

Papaw information kit

Reprint – information current in 2000



REPRINT INFORMATION – PLEASE READ!

For updated information please call 13 25 23 or visit the website www.dpi.qld.gov.au

This publication has been reprinted as a digital book without any changes to the content published in 2000. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research:

- Chemical recommendations—check with an agronomist or Infopest www.infopest.qld.gov.au
- Financial information—costs and returns listed in this publication are out of date. Please contact an adviser or industry body to assist with identifying more current figures.
- Varieties—new varieties are likely to be available and some older varieties may no longer be recommended. Check with an agronomist, call the Business Information Centre on 13 25 23, visit our website www.dpi.qld.gov.au or contact the industry body.
- Contacts—many of the contact details may have changed and there could be several new contacts available. The industry organisation may be able to assist you to find the information or services you require.
- Organisation names—most government agencies referred to in this publication have had name changes. Contact the Business Information Centre on 13 25 23 or the industry organisation to find out the current name and contact details for these agencies.
- Additional information—many other sources of information are now available for each crop. Contact an agronomist, Business Information Centre on 13 25 23 or the industry organisation for other suggested reading.

Even with these limitations we believe this information kit provides important and valuable information for intending and existing growers.

This publication was last revised in 2000. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.

This information has been made available to assist users to identify issues involved in the production of mangoes. This information is not to be used or relied upon by users for any purpose which may expose the user or any other person to loss or damage. Users should conduct their own inquiries and rely on their own independent professional advice.

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Queensland Government



Common **QUESTIONS**

This section contains the most commonly asked questions about growing papaw in Queensland. The answers are as brief as possible. Where this is difficult and more detail is required, we refer you to other sections of the kit. Symbols on the left of the page will help you make these links.

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Varieties



a key issue

Varieties
Section 4 page 10

What type of papaw do people buy?

The market for papaw is divided into different segments, based on fruit characteristics and how it will be eaten. There are yellow-fleshed papaw and red-fleshed papaya, small and large papaw, and both can be eaten either as fresh fruit or used as a vegetable. Once you decide which market segment you want to supply, then you can decide on the varieties to plant.

What variety should I grow?

Most papaws grown in Queensland are hybrid varieties or inbred lines. The variety you choose depends on whether you are in north, central or south Queensland. You should also consider what type of fruit your market agent prefers.

The more established yellow-fleshed hybrid varieties, Hybrid 1B and Hybrid 11B, and the red-fleshed Hawaiian Sunrise Solo, are popular commercial papaw varieties for north Queensland.

The yellow-fleshed hybrids Hybrid 29 and Hybrid 14 have performed well in the Yarwun area of central Queensland.

South-east Queensland growers have traditionally grown the yellow-fleshed PG and Richter Gold lines. Other recent but relatively untested red-fleshed papayas are becoming increasingly popular.

Where can I get seed or planting material?

Most papaw varieties are hybrid or specialist lines and are produced by professional seed producers. A list of commercial seed producers and nurseries is available from DPI.

Seed of Sunrise Solo has usually been sourced from the University of Hawaii.

There is growing interest in the use of tissue-cultured and vegetatively propagated material as planting material. Techniques for these are still to be commercialised.



more info

Seed producers
Section 6 page 4

Money

What area do I need to grow to make a living?

A reasonable area for a family farm is 2 ha under production with about 10 ha available for rotation. A larger area, between 2 and 4 ha under production, is needed in lower yielding regions.



more info

Economics of
production
Section 4 page 6

How much money can I make?

Returns from papaw vary according to supply and demand, and fluctuate widely between and throughout years. They can range from \$4 to \$45 per carton because of variations in supply and fruit quality. Papaws are severely affected by adverse climatic conditions, particularly strong winds, storms, tropical cyclones and floods, and these events will affect profitability.

Based on an average production of 6600 cartons per hectare per crop cycle in north Queensland and an average price of \$15 per 13 kg or 30 L carton, you would expect a gross income of \$99 000 per hectare. Assuming variable costs range between \$55 000 and \$86 000 per hectare, a gross margin of between \$13 000 and \$44 000 per hectare can be expected.

Farm overheads, living expenses and labour supplied by the grower or the grower's family are not included in a gross margin.

Growing the crop

What plant and row spacings should I use?

Most growers use a double row with 2 m between plants and 4 m between the centres of the double rows. In areas of high humidity and high disease pressure, a single row system with rows 3 m apart and plants 1.8 m apart in the row is recommended.

Should I use transplants or direct-seeding to establish the crop?

In south-east and central Queensland you should only use transplants. In north Queensland you can use transplants or direct-seeding. Avoid direct-seeding during wetter months.

What soil is best?

There is no preference for soil type for papaw. The most important considerations are surface and internal drainage. The minimum depth of free draining soil should be 50 cm.

When do I plant?

In coastal north Queensland most papaws are planted from March to May and September to November. In central Queensland and the Atherton Tablelands, planting is from March to May and in October. Papaws are planted between February and March in south-east Queensland, before temperatures get too cool.

more info



Planting density
Section 3 page 12



Understanding the papaw plant
Section 4 page 3

What sex ratio should I use?

For dioecious lines (male and female flowers are on separate plants), the standard practice is to prune out excess male trees to achieve one male tree for every 10 female trees. For bisexual varieties you should aim for all bisexual plants and remove all female plants.

Can you sex plants before flowering?

No.

How long from planting to harvest?

Fruit can be harvested ten to 16 months after planting, depending on the time of year you planted and the district.

How long do papaw plants last?

Two and a half to four years, depending on the region. Commercial plantations are ploughed out when the trees grow too tall for easy picking or when too many trees have died from disease.



Organic growing
Section 4 page 70

Can I grow papaw organically?

Yes, but pests and diseases can be very hard to manage. You should consider a drier or more isolated environment if you want to grow papaw organically.



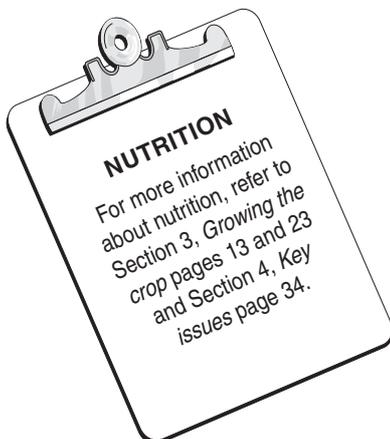
Mounding
Section 3 pages 8, 12

Why should I mound papaw?

Mounding will improve soil drainage and decrease the incidence of root rot. Mounds are particularly important in high rainfall areas.

Can I ratoon my crop?

Trees can be ratooned, depending on the weather and providing they are growing strongly and no more than 20% of the plantation is lost from dieback and *Phytophthora*. In coastal far north Queensland, ratooned trees often subsequently die from root rots. Ratooning is generally more successful in drier production areas.



Fertilising

How much fertiliser do I use?

Fertiliser requirements differ greatly between production regions and this is mainly due to different growth rates, climate and soil

conditions. It is difficult to recommend an amount of fertiliser without using tissue and soil analysis.

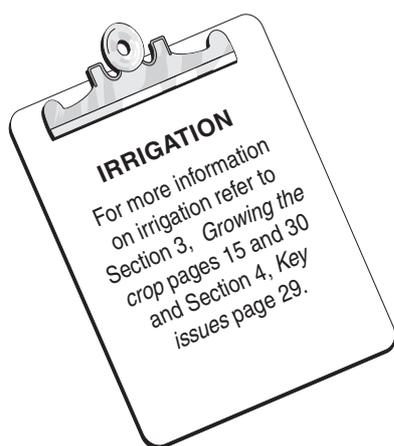
As a general rule, the following amounts (kg/ha of the element) are applied to bearing trees each year.

Table 1. Nutrient requirements for bearing trees in different growing regions

	South-east Queensland	Central Queensland	North Queensland
Nitrogen (N)	120	200	300
Phosphorus (P)	30	32	50–150
Potassium (K)	90	200	570

Other nutrients such as calcium and magnesium, and the trace elements boron and zinc, are often required. Trace elements are very important. Pay particular attention to boron.

Irrigation



How much water do I apply?

Papaws require good soil moisture but cannot withstand waterlogging. The actual amount required depends on:

- the environment (The rainfall for a district/region will influence the amount of irrigation required, as will the water-holding capacity of the soil. The rainfall distribution throughout the year will also influence the amount of irrigation required.)
- stage of growth (Different growth stages, related mostly to plant size, require different amounts of water.)
- irrigation system.

Use a soil moisture measuring device such as a tensiometer to decide how often and when to water.

Which irrigation design do I use?

Both drip irrigation and microsprinklers are suitable for papaw. We recommend you use an irrigation consultant to design your system.

more info



Irrigation consultants
Section 6 page 11

Spraying

What chemicals are registered for use on papaw?

Many chemicals are registered for control of pests and diseases in papaw. Make sure that papaws are listed on the chemical label or that the National Registration Authority has a current permit in place before you use any chemical on your plantation.

more info



Problem solver
handy guide

Problems

Why won't my plants set fruit?

Poor fruit set may be caused by poor pollination, over- or under-watering, nutrient deficiency or other plant stress. Cold weather can affect flower development on bisexual plants. Occasionally virus diseases cause this problem.

Why don't my fruit have seeds?

Fruit do not set seeds if they are not pollinated effectively. Poor pollination can be caused by:

- not enough male plants (At least 10% male plants are needed to ensure there is enough pollen is available for good pollination.)
- wet weather and windy conditions
- the overuse of insecticides, which can affect insect pollinators.

Marketing

Where can I sell papaw?

Papaw grown in Queensland can be sold in all Australian states and territories except Western Australia. Western Australia currently prohibits entry of Queensland papaw for pest and disease quarantine reasons. Fruit consigned to Tasmania, Victoria, South Australia and certain areas within New South Wales must be produced and treated under specific Interstate Certification Assurance (ICA) schemes.

What is Interstate Certification Assurance?

Interstate Certification Assurance (ICA) schemes outline the conditions under which other Australian states will accept Queensland produce. They detail the pest and disease treatments and fruit protocols that must be achieved before entry is permitted. Entry requirements may differ from state to state and between papaw varieties.

How do I sell my fruit?

There are three main markets for papaw:

- **Central**—agents and merchants in wholesale markets in major metropolitan centres.
- **Regional**—agents and merchants buying for large regional cities and towns.
- **Local**—flea markets, direct supply, roadside stalls.



ICA schemes
Section 3 page 48



Marketing
Section 6 page 14

Growers usually market independently to the central market agents/merchants.

There is potential for group marketing and directly supplying supermarket chains.

Depending on your marketing method, you may need to implement one or more components of a quality assurance or food safety scheme.

What components of quality assurance and/or food safety do I need?

The level of quality assurance or food safety needed depends on the requirements of the retailer of your fruit and your agent or merchant. The most stringent conditions are being imposed by the major chain stores. Most agents/merchants will require you to be part of an Approved Supplier Program.

The requirements of an Approved Supplier Program may differ slightly between agents/merchants, which, in turn, depends on the requirements of their customers. If you are supplying fruit direct to a regional chain store you will probably need to implement an HACCP-based quality management system. The best advice is to ask your agent/merchant or retailer for details of their requirements.



a key issue

Quality management
Section 4 page 65

What storage temperature is best?

The best storage and transport conditions for ripe papaw are 13°C with a relative humidity of 90%.

How do I ripen fruit?

Papaw is ripened using ethylene gas under controlled conditions in special ripening rooms.



a key issue

Ripening fruit
Section 4 page 58

How do I pack papaw?

The fruit are packed in a single layer box. Thirty-litre cartons are generally used for yellow papaw and 18 L for red papaw. Inside the box the fruit is protected from damage with poly socks or paper wraps. Cardboard or polystyrene cartons are used.



more info

Packing and grading
Section 3 page 44

Quarantine

What quarantine regulations govern papaw?

The Plant Protection Act 1989 prohibits the movement of papaw plants from south-east Queensland into other parts of Queensland. This is to help prevent spread of the lethal papaw



more info

Papaw ringspot virus-P
Section 3 page 17, 38

ringspot virus (PRSV). Fruit movement within Queensland is not regulated. Interstate Certification Assurance (ICA) schemes outline the conditions under which other Australian states will accept papaws.

a key issue



Black spot
Section 4 page 51

more info



Growing the crop
Section 3 page 39

Pests, diseases and disorders

How do I control black spot?

Deleaf older diseased leaves regularly and follow with strategic sprays of registered protectant and systemic fungicides incorporating a wetting agent. Begin the control program in February and continue spraying until October.

Where do I obtain biological control agents for scale?

Biological control agents for scale can be bought from suppliers of beneficial insects. Check Section 6, *Contacts and references* for details.

Why are my seedlings dying?

The soil-borne organisms *Pythium*, *Rhizoctonia* or *Phytophthora* are common causes of seedlings dying. Damage from herbicide sprays, applying too much fertiliser, too much or too little water, salinity and frost will kill young seedlings. If the seedlings are chewed off at ground level the culprit could be cutworms.

What are the spots on my leaves?

Several pests and diseases will cause spots on papaw leaves. Spots could also be due to spray burn. Check in the *Problem solver* to help identify the most likely cause.

Why are my plants wilting?

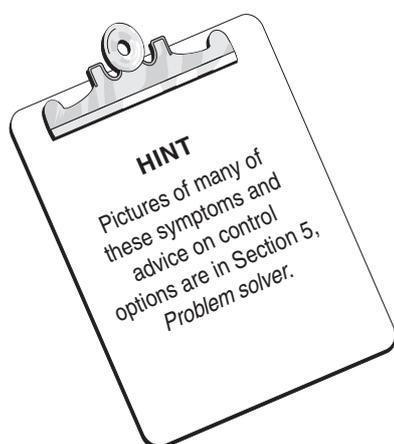
Lack of water or too much water is the main cause of plants wilting. Root rot disease is aggravated in very wet conditions. Severe fruitspotting bug damage will cause plants to wilt. Plants suffering the advanced stages of dieback will also wilt.

Why are my seedlings cut off?

Pests such as cutworm, grasshoppers or vermin chew through the young stalk and cut off papaw seedlings.

Why are my bottom leaves yellowing?

A range of problems can cause yellowing of the bottom leaves. These include diseases, insects, nutritional factors, herbicide



damage and environmental conditions. Over- or under-watering and poor drainage can also cause the same condition. Check in the *Problem solver* to help identify the most likely cause.

Why are my leaves deformed?

Deformed leaves can be attributed to insects, diseases, nutritional levels or herbicide spray drift. Check in the *Problem solver* to help identify the most likely the cause.

Why are my leaf margins brown?

The two major causes of leaf margins turning brown and dying are over-fertilising and excessive soil salinity. Tissue testing and water analysis will diagnose the cause.

Why do my crown leaves shrivel and die?

Dieback is the major cause of crown leaves shrivelling and dying. This disease is more common in central and southern Queensland, particularly during the dry spring and autumn months. Fruitspotting bug also attacks crown leaves, causing similar symptoms. Powdery mildew can also cause similar symptoms in crown leaves.

Why are my leaves mottled?

The most common causes of mottled leaves are the virus diseases mosaic or ringspot, a fungus disease called powdery mildew, or severe infestations of two-spotted mite underneath the leaves. Herbicide spray drift can also cause a mottled effect on the leaves. Check in the *Problem solver* to help you diagnose the cause.

Why are my leaf stalks and stems cracking?

Fruitspotting bugs feeding on leaf stalks and stems will cause them to fold in around the feeding site and then crack open. Very severe infection by the brown spot fungus can also cause this problem.

Why are my roots lumpy, bumpy or gally?

Root-knot nematode causes root swelling and galls. Control is not normally warranted. Attention to maintaining good plant vigour will keep the problem under control.

Why do my plants fall over?

The most common cause of young seedlings falling over is chewing by cutworms that eat through the stem. In older plants,

root systems can be damaged and weakened by root rot or nematodes. Strong winds will blow affected plants down more easily. Some varieties are more susceptible to damage than others.

Why is my fruit going rotten?

Papaw fruit are susceptible to field and postharvest fungal rots. Any damage to green fruit can allow the growth of fungal diseases in the fruit. Pest or vermin feeding or mechanical damage of green fruit could cause this injury.

Fruit flies will lay eggs in ripening fruit. If you cut this fruit open the presence of maggots will indicate fruit fly attack. Attention to field and shed hygiene and dipping fruit in a fungicide solution will help to minimise the problem.

What are these circles on my fruit?

The papaw ringspot virus-P causes circles on the fruit. This virus is currently restricted to south-east Queensland and quarantine restrictions are in place to try to stop the disease moving throughout Queensland. If you suspect that you have papaw ringspot virus, contact your local office of the DPI to confirm the problem.

What are these spots on my fruit?

Fungi, insects and environmental factors can all cause spotting on fruit. Check in the *Problem solver* to help identify the most likely cause.

Why are my fruit deformed?

Fruit can be deformed and scarred as a result of severe powdery mildew. Cat-face and overcrowding of the fruit occur during cold weather. Cat-face, resulting from abnormal development of bisexual flowers, causes fruit to develop longitudinal ridges. Boron deficiency causes fruit that looks very lumpy and bumpy.

Why are my trees dying?

Depending on your location, the most common causes of premature tree death are dieback in South-east and Central Queensland and *Phytophthora* root rot and dieback in North Queensland.

Why do my trees drop fruit?

The most common reasons for fruit drop include severe environmental conditions such as hot dry weather and boron deficiency.

What causes the lumps in papaw flesh?

The cause of lumps in papaw flesh is unknown. It is possibly a physiological problem related to growing conditions.

Why are my leaves falling off?

Heavy rain, waterlogging, heavy incidence of leaf spot diseases or poor nutrition can all cause leaves to fall.

What causes dieback?

Dieback-infected plants have been found to contain a virus-like organism called phytoplasma. Research work is being conducted into this disease.

How do I prevent root rot on replant ground?

The current recommendation is to avoid replanting on *Phytophthora*-infected sites. Seventy-five centimetre high mounds in single rows and improved drainage within the block will also reduce the incidence of disease.



Disease management
Section 4 page 49

General

Is there a papaw grower organisation?

Yes. Check Section 6, *Contacts and references* for details.

GLOSSARY

This glossary covers terms used in the papaw industry.

axil (of leaf)	angle between upper side of leaf and stem on which it is borne
dioecious	papaws having separate female trees and male trees; male trees sometimes set hermaphrodite or bisexual flowers and will subsequently set fruit
elongata (of flower, fruit)	lengthened shape
flavour	flavours are described as nasturtium, bland, musk or frangipanni and each flavour may include a range of sweetness. The best way to get an appreciation of the different flavours is to taste the different varieties
flesh colour	flesh colours range from light yellow, yellow-orange through to pink and reddish-orange
gynodioecious	papaws having separate female and bisexual or hermaphrodite trees, with both tree types setting fruit. The hermaphrodite fruit is preferred for marketing. Growers generally refer to these papaws as bisexual
hermaphrodite (or bisexual)	having both male and female reproductive organs in the same flower
hybrid	progeny resulting from a cross between two stable and inbred parents
palmate (of leaves)	spreading and open, like a palm leaf
pentandria (of flower)	short and squat shape
petiole	leaf stalk
pistillate (of flowers)	possessing female reproductive organs
stamens (of flower)	organ of flower which produces microspores or pollen grains
staminate (of flowers)	possessing male reproductive organs
sweetness / Brix	Brix is a measure of the sugar content; less than 8% means 'not sweet', 8–11% means 'moderately sweet' and greater than 11% means 'sweet'
variety name	the standard industry name accepted for a variety. The naming code used depends on the original breeder of each variety