Papaya Manual
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July 2008

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Trinidad and Tobago
www.agriculture.gov.tt
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INTRODUCTION

The papaya or pawpaw (*Carica papaya*) is one of the most popular fruits for consumers and producers alike. It can be very profitable and rewarding for a farmer even on a small parcel of land (0.2 ha). There are a number of processing opportunities for the fruit. Of course there is always the potential to generate foreign exchange through export. Consumers also benefit from the high nutritional content of the fruit.

Due to the high demand for papaya year-round, there is constant need for existing farmers to increase production. The opportunity exists for more farmers to engage in the business of producing papaya, or even to utilize the fruits in agro processing. Whichever way you decide, this manual would serve as a guide to the production of good quality papaya.

Terrance Harewood  
President of the Papaya Association of Trinidad and Tobago

The papaya industry is gaining importance since farmers are realizing more about the overall benefits of the papaya as well as the potential for producing papaya as a business.

The Extension Training and Information Services Division of the Ministry of Agriculture, Land and Marine Resources continues to share information and guide interested persons on the best practices to produce papaya.
THE PAPAYA PLANT

Here are some important facts about the papaya plant:

- Papaya is a herbaceous shrub and not a true tree. This makes it susceptible to toppling by high winds.

- Most commercial varieties grown locally begin to flower approximately 2.5 months after transplanting.

- Fruit set occurs approximately 3.5 months after transplanting.

- Fruit maturity occurs 8.5 months from seed germination or approximately 4 months from the flower bud stage.

- Within some varieties, the sex of the flowers determines shape of the fruit; e.g. female flowers produce more rounded or oval-shaped fruits while *hermaphroditic flowers produce more elongated or pear-shaped fruits.

Variation in shapes and sizes of the fruit

- Fruit sizes vary:
  Lengths may range from 5 cm (2 in) to 50 cm (20 in).
  Weights may vary from 113 g (4 oz) to more than 1 kg (2.2 lb).

* A Hermaphroditic flower has both male and female parts.
CHARACTERISTICS OF THE MAIN VARIETIES

There are many varieties of papaya grown in Trinidad and Tobago, but the more popular ones used in commercial production are the Tainung No. 1, Tainung No. 2 and Red Lady.

Tainung No. 1 and Tainung No. 2 are produced for the fresh fruit market and Red Lady is used mainly for processing. To a lesser extent Solo Sunrise is cultivated but mainly for the export market.

Tainung No. 1

This is used in the fresh fruit market and also for processing.

It is very similar to the Tainung No. 2 but has a tougher skin.

Tainung No. 2

This is the preferred variety in production.

It is a medium oblong fruit weighing on average 1.1 kg (2.5 lb).

This variety is an early bearer; maturing 6 months after transplanting.

Used mainly in the local fresh fruit market.

The commercial life of the papaya crop in the Caribbean ranges from 1.5 - 3 years

The extra regional market prefers a small pear shaped fruit weighing approximately 450 g (1lb)
**Red Lady**

A large oval-shaped fruit on average weighing 1.8 kg (4lb).

It is used mainly for processing.

Matures in 7 - 9 months after transplanting.

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**Solo Sunrise**

A small round or pear-shaped fruit.

It weighs on average about 0.4 kg (1lb).

It is grown mainly for the export market and/or for hotels and restaurants.

Matures in 6 - 8 months after transplanting.
CULTIVATING YOUR PAPAYA CROP

1. Seedling Production

- Commercial production is done from hybrid seedlings.

- Usually, you can purchase seeds at your agro-shops and set them yourself or take them to a commercial nursery.

- Papaya seeds germinate in 8 -15 days.

- A standard pack has about 700 seeds with a germination rate of 90%.

- The seeds should be set in styrofoam cups or preferably seedling trays with large capacity cells. Place cups with seeds under shade. A shade cloth such as Saran Netting can be used. Ensure the cups have 2 - 3 drain holes.

- Use 250 g (8 oz) Styrofoam cups and fill to three quarter with commercial medium (eg. Promix). Sow one seed per cup. One pack of seeds would use 1½ bales of this medium.

- Place cups in a rack made from chain-link wire mesh or BRC wire and place above the ground [at least 15 cm (6 in)]. This prevents the roots from becoming damaged.

- Apply a mixture of insecticide and fungicide at a low dose rate to each cup after the first watering. This lowers the risk of pests and diseases.

- The seedlings should be watered minimally daily, taking care not to use excess water especially on cool days.

- Seedlings take about six to eight weeks from setting to transplanting in the field.
2. Some Important Factors Affecting Growth

- The papaya plant prefers fertile soils with good drainage and a pH of approximately 6.5.
- Where possible, avoid heavy clays and saline soils.
- The amount of water available to the plant determines the fruit size and fruit quality.
- In high soil moisture the fruit is larger and develops a watery pulp. There is the risk of fruits being easily damaged especially during transport.
- In dry conditions the fruits are smaller with a hard texture when ripe.
- The plant does not tolerate strong winds, flooding or prolonged dry periods.
- Papaya will grow and produce best on well drained soils. If you are planting in an area previously uncropped, it may not be necessary to plough.
- If however, you are planting in an area after the removal of a previous crop (papaya, or any short crop) then deep plough using a chisel to about 45 cm (18 in). This is necessary to properly break up the compacted soil for adequate aeration. If you need further guidance contact your nearest Extension Office.

4. Field Layout

For good yields and high fruit quality, it is important to orient the beds to allow adequate sunlight and free flow of air through the field to reduce relative humidity.

3. Land Preparation

- The method of land preparation will depend on topography, soil type, size of operation, the equipment and labour available. It may involve brushcutting, ploughing, rotavating and then banking.

pH is a measure of levels of acidity or alkalinity of the soil. Uptake of some nutrients is hindered in very acidic soils (pH less than 5.0)
5. Spacing

- Recommended plant spacing varies between 2 m to 2.5 m (6 to 7.5 ft) between plants and 2.5 m to 3 m (7 ft to 9 ft) between rows.
- The wider spacing accommodates interplanting.

Plant density varies from 1000 to 3000 plants per hectare (400 - 1200 plants per acre). Solo varieties produce undersized fruits at 2000 plants per hectare (800 plants per acre) while Tainung hybrids can produce well at 3000 plants per hectare (1200 plants per acre).

6. Planting your Papaya

- At transplanting slightly cover the seedling plug.
- When using cambered beds, plant seedlings along the middle of the bed.
- Stagger the plants in adjacent rows to capture adequate sunlight.

7. Fertilizer Application

- Apply fertilizer around each plant, using the drip line as a guide for placing the fertilizer.
- Chlorine-free fertilizers should be used since papaya is sensitive to chlorine.
- One week after transplanting, apply 28 g (1 oz) of high phosphate fertilizer eg. 12:24:12 to each plant.

(cont’d on page 10)
PAPAYA

TIMELINE FROM SEEDING TO HARVEST - 1ST CROP

(A two-page spread: pages 8 and 9)

<table>
<thead>
<tr>
<th>NURSERY</th>
<th>GROWTH</th>
<th>FLOWERING &amp; FRUIT SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 - 6</td>
<td>Week 7 - 16</td>
<td>Week 17 - 21</td>
</tr>
</tbody>
</table>
## PAPAYA

**TIMELINE FROM SEEDING TO HARVEST - 1ST CROP**

(A two-page spread: pages 8 and 9)

<table>
<thead>
<tr>
<th>FRUIT MATURITY</th>
<th>1ST HARVEST &amp; HARVESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 22 - 36</td>
<td>week 37 - 72</td>
</tr>
</tbody>
</table>
7. Fertilizer Application (cont’d)

- Thereafter, apply 57 g (2 oz) of a high nitrogen fertilizer e.g. 20:10:10 every two weeks.

- Potassium is needed for flowering and fruit set. At first signs of flowering apply 114 g (4 ozs) of a high potassium fertilizer e.g. 12:12:17+2 per plant. Repeat this application every month.

- Apply foliar fertilizers of trace elements (containing Boron) monthly. These are very important to ensure good quality fruits.

8. Weed Control

- Control weeds early to avoid competition and eliminate chances of them becoming hosts for insect and other pests.

- After transplanting, a weedicide can be used up to 3 months.

- After 3 months, herbicides such as the Glyphosate can be used as long as they do not come in contact with the plant.

9. Irrigation

While water is essential throughout the life of the plant, it is especially important at flowering, fruit set and fruit development. An irrigation system e.g. drip irrigation is recommended during dry periods.

Drip Irrigation In Papaya

In the productive stage, the plant requires a consistent supply of water; an average of 23 litres (5 gals) per plant per week.

Tip:
The papaya plant is very susceptible to 2, 4-D Amine sprays. Avoid them.
PEST AND DISEASE MANAGEMENT

Integrated Pest Management (IPM) is the recommended approach to control pests and diseases. IPM is a combination of cultural, biological and chemical practices to manage pest and disease populations. This approach promotes an environment which is beneficial for the crop and will help farmers increase their production and profitability.

One of the aims of IPM is to reduce pesticide use.

IPM Guidelines

- Assess the problem and determine the cause.
- Choose the appropriate management method.
- Consider cultural and biological methods before chemical control.
- Rotate the pesticides used in control programmes.
- Use chemicals which do not harm beneficial organisms.
- Use environmentally safe pesticides.

Farmer Field School

To produce a healthy crop you must understand your crop environment or agro-ecology. This is the key to successful crop production.

The Farmer Field School has been successful in training farmers to understand IPM practices using Agro Eco System Analysis and Participatory Learning. Simple practices such as crop monitoring and pest and disease identification can help farmers to discover the cause of their problems and make informed decisions.

Participants in a Farmer Field School doing an Agro Ecosystem Analysis

Pesticide Application

- Mist-blowers are recommended for application of pesticides to obtain effective coverage.
- Alternate the pesticides for effective control and to avoid pests developing resistance.

Contact the County Agricultural Office in your area for more information on Farmer Field School
Here are some guidelines to follow for the safe handling of pesticides:

- Only purchase pesticides in labelled containers.
- Choose the right pesticides for the job.
- Buy and use the least toxic pesticide.

When Using Pesticides:

- Carefully follow all instructions on the container.
- Wear protective clothing, mask, and eye protection when spraying.
- Choose a calm, wind-free time of the day to spray.
- Do not spray near children and pets. Keep them away from sprayed areas.
- Follow the restricted time for re-entering an area after a pesticide has been applied.
After Using Pesticides:

- Wash hands and face thoroughly. Wash all clothing used.
- Keep all pesticides locked up, out of sight and reach of children and pets.
- Keep the pesticide stored in its original container - do not transfer a pesticide to a food or drink container.
- Store pesticides away from food, including pet food and livestock feed.
- Dispose of empty pesticide containers and unused pesticides properly.

In Case of Poisoning:

- Contact your Doctor or nearest health centre immediately if a pesticide comes in contact with your skin, is inhaled or swallowed.
- Carry the pesticide container with you if you have to visit a doctor or health facility.

Use Extreme Care Always!
## Some Common Pests and Diseases

<table>
<thead>
<tr>
<th>DISEASES</th>
<th>SYMPTOMS</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUNCHY TOP</strong></td>
<td>• Oil streaks on stems (first sign)</td>
<td>• Weekly inspection</td>
</tr>
<tr>
<td>Spread by an insect: a leafhopper (Empoasca stevensii)</td>
<td>• Yellowing of upper leaves</td>
<td>• Remove and burn affected trees</td>
</tr>
<tr>
<td></td>
<td>• Bunching and stunting of top (crown) leaves</td>
<td>• Maintain weed-free fields</td>
</tr>
<tr>
<td></td>
<td>• Death of top of plant</td>
<td>• Use recommended insecticides to control leaf hopper</td>
</tr>
<tr>
<td><strong>ANTHRACNOSE</strong></td>
<td>• Small round dark spots on ripening portion of the fruit</td>
<td>Apply copper - based and other recommended fungicides</td>
</tr>
<tr>
<td>Caused by fungus (Colletotrichum gloeosporoides)</td>
<td>• As fruit ripens, spots enlarge to form circular, sunken craters</td>
<td>Fungal Spores are spread by wind and water splash</td>
</tr>
<tr>
<td><strong>PAPAYA RING SPOT VIRUS</strong></td>
<td>• Leaves roll upward along the margins</td>
<td>• Spread by mechanical means e.g., unsanitized tools. Ensure tools are properly sanitized</td>
</tr>
<tr>
<td>Caused by a virus</td>
<td>• Affected leaves appear lighter green than healthy leaves.</td>
<td>• Weekly inspection</td>
</tr>
<tr>
<td>Spread by aphids: mainly by the Green Peach Aphid (Myzus persicae)</td>
<td>• Dark-green spots and oily streaks on main stem</td>
<td>• Remove and burn affected trees</td>
</tr>
<tr>
<td></td>
<td>• Yellow spots and yellow rings on mature green fruits</td>
<td>• Maintain weed-free fields</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use recommended insecticides to control aphids</td>
</tr>
<tr>
<td><strong>PESTS</strong></td>
<td><strong>SYMPTOMS</strong></td>
<td><strong>CONTROL</strong></td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>PAPAYA FRUITFLY</strong></td>
<td>• premature yellowing and fruit drop.&lt;br&gt;• Fruits are undersized.&lt;br&gt;• The fruit fly lay eggs in very young fruit.&lt;br&gt;• These eggs develop into maggots (worms).</td>
<td>• Keep your field clean. Collect and remove all infected fruits from field and burn or bury deeply.&lt;br&gt;• If symptoms or signs are observed apply a suitable insecticide.&lt;br&gt;• Perform spray operation at mid-morning when adult insects are in the field.&lt;br&gt;• If necessary apply a suitable insecticide to pupation sites of the insect in the soil around the plants.</td>
</tr>
</tbody>
</table>
1. When to Harvest

- The time from planting to fruit maturity varies with the cultivar used, as well as the cultural practices.

- In the Caribbean, papaya is generally ready for harvesting 9 months after sowing or 7 months after transplanting.

- The skin colour changes from deep to light green with one to two yellow streaks at the blossom end.

- Do not squeeze fruits to determine ripeness.
2. Methods of Harvesting

The harvesting method would depend on the variety, the scale of operation and the quality and quantity of labour available. Harvesting can be done:

- By hand - carefully twisting and breaking the fruit by skilled pickers.
- Using cutting tools e.g., Harvesting knife, secateur.
- Using picking poles.

3. Post Harvesting Practices

- Place fruits gently in single layers in field crates. Never drop.
- Use light-coloured field crates, preferably with a foam layer or shredded paper for cushioning.

- Do not use mesh bags, sacks or baskets.
- All stems should be trimmed to ensure no stem-to-fruit rubbing.
- Store filled crates in shaded areas (25 °C to 28 °C).
- Wash, grade and package as soon as possible after harvest (within 3 hours).
- Use polyurethane sleeves for wrapping single fruit.
- Allow the latex to flow before wrapping fruits.

Do not use plantain or banana leaves for packing payaya. This is to prevent spread of Black Sigatoka Disease to banana or plantain fields.
USES OF THE PAPAYA

Food for Humans

Excellent quality fruit, high in vitamin A. Ripe fruit is consumed fresh as a breakfast or dessert fruit and with honey, green fruits are grated in salad or boiled like squash.

Food for Livestock

Foliage is sometimes used as a feed source in fish ponds (Tilapia etc.).

Other Uses

The green fruit is the source of the enzyme papain, which is used in commercial meat tenderizers. In the Philippines, meat is wrapped in young leaves to tenderize it.

Alternative Products

Medicinal and Non Food Uses:

In tropical folk medicine, the fresh latex is smeared on boils, warts and freckles. It has also been used as a dewormer.

A root decoction is claimed to expel roundworms.

Crushed leaves have been used as vermifuge (dewormers) and as a primitive soap substitute in laundering.

Dried leaves have been smoked to relieve asthma. Packages of dried, pulverized leaves are sold by “health food” stores for making tea. In Ghana and in the Ivory Coast it is used as treatment for genito-urinary illness.

Green fruit and leaves are used in cosmetics. Papaya is claimed to reduce the signs of premature ageing and to eliminate dead skin cells. It is claimed to make a great facial peel. Beta-carotene protects the skin and provides elasticity.

The inner bark has been used for toothache relief.