

LEARNING FACILITATING MATERIALS

NATIONAL PROFICIENCY LEVEL 2

TRADE AREA: **CASHEW PRODUCTION**

UNIT 1

ESTABLISHMENT OF A NURSERY IN CASHEW PRODUCTION



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UNIT INTRODUCTION

Welcome to Unit 1 of your learning journey in cashew production. This guide explains the main steps in establishing a nursery in cashew production.

Do you already know why it is important to establish a well-managed cashew nursery?

Farmers need better access to improved planting material in order to plant high-yielding cashew trees that produce high-quality cashew fruits. A cashew tree that produces more and has higher quality raw cashew nuts and apples can increase farmer incomes significantly.

If you follow the steps for establishing a cashew nursery in the right sequence, you will produce high-quality cashew seedlings that mature into high-quality cashew trees. Do not miss a step! Apply your knowledge and skills accurately to establish a clean and well-functioning cashew nursery.



The learning material covers six sub-units:

- 1) Nursery establishment
- 2) Planning seedling production
- 3) Selecting a site for nursery
- 4) Providing shade to plants
- 5) Preparing rootstock
- 6) Nurturing rootstock

Each sub-unit contains theoretical and practical exercises. Each module includes written materials, visuals as well as self-assessments to test your knowledge and skills.

The benefit of learning this information is to establish a favourable environment to produce and grow high-quality grafted cashew seedlings.

Remember that the work, time and resources you put into setting up your nursery, preparing your rootstocks and nurturing them, also has an effect on the survival rate of your plants – not only in the nursery, but also after transplanting on the field.

Even though this learning material provides essential information on establishing a nursery in cashew production for National Proficiency Level 2, you should also look out for new information, innovations and technological advances during your practical work that expand your knowledge and skills.

Are you ready to start your learning journey on cashew? Let's start!

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ICONS



LEARNING
OBJECTIVES



ATTENTION



PRACTICALS
HANDS ON



CROPPING
CALENDAR



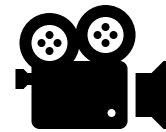
SELF ASSESSMENT



WELL DONE!



TAKE A BREAK!



WATCH VIDEO

ABBREVIATIONS

Here are some commonly used abbreviations.

cm	Centimetre (<i>1 cm = 10 millimetre</i>)
g	Gram (<i>1000 g = 1 kg</i>)
kg	Kilogram (<i>1 kg = 1000 g</i>)
m	Meter (<i>1 m = 100 cm</i>)
m²	Square Meter (<i>1 m x 1 m</i>)
RCN	Raw Cashew Nuts

1. DEMONSTRATE KNOWLEDGE OF NURSERY ESTABLISHMENT

a) Explain a nursery in cashew production

A cashew nursery is a specially-selected site where cashew seedlings and grafts are raised. In a cashew nursery, workers plant rootstocks, raise, graft and nurture cashew seedlings until they are ready for transplanting into the field.

There are four (4) types of nurseries:

1. Institutional nursery – operated by a public institution or private organization
2. Project nursery – operated by donor-funded organization
3. Group nursery – operated by households or cooperative groups
4. Individual nursery – operated by an individual as a commercial business



Source: GIZ/ComCashew – Nursery with batches of rootstock seedlings

b) State the importance of a nursery in cashew production

Grafted cashew seedlings are among the most important inputs in cashew production. They determine the potential yields and the ultimate productivity per unit area. In a tree nursery, it is easier to protect, care for, and monitor the tree seedlings.

The nursery area is small, which makes it easy to:

- create a conducive microclimate
- protect the plants against pests with minimal efforts
- save time and labour
- transplant seedlings to less favourable conditions (farm) only when they attain a desirable tolerant stage of growth
- grade seedlings into lots of similar strength to facilitate uniform plant stand after planting out on the field



Source: GIZ/ComCashew – Grafted seedlings in nursery

c) **State the uses of tools in cashew nursery establishment**

The size of the nursery determines the number and types of equipment, tools, materials and labour you need.

The following tools are required in establishing a cashew nursery:

- **Wheel Barrows** to transport materials, tools and rootstocks



Source: <https://www.coopsuperstores.ie/Garden/Garden-Tools/Garden-Wheelbarrow/Build-It-Galvanised-Wheelbarrow-100lt-1773313>

- **Sprinklers** to water the rootstocks and seedlings



Source: <https://www.energy.gov/eere/femp/water-efficient-technology-opportunity-multi-stream-rotational-sprinkler-heads>

- **Hoses** to water the rootstocks and seedlings



Source: <https://www.indiarubbers.com/pvc-hose.html>

- **Hand Sprayers** to water the seedlings or to treat plants against pests and diseases



Source: <https://de.aliexpress.com/item/32867580916.html>

- **Watering Cans** to water the rootstocks and seedlings



Source: https://www.diy.com/departments/sankey-green-plastic-watering-can-13l/244059_BQ.prd

- **Hoes** to clean the nursery of any weeds



Source: <https://seymourmidwest.com/42441>

- Large and small **Shovels** for soil amendment and filling of poly bags



Source: <https://www.bergfreunde.de/cold-steel-special-forces-shovel-spaten/>

Source: <https://kentandstowe.com/Our-Products/Digging/Stainless-Steel-Pointed-Spade>

- **Rake** to collect the weeds and rubbish in the nursery



Source: <https://www.krafttool.com/GG871>

- **Knives** for grafting cashew seedlings



Source: https://www.duebuoiagriculture.it/en/pr/grafting_knife_260c/1402.html

- **Saw** to clear the plot and cut down bushes during site selection



Source: <https://www.obl.at/handsaegen-feilen/lux-baumsaege-holz-350-mm-classic/p/3028891>

- **Cutlass** to clear the plot and weed during site selection



Source: <https://hosstools.com/product/farm-machete/>

- **Secateurs** for grafting cashew seedlings and scion selection



Source: <https://www.grube.de/freund-bypass-gartenschere-64-276/>

- **5mm Soil Sieve** to remove stones and debris from the soil



Source: https://www.diy.com/departments/b-q-metal-soil-sieve-w-110mm-l-390mm/189497_BQ.prd

- **Hammer** to establish a fence around the nursery and to erect shade



Source: <https://www.pixelsquid.com/png/claw-hammer-946110182822253732?image=D07>

- **Nails** to establish a fence around the nursery and to erect shade



Source: http://www.ubmf.net/products_de.aspx?id=1&idcat=23

- **Fence Wire** to protect your nursery
 - Alternatively, you can also use **bamboo** to fence your nursery



Source: <https://www.craigmarloch.co.uk/landscape-maintenance-c356/horticultural-fabrics-edging-netting-fencing-c332/netting-c333/pvc-wire-netting-p7495>

Other materials required in establishing a cashew nursery are: **sand, fertile top soil, decomposed organic matter, seeds, poly bags, grafting tapes, poly caps, poly sheets, tarpaulins, poles and shade net.**

d) State the factors to consider in cashew nursery establishment

- Review and confirm demand for seedlings from customers
- Procure nursery inputs according to the number of seedlings you are planning to prepare:
 - Sand
 - Poly bags
 - Tools
- Conduct staff training on:
 - Sowing
 - Grafting seedlings
 - Scion selection and harvest
 - Nurturing plants
- Raise rootstocks
- Carry out grafting
- Distribute / sell grafted seedlings to farmers in your community and around

SELF ASSESSMENT



1. Explain a nursery in cashew production.

2. State the importance of a nursery in cashew production.

3. State the uses of tools in cashew nursery establishment.

4. State the factors to consider in cashew nursery establishment.



Well done! You have completed the first set of questions. This is very encouraging. Let's proceed on your cashew learning journey.

2. DEMONSTRATE SKILLS FOR PLANNING SEEDLING PRODUCTION

a) Explain planning in seedling production

Planning guides the allocation of resources for activities to be undertaken.

Consider the following resources in planning seedling production:

- Time
- Labour
- Tools
- Materials
- Costs

b) State the importance of planning in seedling production

Cashew is a seasonal tree, so nursery operations require proper planning, budgeting and timing to enable the timely delivery of grafted seedlings to cashew farmers.

Planning provides a nursery operator with a better understanding of the economic aspects of nursery operation. It helps in the selection of and budgeting for effective and appropriate production processes.



Source: GIZ/ComCashew – Grafted seedlings in nursery

c) State the factors to consider in planning for seedling production

It is very important to plan and budget nursery operations.

The three (3) main tools that help you in planning and monitoring nursery activities are:

- Calendar of work
- Record keeping
- Cost-Benefit Analysis

Calendar of work:

- Helps to estimate the commencement date for nursery operations
- Helps to take decisions about needed additional resources
 - Material
 - Labour
 - Tools
 - Time
 - Money
- Helps to estimate the target of how many grafted seedlings you plan to produce
- Helps to estimate the time for production and distribution of grafted seedlings

Activities	Rain & Vegetative Season					Dry & Reproductive Season						
	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Procuring Inputs									x			
Potting									x	x	x	
Sowing Seeds	x									x	x	x
Watering	x									x	x	x
Scion selection/ harvest	x	x	x								x	x
Grafting seedlings	x	x	x								x	x
Selling/ distributing grafts	x	x	x									x

Source: GIZ/ComCashew - Cashew Nursery Management and Grafting Technical Manual

Record keeping:

- Helps to know the quantity of planting materials in stock
- Helps to monitor success rates of grafted seedlings
- Helps to estimate the returns after selling grafted seedlings
- Helps in planning, monitoring and decision-making about activities, budgets and the nursery business at large

Important records in the nursery include:

- Date of potting, seed sowing, germination and grafting
- Success rates of grafted seedlings
- Activity schedule for casual labour, recruitment and termination
- Target for grafted seedlings
- Requests and deliveries
- Observations e.g. seedling nutrient status, insect pest and disease outbreak

Cost - Benefit Analysis:

- Helps to determine if an investment or decision is profitable
 - Do the benefits outweigh the costs?
- Helps to provide a basis for comparing profitable and non-profitable investments or decisions
 - Compare the total expected cost of each investment option with its total expected benefits

A Cost - Benefit Analysis compares investment cost and expected benefits gained from making an investment. The objective of a cost-benefit analysis is to find the most profitable investment option, so that benefits outweigh costs.

A Cost - Benefit Analysis is especially important in determining the selling price of seedlings. You need to ask yourself some of these questions before pricing your cashew seedlings:

- What kind of materials do I want to use in developing high-quality seedlings?
- What are the costs of those materials?
- Which materials can I afford and still make a margin?
- How many seedlings will I raise and graft?
- What are the costs of hiring labour to raise and graft these seedlings?
- How many workers can I afford and still make a margin?
- What is my expected margin per seedling?
- What should be the unit selling price?

d) Prepare a plan for seedling production



Practical Exercise: Prepare a plan for seedling production considering all the factors you have learned so far.



SELF ASSESSMENT

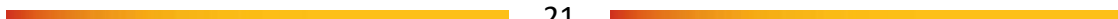
1. Explain planning in seedling production.

2. State the importance of planning in seedling production.

3. State the factors to consider in planning for seedling production.



*Congratulations! You have completed the second set of questions.
Let's move on to the next chapter.*



3. DEMONSTRATE SKILLS FOR SELECTING A SITE FOR NURSERY ESTABLISHMENT

a) Explain site selection in cashew nursery establishment

Selecting an appropriate site for the establishment of a cashew nursery will contribute to the success of your business. If you create ideal conditions for your rootstocks, seedlings and grafts to grow, you will maximize the success rate of your grafted seedlings. The more grafted seedlings survive, the more you can sell to farmers in your community or plant on your own field for best results – high yields and high-quality cashew fruits.

b) State the factors to consider for site selection

The nursery should be located on land with similar properties and climatic conditions as the area where the grafted seedling will be planted out. It is important to pay attention to the following factors when selecting a site for a cashew nursery.

The area should:

- be accessible (near the main road)
- be close to a community in order to find labour
- be near a permanent water source
- have few shade trees – do not choose a site without sunlight!
- not be waterlogged and ideally located on level land in order to avoid erosion
- be slightly sloping to avoid water accumulation in the nursery
- provide sandy and fertile soil for potting
- be easy to protect against animals
- be protected against strong winds



Make sure you find a place that covers most of these factors to make your nursery business a success.

The size of your nursery will depend on:

- the area available
- the scale of production that you anticipate

Layout of the nursery:

- Arrange polybags in squares of 150 or 200 polybags per batch in a row
- Every row should be:
 - 1-meter wide
 - 10-meters long
- Add 20 % to the estimated land area of your nursery for:
 - nursery beds for pre-germination
 - walking alleys between batches of rootstocks or seedlings
 - small buildings for storage of tools and materials
 - toilets
 - work areas



For more information on the site selection, watch video on *Cashew Nursery Establishment and Grafting* from Minute 0:31 to 1:35.

c) **State the uses of the tools for site selection**

The following tools are required for site preparation in establishing a nursery:

- Use a manual **Tree Saw** for cutting trees, sticks and stumps.



Source: <https://www.obi.at/handsaegen-feilen/lux-baumsaege-holz-350-mm-classic/p/3028891>

- Use **Cutlass** to cut your pathway in the bush to select your site. The cutlass also protects you from bush animals, such as snakes, rats and lizards.



Source: <https://hosstools.com/product/farm-machete/>

- **Chain Saws** are used for cutting trees and stumps.



Caution! Only use a chain saw after you have been trained on the use and maintenance of a chain saw. Find a chain saw operator to help you with land clearing.



Source: <https://www.murdochs.com/products/power-equipment/saws/heavy-duty-chainsaws/>

- Wearing **Personal Protective Equipment** is required during chain saw operations

Eye protection

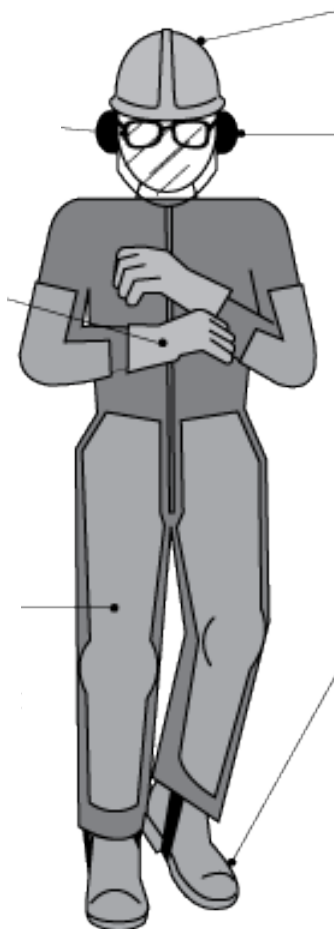
Safety glasses, safety face shield

Gloves

Leather gloves with nylon reinforcement offer good grip and absorb vibration.

Leg protection

Fitting trousers or chaps with nylon reinforcement from woven fabric.



Head protection

Hard cover hat with a visible colour such as yellow, orange or red

Hearing protection

Chain saws create high noise levels of 95 – 115 decibels

Foot protection

Heavy, well-fitted work boots made of ballistic nylon with rubber soles.

Source: https://www.ccohs.ca/oshanswers/safety_haz/chainsaws/ppe.html

- Use a **Mattock** for digging the soil, removing stumps from the field and chopping undergrowth. Use a mattock for breaking up hard and rocky soils



Source: <http://tools-pmc.com/en/hand-tools/347-pick-mattock.html>

- Use a **Hoe** to remove weeds, shape and clear the soil of old roots.



Source: <https://seymourmidwest.com/42441>

- Use a **Rake** to loosen and level the soil and after weeding.



Source: <https://www.krafttool.com/GG871>

- Wear **Rubber/Wellington Boots** to protect your feet from cuts and bites from snakes, bush rats and lizards.



Source: <https://www.lamps2udirect.com/garden-and-outdoor-lighting/full-length-green-wellington-boots-uk-size-11-euro-size-45/143256>

- Wear **Gloves** to protect your hands from cuts and bites from snakes, bush rats and lizards.



Source: <https://pksafety.com/pip-atg-maxiflex-cut-resistant-glove-34-8743-12-pairs/>

d) Outline the procedure for site selection

Use the checklist to follow steps 1 to 5 in site selection. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Inspect land suitability (accessibility, protection)	
2. Inspect soil suitability (sandy, fertile soils)	
3. Check water availability from a natural water source nearby	
4. Ensure appropriate climatic conditions similar to those after transplanting on the field	
5. Prepare the land for nursery establishment with the tools available to you.	

In the midst of difficulty always lies an opportunity. Enjoy your learning journey.

e) Select a site for cashew nursery establishment



Practical Exercise: Go out and find a site for establishing a cashew nursery.



SELF ASSESSMENT

1. Explain site selection in cashew nursery establishment.

2. State the factors to consider for site selection.

3. State the uses of the tools for site selection.

4. Outline the procedure for site selection.



You are making great progress! You have completed another set of questions. Take a break or go ahead and start with the next chapter.

4. DEMONSTRATE SKILLS FOR PROVIDING SHADE TO PLANTS

a) Explain shading in cashew nursery

Shading in a cashew nursery is the process of erecting shade for your cashew seedlings. It is important to nurture cashew seedlings in appropriate environmental conditions to help them grow well and produce high-quality grafted seedlings.

The environmental conditions that you need to control in a cashew nursery include:

- Humidity
- Aeration
- Light quality
- Light quantity
- Temperature
- Moisture



Providing shade is the most important aspect in order to control the factors that help quality seedlings grow.



Source: GIZ/ComCashew – Cashew nursery with shade nets

b) State the importance of shading

Cashew seedlings are sensitive to unfavourable environmental conditions such as:

- extremely low and high temperatures
- excessive moisture
- high solar radiation

Shading is important because it regulates all three factors.



The optimum sunlight for cashew seedling growth is 50 %. Shade must be carefully regulated. Allowing more than 75 % of shade can reduce seedling growth and increase the occurrence of diseases.

c) State the uses of tools for shed construction

The following tools are required for shed construction:

- A **Hammer** to connect the poles that result in a structure for the shade materials



Source: <https://www.pixelsquid.com/png/claw-hammer-946110182822253732?image=D07>

- **Nails** to connect the poles in constructing a structure for the shade materials



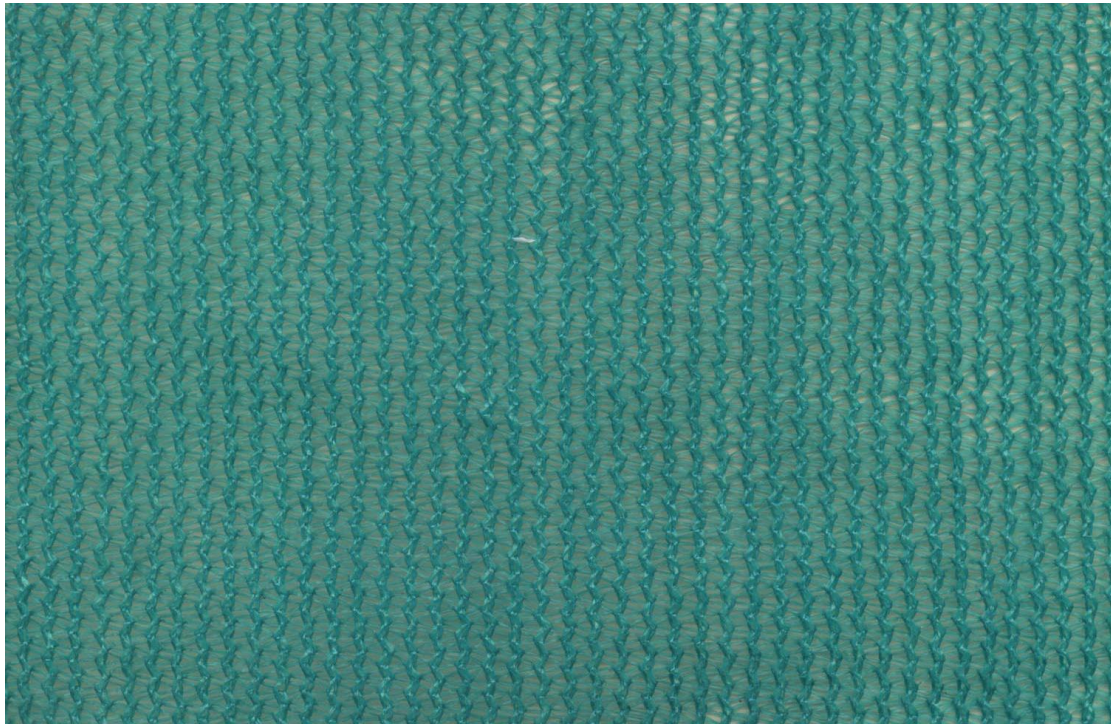
Source: http://www.ubmf.net/products_de.aspx?id=1&idcat=23

- **Poles** to develop a structure for the shade materials



Source: <https://timbertrading.co.za/poles-planks/>

- **Permanent Poly Shade Net** to protect the rootstocks and seedlings from sunlight



Source: <http://www.agronetindia.com/green-net.html>

d) **State the types of nursery sheds**

Shade structures can be temporary or permanent.

- Temporary shade structures are short-term structures constructed with easily degradable materials like straw or palm leaves



Source: *GLZ/ComCashew – Cashew nursery shading with palm leaves*

- Permanent shade structures are built with poly nets



Source: GIZ/ComCashew – Cashew nursery with shade nets

You can also build a shade structure with a mixture of permanent poly nets and temporary materials.

e) Outline the procedure for constructing sheds

Use the checklist to follow steps 1 to 7 in constructing sheds. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Decide on how big your shed should be. How many seedlings are you planning to grow?	
2. Decide on the type of shading materials you want to use Do you want to use poly nets or natural materials?	
3. Assemble all tools and materials that you need to construct the shed	
4. Put up the poles on the outer ends of the shed and mount additional poles above the alley ways of your shaded area.	
5. Connect the poles with nails on the top ends to squares	
6. Place the poly net or natural material over the pole structure and fix it with nails	
7. If the net hangs too low, you might need to put up more poles in the shed to hold up the net	

Believe in yourself! Have faith in your abilities!

f) Construct a shed



Practical Exercise: Construct a shed and choose shading materials to protect the cashew seedlings from the direct sunlight. Considering all the factors you have learned.



SELF ASSESSMENT

1. Explain shading in cashew nursery.

2. State the importance of shading.

3. State the uses of tools for shed construction.

4. State the types of nursery sheds.



Great success, you are almost done! Let's tackle the two last chapters.

5. DEMONSTRATE SKILLS FOR PREPARING ROOTSTOCK

a) Explain rootstock preparation

The rootstock is the part of the plant comprising the root system and the stem.

Rootstock preparation includes the following steps:

1. Filling poly bags with a good potting mix
2. Arranging filled poly bags in nursery
3. Watering filled poly bags
4. Seed selection
5. Seed sowing



For more information on the rootstock preparation, watch video on *Cashew Nursery Establishment and Grafting* from Minute 1:35 to 3:30

b) State the importance of rootstock preparation

You must prepare a rootstock, so it can develop into a healthy seedling with a strong root system and stem before you can graft.



Source: Yeboah, Cocoa Research Institute Ghana (2018) – Re-arranging rootstock after sowing

c) State the different operations to consider in cashew rootstock preparation

1. Filling poly bags with a good potting mix

The main requirement for filling poly bags is the preparation of a good potting mix, according to the recommended ratios.

Soil type	Use these ratios		
	Topsoil	Sand	Manure
Heavy (clay soil)	1 Part	2 Parts	2 Parts
Medium (loam soil)	1 Part	1 Part	1 Part
Light (sand)	1 Part	0 Part	1 Part

Source: GIZ/ComCashew - Cashew Nursery Management and Grafting Technical Manual

A good potting mix is:

- thoroughly and uniformly mixed
- free of diseases
- light enough for the roots to easily penetrate
- one that holds moisture but drains well
- one that supplies all nutrients needed for the seedlings to grow

The soil should be moistened, but not so wet as to form a ball when squeezed in the hand. Fill the soil into the black poly-bags and compress it gradually. Then, place the filled bags in shade.



Prepare your pot mix between December and February.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
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For filling the poly bags, you can use any of the black poly-bag sizes:

- Small (6cm x 20cm)
- Medium (11cm x 20cm)
- Big (16,5cm x 20cm)

The size of poly bags also influences production costs in terms of:

- Labour
- Amount of pot mixture needed for filling
- Transportation



The size of poly bags also influences the growth of cashew seedlings. The most commonly used poly bag is the medium size (11cm x 20 cm).

2. Arranging poly bags in nursery

Before arranging the poly bags in the nursery, spread a thick plastic sheet or tarpaulin on the ground to restrict roots from penetrating into the ground. After filling the poly bags, place them in 1-meter-wide and 10-meter-long batches and leave a space of 70 cm on each side of the batch to facilitate nurturing of the rootstocks in the nursery.

Arrange the rootstocks in batches of 100, 150 or 200 rootstocks, depending on:

- the size of your nursery
- the number of rootstocks that you produce per day / week / year

Arrange the rootstocks in an open nursery, with a lot of ventilation and under the shade.



Source: Yeboah, Cocoa Research Institute Ghana (2018) – Arranged rootstock after sowing



Define the layout before placing the rootstocks to get the spacing right!

3. Watering poly bags

Reasons for watering rootstocks are:

- to prevent the soil from drying out.
- to supply the young, weak and sensitive plants with enough water to make sure they grow strong and healthy.

Water the rootstocks twice a day:

- early in the morning before sunrise
- and late in the afternoon



Source: Yeboah, Cocoa Research Institute Ghana (2018) – Watering of rootstock after sowing

4. Seed selection

From the first harvest, select the seeds from so-called mother trees that are/have:

- high yielding
- healthy
- in good vegetative state
- dark green leaves
- compact flowering
- a lot of good quality nuts

The selected nuts should have no flesh/pulp leftovers from the apples, after separating the raw cashew nut from the apple.

You can also procure the seeds from the National Agricultural Research Station, or from an old cashew farm with good mother trees.



It is important to estimate the volume of seeds required for raising a certain quantity of rootstocks depending on the germination rate.

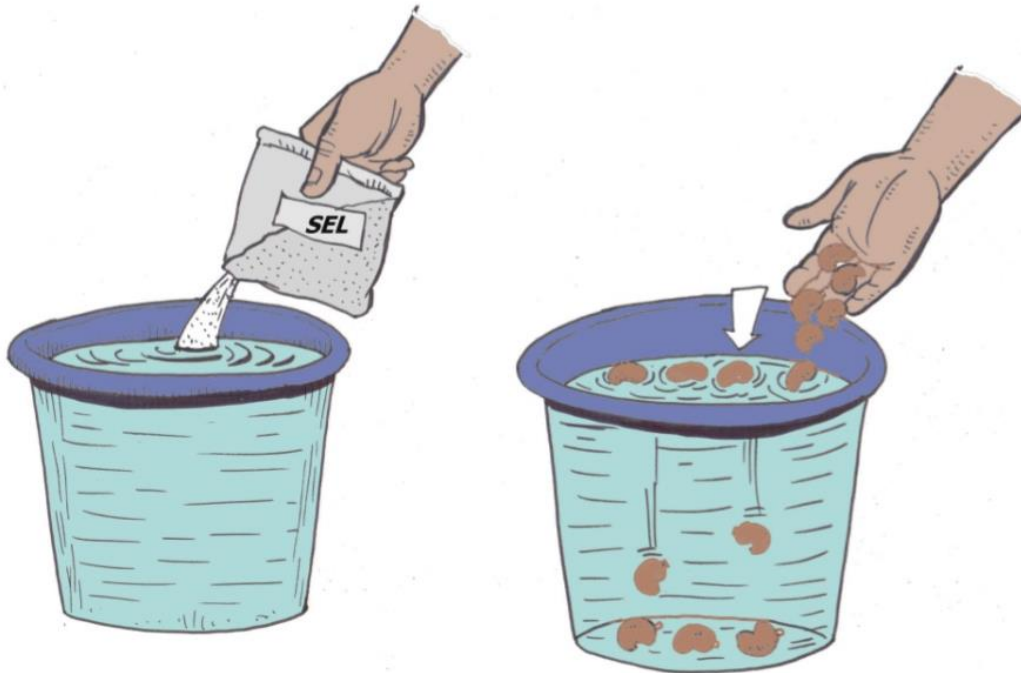


Pick medium-sized seeds (weight not less than 6g)



Source: GIZ/ComCashew – Raw cashew nuts from mother trees

Carry out a floatation test, to identify appropriate raw cashew nuts as seeds for sowing. Only select the seeds that sank to the bottom of the bucket.



Source: GIZ/ComCashew - Floating test

The following steps will guide you to conduct a floating test:

1. Fill a bucket with water
2. Add a hand full of salt to 10 litres of clean water
3. Put the medium-sized nuts in the water and stir vigorously. Do not put too many seeds at a time, they need space to float or sink to the bottom
4. Wait for 30 minutes
5. Discard the floating nuts. They are of lower quality and **cannot** be used for sowing
6. Select the nuts that sank to the bottom of the bucket. They have high viability and good germinative quality
7. Wash off the sunken raw cashew nuts (seeds) with clean portable water to remove the residual salt



Select your seeds for sowing from January to March.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
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5. Seed sowing

Sow the seeds as soon as possible after you have received them because they tend to lose viability and germination capacity over time.

Follow the seven (7) steps for direct seed sowing:

1. Soak the selected seeds (raw cashew nuts that sank during floating test) for 48 hours to encourage good germination. Change the water every 6 hours.
2. Sow the wet seeds (directly after soaking) at 2.5 cm deep with the seed scar facing upward in the filled poly bags.



The position of the nut during sowing should be the same as it appears on the tree



Source: GIZ/ComCashew – Direct seed sowing

3. Press the soil down firmly to ensure good contact between the soil and seed
4. Keep filled poly bags under shade for at least two weeks
5. Water the seeds twice a day
6. Mulch the seeds with grass to conserve moisture
7. Remove the grass as soon as the seeds germinate



Seeds will germinate within 2 to 3 weeks, depending on the quality of the seed.



Source: GIZ/ComCashew – Direct seed sowing



For more information on the direct seed sowing, watch video on *Cashew Nursery Establishment and Grafting* from Minute 2:29 to 3:38

If your seeds have been stored for more than 2 months, conduct pre-germination:

- Soak the selected seeds (raw cashew nuts that sank during floating test) for 48 hours to encourage good germination. Change the water every 6 hours
 - Plant seeds on a sandy bed (15 cm depth and 100 cm width), or in wet jute bags for germination before transplanting into poly bags.



Pre-germination is also useful in order to replace already sowed but un-germinated seeds with pre-germinated seeds.



For pre-germination, follow step 1 to 6 above under direct seed sowing. Prepare only as many germinating seeds as you can pot within 30 minutes.

After pre-germination, follow the five (5) steps for transplanting pre-germinated seeds into poly bags:

1. Lift the germinating seed carefully, holding it by the cotyledons, so that the roots do not get damaged.
2. Make a hole in the poly bag mixture using a small stick. Ensure that the hole is in the centre of the poly bag and that it is longer than the roots of the germinating seed to be potted. This will ensure adequate room for the root and prevent damage.
3. Put the seed into the hole, ensuring the roots are not damaged. Insert the seed a bit deeper than necessary to ensure proper coverage.
4. Press soil mixture firmly around the seed and water thoroughly to avoid air pockets in the soil mixture.
5. Keep filled poly bags under shade for at least two weeks.



Source: GIZ/ComCashew – Transplanting of germinated seeds

d) **State the uses of tools used in rootstock preparation**

Soil preparation, filling and transporting poly bags require the following tools:

- **Shovels of two sizes** for soil amendment and filling of poly bags



Sources: <https://www.bergfreunde.de/cold-steel-special-forces-shovel-spaten/>
<https://kentandstowe.com/Our-Products/Digging/Stainless-Steel-Pointed-Spade>

- **5mm Sieve** to remove stones and debris from the soil



Source: https://www.diy.com/departments/b-q-metal-soil-sieve-w-110mm-l-390mm/189497_BQ.prd

- **Wheel Barrow** to transport the filled polybags inside the nursery



Source: <https://www.coopsuperstores.ie/Garden/Garden-Tools/Garden-Wheelbarrow/Build-It-Galvanised-Wheelbarrow-100lt-1773313>

- **Watering Can** to moisten the soil before and after filling the poly bags

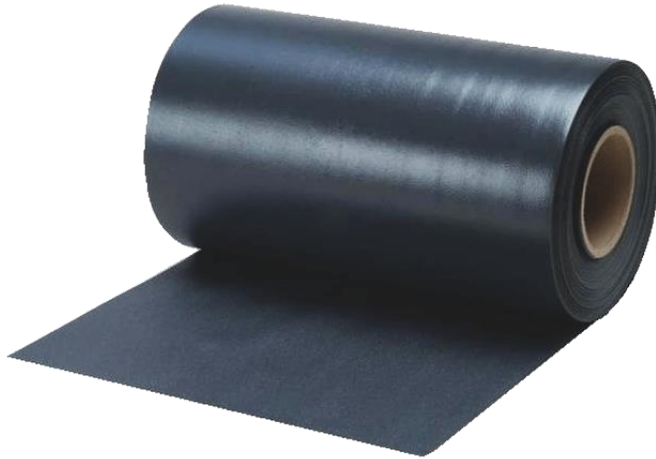


Source: https://www.diy.com/departments/sankey-green-plastic-watering-can-13l/244059_BQ.prd

e) **Identify the materials used in rootstock preparation**

The following materials are required for rootstock preparation and arrangement:

- **Poly sheet** to make your own poly bags.
 - The standard thickness of polybags is >250 micron.



Source: <https://www.gt-max.com.my/plastic/product/construction-sheets-builder-films/>

- **Poly bags in different sizes**
 - Poly bags are also available in different sizes:
 - Small (6cm x 20cm)
 - Medium (11cm x 20cm)
 - Big (16,5cm x 20cm)



Source: <https://www.ugao.com/nursery-plant-poly-bag-pack-of-100-bags-6-in-x-8-in-dia-x-h.html>

Before arranging rootstocks, cover the ground soil with **tarpaulins** to:

- avoid contact with the ground
- minimize pest and disease infestation



Source: https://www.msquaredphotog.com/index.php?main_page=product_info&products_id=2620

f) **Prepare cashew rootstock**



Practical Exercise: Go to the nursery and prepare rootstocks considering all the factors you have learned in this unit.



Source: GIZ/ ComCashew - Cashew Nursery Management and Grafting Technical Manual



SELF ASSESSMENT

1. Explain rootstock preparation.

2. State the different operations to consider in cashew rootstock preparation.

3. State the uses of tools used in rootstock preparation.

4. Identify the materials used in rootstock preparation.



Well done! You only have one more unit to complete.

6. DEMONSTRATE SKILLS FOR NURTURING ROOTSTOCK

a) Explain nurturing of cashew rootstock

Nurturing rootstocks is your daily task at the nursery. All rootstocks that you have planted so far need good care to grow into high-quality seedlings.

Nurturing practices include:

- watering of rootstocks
- checking for pest and disease during rootstock development
- cleaning the nursery from any rubbish to avoid contamination
- providing enough shade when the rootstocks develop into seedlings

b) State the importance of nurturing cashew rootstock

Nurturing your rootstocks is important, so the seed can develop a strong root system and a healthy stem. Provide the rootstock with the necessary water and protection against pests and diseases by following the recommended nurturing practices. Some of the common pests and diseases of seedlings and rootstocks in cashew nurseries are:

1. Cashew leaf miner

Acrocerops sp.



Source: Awudzi (2018) – Cashew leaf miner

Mode of attack and symptoms:

- The larva of the leaf miner scrapes and covers the upper leaf surface with a gelatinous secretion which dries and gives a silvery appearance

Procedure for pest control:

- Physical control
 - Practice good nursery sanitation
 - Prompt removal & destruction of affected leaves to prevent spread of the infestation (Practicable at the nursery stage).
- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)

2. Cashew Mosquito Bug

Helopeltis spp.



Source: Awudzi (2018) – Sap-sucking bugs

Mode of attack and symptoms:

- Both nymphs and adults feed on young shoots, leaves, young nuts and apples. The injection of toxic saliva into the plant tissue results in damage to flush leaves and stems by the presence of brownish-black patches, which result in dieback. In severely damaged seedlings, the entire leaves are destroyed.

Procedure for pest control:

- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)

3. Cricket

Gryllus sp.



Source: <https://bugguide.net/node/view/846888>

Mode of attack and symptoms:

- Crickets cut the stem of young cashew seedlings which, in many cases, results in the death of the plant.

Procedure for pest control:

- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)

4. Caterpillars / Defoliators



Source: http://invasives.wsu.edu/defoliators/galleries/gallery_larvae.html

Mode of attack and symptoms:

- Caterpillars feed on young developing leaves of cashew. These caterpillars are the larval stage of moths.

Procedure for pest control:

- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)

5. Termites



Source: <https://www.orkin.com/termites>

Mode of attack and symptoms:

- Termites destroy seedlings and young plants by biting on fresh stems.
- This results in the wilting of leaves and death of the plant.

Procedure for pest control:

- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)

6. Seedling blight

Mode of attack and symptoms:

The disease caused by *Septocylindrium sp.* causes wilting and withering of leaves as a result of root rotting.

Procedure for pest control:

- Preventative control
 - Ensure good soil drainage to reduce disease incidence
 - Ensure seedlings germinate promptly
 - Avoid over-shading
- Chemical control (*Study Unit 3 on Pest and Diseases Management, NC 2 Level*)



Source: GIZ/ComCashew – Seedling blight



In nurturing your rootstocks, you prepare them for successful grafting.

c) **State the uses of tools for nurturing cashew rootstock**

The following tools are required for nurturing grafted seedlings:

You can water your rootstocks in different ways, depending on the equipment you have available:

- by hand with a **Watering Can**



Source: https://www.diy.com/departments/sanke-green-plastic-watering-can-13l/244059_BQ.prd

- through a **Water Pipe System** (motor pump, pedal pump, etc.) connected to **Garden Hoses**



Source: https://www.diydoctor.org.uk/projects/installing_an_outside_tap.html



Source: <https://www.indiarubbers.com/pvc-hose.html>

- through an installation of pipes connected to a **Natural Water Reserve** (for example, Lake Volta)



Source: <https://hiveminer.com/Tags/dji,volta>

- Use a **Hoe** to remove weeds in the nursery.



Source: <https://seymourmidwest.com/42441>

- Use a **Rake** to collect the weeds and any rubbish in the nursery.



Source: <https://www.krafttool.com/GG871>

d) Identify the practices for nurturing cashew rootstock

The following practices are important in nurturing cashew rootstocks:

- Hoeing to remove weeds
- Clearing the nursery of any rubbish
 - Sweeping and cleaning of poly bags
- Watering of rootstocks and later seedlings
- Inspecting seedlings for pests and diseases
- Treating seedlings against pests and diseases
- Providing enough shade for the fragile plant

e) Outline the procedure for nurturing cashew rootstock

Use the checklist to follow steps 1 to 6 in nurturing cashew rootstocks. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Carefully place and arrange the rootstocks in a stress-free environment	
2. Keep nursery clean of any rubbish	
3. Water the rootstocks once or twice a day (depending on the weather)	
4. Inspect rootstocks for signs of insect and disease attack	
5. Treat seedlings against pests and diseases	
6. Provide enough shade for the rootstocks	

Results happen over time, not overnight. Work hard, stay consistent, and be patient.

f) Nurture cashew rootstock



Practical Exercise: Go to the nursery and nurture your cashew rootstock considering all the factors you have learned.



SELF ASSESSMENT

1. Explain nurturing of cashew rootstock.

2. State the importance of nurturing cashew rootstock.

3. Identify the practices for nurturing cashew rootstock.



*Congratulations! You have completed this entire unit successfully.
Be proud of yourself!*

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