

Sustainable Production of Cocoa

- Trainers' Booklet -



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Topic 1: Productivity

Farmer: "I would like to produce more cocoa to increase my income. I plan to slash and burn the forest to plant more cocoa trees."

Trainer: "You do not necessarily need to expand cocoa farm to produce more cocoa. Instead of expanding your farm, you can increase the productivity of your existing farm to get more cocoa."

Productivity is the most important thing in increasing your income. You will need to make your existing farm produce more cocoa and become more profitable, and hence more attractive to your children and the next generation of farmers. The goal of our training program is to help you demonstrate improvement in productivity performance of your certified farm and to avoid further cutting down of forest through slash and burn.

In order to increase the productivity, it is important to conduct Good Agricultural Practices on your farm.

- Weedy farm would not be productive, as weeds would be competing with cocoa trees for the nutrients. Weed your farm regularly, but avoid overusing herbicide. By weeding manually, you can maintain a certain level of vegetative cover over the ground, which is good for maintaining soil humidity and soil erosion control.
- Leaving unproductive branches on the trees would bring down the productivity, and could cause pests and diseases. Prune the chupons, dead branches, diseased branches, branches that are too high and branches that have grown too dense.
- No fertilizer application would result in low productivity. Fertilization is important for the productivity, but be careful not to overapply chemical fertilizers. Overuse of chemical fertilizers turns the soil acidic, and is not sustainable in a long run. Your production cost would also go up. Try to apply organic fertilizers as much as possible. Your empty cocoa pods are excellent source of organic fertilizer. You can compost them to make compost at your farm.

- Infestation of pests and diseases bring down the productivity. You should monitor your farm regularly to check any presence of pests and symptoms of diseases. Prevent pests and diseases by keeping your trees strong and healthy. Chemical treatment should be the last resort.
- When you delay in harvesting, your cocoa gets infested by pests and diseases, which results in lower quality and productivity. Timely harvesting is very important for the productivity.

Topic 2: Shade trees

Farmer: "I would like to keep only cocoa trees in my farm. Why should I plant trees?"

Trainer: "Shade trees can serve you in various aspects:

- First, shade trees protect cocoa trees against sunlight and strong winds. If you don't have shade trees, the trees could get scorched and even may die when there is a draught. Without shade trees, trees get exhausted quickly, and its productivity will start to go down.
- Second, shade trees increase organic matter in the soil. Leguminous shade trees fix nitrogen in the soil.
- Third, shade trees keep the soil moisture.
- Fourth, shade trees help control erosion in the farm.
- Fifth, they provide habitat for wildlife.
- Sixth, some shade trees can give you extra income from fruits and timber.

Therefore, shade trees are very important for your farm. "

Farmer: "Now I see that shade trees are good, but how can I have shade trees in my farm?"

Trainer: "There are two ways to have shade trees in your farm. One way is to protect the wild seedlings that grow naturally in the farm. This way, you will have trees in your farm without having to buy them. The other way is to create a nursery of shade trees and transplant the seedlings to your farm. This way you can have the species that you want. "

Farmer: "I would like to create a nursery of shade trees. Which trees should I grow? Are there some trees that are good for the cocoa trees? Are there any trees that are bad for cocoa?"

Trainer: "Trees like the *Terminalia superba*, *Terminalia ivorensis*, and *Glyricidia* or *Acacia* tree are good for cocoa trees. In addition to providing shade, *Acacia* tree

improves soil fertility. On the other hand, Cola tree attracts leaf bugs. You should consult you trainer about the recommended species for shade trees. "

Farmer: "How many trees should I plant? At what interval should I plant them?"

Trainer:

- "It is recommended to plant at least 18 trees per hectare. There is no problem if you plant more.
- Plant several different species. This is important to prevent the spread of disease. If you have only one species, and it is affected by a disease, you will lose all the trees. It is best to plant several varieties of trees.
- Avoid planting foreign species such as eucalyptus or teak that originally did not exist in Ghana. Foreign species may affect native species."

Farmer: "There is too much shade in my farm, and this is causing disease problem. Can I cut down the trees?"

Trainer: "Cutting down shade trees is not a good solution. Once you cut them down and if you need some more shade again, you would have to re-plant new trees. If the shade trees in your farm are creating too much shade, adjust the shade level by pruning them. This will allow you to better control the moisture level and prevent disease. "

Topic 3: Wildlife Protection

Farmer: "I sometimes hunt animals that I find in my farm, and I eat them. I may also keep a monkey as a pet for my children. "

Trainer: "Your farm should be a place where animals can live and breed freely. You should not cage or kill animals for fun. We should protect them so they do not disappear and to make it possible for our children and grandchildren to know them in the future."

Farmer: "I cannot hunt any animal at any time? I cannot even eat a grass cutter?"

Trainer: "You should not kill endangered species at any time. Endangered species commonly found in cocoa farms include the following:

Name in English	Local Names in Twi
Chimpanzee	Akatia
Black And White Colobus	Efoo
Olive Colobus	Asibe
Red Colobus	Ebene
Diana Monkey	Boapia
Bosman's Potto	Aposo
Bush Baby	Aprenkensima
Giant Pangolin	Opra
Long Tailed Pangolin	Aprawabene
Tree Pangolin	Aprawa
Elephant	Osono
Nile Monitor	Mampam

During the Closed Season, which starts on the 1st of August and ends on the 1st of December, you are not allowed to kill/hunt any wild animal. During the Open Season, which is from the 1st of December until the 1st of August next year, you are allowed to hunt certain non-endangered species of animals only for the purpose of feeding your family. You are not allowed to hunt wild animals to sell.

You can eat domesticated livestock, such as chickens, pigs, cows and grass cutters, which are reared for food purpose. They are not considered to be wildlife.”

Topic 4: Ecosystem conservation

Farmer: "What are ecosystems?"

Trainer: "An ecosystem is a balanced system composed of an environment and living beings, which include water, soil, animals, insects, trees and plants. They are all interlinked and maintain a delicate balance. Any intervention from outside, such as drift of chemical spraying, could destroy this balance."

Farmer: "Why should I protect ecosystems? Why should I not burn a forest to create a farm? "

Trainer: "You must protect the forest because it is home to many species, some of which could be endangered. Burning would completely destroy the existing ecosystem. Once a forest is destroyed, the species lose their habitats and their will disappear. Deforestation makes the climate drier, and your cocoa will suffer from lack of rain."

Farmer: "Why is it a problem if my farm is adjacent to a river or a forest?"

Trainer: "If your farm is too close to a river or a forest, the chemicals that you apply will enter the water and kill all the animals living there. Besides, people may drink the contaminated water and get sick. It is therefore important to find ways to protect the water and forests that are very close to your farm. "

Farmer: "How can I protect the rivers in my farm or the forest near to my farm?"

Trainer: "You can protect the forests and streams from the drift of agrochemicals in three ways:

1. You can first establish no-spray zones where you do not spray chemicals. These separation areas will serve as buffer that will prevent the drift of chemicals into the water or to the forests.

2. You can then create vegetative barriers by planting indigenous trees and bushes between your farm and the protected areas. When the trees grow up, they can form a barrier and protect streams and forests from the drift of chemicals.
3. You can also keep a certain distance between your farm and the protected areas. The distance between your farm and the protected area will prevent chemicals from drifting into streams and forests.

Additionally, you should not throw any waste into rivers and streams. You should also not cut trees in the forest and near the streams. You should inform your family and your workers so that they also do the same."

Farmer: "If I establish a buffer zone where I will not spray, I may start having disease problems in this area. What can I do?"

Trainer: "You should not leave cocoa trees in the no-spray zone infested by pests and diseases. You should use other non-chemical control methods to fight against insects and diseases in the no-spray zones. We will talk about these methods in detail in the session on integrated pest management."

Topic 5: Integrated Pest Management

Farmer: "How can I prevent pests and diseases that attack my cocoa trees? How can I control them without spraying chemicals?"

Trainer: "There control methods that can be used to effectively fight against insects without using chemicals.

For example, against the Black Pod disease, you should:

- Weed regularly to maintain good ventilation and sanitation in your farm.
- Respect the recommended spacing (3m x 3m) to ensure that each cocoa tree receives enough nutrients from the soil. When the cocoa trees have been planted too dense, you need to cut down cocoa trees to create more space between the trees.
- Prune the diseased branches or where the branches are too dense. Remove chupons.
- Remove diseased pods, and bury them to prevent the spread of disease.
- Control the level of shade by regular pruning.
- Keep the farm clean and manage waste properly.

Against Mirids, you should:

- Plant shade trees or cocoa trees in areas where the sunlight enters too much.
- Remove chupons because fresh leaves and young branches attract Mirids
- Red ants are natural enemies of Mirids, so keep red ants on the farm."

Topic 6: Waste management

Farmer: "What can I do with the organic waste from my house?"

Trainer: "You can make compost with organic waste from your house together with cocoa pods in your farm. This way, you can convert organic waste into free fertilizer for your farm."

How to make compost

- Demonstrate during the field school -

- 1. Separate healthy cocoa pods and diseased cocoa pods after harvesting.**
- 2. Bury diseased cocoa pods. Use only healthy cocoa pods for composting.**
- 3. Mix the empty cocoa pods with other materials, if you have them.** (animal waste, pruned branches, rice straw, organic waste from the house, etc.)
- 4. Pile the mixture and cover it completely with a big plastic or banana leaves.**
- 5. Once in every two weeks, open the cover and mix the pile to facilitate the decomposition** (Make sure the pile is hot and wet. If the pile gets dry, you should add a little water.)
- 6. Continue to mix them for 4 to 6 months until the pods are completely disintegrated, odorless and black-colored.**
- 7. Apply the mixture around the cocoa trees.**

Farmer: "What should I do with the plastic waste and empty chemical containers?"

Trainer: "Plastic waste should be recycled as much as possible. Your Group Administrator should try to find a company who can collect the plastics for recycling."

Your Group Administrator should also talk to the ETP (Environmental Protection Agency) office in the regional capital so that the group can send empty containers to them for incineration."

Topic 7: Wastewater management

Farmer: "What should I do with the wastewater from dishwashing, laundry and shower?"

Trainer: "Do not throw away domestic wastewater or leave it flow around your house. The wastewater will allow the insects, such as flies and mosquitoes, to grow, and these insects cause diseases such as typhoid and malaria. Proper management of domestic wastewater helps protect the health of your family.

For wastewater from laundry and dishes, you can dig a hole of less than one meter, then fill it with sand, gravel or palm nut seeds to dispose of wastewater. The water will pass through these layers of sand and pebbles to seep into the ground; the solids will remain on the surface. You can pick the accumulated solid wastes on the surface and throw them into the hole that was dug for inorganic waste.

For shower wastewater, dig a hole and cover it with a concrete with a pipe that leads the waste water into the covered hole."

Farmer: "What should I do with the wastewater from washing the boom sprayer?"

Trainer: "It is important to wash spray equipment away from water sources to prevent contamination of water. You must dig a hole at your farm away from water sources, and fill it with sand, gravel and charcoal. The wastewater from washing your equipment should be discharged into the hole. The hole must be large enough to contain the wastewater so that it does not overflow. "

Topic 8: Soil Conservation

Farmer: "I have erosion problem in my farm. What can I do? "

Trainer: "Erosion is caused by water runoff, by overuse of herbicides or by steep slopes. To control soil erosion in your farm, you should:

- Keep a ground cover on the farm through manual weeding instead of herbicide application.
- Keep mulch over the soil. You can use materials such as pruned branches of cocoa and shade trees, fallen leaves of cocoa and shade trees, and weeded plants, as mulch.
- To decrease the speed of the water, you can establish barriers in the canals, dig small holes on the ground to promote water infiltration, or create small drainage channels to allow water to escape.
- Plant vegetation and trees along streams and in areas with slope
- Plant cocoa against the slope. Do not plant cocoa along the slope."

Farmer: "What can I do to conserve soil fertility and moisture?"

Trainer: "You can preserve soil fertility and moisture in your farm by:

- Planting shade trees, especially leguminous trees. Leguminous trees fix nitrogen from the atmosphere and transmit it to the ground for the benefit of cocoa trees
- Making compost using materials from your farm and organic waste from your home
- Keeping your soil covered with mulch
- Avoiding using herbicide."

Topic 9: Storage of chemicals

Farmer: "What are the problems if I keep my chemicals in my house?"

Trainer: "If you keep your chemicals in your bedroom or in your kitchen, your family may take them intentionally or by accident. Children are particularly at risk of accidents. Chemicals release toxic fumes into the air where they are being stored. Therefore, inside your house is not an appropriate place to store chemicals."

Farmer: "I have no money to build storage. What shall I do?"

Trainer: "For a small farmer, it is not necessary to build a warehouse just to keep a few bottles. You can be creative to make small storage, using locally available materials. For example, you can convert a metal drum into storage, or build a small storage like the way you build a chicken cage."

For all types of storage, always keep the storage locked with key. Make sure that the materials inside and the shelves are made of waterproof materials so that the spilled chemical would not be absorbed. Place a warning sign on the storage to warn other family members and visitors of the danger. Avoid keeping the storage inside your house. Put the powders on top and liquids at the bottom to prevent contamination in case of leakage of the liquids. "

Farmer: "Why can't I put a chemical in an empty water bottle to carry it?"

Trainer: "You should avoid putting chemicals in a water bottle because some children, workers and other family members may think it is a juice and drink it by accident."

Farmer: "Can I keep chemicals that I use for my vegetables in the same storage?"

Trainer: "You should keep all the chemicals you use in a safe storage, but please be careful and check whether you are not using prohibited chemicals for your vegetables and maize. The Standard prohibits the use of certain chemicals, and if you use them, you could lose the certification."

All the chemicals that contain Paraquat as active ingredient are prohibited. Such chemicals include Gramoquat, Gramosharp Super, Greenquat, Gramozone, Gramofast, Gramoquick and Kamazone. They all contain Paraquat. Another prohibited active ingredient is Atrazine. The brand names such as Kaltrazine, Maltrazine are the products that contain Atrazine. If you are using any of these chemicals and are keeping them in your storage, you need to eliminate their use. Otherwise, you would risk the certification."

Topic 10: Protective equipment

Farmer: "Why should I wear protective equipment when I spray?"

Trainer: "These chemicals are extremely damaging to your health, and they accumulate in your body. While you spray, the chemicals are entering into your body through your mouth, your nose and your skin. If you continue breathing in chemicals each time you spray, you would eventually become seriously sick, such as cancer, and die early."

Farmer: "I understand that protective equipment is important, but I do not have the money to buy it. What should I do? "

Trainer: "You can use available waterproof materials that are inexpensive. For example, you can use your raincoat or a plastic sheet. In order to fully protect your body, you should also wear a hat, goggles, a mask, boots and gloves. You should not use a dust mask, as it does not protect you against chemicals. You need to use a mask with chemical filter. During the application, you need to cover all parts of the body and to use protective equipment that is appropriate and not damaged. "

Farmer: "After the application, what should I do with the equipment?"

Trainer: "After the application of chemicals, you should not go home without bathing. You should not bring contaminated protective clothing and equipment at home to wash. This would put your family at risk. You need to bath and wash protective equipment in a designate place on the farm before going home. "

Farmer: "During and after spraying, what should I do with other people who are not wearing protective equipment?"

Trainer: "During product application, you should ensure that all sprayers or anyone present wear protective clothing. You should ensure that there is not anyone without protection in the application area and its surroundings.

After application, you should put a red flag at the entrance of the farm to warn the others that the farm has recently been sprayed."

Topic 11: Social conditions of workers

Farmer: "Can I have young workers on my farm?"

Trainer: "You should not have employment contracts with children less than 15 years of age. As for youth between 15 to 17 years old, you may sign a written contract with the permission of their parents. In this case, you must ensure that they do not work over 42 hours per week, work at night, handle chemicals, or carry heavy loads. The young workers of 15-17 years old should be given an opportunity to continue schooling if they so wish."

Farmer: "Can my children come to the farm to help me?"

Trainer: "Yes, your children can help you but only outside the school hours, on weekends, during vacations or holidays. They must go to school on weekdays, and during the school days, they can only help maximum 2 hours per day. During the weekends and holidays, they could spend maximum 8 hours per day, helping on the farm. The assistance they provide on the farm should not affect their education or growth. Your children should not handle chemicals, work on slopes or carry heavy loads. They must always work under adult supervision. "

Farmer: "What kind of work children cannot do?"

Trainer: "Children should not carry heavy loads, apply chemicals and fertilizers or use sharp tools. They should not work on slopes, set fire or work at night. They should not do any work that may pose negative impact on their health and growth."

Farmer: "What types of work can children do?"

Trainer: "Children can help collect cocoa pods during harvesting, separate fiver from cocoa beans, bring food or water to workers, take care of smaller children while their parents are working, etc. They can do simple works that have no risk of harming their health. "