



## **Training Manual**

# **Farmer Field School Approach and Methodology for Liberian Cocoa Farmers Tree Crop Extension Project (TCEP)**

**Program Management Unit  
(/MOA/PMU/IFAD—PIU/IC/SC/003/2019)**

**Ministry of Agriculture**

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## Foreword

The conventional agricultural extension delivery systems has for long promoted technological packages which did not meet the practical needs of smallholder farmers because it was central driven from the perspectives of the extension agents themselves and from the orientation of research institutions. However, small-scale poor resource farmer hardly implement the new technology promoted by the agricultural extension messages. This might partly be due to extension methodologies which have not always focused on farmers' priority issues, or have given recommendations that are unsuitable or with no immediate tangible benefits and farmers must often adapt them to suit their particular conditions. Accordingly, such extension methods are often as much a part of the problem as unsuitable technologies. A demonstration plot managed by outsiders may not convince a farmer to try something new. Farmers are often given "technological recipes" without they knowing the underlying principles, and are not able to cope with new situations or different problems. An alternative way forward is to create opportunities and operational frameworks among smallholder farmers to experiment with new ways of doing things, to learn how to evaluate different options more systematically and to decide for themselves, which are worthwhile. This can be realized in the principles of adult education, which recognizes that adults learn best from direct experiences and among themselves. Learning by doing adds to farmers' knowledge and experience, and increases their capacity as farm managers in a way that the passive experience of exposure to extension messages cannot.

As a means of providing sustainable solutions to the afore-mentioned gaps and bottle-necks in transferring knowledge to cocoa farmers, an expression of interest was requested by the Tree Crop Extension Project (TCEP), of the Ministry of Agriculture (MoA) to develop Liberian owned model of Farmer Field School (FFS) for cocoa farmers. A lead consultant assisted by a co-consultant developed a curriculum upon which the syllabuses for the FFS Training of Trainers were formulated. The curriculum was validated during a pre-Training of Trainers (ToT) workshop by lead farmers, the Ministry of Agriculture Extension Staff and other subject's related specialists.

This Training Manual for Liberian Cocoa Farmers is being developed on the model approach and methodology of the FFS which was first introduced in smallholders farming system in Indonesia to transfer knowledge to poor resource farmers who found the formal extension form of information delivery system unsuitable and impractical. The FFS concepts and approaches have since been used extensively in Africa, principally, Sierra Leone, Ghana, Mali among West African countries which have adapted this new method of knowledge transfer and sharing to improve individual farmer's productivity. This manual is therefore intended for use by the TCEP, Lead Farmers and Young Professionals (YPs), Agriculture Extension Officers of the MoA, Farmers Cooperatives and other stakeholders implementing agricultural programs in the country in the cocoa sector.

The Tree Crop Extension Project (TCEP) under the Project Implementation Unit (PIU) of the Ministry of Agriculture is proud to be the lead project in the development of the Farmer Field School Training Manual for Liberian cocoa farmers who are the direct beneficiaries. The Tree Crop Extension Project (TCEP) is committed to working with all partners to promote Good Agriculture Practices (GAP) for sustainable cocoa production. Upon validation this Training Manual becomes a national training document for cocoa FFS facilitation.

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## Acknowledgement

This Training Manual is for the training of cocoa farmers, technicians and farmer cooperatives under the Tree Crop Extension Project (TCEP) Program Management Unit/(MoA/PMU/IFAD-PIU/IC/SC/003/2019, Ministry of Agriculture, implemented in eight districts of Nimba County, Liberia.

The development of this Training Manual is the result of experiences gained from a study tour to Sierra Leone and Ghana where the Ministries of Food and Agriculture and Food Security have adopted the Farmer Field School (FFS) extension knowledge transfer approach and methodologies which have increased agricultural productivity in those countries. Moreover this Training Manual is based on interactions and exchange of experiences, knowledge and views on cocoa production with cocoa farmers in Nimba County during the conduct of the FFS activities facilitation in Saclapea, Nimba County from November 27, 2019 to December 21 2019.

We are grateful to Mr. Patrick Komba, the FFS Coordinator at the Ministry of Agriculture and Food Security of the Republic of Sierra Leone, who conducted a four-month long Food Crops-Farmer Field School training session in Liberia for the Ministry of Agriculture technicians and staff of development partners in Liberia.

Meanwhile, the co-consultant and I are very thankful to Professor Anthony Youdeowei, FAO FFS and IPPM consultant whose works including extension field guides contributed to this training. (Write). We are also grateful to Dr. Sonii David of the STCP/IITA whose work on cocoa farming and adoption to the FFS was helpful and is referenced here.

Finally, we are also thankful to the International Fund for Agriculture Development (**IFAD**), the Project Coordinator and Management of the Tree Crops Extension Project (**TCEP**), and the Ministry of Agriculture, Republic of Liberia for affording us the opportunity to train cocoa farmers to adapting the approaches and methodologies of Farmer Field School (**FFS**) in Liberia.

## Abbreviations and Acronyms

ASEA	Agro-Ecosystem Analysis
CAC	County Agriculture Coordinator
FAO	Food and Agriculture Organization of the United Nations
FBOs	Farmers Based Organizations
FSS	Farmer Field School
GAP	Good Agricultural Practices
GoL	Government of Liberia
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
IPM	Integrated Pest Management
IPPM	Integrated Production Pest Management
MoA	Ministry of Agriculture
NGOs	Non-Governmental Organizations
PIU	Project Implementation Unit
PMU	Program Management Unit
STCP	Sustainable Tree Crops Project
TCEP	Tree Crop Extension Program
ToT	Training of Trainers
Yps	Young Professionals

## Section I: Overview of the Training Manual and how to use it

This Training Manual is intended to enhance and strengthen the capacity and skills of cocoa FFS facilitators in transferring knowledge to cocoa farmers, extension agents, farmers' cooperatives, and farmers based organizations (FBOs), lead farmers, and development partners' staff to improve cocoa yield and quality of cocoa beans, thereby raising smallholder cocoa farmers' income.

### **FFS Methodology:**

The FFS methodology employs a participatory approach and hands-off practical learning that is characterized by simulation of farmers, and practical exercises; which include cocoa farms inspection and group presentation of Agro-Ecosystem Analysis (AESA; sharing of individual experiences and knowledge with fellow farmers and participants, comparing farmer's plot with IPPM plot, including the adoption of good agricultural practices (GAP).

### **Learning Guides:**

Learning guides and infographics will be developed for use by facilitators (Lead Farmers, Young Professionals, etc.) during FFS training at the community and district levels. These references will be in line with the topics of cocoa production as outlined in the FFS Cocoa curriculum. There are also guidance notes on key topics in the annex for quick reference by the facilitators. The intent of the learning guides and infographics will be to provide facilitators with guidance notes and pictorials that will enhance their technical capability and better equip them to be competent facilitators in the various farming districts. Technical materials will be prepared and will form part of the facilitators' training package for use during training sessions.

### **Key Approaches and Routine Activities:**

#### **First Meeting**

- Introduction of Participants and farmers
- Submitting Farmers' Titles to the Facilitators
- Election of Chairman Introduction of Suggestion Box
- Ground Rules and Participants' Fears
- Ground Rules and Participants' Fears
- Election of Chairman

#### **Routine FFS Session:**

Daily Approach and Routine Activities:

- Prayer
- Introduction of Participants and Facilitator/Consultants
- Submitting Farmers' Titles to the Facilitators
- The FFS Prayer
- The FFS Pledge
- Suggestion Box
- Analysis of Mood Meter
- Recap of Previous Work
- Simulation to break the ice
- Return of titles farmers or participants

## Section II: Training Manual Sections: topics and activities

The composition of the training manual is basically twenty-one sections and sub-topics as follows:

Section	Main Training Topics	Sub-topics/activities
1.	Farmers Field School (FFS) Overview	- FFS Definitions, concepts and approaches in cocoa farming in Liberia
2.	Pre-planting activities	- Site selection and land preparation; - Soils and favorable climate
3.	Nursery establishment	- Site selection and activities - Time of nursery activities: Sep. to December. - Site preparation and shade construction - Source of continuous supply of running water - Nursery layout - Arrangement of polybags
4.	Seeds collection, inspection and selection	- Seeds planting and care
5.	Nursery care and upkeep	- Watering - Weeding - Shade control - Pest and disease control
6.	Field planting and field layout	- Pegging - Digging/holing - Shade control - Planting
7.	Taking care of plants in the field	- Weeding - Plant food - Monitoring (pest and disease, Look up for dead plants and replace, ) - Pruning
8.	Flowering and pods production	- Ensuring good jorquette formation through appropriate pruning. - Monitoring for pests and diseases to ensure control measures based on IPM or IPPM strategy
9.	Pods ripeness and harvesting	- Good practices for cocoa harvesting (Ensuring regular field visit, inspecting the trees etc.)
10.	Harvesting signs	- Complete yellowing of pods; orange and pink - Timely harvesting to minimize pre and post- harvest losses.
11.	Harvesting & Processing: pod storage and breaking	- Harvesting pods in bulk and - Transporting pods to storage point
12.	Pods breaking	- Good practices during pod breaking (good sanitary practices)
13.	Fermentation	- Good fermentation practices to address color and flavor
14.	Drying and processing	- Drying beans on raised platform at regular Intervals ensuring care of beans. - Improved drying practices - Sorting out sick and non-bean materials and substances.
15.	Packaging and marketing	- Appropriate and recommended packaging facilities and methods. - Sources of latest marketing and price bulletin; - Sharing marketing information with colleagues.
16.	Record keeping	- Record keeping on farm growth and development

		<ul style="list-style-type: none"> <li>- Record keeping on money used to establish and take care of the farm.</li> </ul>
17.	Child labor	<ul style="list-style-type: none"> <li>- Health and age of work of a child</li> <li>- Time of work</li> <li>- Type of work</li> </ul>
18.	Climate Change Adaptation	-
19.	Marketing	<ul style="list-style-type: none"> <li>- Marketing and market chain analysis</li> <li>- Agriculture as a business</li> <li>- Marketing concept</li> </ul>
20.	Farmer Field School applied to Integrated Production & Pest Management	-
21.	Agro-ecosystem Analysis (AESAs)	<ul style="list-style-type: none"> <li>- Observation of existing farming practices at traditional farmers' field compared to FFS improved method</li> </ul>

## Section-III: What is Farmer Field School?

### Objectives

To introduce the concept, methodologies and approaches of Farmer Field School (FFS) to cocoa farming in Liberia. Also to provide smallholder cocoa farmers' basic information on the Farmer Field School (FFS) definitions, goal, objectives, concepts and approaches.

### Methodology:

The methodology presented here is based on Focus group or Kuu (a Liberian language) group discussion and interactions at Training of Trainers workshop.

### Materials:

Flip charts  
Markers  
Scotch tapes  
Note pads  
Papers  
Paper clips  
Stapling machines, etc.

**Duration:** forty five (45 minutes)

### Discussion Points and Notes

#### a. What are the basic FFS Concepts and approaches?

- The term “Farmer Field School”) FFS comes from the Indonesian expression, Sekolah lapangan meaning field school. This name reflects the educational goals. The course takes place in the field and the field conditions define most of the curriculum; but real field problems are observed and analyzed from planting to harvest, post-harvest and marketing. It is a group extension method based on adult education.
- FFS is a platform where farmers and facilitators analyze, debate observations or problems, apply their experiences in resolving the problems and present new information from outside the community. The results of the meetings are management decisions on what action to take. Thus, FFS as a new extension methodology is a dynamic process that is practiced and controlled by the farmers to transform their observations to create a more practical understanding of the crop/livestock agro-ecosystem.
- The FFS model is a farmer training approach, which is based on principles of adult education and applied knowledge. It is based on innovative, participatory, learning by discovery approach, which enables farmers to acquire an understanding of the principles of Integrated Pest Production Management (IPPM) that can be applied in any situation.
- Farmers can learn how to analyze pest problems in the field and how to make sound management decisions from both ecological and economic viewpoints in the control of the pest problem. This approach has led to substantial reductions in the use of pesticides, increased profits, and farmers have decreased sole dependence on agricultural extension agents.
- FFS was originally developed in 1989 to promote Integrated Pest Management (IPM) among rice farmers in Asia. Since 1995, the Food and Agriculture Organization of the United Nations (FAO) has been testing the FFS as a means of helping small farmers in East Africa. They are a complement to the existing research and extension activities contributing to four objectives.
- The FFS program in Africa started through the efforts of the FAO global IPM facility. The first Training of trainers (TOT) for Integrated Pest Management (IPM) Farmer Field School

was held in Ghana in 1995. Mali established FFS in rice in 1999 through a national IPM program. Applying the FFS approach and methodology to Cocoa farming has been one of the tasks undertaken by the STCP under the ITTA program in Cameroon and other West African Countries.

**b. What is the goal of the FFS Program:**

- The long term goal is to expand the capacity of government, NGOs, and the private sector to respond to the needs of resource-poor farmers for knowledge and access to information that will enable them to upgrade their farming system;

**c. What are the Specific objectives of the FFS?**

- Shorten the time it takes to get to research stations to adoption in farmers' fields by involving farmers in experiments of their own;
- Enhance the capacity of extension staff to serve as technically skilled and group sensitive facilitators of farmers' experimental learning, rather than prescribing blanket recommendations that covers a wide geographical area;
- Increase the expertise of farmers to make logical decisions on what works best for them, based on their own observations of experimental plots in their FFS;

**d. Other Objectives:**

- Increase the competence of extension systems to provide farmer education that responds more effectively to local resources and conditions;
- Establish a networking capacity for the exchange of FFS experiences within and between countries;

**e. Characteristics of FFS:**

- The training and facilitation of knowledge takes place in the field;
- The field condition determines most of the curriculum;
- Observation of real problems and analysis begin right from planting of the crop to harvest, market and processing;
- A field study established by participants with a research component to compare IPPM methods and conventional practices;
- Pre- and post-test;
- Season-long training;
- Graduation based on attendance and learning performance;
- Graduation certificates awarded to farmers.

## Section IV: Key Program Activities of the FFS

### Objectives

To follow FSS syllabus to train cocoa farmers and facilitators.

### Methodology:

FFS curriculum based on Liberian situation but improved ways of cocoa farming local practices.

### Materials required:

- Gather participating TCEP cocoa farmers, using existing knowledge facilitated and enhanced by FFS facilitators to build farmers' capacity through learning by doing and field practicals based on the following:
- Facilitating visual aid such as pictorials, graphics, etc.

#### 1. Training of Trainers:

It is a season-long residential TOT course. This corresponds to a crop season so as to give the trainees a chance to gain first-hand experience in working with crops and hereby develop a better understanding of problems faced by the farmers;

#### 2. Farmer Field Schools:

Each trained facilitator is expected to lead four parallel FFs each year after graduation. The FFS will receive training materials and involve an average of 25-30 farmer pupils.

The FFS sites will be selected by trainers in consultation with district extension staff, giving precedence areas with high concentration of poverty and to farmer groups with large number of women members. FFS meetings will be more intensive during the growing season with sessions held weekly;

#### 3. Farmer-to-Farmer FFS:

After graduation, each FFS will be encouraged to set up and conduct another FFS in the same community or in neighboring villages. Facilitators will provide technical backstopping during some school sessions.

#### 4. Planning Workshops:

A pre-season planning workshop will be convened at the start of each year in order to draw up annual work plans and budgets and review technical curricula;

#### 5. Assessment Workshops:

This will be held annually in order to take stock of progress, identify critical issues affecting the project and undergo refresher training. Representatives of other program and projects supporting the use of FFS or similar approaches to farmer training will also be invited;

#### 6. Regional Meetings:

These meetings can be held each year for the purpose of sharing information and making comparisons between countries.

#### 7. Evaluation Activities:

This will be shared among the entire project implementers and FFS themselves. Within FFS, a system of participatory M & E will track economic and social information (crop budgets, community contributions, implementation costs, etc.

#### f. Organizational Structure of the FFS:

- The FFS groups are formed, based on common interest. For example: A group in Food Crops, Tree Crops, Fisheries, Livestock, etc.;
- The group is comprised of 25-30 farmers per FFS group;
- The FFS is governed by a bye-Law/constitution with strict adherence to it. The members of the FFS are all practical farmers with each member owning a farm;
- The group is headed is headed by a chair and assisted by a co-chair, with other members as recording secretary, financial secretary, advisor and other members
- Election of members is based on the active and participatory role played by a member;
- The leadership of the FFS constitutes ordinary members;

- No power actor or influential person in the community holds a leadership position in the FFS;
- Position in the FFS is open to ordinary members;

**g. Seating Arrangement:**

- Participatory training aims at increasing communication and sharing of knowledge amongst participants.
- The seating arrangement in the FFS is important. An FFS is not classroom style training. Instead, it is arranged in a U-shaped seating arrangement that allows everybody to be seen and participate in the discussion. In this case a Participant can easily relate to the person by his or her side.

**h. Other Characteristics/Management of the FFS:**

- The FFS is a farmer support learning institution organized in rural communities to enable farmers to produce using the IPPM measures, add value to the commodities and market their produce, open bank accounts, continue the process and thereby improve their livelihood;
- The FFS relies on registration and membership dues, monthly dues, sales from their produce, contributions as a group to sustain themselves; donors assist when such interests exhibited by the group is appealing;
- The FFS meets once or twice a month depending on the crop cultivated and discuss issues observed during crop growth; For cocoa cultivation, the farmer group meets twice a month;
- The farmer groups meet for about 4-5 hours to discuss observations and find solution during crop growth;
- The FFS is a field school without wall and windows and is conducted in the farmers' fields;
- The FFS is field-based, season long and covers all the developmental stages of the crop (from seeding to harvest) including processing and marketing;
- For climate smart agriculture in cocoa farming, some food crops and tree species can be grown in the between the main plants to provide food and ready cash income for farmers;
- The land is not left bare but plant into food crops throughout the year;
- The use of indigenous language is allowed to encourage full participation of members in the discussions; this helps to “**break the ice**” in those who are coy or shy and thereby making them active to fully participate in discussion and information sharing;
- Respect the views of others; one's views are wrong but **noted**;
- In the FFS, farmers conduct a study comparing IPPM strategy with the usual farmers' practice;

**i. Implementation of the FFS Method:**

There are 4 main steps in implementing the FFS;

- (1) One is required to conduct **Needs Assessment and Community Sensitization** (Ground-working):
- (2) **Farmer Selection:**  
A selection criterion is necessary for this component;  
Cocoa farmers with about 1 hectare should be selected;  
However, widows, single mothers and other disadvantage with about less than an acre should be given consideration;
- (3) **FFS Implementation:**
- (4) **Graduation**

**j. Formal and Non-formal Education:**

The type of training that takes place in a Farmer Field School is often referred to as “**Non-formal Adult Education**”. What is the difference between **formal and non-formal Education**?

**Table 1: Comparison of Formal Education and Non-formal Education**

<b>Formal Education</b>	<b>Non-formal Education</b>
<ul style="list-style-type: none"> <li>• Teacher</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitator</li> </ul>
<ul style="list-style-type: none"> <li>• Teacher is the center of instruction</li> </ul>	<ul style="list-style-type: none"> <li>• Participants can give inputs</li> </ul>
<ul style="list-style-type: none"> <li>• Information ‘push’ (teacher decides what trainees are being taught)</li> </ul>	Information ‘pull’ (focus on actual information needs)
<ul style="list-style-type: none"> <li>• Teacher is responsible to deliver contents from the curriculum</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitator ensures that participants learn basic contents and involves participants to determine additional learning goals</li> </ul>
<ul style="list-style-type: none"> <li>• Teacher has to prepare all sessions</li> </ul>	<ul style="list-style-type: none"> <li>• Informal, open exchange, equal chance to participate</li> </ul>
<ul style="list-style-type: none"> <li>• Teacher forced to being expert</li> </ul>	<ul style="list-style-type: none"> <li>• Active cooperation and collaboration from all participants</li> </ul>
<ul style="list-style-type: none"> <li>• Teacher lectures trainees</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitator is a group member</li> </ul>
<ul style="list-style-type: none"> <li>• Trainees are passive receivers of information</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitator can rely on inputs of the group</li> </ul>
	<ul style="list-style-type: none"> <li>• Questions from the group can be answered by the group (discussion/sharing of experiences, setting up experiments, inviting resource persons)</li> </ul>
	<ul style="list-style-type: none"> <li>• Working in small groups</li> </ul>
	<ul style="list-style-type: none"> <li>• Facilitator stimulates critical thinking</li> </ul>

## Section V: Facilitation Skills in Transfer of Knowledge and Skills to Cocoa Farmers

### Objectives

The objective of this chapter is to present knowledge and skills required to undertake Farmer Field School Training session.

- **What is facilitation?**
- **Methodology:**
- The following topics and step by step discussions of topics outlined in this preceding are the methodologies of this session.

### Materials required:

- training curriculum
- FFS Syllabus
- Flip charts
- Markers scotch tapes
- Papers
- Paper clips

To facilitate is:

- To free from difficulties or obstacles;
- To make easy or easier
- To carry put a set of functions or activities before, during and after a meeting to help the group achieve its own object;

### Role of a Facilitator:

- Prepare for the FFS session;
- Prepare materials, visual support, etc.;
- Stimulate thinking;
- Stimulate interaction between farmers;
- Stimulate experimentation;
- Guide the learning process;
- Create a good learning environment;
- Manage effective discussion

### Good Habits of Facilitators:

- Smile;
- Have eye contact
- Ensure clear speaking
- Use local language
- Respect moments of silence
- Respect differences
- Listens carefully
- Use open questions
- support participation

### Some Personal Skills & Qualities:

1. Flexibility:
  - It is the ability to fulfill different group roles, leader, supporter, etc.; in order to keep the group fluid and maximize the potentialities.
2. Confidence:  
It is to instill confidence or trust in the group by appearing decisive and in control and thereby subduing group insecurities;
3. Respectable:  
To have the admiration of the group as being a person whom they can trust the judgment of;
4. It is to appreciate the difficulties of group working and have the determination to see a task finish.
5. Perceptive:

To have the capability to recognize undertones in group, using the positive ones to the group advantage and countering the negative ones to diminish them.

**Table 2: Problems that may erupt at Group facilitation; table 2 showing potential problems and Solutions in Group interaction at FFS Facilitation**

No.	Potential Problems	Possible Solutions
1.	<p><b>Quiet/Shy Participant</b>            This may be because the participant is:</p> <ul style="list-style-type: none"> <li>• Shy, timid or insecure;</li> <li>• Bored</li> <li>• Feeling superior</li> <li>• Distracted by personal pressing issues;</li> <li>• Having trouble understanding the topic under discussion in conflict with other group members</li> </ul>	<ol style="list-style-type: none"> <li>1. Make eye contact with the participant and ask a simple question;</li> <li>2. Involve the participant in a small sub-group discussion and ask them for an oral summary of their discussion;</li> <li>3. Ask during a break or in private about why the participant is so quiet;</li> <li>4. Suggest that everyone takes a turn in sharing their opinion</li> </ol>
2.	<p><b>Overly Talkative Participant</b>            This may be caused by:</p> <ul style="list-style-type: none"> <li>• A natural need for attention;</li> <li>• Being overly prepared/unprepared</li> <li>• Having the most authority</li> </ul>	<ol style="list-style-type: none"> <li>1. Glance at your watch while the participant is speaking;</li> <li>2. During a pause for breath, thank the participants for their comment, and re-state the agenda;</li> <li>3. Emphasizing relevant points and time limits;</li> <li>4. Ask the participants to explain how their comments add value to the topic on hand;</li> <li>5. Reflect their comments back to the group;</li> <li>6. Remind everyone of the time limit.</li> </ol>
3.	<p><b>Side conversation</b>            This may be because the participant is:</p> <ul style="list-style-type: none"> <li>• Feels the need to introduce an item not on the agenda;</li> <li>• Is bored with the meeting;</li> <li>• Has a point to raise that they feel makes other items on the agenda less important;</li> <li>• Is discussing a related topic but not being heard;</li> <li>• Wants to be the center of attention</li> </ul>	<ol style="list-style-type: none"> <li>1. Ask the participant to share their idea with the group;</li> <li>2. Get up and casually walk around near the participant having the side conversation;</li> <li>3. Call participant by name and ask if they want to add the topic of their discussion to the agenda;</li> </ol>
4.	<p><b>Overly disagreeable participant</b>            This may be because the participant is:</p> <ul style="list-style-type: none"> <li>• Having a combative personality;</li> <li>• Is upset by other opinions or a specific meeting issue;</li> <li>• Is a show off by nature;</li> <li>• Is unable to make suggestion constructively;</li> <li>• Feel that they are being ignored;</li> </ul>	<ol style="list-style-type: none"> <li>1. Paraphrase the participant's comments and after their response, recap his/her positioning objective terms;</li> <li>2. Find merit in the participant's suggestion, express agreement, then move on;</li> <li>3. Respond to the participant's comments, not the attack;</li> <li>4. Open the discussion of the participant's comments to the group;</li> <li>5. Mention that, due to time constraints, the comments can be put on the agenda for the next meeting</li> </ol>

## Section-VI: Cocoa Pre-Planting Activities & Nursery Establishment:

### Objectives:

1. To select best suitable land for cocoa growing
2. To obtain good quality disease free seeds (high yielding)
3. To obtain healthy and disease free seedlings

### Methodology/Procedure:

The methodology is discussed below in the preceding:

### Materials

1. Polythene bags
2. Fertile Soils
3. Twines
4. Palm fronds
5. Bamboos sticks
6. Cocoa seeds
7. Water
8. Sieves
9. Buckets
10. Watering cans
11. IPPM materials

### 1. Site Selection and Land Preparation:

Location of the Nursery site:

- Selection of suitable site for nursery construction starts in September or October;
- The site should be closed to available source of water, with a gentle slope land and access to motor road;
- The source of water should be a running creek, stream or river;
- Do not use well water;

### 2. Nursery Shade Construction:

- Nursery shade preparation including brushing, clearing, de-stumping and levelling starts in November;
- Cutting of reeds, palm frond and bush ropes are done the same month;
- Bamboo poles with about 6 feet above ground is recommended for the nursery;

### 3. Nursery Soil:

- Nursery lay out, pegging to line polybags and gathering of black top humus soil from three different locations are all done in November; add manure;

### 4. Cocoa Polybags

- Use perforated black polythene bags;
- The sieved black humus soils free from stones or rocks and roots are put in cocoa polybags with dimension of about 3 inches wide and 9 inches long;

### 5. The Cocoa Seeds:

- Take mature ripe pods from trees that are high yielding and disease-free;
- Take the big seeds from the center of the pods and not at the end of the pod;
- Do not use dry seeds for sowing;
- Sow cocoa seeds or beans in a day's time;

### Nursery Activities:

- Seedlings are expected to be in the nursery for 5-6 months;
- Sow cocoa seeds or beans in January and transplant in June (Good Agricultural Practices);
- Traditionally, you can sow seeds earlier, maybe in November or December;

**NOTE: Age and Time** are very important for Nursery Activities:

**Nursery Operational Schedule for Cocoa:**

**1. September:**

- Do site selection;

**2. October:**

- Clear the nursery site with a top rich-sieved forest soil and fill polybags;

**3. November:**

- Building of shade and filling of more polybags;

**4. December:**

- Taking the seeds from pods;
- Seeds are sown and watered thoroughly;
- Seeds start to germinate from 3 to 7 days;

**5. January:**

- Finish completing sowing of seeds;
- Seeds are sown on their sides in the polybags;
- They are lightly covered with soil and watered heavily;
- Thereafter, watering is done every other day, and also during the Harmattan season;
- On nursery beds, single seeds are planted per hole which is usually 15-20mm deep and 15-16cm apart in the polybag;
- The poly bags have a dimension of 20 X 12cm;

**6. February-May:**

- Maintenance of plants continue;
- Shading is thinned from late April and removed by the 3<sup>rd</sup> week of May;

**7. June:**

- The seedlings are transplanted onto the field as soon as the rains become steady;
- Wire nettings are used to keep rodents out of the nursery;
- Provide the seedlings with shade once they germinate;
- When cocoa seedlings are about 5-6 months old and 30-60cm tall, they are transplanted to well-prepared field;
- A day before transplanting, the seedlings are dug up with balls of earth;
- They seedlings should be planted immediately on arrival at the field;
- Put the seedlings in the already dug holes at a spacing of 10ft. X 10ft. or 3.04m X 3.04m giving 435.6 plants per acre;

**D: Seed Collection, Inspection and Selection:**

- Cocoa seeds which are healthy and disease-free can be obtained from Cocoa Research Stations and nursed and raised at central nurseries for multiplication purposes;
- Seeds are collected from ripe yellow pods from healthy trees;
- The seeds are collected mainly from the center of the pods and not at the end sides of the pods;
- Immediately after breaking the ripe yellow pods, the seeds are laid flat on their sides and placed or sown in to the polybags already filled rich humus soil and watered daily;
- Cocoa seeds will germinate between 3 to 7 days;
- Watering continues up to the onset of the rainy season;
- maintenance works such as weeding, fertilizer application using NPK or Urea follows, including chemical application;

**E: Nursery Care:**

- Build nursery for shade before sowing of seeds in the nursery;
- Line up the polybags filled with black soil in the nursery shed;
- Watering continues up to the onset of the rainy season;
- Maintenance works such as weeding, fertilizer application using NPK or Urea follows,
- Apply pest control measures against insect pests and diseases;
- Do thinning of shade two to three weeks before transplanting seedlings onto the field.

## Section-VII: Field Layout and Field Planting:

### Objectives:

- a. To select overall suitable land for the cocoa crops
- b. To enable farmers to learn the skills and practice of pegging, lining, digging, correct planting and crop maintenance using IPPM.
- c. o follow the cocoa cropping calendar in Liberia.

### Methodology/Procedure:

The below proceedings are the methodologies for cocoa field work.

### Materials required:

1. Healthy and disease free high yielding Cocoa seedlings from the nursery.
2. Small tools, for example pingalines, wheelbarrows, twines, tape lines
3. Manuring materials
4. IPPM materials

**Duration:** to be discussed during ToT

### Discussion Points and Notes:

#### Field preparation and brushing begins in May;

- Field pegging, layout and hole digging are done in June and July;
- Seedlings distribution and transplanting are done in June and July;

#### Soil conditions:

- Cocoa soils should be easily penetrated by the tap root, meaning it is deep and suitable
- If the soil has a hard pan and if the water table is high, then the soil is not suitable; the soil should be at least 6 feet deep;
- The soil should be well-drained, water retentive especially during the dry season.
- Clay loam soils are best for cocoa;
- The soil should permit easy circulation of air and water;
- The soil should be fertile and well supplied with nutrients especially near the surface;
- Normal Soil pH is between 6 and 7.5 but Liberian soils generally have pH of around 4.5 to 4.9 which still support healthy cocoa plants ;
- Though the rainfall should be well distributed throughout the year which is not the case in Liberia which has extreme weather pattern of any of the two weathers, but with effective shade management and good ground covers the cocoa plants will flourish very well in these ecologies.

#### Temperature:

- The average daily temperature shall not exceed 92.3°F and should not go below 60°F.
- Temperature should not go below 56°F;
- Cocoa is a drought sensitive plant;

## Section-VIII: Crop Maintenance in the Field:

### Objectives

- a. To have a healthy and productive farm with correct plant density
- b. To ensure good agriculture practices (GAP) for sustainable production
- c. To motivate farmers to take cocoa farming as a business.

### Methodology/Procedure:

The procedure is as follow in the preceding.

### Materials

1. Cutlasses
2. Pruning knives
3. Brushes
4. IPPM materials
5. Manuring materials
6. Wheel barrows
7. Empty bags

Duration: as much as there is a need for upkeep of the farm.

### Discussion Points and Notes:

#### a. Transplanting:

- A day before transplanting, the seedlings are dug up with balls of earth;
- The seedlings should be planted immediately on arrival at the field;
- Put the seedlings in the already dug holes at a spacing of 10ft. X 10ft. or 3.04cm X 3.04cm giving 435.6 plants per acre;
- Shade the young cocoa plants with banana or plantain seedlings when the field is entirely cleared; but do not clear the planting field only do shade control or management.
- Put the banana or plantain in the field a year before transplanting the cocoa seedlings;
- If shade trees are left on the field, it is not necessary to provide shade;
- Do constant weeding in the first 3 to 4 years;
- Brush undergrowth about 4 times a year in August, November, March, May or June;

#### b. Manuring:

- Fertilizer may be applied to cocoa farm; usually NPK fertilizers at 100kg, 150kg and 50kg per hectare are recommended per annum.
- Monitor pests and diseases;
- Do infilling of plants in year two;

#### c. Mulching:

- Young cocoa trees should be mulched before the onset of the first dry season to assist in conserving moisture in the soil;
- Mulching helps to reduce losses of seedlings that occur during the first year of planting;
- It also helps in the maintenance of soil fertility by acting as anti-erosion measure by conserving organic matter;
- Use chopped dry grass around the stem but avoid touching base of stem.
- Weed control: weeding is done 2x quarterly to reduce nutrient competition effect and reduce vegetation.

#### d. Pest and disease control

- Pest and disease control (P&D). The principle of integrated pest management (IPM) or integrated pest production management (IPPM) is applied with effective monitoring of the effects of these pests on a monthly basis. Details of the IPM/IPPM are discussed below in chapter 9.

## Section-IX: Re-habilitation of Cocoa Farms:

### Objective

- a. To get a healthy and productive farm
- b. To ensure continuous production of good quality cocoa pods.
- c. Using IPPM procedures to manage pest and disease (P&D).
- d. Control shades and removal of unproductive branches.

**Methodology:** The methodologies are presented below:

### Materials

1. Cutlasses
2. Pruning knives
3. De-barking materials, e.g. Axes
4. Wheelbarrows

### Procedures or methods:

Discussion Points and Notes:

#### a. Why should Re-habilitation of Cocoa Farms be carry out?

Many cocoa farms in Liberia are old (more than 40 years) which have low yield due to age of trees including poor maintenance;

A healthy cocoa tree may produce up to 60 pods per tree per year depending on the variety or clone;

The minimum number of pods a healthy tree may produce is 25-30 pods per tree per year which gives two pounds (lbs.) of dry cocoa;

As a guideline, yield per year can be divided into;

- (a) Good (20 or more pod/tree;
- (b) Average (15-18 pods/tree;
- (c) Poor (10 or less pod /tree;

Trees that produce 10 or less pods per year are not producing anymore and the farmer should think to improve the yield;

There are 3 ways to increase productivity:

#### b. What are key activities in cocoa farm rehabilitation?

##### 1. Rehabilitation:

- a. This is the process of bringing existing trees into better production;
- b. Perform under-brushing, pruning of cocoa trees, remove too much shade and all diseased and pest infected pods and mistletoes as well as fern;

##### 2. Regeneration:

- a. Grafting new genetically improved superior high yielding germplasm onto old but disease resistant root stock;

##### 3. Replanting:

- a. [You] do replanting of old unproductive trees by block planting annually.

##### 4. Under-brushing:

- Why under-brush?
- Weeds compete with cocoa trees for nutrients and water from the soil;
- Weeds increase the humidity on the farm and serve as host to insect pests and pathogens where they lay eggs and multiply and induce new infection level, respectively;
- Weeds make it extremely difficult to walk through the farm to work such as pruning and harvesting;
- Some farms closer to the river beds have more water in the soil so weeds grow faster;
- The farms need more under-brushing than dry farm where weeds grow slowly; Therefore, under-brushing needs to be done when weeds infestations are high;

- Farmers should under-brush just before harvest and at beginning of dry season;

## 5. Sanitation:

### a. Why carry out Sanitation on the cocoa farm?

- Black pods can easily spread the disease and therefore, remove all black pods immediately after every under-brushing;
- Men can do the under-brushing while the women remove all the black pods from the tree;
- Also, remove black pod immediately after every harvest of mature pods; at the end of the harvest season, there should be no black pod left on the cocoa farm;

## 6. Pruning:

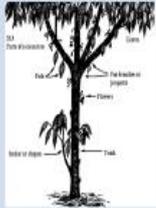
### a. Why do pruning?

- Cocoa trees produce more branches than they need to be strong enough to compete with other trees;
- The more branches a tree has, the more energy and food, it must give out to the branches which reduces the size and number of pods that reach maturity;
- The best cocoa tree has 1 main stem only and 2 or 3 main branches with enough side branches and leaves to get sunlight;
- Pruning is done to regulate the number of branches;
- It is mainly done to remove unwanted growth and thus maintain regularly shaped trees carrying a well-balanced, firmly closed canopy;
- It is done to remove old and dead branches;
- Pruning enhances good jorquette formation;
- All suckers which develop below the main branches should be removed as close as possible to the stem on which they have grown;
- If a tree produces more than one main branch, one of these should be removed;
- Pruning encourages a good canopy formation, adequate light penetration and improved air movement;
- It also reduces damage from pests and diseases and promoted vigorous tree growth;
- Tall trees with lot of branches attract rats and squirrel;
- Black pod disease spreads quickly in warm and wet condition found in un-pruned farms;
- There are more diseased and dead pods in un-pruned farm where the disease is prevalent;



GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS

Lesson # 2 – Pruning Cocoa Trees

What is it?	Why do it?	How do you do it?	When do you do it?																
<ul style="list-style-type: none"> <li>• Cutting off branches that are dying or are making the tree produce less cocoa; cutting the number of unnecessary branches.</li> </ul> 	<ul style="list-style-type: none"> <li>• You control the amount of light reaching the cocoa</li> <li>• It lets air move through the trees to stop back pod disease</li> <li>• It makes trees produce <b>more cocoa</b></li> </ul> 	<ul style="list-style-type: none"> <li>• Cut low hanging branches</li> <li>• Cut branches within 60cm from jorquette</li> <li>• Cut out shiny new branches (chupons)</li> <li>• Tree should cut to be 3.5 meters tall</li> </ul> 	<ul style="list-style-type: none"> <li>• <b>Heavy pruning (large branches)</b> is done in the dry season</li> <li>• <b>Maintenance pruning</b> (Proper shade, dead branches, and chupons) is done all year long</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">CALENDAR</th> </tr> <tr> <th>Jan</th> <th>Feb</th> <th>Mar</th> <th>Apr</th> </tr> <tr> <th>May</th> <th>Jun</th> <th>Jul</th> <th>Aug</th> </tr> <tr> <th>Sep</th> <th>Oct</th> <th>Nov</th> <th>Dec</th> </tr> </thead></table>	CALENDAR				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CALENDAR																			
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Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

## The 3 types of Pruning:

### Architectural Pruning:

This is done when trees are up to 4 years old;

#### Purpose:

The purpose of this type of pruning is to make sure the trees do not grow too tall but have the **right shape**;

- If the trees are not properly pruned at this age, they will become too tall to properly manage;

### Shape Pruning:

- This is to give cocoa trees a shape that allows them to get the most sunlight and wind without leaving holes in the canopy;
- This is done by removing branches that trees do not need;
- Shape pruning is best done at the beginning of the rainy season after most leaves have dropped and the trees do not have pods yet;
- Leave enough branches and leaves to make sure little or no sunlight reaches the ground as this will increase weeds;
- Removing new shoots and new branches that are not needed for the health and strength of the tree throughout the year is called “Maintenance Pruning”;

**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**  
**Lesson # 3 – Shade Management**

**What is it?**

- Making sure there is the right amount of light going to the cocoa tree

**Why do it?**

- The proper light reduces the amount of black pod disease
- Too much light encourages pests
- Heavy shade means low yields and black pods

**How do you do it?**

- There should be **50% light and 50% shade**
- Prune trees and remove unwanted trees
- There should be 7 shade trees per acre

**When do you do it?**

- Shade management is part of **maintenance pruning** and should be done all year long

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Source: Agro-Up (Good Agricultural Practices for cocoa farmers)- Grow Liberia

### Maintenance pruning

- can be done any time of the year;
- Tall trees take time and effort to prune than small tree;
- If trees are too tall to prune, consider re-habilitation;
- Trees that have not been prune for a long time needs to be re-shaped;
- If the main stem is still healthy and its branches are still bearing pods, remove all unwanted side branches that have grown later, including water shoots;
- If the main stem and branches are too old and un-productive, choose a water shoot that can develop into a main stem;
- Slowly cut or saw all other branches and the main stem away;
- A suitable water shoot used for rejuvenation is one that is still low at the time of pruning;
- It needs to get a lot of light quickly so that it will the first jorquette at the height of 1-1.5 meters;

### Shade Management:

Why control Shade?

- Shade trees have an important function in cocoa farming;
- The more shade the more humidity;
- If there is not enough shade, the farm gets too dry during the dry season;

- If there is too much shade, the farm gets too humid in the rainy season;
- Shade suppresses the level of capsid attack but increases the incidence of black pod disease;
- It is therefore important to balance the level of shade;
  - If your farm has too much shade, you must remove some of the shade trees or remove some branches of the shade trees ;

How?

- Are there any trees that are harmful to cocoa trees? If so, remove them first;
- Secondly, trees that remain smaller or of equal height as cocoa tree, even when fully grown, do not provide any shade or only get in the way;
- Remove trees that are not really shade trees;
- Thirdly, select the other shade tree you may want to remove;
- Select them in such a way that the remaining shade trees will have an evenly distributed canopy, above the cocoa trees that will provide an even layer of shade;

How to Remove Big Trees?

- Felling shade trees with chain saw may harm the cocoa tree; the shade tree may fall on the cocoa tree;
- It is better to let shade trees die slowly;
- The best way to let shade trees die slowly is by ring—barking them;
- Do not use Kola tree for shade as they provide suitable conditions for plant parasites such as mistletoes, ferns as wells as humidity;

## Section X: The FFS Approach to the Principles of Integrated Production and Pest Management (IPPM):

### Objectives

- a. To apply the FSS principle, approach and methodology to cocoa farming for sustainable production.
- b. To use the FSS approach to control pest and disease as based on IPPM practices.
- c. To apply GAP to cocoa farming for maximum production.

### Methodology:

The following are the basic methodologies used in FFS as based on IPPM principles.

### Materials required:

1. Sweep nets
2. Hand lenses
3. Plastics bags
4. Camera
5. Field diagnostic materials
6. Plastic bags
7. Vials
8. Alcohol
9. Clorox
10. Recoding note pads
11. Etc.

### Discussion Points and Notes:

#### The FFS approach is based on 4 principles of IPPM;

##### (1) Grow a healthy seed, cutting or planting material;

- Strong vigorous plants (resistant varieties) are produced and better able to tolerate insect pest and disease damage;

##### (2) Protect and Help Natural Enemies:

- Many natural enemies live in naturally within crop field and others live on wild plants in nearby fields;
- Just like the crop and insect pests are managed, natural enemies must also be managed so that they become abundant and effective;
- They feed on the pest;

##### (3) Regular Field Observation and Analysis:

- Farmers can make good decisions if they have good information;
- Insect pests, natural enemies, diseases, crop growth stage and weather are amongst the factors that should be observed and analyzed;

##### (4) Know the Weak Point of the Pest Biology:

- One may want to inquire the stage at which the pest is vulnerable in order to apply control measures, for example: (egg, larva or caterpillar, pupae, adult);
- Other may want to know when does the pest feed on the plant in order to apply control measure, for example: (early morning, daytime, night); This enable the farmer to know when to apply the control measure;

##### b. Farmers Become Expert:

- Farmers have confidence in their own knowledge and ability to make their own decisions;

##### c. Integrated Production & Pest Management Tips:

- (1.) Recognize the common and important pest, diseases and weeds that attack crops in the field and storage;

- (2.) Identify the damage done by particular pests and diseases at different growth stages of crop;
- (3.) Know and understand the options that are available for effective IPPM of major crop pests, diseases and weeds;
- (4.) Work with farmers on how to apply IPPM methods to manage crop pests, diseases, and weeds to achieve sustainable and environmentally sound and social economic benefits;

**Table 3: Pests and Diseases of Cocoa in Liberian cocoa ecologies:**

**Insect Pests:**

No:	Name of Pest	Description	Mode of Damage	Control
1.	<b>Stem borers</b>	They are caterpillars which bore into the stem of the trees	They take away nutrients from the cocoa tree and make it weak	Do shade management: Stem borers hate heat and sun will kill them
2.	<b>Pod-Borers</b>	They are insects that suck out the cocoa sap of the pods	They make holes in cocoa pods and infect the beans	Shade Management: Take away infected cocoa pods and bury them
3.	<b>Capsids or Mirids</b>	They are found in all cocoa growing countries; They are the most important pest of cocoa; A relative of mirid ( <i>Sahlbergella singularis</i> ) causes more damage to cocoa in Liberia; The adult is brown colored;	They feed by sucking sap from the young shoots, young pods, branches and chupons; Capsid infection delays maturity period of cocoa trees, reduces yield and may result in the death of the tree; They feed mainly in the night or early hours of the morning and rest at day; They are usually found resting at branch unions, beneath the scales of bark and beneath the pods; They pierce the young shoots, and suck sap, leaving oval, circular patches of drying tissues; When mirids attack pods they leave a lot of punctures in the pod wall, which stop free movement of liquid giving the cluster of beans dry;	
4.	<b>Termites</b>	They are insects that attack the young plant; including the roots, stem and branches and leaves	They feed on the young roots, stem and branches as well as the leaves;	Red ants serve as natural enemies
5.	<b>Mealy bug</b>	It is an insect through its feeding habits a virus is transmitted;	The feeding habits of the insect causes the virus CSSV	No specific control


**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**


**BONUS LESSON – Other Cocoa Pests**

Name of Pest	What is it?	Why is it bad?	How to treat it	Picture:
Cocoa Swollen Shoot Disease	A virus that causes shoots to swell, and causes white patches on veins of leaves	It can make branches too big and eventually can kill the tree	Cut off affected shoots. Remove affected bark that looks old and dry. Cut down dead trees.	 X
Which's Broom	A fungus that develops in wet places, it has a black and white colour on cocoa pods	Attacks the trees and cocoa pods	Shade management and underbrushing. If seen remove and bury in a pit 3m from the farm	 X
Thread Disease	A fungus that can be on the stem and leaves of the cocoa tree and is green	It causes leaves of the cocoa tree to turn white and to die	Use a stiff broom to scrape it from the tree	 X
Stem Borers	Caterpillars which bore into the stem of the trees	They steal nutrients from the cocoa and make trees weak	Shade management: Stem borers hate the heat and sun will kill them	 X
Pod-Borers	Insects that suck the sugar out of the cocoa pods	They make holes in cocoa pods and infect the beans	Shade management Wrap the affected pods in plastic to kill them	 X
Mirids	Insects that suck the sugar out of cocoa pods and leave black spots behind	Affected pods are hollow and have no weight, and the beans are no good	Shade management with enough sunlight	 X
Red Ants	Ants that are red in colour. They fight other pests on the farm	Red ants are GOOD! They should be encouraged on the farm!	Encourage red ants to fight other pests.	 ✓

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Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

**Diseases:**

No:	Name of Pest	Description	Mode of Damage	Control
1.	<b>Cocoa Swollen Shoot Virus</b>	It is a virus transmitted through the feeding activities of mealybugs; It is the most dangerous disease of cocoa which causes crop loss in Ghana and Nigeria; This fungus occurs mainly during the wet season (May-September);	The symptoms of the disease include mottling of the veins, vein clearing, and occasional swelling of stems of young plants and roots; Infected trees usually stop fruiting and 2-9 years and die soon after;	No chemical control; Cultural control is by removing infected trees and burning them;
2.	<b>Black-pod Disease</b>	This is the most serious of cocoa; It is caused by a fungus; The fungus occurs mainly during the wet season (May-September)	The disease attacks pods, leaves, and young cocoa plant, but the most important effect is pod loss; The fungus survives during dry season as a spore in the soil, leaf debris and sometimes in the flower cushion; It is first seen as a brown spot on the pods often near the tip; The disease spreads fast and the whole pods turn black, in about 10 days; As the pods become black the beans become useless; If mature pods are attacked, the beans may be saved if the	Control may be effected by spraying copper-based fungicide; Culturally, black pod disease can be controlled through proper shade;

			Pods are harvested soon;	
3.	<b>Mummified Pods</b>	Black, broken and dehydrated pods left on the tree; 1	Since the pods are diseased and present on the tree or branches, that part of the branch may not produce flower cushion.	Cut off the entire branch;



GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS

**Agro-Up Lesson # 4 – Black Pod Disease Control**



What is it?

- Removing black pods from the farm as soon as you can
- Black pods come from wetness, rain, and heavy shade on the farm, and make cocoa pods black and ugly



Why do it?

- Black pods kill your cocoa production
- Black pod spreads quickly and can spoil the entire farm
- If you remove black pods **you will have a better yield**



How do you do it?

- Proper shade management
- Proper pruning
- Undebrushing is very important
- Remove black pods in a basket **as soon as you see them on your farm**
- Bury them together at least 3 meters from the cocoa farm
- DO NOT** mix black pods with healthy pods!!

When do you do it?

- You must always be looking for black pods
- Remove black pods **as soon as you see them!**
- Black pods spread quickly to healthy pods, so you must always be looking!

CALENDAR

Jan	Feb	Mar	Apr
May	Jun	Jul	Aug
Sep	Oct	Nov	Dec

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Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

**Plant Parasites:**

No.	Name of Pest	Description	Mode of Damage	Control
1.	<b>Mistletoe</b>	They are plants that grow on cocoa trees and depend on them to grow and live; Mistletoes have red flower and berries;	They rely entirely on the host (cocoa tree) for water and mineral salt, and they damage the canopy by killing cocoa tree branches;	Mistletoe should be removed during flowering season; when you see it, Cut infected branches.
2.	<b>Mosses*</b>	They are small green plants (algae) that grow on the cocoa tree.	They reduce the amount of cocoa pods that a tree produces as they rely on the cocoa tree for mineral salts and water; Mosses stop or interfere with the production of flower cushion which means less pods	Remove mosses by scraping the tree using a cutlass or hard rubber brush;

			production;	
3.	<b>Ferns</b>	They are plants that grow on tree and live on the host for water and mineral salts	They predispose the cocoa trees to parasites and pathogens due to high humidity and shade.	Shade management



GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS

**Lesson # 5 – Moss and Mistletoe**



What is it?

- Moss:** Small green plants that can grow on the cocoa trees
- Mistletoe:** Are plants that grow on cocoa trees and depend on them to live, it has red flowers and berries



Why do it?

- Moss reduces the amount of cocoa that a tree produces
- Moss stops flowers growing which means less pods
- Mistletoe means less cocoa from your tree and weaker trees



How do you do it?

- Remove moss by brushing it off with a hard-bristled broom
- Use a cutlass or pruning saw to cut out mistletoe



When do you do it?

- Moss should be removed whenever you see it on your farm
- Mistletoe should be removed in the flowering season when you can see it on the plants

CALENDAR			
Jan	Feb	Mar	Apr
May	Jun	Jul	Aug
Sep	Oct	Nov	Dec

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Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

**Vertebrate Pests:**

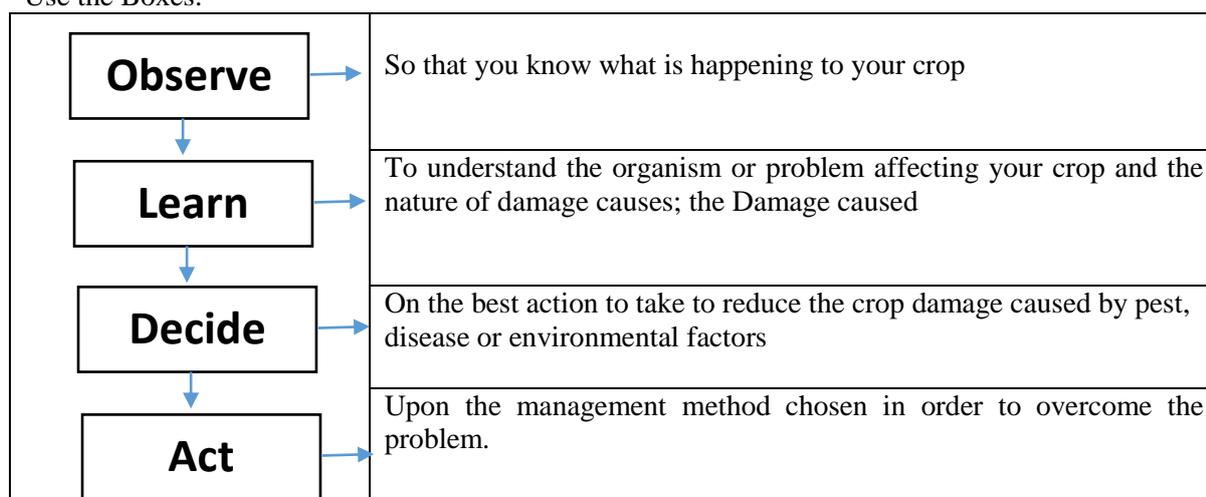
**Rodents:**

No.	Name of Pest	Description	Mode of Damage	Control
1.	<b>Squirrels</b>	Small brown rodents	Damage the young cocoa tree and eat the pod; damage prevalent at seedlings growth.	Use wire netting or set trap
2.	<b>Bush Rats</b>	Small rodents	Damage the young cocoa tree and eat the pod	Same as above.

Insert Photos of cocoa pests

The above is summarized as follows:

Use the Boxes:



**Adapting the FFS Approach to Cocoa Farming:**

- The FFS approach was initially developed for training farmers on integrated production and pest management practices on Food/Annual Crops; example Rice and Vegetables;
- This approach developed by the Food and Agriculture Organization of the United Nations was adapted to Cocoa Farming:

**Table 4: Comparison of FFS for Food Crop IPPM and Cocoa IPPM**

	<b>FOOD CROP IPPM</b>	<b>COCOA IPPM</b>
<b>Meeting Frequency</b>	<b>Weekly</b>	<b>Twice a Month</b>
Length of Training	Season Long	9-10 Month
Number of Session	About 14 (Average)	15-20
Length of Training Sessions	2 hours	4-5 hours
Focus during AESA	The Whole Plant and Condition on the Learning Plot	Up to 2 meters on the Whole Tree Learning Plot
Technical Content/Information	Identification and Conservation of Natural Enemies	Disease and Pest Management; Cultural Practices
Emphasis of FFS	Training and Research	Training

## Section-XI: Flowering and Pod Production:

### Objective:

- a. To monitor flowering and fruiting process for good quality pods formation.
- b. To identify early production defects and provide prompt remedies.

**Methodology:** the following are step by step methods of monitoring and scouting for better fruiting and pod formation. The methods are discussed in details as follows:

### Materials required:

1. Hand lenses
2. Rain boots
3. Cutlasses
4. Empty bags
5. Etc.

### Procedure:

#### Discussion Points and Notes:

- d. How do Cocoa flowers in little clusters?
  - Flowers and fruit are produced on the main stem and branches;
  - On the main stem and branches are found cluster of swellings referred to as flower cushion;
  - It is from the flower cushions that flowers and fruits or pods are produced and care should be taken not to injure the flower cushion;
  - Pod production usually begins 3-5 years from planting;
  - It takes cocoa pods from 110-130 days, depending on variety, from pollination to pod ripening;
  - Only mature and fully ripe pods which sound hollow when topped should be harvested;
  - However, new varieties being bred may come into bearing in the second or third year;
  - Physical Injury or damage to the flower cushions means low production of pods;
  - About 50 flower cushions can be found on the tree;
- e. **Pod Ripeness and Harvesting:**
  - The first stage in the processing of cocoa is harvesting;
  - Ripe, healthy looking pod, which are yellow or orange in color, are removed from the cocoa tree by cutting through the short pod stalk with a sharp shear or cutlass;
  - Pods borne high up in the leaf canopy are usually removed with sharp knives tied on long or short sticks;
  - These are known as harvesting hooks which are designed to cut both ways with either an upward or downward thrust;

### f. Harvesting Signs:

#### Harvest on time to prevent pre and post-harvest loss;

- Harvest cocoa pods that are completely bright yellow;
- Harvest frequently during the cocoa season as the pod become ripe;
- Harvesting at the right time improves the quality of the cocoa beans;
- Harvesting un-ripe pods give bad fermentation;
- Harvesting over-ripe pods is bad because seeds start to grow;
- The frequency of harvesting depends on the crop;
- On small farms, harvesting does not follow any particular pattern;
- The important thing to know is whether enough ripe pods are available;
- For good hygiene, all diseased and dead pods should be removed along with the ripe, good pods;
- All damaged and infested pods should be destroyed;
- When harvesting, cocoa trees should NOT be climbed and bigger branches carrying many flowers should NOT be shaken vigorously as this can cause flower loss;
- Low hanging pods should not be torn off by hand, as this may result in damage to the flower cushion with decrease in pod production;
- Use baskets or containers to pack harvested cocoa pods from the plant to the place where the beans are to be separated;

**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**  
Agro-Up  
Lesson # 6 – Cocoa Harvest

What is it?	Why do it?	How do you do it?	When do you do it?
<ul style="list-style-type: none"> <li>• Harvesting cocoa is the removal of cocoa pods from the cocoa trees once the cocoa pods are ripe</li> </ul>	<ul style="list-style-type: none"> <li>• Harvesting at the right time improves the quality of your cocoa</li> <li>• Harvesting unripe pods gives bad fermentation</li> <li>• Harvesting overripe pods is bad because seeds start to grow</li> </ul>	<ul style="list-style-type: none"> <li>• Only harvest pods that are <b>completely bright yellow</b></li> <li>• Make a clean cut with a cutlass or knife to remove the pods, be careful not to damage flowers</li> <li>• <b>DO NOT</b> hand-pull pods</li> </ul>	<ul style="list-style-type: none"> <li>• Harvest frequently during the cocoa season, as pods become ripe (yellow!)</li> </ul>

**CALENDAR**

Jan	Feb	Mar	Apr
May	Jun	Jul	Aug
Sep	Oct	Nov	Dec



Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

- **g. Production Yield:**
- Yields are low in West Africa;
- They are between **224-692 kilograms** of dry beans per hectare;
- Good yields of **896-2241 kilograms** on experimental farm;
- Good and large farms are from **896-1120 kilograms** of dry beans per hectare;

## Section-XII: Harvesting & Processing:

### Objectives

- To ensure timely harvesting
- To minimize pre and post-harvesting losses
- To ensure quality beans

### Methodology:

The following are considered the practical methods of achieving quality beans as stated in the objectives.

### Materials required:

- Moisture meter
- Fermentation boxes
- Banana leaves
- Polythene sheets
- Raised drying beds
- Etc.

### Procedure:

#### Discussion Points and Notes:

##### a. Pod Breaking:

- All fermentable pods are collected and broken on the farm or just outside it;
- Pods should be broken 1 to 3 up to 5 days after they are harvested;
- Break pods with a stick or blunt object, stone or wooden mallet;
- Do not break open the pods with a cutlass or knife as it will damage the pods;
- Any pod fragments and the placenta must be removed from the beans;
- Beans to be fermented must not be those that have started to germinate, immature ones which are too small, dry or diseased beans;
- Beans from pods showing the first signs of black pod disease attack are generally good and can be fermented;
- Do not leave pods for more than 5 days after harvesting before breaking;

**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**  
**Lesson # 7 – Breaking the Pods**

**What is it?**

- Breaking the pods is the act of breaking open the cocoa pods so you can remove the cocoa beans



**Why do it?**

- Breaking pods in the right way at the right time means you will have good quality cocoa
- You will get more money for good quality cocoa



**How do you do it?**

- Break pods with a stick, stone, or a blunt object
- Do not** break open pods with a cutlass or knife as it will damage the beans
- Remove beans by hand
- Discard pods across the farm, they are good fertilizer and will help trees grow



**When do you do it?**

- Pods should be broken open **no later than 7 days after harvesting**
- DO NOT** break cocoa pods when it is raining

CALENDAR			
Jan	Feb	Mar	Apr
May	Jun	Jul	Aug
Sep	Oct	Nov	Dec

Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

##### b. Fermentation:

#### Fermenting Cocoa Beans:

- Fermentation is one of the most important operations in the preparation of cocoa beans for the market.

**Fermentation** process serves to:

- Develop the chocolate flavor (taste), color and scent (**aroma**);
- Kill the embryo of the seed so it cannot germinate during drying, storage or processing; the **acetic acid** produced during the process reacts with the beans to give the **chocolate flavor**;
- Make the bean more brittle and easier to separate from the seed coat; the beans increase in size due to plumping of the bean testa;

- this loosen the testa, making the removal of the testa easy at the factory during chocolate manufacture;
- Remove the pulp or mucilage surrounding the seed to make subsequent drying easier.

**Fermentation** is mainly a **heating process** but to be successful there must be adequate ventilation;

- During the process the temperature of the beans rises to between 47°C-5°C and efforts are made to keep the temperature within that range;
- Sudden drops in temperature are however experienced during the turning and mixing of the beans which helps to move the carbon dioxide (CO<sub>2</sub>) produced during fermentation;
- Fermented cocoa produces a fine flavor;
- Fermentation makes good brown beans;

**c. There are 3 ways to Ferment Cocoa:**

**1. Basket Fermentation:**

**Insert a Photo:**

- This is the most common method used to ferment small quantities of cocoa beans obtained by smallholder farmers;
- Basket made with oil palm frond midrib back are lined with banana or plantain leaves;
- The beans are poured inside and the protruding ends of the leaves are folded over to cover the beans and then place a heavy stone or piece of wood;
- The basket are placed on wooden platform to permit drainage of the excess water and mucilage;
- The package is opened, turned and mixed thoroughly on the 3<sup>rd</sup> and 5<sup>th</sup> days;
- The fermented beans should be ready on the 7<sup>th</sup> day;

**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**  
**POST-HARVEST LESSON #2:**  
**QUALITY COCOA FERMENTATION**

**1. BOX METHOD (RECOMMENDED)**

★ ★

✓

Make 2-3 boxes

Cover with banana leaves

Mix beans every 2 days!

**2. BASKET METHOD**

✓

Mix with wooden tools, NOT metal shovels

**3. HEAP METHOD**

✗

**HOW TO FERMENT COCOA - Details!**

Box Method (BEST)	Basket Method (SECOND BEST)	Heap Method (LEAST RECOMMENDED)
1. Make 2 boxes out of wood. You don't need a top for the box, but it should have an open top and holes in the bottom. 2. Make sure the box is on a table. 3. Put the beans inside the box and fill it to the top – don't leave any space. 4. Cover the top of the beans with banana leaves or fan leaves. 5. When mixing, do it fast to keep the heat inside. <ul style="list-style-type: none"> <li>○ Use two boxes to help with the mixing.</li> <li>○ Lift the box with the beans up and place an empty box under, with fresh banana leaves all around it.</li> <li>○ When mixing, open the side of the box with the cocoa beans inside.</li> <li>○ Move the cocoa from one box to another and mix while you're doing it.</li> </ul>	1. Find a basket and put banana leaves around and inside it. 2. Put the basket up high (on a table) to let the water from the cocoa come out. 3. Put cocoa beans in the basket. 4. Cover the basket with banana leaves to keep the heat inside.	1. Spread salt on the floor to repel ants. 2. Arrange pieces of wood on the floor covered with banana leaves. 3. Heap the wet beans on into a pile 60-90cm high. 4. Cover the heap with banana leaves to retain the heat, holding them down with pieces of wood.

**For ALL Methods**

Mix beans every 2 days!

Fermentation is complete after 7 days!

Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

## 2. Heap Fermentation:

- In this method, straight pieces of wood about 2-3 meters long are arranged about 15cm apart on clean ground to form a base;
- Banana or plantain leaves are spread over the platform;
- These leaves are perforated in a number of places to allow for drainage of sweating;
- Wet beans are then piled on this base until a heap of 60-90cm high is formed;
- The heap is then covered with the banana leaves held down with logs of wood or pieces of banana stem;
- On the 3<sup>rd</sup> and 5<sup>th</sup> day, heap is thoroughly turned and evenly mixed with a wooden spade or by hand;
- This should be done quickly to avoid heat loss before the heap is covered up again;
- If properly done, the covered beans should be fully fermented and ready for drying on the 7<sup>th</sup> day;

## 3. Box Method:

### Insert a Photo:

- Make 2 boxes out of wood. There is no need for a top for the box, but it should be with an open top and holes in the bottom;
- Make sure the box is on a table;
- Put the beans inside the box and fill it to the top, do not leave any space;
- Cover the top of the beans with banana leaves;
- After 2 days, mix the beans and cover again with banana leaves;
- When mixing, do it fast to keep heat inside;
- Use 2 boxes to help with the mixing;
- Lift the box with the beans up and place an empty box under, with fresh banana leaves all around it;
- When mixing, open the side of the box with the cocoa beans inside;
- Move the cocoa from one box to another and mix while you are doing it;
- After another 2 days, mix the beans and cover with banana leaves;
- Fermentation is finished after 7 days

### d. Drying and Processing:

#### Drying and Sorting Beans:

- Drying of fermented cocoa is done to retain the chocolate flavor developed during fermentation;
- Moisture content (MC) of cocoa is reduced to **7%**;
- When properly dried, **100lbs. of wet cocoa beans** will convert to about **40lbs. dried beans**;
- Drying can be done naturally by making use of the sun rays;
- Drying too rapidly should be discouraged as it causes the crinkling of the bean testa and leads to inactivation of enzymes necessary to ensure good chocolate flavor;

#### i. Sun-Drying:

- This is possible in Liberia since the main crop is produced during the dry season;
- This method is simple, economic and effective;
- A platform made from bamboo which is about 3.5ft. high is covered with a mat;
- The cocoa beans are spread on the mat to dry;
- Every evening the beans are heaped horizontally on the mat;
- This is then covered with palm thatch or tarpaulin;
- In the morning the beans are spread;
- The beans are turned with a wooden rake or by hand to ensure even drying;
- The beans are dried usually by spreading out in the Sun or raised platform for (7-14 days);
- This is to protect the beans from contamination from dust and domestic animals;

- It also hasten the drying process since air and warmth circulate around the beans more effectively than if they were spread on the ground;
- Rapid drying should be avoided as the beans will shrivel;
- They should be shaded at mid-day on the 1<sup>st</sup> and 2<sup>nd</sup> days of drying and left un-shaded on the 3<sup>rd</sup> and 4<sup>th</sup> day;
- During drying, the beans should be regularly stirred to prevent them from sticking to each other;
- Also, damaged seeds and foreign matter should be removed;
- Beans should always be covered with a waterproof sheet during rains;
- Well-dried beans produce a cracking sound when rubbed;



GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS

## POST-HARVEST LESSON #3: QUALITY - DRYING COCOA



**WHAT IS IT?**

- Heating cocoa beans under the sun to get rid of the moisture
- It makes sure mould does not grow on the beans | You will get a better price for your cocoa!

**DO:**

- Start drying **immediately after fermentation**
- Spread out the cocoa
- Turn the cocoa every two hours with a wooden paddle

**DO NOT:**

- Dry cocoa on zinc sheets
- Dry cocoa on the ground
- Dry near gasoline, diesel, animals, or smelly things

### WAYS TO DRY COCOA:

**1. USE A SOLAR DRYER**  
★ (RECOMMENDED) ★

- Cocoa dries several days faster - less work for you!
- Cocoa is safe from the rain
- Better quality cocoa means more money
- Cocoa is secure from theft



Cocoa is off the ground:

- Easier to sort
- Easier to grade
- Less contaminants
- Dries faster

COCOA IS DRY AT 7.5% MOISTURE: THIS IS WHEN IT MAKES A CRACKING SOUND WHEN SQUEEZED IN YOUR HAND!



Cocoa is on the ground:

- Difficult to grade and sort
- More risk of contaminants
- More risk of foreign matter

**2. ON A DRYING TABLE**



**3. ON A TARPULIN OR CEMENT FLOOR (Not Recommended!)**



Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

ii. **Drying in a Solar Dryer:**

- It is a structure covered in plastic with raised tables inside for drying cocoa;
- It keeps the beans safe from rains;
- Fast drying prevents mold and keeps the attractive brown color of the beans;
- Spread the beans out on the drying table and turn the beans every 2 hours;
- Do not dry near diesel, gasoline or smelly objects;

35

- Do not dry on roofing zinc;
- Cocoa should be dried for 7-10 days when the cocoa makes a cracking sound in your hand when squeezed;

**iii. Testing for Dryness:**

- Well-dried cocoa should have a moisture content of about 7.0% in order to **store well**;
- A simple practical test for dryness is to press a handful of beans together;
- If the (testa) crackle, then the sample is dry;
- A better test is to cut a bean with a knife;
- If well-dried, the cotyledon will separate easily indicating the clear brown color;

**iv. Sorting:**

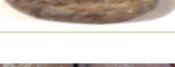
- Fermented dried cocoa is first sorted before it is graded, stored and marketed;
- Sorting is done to remove dirt, loose particles of seed coat and broken beans;
- The good beans are then bagged and placed on pallets;
- This final stage of processing is very important and must not be ignored;

**v. Grading:**

- This is mainly carried out by produce inspectors to ensure the maintenance of satisfactory standards of quality;
- Grading takes place at two main places, the port and inland;
- Inland grading is done by registered buying agents;
- Grading of cocoa is conducted before marketing;
- Quality of cocoa beans is divided into 3 main categories:
- **Grade I**
- **Grade II**
- **FAQ (Fair Average Quality)**

**GOOD AGRICULTURAL PRACTICES (GAP) FOR COCOA FARMERS**  
**POST-HARVEST LESSON #4:**  
**BASIC COCOA GRADING and STORAGE**

 **THIS IS PROPERLY FERMENTED COCOA, GRADE 1!**

Defect/Issue	What is it?	What is the cause?	How to prevent?	Picture:
<b>Under-fermented</b>	Fermentation not complete, beans purple when split open	Beans not fermented properly or for enough days	Ferment beans properly for <b>6-7 days (Use the Box Method)</b>	
<b>Mould</b>	Fungus growing on the cocoa beans	Too much moisture, bad storage practices	Dry cocoa until it makes a cracking sound in your hand, proper storage	
<b>Slate</b>	Bean has not been properly fermented; darkish or dirty looking	Fermentation not properly done.	Cocoa should be fermented 6-7 days. Box method is best.	
<b>Foreign Material</b>	Other objects like rocks or sticks mixed with the cocoa	Allowing rocks, sticks and wood into the cocoa, chickens and other animals	When fermenting and drying cocoa remove all foreign objects and defective cocoa	
<b>Infestation</b>	Beans are attacked by pests such as insects or fungi	Storing in old bags, storing near infested crops	Use new or clean bags, keep cocoa away from infested areas	
<b>Germination</b>	The cocoa bean begins to grow into a plant in the pods	Harvesting too late, not fermenting soon enough; removing beans too soon	Harvest cocoa when ripe and yellow; harvest properly	
<b>Flat Beans</b>	Immature beans that are not fully grown, less weight and fat	Harvesting too early when the pods are not yet ripe	Harvest only when pods are fully ripe	

**COCOA STORAGE:**



Use clean new jute bags to store cocoa beans



Use wooden pallets to keep the cocoa bags off the ground



Stack bags on pallets in a clean dry space away from walls



**NEVER** store cocoa near chemicals or smelly things



Keep your cocoa secure. Always lock your storage space

Source: Agro-Up (Good Agricultural Practices for cocoa farmers)-Grow Liberia

**Grade I Cocoa:**

Cocoa which is thoroughly dry, free from foreign matter and free from germinated or flat beans, smoky, velvety or black beans and contains less than;

- (1) Less than 3% by count of slaty beans;
- (2) Less than 3% by count of moldy or insect damaged beans;

**Grade II:**

Cocoa which does not qualify for Grade I and which is thoroughly dry, free from foreign matter and from germinated or flat beans, smoky, velvety or black beans, and contains less than:

- (1) Less than 4% by count of slat beans;
- (2) Less than 4% by count of moldy beans;

**Fair Average Quality (FAQ):**

Cocoa which does not qualify for Grade I and Grade II and which is thoroughly dry, free from foreign matter and odor, smoky, velvety, black beans and which contains less than:

- (1) 10 percent of slat beans;
- (2) 10 percent of moldy and insect damaged or flat beans;

- The actual inspection is carried out by taking a random sample of **300 beans**;
- The produce inspector takes the trouble of splitting the beans with a knife;
- From this, he can determine easily those beans that are slaty, moldy, and under-dried or other defective beans;
- It is important to mention that **3 of such beans equal 1%**, hence, **90 slaty beans** from random sample of 300 beans will amount to **30%**;

**vi. Storage:**

- Dry cocoa beans should be stored in clean baskets or in sacks which should be kept off the ground and away from the walls of the warehouse;
- Sacks previously used to store food stuffs should not be used as they are likely to harbor weevils and other insect pest pests that may attack cocoa beans;
- Cocoa should not be stored near maize, tobacco or other food stuff so as to pick up their odor;
- It should also be kept away from smoke as this will produce smoky beans;
- It is not advisable to store cocoa beans indefinitely as the quality may drop;

It is necessary to preserve the quality of cocoa beans during storage so as to attract the highest price for the produce;

- During storage the beans are prone to attack by many insects mainly moths, weevils and beetles;
- Agents are advised to transfer their produce as soon as possible to the Central depot where pests can be controlled;
- Keep cocoa warehouse very clean;

**vii. Packaging and Marketing:**

- Processed cocoa beans are put in jute bags and store on pallets in the warehouse;
- The warehouse has screens for ventilation at the windows;
- The wooden pallets are treated for pests and diseases and allow air to circulate on the surface of the floor to allow drying of the bags at the bottom;
- The bags are stack properly in batches with gangway to allow movement;
- The bags do not touch the walls in order to prevent moisture migration from the walls to the bags;
- Wind direction is considered in the construction of warehouses so as to prevent a lot of rain-flash on walls and eaves of the building;

**Table 5: Defective/damaged Beans and their Causes:****Defective Beans:**

	<b>Defective Beans</b>	<b>Causes</b>	<b>Remarks</b>
1.	<b>Smoky beans</b>	Storing beans in smoky areas or room or near fire, drying over fire;	Many of such beans are unacceptable to manufacturers;
2.	<b>Velvety beans</b>	Leaving ripe pods on the tree un-harvested for several weeks; Collecting beans from pods damaged by rodents and collecting beans from diseased black pods;	Many of such beans are unacceptable to manufacturers;
3.	<b>Black beans</b>	Not fermenting in time, drying on iron or metal sheets,; Collecting beans from diseased black pod;	Many of such beans are unacceptable to manufacturers;
4.	<b>Moldy beans</b>	Under-dried beans and bad storage, storing in a damp place;	Reduces the price and renders the cocoa beans un-saleable if found in large numbers;
5.	<b>Weevil infested beans</b>	Collecting beans from pods damaged by rodents; Storing cocoa near tobacco and food stuff; Storing in damp places; Leaving bags on the ground;	Reduces the price and renders the cocoa beans un-saleable if found in large numbers;
6.	<b>Flat or Empty beans</b>	Beans from immature pods in which the cotyledons are not filled (they are not diseased);	Reduces the price and renders the beans un-saleable if found in large numbers;
7.	<b>Germinated beans</b>	Leaving the ripe pods on trees un-harvested for several weeks; Fermenting in holes in the ground; Not turning beans during fermentation;	Lowers quality and reduces price; Cocoa beans un-saleable if too many are found;
8.	<b>Slaty beans</b>	Result of non-fermentation of beans;	Forbidden entirely;
9.	<b>Purple beans</b>	Results of under fermentation	Lowers the quality and reduces price; Cocoa beans un-saleable if too many are found;

## Section-XIII: Market and Marketing Chain Analysis:

### Objectives

- a. To determine market demand and products
- b. To avoid being price taker
- c. To produce quality beans as requested by customers
- d. To sell your products to make profit.
- e. To facilitate knowledge and skills on Market and Marketing Chain Analysis to cocoa

### Methodology:

- Do market survey first to determine what good and services are needed and how you can meet the demand.

### Materials required:

1. Market information system
2. Logistics
3. Newspapers
4. Note pads
5. Camera
6. Walkman radio

### Discussion Points and Notes:

- a. **Production and Marketing, which comes first?**
- b. **What is a market?**

A market is a place where:

- Goods are gathered by farmers;
- Goods are exchanged;
- Farmers displayed their goods;
- Farmers learn from one another;
- Good are sold;
- Prices of goods are negotiated and bought;

**Note:** All of the above activities are part of marketing.

### The Five Ps in Marketing:

There are basically five Ps in Marketing. They include:

1. P = Product
2. P = Price
3. P = Promotion
4. P = Policy
5. P = Place

### Product:

To get the best price from your sale, the product must be based on:

- Market Demand
- Quality of the Product
- Quantity in Demand
- Time of Demand

**Note:** consider your competitors in the market because it is where values are required to meet customers' demand.

### Price:

- The price of any product is based on:
- Market Demand
- The form and quality of the product;
- The location of the business
- The culture of the people
- The time of sale

**Note:** The place where a product is sold can determine its price. Consider the below factors in determining prices.

- Areas that are not accessible by motor roads, but can be reached;
- Areas that are not easily reachable all;
- Areas that are accessible by motor roads throughout the year;
- Village/town market;
- City markets;

**Promotion:**

The sale of a product can be determined by the kind of awareness that is created. This can be done through:

- The radio
- News papers
- Community awareness forum
- Quality of the product on the market
- Location of the product
- Market demand

**Government Policy:**

- It helps to determine marketing directions;
- Organized farmers have the ability to influence government’s policy on marketing;

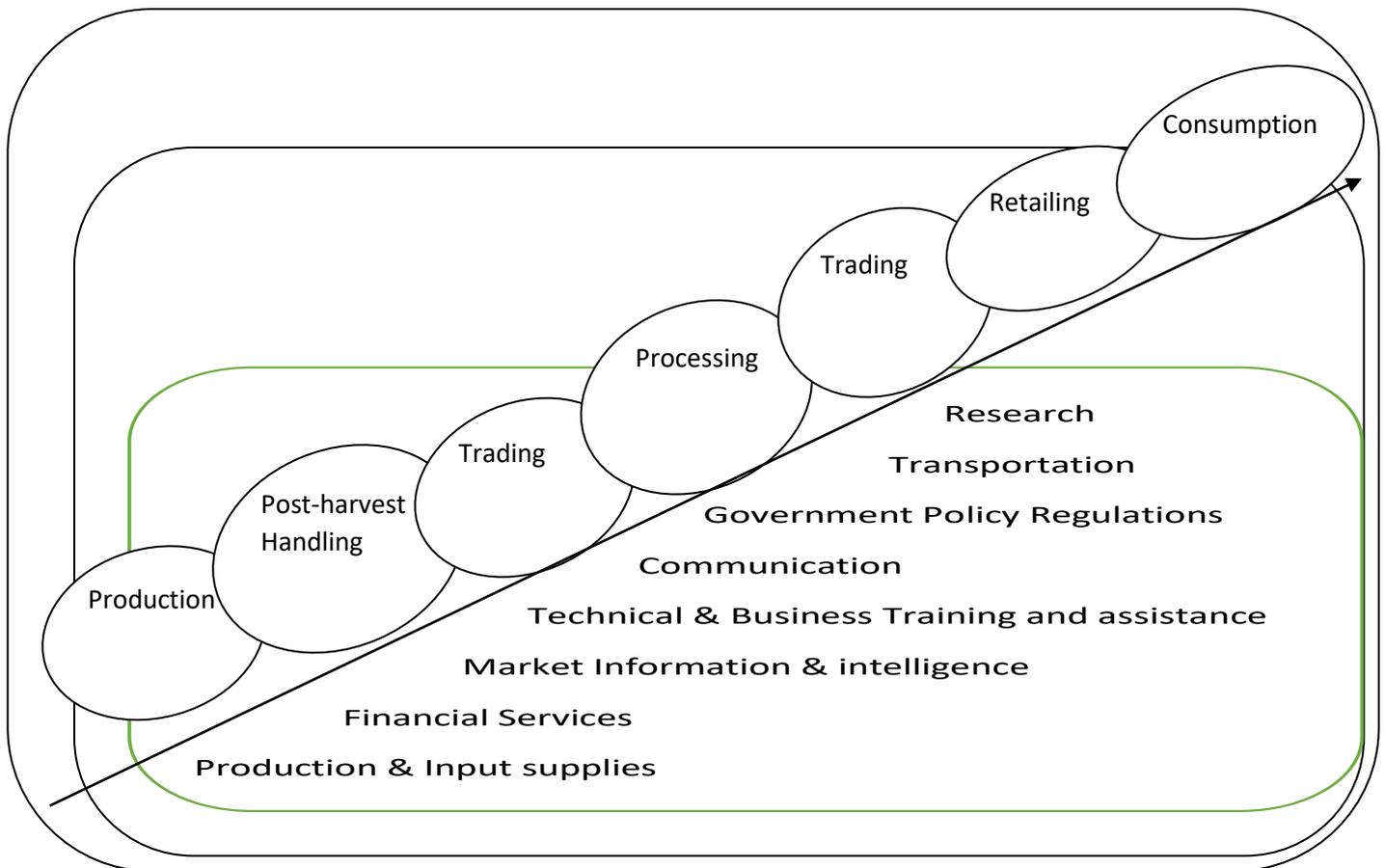
**The additional elements that transition the 5Ps to the 7Ps marketing model**



**What is a Market Chain?**

Market chain is a collection of actors linked informally or formally that move a product from its basic state to the final consumer.

## Market chain and service providers: Basic Concepts



## Section-XIV: Record Keeping

### Why keep record?

#### Objectives:

- To keep track of farm operation
- To enable farmers to Know and benchmark all the conditions and processes leading to the farm as business unit.
- To also enable farmers to know and benchmark all the transactions of the farm operations.
- To enables farmer to make financial report and such financial report or statement may act as a catalyst in obtaining loan to improve the business.

#### Methodology/Procedure:

The practice is to take notes on all transactions at all times with accurate date. Make a monthly financial report of all transactions.

#### Materials required:

1. Column pads and note pads
2. Pens
3. Note pads
4. Walkman radio
5. Camera
6. Etc.

#### Discussion Points and Notes:

##### Why keep record?

- To keep track of farm operation
- Enable farmers to Know and benchmark all the conditions and processes leading to the farm as business unit.
- Also enable farmers to know and benchmark all the transactions of the farm operations.
- Enables farmer to make financial report and such financial report or statement may act as catalyst in obtaining loan to improve the business.

Record keeping with local traditional cocoa farmers takes into account the following:

- a) Relating the cultural and cropping pattern history of the cultivated land, history of the prevalence of pests and diseases; husbandry practices over the years.
- b) Yield potential
- c) Means of ownership; all of these pieces of information may be passed orally to the next line of kin as records of the farm.
- d) Then of course the book keeping record with accountant practices which tend to benchmark all transactions of the farm and present financial report at a certain period of operation. This aspect of record keeping deals with expenditures and revenues during the farm operation for a given period. Like most traditional farmers cocoa farmers do present good oral account and knowledge of the first three elements but when it comes to book keeping where actual transactional activities regarding expenses and revenues or financial reports are produced are usually forgotten and do not necessitate any relevance in such operation.

However, during the conduct of TOT farmers and participants were acknowledged and exchanged views and experiences on the importance of recording keeping on all transactions and how it can help to tell farmer whether he or she is making profit or not or whether the farm operation is worth further investment or the farmer should switch to other business initiative or employ some strategies to improve profitability. Farmers and participants then endorsed the concept and promised that it would form nucleus of their farm operation because according to them it would help to improve their farms. They also recognized that farming is no child play; it is a serious

business so it needs every sound practice including book keeping record to ensure money being expended for the operation of the farm is accurately accounted and benchmarked as financial report or statement which guides continual operation.

A simple Financial Record of a Typical 10 acre Cocoa Farm for the First quarter 2019 as illustrated at the TOT workshop (US\$), Saclepea.

**Expenditures**

• Cost of fertilizer, rice, etc.	US\$ 150.00
• Medicines	75.00
• Labor wages	225.00
• Transportation	150.00
• Sales tax	50.00
• <u>Others (Management fee )</u>	<u>100.00</u>
• <u>Total expenditures</u>	<u>US\$650.00</u>

**Income (revenues)**

• Cocoa sales (7, 50kg. bags) =	1,250.00
• <u>Others: n/a</u>	<u>0.00</u>
<u>Total</u>	<u>1,250.00</u>

Net earing for three month period: Income (less expenditures) = **1250.00-650= 600.00 USD.**

## Section-XV: Child Labor in Cocoa Farming:

### Objectives:

- Not to use children knowingly or unknowingly on the farm to do work that they are unable to do or work that interferes with school's time;
- Not to breach national and international law regarding child labor
- To allow the child to do work that won't endanger its health and mental well-being;
- Also to allow the child to do work that won't harm its physical well-being as well as jeopardized its childhood upbringing;
- To satisfy your buyers that you as a producer or farmer are not using child labor on the farm especially work not conducive for the child and interferes with it schooling.

### Methodology:

Follow or adapt guideline or national and international legal instruments on child labor at national, district, community and farm level.

Adhere and apply it at local level.

### Materials required:

- Copy of Decent work bill act
- Copy of ILO/UN convention on child labor and rights of the child.
- Jingles on child labor

### Discussion Points and Notes:

#### What is child labor?

Child labor can be defined as follows:

- Work a child does which deprives the child its childhood;
- Work which deprives the child the potential and dignity;
- Work which is harmful to the physical and mental development or well-being of the child; in short it refers to work that:
- Is mentally, physically, socially or morally dangerous and harmful to the child;
- Interferes with the child's schooling or education
- Deprives the child from going to school even when it is time to go to school.

Since cocoa farming is an agricultural activity it is here where most children may be deprived of their childhood, unable to attend school and prone to hazardous and harmful job that may affect their physical and mental development or life.

- **Minimum age of work under ILO and Liberian law**

Realizing and cognizant of the fact that children are very vulnerable and can be exploited to work either at the request of their parents or business enterprises, the International Labor organization (ILO) of the United nations Convention no. 138 specifically sets Minimum working age at 14 years. However, the Government of Liberia (GOL) in its decent work bill act of 2017 set the minimum working age of child at 15 year. With respect to this minimum age it is stipulated and required that no individual, business entity or family farming enterprises should give job or work to the child that would be hazardous, harmful to both his or her physical, mental well-being as well as health. Additionally such work must not interfere with the child's schooling time, period to study or play.

Oversea buyers mainly Europeans forbid child labor on the farm, other-wise they won't not buy your produce. So this message was strongly articulated by the facilitators and all participants including lead farmers took notes to form part of their farming routine.

- **Type of job allowed for a child to do**

As pointed out during the TOT, it does not imply that children cannot work but such work must consider their well-being, development, schooling or education and childhood. For example on the farm it was discussed and views exchanged among farmers and participants that after the children return from school and on week-ends the older ones could help again taking into account that such work will not endanger their life, health, including mental and physical well-being. In other words at

the farm level give light, not hazardous job to the child to do. Do not endanger the health and life of your child; this was the chorus for this aspect of the facilitation.

- **Categories of child labor**

Child labor may take the form of slavery in which case the child is under bondage or is sold or trafficked, or the use of child in procuring or offering the child for prostitution, etc.

The use, procuring or offering of a child for illicit activities, for example the trafficking of drugs is another worst form of child labor.

## Section XVI: Climate Change and Climate Adaptation:

### Objectives

- a. To be aware and know that climate is changing before your very eyes and can affect your farming;
- b. To know that your farming activities can accelerate or destroy forest which may lead to climate change;
- c. That as a farmer you can do something to avoid or remedy climate change by not clearing virgin forest land, doing soil conservation and management.

### Methodology/Procedure:

The procedure is discussed below as follow:

Discussion Points and Notes:

### Materials required:

1. Pictorials on effects of climate change
2. Field visitation and assessment
3. Note pads
4. Flip charts
5. Pens
6. Markers
7. Jingles
8. Etc.

- **What is climate and why should cocoa farmers worry about climate change?**

**Section Objectives:** To provide cocoa farmers with knowledge and skills on climate change with respect to cocoa production

### Procedure:

- **What is climate and why should cocoa farmers worry about climate change?**

Climate change may be defined as a periodic modification or changes of the Earth's climate caused by changes in the atmosphere and interactions between the atmosphere and various other geologic, chemical, biological and geographic factors.

Changes in the atmosphere which is the layer that protects the Earth from the sun rays include but not limited to:

- CO2 emissions
- Increase in greenhouse gases
- Deforestation
- Agricultural activities, etc.
- Mining

### Effects of climate change in agriculture, the example of cocoa farming:

- a) Flood and overflowing of rivers which may destroy farming land;
- b) Drought
- c) Abrupt outbreak of pests and diseases
- d) General breakdown of the farming cycle.

All of these prevailing conditions may affect yield performance of the cocoa crop, hence the income of the farmer.

### Mitigating measures or remedial actions at the Ministry of Agriculture and farmer level:

- a) Farmers should adapt climate smart resilient food crops in multiple cropping system with cocoa farming;
- b) Farmers should not fell primary forest for cocoa production, rather tertiary forest should be used;

- c) Farmers should use medium or short duration, drought resistant varieties to shorten gestation period;
- d) MOA Extension Staff in collaboration with lead farmers should institute surveillance of climate change and climate change related pests and diseases so that such pests and diseases can be benchmarked for quick action to be initiated for the control.

## Section XVII: Procedure for Starting Agro-Ecosystem Analysis (AESAs)

### Objectives

- a. Farmers to put into practice what has been presented at facilitation;
- b. To enable farmers to make group decision based on their observations;
- c. Do self- analysis of group's competence level;
- d. To improve methodology and presentation.
- e. To compare farmer's plot with IPPM plot
- f. To able tell the difference between the usual farmer's plot to that of IPPM's plot

### Methodology:

The procedures and methods are presented in the preceding below:

### Materials required:

1. Selected farm or field for practicals
2. Note pads
3. Pens
4. Walkman radio

Flip charts

5. Markers

### Procedure:

#### Discussion Points and Notes:

##### What are the procedures for Starting Agro-Ecosystem Analysis (AESAs):

1. Farmers should select a field where the AESA will be done;
2. The field is divided into 2 plots: (a) Farmer Plot (2) IPPM Plot;
3. In cocoa farming each plot should be 100ft. X 100 ft. each;
4. Randomly select and tag 5 trees in each plot and make sure the tag is made from durable material and attached for about 6 months;
5. Divide the participants into 5 groups; Each group goes to a different farm and makes observations in both Farmer Plot and the IPPM Plot;
6. Each group should select one person to record data; however, it can be rotational;
7. Start the AESA process by walking in the field from all directions;
8. Record the following information on cocoa trees in the 2 plots and the whole farm:
  - Variety of Trees
  - Estimated age of tree (show range)
  - Topography (flat, gentle, steep)
  - Drainage (good, medium, poor)
  - Shade Covering (heavy, medium, light, un-shaded)
  - Soil fertility (light, medium, low)
  - Average number of stems per stand
  - Average number of main branches
  - Average spacing of cocoa trees to other trees
  - Presence and size of open spaces (large, small, none)
  - Average number of shade trees per acre/hectare

Make observations in the 2 Plots:

- Divide again in 5 groups and start the next AESA:
- At each sessions, record the following conditions at the time you made the observations;
- Weather (sunny, cloudy, rainy);
- Temperature (cold, warm, hot)
- Soil moisture (dry, moist, wet)

For Cocoa most observations are made up to 2 meters high in the tree, but observations on rodent damage can be made above;

Of the 2 sets of 5 trees that were tagged, record the following agronomic observations each:

- Number of small pods
- Number of large, immature pods
- Number of ripe pods;
- Number of chupons
- Presence of new flushes (none, light, medium, heavy)
- Presence of creepers and mistletoe (none, low, medium, high)

At each AESA session, observe the selected trees for insects and diseases;

- Count all insects and show whether they are pest or beneficial insects;

Record the following pest and disease symptoms:

- Number of pods damaged by pest (above 2 meters for rodents)
- Number of natural enemies
- Number of pods affected by diseases;
- After counting the total number of insects and diseased pods found on the 5 trees, calculate the average of each tree, that is the total number divided by 5;

### Agro-Ecosystem Analysis Drawing for Group Presentation:

- Each group draws all the observations made in the field on flip chart;
- Draw a representative Cocoa Tree at its present growth stage, with the Sun or Clouds showing the Weather conditions at the time of observations;
- Show weeds found and the number of species;
- To the right of the Tree on the Flip Chart draw the Natural Enemies found and indicate the number;
- To the left of the Tree on the Flip Chart, draw insect pests, disease symptoms found and indicate number;

### The Analysis:

After discussion, group members should do the following:

1. Analyze and interpret field information;
2. Discuss the growing stage of the plant and compare the number of chupons, presence of new flushes, creepers and mistletoes between the observed trees;
3. Compare the diseases observed and the number and any type of pests and natural enemies;
4. Draws conclusions about the overall situation compared with the previous AESA;
5. List Observations of specific problem areas in the AESA drawing and show Possible Causes and Recommendations;



Source: ASEA Presentation by Participants of the TCEP FSS ToT Workshop @ United Inland Mission Open Field, Saclepea, Nimba County.

**Record Sheet:**

This table below shows the General, Environmental and Agronomic Data:

Date:.....

Group.....

Village:.....

Farmer .....

Table 6: Record Sheet showing Environmental and Agronomic data from the field.

General Information	
Variety (Estimate age of the tree and show range)	
Topography (flat, gentle, steep)	
Drainage (good, medium poor)	
Shade Coverage (heavy, medium, light)	
Soil Fertility (high, medium, low)	
Average number of stem per stand)	
Average number of main branches	
Average spacing of cocoa trees between other trees	
Presence and Size of open spaces (large, small, none)	
Average number of shade trees per hectare	

**Environmental Data:**

1. Weather (sunny, cloudy, rainy)
2. Temperature (cold, warm, hot)
3. Soil Moisture (dry, moist, warm)

**Table 7: Environmental data**

Agronomic Conditions	Selected Cocoa Trees					Total	Average
	1	2	3	4	5		
Number of Small Pods							
Number of large, immature pods							
Number of ripe pods							
Number of Chupons							
Presence of new flushes (none, light = 25% Less of canopy, medium = most branches, heavy = nearly all branches)							
Presence of creepers and mistletoe (none, low, medium, high)							
Crop Health	No. of Pods Damaged by Pest (Above 2 Meters)					Total	Average
List Pest	1	2	3	4	5		

List Natural Enemies	No. of Natural Enemies					Total	Average
	1	2	3	4	5		

<b>List Diseases</b>	<b>No. of Pods Affected by Pests</b>					<b>Total</b>	<b>Average</b>
	1	2	3	4	5		
<b>List Weeds</b>						<b>Total</b>	<b>Average</b>
	1	2	3	4	5		

**AESA Drawing**

**Group Name**.....

**Type of Plot (IPPM,**

**Farmers Plot)**

**Date:** .....

**Weather**

(Draw the weather at the time of the Observation)

**Draw One Large Cocoa Tree**

**In the Center of Page**

**Right: draw natural enemies found and indicate their number**

**Left:**

Draw the insect pest, any disease

Symptoms, plant parasite found

And indicate each kind

**At the Base of the Plant draw weeds found and indicate the Number:**

On the next page kindly write your information as shown:

**Observations:**

**Causes:**

**Recommendations**

## References

1. Anonym, Good Agricultural Practices (GAP) for cocoa farmers Lesson: in Good Agricultural Practices for Cocoa Farmers Training Manual
2. Anonym, Agro- Up Liberia, [www.agro-upliberia.com](http://www.agro-upliberia.com)
3. David, Sonii, et al, 2006: A Guide for Conducting Farmer Field School on Cocoa Integrated Crop and Pest Management.
4. David, Sonii, 2005: Organic Cocoa Production: A guide for Farmer Field School in Sierra Leone.

## List of Tables:

- Table 1. Comparison of Formal Education and Non-formal Education
- Table 2. Potential Problems Arising From Group Facilitation
- Table 3. Pests and Diseases in Liberian Cocoa Ecologies
- Table 4. Comparison of FFS for Food Crop IPPM and Cocoa IPPM
- Table 5. Defective or damaged Beans
- Table 6. Record Sheet of Environmental and Agronomic data.

## Annexes:

1. Facilitator's Notes
2. photographs

## Annex-1: Facilitator's Notes

### Facilitation Skills in Transfer of Knowledge and Skills to Cocoa Farmers:

- **What is facilitation?**

To facilitate is:

- To free from difficulties or obstacles;
- To make easy or easier
- To carry put a set of functions or activities before, during and after a meeting to help the group achieve its own object;

### Role of a Facilitator:

- Prepare for the FFS session;
- Prepare materials, visual support, etc.;
- Stimulate thinking;
- Stimulate interaction between farmers;
- Stimulate experimentation;
- Guide the learning process;
- Create a good learning environment;
- Manage effective discussion

### Good Habits of Facilitators:

- Smile;
- Have eye contact
- Ensure clear speaking
- Use local language
- Respect moments of silence
- Respect differences
- Listens carefully
- Use open questions
- support participation

### Some Personal Skills & Qualities:

6. Flexibility:
  - It is the ability to fulfill different group roles, leader, supporter, etc.; in order to keep the group fluid and maximize the potentialities.
7. Confidence:  
It is to instill confidence or trust in the group by appearing decisive and in control and thereby subduing group insecurities;
8. Respectable:  
To have the admiration of the group as being a person whom they can trust the judgment of;
9. It is to appreciate the difficulties of group working and have the determination to see a task finish.
10. Perceptive:  
To have the capability to recognize undertones in group, using the positive ones to the group advantage and countering the negative ones to diminish them.

**Table 2: Problems that may erupt at Group facilitation; table 2 showing potential problems and Solutions in Group interaction at FFS Facilitation**

No.	Potential Problems	Possible Solutions
1.	<b>Quiet/Shy Participant</b> This may be because the participant is: <ul style="list-style-type: none"><li>• Shy, timid or insecure;</li><li>• Bored</li></ul>	<ol style="list-style-type: none"><li>5. Make eye contact with the participant and ask a simple question;</li><li>6. Involve the participant in a small sub-group discussion and ask them for an</li></ol>

	<ul style="list-style-type: none"> <li>• Feeling superior</li> <li>• Distracted by personal pressing issues;</li> <li>• Having trouble understanding the topic under discussion in conflict with other group members</li> </ul>	<p>oral summary of their discussion;</p> <ol style="list-style-type: none"> <li>7. Ask during a break or in private about why the participant is so quiet;</li> <li>8. Suggest that everyone takes a turn in sharing their opinion</li> </ol>
2.	<p><b>Overly Talkative Participant</b> This may be caused by:</p> <ul style="list-style-type: none"> <li>• A natural need for attention;</li> <li>• Being overly prepared/unprepared</li> <li>• Having the most authority</li> </ul>	<ol style="list-style-type: none"> <li>7. Glance at your watch while the participant is speaking;</li> <li>8. During a pause for breath, thank the participants for their comment, and re-state the agenda;</li> <li>9. Emphasizing relevant points and time limits;</li> <li>10. Ask the participants to explain how their comments add value to the topic on hand;</li> <li>11. Reflect their comments back to the group;</li> <li>12. Remind everyone of the time limit.</li> </ol>
3.	<p><b>Side conversation</b> This may be because the participant is:</p> <ul style="list-style-type: none"> <li>• Feels the need to introduce an item not on the agenda;</li> <li>• Is bored with the meeting;</li> <li>• Has a point to raise that they feel makes other items on the agenda less important;</li> <li>• Is discussing a related topic but not being heard;</li> <li>• Wants to be the center of attention</li> </ul>	<ol style="list-style-type: none"> <li>4. Ask the participant to share their idea with the group;</li> <li>5. Get up and casually walk around near the participant having the side conversation;</li> <li>6. Call participant by name and ask if they want to add the topic of their discussion to the agenda;</li> </ol>
4.	<p><b>Overly disagreeable participant</b> This may be because the participant is:</p> <ul style="list-style-type: none"> <li>• Having a combative personality;</li> <li>• Is upset by other opinions or a specific meeting issue;</li> <li>• Is a show off by nature;</li> <li>• Is unable to make suggestion constructively;</li> <li>• Feel that they are being ignored;</li> </ul>	<ol style="list-style-type: none"> <li>6. Paraphrase the participant's comments and after their response, recap his/her positioning objective terms;</li> <li>7. Find merit in the participant's suggestion, express agreement, then move on;</li> <li>8. Respond to the participant's comments, not the attack;</li> <li>9. Open the discussion of the participant's comments to the group;</li> <li>10. Mention that, due to time constraints, the comments can be put on the agenda for the next meeting</li> </ol>



## Annex-2: Integrated Production and Pest Management (IPPM) Pictorials:

