

# Training Manual: The Basics of Financing Agriculture

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Module 4.3 | Crop Analysis: Cocoa

# Acknowledgement

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*The Agriculture Finance Training Manual is part of AgriFin's Agriculture Finance Training Tools. The Manual was developed by [IPC](#) - Internationale Projekt Consult GmbH as part of AgriFin's technical advisory project for Cameroon Cooperative Credit Union League ([CamCCUL](#)).*

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# Session Overview

<b>LEARNING OBJECTIVE</b>	<b>Using the example of cocoa production, this session aims to provide the trainee an overview of the production process of a major crop and the role of the ALO in analyzing the lifecycle of the crop. The ALO needs to be aware of the key activities involved, the major expenses, potential risks, and the business avenues of cocoa production.</b>
<b>SCOPE</b>	By the end of this presentation, the session will provide a basic introduction to: <ul style="list-style-type: none"><li>• Cocoa and its general uses for farming</li><li>• The different varieties of cocoa and how it thrives in its environment</li><li>• Methods of cultivating cocoa in a changing environment</li><li>• Production process for harvest and storage</li><li>• Assessing cocoa farmers in order to sanction loans</li></ul>
<b>TARGET</b>	Agriculture loan officers, trainers, agriculture experts with limited financial analysis training, and other professionals interested in agriculture financing
<b>DURATION</b>	3 hour

# Content

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1. General
2. Cocoa Cultivars
3. Yields Indicators
4. Cocoa and its environment
5. Cultivation Methods
6. Harvest and Post-Harvest Operations
7. Production cycle in the North-West region
8. Costs and sales prices
9. Assessment

# 1. General

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- Cocoa has been cultivated for more than 3000 years
- It originated in Central and South America
- It arrived in Africa at the beginning of the 19th century
- Cocoa belongs to the *Malvaceae* family. The only variety cultivated is *Theobroma cacao*, with its 3 main cultivar groups: Criollo, Forastero and Trinitario.
- The cultivation of cocoa has grown into a major industry
- The pods contain 20 – 60 seeds, commonly known as beans
- These are processed into a beverage, also known as cocoa, as well as into solid chocolate.



# 1a. General – Cocoa Farmers

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- Less than 10% of the GDP (Office National du Cacao et du Café), at one time it accounted for 25%. Reasons possible:
  - Old trees with low yields (more than 40% of the trees are more than 40 years, that give an average of 300kg/ha)
  - Farmers getting older (35 to 38% are more than 60) in Lékié and Nyong-et-So'o departments
  - Fewer subsidies
  - Shortage of labor
  - Sales prices have decreased
- Consequences:
  - No/few investments made in the plantations
  - Bad cocoa quality (and prices even lower)

# 2. Cocoa Cultivars

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## •Main cultivar groups

- Criollo: red or green fruits before maturity, elongated, with white broad beans.  
1% of the world production
- Forastero: green pods, becoming yellow at maturity, ovals. Broad beans are dark purple and flat. About 80% of the world production
- Trinitario: hybrid of Criollo and Forastero



## 2c. Cocoa Cultivars

The pictures below were taken in Ghana, where fortunately, viable beans may sometimes be extracted from pods showing external signs of disease - unlike pods infected with *Moniliophthora*







# 3. Yields Indicators

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- **Characteristics of the cocoa tree**

- A healthy cocoa tree produces 25 pods per year that results in approximately 900 g of dry cocoa. As a guideline, yield per year can be divided into:

- Good (20 or more pods per tree)
- Average (15-18 pods per tree)
- Poor (10 or less pods per tree): ***Poor means the plantation is not profitable!***

- **To improve productivity, there are 3 approaches:**

- Rehabilitation
- Regeneration
- Replanting

- **Rehabilitation:** bringing existing trees into better production. This involves underbrushing, pruning, removing too much shade, and removing all diseased and pest-infected pods and mistletoe. It may also involve cleaning clogged drainage and adding organic matter to renew soil nutrients. Many technical bulletins are available on rehabilitation techniques.



# 4. Cocoa and its environment

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## •Characteristics

- The cocoa tree reaches full maturity between 6 and 8 years old
- It grows to a height of 4 to 6 meters
- Starts producing at 2 years old (certain varieties) and usually produces for 25 to 30 years. Some specimens can be productive for as much as 50 years
- Cocoa beans are ready to germinate as soon as the fruit (pod) ripens. They lose their power to germinate a few hours after being extracted from the pod
- Cocoa trees blossom throughout the year, often producing more than 10,000 flowers annually; however, these produce just a few dozen pods.
- The pod takes 5 to 7 months to ripen fully
- A pod weighs around 400g and contains 100g of fresh broad beans, yielding 35 to 40 g of commercial cocoa

## 4a. Cocoa: habitat

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- Annual average optimum temperature: 25°C, absolute minimum: 10°C
- Optimal rainfall: 1500 to 2500 mm. Dry period should be 3 months maximum
- Air humidity is important (around 85%)
- Saplings need to be protected from intense sunshine for the first 3 years
- Soil must ensure good water retention but roots should not be asphyxiated. Soil must be slightly acidic
- Although cocoa trees can be cultivated at altitudes of up to 1000 m on the equator, most are grown below 300 m

# 5. Cultivation Methods

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- **Main cultivation systems**

- 90% of the world's production comes from small producers with less than 10 ha under cultivation. Industrial production is rare in Africa

- **Commercial cocoa productivity:**

- Industrial production: 1000 to 2000 kg/ha
- Small African producers: 300 to 700 kg/ha

# 5a. Cultivation Methods: Planting

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- shade is very important. If no natural shade is available, temporary shade should be provided for the tree's first 6 to 8 months (e.g. plantain or papayas)
- Spacing: 3m x 3m to 2.5m x 2.5m (south Cameroon)
- Trees per ha: 1111 to 1600
- To increase the profitability of the plot during the first years, other crops can be cultivated between the rows, such as: yams, rice or occasionally groundnuts)
- There are various ways to replant an older cocoa plantation
- A nursery system is recommended (plan 2000 saplings per ha)
- Holes: 40 cm<sup>3</sup>

# 5a. Cultivation Methods: crop maintenance

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## •Crop maintenance

- Weeding, shade management, removal of suckers, etc.
- Trees should not be allowed to grow too tall and a suitable tree height should be maintained. There are various techniques for pruning trees, but these usually involve substantial loss of crop over 2-3 seasons
- Pods should be harvested as regularly as possible. NB: there is a difference in emphasis between massive harvesting and regular complete harvesting;
- Destroy infected/infested crop residues
- Consider removing nearby trees that act as hosts for pests, e.g. kola trees in Africa that may encourage mirids and *B. megakarya* (black pod disease)



# 5b. Cultivation Methods: pest control

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## •Pest and disease control

- Losses due to disease, insects and other pests are estimated to affect about half of the potential production
- Major damage is caused by mirids (a type of insect)



# 5b. Cultivation Methods: pest control (contd.)

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***Distantiella theobroma* adult**



***Moniliophthora* diseases**



***Sahlbergella singularis***



# 5c. Cultivation Methods: labor needs

## Working time

Nursery: (80m<sup>2</sup> for 2000 saplings)

Operation	Time - days
Shade-house construction	4
Preparation of seed beds	2
Potting soil distribution	6
Polybag filling (300/day)	7
Sowing	2
Maintenance - watering	25
<b>Total</b>	<b>46</b>

Plot preparation: (for 1 ha, 1333 plants/ha)

Operation	Time - days
Burning/thinning existing forest	3
Clearing undergrowth	13 to 20
Chainsaw felling	50
Stump extraction	60
Selective burning	10
Setting out cocoa saplings	21
Digging holes for planting	25 to 35
Refilling holes	7
Lining and pegging	7
<b>Total</b>	<b>196 to 213</b>

ALO should use # of days of operation as reference to cross-check the economics of a cocoa farm (business plan, loan purpose, equity investment, etc.)

# 5f. Cultivation Methods

## COCOA PLANTATION

Operation	Time (in days)
Initial weeding: manual (2) or chemical (8)	2 to 8
Transport of saplings	10
Planting	18
Sunshade with palm leaves	18
Monitoring and replacement	8
<b>Total</b>	<b>56 to 62</b>

## MAINTENANCE

Operation	Time (in days)
Chemical weeding (6 times)	12
Manual weeding (7 times)	42
Cutting (8 times)	16
Pruning	10
Insecticide treatment (4 times)	8
Fertiliser (3 times)	6
<b>Total</b>	<b>119</b>

# 5g. Cultivation Methods

## MAINTENANCE (EACH SUBSEQUENT YEAR)

Operation	Time (in days)
Weeding (4 times)	16
Shade elimination (balance)	4
Pruning / sucker removal	6
Shade maintenance	6
Insecticide treatment (4 times)	8
Fertiliser (3 times)	6
<b>Total</b>	<b>46</b>

## HARVEST AND POST-HARVEST (TO PREPARE 1 TONNE OF COMMERCIAL

Operation	Time (in days)
Harvest (1500 pods / day)	17
Pod opening	17
Fermentation and drying	16
<b>Total</b>	<b>50</b>

# 5h. Cultivation Methods

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## Best practice in pruning:

- There are three types of pruning: architecture, shape and maintenance pruning.
  - Architectural pruning is done when trees are young (up to 4 years of age). The purpose of this type of pruning is to make sure the trees do not grow too tall, and have the right shape. If trees are not properly pruned at this age, they will become too tall for you to properly manage.
  - The purpose of shape pruning is to give cocoa trees a shape that allows them to capture the most sunlight with the fewest branches, without leaving holes in the canopy (see “Pruning older cocoa trees”). This is done by removing branches that trees do not need.
  - 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
  - Tall trees take more effort to prune than small trees, but it is worth the effort. If trees are too tall to prune (or even to harvest), consider rehabilitation options. Trees that have not been pruned for a long time need to be “reshaped”.



## 6. Harvest and Post-Harvest Operations

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# 6a. Cocoa Fermentation

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## 6b. Harvest and Post-Harvest Operations

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- **Harvest**
- Manual, important to harvest pods only when fully ripe, requires each tree to be visited several times
- **Pod opening**
- **Fermentation**
- It is very important to remove pulp from around seeds, this helps the flavor to develop and impedes germination.
- Poor fermentation = poor cocoa quality
- Duration: 2 to 8 days depending on the variety (aeration recommended: 24h – 48h – 96h).
- Fermentation should be stopped at the correct time
- **Drying**
- This stops fermentation, reduces water content from 55% to 7% and enables better preservation/storage. Sub-standard drying can result in rot
- Beans are usually sun dried for 1 to 3 weeks. Need 50 m<sup>2</sup>/t, lots of labor required to mix the cocoa 4 times a day and store it in case of rain

## 6c. Harvest and Post-Harvest Operations

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- **Importance of correct harvest and best practice in harvesting**
- Harvesting is the start of the post-harvest processes that determine the quality of the beans to be sold, which will be used by industry. Getting any of the post-harvest steps wrong can lead to poor quality beans
- If farmer harvests too early, or too frequently, he is likely to collect unripe pods. Pods that are still green or partly green have more solid pulp (with less sugar content) and the beans may be hard to break up. Unripe pulp gives rise to clumps of beans and leads to poor fermentation
- Harvesting early in the season and at the end can mean that farmer will not have enough pods/beans to make a good fermentation heap
- Harvesting too late leads to overripe pods with the pulp drying up, and in extreme cases, the beans may start to germinate. Lack of pulp will result in poor fermentation. Also, germinated beans will not ferment well, and the hole caused by the emerging shoot will allow mold to enter the bean
- Before fermenting, you can store unopened pods for no longer than 5 - 7 days as storage allows the pulp to increase in sugar content, which causes faster fermentation. Storing pods for longer than 7 days may allow mold to damage the beans and/or encourage the beans to germinate



## 6d. Harvest and Post-Harvest Operations

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- **Farmers must harvest the whole farm at least every two weeks :**
  - Break the pods and start fermentation as soon as the whole farm is harvested
  - If possible, avoid the use of a machete to open pods, because of the danger of damaging beans and cutting the hand. Use a short stick, a stone or a piece of angle iron, filed to form an edge that is about the same depth as the thickness of the husk of an average cocoa pod.
- **Importance of fermentation**
  - Proper fermentation is important because it will give a good quality to the beans (and from that will depend the price it will be bought).
  - Good fermentation stops germination, gives the beans a good taste when roasted.
- **Importance of drying**
  - Fermented cocoa must be dried. Drying cocoa beans reduces the growth of mold and helps improve the flavor. Dried cocoa beans are easier to store and to transport.
  - In the rainy season beans dry more slowly than in the dry season. There is no fixed drying time. Dry the beans for as long as necessary.

A properly fermented and dried bean should be brown in color when you cut the bean in half.

## 6e. Harvest and Post-Harvest Operations

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### •Importance of drying

- Fermented cocoa must be dried. Drying cocoa beans reduces the growth of mold and helps improve the flavor. Dried cocoa beans are easier to store and to transport.
- In the rainy season beans dry more slowly than in the dry season. There is no fixed drying time. Dry the beans for as long as necessary.
- A properly fermented and dried bean should be brown in color when you cut the bean in half.

# 6f. Harvest and Post-Harvest Operations

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## •Storage

- The crop should be protected from rat
- Difficult in equatorial climates



# 7. Production cycle in the North-West region

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
<b>Nursery</b>	■											
<b>Clearing</b>			■			■					■	
<b>Planting</b>							■					
<b>Fertiliser appl.</b>								■				
<b>Clearing</b>									■			
<b>Treatment with pesticides</b>	Every 2-3 weeks, less frequent in the dry season											
<b>Harvesting</b>	Year round from third year peak harvest : Aug - Dec											

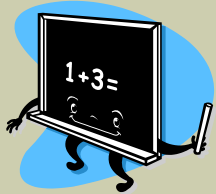
# 8. Costs and sales prices

e.g. for 12 ha in Bafia	Unit	Cash inputs per ha/ season
<b>clearing</b>	<b>XFA</b>	<b>25,000</b>
pruning	XFA	25,000
spraying	XFA	20,417
workers	XFA	133,333
fertilising	XFA	30,000
harvesting	XFA	25,000
fermentation	XFA	25,000
drying	XFA	12,500
transportation to fermentation site	XFA	9,375
machinery - depreciation and maintenance	XFA	30,000
total	XFA	335,625
yields	Kg/ha	1,000
price	XFA	850
income	XFA	850,000
profit	XFA	514,375

# 8a. Costs and sales prices

<b>Prices paid to farmers by CAMACO - Monthly</b>	<b>XFA/kg in 2012</b>
<b>Jan</b>	1050
<b>Feb</b>	1050
<b>Mar</b>	1050
<b>Apr</b>	1050
<b>May</b>	1050
<b>Jun</b>	1050
<b>Jul</b>	1000
<b>Aug</b>	1000
<b>Sep</b>	1000
<b>Oct</b>	930
<b>Nov</b>	930
<b>Dec</b>	850

# 9. Assessment



What should you take into account in order to make a good financial analysis of a cocoa farmer?



**For more resources please visit AgriFin's website**

**[www.AgriFin.org](http://www.AgriFin.org)**

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We welcome your feedback to help us further refine these training materials. Please contact us at [agrifin@worldbank.org](mailto:agrifin@worldbank.org).