

# Training Manual: The Basics of Financing Agriculture

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## Module 4.1 | Analyzing Crop Production

# 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>A fundamental understanding of the production process of vegetables will help analyze and advise a farmer’s loan application for crop farming more effectively. With this understanding, Agriculture Loan Officers (ALOs) will be provided a basic understanding of the lifecycle of producing vegetables in this session.</b>
<b>SCOPE</b>	By the end of this session, the trainee will have an understanding of the following key elements of vegetable production: <ul style="list-style-type: none"><li>• Types of vegetable crops and their plant characteristics</li><li>• The process of crop production and their management from planting to sowing</li><li>• The common diseases that affect crops and their management</li><li>• The case of tomato crop production</li><li>• Assessing vegetable farmers for loan sanctions</li></ul>
<b>TARGET</b>	Agriculture loan officers, financial analysts, trainers, and other professionals interested in agriculture financing
<b>DURATION</b>	3 hour

# Content

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1. Vegetable Crops
2. Crop Process
3. Diseases and Pest Control
4. Marketing
5. Crop Varieties
6. Case: Tomato
7. Assessment



# 1. Vegetable crops

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## Definition

- Vegetables are the edible shoots, leaves, fruits and roots of plants that are eaten in whole or in part, raw or cooked, often served as supplements to starchy foods and meals.

## •Examples

Vegetables produced in Cameroon are: tomatoes, peppers, okra (lady's finger), onions, lettuce, cabbage, carrots, sweet potatoes, watermelons, cucumbers, cauliflowers, radishes.

- For more information on good agricultural practices for vegetable crops:

- <http://www.fao.org/docrep/013/i1645e/i1645e00.pdf>

- <http://www.fao.org/docrep/MEETING/006/Y8704e.HTM>

# 1b. Vegetable Crops - Characteristics

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## Characteristics

- Growth depends on local conditions
- Very dependent on soil characteristics (physical & chemical): must be rich in organic matter and well drained
- Vegetables that are at the limit of their range grow better in the dry/cool season
- Need irrigation
- Require intensive cultivation, involving lots of manual work (average: 1000 days/ha) and needing a great many experienced workers
- Have short growth cycles
- Are perishable products
- Need readily available transport
- Are subject to theft
- Are susceptible to many pests and diseases

# 1c. Vegetable Crops - Benefits

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## Benefits

- Create employment opportunities
- Profitable crops (if well managed)
- Source of foreign exchange or income
- Source of vitamins and minerals for humans and animals



A Carrot Farm

# 2. Crop Process – Step 1

The following steps must be respected (in order) (1/4)

- Choose land (site selection)
  - Close to the market
  - With good fertility
  - Easy to work (flat, fenced)
  - Irrigable if necessary (easy access to water, well, motor pump...); main growing period requirements = 3 L/s/ha
- Establish a crop plan
  - Take markets and possible speculation into account
  - Practice rotation to aid soil fertility and pest control

### Example of crop rotation in beans

To be avoided as preceding crops	Not useful as preceding crop	Recommended as preceding crop
Beans, peas, potato, African eggplant, melon, cucumber, watermelon, lettuce and okra	Ground nuts, pepper, lettuce, carrot, onion and garlic	Cereals (maize, sorghum, millet, fodder, grass) cabbage, kale, sukumawiki, cassava, sweet potato



## 2a. Choice of Land

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- While choosing the land, the farmer must take into consideration:
  - The land history (has the land been used for animal feeding? For domestic animal production? as a garbage or toxic waste disposal site? As a sanitary waste-management site? for mining activity? experienced serious folding? Been treated in an uncontrolled manner with organic/inorganic fertilizers or pesticides?)
  - Previous crops in rotation: Crop rotation plays an important part in the health of the crop, which may be susceptible to Fusarium and root knot nematode and other soil-borne pests and diseases. For example: Beans should not follow crops that are hosts to pests and diseases that attack beans (see table above); in particular, other legume crops such as runner beans should be avoided.
  - Flood control (what measures must be put in place?)
  - Pests and diseases (crops new to an area are likely to be free of pest and disease, but threat will increase quickly with continual cultivation; crop rotation is the best way to avoid pests and integrated methods is preferable (where feasible) as chemical control...)

## 2a. Choice of Land (continued)

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- When choosing the land, the farmer must take into consideration:
  - Irrigation (if rainfall is insufficient for targeted yields, a reliable and affordable source of supplementary water should be planned; gravity flow or flood irrigation is usually more manageable for smallholders than sprinkler or drop irrigation, etc.)
  - Erosion control (if terrain is exposed to erosion, a system to strengthen soil structure should be set up...)
  - Cultivation methods (animal traction? Mechanization needed? ...)

## 2b. Crop Process – Step 2

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The following steps must be respected (in order) (2/4)

- Organize a regular supply for:
  - Seeds
  - Products (organic and chemical fertilizers, insecticides and pesticides, various inputs)
  - Equipment (sprayers, farm implements...)
- Land preparation
  - Rooting out
  - Tilling the soil
  - Fertilizing

## 2b. Land preparation and field terracing

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- **Land Preparation**

- Any land preparation methods should take into consideration adaptive methods that ensure soil conservation, water resource management and environmental conservation. Depending on availability of resources and crop requirement, and landscape, soil preparation may be mechanized or non-mechanized.

- **Terracing the field**

- On slope land that is liable to wash away in heavy rains – especially when the soil is bare – terraces should be constructed to prevent this soil erosion. Terraces are more effective if a strip of vegetation is left at the edge of the terrace, and the runoff water is channeled across the slope instead of running quickly down the slope.

## 2c. Crop Process: Field preparation

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### •Tillage – Field preparation

- Excessive disturbance of the existing soil layers should be avoided during tillage to prevent the bringing to the surface of the poorer layers. Soil preparation should enable the root system to spread to a depth of 40 to 60 cm for shallow root crops to ensure good water and mineral supply to the plant. Any ploughing should be performed once a year and be completed before cropping by levelling and finer loosening.
- Organic, lime or lime-magnesium enrichment agents are applied before ploughing so that they are turned in evenly.
- Good soil levelling prevents the accumulation of water that could asphyxiate the plants or cause the spread of diseases. The field should be perfectly level and not too stony.
- Ridging or shaping is performed in case of furrow irrigation. The ridges should be regular

## 2d. Crop Process: Hoeing and mulching

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### •Hoeing

- At a certain time of plant growth, hoeing may be required for aerating the soil and weed management; hoeing must be very shallow to avoid damaging roots near the surface.

### •Mulching

•Mulch is the protective layer of material that is spread on top of the soil between crop plants. Mulches can be decaying weeds, grass, rotten manure or compost. Mulches have many benefits, they:

- protect the soil from erosion;
- reduce compaction from the impact of heavy rain;
- conserve moisture, reducing the needs of the irrigation;
- prevent weed growth;
- maintain soil temperature;
- keep fruits and vegetables clean;
- prevent disease spores splashing up on to the crop;
- break the cycle of some pests.

## 2e. Crop Process: Seed and crop selection

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- **Seeds, crops selection**

- The use of pure certified seeds and rootstock is essential for obtaining the quality and uniformity of the product that the market demands. The main consideration should focus on selecting the crops that are most suitable for production and of course the demands of the market – there is no point in producing something unless someone wants to buy it. However, among crops for which there is a sure demand some require agronomic practices or environmental controls that make them particularly suitable, or particularly unsuitable, for smallholder producers.



## 2f. Crop Process – Step 3

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The following steps must be respected (in order) (3/4)

- Prepare seed beds
- Prepare nursery
  - taking wind and topography into account
- Prepare local amenities for:
  - managing the harvest
  - storing inputs & materials
- Prepare the beds for:
  - bench terracing
  - planting
  - (= tilling, raking)
- Maintaining fertility



# 2g. Soil Fertility

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## Maintaining soil fertility

Soil fertility improvement include maintaining and improving organic matter, appropriate crop rotation, manure application, rational mechanical and conservation tillage, maintaining soil cover, minimizing soil erosion losses by wind and water, and application of organic and inorganic fertilizers in the correct amount and timing, and by methods appropriate to agronomic, environment and human health requirements.

- Maintaining soil organic matter through mulching and allowing plant stalks to rot in the field
- Disturb the soil as little as possible during land preparation
- Practice appropriate crop rotation
- Aerate the soil
- Provide drainage
- Protect the land from soil erosion and degradation
- Apply compost, manure and inorganic fertilizer in correct amounts and timing and by methods that are appropriate to agronomic and environmental requirements



## 2h. Crop Process – Step 4

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The following steps must be respected (in order) (4/4)

- Plan
  - Seed treatment (or buy treated seeds)
  - Soil treatment (by fire, pesticides)
  - Crop treatment
- Plan daily work routines
  - Watering
  - Weeding
  - Spraying
  - Applying fertilizer
  - Harvesting

# 3. Disease and Pest Control

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## Disease and pest control

- Ants, damping off, root rot, etc.

## Pesticide

- Pesticides should be used properly (the dangers of pesticides should be respected)
- Only authorized pesticides should be used (otherwise: danger for farmers and consumers)
- Too much pesticide: improper use can result in water pollution...



# 3a. Disease and Pest Control

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- Notes:

- Best way to avoid pests and disease is to rotate crops appropriately
- The weather can also affect yields
- Know the types of chemicals and insecticides used to control prevalent pests and diseases.
- Pests can get used to pesticides and are more and more harder to fight effectively

## 3b. Disease and Pest Control

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### •Reminder on pesticides:

- A pesticide is defined as “a substance or association of substances that is intended to repel, destroy or combat undesirable species of plants or animals causing damage or otherwise harming the production, processing, storage, transport or marketing of foodstuffs, agricultural products, wood and wood products, or animal feed.”
- All pesticides are dangerous, some very dangerous while others are less dangerous. The level of danger is usually marked on the pesticide label as hazard classification in the WHO systems. The Categories are Ia, Ib, II, III, or unclassified. Do not use pesticides under Categories Ia and Ib.

## 3c. Disease and Pest Control

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- **All personnel responsible for using and applying pesticides must wear PPE during mixing, filling, and cleaning/maintaining the sprayer. These include:**
  - gloves or plastic bags on hands;
  - eye protection, i.e. visor, goggles, to protect eyes;
  - cotton clothes to cover body, long trouser legs worn outside the boots, and long sleeves;
  - boots or shoes that cover the feet (**NEVER** sandals); a hat;
  - light disposable mask or respirator;
  - waterproof apron or large plastic bag to cover the front of the body;
  - always have soap and water available to clean spilled pesticide off the skin;
  - Keep pesticides in a lockable store to avoid pollution and reduce fire hazards.
  - Sprayed field should be clearly marked to prevent people from entering until safe to do so.
  - Always observe PHI, (the waiting period between the last spray and harvesting date). This period must be strictly observed so that the residue level does not exceed the acceptable limits.

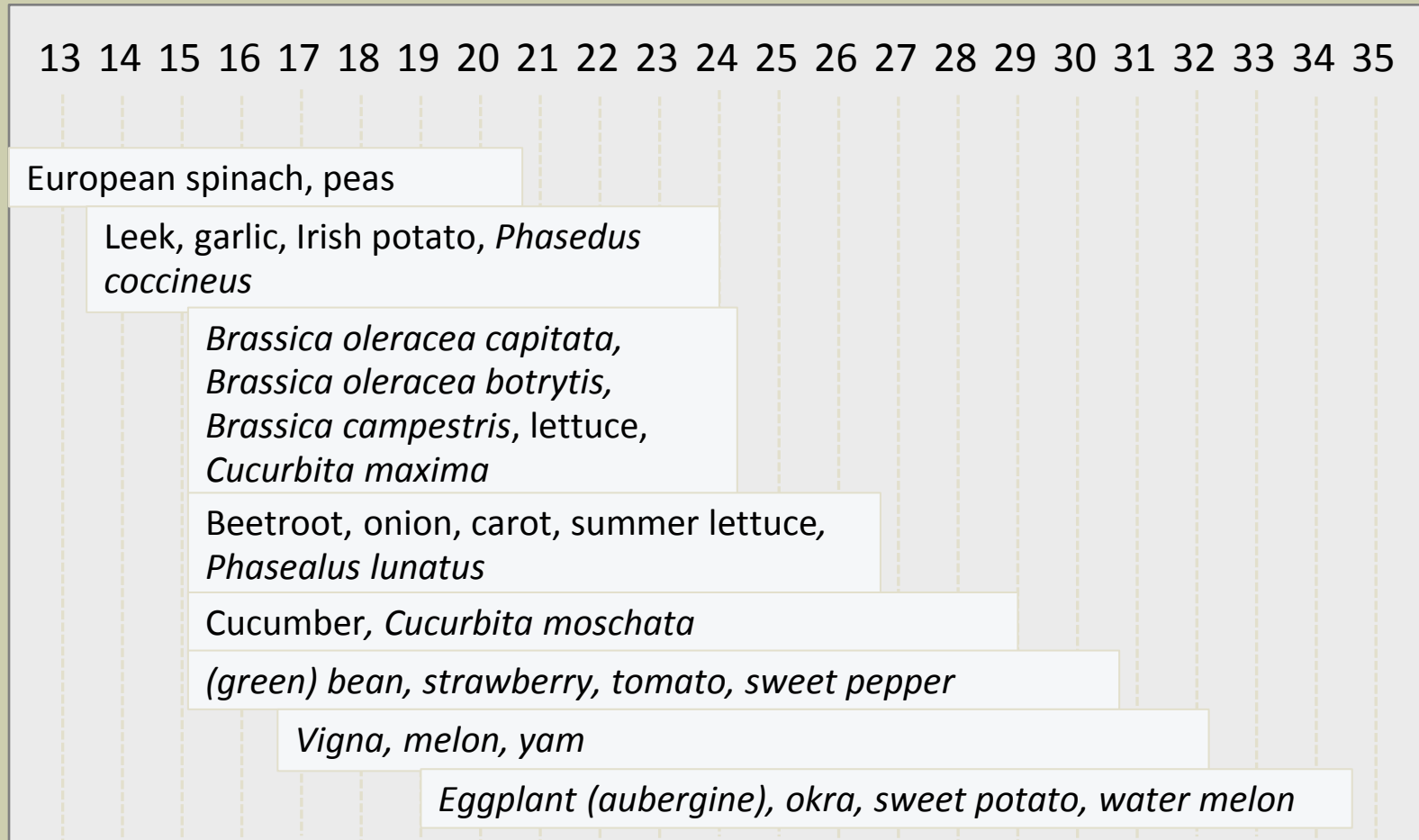
# 4. Marketing

## Know the market potential!

- The market for vegetables is not just in Bamenda
- One very important point the ALO should consider is the market for the vegetable production. Vegetables are very perishable and the market should be ready. The ALO must also take into consideration the rainy season: will there still be roads that can be used during the rainy season to transport and sell the vegetable produced?
- Table: Estimated average tonnage leaving Foubot every week

Destination des camions	Nombre de camions par semaine	Chargement moyen par semaine (t)
Douala	14	191,24
Yaoundé	9	122,94
Kongsamba	2	27,32
Limbé	2	27,32
Maroua	1	13,66
Edéa	1	13,66
Bafoussam	2	27,32
Gabon	2	27,32

# 5. Crop Varieties – Optimal Temperatures





# 5a. Crop Varieties – Main Crops

CROP	Weight in g of 1l of seeds	Number of seeds in 1g	Average duration in years	Duration of germination (days)	Depth of seeding (mm)	Cycle (days)	Yield (kg/are)
Eggplant	500	250	6	5-6	12	100-140	15-30
Carrot	350	900	4-5	4-6	12	65-90	100-300
Cucumber	500	35	10				
Squash	400-425	3-6	6	4-8	18	130	100-200
Zucchini	400-425	3-6	6	4-8	18	130	200-500
Okra	620	15-18	5	8	20	80-100	40-80
Green bean	625-850	0.75-0.8	3	2-3	20-30	75	20-70
Dry bean	625-850	0.75-0.8	3	2-3	20-30	120	10-20
Lettuce	430	800	5	2-5	6-12	60-90	80-200
Melon	360	35	5	5-8	12-20	110-150	60-150
Water melon	460	5-6	6	6-8	20		200-400
Onion	500	250	2	7-15	10	110-130	200-300
Leek	550	400	3	5-15	12	120-150	100-300
Sweet pepper	450	150	4	8-10	12	125-150	50-200
Tomato	300	300-400	4	4-6	6-12	110-160	60-300

## 5b. Crop Varieties – Main Crops

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**Convert the yields (of one of the crops in the previous table) that are in kg/are into t/ha:**

Clues:

- 1 are = 100m<sup>2</sup>
- 1 ha = 10,000m<sup>2</sup>
- 1 t = 1000 kg

# 6. Case: Tomato



# 6a. Case: Tomato

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- **Family:** Solanaceae
- **Cultivars:** There are many varieties
- **Temperature:** Tomato is a warm-season crop that is sensitive to frost. An average daily mean of 20 ° to 24 °C is optimum for growth, yield and fruit quality. Fruit set and quality are poor at temperatures below 12°C and above 35°C. It is recommended that tomatoes be grown in dry areas under irrigation.
- **Soil requirements:** Best results obtained in deep, well-drained loams. The soil should be rich in organic matter & plant nutrients, with pH value of 6-7
- **Propagation:** from seed
- **Soil preparation:** The soil should be well-prepared, loose and in good tilth.
- **Planting:** Seedlings are raised in seedbeds and transplanted to the field. Transplanting is preferable if hybrid seed is used for early planting. The seeds are broadcast on beds and lightly covered with soil. Seedlings are ready for transplanting 3-4 weeks after sowing and they should be transplanted into moist soil. The seedbeds should be watered after sowing and this should be repeated regularly until the seedlings reach a height of 5 to 7 cm.

## 6b. Case: Tomato

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### **Fertilization**

Tomatoes are heavy consumers of plant nutrients including nitrogen, phosphorus and potassium and it responds well to organic fertilizers.

The amount of fertilizer applied is influenced by the fertility of the soil, season and the cultivar. The plants have a moderately high requirement for nitrogen.

A minimum of 250 kg per hectare of nitrogen is recommended in high rainfall areas or for high production.

Approximately a quarter of the nitrogen is applied when planting with the remainder being applied in the first six to eight weeks of growth at two to three week intervals. Further light dressings are applied over the next six or more weeks. Tomatoes also require high levels of potassium. A minimum of 100 kg of potassium should be applied per hectare. A total of 40 to 60 kg of phosphorus per hectare is recommended in soils with a build-up of this nutrient.

## 6c. Case: Tomato

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### **More about the fertilization for tomatoes crops:**

Tomato is a heavy feeder of plant nutrients including nitrogen, phosphorus and potassium and it responds well to organic fertilizers. The amount of fertilizer applied is influenced by fertility status of the soil, season and the cultivar. The plants have a moderately high requirement of nitrogen. Nitrogen promotes better growth and better flower and fruit set. A minimum of 250 kg per hectare of nitrogen is recommended in high rainfall areas or for high production. Approximately a quarter of nitrogen is applied at planting while the remainder is applied in the first six to eight weeks of growth at two to three week intervals. Further light dressings are applied over the next six or more weeks. Tomato also requires high levels of potassium. Adequate levels of potassium result in improved color, taste, firmness, sugars, acids and solids of the fruit. Plant cells are also strengthened. A minimum of 100 kg of potassium should be applied per hectare. Phosphorus promotes root development, early flowering and fruit set and ensures more vigorous growth. A total of 40 to 60 kg of phosphorus per hectare is suggested in soils with a built-up of the nutrient. It is recommended that phosphorus be banded in acid soils.

## 6d. Case: Tomato

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### **More about the fertilization for tomatoes crops:**

Tomatoes also require micronutrients for growth and development. Deficiencies of magnesium, calcium, and molybdenum are common in acid soils while boron and copper deficiencies are not often found in tomatoes. However, boron deficiency, if it occurs, results in fruit cracking, pitted and corky areas, deformed shape, malformation and uneven fruit ripening. Iron has been found to be deficient on calcareous, alkaline soils or after heavy applications of lime. Manganese deficiencies are mainly found in calcareous soils.

## 6d. Case: Tomato

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### **More about the fertilization for tomatoes crops:**

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# 6f. Case: Tomato

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## Pest control

### Nematodes

Tomatoes are attacked by various nematodes. Attack by nematodes is more likely in sandy soils and during warm conditions. They attack roots causing galls to develop, reducing the size and efficiency of the root system. Stunting of plants, reduced fruit set and yield and quality are the result of infestation. Plants also show drought symptoms and may sometimes wilt and die even when moisture is adequate.

### Control

- Practice crop rotation
- Proper field hygiene is important (keep cultivated fields free of weeds and other foreign material that can serve as host for the killer pest).
- Always destroy infected plants away from the field.

# 6g. Case: Tomato

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## Other cultivation practices

### 1: Training

- Training of plants has a number of benefits, including improved spraying to control foliar diseases and pests, less sunburn, better air circulation around the plant and less fruit rotting. Cultivars that have an indeterminate growth pattern require training on trellises or suspended on twine from overhead wires. Crops grown for the fresh market should also always be trellised.

### 2: Pruning

- Pruning influences the flowering and fruiting of the tomato plant. Plants are pruned by pinching off lateral branches as they appear in the leaf axils. It has been reported that pruning reduces early and total yield, detrimentally affects quality and increases the incidence of viral diseases and other disorders. This practice is not recommended for tomatoes grown in the open field.

### 3: Crop rotation

- A three-to four year-rotation programme with non-related crops is recommended to reduce build-up of pests and diseases.

# 6h. Case: Tomato

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## Harvest

Tomatoes grown for processing are harvested when they are fully mature. Fruit to be shipped long distance is harvested at a less mature stage, while crops destined for local markets are picked at a more mature stage.

## Harvesting methods

- Tomatoes are harvested at different maturity stages
- Tomatoes in Cameroon are harvested by hand
- It is recommended that picking be done early in the morning (when the temperatures are the lowest).

## Post-harvest handling

Tomatoes should be moved from the field to the packing station as soon as possible and should not be left in a hot area for long periods.

In the packing station, tomatoes are cleaned, graded, waxed, wrapped and packaged.

# 7. Assessment

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## Source of seeds

- own farm
- seed merchants

## Source of Funds

- personal
- friends
- banks, etc.

## Availability of labor and extension service

## Methods of farming

- irrigation
- rain fed

## Experience of farmer

## Type of Cropping

- mono-cropping,
- mixed cropping and why?

# 7a. Assessment

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## Harvesting, marketing, transport

- Frequency of harvesting, work plan
- Availability of storage facilities
- Distance from farm to market
- Market days in the area

## Questions

- How can market days affect instalment payments?
- Pricing : Who determines the price of produce?  
(farmers, government, market stallholders, suppliers )
- Availability of transport from farm to market centers  
(i.e. by vehicle or being carried)
- Transport infrastructure
- Sales – cash sales

# 7b. Assessment

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## Disease and pest control

- Ants, damping off, root rot, etc.
- However be aware that the weather can also affect yields
- Know the types of chemical or insecticides used to control prevalent pests and diseases.

## Seasonality, yields, and pricing

- How many bags, boxes, tonnes, kilograms, etc. produced per hectare in peak season
- Maximum and minimum prices during the season and why they fluctuate?

### **Do not forget the following:**

- Loan purpose
- Repayment purpose
- Repayment capacity
- Instalment structure

**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).