

## LEARNING FACILITATING MATERIALS

### NATIONAL PROFICIENCY LEVEL 1

### TRADE AREA: **CASHEW PRODUCTION**

#### UNIT 2

## **RAISING AND NURTURING OF ROOTSTOCKS IN A CASHEW NURSERY**



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## UNIT INTRODUCTION

Welcome to Unit 2 of your learning journey in cashew production. This guide explains the main steps for raising and nurturing rootstocks in a cashew nursery.

Do you already know why rootstocks are raised and nurtured in a cashew nursery?

If you follow the steps for raising and nurturing rootstocks in the right sequence, you are conducting the first steps in developing improved planting materials that will produce a lot more of high-quality cashew nuts. Do not miss a step! Apply your knowledge and skills perfectly to raise and nurture rootstocks.



In this unit, you will learn about the main steps for raising and nurturing rootstocks for cashew seedling production. The learning material covers four sub-units:

- 1) Filling poly-bags
- 2) Arranging rootstocks
- 3) Watering rootstocks
- 4) Seeding (Sowing)

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.

Follow the recommended steps for raising and nurturing rootstocks to produce high-quality seedlings that will grow into high-producing cashew trees.

Raising and nurturing your rootstocks correctly is the first step to setting up a successful nursery business in cashew production.

Even though, this learning material provides essential information on raising and nurturing rootstocks for the National Proficiency Level 1, 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 cashew learning journey? Let's start!

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## ICONS



LEARNING  
OBJECTIVES



ATTENTION



PRACTICALS  
HANDS ON



CROPPING  
CALENDAR



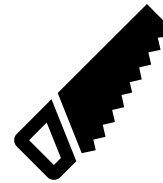
SELF ASSESSMENT



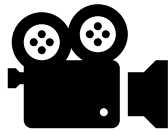
WELL DONE!



TAKE A BREAK!



DEMONSTRATE  
USE OF  
TOOLS



WATCH VIDEO

## ABBREVIATIONS

Here are some commonly used abbreviations.

<b>cm</b>	Centimeter (1 cm = 10 millimeter)
<b>g</b>	Gram (1000 g = 1 kilogram)
<b>m</b>	Meter (1 m = 100 cm)

## 1. DEMONSTRATE SKILLS FOR FILLING POLY BAGS FOR ROOTSTOCK PROPAGATION

### a) Identify the materials/tools required for filling poly bags

Filling poly bags requires the following tools:

- **Shovels of two sizes** for collecting, mixing and filling the soil



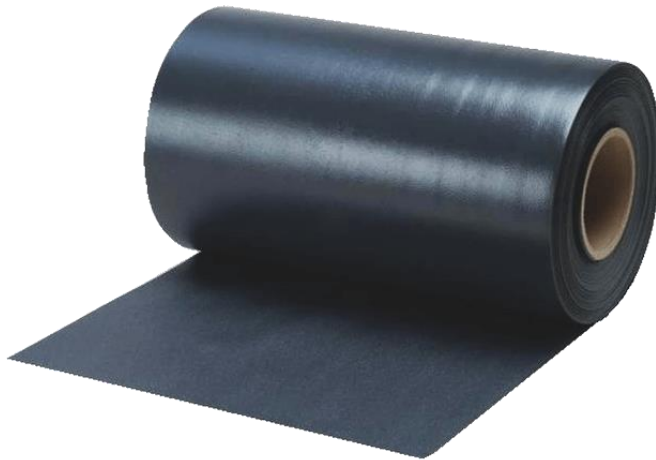
Sources: <https://www.bergfreunde.de/cold-steel-special-forces-shovel-spaten/>  
<https://kentandstowe.com/Our-Products/Digging/Stainless-Steel-Pointed-Spade>

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

- **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.ugaoo.com/nursery-plant-poly-bag-pack-of-100-bags-6-in-x-8-in-dia-x-h.html>

- **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](https://www.diy.com/departments/sankey-green-plastic-watering-can-13l/244059_BQ.prd)



- **Soil materials** to develop the pot mixture for filling the polybags
  - A good pot mixture is made up of:
    - Top soil
    - Sand
    - Decomposed or well-composted manure

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

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

- **Rubber Boots** to protect your feet during nursery operation



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

- **Gloves** to protect your hands during nursery operations



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

**b) Describe the process of soil preparation before filling poly-bags**

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



Excellent



Okay



Try Again

Activities	Rate
1. Mix arable top soil, sand and well-decomposed or compost manure according to the ratios mentioned under soils materials	
2. Sieve the mixture through a 5mm sieve to remove large particles and debris	
3. Moisten the mixed soil	
4. Fill the mixed soil (pot mixture) in the poly bags	
5. Keep the filled poly bags under the shade	

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



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

**c) Outline the requirements for filling poly bags**

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

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

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

A good pot mix is:

- thoroughly and uniformly mixed
- free of diseases
- light enough for the roots to easily penetrate
- holding moisture but drains well
- supplying 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

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)



Small poly bags are more economical, they require less soil mixture and occupy less space in the nursery. The size of the poly bags influences the growth of cashew plants. Plants in small poly bags exhaust the nutrients and moisture in the bags more quickly than those in big poly bags.

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

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

#### d) Fill poly bags for raising rootstock



Practical Exercise: Go to the nursery or farm to prepare your pot mix and fill poly bags for raising your rootstocks. Considering all the factors you have learned in this unit.



Source: GIZ/ComCashew - Cashew nursery at Volta Cashew



## SELF ASSESSMENT

1. State three (3) soil materials you need for filling poly-bags.

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2. State the soil ratios that you need to consider in preparing a good pot mix.

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3. Describe the process of filling polybags in five (5) steps.

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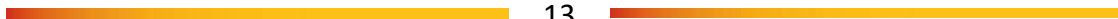
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*Congratulations! You have completed the first set of questions.  
Take a break before you move on to the next chapter.*



## 2. DEMONSTRATE SKILLS FOR ARRANGING ROOTSTOCKS

### a) Outline reasons for rootstock arrangements/re-arrangements

Rootstock arrangement is done to facilitate:

- sowing
- transplanting
- watering
- weeding
- grafting
- pruning
- counting seedlings
- monitoring and documenting seedling performance



Arrange your rootstocks wisely, to save a lot of time and materials in nurturing and maintaining your rootstocks and seedlings.



Arrange your rootstocks wisely, to save money and increase your profits.



Arrange your polybags after filling in between December and February.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
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**b) Outline the procedure for arranging/re-arranging rootstock**

After filling the poly bags, place them in 1 m wide strip 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: GIZ/ComCashew - Cashew nursery at Volta Cashew with arranged seedlings



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

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



After arranging the rootstocks, prepare a label for each batch, with your name, date and the number of rootstocks that you have prepared for easy tracking.



**c) Arrange/re-arrange rootstocks**



Practical Exercise: Go to the nursery or farm and arrange/re-arrange your rootstocks, considering all the factors you have learned.



**SELF ASSESSMENT**

1. State five (5) reasons for arranging your rootstocks.

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2. State the number of rootstocks that make up a batch in a nursery.

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3. State the appropriate spacing between the batches of rootstocks.

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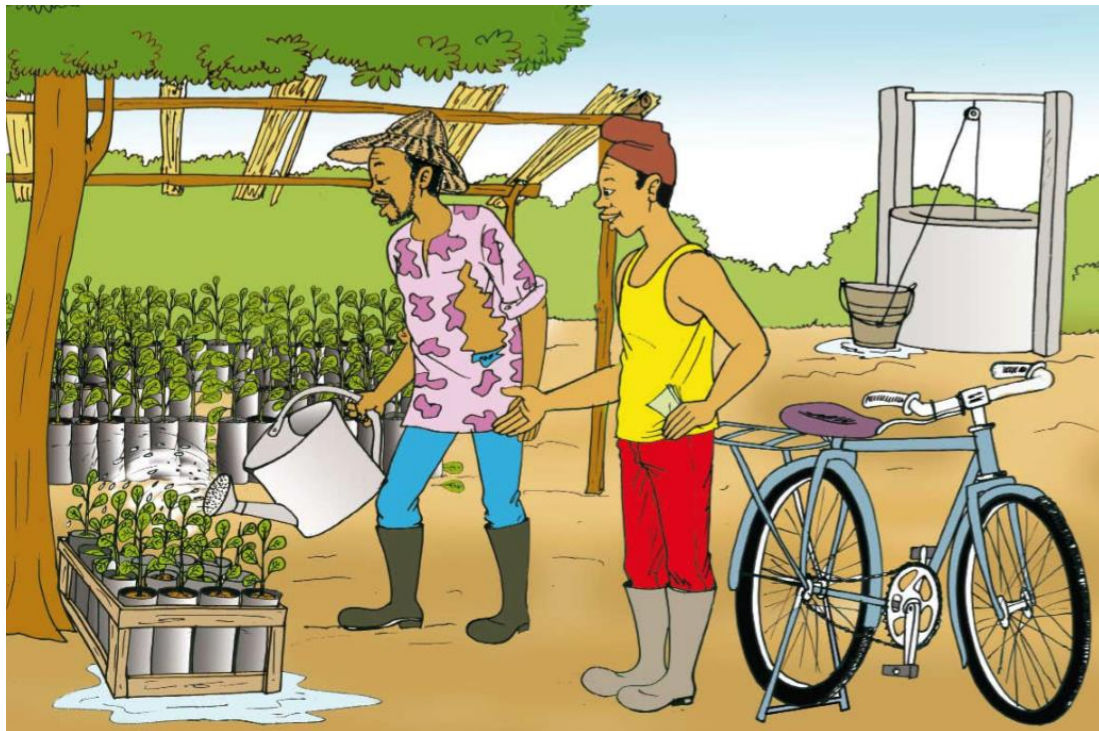
*Well done! You are doing great on your path to success.*

### 3. DEMONSTRATE SKILLS FOR WATERING ROOTSTOCKS

#### a) Outline the reasons for watering rootstocks

Reasons for watering rootstocks are:

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



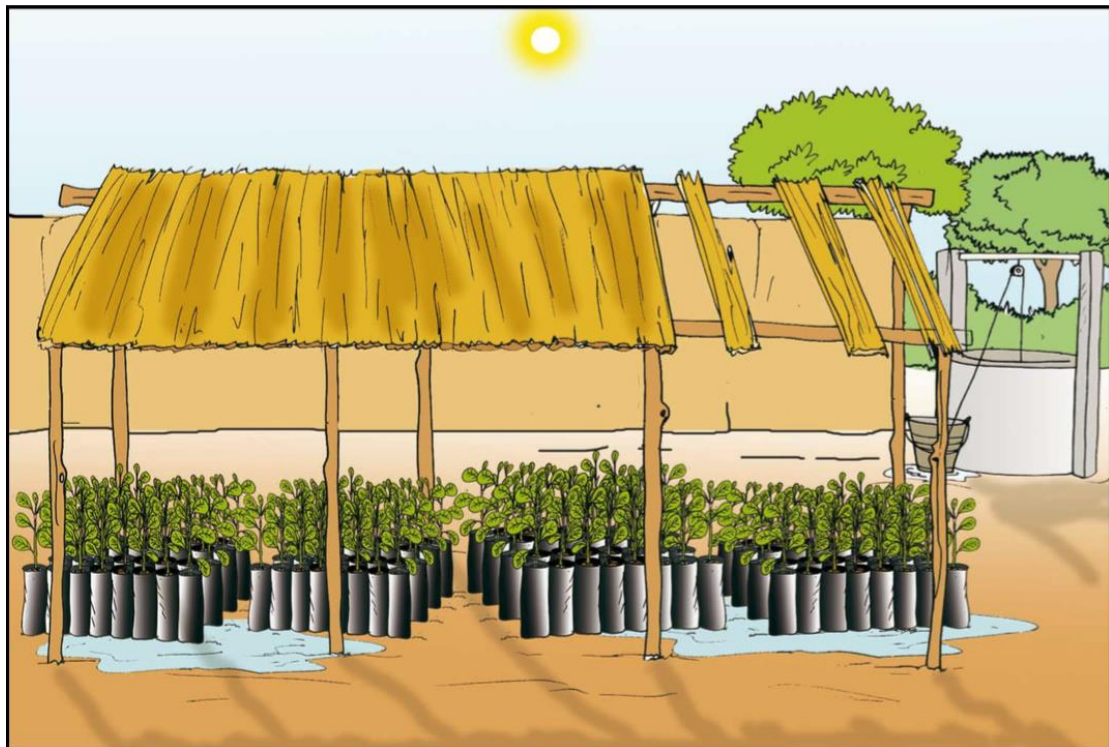
Source: GIZ/ComCashew – Watering of seedlings in cashew nursery

## b) Outline the procedure for watering rootstocks

It is necessary to water the plants regularly, at least once or twice a day depending on the weather conditions (heat and rain).

Water the rootstocks twice a day:

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



Source: GIZ/ComCashew – Watered cashew seedlings in cashew nursery



Don't use more water than necessary! Water is a precious good!

c) **Demonstrate the safe use of equipment for watering**



Practical Exercise: Go to the nursery or farm for your apprenticeship and demonstrate the safe use of tools during watering your rootstocks.

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/sankey-green-plastic-watering-can-13l/244059\\_BQ.prd](https://www.diy.com/departments/sankey-green-plastic-watering-can-13l/244059_BQ.prd)

- with **Sprinklers** from a nearby water source



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

- 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.htm](https://www.diydoctor.org.uk/projects/installing_an_outside_tap.htm)



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>



Don't use more water than necessary! Water is a precious good!

d) **Water rootstocks**



Practical Exercise: Go to the nursery or farm for your apprenticeship and water your rootstocks with a watering can.



Source: GIZ/ComCashew – A watered rootstock



**SELF ASSESSMENT**

1. State two (2) reasons for watering rootstocks.

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2. State the various equipment used for watering.

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*Congratulation! You completed half of this training on establishing cashew plantation. Take a deep breath and continue to the next chapter. You are doing great!*

#### 4. DEMONSTRATE SKILLS FOR SEEDING (SOWING)

##### a) Identify raw cashew nuts as seeds for sowing

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.



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



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



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



Source: GIZ/ComCashew - Floating test



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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**b) Outline the selection process of seeds for sowing**

Use the checklist to follow steps 1 to 7 in selecting seeds for sowing with the help of a floating test. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Fill a bucket with water.	
2. Add a hand full of salt to 10 liters of clean water.	
3. Put the mediums-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 sunk to the bottom of the bucket. They have high viability and good germinative quality.	
7. Clean the sunken raw cashew nuts (seeds) from the residual salt.	

*Life is a learning journey!*



For more information on the floating test, watch video on *Cashew Nursery Establishment and Grafting* from Minute 1:35 to 2:29

### c) Outline the sowing process

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

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
  - Germinate seeds on a sandy bed (15 cm depth and 100 cm width), or in wet jute bags before transplanting into poly bags.



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 so 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 center 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) Perform sowing**



Practical Exercise: Go to the nursery or farm to sow the seeds into the poly-bags that you have prepared, using the direct sowing method.  
Keep in mind, what you have learned about how your seeds will grow best!



**SELF ASSESSMENT**

1. State three (3) factors to consider in determining a good raw cashew nut for sowing.

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2. Explain the floatation test.

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3. State in which months the seed selection takes place for sowing.

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*Congratulations! You have completed this Unit*

## REFERENCE

Peace Corps. (n.d.). *Cashew Nursery Establishment and Grafting*. Retrieved from <https://www.youtube.com/watch?v= OOlOiVryc>

GIZ/ComCashew. (2018). *Cashew Nursery Management and Grafting Technical Manual*.

ACi (2010). *Bonne pratique de creation d'un nouveau verger d'anacadiers*