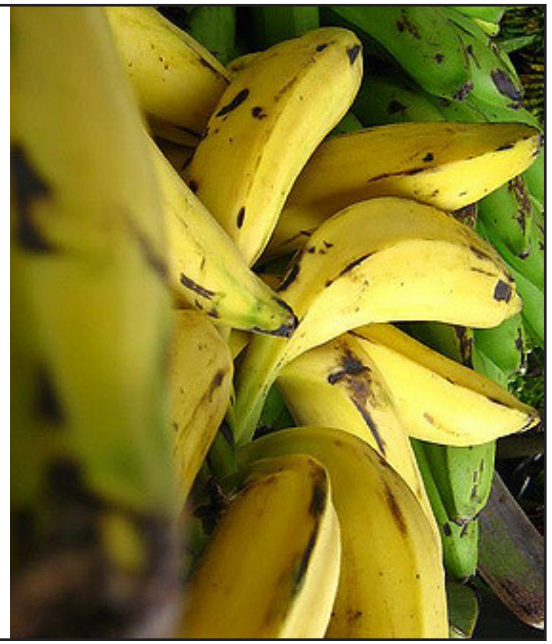
Tree Crops

1. Avocado
2. Breadfruit
3. Citrus
4. Cocoa
5. Coconut
6. Mango
7. Plantain

TECHNOLOGY PACKS



PLANTAIN

November 2015

Background

Production decisions concerning how much effort and resources to invest and which farming practices to follow, have consequences and create opportunities for the farm affecting production levels, input costs, time constraints, and the potentially size of the operation. They also may have implications for resource use and environmental quality.

Numerous information exist on the various aspects of production and handling/ marketing of crops and livestock, the majority of which are outdated, not easily understood and lacking the where with all for addressing present day challenges such as good agricultural practices (GAPs) and food safety and climate change that impact on the environment and rural livelihoods. These issues are also closely related to the importance of the role of primary producers in increasing the earnings of all actors along the value chain in supporting the development of a commercially viable and sustainable agricultural industry.

The production of high quality and easily understood information packages is critical as this forms a basis for farmers to obtain financing from lending institutions and to efficiently increase their production through the availability of modern technology. This will also result in a reduction of rural unemployment and will greatly help in alleviating poverty and other associated social ills.

TECHNOLOGY PACKS

PLANTAIN

November 2015

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Introduction

This Technological Package (Tech Pack) deals with the production and postharvest aspects of plantain.

Also included in the Tech Pack are appendices:

- List of recommended pesticides and application rates
- Good Agricultural Practices data record sheet.

Notwithstanding the identification of any specific pesticide for the control of pests and diseases, this decision is for the discretion of the Ministry of Agriculture Area Extension Officer and the farmer.

However, the mention of any pesticides and other products used in the Tech Pack should strictly comply with local regulations and all instructions provided by the manufacturer. Also, the use of trade names in the Tech Pack is for the purpose of citing examples and is not meant to either endorse or discredit any particular product.

Description

Plantain (*Musa paradisiaca*) is a member of the Musa species. The most popular varieties in St. Lucia are the Cent Livres, Dominique, Apem and the Horn (dwarf and tall). The Cent Livres and Dominique are tall and bear huge bunches; whereas the Apem is a small plant and bears a smaller bunch.

Site Selection

The site should be easily accessible, with good exposure to sunlight and offer shelter from the wind. Flat or slightly sloping land with good drainage should be chosen, rather than land with steep slopes that could lead to problems of erosion, and greater risk of wind damage and toppling. At all costs, avoid former banana or plantain plantations, due to the likelihood of poor soil fertility and phytosanitary conditions.

The optimal temperature for growing plantain is 82°F (28°C). At temperatures below 82°F (28°C) growth will be slower and will become negligible around 60 - 65°F (16–18°C).

Light: Shade accelerates growth, and it is advisable to determine the planting density depending on the cultivar selected, in order to provide the best light conditions for the plantation.

Water: Plantain needs a lot of water. It should get around 8 inches (200 mm)/month throughout its life cycle.

Wind: Plantain is very sensitive to strong wind, which can cause physical damage to the plant (torn leaves, toppling).

Soil: Plantain grows best in deep silty sandy and silty-clayey soils that are well drained and rich in organic matter. The plants prefer soils with pH between 5 - 6.5. Soils with a very low pH are not recommended.

Planting Material

Tissue culture plants (Plate 1) are the best source of clean planting material.

Plate 1 Weaned and hardened tissue culture plants

Sword suckers (Plate 2) are generally used as planting material if tissue culture plants are not available. Do not use water suckers as planting material.

Plate 2 Sword suckers

Bull heads or the entire rhizome also make good planting material, and can be cut into several pieces with each piece containing two buds or eyes (Plate 3).

Plate 3 Plantain bull head

Plantain is susceptible to and borer attacks and nematodes; so all sword suckers and bull heads should be clean pared to the white tissue to remove all signs of borer or nematode damage. The peeled stem is soaked in a mix of fungicide and insecticide and then dried in the open air, in a dry, shady place for between 48 - 72 hours. The Ministry of Agriculture Plant Protection Unit should be contacted for information on which fungicide and insecticide to use. For example, the peeled bulbs can be soaked in a mix made up of 3½ ounces (100 g) of Callidium 50EC and 3½ ounces (100 g) Ridomil Plus in 10 gallons (40 L) of water. The chemicals should be added to the water while stirring.

Land Preparation

After clearing the land, dig the planting holes about 12 x 12 x 12 inches (30 x 30 x 30 cm). Holes spaced at distances of 8 x 8 feet (2.5 x 2.5 m) or 9 x 6 feet (3 m x 2 m) will give around 4,000 – 5,000 plants/acre (1,700 - 2,000 plants/ha).

Separate the top soil (4 - 6 inches/10 - 15 cm) that is rich in humus from the sub-soil; place the top soil into the hole. In addition, composted manure (5 lb/2 kg) can be added to the top soil and mixed in the hole.

When placed in the hole, the collar of the plant should be visible. Pile up a little soil around each plant and avoid planting them too deep.

Fertilization

The plantain is a heavy feeder and fertilizer application is necessary if high yields are to be obtained. All fertilizers should be applied between planting and flowering.

With mixed fertilizers (NPK: 16:8:24+2MgO) apply the following to each plant:

1. month after planting ¼ lb (115 g) per mat
2. months after planting ½ lb (230 g) per mat
3. months after planting ½ lb (230 g) per mat

After the initial 3 months apply ¾ lb (345 g) every 3 months
If at 3 months after planting, the plants are not growing vigorously in spite of good growing conditions, give every mat ½ lb (230 g) NPK plus ½ lb (230 g) sulphate of ammonia, taking into consideration the soil pH.

In the high rainfall areas, after the initial 3 months give each mat ½ lb (230 g) NPK every 2 months, instead of ¾ lb (345 g) every 3 months. Alternatively, two applications can be made per year in May and November, at the rate of 1 lb (460 g) per mat placed in pockets (holes) and covered with soil.

Apply the fertilizer in a circular band on flat land, and in a semi-circle on slopes. The band should be 1 ½ feet (45 cm) from the base of young plants, and 3 feet (90 cm) for mature plants.

Propping

This involves supporting the plantain plant by using some form of support. It is used mainly for tall varieties (e.g. Cent Livres), or in areas that are subject to strong winds. Props should be used when bunches begin to appear (Plate 4).

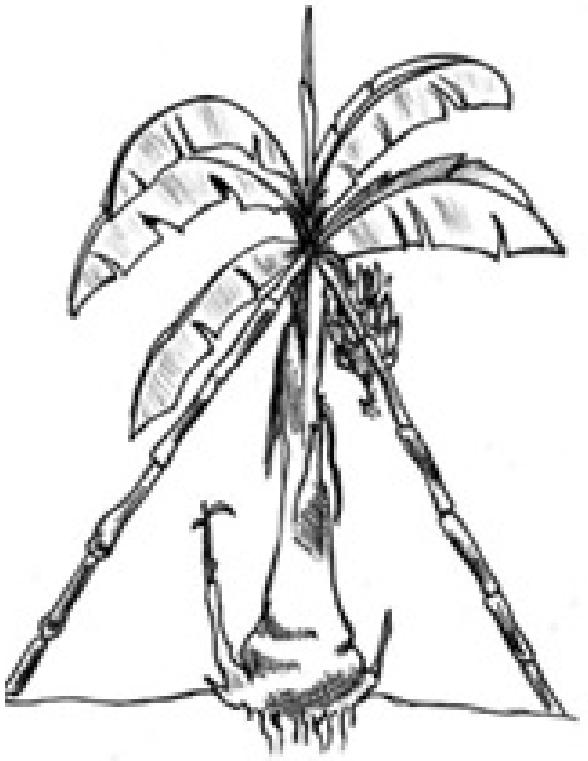


Plate 4 Propping

Weed Control

Trade name	Active ingredient	Quantity per application	Remarks
Round Up	Glyphosate	5 pints/acre (6 L/ha) for perennial weeds; 3½ pints/acre (4.5 L/ha) for annual weeds	Long-lasting effect, useful in dry season (needs 4 hours without rain after application)
Gramoxone	Paraquat	1½ - 2½ pints/acre (2 - 3 L/ha)	Useful in the wet season (needs 1 hour without rain after application)
Basta	Ammonium glufosinate	2½ - 4 pints/acre (3 - 5 L/ha)	Long-lasting effect (needs 4 hours without rain after application)
Gramuron	Diuron paraquat	2½ - 3 pints/acre (3 - 4 L/ha)	Not useful in the dry season

Weed regularly during the first 6 months, using a cutlass or herbicide. Herbicides can be used on weeds which are 4 - 6 inches (10 - 15 cm) in height (Table 2). If weeds are higher, they should be brushed cut with a cutlass or weed eater. Herbicides should never touch the plantain plants. Do not spray when conditions are windy, or immediately before, after or during rains.

Caring for the Bunch

Break the male bud (Plate 5) 7 to 10 days after the appearance of the last hand. The break should be about 8 inches (20 cm) from the last hand. Sleeving or polythene bagging will control rust thrips and promote high quality fruit production. Sleeve all bunches early, or at the time when the last hand becomes exposed with a sleeve long enough to cover the entire bunch.

Plate 5 Removing the male bud

Trimming and Field Sanitation

Remove any old, dry leaves that hang down on the pseudostem (they can hide insects and larvae). For ripening of bunches, it is essential that the green leaves are left uncut. Approximately 2 - 3 months after harvesting, remove all remaining shoots apart from two bayonet-shaped shoots, one large and one small. Avoid weeds, dead leaves, pieces of pseudostem and other plant debris piling up at the base of the plantain plants, where they could provide shelter for the Banana root weevil or other insects and larvae.

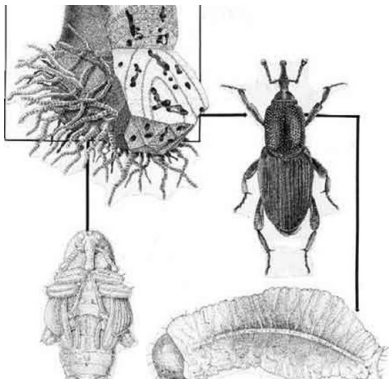
Pruning

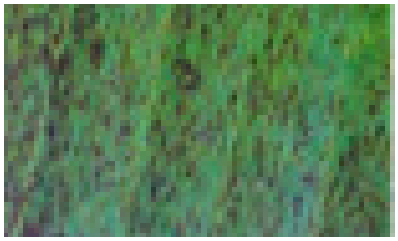
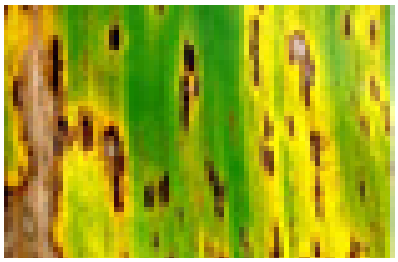
Pruning is the process of removing suckers, or followers at the level where they emerge from the mother plant. Unlike bananas, it is generally not necessary to prune plantains before the selection pruning, which take place in the second cropping cycle. As most suckers are inhibited by the mother plant, they usually remain undeveloped until bunching.

Pests and Diseases

The major pests and diseases affecting plantain in St. Lucia are shown in Table 3. Good Agricultural Practice (GAP) related to the use of pesticides, requires farmers to maintain up to date records on the application of pesticides to the crop. These records should include trade names, application rates and dates of application. During the harvesting period use pesticides with a very short harvest interval

Table 1 Causal agents, symptoms and control of pests and diseases of anthuriums

Pest & Diseases	Symptoms	Control/ Management
 Plates 6 and 7 Banana Weevil (*Cosmopolites sordidus* Germ) 	The larva of this weevil bores into the root of the plantain in order to provide food for itself, thereby destroying the root system. As a result, the plant cannot draw up nutrients effectively and its anchorage to the soil is undermined, and it can be toppled even by a light breeze.	Neem powder, mixed with soil, can be effective against banana weevils. The effective chemical products tend to be relatively expensive Dursban (active ingredient: chlorpyrifos): a liquid pesticide Furadan (active ingredient: carbofuran): a systemic pesticide in granular form Apply Dursban or Furadan 2 - 4 times per year, depending on the degree of infestation. Use these pesticides only during the wet season Chemical products should be applied to the soil at the edge of the plant in a drip line placement 4 – 6 inches (10 - 15 cm) wide (make sure to first remove any organic waste material).

Pest & Diseases	Symptoms	Control/ Management
  Plate 8 Nematodes	Nematodes are microscopic "worms" that penetrate and reproduce in the roots of the plantain, thereby destroying them. Infested roots die off, and as the plant can no longer extract nutrients from the soil it can topple easily.	To combat nematodes, apply a mix of water, clay and nematicide to the base of the infested plant.
   Plate 9 Black Sigatoka Disease (BSD) **Progressive symptoms of BSD Source:http://lib.convdocs.org/docs/index-129968.html?page=27**	Black Sigatoka is a leaf spot disease caused by a fungus that grows on the plantain leaves, causing them to wilt. The fruits are badly filled and maturation is abnormal resulting in poor taste quality and lower fruit yields.	Remove the damaged leaves (burning them, if possible) Make sure plantations are not too damp: reduce the density of plants in order to facilitate good air circulation; weed regularly Good nematode and borer control Adequate fertilization Spray fungicides; ensure that fields are ready for spraying by sleeving bunches on time Use tolerant varieties.

Harvesting

Harvesting begins nine to eleven months after planting and normally at the full stage. During harvest remove foliage, and chop up the pseudostem.

Harvest bunches at the correct grade according to market requirements. Care should be taken not to damage the harvested bunch, especially Cent Livres variety. Damaged fingers serve as a point of entry for micro-organisms, which cause rotting and spoilage. Protect harvested fruit from direct sunshine and mechanical damage during field transport.

Yield

Expected yields for the Cent Livre and Dominque varieties are between 38,000 - 40,000 lb/acre (18,000 – 19,000 kg/ha) and for the Apem variety between 26,000 - 32,000 lb/acre (12,000 - 15,000 kg/ha).

Marketing and Packing

Fruit must be green with no visible break in colour on the shoulders, free of scars, rust damage, rots and latex stain.

The cluster must have sufficient crown which is well trimmed with three to eight fingers each with a minimum length of 8 inches (20 cm) and dipped in Neozil.

The grade of the fruit is light ¾ to 3/4 and must be packed in a standard plantain telescopic box, using kraft liner and a polybag in accordance with banana packing scheme (crowns towards first row; crowns away second row etc.)

The gross weight of the box when packed should be 45 lb (20.3 kg).

APPENDICES

INSECTICIDES	APPLICATION RATE
Pronto 35 SC	3 - 5 teaspoons/gallon of water
Target	1 - 2 teaspoons/gallon of water
Pirate	½ - 1 teaspoons/gallon of water
Fastac	1 - 2 teaspoons/gallon of water
Caprid	½ - 1 teaspoon/gallon of water
Diazinon (Basudin)	¾ - 1½ pints/acre
Admiral	¼ teaspoon/gallon of water
Dipel	1½ - 2 teaspoons/gallon of water
Aza-direct	1 - 2 teaspoons/gallon of water
Cure	½ - 1 teaspoon/gallon of water
Danitol	1 - 2 teaspoons/gallon of water
Cypro	½ tablespoon/gallon of water
Dimethoate (Perfecthion, Rogor 40)	1 pint/acre
Phosvel	1¼ - 2 pints/acre
Orthene	3.2 ounces/acre
Permethrin (Ambush)	½ teaspoon/gallon of water
Padan 50 WSP	2 - 3 teaspoons/gallon of water
Lannate	1 teaspoon/gallon of water
Decis	½ teaspoon/gallon of water
Kelthane 42%	1¼ lb/acre
Orthene 75S	1 lb/acre
Malathion	½ - 1 pint/acre
Sevin	1½ lb/acre
BT (*Bacillus thruingiensis*)	Label rates
Rotenone	1 - 2 teaspoons/gallon of water
Neem X.	8 - 10 oz/gallon of water
FUNGICIDES	**APPLICATION RATE**
Bellis	2 teaspoon/gallon of water
Acrobat	2 - 4 teaspoon/gallon of water
Mancozeb (Dithane M45)	1.5 lb/acre
Cabendazim	2 teaspoon/gallon of water
Daconil	1½ - 2 pints/acre
Benomyl (Benlate)	6 oz/acre
Captan	2 - 3 teaspoons/gallon of water
Peltar	3 teaspoons/gallon of water
Manzate DF	2 - 4 teaspoons/gallon of water

Bravo	1½ - 2 pints/acre
Tri-Miltox-Forte	3 teaspoons/gallon of water
Botrilex	5 - 200 lbs/acre
Kocide 101	2 - 4 teaspoons/gallon of water
Cupravit	2½ lb/acre
WEEDICIDES	**APPLICATION RATE**
DCPA (Dacthal W-75)	10 lb/acre¬¬¬
Diphenamide	4 - 10 lb/acre
Paraquat (Gramoxone)	1 - 2 pints/acre
Dymid 80W	5 lb/acre
Atrazine 80 (Gesaprim).	1¼ - 1½ lb/acre
Linuron (Lorox)	1 pint/acre
Prometryn (Caparol)	0.8 - 1.6 lb/acre
Sethoxydim (Poast)	1¼ - 3½ lb/acre
Clethodim (Select)	0.094 - 0.25 lb/acre
Prometryn 50WP (Geagard)	2 - 3 lb/acre
Herbicidal Oil (Stoddard Solvent, Kerosene oil)	40 - 80 gallons/acre

APPENDIX I: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES

APPENDIX II: GOOD AGRICULTURAL PRACTICES DATA RECORD SHEET

Grower name:

*Name of applicator	Date	Brand and product name	Rate	Size of area/no. of plants treated	Total application (amount of the product used)	Notes/target pest	Start/finis time

*The applicator should be trained or, if not, supervised by a trained or certified person. Proof of training required.