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Ministry of Agriculture, Land & Fisheries

Extension Training and Information Services Division

Technical Bulletin

Cassava Production

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Cassava (Manihot esculenta) belongs to the family Euphorbiaceae and is one of the popular root crops consumed in the Caribbean.

The tubers contain protein, fat, carbohydrate, calcium, phosphorus, iron, vitamins B and C and starch. The leaves are a good source of vitamins A, B1 and C, calcium and iron. The cassava leaves also contain 8 -10% protein.

**Did you know?**
**Cassava is good for your digestive health.**
The tuber contains insoluble fibre which is not soluble in water. Fibres of this type serve to facilitate bowel movement, and are able to absorb and remove toxins from the intestine.

**Land Preparation**
Cassava can be grown on many soil types, but a sandy clay loam or sandy loam soil will encourage better tuber shape and size. Avoid planting in flood prone areas.

*This crop has a high demand for potash. Excessively fertile soils will, however, result in high stem and leaf production with little or no tuber formation.*

The cassava crop grows well at a pH range of 4.5 - 6.5.

A soil test is recommended to determine the soil pH and the amount of limestone and fertiliser needed for optimum crop growth.

**The following land preparation practices are recommended:**

- Clear the area of all vegetation, then plough.
  - On hilly areas, ensure ploughing is done along the contours to minimise soil erosion.
- Broadcast limestone based on the soil test results.
- Rotavate and make ridges (banks) 60 - 90 cm (2 - 3 ft) high and 60 - 90 cm (2 - 3 ft) apart (Figure 1).
- Apply a pre-emergent weedicide to the soil, according to the manufacturer’s recommendation, before planting the crop.
Note: No manure is needed, since manure is high in nitrogen. High nitrogen encourages the plant to produce too many leaves and little or no tubers.

Did you know?
Cassava has a level of hydrocyanic acid (HCN) in the peel and tissues. Hydrocyanic acid is a highly poisonous acidic solution of hydrogen cyanide in water. If consumed in its concentrated state, death can occur.

Types
Cassava is divided into two (2) types based on the hydrocyanic acid (HCN) content.

- **Sweet Types** - the HCN is confined mainly to the outer skin layers of the tuber. Once the tuber is peeled, the cassava is safe to consume.

- **Bitter Types** - the HCN is widely distributed in the outer skin layer and also in the edible flesh of the tuber. These types high in HCN are used for animal feeds, since the chipping and drying processes reduce the HCN content to an acceptable level.

Note: All varieties grown in Trinidad and Tobago for the fresh market are the sweet types and are safe for human consumption.

Varieties in Trinidad and Tobago
There are more than forty (40) varieties of cassava in a collection at the Research Division, Centeno. Some are local varieties, for example, Maracas Black Stick, Butter Stick and Blue Stick. Others were introduced varieties, for example, M Col 22, CIAT Hybrid, CMC 40 and M.Mex.

The recommended variety for production at this time is M.Mex. This variety is characterised by high yields, pests and disease tolerance and good cooking quality.
Selection of Planting Material
Cassava is propagated by stem cuttings commonly called “sticks”.

Select sticks from plants which are 8 - 15 months old, semi-hard and free from pests and diseases. Younger planting material tends to be too soft and susceptible to drying out, while older material do not have sufficient food reserves necessary for development of roots and shoots.

Preparation of Planting Material
Cut the middle portion of the branches into pieces 30 cm (1ft) long (Figure 2). Use a clean sharp cutlass to cut the top of the sticks flat and the lower end at an angle. Soak the prepared sticks in a fungicide and insecticide solution for 10 - 15 minutes before planting.

Note: Always use protective gear when handling agricultural chemicals.

Planting
Cassava sticks should be planted 90 cm (3ft) apart on the ridge at a 45° angle leaving 2 - 3 nodes above ground (Figure 3). Planting at an angle makes it easier for harvesting by hand and prevents the tubers from breaking while harvesting.

Figure 2: Cassava stick ready to be planted

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In recent times, with the introduction of the mechanical cassava planter (machine used to plant cassava sticks), the recommendation is to plant cassava flat (horizontal). The mechanical harvester is then used to remove the tubers from the soil.

**Irrigation**
Water is needed to keep the soil moist throughout the life of the crop. Cassava is considered to be a drought tolerant crop. Too much water and lack of proper drainage cause tubers to rot. *Tuber initiation* (tuberous roots start to form) occurs at 3 - 4 weeks after the sticks are planted. Soil moisture is critical at this time to encourage tuber initiation and development.

**Weed Control**
Weeds compete with the growing plants for moisture, nutrients and sunlight. They also harbour pests and diseases.

*Remember a pre-emergent herbicide should be applied to the soil before planting to suppress weed growth.*

Remove weeds manually or control with contact herbicides, when necessary, using a shield to prevent chemical drift onto the growing crop. Selective herbicides can also be utilised during crop growth.

**Fertiliser Application**
Fertilisers add nutrients to the soil. This encourages the plant to produce higher yields. *Use the results of the soil test to determine the types and amounts of fertilisers to be used for growing the crop.*

If a soil test is not performed, three (3) fertiliser applications are generally recommended (Table1).
Table 1: Recommended Fertiliser Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Amount of Fertiliser</th>
<th>Type of Fertiliser</th>
</tr>
</thead>
<tbody>
<tr>
<td>At planting or two-three (2 - 3) weeks after planting the stick.</td>
<td>57 - 85 grams (2 - 3 oz.) per plant. Approximately 91 kg/hectare (200 lbs/acre).</td>
<td>Apply N.P.K. fertiliser high in phosphorus, for example 12:24:12, to encourage the formation of tuberous roots.</td>
</tr>
<tr>
<td>Twelve (12) weeks after planting the sticks.</td>
<td>85 - 113 grams (3 - 4 oz.) per plant. Approximately 136 kg/hectare (300 lbs/acre)</td>
<td>Apply N.P.K. fertiliser high in potassium, for example 16:8:24, for the tubers to bulk up (gain weight) and have good cooking quality.</td>
</tr>
<tr>
<td>Twenty-four (24) weeks after planting the sticks.</td>
<td>85 - 113 grams (3 - 4 oz.) per plant. Approximately 136 kg/hectare (300 lbs/acre)</td>
<td>Apply N.P.K. fertiliser high in potassium, for example 16:8:24, for the tubers to bulk up (gain weight) and have good cooking quality.</td>
</tr>
</tbody>
</table>

At twelve (12) and twenty-four (24) weeks after planting, place the recommended fertiliser between the plants, along the ridge.

- Fertilisers must be placed 5 - 8 cm (2 - 3 inches) away from the stem cutting to prevent burning.
- Excessive nitrogen fertilisers can increase the HCN content, while potassium fertilisers can reduce the HCN content in the tubers.

Pest Management
The major pests of cassava include thrips, mites, shoot fly and chinch bugs.

Thrips and Mites
These pests are very tiny and difficult to see with the naked eye. They suck the sap from the young leaves causing them to become crinkled, distorted and discoloured (mottling) (Figure 4). This results in low tuber yields. These pests are more prevalent during the dry periods. However, the population decreases when rainfall increases.

Figure 4: Symptoms of damage caused by thrips and mites on cassava plant
Cassava Shoot Fly
The larva of this pest feeds on the tips of the plant causing damage. Only the apical stem tips are seen in affected plants (Figure 5). The reduction in the number of green leaves results in low tuber yields.

![Figure 5: Symptoms of cassava shoot fly damage on cassava plant](image)

Management of Thrips, Mites and Cassava Shoot Flies
1. Apply a systemic insecticide every 2 - 3 months or as required, depending on the level of damage observed.
2. Practice good field sanitation and crop rotation where possible.

Cinch Bug
This pest lives in the soil and attacks (punctures) the young developing tubers, making them unmarketable. The feeding action of the pest causes black spots to appear on the flesh but this is only seen when the tuber is peeled.

Management
1. Drench the soil with a soil acting insecticide before planting the sticks.
2. Practice good field sanitation and crop rotation where possible.

Note: Crotalaria plants can be used as trap plants for this pest.

Disease Management
Diseases of cassava are not widely distributed. However, there have been cases of cassava bacterial blight (Xanthomonas campestris).
**Cassava Bacterial Blight**

This is a bacterial disease which causes rapid wilting and death of the plant. Water-soaked spots are seen on the leaves and the stems of the plant. This bacterium is spread by using diseased planting material or contaminated soil.

**Management**

1. Choose disease-free planting material, **since there is no chemical control**.
2. Practice good field sanitation and crop rotation where possible.
3. Remove all affected plants and burn them.

**Other Problems**

- **Vascular streaking** is the first symptom of spoilage of the tubers. This occurs when freshly damaged tubers are exposed to the air, causing a discolouration to the flesh.
- **Soft rot** occurs when damaged tubers become infected by bacteria and other micro-organisms.

**Harvesting**

Cassava matures and is ready for harvesting between 9 - 10 months after planting.

Cut back the cassava stems at 30 cm (1ft) from the soil level. Then hold the stem gently, shake and pull to uproot the tubers. In soils that are compacted, use a fork to break the ridges before removing the tubers. Ensure the tubers do not break while harvesting.

Remove the excess soil from the harvested tubers and carefully pack in crates for transport. Crates with harvested tubers must be stored in a cool place.

Tubers should be prepared and ready for the market within 3 - 4 hours of harvesting. Failure to do so will result in greater post harvest losses.

**Estimated Yields: 13,636 kg/ha (30,000 lbs/acre)**

**Note:**

- **Soak** tubers in water and then wash under running water. A soft bristle brush will help remove soil debris.
- Tubers can also be sanitised by immersing them in a solution made from household bleach mixed at a rate of 2 tablespoon of bleach to 1 gallon of water. Soak for 10 minutes and allow to air dry.
- **Stem cutting (sticks)** must be selected at the harvesting stage for future planting.
Did you know?
Damaged tubers can be stored.

How?
Tubers can be peeled, washed and cut into chunks, then placed in low density polythene bags (plastic bags), sealed and frozen. Use as needed.

Precautions to minimise cassava tuber spoilage

- Harvest at the correct time.

- Ensure that tubers are not damaged during harvesting and post harvest operations.

- Ensure a moist environment around the tubers (place tubers in the refrigerator).

- Prevent exposure of the tubers to air for long periods.

- Clean and sanitise the tubers soon after harvesting to remove surface pathogens.

Cost of Production
When preparing a cost of production for a crop, consideration must be given to all the activities in growing the crop and the cost of the inputs. Some of these activities include land preparation, planting and fertilising.

Labour cost for weed control, pest management and harvesting must also be considered (Table 2).
### Table 2: Estimated Cost of Production/Hectare (2015)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Unit</th>
<th>Number of Units</th>
<th>Unit Cost $</th>
<th>Total Cost $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Preparation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brush Cut</td>
<td>ha</td>
<td>1</td>
<td>1,350</td>
<td>1,350</td>
</tr>
<tr>
<td>Plough</td>
<td>ha</td>
<td>1</td>
<td>1,800</td>
<td>1,800</td>
</tr>
<tr>
<td>Rotavate/Bank Formation</td>
<td>ha</td>
<td>1</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticks</td>
<td>each</td>
<td>10 200</td>
<td>0.25</td>
<td>2,550</td>
</tr>
<tr>
<td>Labour</td>
<td>man days</td>
<td>15</td>
<td>200</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Fertiliser</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Phosphate</td>
<td>kg</td>
<td>100</td>
<td>15</td>
<td>1,500</td>
</tr>
<tr>
<td>High Potassium</td>
<td>kg</td>
<td>200</td>
<td>18</td>
<td>3,600</td>
</tr>
<tr>
<td>Labour</td>
<td>man days</td>
<td>10</td>
<td>200</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Pests and Disease Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>litre</td>
<td>3</td>
<td>750</td>
<td>2,250</td>
</tr>
<tr>
<td>Labour</td>
<td>man days</td>
<td>10</td>
<td>200</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Weed Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Weedicide</td>
<td>litre</td>
<td>3</td>
<td>150</td>
<td>450</td>
</tr>
<tr>
<td>Pre-emergent</td>
<td>litre</td>
<td>3</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>Labour</td>
<td>man days</td>
<td>10</td>
<td>200</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Harvesting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td>man days</td>
<td>60</td>
<td>200</td>
<td>12,000</td>
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<tr>
<td><strong>Total Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
<td>37,100</td>
</tr>
<tr>
<td><strong>Expected Yields</strong></td>
<td>kg</td>
<td>13,636</td>
<td>4.10</td>
<td>55,907.60</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td></td>
<td></td>
<td></td>
<td>18,807.60</td>
</tr>
</tbody>
</table>

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