause total cassava crop failure, causing significant economic and food security issues. Control measures for CBSD and CMD can involve integrated management strategies that combine:*

- *Growing improved varieties that are tolerant to diseases,*

- *Using disease-free planting materials,*
- *Uprooting and burning infected plants and,*
- *Insecticide applications against disease vectors (e.g. white flies).*



*Figure 10: Symptoms of CMD (credit: TARI Naliendele)*



*Figure 12. Effect of CMD (credit: TARI Naliendele)*



*Figure 13. Symptoms of CBSD on leaves (credit: TARI Naliendele)*



*Figure 14. Symptoms of CBSD on the stem (credit: TARI Naliendele)*



*Figure 15. Symptoms of CBSD on roots (Credit: TARI Naliendele)*

*Cassava pests of economic importance include cassava green mites (CGM), cassava mealy bug, and white flies.*



*Figure 16. Cassava green mites (Credit: TARI Naliende)*



*Figure 17. Cassava mealy bug (Credit: TARI Naliende)*



*Figure 18: Cassava leaf infested by white flies (Credit: TARI Naliende)*

## SESSION 9: CASSAVA HARVESTING

*Learning objectives:* At the end of the lesson, learners will be able to:

- Explain when cassava is ready for harvesting.
- Identify the best weather/season for cassava harvesting.
- State the benefits of timely harvesting and implications of late cassava harvesting.
- Identify methods of harvesting cassava
- Recognise the storage limitation of cassava after harvesting.

**Duration:** 1.5 hours

**Materials:** Printed cards showing disease symptoms, action plan template, flipchart, and markers

*Activity:*

1. Divide participants into groups.
2. Ask participants:
  - How long does it take for cassava to grow?
  - What is the right time for harvesting cassava
  - How do you harvest cassava?
  - What are the major indicators for harvesting groundnut and sesame crop?
  - What tools do you use for harvesting and do you think that the tools used are appropriate for quality harvest of the crop?
  - What are the key challenges in crop harvesting in terms of labor, time and equipment?
3. Ask each group to write their responses on a flip chart.
4. When all groups finish writing their responses on a flip chart, ask one volunteer from each group to present the key points of their responses and facilitate them.
5. After the presentations, explain the methods and time of harvesting cassava by using the facilitator's notes below to complement their answers.
6. Fill in the action plan with participants according to their respective areas

| ACTION PLAN –AREA:      |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
|-------------------------|------|--|-----|--|-----|--|-----|--|-----|--|-----|--|------|---------------|-----|--|-----|--|-----|--|-----|--|-----|--|-----|--|--------|-----|--|
| Farm size:              |      |  |     |  |     |  |     |  |     |  |     |  |      | Type of land: |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
|                         | 2025 |  |     |  |     |  |     |  |     |  |     |  | 2026 |               |     |  |     |  |     |  |     |  |     |  |     |  | BUDGET |     |  |
|                         | AUG  |  | SEP |  | OCT |  | NOV |  | DEC |  | JAN |  | FEB  |               | MAR |  | APR |  | MAY |  | JUN |  | JUL |  | AUG |  |        | SEP |  |
| Week                    |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Farm preparation        |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Farming                 |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Collection of seed      |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Seed planting           |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Gap Filling             |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| 1 <sup>st</sup> weeding |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| 2 <sup>nd</sup> weeding |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| 3 <sup>rd</sup> weeding |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Drying facilities       |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| Harvesting, drying      |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |
| TOTAL                   |      |  |     |  |     |  |     |  |     |  |     |  |      |               |     |  |     |  |     |  |     |  |     |  |     |  |        |     |  |

7. Ask participants if there are any questions/clarifications.

**Facilitator's notes**

***How long does it take for cassava to grow?<sup>6</sup>***

*Cassava typically grows from 8 to 24 months. Early-maturing varieties (most improved varieties) are ready for harvesting in 6–12 months, while late-maturing varieties (local varieties) can grow up to 18 months before harvest. Extreme drought or flooding can significantly delay growth and development. After harvest, the roots start deteriorating within 2 to 3 days and rapidly become of little value for consumption or industrial use.*

***When and how to harvest cassava?<sup>7</sup>***

***When to harvest cassava***

*Cassava roots should be harvested at the peak of maturity or the right age, size, and tenderness required for fresh market (use of roots as a snack or home cooking). Fully matured cassava roots should be harvested for processing.*

*Cassava roots may lose the valuable starch, rot, or become woody if not harvested at maturity. They are exposed to rodents and the land cannot be put into productive use in the next season if the roots are not harvested. This section provides a guide on the proper harvesting and postharvest handling of cassava.*

- *Harvest cassava roots when they are mature to have accumulated enough starch but have not yet become fibrous.*
- *The optimum age when the starch and dry matter yields are highest is 8 – 12 months after planting, depending on the variety and the climate. Some varieties mature in 15 – 18 months. An extended cold season may delay the maturity of cassava.*
- *Harvesting too early results in a low yield, while delayed harvesting could reduce yield.*
- *Harvest cassava when the soil is slightly soft but has no excessive water so that you can easily remove soil from the roots. Harvesting in soft soil is easier than when the soil is harder. Roots harvested in moist conditions get soil stuck between them, and this can lead to inaccurate weight records. Also, the roots may be very dirty and highly contaminated when peeled, thereby requiring large volume of water and extended time to wash the peeled roots thoroughly.*

<sup>6</sup>Vasyl Cherlinka (2024). Growing Cassava: From land choice & planting to harvest <https://eos.com/blog/how-to-grow-cassava/>

<sup>7</sup>Adebayo B. Abass, Elifatio Towo, Ivor Mukuka, Richardson Okechukwu, Roger Ranaivoson, Gbassey Tarawali and Edward Kanju. 2014. Growing cassava: A training manual from production to postharvest. IITA, Ibadan, Nigeria.

### ***How to harvest cassava***

*Cassava roots are harvested by pulling the stem which carries the roots out of the ground. Harvesting could be done manually or by mechanical methods.*

*Manual method:*

- *Cut the plant at about 30 – 50 cm above the ground; use the stem to lift the roots.*
- *Pull the plant gently and do not drag the roots (Figure 7). Dragging can cause bruises and cuts which may lead to early deterioration*



*Figure 7. Harvesting (pulling)*

- *If the soil is compact, loosen it first but take care not to damage the roots (Figure 8)*



*Figure 8. Loosening the soil before pulling*

- *Separate the roots from the stem using a sharp knife or cutlass. Cut each root near the stem. Do not break the roots from the stump by hand. This will cause injuries that lead to root rot (Figure 9).*



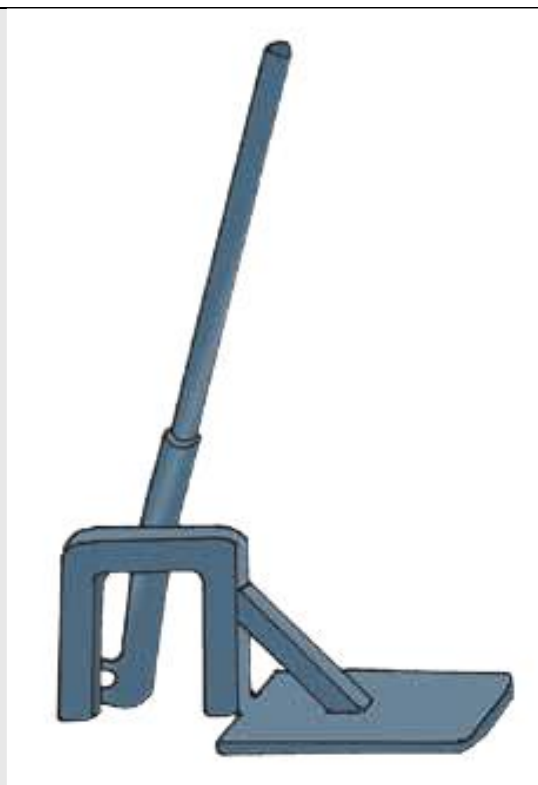
*Figure 9. Cut each root near the stem*

- *After harvesting, do not leave the roots under the sun. Too much heat causes weight loss and early deterioration.*
- *Manual harvesting usually requires 16-24 persons, depending on the season, to harvest 1 acre of cassava in 1 day.*

### ***Mechanical methods***

#### ***Cassava lifter***

- *This equipment is manually operated and reduces the drudgery in lifting tubers (Figure 10).*
- *The jaws will grip the base of the stem tightly.*
- *The lever is then used to lift the roots.*
- *The lifter can harvest up to 200 plants/hour.*



*Figure 10. Cassava lifter*

***Motorized cassava harvester***

*The mechanical harvester cuts, digs, and raises soil containing the cassava root cluster. The equipment is usually pulled by a tractor and used by large-scale farmers. A 2-row mechanical harvester can harvest 3-5 ha cassava farm in 1 day, depending on the terrain. It is faster and 50% cheaper than harvesting by hand.*

## SESSION 10: POSTHARVEST HANDLING AND STORAGE OF FRESH ROOTS

*Learning objectives:* At the end of the lesson, learners should be able to:

- Explain how to transport cassava roots
- Appreciate the importance of processing cassava

**Duration:** 1 hour

**Materials:** Flipchart and Marker

*Activity:*

1. Divide participants into groups
2. Ask participants:
  - How do you transport cassava after harvesting?
  - Why is it important to process cassava?
  - What are the operations used for processing cassava?
3. Ask each group to write their responses on a flip chart
4. When all groups finish writing their responses on a flip chart, ask one volunteer from each group to present the key points of their responses and facilitate them.
5. After the presentations, summarize the responses by using the facilitator's notes below to complement their answers.
6. Ask participants if there are any questions/clarifications.

### ***Facilitator's notes***

*Cassava tubers attached to the main stem can remain safely in the ground for several months. However, after harvest the roots start deteriorating within 2 – 3 days and rapidly become of little value for consumption or industrial use.*

### ***Transporting cassava roots***

*To avoid root deterioration and loss of quality, transport to the homestead, market or processing plant immediately after harvesting.*

### ***How to transport cassava roots***

- *Use any suitable container to transport roots in small quantities and short distances, such as from the farm to the roadside or bulking center, where they will be loaded on a vehicle for long-distance transportation.*

- *Gently offload the roots from the wheelbarrow or container without causing bruises or damage to the roots*
- *Vehicles transporting cassava a long distance should be covered with tarpaulin to avoid rapid moisture loss from the roots*
- *Use oxen-cart for transportation especially in the rural areas where there are no paved roads or the roads are not passable to vehicles*
- *Carefully sort and arrange roots neatly in the vehicle or cart to save space*
- *Do not seat or put heavy objects such as vehicle tyres on roots after loading.*

### ***Storing cassava roots***

*Cassava roots start deteriorating soon after harvesting. Internal discoloration and loss of marketing value occur if they are not cooked or processed within 24 – 48 hours of harvesting. Secondary fungi and bacteria infection may cause rot in untreated roots.*

### ***Processing operations and machinery***

*Why cassava is processed*

*Cassava is processed for many reasons. These include:*

- *To increase the shelf life of roots and prevent spoilage or food loss*
- *To reduce bulkiness, ease transportation, and reduce the cost*
- *To remove the toxic compounds in cassava*
- *To produce industrial raw materials*

### ***Operations in cassava processing***

*There are many operations used for processing cassava. These operations include peeling, washing, size reduction, drying, cooking/boiling, roasting, frying, etc. These processing operations are combined in different sequences to make different products such as granules, dried chips/flour, starch, etc.*

#### ***Peeling***

*Cassava is peeled to improve the quality and safety of cassava foods. Nearly all cassava products are made by first peeling the roots.*

#### ***Size reduction***

- *Size reduction facilitates detoxification and drying of cassava. Size reduction is mostly by chipping, slicing, and grating.*
- *Grating is widely used for making starch, flour, and some other products. Manual grating is labour-intensive and exposes the women processors to injuries.*
- *Grating is very efficient in reducing the toxic compounds within 3 hrs, after which the compounds can be almost entirely removed by dewatering.*

- *Chipping is used for making dried chips that could be milled to flour if low-cyanide cassava variety is processed*
- ***Dewatering***
  - *Dewatering or removal of water facilitates drying of fresh mash. Processed cassava is dewatered during the making of high-quality flour starch.*
  - *Dewatering can be done by the use of presser*
- ***Drying***
  - *Cassava is traditionally dried to increase storability*
  - *The most common traditional method of drying cassava is sun-drying (sun-heat and wind) on the ground in the farm, around the homestead, on rooftops, etc.*
  - *These methods are prone to microbial contamination, infestation by insects and are slow, especially during the rainy season when drying could take 2-3 weeks. These promote poor quality and insect infestation.*
  - *An improvement to this is the drying of cassava on raised platforms on a black polythene sheet or the use of solar driers. This improves the quality of the product.*
- ***Milling***
  - *Dried cassava is mostly made into flour before use.*
  - *Milling machines for grains and other crops are very common and are used for milling of cassava.*

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