COCOA NURSERY ESTABLISHMENT USING FARMER FIELD SCHOOL APPROACH

Training Module Prepared by:

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INTRODUCTION

- Cocoa (*Theobroma cocoa*) is one of the most essential cash crops grown in Liberia as an important foreign exchange product earner.
- The major cocoa producing counties in Liberia are Lofa, Bong, Grand Gedeh and Nimba.
- With the present level of management, low inputs of labor and planting materials of unproven yield potential, yields of cocoa are low.
- The low yields could be increased significantly through the growing of improved varieties and good husbandry practices of which establishing high quality nursery is one.

Target Audience

- Undergraduate students
- Farmer-facilitators
- Extension officers and
- Nursery establishers/operators.

Objectives

At the end of this training, participants will be able to:

1. Describe the techniques and practices that will help farmers and nursery operators to achieve success in the production of healthy cocoa seedlings.
2. Identify common nursery problems and how to deal with them or avoid them.

Day 1 Overview

- Lesson 1. Site Selection. An important practice in nursery operation. It enhances quality seed production.

- Lesson 2. Site Preparation and size. Timely and proper site preparation is necessary for the production of quality seedlings in the nursery. Proper clearing and leveling of the site is paramount to establishing successful nursery.

Suggested Schedule

Time	Activity	Teaching strategy
8:30	Breakfast	N/A
0900	Introduction	N/A
09:30	Lesson 1. Site Selection	Brainstorming , Discussion , Plenary sessions Lecture
12:00	Lunch	
13:00	Lesson 2. Site preparation and size	Discussion, brainstorming, worksheet, lecture Group activity
14:45	Break	
15:00	Lesson 2. Site preparation and size	Discussion, brainstorming, worksheet, lecture
16:30	Daily Recap	Open discussion, questions and answers
17:00	Conclude	

Lesson 1: Site Selection

Selecting an ideal site for cocoa nursery establishment is a crucial aspect to nursery operation. This lesson will provide a clear picture on how this is done.

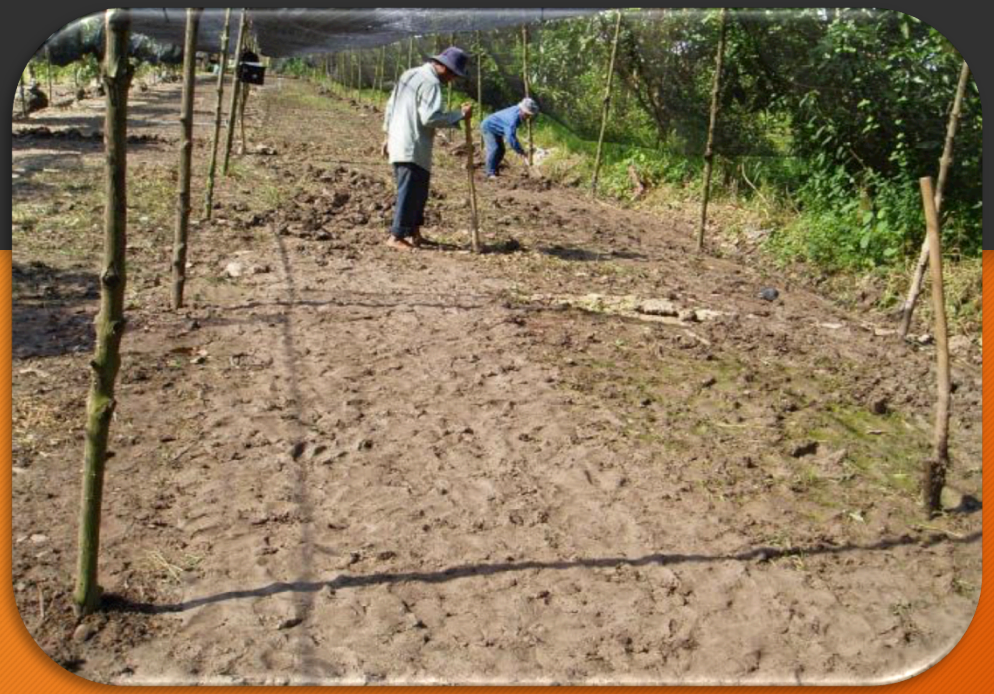
Characteristics of a good site

- The site must be easily accessible by humans and vehicles
- The site must have a good supply of fresh water, not salty at any time
- The nursery must be reasonably close to the permanent cocoa site.
- The nursery area should be fenced off.
- The nursery ideally will be 100 meters or more from existing cocoa trees
- Nursery site should be free from hills and very stepy slope

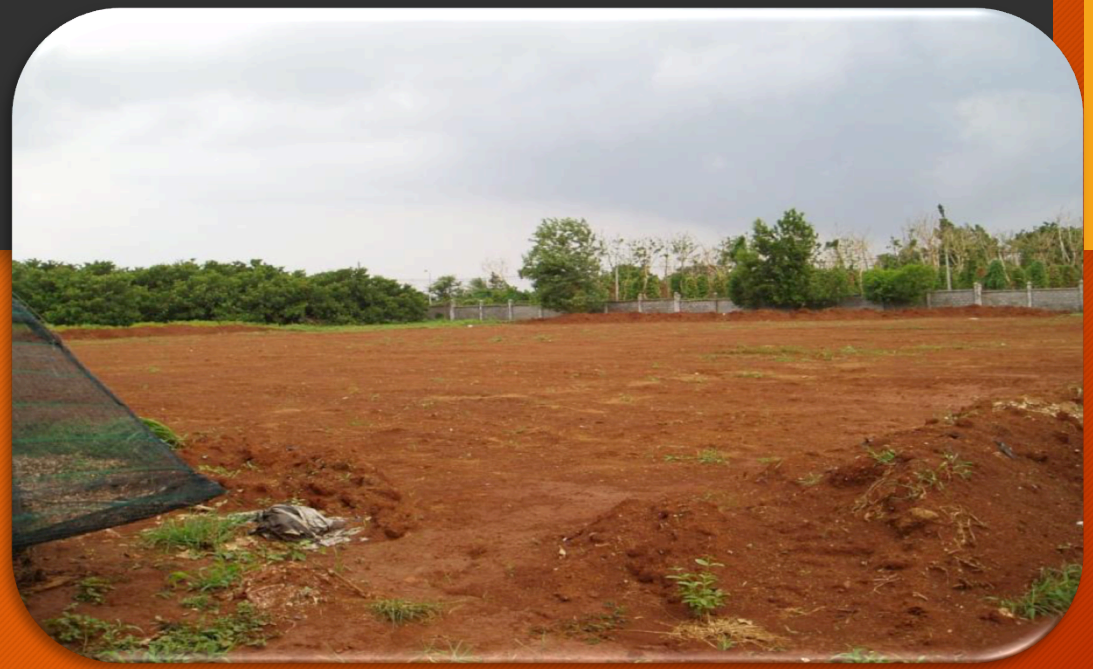
Site Preparation

- A well prepared site promotes easy construction and layout of field
- Design the nursery site on a piece of paper indicating the size of the field and other dimensions
- Mark out the entire field using tape rule, twine and pegs
- Properly clear the entire site using local farm tools
- Carefully mark the four corners, entrance and the area for the fence
- Clear the entire field by removing all grasses and bush/ obstacle
- If possible plow and level the entire field

Site Preparation Continued



Farmers clearing and marking out their field



A well leveled site ready for layout

Site Preparation Continued

Pegging Poles at the Nursery site

Conclusion

- Summarize lessons taught for the whole day and ask participants what they have learnt and how useful they find the new knowledge they have had.
- Lead the farmers through a practical session on the field.

Day 2: Overview

Daily Lessons

- Lesson 3: Nursery construction and design.
- Lesson 4: Planting media and Poly bag.
- Lesson 5: Seed Propagation.

Suggested Schedule

Time	Activity	Teaching strategy
8:30	Breakfast	N/A
09:00	Lesson 3: : Nursery construction and design	Brainstorming, Discussion Plenary sessions , Lecture
11:00	Lesson 4: Planting media and Poly bag	Lecture, brainstorming, group activity, demonstration
12:00	Lunch	
13:00	Lesson 4. Continued	Group activity and demonstration
14:45	Break	
15:00	Lesson 5. Seed Propagation	Discussion, brainstorming, worksheet, lecture, demonstration
16:30	Daily Recap	Open discussion, questions and

Nursery Construction and Design

- There are several designs used to construct cocoa nursery
- Use an appropriate design that suits your field and the level of your income.
- For a temporal, short term and cheaper nursery, use bamboo or log posts, well pruned upright growing trees (ie Glyricidia, Erythrina) and wire or twine to make the frame, and cover the structure with palm fronds to provide shade or stretch shade cloth over the frame.
- For a permanent and a longer lasting nursery, use steel posts embedded in concrete, with a wire frame or steel tubing framework. Timber posts are susceptible to termites and rotting.
- Use PVC piping for small nurseries, and galvanized pipe and fitting for any size nursery.

Nursery Construction and Design Continued

- Palm fronds or shade clothes can be used to cover the frame
- The shade material used should provide 60-70% shade for the sit e

Timber frames used as scaffold

Local and poorly constructed nurseries

Nursery Construction and Design Continued

Bamboo poles as scaffold, with wire supported shade cloth

Concrete posts as scaffold, with wire supported shade cloth

Nursery Construction and Design Continued

There are different layout used in nursery

Twines used to mark beds and pathways

Good Nursery VS Poor Nursery

Well Design and layout Nursery

Poorly Design and laid out Nursery

Planting Media and Polythene Bag

Cocoa seeds can be sown in various potting media. They are

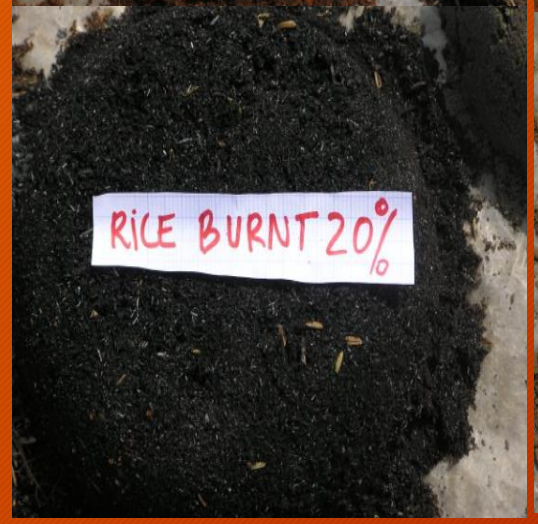
- ❑ Natural potting mix
- ❑ Artificial potting mix

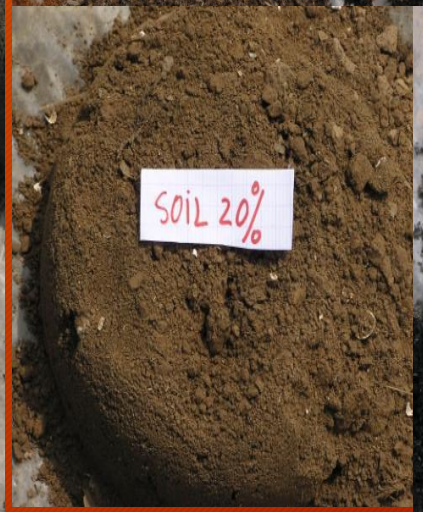
1. Natural Potting Mix – these comprised of soil and other organic materials that support plant growth. These materials can be used alone or blend to give a perfect mix that will enhance rapid seedling establishment.
2. Artificial Potting Mix- they are made up of a blend of different materials Artificial potting mix components suitable for cocoa seedlings include- 20% coco peat, 20% rice hull, 20% CRH, and 20% soil,10% sand and 10% manure.

Natural and Artificial Potting Media

Natural Potting Media

Artificial Potting Media





Natural Potting Material Ready for Mixing

Polythene Bag Size

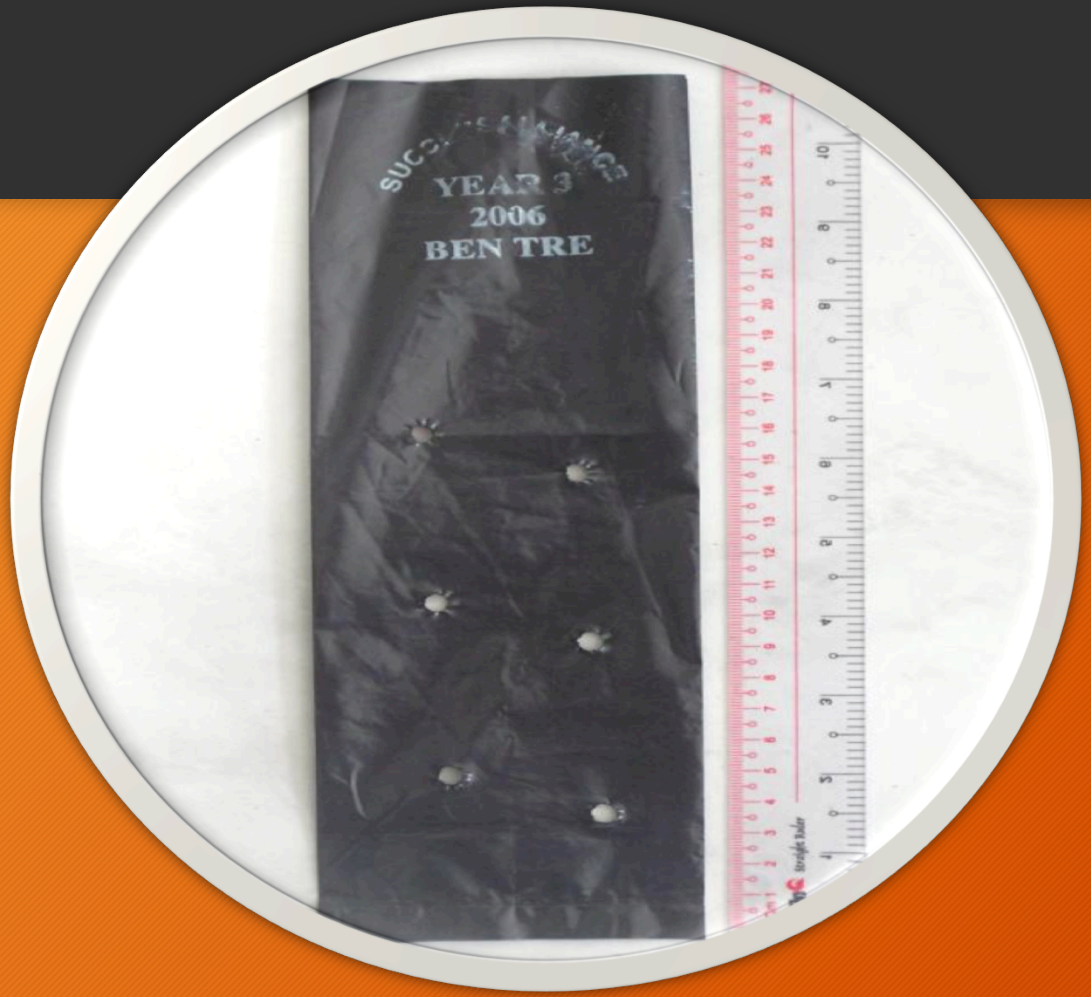
- The size and color of polythene bag has effect on cocoa seedling establishment in the nursery.
- Black poly bags are preferred over clear poly bags
- Note that clear bags support algae infection
- Use black poly bag with 150 -200 guage
- Use the smaller size poly bag if the nursery is going for a shorter period say less than 5 months
- Use large size poly bag if the nursery period is going above 5 months

Disadvantage of Using Small Poly Bag

- Causes problems in the growth and root development of cocoa
- It result in the production of bent, deformed and twisted root

Photo Showing defective tap roots as a result of small size poly bag

Filling of Poly Bag



Poly Bag with size 26 x12 cm

Filling of Poly bag

Seed Propagation

Propagation of seeds refers to the multiplication of plants by seeds

❑Seeds as Planting Material

- Seed is a major propagating material used in cocoa production
- Good quality seeds promote good germination and growth
- Select seeds from healthy, mature and ripe pods
- Do not store pods for more than four days

❑ Plant part as Planting material

- Use healthy root stock

Propagating Material Seed and Vegetative parts

Cocoa Seed

Vegetative Plant part

Rootstock

Scion

Seed preparation

Steps in Seed Preparation

- ❑Select pods that are ripe and healthy

Healthy pods

Unsuitable pods

Defective beans in a pod

Processing Seeds for Planting

Steps

- ❑ Open a healthy pod using wooden mallet
- ❑ Don not use knife as you may cut the seeds
- ❑ Remove seed from pods and separate seeds from placenta and pulp
- ❑ Discard any flat seed, damaged, germinated seed or very small seed
- ❑ Rub the seed in saw dust or smooth sand to remove the pulp from outside of the seeds
- ❑ Wash the seeds in water and drain
- ❑ Soak the seed in a fungicide solution for about one minute
- ❑ Drain the seeds and place onto a tray or sack in a shaded and cool area, protected from wind and rain, to drain for about 10 minutes

Processing Seeds for Planting Continued

Seed germination and pre- germination

Pre-germination of seeds is the act of forcing the seeds to germinate before we plant them in the poly bags.

Steps

- ❑Place the seed in a single layer on clean jute bags out of the wind, sun and rain. Cover with another jute bag. For a small quantity use a plastic tray with plastic cover.
- ❑Record the date seed was placed onto tray, i.e. when germination started
- 3) Every day for up to 4 days inspect the seed and remove any seed that has germinated. This will show as a white ‘button’ on one end of the seed. These seeds are ready to plant into the pots, and you should plant them straight away. Do not wait to get a large amount ready before you plant them.

Seed germination and pre- germination Continued

After 3 to 4 days, seeds will start to have long shoots on them and these should be discarded, as they can result in stem and collar deformations and root problems. So make sure that you inspect seed every day and discard all remaining seed after 4 days. (It cannot be fermented either).

Pre-germination of seeds using plastic tray

Pre-germination of seeds using plastic tray

Pre-germination of seeds using plastic tray

Seed planting

- Place the pre-germinated seed with the root tip pointing down, into the potting mix in the bag. Make a small hole about 1 cm deep for this and leave about half of the seed poking out of the potting mix.
- Don’t sow the seeds too deep
- After planting use a fine spray or watering can to water the potting mix

Conclusion

- Summarize lessons taught for the whole day and ask participants what they have learnt and how useful they find the new knowledge they have had.

- Lead the farmers through a practical session on the field.

Day 3 Overview

Daily Lessons

Lesson 6: Water Application

Lesson 7: Seedling Health Management.

Suggested Schedule

Time	Activity	Teaching strategy
8:30	Breakfast	N/A
09:00	Lesson 6: Irrigation	Brainstorming, Discussion Plenary sessions , Lecture
11:00	Lesson 7: Seedling Health Management	Lecture, brainstorming, group activity, demonstration
12:00	Lunch	
13:00	Lesson 7 continued	Group activity and demonstration
14:45	Break	
15:00	Lesson 7: Seedling Health Management	Discussion, brainstorming, worksheet, lecture, demonstration
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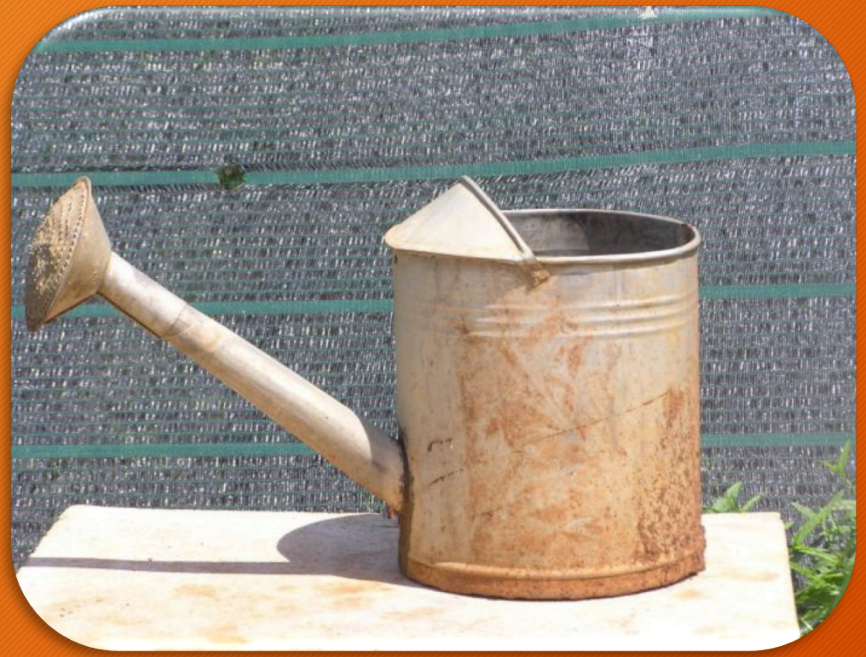
Water Application

- Apply water immediately after sowing seeds in the poly pot
- Apply water in the morning and in the evening
- Do not over water the crop
- Use watering can and hose
- If by hoses reduce the pressure and use a water rose to sprinkle water
- Use good quality water that is free from salt



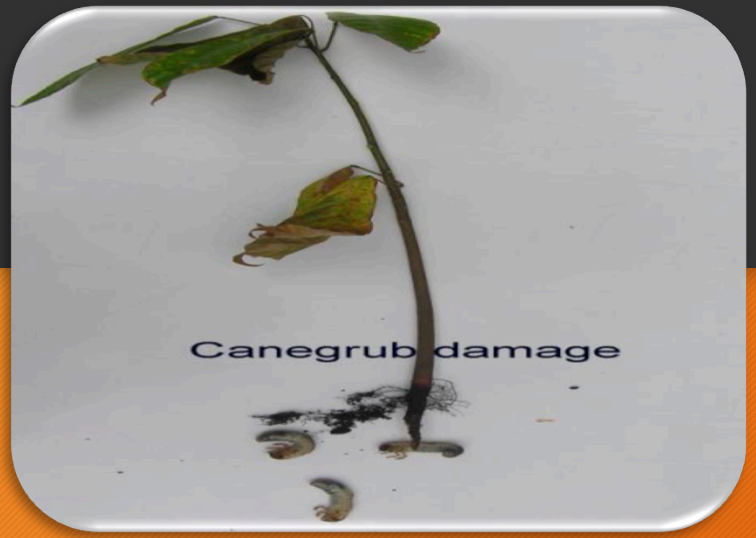
Seedling Health Management

- Healthy seedlings are free from pest, disease and weed attack.
- These natural enemies of crop can be put under control to ensure the production of healthy and high quality cocoa seedlings.
- The most common insects are insects such as thrips, mites, aphids and mirids, which suck plant tissues causing leaf and stem distortion and leaf drop.
- Other insects such as armyworms, loopers and grasshoppers eat leaves.
- Occasionally termites and root chafers may be a problem

Control Measure

- Treat insects with ‘softer chemicals’ such as oil based sprays (Summer oil or DC Tron) or pyrethroids (Confidor).
- Treat termites and root chafers with a drench of Chlorpyrifos, or insecticide granules.
- Use IPM approach to nursery insect pest management. This includes removing insects by hand, keeping insects out by having all sides covered with shade cloth, keeping weeds out of the nursery, and introducing insect predators.

Seedling Health Management



Disease Problem and Management

- The most common disease problems seen are seed and seedling rots and seedling blight
- Seed and seedling rots are best controlled by prevention
- Seedling blight is caused by Phytophthora fungi, and occurs if leaves are wet for long periods such as in heavy rains
- It can spread very quickly by rain splash and leaf to leaf contact.
- Control by initiating good ventilation in the nursery
- Integrated Disease Management approach to control disease problem
- Treatment with metalaxyl in alternation with copper sprays also works, for a short time.

Disease Problem and Management

Seedling blight disease of cocoa

Disease Problem and Management

Vascular streak dieback disease VSD.

Weed and Weed Management

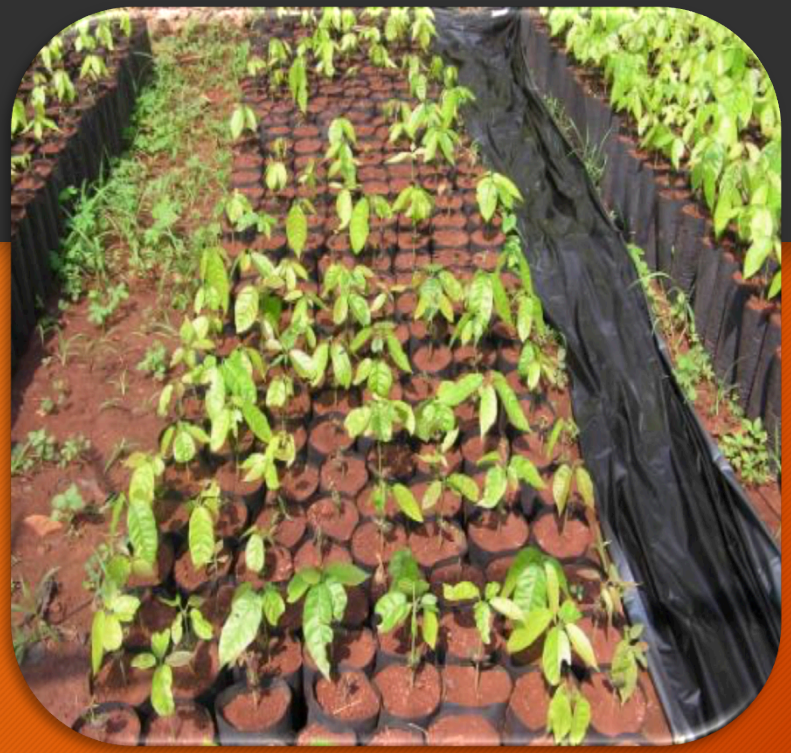
- Weeds are natural enemies of crop plant
- They compete with seedlings for plant food, light and water
- They reduce cocoa growth rates
- They serve as host for insect pest and diseases

Control

- They best control is preventing the weeds from developing seeds
- Allow the seeds to germinate and grow before planting cocoa seedlings
- Weeds can control through hand weed or spraying (as long as there are no cocoa in the nursery)don't use residual herbicides as diuron as this will kill emerging cocoa seed.

Weed and Weed Management Continued

Weeds in Potted bags



Weeds growing in walk way

WMeeds in Potted bags

Conclusion

Summarize the presentation by:

- Recapping all the major points from the topics taught
- Ask farmers questions on the various topics discussed