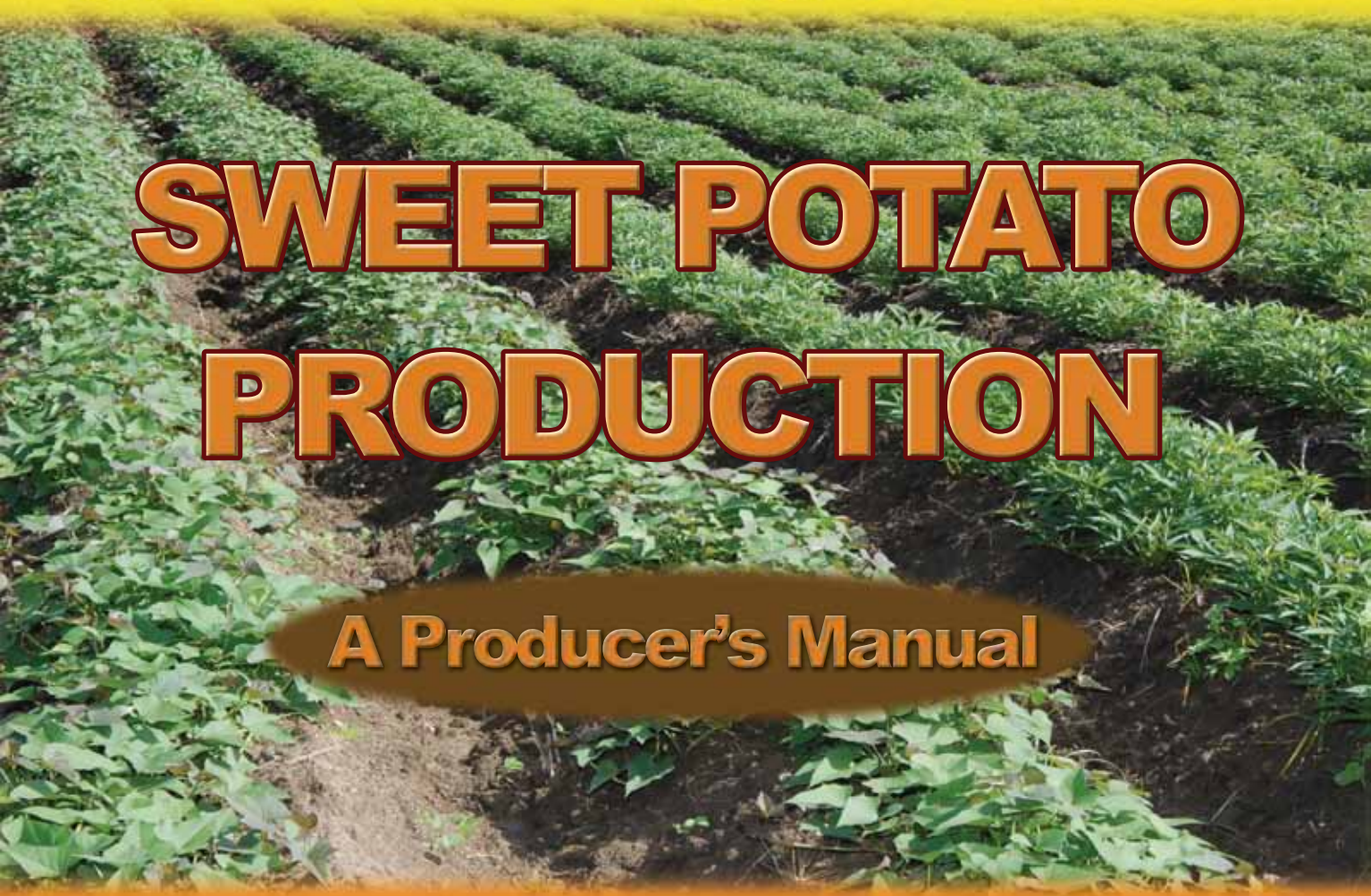
MINISTRY OF FOOD PRODUCTION LAND AND MARINE AFFAIRS



SWEET POTATO PRODUCTION

A Producer's Manual

Extension, Training and Information Services Division

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TRINIDAD AND TOBAGO

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Sweet Potato Production Manual

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Table of Contents

	Page
Introduction	1
Health Benefits of Sweet Potato	1
Characteristics of Sweet Potato	1
Ten Steps to Produce A Succcessful Sweet Potato Crop	2
1. Land Preparation	2
2. Choosing a Variety	4
3. Selection and Preparation of Planting Material	5
4. Planting	6
5. Water/Irrigation	7
6. Weed Control	8
7. Fertilizer Application	8
8. Pest and Disease Management	9
9. Harvesting	12
10. Postharvest Handling of Sweet Potato	13
Conclusion	13
Estimated Cost of Production/Hectare (2011)	15

Introduction

This manual is designed to provide guidelines to potential producers of sweet potato. While this manual may be used by home owners, it provides information for commercial producers. The manual covers ten steps required for successfully producing a sweet potato crop: from land preparation to postharvest handling practices. A brief description is given on each of the following steps:

1. Land Preparation
2. Choosing a Variety
3. Selection and Preparation of Planting Material
4. Planting Stem Cuttings (Slips)
5. Water/ Irrigation
6. Weed Control
7. Fertilizer Application
8. Pest and Disease Management
9. Harvesting
10. Postharvest Handling Practices

Health Benefits of Sweet Potato

Sweet potato is rich in Vitamin A (beta-carotene), Vitamin C and Vitamin B6. Both Vitamins A and C are powerful antioxidants that work in the body to remove free radicals which can damage healthy cells.

Beta-carotene is converted in the intestine into Vitamin A, which is essential for normal vision as well as proper bone growth, healthy skin and protection of the mucous membranes of the digestive, repiratory and urinary tracts against infection.

Darker varieties of sweet potatoes have a higher concentration of beta-carotene.

Characteristics of Sweet Potato

• ***Roots*** **-** arise from the stem nodes of the sweet potato.

There are three types of roots:

1. ***Thick*** roots for absorption and anchorage
2. ***Thin*** roots for absorption
3. ***Tuberous*** roots which develop into sweet potato tubers

[Tuberous roots start developing 5 - 6 weeks after the stem cuttings (slips) are planted]

• ***Tubers*** **-** vary in size and shape depending on the variety and soil type. The surface or skin colour ranges from white, yellow, red, purple or brown.

• ***Flesh*** **-** the flesh colour varies from white, yellow, orange, red or purple depending on the variety.

TEN STEPS TO PRODUCE A SUCCESSFUL SWEET POTATO CROP

1. Land Preparation

The soil in which sweet potato is grown directly influences the shape and appearance of the tubers. ***A well-drained, moderately deep, fine sandy loam soil is required to produce good quality sweet potatoes.***

When sweet potatoes are grown on heavier soils, they tend to crack because of excessive moisture or lack of adequate moisture. Areas prone to flooding should be avoided as excess moisture can also lead to root and tuber rot.

The soil should be friable enough to permit unimpeded root enlargement and be adquately aerated to provide oxygen to the developing roots and tubers.

Generally, the soils in Trinidad are acidic in nature. As a result;

- » They are low in calcium.
- » They have a high concentration of aluminum, iron and manganese which can be toxic to plants.
- » Beneficial bacteria are unable to rapidly decompose organic matter.

Tip: A soil test is recommended before planting.

To ensure optimal soil conditions, the soil should be tested before planting. **Soil testing is a free service** provided by the Ministry of Food Production, Land and Marine Affairs and must be carried out every three years once the land is under cultivation, to assess the pH of the soil. The soil pH measures the acidity (sourness) or alkalinity (sweetness) of the soil.

- Sweet potato is tolerant to soil pH as low as 4.5, however a range 5.6 - 6.5 is best for plant growth.
- For best results use 2 - 4 tonnes / ha of limestone. Limestone brings the pH closer to pH 7 (neutral) and also adds calcium to the soil.

Prepare the land by carrying out the following:

- Clear the land of all vegetation
- Deep plough
- Rotavate and form ridges

Ridges are formed 30 - 60 cm (1 - 2ft) high and 60 - 90 cm (2ft - 3ft) apart.

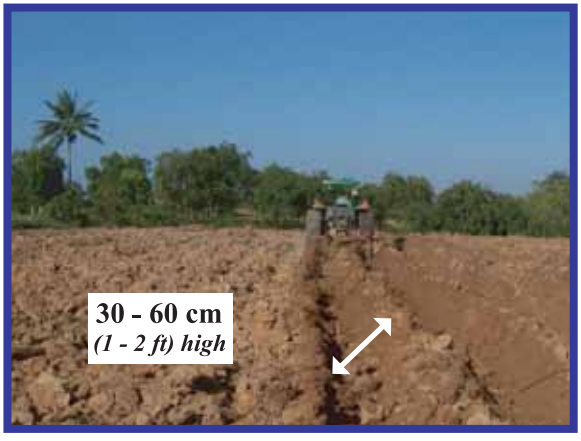

Figure 1: Height of the ridges

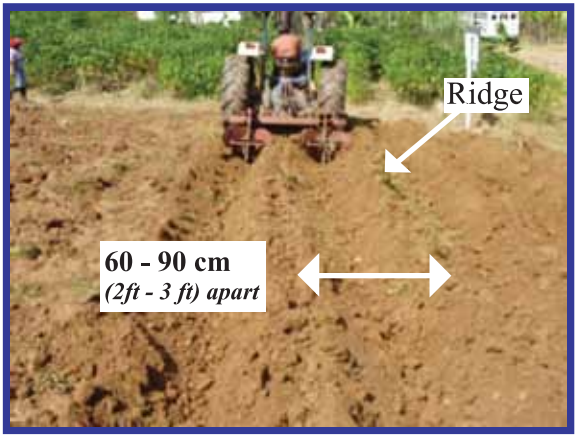

Figure 2: Ridges being formed

2. Choosing a Variety

Growers select varieties which are high-yielding, have good shelf life and are resistant to pests and diseases.

The Research Division of the Ministry of Food Production, Land and Marine Affairs has approximately fifty-five (55) varieties in their collection at present.

These varieties vary in shape, size and colour.

In Trinidad, the most popular variety grown by farmers is Chicken Foot. It can be distinguished from the other varieties by the shape of its leaf which is shaped like a chicken foot.

The recommended variety is Chicken Foot (yellow or white flesh) because of its characteristics:

- Chicken Foot produces relatively good yields
- It is able to withstand environmental conditions
- It is tolerant to certain pests and diseases
- Most accepted by the consumers

Figure 3: Chicken Foot Variety

Table 1: Characteristics of the Chicken Foot Variety

Variety	Average Weight of Tuber	Predominant Skin Colour	Predominant Flesh Colour	Secondary Flesh Colour (when boiled)	Latex Production	Oxidation (turning black after peeling)
Chicken Foot	820 gm	Purple-Red	Yellow	Orange	Low	Little

3. Selection and Preparation of Planting Material

Sweet potatoes may be propagated from:

- Seed (small tubers)
- Slips (vine cuttings)

Select slips from plants which are healthy, vigorous and free from pests and diseases. Approximately 35,000 - 40,000 slips are needed to plant one (1) hectare (2.3 acres) using an average of 16,000 slips per acre.

Figure 4: Healthy plant

Preparation of Planting Material

Cut slips 30 - 45 cm (12 - 18 inches) long. Use only the tip since it is the most actively growing part of the plant.

Soak the entire slip in a systemic insecticide solution for 15 - 20 minutes before planting.

Figure 5: Recommended length of the slips

4. Planting

Plant each prepared slip 15 cm (6 inches) deep so that as many nodes as possible are covered by the soil.

The slips are planted 30 cm (1 foot) apart on the ridge.

Figure 6: Slips planted 30 cm apart

Figure 7: A sweet potato field 5 weeks after planting

Note: For added protection, a soil insecticide can be applied to the soil before planting the slips to control pests such as weevils and flea beetle larvae.

5. Water/Irrigation

To ensure adequate moisture in the soil, apply water immediately after planting. Fields should be irrigated as often as necessary, so that the soil does not dry out.

Watering is critical for the first 5 - 6 weeks after planting to encourage tuberous root development.

After this period, the plants would be better able to withstand drier conditions.

Soils which crust easily are low in oxygen and this results in poor tuber set and low yields. Too much water lowers soil oxygen thereby causing tubers to rot. Soil moisture fluctuations usually result in cracking of tubers.

Note: In the absence of rain, irrigate the field once a week.

Figure 8: Irrigation system

Physiological Disorders

- **Cracking:**

This is usually caused by inadequate growing conditions, especially uneven watering.

- **Sores:**

This occurs in waterlogged soils, where oxygen levels are low. Roots are very active and when they are oxygen-starved, the tissues break down causing sores.

6. Weed Control

Weed control is critical especially during the first six weeks after planting, since it is at this time tuber initiation takes place. However, the leaf mass of the sweet potato plant increases with time and eventually, weeds are naturally suppressed.

Manually remove weeds using a hoe or cutlass or spot-spray using a herbicide.

Figure 9: Weed-free sweet potato field

As an alternative to weed control during crop growth, apply a **pre-emergent herbicide before planting the slips.** This approach suppresses the weed growth, giving the slips enough time to establish.

Note: Weeds harbour pests and diseases which can affect the growing crop.

7. Fertilizer Application

Commercial Fertilizers are of two (2) types:

- **Simple Fertilizer:** only one nutrient is provided. **e.g. Urea, Triple Super Phosphate.**
- **Complete Fertilizer:** many nutrients are provided. **e.g. N.P.K. fertilizers.**

Ideally, a soil test is the best guide for determining the types and amounts of fertilizers to be used.

Sweet potato needs moderate amounts of nitrogen and phosphorous but significant amounts of potassium. Low potassium reduces yields and increases the number of long slender malformed roots.

In the absence of a soil test, the following is recommended:

Table 2: Recommended Fertilizer Programme

Stage of Growth	Amount of Fertilizer	Example of Fertilizer
3 weeks after planting - apply a complete fertilizer high in phosphorous.	**57 g** (2oz) per plant	**12:24:12** (91 kg/ha) or (200 lb/acre)
5 weeks after the first fertilizer application - apply a complete fertilizer high in potassium.	**85 g** (3 oz) per plant	**16:8:24** (91 kg/ha) or (200 lb/acre)

A foliar fertilizer can be applied every 10 - 14 days to encourage vegetative growth.

8. Pest and Disease Management

Table 3: Major Pests of Sweet Potato

PESTS	SIGNS and SYMPTOMS	CONTROL / MANAGEMENT
West Indian Sweet Potato Weevil *Euscepes postfasciatus* **Figure 11: Weevil Damage** The **adult weevil** is an insect found in the soil. The **female** lays eggs singly and directly into the stem or roots. Once the **larva emerges** from the egg, it bores deep into the stem and root. ***The larva is white in colour with a brown head.*** **Note: This pest thrives well in the dry season.**	**Brown tunnels** are seen when the stems or tubers are cut.	1. Use slips (stem tips) from healthy plants. ***This is recommended since the larva is not present at the tips.*** 2. Soak the entire slip in an insecticidal solution for 20 minutes before planting. 3. Apply a **Systemic Insecticide** one month after planting and a second application two months later. 4. Practice good field sanitation (remove weeds and diseased plants from the field.) 5. Practice crop rotation to prevent the build-up of pests in the field. 6. Monitor and observe the crop regularly.

Table 3: Major Pests of Sweet Potato *(cont'd)*

PESTS	SIGNS and SYMPTOMS	CONTROL / MANAGEMENT
Sweet Potato Borer *Megastes grandalis* **Figure 12: Borer Damage** The **adults** are active at night. **Eggs** are deposited singly on the leaves and petioles. Once the **larva** emerges from the egg, it bores into the stems and feeds internally. **Figure 13:** **Pupal Stage of the borer in the tuber**	***Larvae are cream to light purple in colour.*** ***Large brown tunnels*** can be seen when the tubers are cut. • Affected plants show poor overall growth. • The foilage of some affected plants appears yellow and wilted.	1. Use slips (stem tips) from healthy plants. ***This is recommended since the larva is not present at the tips.*** 2. Soak the entire slip in an insecticidal solution for 20 minutes before planting. 3. Apply a **Systemic Insecticide** one month after planting and a second application two months later. 4. Practice good field sanitation (remove weeds, diseased plants or containers from the field) 5. Practice crop rotation to prevent the build-up of pests in the field. 6. Monitor and observe the crop regularly.

Table 4: Diseases of Sweet Potato

DISEASE	SIGNS and SYMPTOMS	CONTROL / MANAGEMENT
Black Rot Fungi: *Ceratocystis spp* **Note: This disease usually appears when the field has poor drainage.**	• Small, circular, slightly sunken, dark brown spots are seen on the tubers, mainly during storage. • Spots enlarge and appear greenish black to black when wet and greyish black when dry.	1. Avoid planting in waterlogged or flood-prone areas. This condition encourages the fungus to multiply. 2. Practice good field sanitation (remove weeds, diseased plants and containers from the field). 3. Practice crop rotation to prevent the build-up of diseases in the field.
Soft Rot Fungi: *Rhizopus spp* **Note: This is a post harvest problem.**	• Once the tuber is bruised or wounded during harvesting and or handling, water-soaked lesions may appear. • Lesions become covered by a web-like fungus. • Inner tissues are rotted, soft, slimy and watery. However, the skin of the tuber remains intact.	1. Avoid damaging tubers when harvesting. 2. Avoid planting in waterlogged or flood-prone areas. This condition encourages the fungus to multiply. 3. Practice good field sanitation (remove weeds, diseased plants and containers from the field). 4. Practice crop rotation to prevent the build-up of diseases in the field.

9. Harvesting

Most sweet potato varieties are ready for harvesting four to five months after planting. The size of the tubers normally indicates maturity.

Maturity can be assessed by randomly cutting a tuber and observing the latex. Latex oozing from immature tubers ***quickly*** turns black. The latex in mature tubers is creamy white and takes a longer period of time to turn black.

Harvesting can be done by two (2) methods:

- **Manually -** The soil around the root area is loosened using a fork, taking care not to damage the tubers. The base of the vines is then held and pulled. The tubers are then collected and cleaned.
- **Mechanically -** The vines are firstly removed using a cutlass and then a modified banker is used to uproot the tubers.

Figure 14: Manual harvesting of sweet potato

Figure 15: Machanical harvesting of sweet potato

Figure 16: Tubers after harvester passes

Note:

» **Do not wash tubers,** since moisture can reduce the shelf life of the tubers.
Use a soft dry cloth to remove the soil from the tuber.

» Good quality potatoes should have uniform shape and size and should be smooth and firm.

» Harvested tubers must not remain in the field in heaps where they can be scorched by the sun.

» **Estimated Yield** = 15,680 kg / hectare (15,000 lbs / acre).

10. Postharvest Handling of Sweet Potato

Moist sweet potatoes should be left in a shaded area to air dry. Do not use feed bags for transporting tubers since they cause skin abrasions, moisture loss and heat build-up by the respiring tubers.

Figure 17: Bruised tubers in a feed bag

Harvested tubers should be transported in special harvesting crates made from plastic with adequate vents on the sides and bottom to facilitate good air circulation.

Note: Once tubers are harvested, cleaned and dried they are ready for sale.

Figure 18: Plastic Harvesting Crates

Conclusion

In recent times the tuber has become one of the most popular root crops locally, regionally and internationally. This root crop maintains a relatively stable price on the market and is in high demand for processing.

Processed products include **Sweet Potato:**

- Fries
- Logs
- Soup Packs

Once these ten (10) steps outlined in this manual are followed, good quality sweet potato tubers can be harvested.

For further information contact:

- **Ministry of Food Production, Land and Marine Affairs**
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  Amazon Road, Wallerfield
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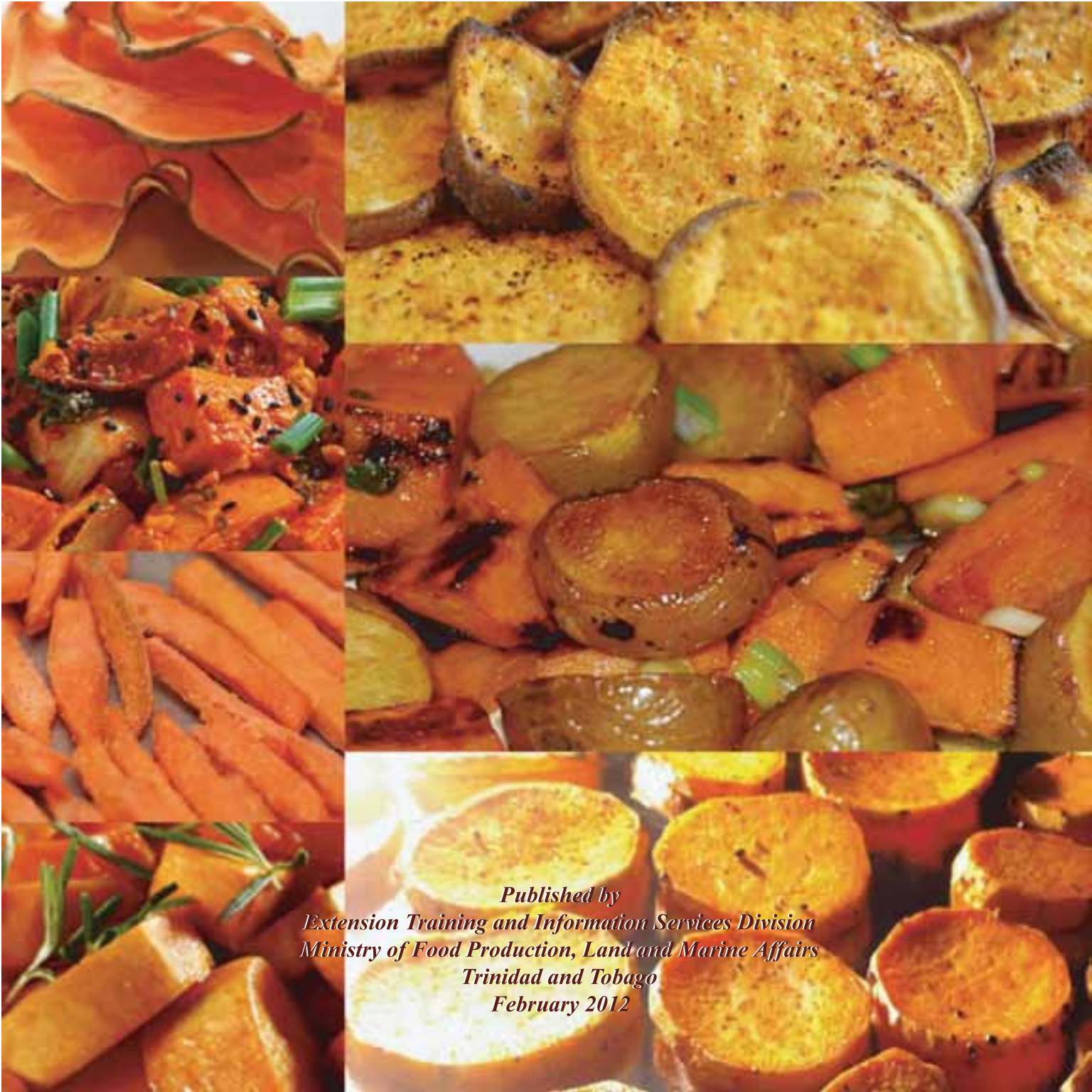
  Fax: 644-2882
  Email:narivamayaro@tstt.net.tt

Table 5: Estimated Cost of Production / Hectare (2011)

Activity	Number of Units	Unit	Unit Cost $	Total Cost $
Land Preparation				
• Brush Cut	1	ha	1250.00	1250.00
• Plough	1	ha	2000.00	2000.00
• Rotovate / Bank Formation	1	ha	2000.00	2000.00
Planting				
• Slips	40, 000	each	0.25	10,000
• Labour	20	man days	200.00	4000.00
Fertilizer				
• High Phosphate	91	kg	15.00	1365.00
• High Potassium	91	kg	18.00	1638.00
• Labour	10	man days	200.00	2000.00
Pest and Disease Control				
• Pesticide	5	litre	350.00	1750.00
• Labour	10	man days	200.00	2000.00
Weed Control				
• Contact Weedicide	3	litre	150.00	450.00
• Pre-emergent	3	litre	200.00	600.00
• Labour	10	man days	200.00	2000.00
Harvesting				
• Labour	60	man days	200.00	12000.00
Total				**43,053.00**

Note: The prices mentioned above may vary based on the location.

NOTES



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