CLIMATE CHANGE ADAPTATION

A manual for trainers



Supported by the European Union





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Introduction

Root tubers and banana crops are considered important staples in Papua New Guinea (PNG). The root staples include sweetpotato (Ipomoea batatas), cassava (Manihot esculenta), yam (Dioscorea spp.) and taro (Colocasia *esculenta*). These crops are normally planted from vines, tubers, stem cuttinas, suckers and headsets, collectively referred to as seed stocks. The seeds of next planting season or cycle are usually derived from previous cropping following a single harvest or after series of harvests have been completed.

Please don't start a training without reading -

Training villagers in PNG!

You can download a copy here-

http://gutpela-pnggaden.net/library/record/view/id/43

Muntwiler and Askin, 2004. Training villagers in PNG - a manual for trainers.

Remember, training is much more than giving technical information. The Muntwiler and Askin manual will provide lots of useful information to assist the process of your training.

While this is much appreciated, the continuous practice of collecting planting materials directly from old gardens and replanting is seen as important route for transferring insect pests and disease organisms. As a result, overall yield continues to decline over many years of planting. Moreover, this has also put much constrains on obtaining good quality and increased number of planting materials to plant new gardens. Distribution of seed materials outside a village where it is normally grown, and distribution of these outside the village or any place of cultivation requires proper care especially when commercial opportunities demands huge supply of seeds stock.

Climate change poses great challenge for adaptive agriculture. Drought events like that which was experienced in 1997 and recently in 2015-16 has already caused much devastation throughout PNG and is predicted to recur with high intensity (i.e. more and on more within short time intervals). Such experience requires use of simple but relevant technologies that are important for safeguarding the wellbeing of vulnerable farming households against climate calamities.

This manual is prepared toward expanding the knowledge base of rural development officers, agriculture extension officers, schools teachers, livelihood officers, and any other interested persons to help train farmers as Trainers of Trainees (TOTs) on improved seed production techniques for rapid field multiplication of quality planting materials of important staple crops in PNG including, sweetpotato, banana, cassava, taro and yam with the overall goal of up skilling and building capacity of farmers/trainers to be climate smart.





Preliminaries: Getting to know each other





Farmers have diverse experiences and exposure in practically applying crop farming practices. They attend trainings with this wealth of farming backgrounds. Farmers may feel timid and uneasy when coming together to participate in trainings because of the cultural norms. Since any training session normally require full participation from trainees whether in theory or practice it is important that farmers get to know each other before the actual training sessions begin.

To achieve this goal the following activities should be done:

Working together
 Ask farmers to introduce themselves, their location, their number of year's experiences crops farming. Discussing together how many different crop staples and varieties do they grow? How do they select and prepare materials for planting new gardens? What plant parts are normally used for planting? When do they normally harvest planting materials for next planting? Do they consciously prepare seed beds for raising planting materials? Do they apply minimum cleaning to materials before planting? Had any of the participants received training on crop production covering some of the questions posed above?

	Farmers will →
Learning Goals	 Appreciate the importance of selecting quality planting materials. Appreciate the importance of sanitizing planting materials. Appreciate the purpose of rapid multiplication of planting materials.





Session 1 - The part of the plant you grow

Traditional knowledge and skills are diminishing or are put to challenge due to modernization coupled with rapid changes in climate conditions. The changes in climate has over the recent decades, affected many rural communities in PNG. Drought events for instance, have had a lot of devastative impacts where crops varieties are lost or are not easily recovered and grown again. Insect pests and disease pathogens have become prevalent in many localities. It has become evident that traditional know-hows have become exhaustive in adapting to such fast-changing scenarios. As a consequence, our rural population mass are falling gradually into poverty.

Drought affects seeds and therefore, the system (especially the informal system in a rural setting) that governs it. True! With drought there is a period of interruption in the seed systems because seeds are affected. Our rural communities need to better equip themselves to understand what can be best done to conserve, manage and utilize seeds.

While we try to think about the breadth and depth of the effects of a climate phenomenon like the drought event, we can but do little in our small ways to cope and live with the changes - that is being resilient!

In this session, we bring the importance of seeds especially those of staple crops, back to your attention.



Farmers will \rightarrow

- Learn to categorize crops into their different mode of propagation.
- Understand the importance of maintaining and planting clean or healthy seed stocks

Materials and methods

Target Participants: Crop farmers, extension service providers, school students, community organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 40 minutes

Materials required
 Seed materials – e.g. banana suckers, taro suckers, taro corms, cassava cuttings, yam tubers, sweet potato tubers, sweet potato vines, corn seed, rice seed, sweetpotato seeds, taro seeds, etc. Flip chart and masking tape or whiteboard marker pens white board markers notebooks and pens and hand outs





	Working together		
LET'S WONK TOGETHEN	 Write the title "The part of the plant you grow " on the whiteboard or flip chart. Engage each participant to do a list of 5 most important crops in their households. Explain what a seed is, and, its importance. 		
	Tasks		
	 Allocate the participants in 5 groups and assign them the following tasks: Allocate the participants in 5 groups Collate individual group member's crop list into one removing the repeating ones. Base on their experience, ask the participants to identify the crops by their mode of propagation, as either (a) true-seeded, (b) vegetative (vines, stem, tuber) and (c) both seeded and vegetative. Ask the participants to discuss how and when seeds/seed stock are collected and prepared for planting Ask the participants to brainstorm on how seed/seeds stock cleaning is done for all or any of the crops before next planting cycle. 		
	Demonstrate		
	 Demonstrate how seeds/seedstock are derived from mother plants (refer to Handouts). Demonstrate how seeds/seedstock are cleaned before planting new gardens (Refer to Handou Demonstrate how seeds/seedstock are derived from mother plants (refer to Handouts). Show how to select seed/seedstock from a previous garden Demonstrate how seeds/seedstock are cleaned before planting new gardens (Refer to Handouts). 		
	Conclude		
	Let the participants raise questions and queriesClarify, and conclude the session		

The important crop staples in PNG

a. Sweet potato: the crop dominates food production in the highlands agriculture systems and has in the past 60 years become more and more important food in many lowlands. Average sweet potato production for all rural villagers is calculated as 685 kg/person/year with significant production in Bougainville, Morobe, Oro, West New Britain, New Ireland, Central, Madang, East New Britain, Milne Bay and Gulf provinces.





b. Banana: the crop is grown in all parts of PNG. Production is greatest in Morobe, East New Britain, Central and Madang provinces.

c. Cassava: this is an important crop in the lowlands. Production is greatest in Milne Bay Province, where it is commonly planted with sweet potato after taro and yam have been harvested, and in West New Britain.

d. Taro (*taro tru*): taro is grown in most locations in PNG, but often only as a supplementary crop. It was formerly the most important staple food in much of the lowlands, and was the most important food in the highlands before sweet potato was adopted there about 300 years ago. Taro production is greatest in Madang, East Sepik and Morobe provinces.

e. Yam: the crop is grown in all provinces and is an important staple food in some locations. Five species are grown, but three of these are unimportant as foods. The lesser yam (*Dioscorea esculenta*) (*mami* or *taitu*) accounts for 66% of yam production, and the greater yam (*D. alata*) (*yam tru*) for most of the rest. The greatest production of yam, especially *D. esculenta*, occurs in the hilly parts of East Sepik Province north of the Sepik River.

What is a seed?

Seed is simply a biological organ that gives rise to next generation of plants. A seed can refer to true (botanical) seed that grows from zygotic embryo or can refer to parts (organs) of vegetatively grown crops.

Crops Seeds and Cropping Cycle

Most of the crops grown in PNG are vegetatively grown. There are also other true seeded crops like pulses (beans) and grains (corn). Each crop has a cycle of planting which is mostly determined by the climatic patterns of various agro-ecological zones.

#.	Staple crop	Seed material	Cropping cycle
1.	Sweetpotato	vine cutting, tuber	4 to 8 months
2.	Banana	sucker, main corm	9 to >12 months
3.	Cassava	Stem	6 to 9 months
4.	Taro	sucker, stolon, main corm	6 to 12 months
5.	Yam	root tuber, aerial tuber	6 to 12 months
6.	Corn	true seed	3 months
7.	Bean	true seed	2 to 3 months
9.	Cabbage	true seed, shoot	4 months
11.	Rice	true seed	4 months
14.	Tomato	true seed	3 to 4 months
15.	Aupa	true seed	2 months

Table 1: Examples of crops grown in PNG, their seed stock and cropping cycle





Harvesting and cleaning of seed stock

The vegetative organs are harvested at various times during the planting periods for each crop species. While there are vast array of crops grown in gardens, only staple crops are explained.

a. Sweetpotato

Vine harvesting: Generally vines from actively growing plants which produce flag leaves can be harvested as soon as first and second harvesting of tubers is done. Do not use tips that show retarded growth and having to produce small, fully opened leave close to the shoot tips.

Vine cleaning: Vines can be cleaned with bleach solution and/or an insecticide.

Step1. Prepare 10 % bleach solution (it means add 10mls bleach in a 1L of water. You can use the lid of the bleach container which is approximately 10mls).

Step2. Sanitize/clean the vines in 10 % bleach for 3-5 minutes and briefly rinse again in clean water.

Step3. Further decontaminate (optional) in 0.1% insecticide solution (it means add 1 ml insecticide in 1 L of water).

Tuber harvesting: Mature tuber should be used. Although any harvested tuber can be used, it is advisable to use smooth tubers that show very less grooves, cracks and wounds on its surface.

Tuber cleaning: Sterilize the tubers in 10 % bleach (add 10 ml bleach in container and top it up to 100 ml with water) for 3-4 minutes and briefly rinse again in clean water. You can further decontaminate in insecticide solution at ratio of 1.0ml insecticide to 1.0 L water.

b. Banana

Sucker/side shoot harvesting: Generally sword leaf suckers should be used for planting in garden. Avoid use of broad leaf and water suckers.

Sucker cleaning: suckers should be cleaned with bleach solution or an insecticide. Harvest suckers, remove excess roots and dried leaves/pseudo-stems and soak in water for at least 2-4 hours or overnight to completely remove soil residues. Clean again and sterilize suckers in 10 % bleach for 5 minutes and further rinse in clean water.

c. Cassava

Stem harvesting: Select and take healthy cassava stems cutting (at least 30 cm long) from 9-18 months old plants.

Stem cutting cleaning: clean the cuttings with bleach solution or an insecticide.

Sterilize the cuttings in 10 % bleach for 5 minutes and briefly rinse in clean water. You can further decontaminate in insecticide solution at a ratio of 1.0 ml insecticide into 1.0 L water.

d. Taro

Sucker/Side shoot harvesting: Generally fully developed suckers should be used to plant.

Sucker cleaning: suckers can be cleaned with bleach solution or an insecticide. Harvest suckers, remove excess roots, trim leaves and soak in water for 2-4 hours or overnight. Sterilize suckers in 10% bleach for 5 minutes and further rinse in clean water.





e. Yam

Tuber harvesting: Mature tuber stored for some times before buds initiate should be used. Although any harvested tuber can be used, it is advisable to use smooth tubers that show very less grooves, cracks and wounds on its surface.

Tuber cleaning: Sterilize the tubers in 10 % bleach for 3-4 minutes and briefly rinse again in clean water. Mature tuber stored for some times before buds initiate should be used.





Session 2: Yam mini-sett and field planting



Yam is a staple crop in Papua New Guinea with cultural values. The rotundata (or Africa) yam has been recently introduced and gaining popularity. The yam is cultivated from tubers alone following a brief dormancy period of at least two months.

Yams can be multiplied using a *mini set* technique. A mini-set is a small piece of yam cut from a tuber (mother seed yam) which is prepared specifically for production of planting materials.



Session 2: Yam mini sett and field planting



Yam is a staple crop in Papua New Guinea with cultural values. The rotundata (or Africa) yam has been recently introduced and gaining popularity as a drought resilient crop. Yams are vegetatively propagated from tubers and bulbils following a brief dormancy period of at least 6-8 weeks in storage, after harvest. Headsets derived from tubers are predominantly used for planting new gardens. They are planted into gardens as soon as buds form on the tubers. Some species of yams have also been able to be produced from vine cuttings.

Alternatively, yams can be rapidly multiplied using 'mini set' technique. A mini-set is a small piece of yam cut from a tuber (mother seed yam) which is prepared specifically for production of planting materials.



Farmers will \rightarrow

- Learn how to prepare yam mini sett
- Sprout yam mini-sets in nursery bed
- Field plant yam seedlings raised from mini-set

Materials and methods

Target Participants: Farmers, rural development officers, extension service providers, school students, and community/Faith-based organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 15 minutes.

Materials required	
 Yam tuber (at sprouting stage) Wooden digging pole Spade Bush knife Kitchen knife String bilum Wood ash Sawdust 	 Bleach (1L) Water (10L) Timer (watch) Laundry buckets (2x) Polythene sheet (optional) Watering can Dry shed Loam soil (or soil mixture of topsoil, sand and manure)
Grass mulch	Handouts
Thinking together Lecture field demonstration Discussions 	



Session 2: Yam mini sett and field planting



	Working together
	 Write on the white board/flip chart or simply say the title "How to do a yam minisett" Discuss how yams are normally propagated
I LET'S	 Explain what yam mini-set is, and its usefulness Demonstrate how to prepare a yam mini-set
TOGETHEN	 Demonstrate how to prepare a yarr mini-set Demonstrate how to sprout a yarr mini-set in a nursery bed and a wooden box
	 Demonstrate how to field plant a sprouted yam mini-set
	 Let the participants raise questions and queries, clarify, and conclude the session

Yam Propagation

Yams are vegetatively propagated from tubers and bulbils. Some species have also been able to be produced from vine cuttings. Headsets derived from tubers are predominantly used for planting new gardens following a brief dormancy period of at least two months. Yams are planted into gardens as soon as buds form on the tubers.

No.	Yam Species	Common name	Propagation method
1	Dioscorea alata	Greater yam	Head set
2	Dioscorea nummularia	Pacific yam	Head set
3	Dioscorea esculenta		Head set
4	Dioscorea bulbifera		Head set, bulbils
5	Dioscorea pentaphylla		Head set
6	Dioscorea rotundata	African yam	Head set



Session 2: Yam mini sett and field planting



Demonstration of yam miniset technique

What is a Yam Mini sett?



How to Prepare Mini-Sett

Cut a mother seed yam into several cylindrical pieces about thumb size

long (5 cm) and remove some tuber flesh. An average mother seed yam can give 20-40 mini-setts. Mix 4-5 handfuls of ash in

one normal household bucket (4 litres) of water to make wood ash solution, or prepare dry wood ash. Place fresh cut mini-setts into baskets or string bags if wood ash solution

is used. Dip the bag containing mini-setts into the wood ash solution while holding the handle of the bags. If using dry wood ash, then treat individual mini-setts separately. Spread the treated mini-setts under shade for two hours to dry off. Do not place mini-setts in direct sunlight. Plant mini-setts in well prepared nursery beds or wooden seed boxes (40 cm x



prepared specifically for production of planting materials.





50 cm x 40 cm) with holes at the bottom to allow water drainage.

Methods of Sprouting Mini-setts

Sprouting in Nursery Bed



Prepare well drained nursery bed 100 cm wide and 30 cm height as shown in the diagram. Then spread fresh moist sawdust or sandy loam soil 2-3 cm thick. Spread minisetts on the moist sawdust side-by-side close together.

Planting of Yam Mini- setts in the Nursery Bed

Cover the mini-setts with moist sawdust/soil

or mulch. Water regularly to keep the bed moist during dry periods and to provide cover during rainy days. Mini-setts should sprout within 3-4 weeks. Mini-setts are ready for transplanting as soon as sprouting occurs but when true leaves are not yet developed.





Session 2: Yam mini sett and field planting



Field Planting

Plough and prepare the field ready for planting. Dig holes of one arms length deep (100 cm) and one spade length wide (30 cm) for clay loam soils, however, a depth of 2 spade lengths (60 cm) can be used in loose or sandy loam soil. Planting holes should be half an arm length (50 cm) apart (plant spacing). Place a stick at the center of the hole for a guide and fill the holes with compost, mulch and black soil until one spade length (15 cm) below the mouth of the hole. Remove the stick and place sprouted minisett on top of the mulch/compost and soil and with the mini-sett sitting in the center of the hole where the stick was placed. Cover with topsoil then water.

Recap of session

The participants are given the opportunity to ask further questions and discuss what has been delivered in the session. The facilitator makes further clarifications and ends the session.

Reference Handouts

• LAL 003(E).Yam Mini-set Information





Session 3: Taro propagation and field planting



Taro is an important staple in the wet-lowland areas of Papua New Guinea. The crop is cultivated vegetatively using head corms, suckers, stolons. Taro can be fast-propagated on the field using mini-set technique. Taro mini-setts are cut pieces of taro corm, or the underground part of taro that has buds or eyes.

	Farmers will →
Learning Goals	 Learn how to prepare taro mini sett Sprout taro mini-sets in nursery bed Field plant taro seedlings raised from mini-set



Session 3: Taro propagation



Materials and methods

Target Participants: Farmers, rural development officers, extension service providers, school students, and community/Faith-based organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 15 minutes.

	Materials required			
	 Taro Woo Space Bush Kitch Strin Woo Sawe 	corm oden digging pole le n knife nen knife g bilum od ash dust	• • • • topsoil,	Bleach (1L) Water (10L) Timer (watch) Laundry buckets (2x) Polythene sheet (optional) Watering can Dry shed Loam soil (or soil mixture of sand and manure)
	• Gras	s mulch	•	Handouts
	Working to	ogether		
 Write on the white board/flip chart or simply say the title "H taro minisett" Discuss how taros are normally propagated Explain what taro mini-set is, and its usefulness Demonstrate how to prepare a taro mini-set Demonstrate how to sprout a taro mini-set in a nursery bed box and polybags Demonstrate how to field plant a sprouted taro mini-set Let the participants raise questions and queries, clarify, and the session. 			or simply say the title "How to do a bagated s usefulness mini-set nini-set in a nursery bed, a wooden routed taro mini-set and queries, clarify, and conclude	





Demonstration of Taro Mini-Sett Technique

What is taro mini-sett?

Taro mini-setts are cut pieces of taro corm, or the underground part of taro that has buds or eyes.







To prepare taro mini-sett, uproot mature taro plant and remove the top, and gently clean the corm. Cut the corm into pieces containing buds or eyes. Treat the cut sides of each mini-sett with wood ash and

Taro corm

place the treated sides facing upwards under shade to dry over night

before potting.

Soil Preparation for Planting of Mini-setts in Nursery Beds

Prepare a well drained nursery bed 100 cm long and 30 cm high.

Make furrows and place taro mini-setts side by side close together as shown in the picture below.

Cover the mini-setts with topsoil and water.

Water the planted mini-setts three times a week to keep the soil moist. Mini-sett should be ready for planting after three to four weeks.



Note:

The advantage of taro mini-sett technique is that a lot of taro planting materials can be produced at one time. One medium size taro corm (20 cm x 6 cm) can easily produce 6-8 mini-setts.

Recap of session

The participants are given the opportunity to ask further questions and discuss what has been delivered in the session. The facilitator makes further clarifications and ends the session.



Session 3: Taro propagation



Reference Handout

- LAL 002(E). Taro Mini-set Information
- Bub026. NARI TOKTOK: Best Practice Note for Taro Farmers





Session 4: Banana bit and field planting



Banana is the second most important staple crop in PNG. Propagation is done by suckers. Bananas can be rapidly multiplied in the field using the banana bit technique. Banana bits are pieces of corm, or the underground part that has roots and buds or eyes.

Bananas are vegetatively propagated from suckers. These seed/planting materials are produced from underground stem which are normally referred to as corm. The corms carry mature eyes or buds which initially grow out as rhizomes, emerge as peeper and then suckers (offshoot of parent plant/corm). Sword suckers have better growth potential as compared to broad leaf and water suckers.



Session 4: Banana propagation





Materials and methods

Target Participants: Farmers, rural development officers, extension service providers, school students, and community/Faith-based organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 15 minutes.

	Materials required				
	•	Banana corm	•	Bleach (1L)	
	•	Wooden digging pole	•	Water (10L)	
	•	Spade	•	Timer (watch)	
	•	Bush knife	•	Laundry buckets (2x)	
	•	Kitchen knife	•	Polythene sheet (optional)	
	•	String bilum	•	Watering can	
	•	Wood ash	•	Dry shed	
	•	Sawdust	• topsoil,	Loam soil (or soil mixture of sand and manure)	
	•	Grass mulch	•	Handouts	
	Working together				
LET'S WONK TOGETHEN		 Write on the white board/fl banana bit". Discuss how bananas are need to be banana bit is a been on the banana bit is a banana bit is a been on the banana bit is a banana bit is a been on the banana bit is a banana bit is a been on the banana bit is a banana banana bit is a banana banana bit is a banana banana banana bit is a banana banana	Write on the white board/flip chart or simply say the title "How to do a banana bit". Discuss how bananas are normally propagated Explain what banana bit is and its usefulness Demonstrate how to prepare a banana bit Demonstrate how to sprout a banana bit in a nursery bed, a wooden box and polybags Demonstrate how to field plant a sprouted banana bit Let the participants raise questions and queries, clarify, and conclude the session		



Session 4: Banana propagation



What is banana bit?

Banana bit is a piece of corm, or the underground part that has roots and bud or eye.





Selection of Banana Corms

Select a plant close to flowering or one that has recently bunched at 8th months or more after planting. The corm from a harvested mother plant can also be used, however this may not provide sufficient banana bits.

Preparation of bits for Planting Material

To prepare bits, cut and remove the banana stem and uproot the corm from the ground. Gently clean the corm and remove leaf sheaths to expose emerging buds or eyes. Cut the corm into bits containing the selected sheaths to expose emerging buds or eyes. Trim the bits into a uniform shape and peel the outer layer of skin a few centimetres away from the bud to remove

unwanted buds. Avoid narrow shaped bits that have buds close to the cut surface or at the bottom. The bud should be at the centre of the bit. Clean again and sterilize suckers in 10 % bleach for 5 minutes and further rinse in clean water. Store the bits in a cool

place and plant within a week of preparation.

Planting Method Planting of Banana Bit in a planting hole

Dig holes one spade length deep and one spade length wide (30 cm x 30 cm). Apply one medium Besta tin (48 grams) of chicken manure in the hole and thoroughly mix it with soil. Place banana bit into the hole at an angle (45°), with the cut surface facing upwards and the bud facing the soil.

Planting of Banana Bit in a nursery bed

Prepare well drained nursery bed 100 cm wide and 30 cm height as shown in the diagram. Then spread



fresh moist sawdust or sandy loam soil at least 5 cm thick. Spread banana bits on the moist sawdust side-by-side close together.

Cover the bits with moist sawdust/soil or mulch to provide cover during rainy days. Provide water regularly to keep the bed moist during dry periods. Banana bits should sprout within 3-5 weeks after planting.



Session 4: Banana propagation



Recap of session

The participants are given the opportunity to ask further questions and discuss what has been delivered in the session. The facilitator makes further clarifications and ends the session.

Reference

LAL 001 E - Banana Bit Information.





Session 5: Cassava mini-stem cutting and field planting



Cassava is normally propagated from stem cuttings. A 90 cm long single stem with 80–100 intact nodes will normally produce 3 plants, each 30 cm long with the conventional method. The rate of getting new planting materials is very low with this approach. Planting materials can be rapidly multiplied using a mini-stem technique. The mini-stem technique uses small stem pieces, which means that a single cassava stem will yield more planting material than the conventional method.



Farmers will \rightarrow

- Learn how to prepare cassava mini stem
- Sprout the cassava mini stem in nursery bed
- Field plant cassava seedlings raised from mini stem

Materials and methods

Target Participants: Farmers, rural development officers, extension service providers, school students, community/Faith-based organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 15 minutes.



Session 5: Cassava propagation



	Materials required		
	• Stem of mature cassava plant	• Water (10L)	
	Secuture	• Timer (watch)	
	• Hand pruning saw	Laundry buckets (2x)	
	• Spade	Polythene sheet (optional)	
	• Bush knife	Watering can	
	String bilum	Dry shed	
	Grass mulch	• Loam soil (or soil mixture of topsoil, sand and manure)	
	• Bleach (1L)	Handouts	
	Upperforated polythene bag		
	Working together		
LET'S WONK TOGETHEN	 Write on the white board/flip chart or simply say the title "How to do a cassava mini stem". Discuss how cassava is normally propagated Explain what cassava mini stem is, and its usefulness. Demonstrate how to prepare a cassava mini stem Demonstrate how to sprout a cassava mini stem in a nursery bed and unperforated polythene bags (clear) Demonstrate how to field plant a sprouted cassava mini stem Let the participants raise questions and queries, clarify, and conclude the session. 		

What is a Cassava mini stem?

Cassava mini-stem is a small stem piece having 2-4 nodes which is primarily used to produce more planting materials. For example, 90 cm stem will produce 40-50 two-node cuttings or 20-25 four-node cuttings with this technique.



Session 5: Cassava propagation



Preparation of mini-stem and sprouting of mini-stem

1. Select healthy cassava stems from the garden at the age of 8-18 months. The cutting should not be too young (A) or woody/old (B). They should be the softwood



2. Cut as many 2-4 node stem the shoot (10-15cm long). Cut using sharp objects like saw, secateurs or cutlass. Blunt edges damage the stems exposing it to infections.

3. Sterilize the mini-stems in 10 % bleach (for





portion which is the right physiological stage (C).

pieces or mini-stems including





clean water. Further decontaminate in fungicide solution (ratio: 1ml insecticide into 1L water) if sprouting in perforated polythene (plastic) bag

4. (a) Sprout the mini-stem in well drained nursery bed. Make furrows and place cassava mini-stems side at 10cm x 10cm spacing. Place buried mini-stem such that 2 opposite



nodes are on the right and left sides. Sprouting can be done in a nursery box or in loose soils on the ground with adequate moisture.



Session 5: Cassava propagation





5. Gently uproot the ministems and transplant onto field at 50-100cm x 100 cm spacing. Within the first 10

4. (b) Put the cassava mini-stem cuttings directly into perforated polyethylene (plastic) bag and stored in a shaded area to sprout. It



weeks after transplanting, control weeds efficiently and manually in order to produce healthy and strong plants





Recap of session

The participants are given the opportunity to ask further questions and discuss what has been delivered in the session. The facilitator makes further clarifications and ends the session.

Reference

Commercial Cassava Production: Technical Bulletin. Issue 5/ 2011. www.cardi.org





Session 6: Sweet potato nodal cutting and field planting



Sweet potato seeds are normally raised from vine cuttings and tuber sprouts. They serve as initial materials to start the process of multiplication in nursery.

	Farmers will →		
Learning Goals	 Learn how to prepare sweetpotato nodal vines cuttings and tuber plantings Sprout sweetpotato nodal vine cuttings and tubers in nursery bed Field plant seedlings raised from sweetpotato nodal vine cuttings and tubers 		

Materials and methods

Target Participants: Crop farmers, extension service providers, school students, community organizations/institutions

Suggested Number of Participants: A maximum of 30 persons

Duration: 15 minutes



Session 6: Sweet potato propagation



	Materials required	
	 Sweetpotato vine cuttings Sweetpotato tubers Kitchen knife Spade String bilum Bleach (1L) Insecticide Mulch (dry grass) 	 Water (10L) Timer (watch) Laundry buckets (2x) Polythene sheet (optional) Watering can Nursery shed Loam soil (or soil mixture of topsoil, sand and manure) Handouts
	flip chart or simply say the title "How to do	
LET'S WONK TOGETHEN	 Discuss how sweet potato is normally propagation 1 Discuss how sweet potato is normally propagated Explain what sweet potato nodal and tuber propagation is, and its usefulness Demonstrate how to prepare a sweet potato nodal cutting and tuber Demonstrate how to sprout a sweet potato nodal cutting and tuber in a nursery bed and polythene nursery bags (black) Demonstrate when to harvest and field plant sprouted sweet potato vines Let the participants raise questions and queries, clarify, and conclude the session 	

Sweetpotato nodal propagation

1. Tuber sprouting and multiplication

- a. Select a mature tuber
- b. Wash and rinse in water
- c. Sterilize in 10% bleach solution and final rinse in water
- d. Place into polypot, nursery bag (with soil mixture 2part topsoil: 1part manure: 1part sand) or nursery bed away from direct sunlight
- e. Mulch with grass or dry leaves.
- f. Water twice daily to sprouting. It may take 2-4weeks to sprout and continue produce vines.
- g. Vines can be plucked out and planted into field or further multiplied in the nursery.



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2. Vine sprouting and multiplication

a. Select healthy looking vines from the field or from sprouted tubers. The vine should continue producing flag leaves.



b. Cut a piece using a pair of scissors or sharp knife into 2-node without detaching the leaves. Shoot tip should be reserved with a fully opened leaf.



c. Sterilise the cuttings in 10% bleach for 2-3 minutes and rinse in water.



d. Plant into prepared bed or nursery trays with a node into the soil. Plant the shoots separately.



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e. Water twice daily to sprouting. It may take 2-4weeks to sprout and continue produce vines.



f. Depending on the number of planting materials required, the vine can be continually multiplied within 4-5 weeks cycle. Once enough planting materials are produced, shoot tips up to 25 cm length can be trimmed for direct field planting.

Recap of session

The participants are given the opportunity to ask further questions and discuss what has been delivered in the session. The facilitator makes further clarifications and ends the session.

Reference

Concluding remarks