Growing Banana And Plantain In The Virgin Islands

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Agricultural Experiment Station

GROWING BANANA AND PLANTAIN IN THE VIRGIN ISLANDS

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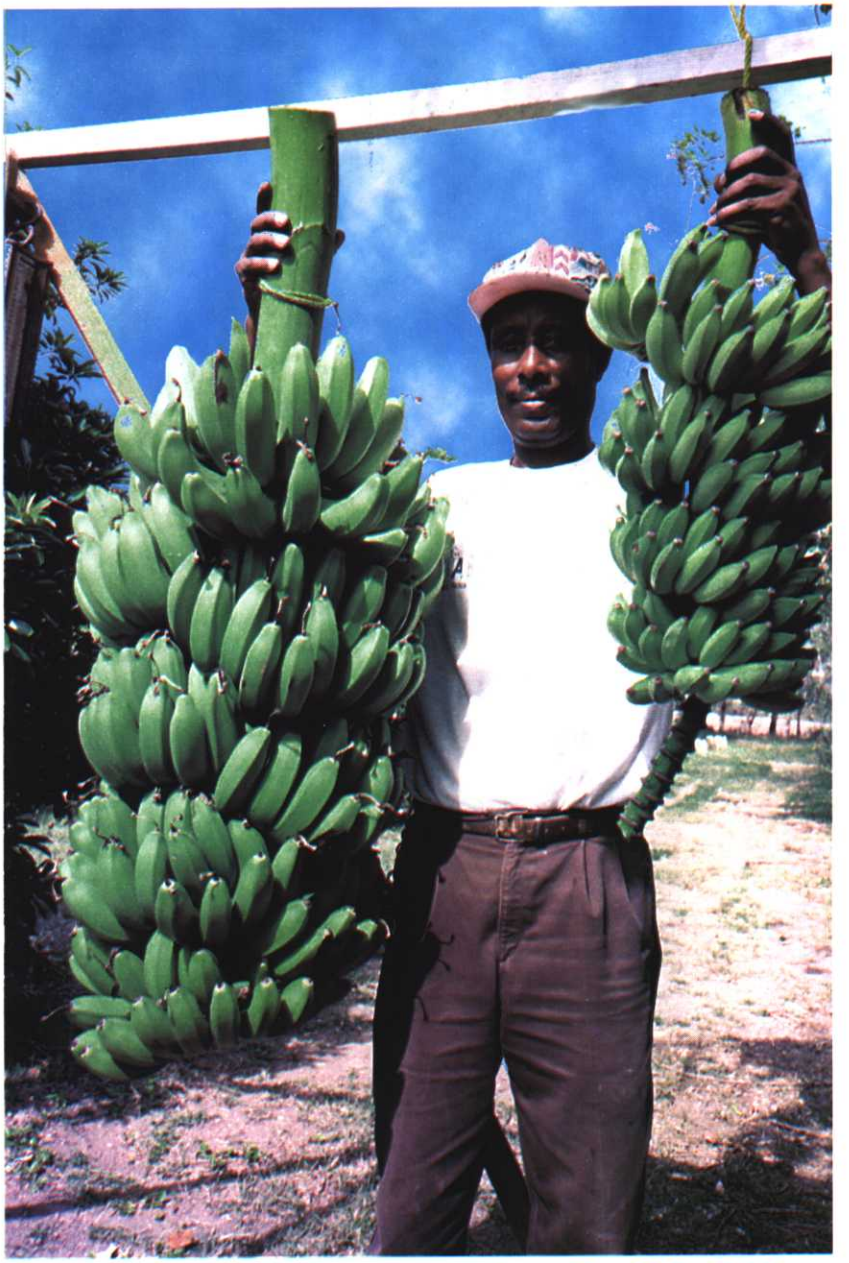
Clinton George, Agriculture & Natural Resources Program Leader, examines the maturity and quality of a banana bunch.

Dwarf Cavendish.



Aberra Bulbulla, UVI-AES Research Analyst with a 95 lb. Goldfinger bunch (FHIA-01)(right) and a 35 lb. Bacuba bunch (left).

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FOREWORD

For agriculture to be successful in the Virgin Islands, it must be productive while preserving our natural resources. The Agricultural Experiment Station and Cooperative Extension Service with their research and outreach capabilities can help our farmers achieve both these objectives. To meet the information/problem-solving needs of our part-time and commercial farmers, the Agricultural Experiment Station and the Cooperative Extension Service has published many factsheets and bulletins. This publication, *Growing Banana and Plantain in the Virgin Islands*, is the latest joint effort in this series.

The banana and plantain, both edible and usually seedless, are very popular fruits throughout the Caribbean including Puerto Rico and the Virgin Islands. The banana, in particular, is grown by many small-scale growers for home consumption and the local market.

Bananas are most commonly used as ripe dessert fruits, but, in the green form, they can be cooked in various ways. Like plantains, they can be boiled, steamed, roasted, baked, fried, or even fermented to make beer or vinegar. In the Virgin Islands, plantains and green bananas are a major constituent of the diet of several ethnic groups.

Both banana and plantain are a good source of potassium while being low in sodium. A high intake of sodium has always been implicated with hypertension, a chronic disease that afflicts many Virgin Islanders. Bananas are high in Vitamin A, C and B_6; plantains are also rich in Vitamin A.

Over the years, the Agricultural Experiment Station has conducted problem-directed research on banana and plantain. Most of this valuable information, however, has been published as research papers in scientific journals and has, therefore, been inaccessible to our local growers.

The Agricultural Experiment Station and the Cooperative Extension Service are, indeed, happy to have researched and published information on this tropical food crop of economic and intrinsic local value. The purpose of this publication is to provide small growers, especially home gardeners, with research-based information on the production, cultivation, and maintenance practices (including pruning, cropping, deflowering, and desuckering) for bananas and plantains. Additionally, *Growing Banana and Plantain in the Virgin Islands* provides description, cultivars, nutritional value and uses, as well as great tasting English and Spanish recipes. I hereby urge all Virgin Islanders to enjoy this information and try the recipes presented in this bulletin.

James E. Rakocy, Ph.D.
Director
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INTRODUCTION

Bananas and plantains are major food crops in the Virgin Islands. Although imported ripe bananas are a major supermarket fruit item, green bananas and plantains are also important staple foods used in different ways by Virgin Islanders. Most of the bananas and plantains consumed in the Virgin Islands are imported from Central and South America and other Caribbean islands. In 1990, 661,017 kgs (1,457,500 lbs) were imported from Latin American countries and 60,445 kgs (133,300 lbs) from the Caribbean. This represented a farm value of $317,400. However, good growing conditions for banana and plantain production exist in the Virgin Islands and the demand for these crops always exceed the limited supply.

After citrus fruits, banana is the most important fruit in world trade...extensively grown in gardens for home consumption or the local market, but also on large plantations for the export market. The crop may be grown in monoculture or in a mixed cropping system. In the Virgin Islands, banana and plantain can be successfully intercropped with cassava, pigeon peas and another popular fruit – papaya.

Bananas and plantains also play an important role in environmental conservation. Their large majestic leaves form closed canopy shading, protecting the soil from erosion and the destructive effects of direct sunlight which can be intensive in the Virgin Islands.

Dr. Christopher Ramcharan, UVI-AES Research Associate Professor with a 95 lb. Goldfinger bunch.

ORIGIN AND DESCRIPTION

The banana and plantain originated in Southeast Asia, with Eastern Malaysia and the Philippine Islands considered the primary areas. Banana and plantain belong to the family *Musaceae*. They are large monocotyledonous plants with succulent pseudostems or false stems, built up from leaf sheaths; the leaves form in a spiral and new leaves and flowers emerge through the pseudostem from an underground true stem or corm.

Musa is monocarpic, that is, it produces a single shoot flowers only once and dies after it has borne fruit. However, the whole plant is perennial as the corm's life is perpetuated by suckers; a whole clump of plants may thus develop. The banana fruit is a berry and is described as parthenocarpic, that is, it

contains many undeveloped ovules, but no seeds. These are the blade specks found in the center of banana fruits. In contrast to the bunch, which grows down, the fruit curves upwards. A fruit cluster is generally called a "hand" and a single fruit a "finger." They differ from cultivar to cultivar in characteristics such as shape, size, color of skin and flavor. A good bunch usually consists of eight hands each containing 15 fingers, with an average finger weight of 150 g (0.33 lbs), fruit weight of 18 kg (39.6 lbs), and the entire bunch weight of about 20 kg (44.1 lbs).

Most bananas and plantains descended from a wild ancestor - *Musa acuminata*. The plantains also carry genes of another wild ancestor - *Musa balbisiana*. These are represented by the genomes A and B, respectively. The edible bananas are triploids that are described as AAA; in other words they carry three sets of chromosomes derived from *M. acuminata*. The plantains and other cooking bananas are generally hybrid triploids and represented as either AAB or ABB.

CULTIVARS (VARIETIES)

Banana:

The varieties or cultivars (cvs) of banana recommended for planting in the Virgin Islands (V.I.) and their agronomic characteristics are shown in Table 1. Most cultivars belong to the AAA group and the Cavendish sub group, which are normally resistant to fusarium wilt disease. The Cavendish group, however, is susceptible to nematodes. This problem can be controlled with the appropriate selection of suckers, the use of nematicides, and the use of tissue-culture starting material.

The most adaptable varieties for the soil and climatic conditions in the V.I. are the giant and dwarf Cavendish and the recently introduced FHIA cvs. This is because of their relatively high yields and tolerance to the windy conditions of the islands. Another advantage of using these cultivars is the possibility of obtaining seedling material from tissue culture. Through this technique of propagation, the farmer can now obtain disease and pest-free material in larger quantities, fairly rapidly. Tissue cultured plants also give more uniform growth and fruiting.

Plantain:

Plantain cvs recommended for the V.I. with their agronomic characteristics are also shown in Table 1. The most adapted are the dwarf types not only because of their wind resistance, but also for their high yields. Research at the University of the Virgin Islands Agricultural Experiment Station (UVI-AES) demonstrated that the dwarf varieties are more resistant to iron (Fe) and potassium (K) deficiency problems, induced by the high pH soils.

French plantain.

The dwarf French plantain was selected from a batch of tissue cultured plants. It is highly prolific and has proven to be best suited for local conditions. At UVI-AES, yields in excess of 46 tons and 200,000 fingers per ha have been achieved.

Other common names of banana and plantain varieties are as follows:

Banana

Robusta = Pisang Buai, Saina, Porto Rique, Poyo, Grande Naine de la Montagna.

Giant Cavendish = Giant Chinese, Giant Governor, Grande Naine, Gigante Enano, Williams Hybrid.

Dwarf Cavendish = Chinese, Dwarf Chinese, Canary, Pigmeo, Governor, Petite Naine, Guineo Enano.

Lady's Finger = Pisang Mas, Sucrier, Honey, Figue Sucree, de Rosa.

Silk = Pisang Rastali, Apple, Manzana, Silk Fig, Figue Pomme, Bacuba.

Goldfinger = FHIA-01.

Bacuba.

Plantain

Horn Plantain = Platano Comun, P. Cuarenteno, P. Maricongo, P. Macho, P. Harton, Liberal, Horse Plantain.

French Plantain = Platano Congo, Maiden Plantain, May Plantain, Green French Plantain, Creole Plantain, Common Plantain.

Dwarf Plantain = Platano Enano, Banana Cochon.

Dwarf French Plantain = Congo Enano.

Cooking Banana

Moko =Bluggoe, Saba, Chamaluco,Buccament, Mafoubay, Malango.

FHIA-03 Moko type (cooking banana).

MANAGEMENT PRACTICES

Soil and Climate:

Banana and plantain are tropical crops and grow best at 80.6°F and stop growing at 100.4°F. However, either will tolerate a minimum temperature of about 64.4°F. Higher temperatures cause sun-scorch. Chilling injury occurs at temperatures below 53.6°F, when sap or latex in the leaves coagulates.

The minimum amount of water needed for good growth is 1650 mm/year (65 in.) well-distributed during the year. In the V.I., where the annual average rainfall is about 1016 mm/year (40 in.) and unevenly distributed, it is critical to apply water during the dry season. Planting during the rainy season (September - November) is recommended, but can be done at any time of the year with adequate irrigation.

A wide range of soils is suitable to grow banana and plantain provided good drainage, adequate fertility and moisture are provided. The clay content should usually be below 40 percent. Other critical factors are soil structure, depth and absence of toxic substances. The banana root is fragile, cannot stand stagnant water and must grow in a well-aerated, yet moist environment; absence of rocks, good soil structure and porosity are also essential features. Although banana and plantain are tolerant of pH in the range of 4.5 - 8.0, the best growth is found from pH 6 to 7.5.

The Super Plantain is intermediate in size between the true French and Maricongo (Horse) plantains.

Selection and Preparation of Seedlings:

The seedling (or sucker) that is selected will ultimately determine the yield and hence the need to select the best available suckers. It is also important to select suckers from a mother plant that produced a large bunch free of diseases or other problems. Ideally, swordsuckers of at least 1 kg weight and 30 cm in girth (circumference) should be selected.

After selection, suckers should be thoroughly cleaned with the removal of all necrotic (dead) areas and red spots which may harbor nematodes or corm borer larvae. It is critical that this procedure be performed far away from the transplanting area. Finally, suckers can be immersed in a solution of an appropriate insecticide before planting. For more details contact your extension agent at University of the Virgin Islands Cooperative Extension Service (UVI-CES). This cleaning procedure is critical for all planting material except in the case of tissue cultured plantlets. Tissue cultured propagated material is pest and disease free, therefore, it may well worth the extra time and cost involved in using this method for planting.

Site Preparation and Planting:

Land preparation usually consists of ploughing and disking, after which soil samples for pH and nutrients status analysis should be taken. In areas of the V.I. with a shallow topsoil and a caliche subsoil, care should be taken to avoid deep ploughing so as not to bring up the calcareous subsoil which can later result in high pH-induced iron chlorosis (yellowing).

The size of the planting hole should be proportional to the size of the suckers, but 40 cm deep by 30 cm wide is usually used. Research at UVI-AES has shown that for large-scale production, the use of a tractor for digging holes could be more economical although this method of hole preparation did not improve yields. For poorly drained soils it is recommended that a portion of the pseudostem of the sucker be above soil level at planting so as to prevent rotting of the rhizome.

For plantains, a planting distance of 1.85 m (6 ft.) (between rows) x 1.8 5m (6 ft.) (between plants) to give a population of 1200 plants per acre is generally recommended while for bananas a distance of 1.85 m (6 ft.) (between rows) x 2.4 m (8ft.) (between plants) with a plant population of 800 plants per acre is adequate.

Planting bananas in an integrated sustainable system.

Irrigation:

For semiarid areas like the V.I., the use of trickle irrigation for small acreages or even backyard plantings is critical. This method conserves water by applying adequate amounts just around the roots of the plant. It also restricts the spread of soil-related banana diseases and nematodes, and since it does not wet the foliage as in overhead irrigation, the trickle system also controls leaf spot. Trickle irrigation can also be used to efficiently apply fertilizers and, if needed, pesticides. A simple low-input chemigation system for bananas and other fruit crops has also been developed at UVI-AES. In general, 1/2 to 1 gallon per plant is adequate when water is supplied by trickle irrigation but this must be applied on a daily basis. Recently, an elevated microsprinkler irrigation system for bananas and plantains has been developed at UVI-AES, and preliminary results have so far indicated it is superior to the traditional trickle system.

Fertilization:

As with all crops, fertilizer recommendations for banana and plantain must be related with the nutrient status of the soil. It is therefore important to take soil samples during land preparation. It is also critical to augment the soil analysis with foliar analysis as a guide to determining nutrient deficiencies and toxicities and in planning a fertilizer program. For more information about how to collect a soil sample, contact your extension agent. Generally, a soil that is neither too acidic nor alkaline, rich in organic matter, with a high nitrogen (N) content, an adequate phosphate (P) level and abundant potassium (K), is ideal for growing banana and plantain. The importance of K to the nutrition of banana is evident by the high concentration found in all the plant tissues. K represents approximately 33 to 38 percent of the ash in plant tissue and 60 to 64 percent in the fruit.

The major nutritional problem in the V. I. are the K and iron (Fe) deficiencies. K deficiency is characterized by leaf-margin necrosis, and Fe deficiency initially by a general yellow leaf chlorosis, that intensifies to almost white as the Fe deficiency increases. For most soils in the V.I., 226 g (7.9 oz.) of a 10-5-20 fertilizer

mix per plant every 4 months is recommended. The first application should occur after sucker germination and be placed around the pseudostem. The next application should be broadcast to cover the outer area from the pseudostem to the drip line of the leaves. It is also important to incorporate about 3-5 kg (6.6-11.0 lbs.) of well-rotted manure into the planting holes. Since local soils are usually low in organic matter content and cation exchange capacity, the incorporation of manure at planting is critical.

High pH-induced iron chlorosis (yellowing) in banana.

Weed Control:

The damaging effects of weeds in most crops are well known: they compete with the crop plants for nutrients, water and light; they may harbor pests and diseases; they may produce chemicals which are toxic to the crop; and lastly, they may create difficulties with managing or harvesting the crop. In many areas the high cost of labor makes hand weeding uneconomical, and chemical weed control has become an integral part of banana and plantain production although manual weeding will continue to be used on small holdings and where bananas are grown as a subsistence crop. But there may be certain disadvantages to manual weeding besides the cost. Bananas have shallow roots, and hoeing, particularly around young plants, may be injurious to roots and may damage trickle irrigation lines. The use of herbicides in bananas has only become widespread since about 1960. Research has shown that a number of herbicides are suitable for use in bananas, and the grower should contact the Cooperative Extension Service for recommendations for his/her area, as these depend on the products available, the soil conditions, and the local weed flora.

Finally, mulching with organic materials including grass, other landscape clippings and the pruning materials of the banana plant itself is an indispensable part of the overall cultural operations. Mulching suppresses weeds, particularly around young plants, and after decomposition adds critical organic matter to the soil. At UVI-AES, superior yields have been obtained with an integration of production practices. These include minimum tillage operations, a judicious use of herbicides and an elevated microsprinkler system.

Banana grown with an elevated micro-sprinkler system.

MAJOR PESTS AND CONTROL METHODS

In the Virgin Islands there are four major pest problems which affect banana and plantain. Of these, the banana root nematode and the banana root borer are responsible for over 30 percent yield reduction.

Banana Root Nematode:

The banana root nematode - *Radopholus similis* - can cause damage commonly referred to as root rot, blackhead disease and toppling disease. They enter healthy roots from the soil and feed on cells of the cortex (bark) resulting in root cavities and tunnels. Initial symptoms are small, elongated lesions which eventually coalesce (grow together) to form an overall dark patch on the root which can be seen if the outer layer of the corm is trimmed off. Small fruit size, number reduction and stunted plants are also common symptoms. Occasionally, leaf chlorosis (yellowing) is observed on infested plants which is an indication of nutritional deficiencies associated with root destruction. Burrowing nematode control involves two basic approaches: planting of nematode-free corms in fallowed soil and the application of soil nematocides to already infested plants.

Banana Root Borer:

The banana root borer or banana corm weevil as it is commonly known is *Cosmopolites sordidus*. Common symptoms include dull yellow-green limpid leaves. Infested suckers often wither and fail to develop. In high winds that often occur locally, more than an average number of plants are blown down at times with severe losses due to weak and poorly developed roots from weevil larvae feeding and tunnelling in the rhizome of the plant.

This pest spreads in two ways: via planting material from infested plants or by adult weevils crawling from infested areas; hence the critical need for clean, healthy planting material. Areas previously infested should not be planted while the old corms remain or where sufficient time has not lapsed for the elimination of adult weevils after old corms have been removed. There are registered chemical insecticides recommended for treating this pest. For further information you can call UVI Cooperative Extension Service. The newly introduced FHIA cvs are tolerant to both nematodes and weevil infestation.

Fusarium Wilt Disease:

This soilborne disease, also called Panama disease, is caused by *Fusarium oxysporum* f.sp. *cubense* which enters the plant through the roots. The fungus blocks the vascular system causing the plant to wilt. The initial symptoms are yellowing of the older leaves or a collapse of the petioles (slender leaf stem) causing all the leaves to eventually die. Internally, there is a characteristic discoloration of the vascular bundles of the pseudostem which when cut has a rotten smell. Although the traditional cavendish cvs have been resistant to Panama disease there have been recent reports of their susceptibility to race(strain) 4 of the fungus. In anticipation of widespread infection and decline of the cavendish cvs, the tolerant FHIA cvs have been bred in Honduras and distributed worldwide, including the V.I., for evaluation studies.

SPECIAL PRACTICES

Pruning:

Pruning or desuckering aims at maintaining a balance between plant vegetative growth and yield and assists in the production of large quality banana or plantain bunches. The system of one mother plant with a bunch and one follower or daughter sucker is usually recommended. A third plant, which should be a follower of the daughter, not of the mother, is allowed to remain only after the main mother-inflorescence has appeared. Pruning consists of cutting back the unwanted suckers, particularly those around the fruiting mother plant, to ground level, removing the heart (center) and pouring a few drops of kerosene into the cavity formed.

If farmers prefer to remove suckers, the daughter follower can be dug up when approximately three-quarters of their field has been harvested. Indiscriminate removal of suckers, particularly when the mother plant is fruiting, can be harmful to bunch development and is not recommended. Recent research has also recommend pruning off of the terminal male flower inflorescence for fuller development of the terminal hands of the bunch. All yellow and hanging dried leaves should be removed soon after flowering or whenever there is a heavy leaf spot infection. After each harvest, psuedostems of the harvested plants must be cut down, cut up and the trash aligned between the plant rows. Diseased leaves should never be used for mulching.

Propping:

Propping serves to protect bearing plants from toppling and wind damage. It is necessary because the weight of the bunch is apt to pull the plant out of balance. Two props forming a triangle are better than one. Care must be taken so that the props do not bruise the bunch. In the Virgin Islands, cut stems of manjack and kenip have proven to be the most durable and termite-free banana prop materials.

In general, bananas and plantains can be produced year-round in the Virgin Islands and are adapted to a family-type operation providing a steady source of income. With the adequate application of soil nutrients, irrigation and proper cultural techniques, crops can be grown successfully even under alkaline soil conditions and are adapted to a moderate level of technology with relatively little investment in machinery and equipment.

Propping serves to protect bearing plants from toppling and wind damage.

Table 1

Growth and Yield Characteristics of Banana and Plantain Grown on St. Croix, USVI

Cultivar	Height at Flowering (m)	Stem Width at Flowering (cm)	Bunch Wt. kg (lbs)	# Fruits/ Bunch	Estimated Yield	
					Tons/ha	Tons/ac
Banana						
Robusta(AAA)	1.8	12.2	15 (33)	111	30	12
Valery(AAA)	1.9	13.5	10 (22)	86	20	8
Giant Cavendish(AAA)	1.7	16.5	17.5 (38.5)	139	35	14
Dwarf Cavendish(AAA)	1.4	16.0	15 (33)	105	30	12
Silk (AAB)	3.2	13.5	15.2 (33.4)	85	30.4	12.1
Goldfinger (AAAB)	2.8	45.0	25.0 (55)	90	50	20
Plantain						
French Plantain (AAB)	3.3	17.8	18.0 (39.6)	92	36	14.4
Horn Plantain (AAB)	3.2	15.0	9.2 (20.2)	35	18.4	7.3
Dwarf Horn(AAB)	2.4	20.8	13.7 (30.1)	57	27.4	10.9
Dwarf French(AAB)	1.9	19.0	26.5 (58.3)	130	53	21.2
Cooking Banana						
Moko (ABB)	3.1	14.0	15.7 (34.5)	82	31.4	12.6
FHIA-03(AABB)	3.0	42.0	21.5 (47.3)	86	43	7.2

NUTRITIONAL VALUE AND USES

The role of banana and plantain is becoming more important with the increasing emphasis today on diets that are low in sodium but high in potassium and vitamins. High intake of sodium has always been implicated with hypertension, a chronic disease that afflicts many Virgin Islanders. Both banana and plantain are good sources of potassium but low in sodium (Table 2). Bananas are high in vitamin C and vitamin B_6. Plantains are also rich in vitamin A. They are highly digestible and contain fiber, blood pressure stabilizers, and calcium and phosphates for healthy skin, teeth and bones. They are also one of the few fruit sources of chromium, a nutrient vital for combating diabetes because it stimulates the metabolism of glucose.

Besides being used as a ripe dessert fruit, banana in the green form can be cooked in various ways. Like plantains, they can be boiled, steamed, roasted, baked, fried, or even fermented to make beer and vinegar. In the V.I., green bananas are a major constituent of the diet of several ethnic groups. There is growing interest in the market for banana and plantain chips, made by deep frying green banana and plantain slices as snack items. The fresh banana itself, however, is an ideal snack item, which may be the reason that processed banana products have not flooded the market.

Table 2

Nutrient Composition of 100g of Banana (Ripe and Green) and Plantain

Nutrients	Ripe Banana	Green Banana	Plantain
Calories	85.0	110.0	119.0
Protein (g)	1.1	1.4	1.1
Fat (g)	0.2	0.2	0.4
Carbohydrate (g)	22.2	28.7	31.2
Calcium (mg)	8.0	8.0	7.0
Phosphorus (mg)	26.0	35.0	30.0
Iron (mg)	0.7	0.9	0.7
Sodium (mg)	1.0	-----	5.0
Potassium (mg)	370	-----	385
Vitamin A (I.U.)	190	290	1200
Thiamine (B_1) (mg)	0.05	0.04	0.06
Niacin (mg)	0.7	0.6	2.1
Riboflavin (B_2) (mg)	0.06	0.02	0.10
Vitamin C (mg)	10.0	31.0	14.0
Vitamin B_6 (mg)	25.0	-----	-----

Abbreviations: g = gram; mg = milligram; I.U. = International Unit

Source: Handbook of the Nutritional Content of Foods. USDA Handbook #8.

Table 3

Estimated Costs and Returns per 1/4 Acre for Plantain Production *(St. Croix Profile)*

Receipt Items	Estimated Yield	Unit	Estimated Cost/Unit ($)	Estimated Value ($)	% of Total Cost
Plantain	12,974.00	lb.	0.40	5,189.80	
Gross Receipts				5,189.80	227.14
Production Operation Items	**Qty. Used**				
Suckers	350.00	plants	3.00	1,050.00	54.07
Replacement Suckers	43.75	plants	3.00	131.25	7.01
Fertilizer (commercial)	1,225.00	lbs.	0.15	183.75	9.81
Chicken Manure	0.43	ton	33.33	14.33	0.77
Insecticide	0.43	pt.	3.50	1.51	0.08
Insecticide	5.25	lb.	3.50	18.38	0.98
Fungicide	0.87	lbs.	12.00	10.44	0.56
Mulch	875.00	lb.	0.02	17.50	0.93
Irrigation Repair	0.43	dol.	40.00	17.20	0.92
Pruning	7.00	hrs.	6.00	42.00	2.24
Staking	7.00	hrs.	6.00	42.00	2.24
Labor	36.75	hrs.	6.00	220.50	11.77
Tractor (Harrow)	0.25	acre	15.00	3.75	0.20
Tractor (Plow)	0.25	acre	60.00	15.00	0.34
Grass Cutting	0.25	acre	15.00	3.75	0.80
Tiller	3.00	day	15.00	45.00	4.09
Subtotal: Production Operation Cost				1,816.36	96.99
Harvesting & Marketing Items					
Cutting and Packing	1.75	hrs.	6.00	10.50	0.56
Subtotal: Harvesting & Marketing Cost				10.50	0.56
Total Variable Cost				1,826.86	97.56
Gross Receipts Above Total Variable Cost				3,362.94	179.58
Fixed Items					
Equipment	0.25	acre	15.00	3.75	0.20
Irrigation	0.43	acre	91.67	39.42	2.11
Other	0.43	acre	6.08	2.61	0.14
Subtotal: Fixed Cost				45.78	2.44
Total Cost				1,872.64	100.00
Net Receipts				3,317.16	177.14

Table 4

Estimated Costs and Returns per 1/4 Acre for Banana Production
(St. Croix Profile)

Receipt Items	Estimated Yield	Unit	Estimated Cost/Unit ($)	Estimated Value ($)	% of Total Cost
Banana	6,125.00	lb.	0.53	3,246.25	
Gross Receipts				3,246.25	294.74
Production Operation Items	**Qty. Used**				
Suckers	200.00	plants	3.00	600.00	54.48
Replacement Suckers	25.00	plants	3.00	75.00	6.81
Fertilizer (commercial)	700.00	lbs.	0.15	105.00	9.53
Chicken Manure	0.25	ton	33.33	8.33	0.76
Insecticide	0.25	pt.	3.50	0.88	0.08
Insecticide	3.00	lb.	3.50	10.50	0.95
Fungicide	0.50	lbs.	12.00	6.00	0.54
Mulch	500.00	lb.	0.02	10.00	0.91
Irrigation Repair	0.25	dol.	40.00	10.00	0.91
Pruning	4.00	hrs.	6.00	24.00	2.18
Staking	4.00	hrs.	6.00	24.00	2.18
Labor	21.00	hrs.	6.00	126.00	11.44
Tractor (Harrow)	0.25	acre	15.00	3.75	0.34
Tractor (Plow)	0.25	acre	60.00	15.00	1.36
Grass Cutting	0.25	acre	15.00	3.75	0.34
Tiller	3.00	day	15.00	45.00	4.09
Subtotal: Production Operation Cost				1,067.21	96.90
Harvesting & Marketing Items					
Cutting and Packing	1.00	hrs.	6.00	6.00	0.54
Subtotal: Harvesting & Marketing Cost			6.00	0.54	
Total Variable Cost				1,073.21	97.44
Gross Receipts Above Total Variable Cost				2,173.04	197.30
Fixed Items					
Equipment	0.25	acre	15.00	3.75	0.34
Irrigation	0.25	acre	91.67	22.92	2.08
Other	0.25	acre	6.08	1.52	0.14
Subtotal: Fixed Cost				28.19	2.56
Total Cost				1,101.40	100.00
Net Receipts				2,144.85	194.74

Mashed Plantains

3	plantains
2	teaspoons salt
	pepper
1/4	cup butter
1/4	cup milk

Cook and mash the plantains adding the butter, milk, salt and pepper. Mix well; serve hot. This may also be put through a vegetable ricer. Makes approximately 6 - 1/2 cup servings.

Each 1/2 cup provides:

Calorie	Fat (g)	Protein (g)	Carbohydrates (g)	Sodium (mg)	Cholesterol (mg)
158	5	2	29	709	15

Substitute skim milk for whole, low-fat margarine for butter, and 1 teaspoon of salt for 2 to lower the calorie content to 146, the fat to 4 grams and the cholesterol to 0.

Plantain Pie - I

3	plantains (hard-ripe)
1/2	cup tomato sauce
1/3	cup margarine
1/2	pound ground beef
1/4	cup green pepper minced
1/4	cup minced onion
	pepper to taste
2	eggs hard-boiled (chopped)
1 1/2	teaspoons salt
2	tablespoons raisins
12	olives

Boil and mash plantains. Fry ground beef lightly in margarine. Add salt, onions, green pepper, hard boiled eggs, olives, raisins and tomato sauce. Cook for five minutes. Grease a glass baking dish, put in half the mashed plantains; then put in the meat mixture and cover with remaining half of plantain. Place baking dish in a pan of water one inch deep. Bake in oven for 30 minutes at 400°F. A good luncheon dish. Makes 8 servings.

Each serving provides:

Calorie	Fat (g)	Protein (g)	Carbohydrates (g)	Sodium (mg)	Cholesterol (mg)
314	15	86	40	723	92.2

To decrease the amount of fat, fry lean ground beef using a light coating of nonstick vegetable spray. Decreasing the amount of olives and salt will lower the sodium content.

Tostones

Peel green plantains, cut them diagonally in 1-inch slices. Cover with salt water for 5 minutes. Drain. Fry until soft then remove and place on a tostonera. Press slices flat. Return to pan. Continue frying until golden brown in color. Serve hot, as a vegetable.

Each 1/4 of whole plantain provides:

Calorie	Fat (g)	Protein (g)	Carbohydrates (g)	Sodium (mg)	Cholesterol (mg)
114	7	.6	14	247	0

Use a monounsaturated oil (e.g. light olive or canola) to fry the tostones.

Banana and Sweet Potato Casserole

4	sweet potatoes
2	teaspoons salt
4	ounces butter
4	bananas
1/2	cup sugar
	juice of 2 oranges
1/2	teaspoon ground ginger

Cook potatoes in boiling water until just tender. Drain and allow to cool. Peel and cut into quarter inch thick slices. Butter a deep casserole dish and fill with alternating layers of potatoes and bananas. Combine orange juice, sugar, ginger and salt. Pour over layers. Dot with butter. Bake at 300°F for about 30 minutes. Serve hot with meat or poultry. Serves 6 - 8.

Calorie	Fat (g)	Protein (g)	Carbohydrates (g)	Sodium (mg)	Cholesterol (mg)
216	12	1	28	612	41

This analysis is done assuming that the recipe will serve 8. Substitute butter with a low-fat margarine and reduce the fat to 6 grams and calories to 163 per serving. Use only 1 teaspoon of salt and lower sodium to 387 mg.

Banana Fritters

3	cups mashed, overripe bananas
1/4	cup sugar
1/2	teaspoon salt
1	teaspoon vanilla essence
1	teaspoon baking powder
1	egg
1	cup white flour
1/2	cup water

Combine ingredients in order. Beat well. Drop into deep fat by spoonfuls. Fry until golden brown. Serves 10.

Banana Pie

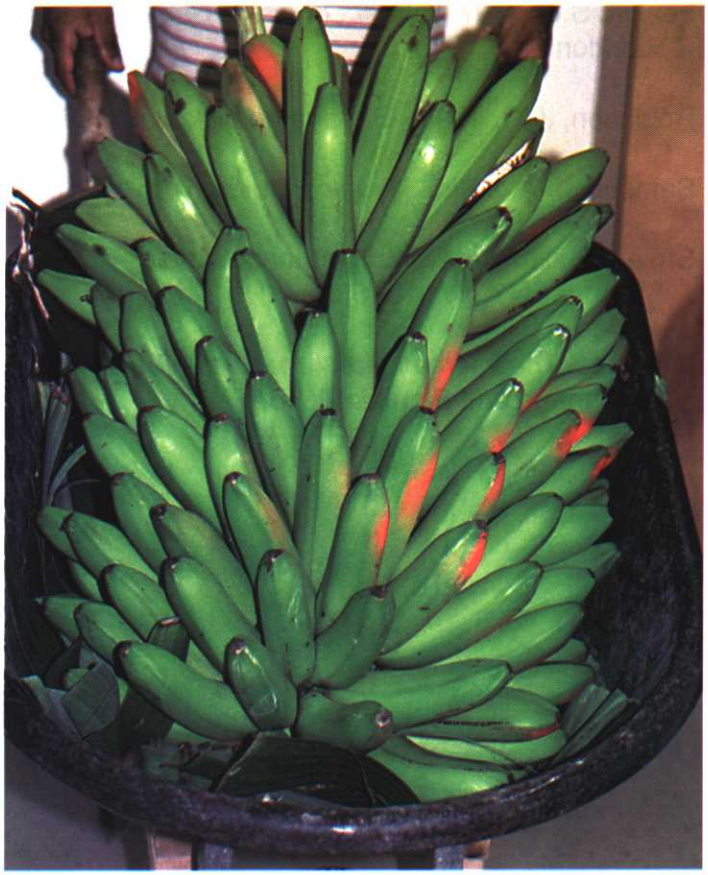
pie crust

3	ripe bananas
2	cups milk
2	eggs
1	teaspoon vanilla whipped cream
2	heaping tablespoons cornstarch
3	heaping tablespoons sugar

Line pie plate with a good crust and bake to a light brown. Cover with a thick layer of sliced ripe bananas. Pour over these a hot custard made as follows:

To 1 3/4 cups boiling milk, add 2 heaping tablespoons of cornstarch or 4 tablespoons flour, dissolved in 1/4 cup cold milk; 2 eggs and 3 heaping tablespoons sugar. Cook in double boiler until thick. Flavor with vanilla.

Place in refrigerator until set. Serve cold topped with whipped cream. Serves 8.



Calorie	Fat (g)	Protein (g)	Carbohydrates (g)	Sodium (mg)	Cholesterol (mg)
254	13	6	30	193	153

(with 3 bananas, 1 cup whipped cream and whole milk)

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A recently emerged inflorescence (unfolding of blossoms) with flower parts on fruits.

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