

Banana Growing Guide

Cavendish Bananas

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NSW DEPARTMENT OF
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About this guide

This guide has been developed by NSW DPI and Bananas NSW, using our combined technical resources, and above all, the experience of some very successful growers.

This Cavendish growing guide is one of a set of publications for banana growers. It gives details of crop management activities for Cavendish banana production in the plantation and packing shed. Other publications from NSW DPI cover pest and disease management and sustainable banana growing.

Another publication *What the good growers do* also gives an insight into the production and management practices of 23 of NSW's top banana growers. This highlights the practices and philosophies of these successful growers, and spells out their priorities. We recommend the *What the good growers do* guide as a great starting point for new growers or a refresher for established growers looking to move ahead. It is available from NSW DPI or Bananas NSW.

Current contacts within the contributing organisations are listed below.

NSW Department of Primary Industries.

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This document is part of a set of publications. The remaining parts of the set can be found at www.dpi.nsw.gov.au. Updated versions of this document will also be found at the above web address.

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (2008). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of NSW DPI or the user's independent adviser.

The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product name does not imply endorsement by NSW DPI over any equivalent product from another manufacturer.

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BANANAS

The Cavendish variety accounts for over 90% of Australian production and has a loyal following amongst consumers. The industry often produces more fruit than the markets require and prices can be poor for extended periods. This is reflected in the wide range of prices for Cavendish bananas in wholesale markets from season to season. When the market is over supplied fruit quality is important as returns for poor quality fruit do not cover costs of production.

The Cavendish variety includes varieties commonly referred to as Hybrids, Williams, Mons or Dwarf Cavendish.

The ladyfinger variety makes up the majority of the remaining crop and has a ready following, particularly in the Brisbane area. The goldfinger variety also has a small following in Brisbane and small quantities of other varieties are available in the market place.

Consistent quality is the key to profitable banana production and this is the major focus of this manual.

Growing quality bananas all year round in a sub-tropical climate is not easy. As well as pests and diseases, environmentally induced problems, such as chilled fruit during winter and November dumps have to be managed.

These challenges can be met, and this Grower Guide is one step towards seeing Best Practice adopted in the banana industry.

One special caution. Bananas suffer from a soil-borne fungal disease known as Panama disease which kills the plants. Race 1 affects ladyfinger and other similar varieties and subtropical Race 4 affects ladyfinger and Cavendish plants. It is a major threat to the industry's future. The Panama fungus is spread by movement of infected plants or soil. If you get Panama disease on your property, you cannot get rid of it, so be sure your planting material comes from a clean source or you may be planting problems with your plants. The more detailed *Agnote Panama disease – on-farm management* is available at www.dpi.nsw.gov.au

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

Site selection

To grow a good plantation choose a frost-free site, sheltered from strong winds on a workable slope. Banana plants are susceptible to blow out with strong winds so shelter is important. North east to north slopes are best because they are warmer and sheltered from cold south westerly winds. The ideal temperature for bananas is 27°C to 30°C. Growth is very limited below 13°C and chlorophyll is damaged below 6°C.

Bananas grown on cool sites have:

- inferior fruit quality
- higher incidence of Deightoniella disease
- dull grey winter/spring fruit
- stale fruit
- slower ratooning
- more frequent treatment for fruit pests and diseases
- lower production.

A permit to plant and move bananas must be obtained from your local NSW DPI Regulatory Officer before you begin.

Site preparation

Bananas grow best in fertile soil that is free of pests, diseases and competition from weeds.

If the ground is free of Panama disease every effort should be made to keep it that way. Clean planting material is essential as diseased planting material is the major means of spreading Panama disease. Tissue cultured plants are the only guaranteed clean material. It is also worthwhile to make sure any machinery being used is clean before it enters the farm. See the Panama checklist on page 5 for more details.

When replanting a ladyfinger plantation with Cavendish where Panama disease has been a problem, clean planting material should also be used for best results.

Preparing new ground

If you are starting from scratch and clearing a new site, the design of the roadways should aim to maximise the efficiency of the patch and minimise soil erosion. Well formed, smooth roads will minimise fruit damage during transport from the plantation to the shed. When clearing, sites that could harbour vermin such as weedy patches, logs, stumps, lantana, old tins, etc. should be cleaned up.

Take samples for a soil test and follow the recommendations. This is the time to get the soil pH and nutrients right so the plants get a good start. The ideal range for soil pH is 5.5 to 6.5. The soil should also be of reasonable depth to allow development of strong root systems. Siting plantations on shallow, stony soils can result in blowovers during high winds.

Once cleared, protect the soil from erosion with a cover crop. Cover crops will also minimise weed growth and provide mulch for the soil. See the recommendations on cover crops on page 11. On recently cleared ground, a mix of short and long term cover crops can be useful.

If the land is cleared in spring, use a mix of millet, which is cheap and easy to establish and manage plus broadleaf paspalum, which will persist in the established plantation.

When land is cleared in autumn either ryegrass or a mix of oats and broadleaf paspalum is recommended. If grasses are considered a problem, an autumn sowing of white clovers may be an option.

Much of the cover crop can be kept when preparing for planting by spraying out a 1 metre strip along the row or 1 metre circles at each planting site.

- **Note:** avoid autumn clearing if possible, as there is a higher risk of erosion from storm rains.
- Don't forget to fertilise the cover crop.

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

When replanting a spelled patch

Replanting with bits or corms in the cooler subtropics is carried out from September to December. When replanting using tissue cultured plants this should be done as soon as the plants are available, usually around Christmas time.

The best method of killing the old plantation is to inject the plants with a herbicide. The old plants will help protect the soil until the cover crop is established. A cover crop can be established as the old plantation is being destroyed.

- Do not cut down old banana plants before injecting with a herbicide. This needs to happen at least six months but preferably two years before the new planting commences. This will give sufficient time to eliminate banana weevil borer (which can persist in the dead corms of plants for many months), nematodes and bunchy top disease. Most growers would agree that anything less than two years out of bananas gives disappointing results.

Pushing over and track walking with a dozer is another method of destroying an old plantation prior to replanting. This has to be considered second best to injecting a herbicide. The dozer can introduce Panama to the plantation and could create an erosion problem.

A soil test should be taken early enough to apply lime and other soil amendments as required before the planting season, ideally before the ground is ripped in preparation for planting.

Spray off the cover crop in strips one metre wide or circles 1 metre in diameter, well before replanting, but keep the rest of the cover crop growing as protection against soil erosion and weed invasion.

What to plant

When establishing any banana plantation it makes sense to commence with the best quality planting material available. The use of poor quality planting material or planting material of unknown origin will put the long-term viability of a plantation at risk.

Panama and bunchy top diseases, nematodes, banana weevil borer and rust thrips can all be introduced to a plantation in contaminated planting material. Once they are introduced the viability of a plantation is decreased.



Tissue cultured plants almost ready for planting.

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

Planting material choices

Growers have the choice of tissue-cultured plants (directly planted in the plantation or via a nursery block) or conventional corm bits and suckers. Each of these has different levels of pest and disease risk. Tissue-cultured plants go a long way to reducing risks and are by far the preferred option.

Choice 1 Tissue-cultured plants

The use of tissue-cultured plants virtually eliminates the chance of introducing pests or disease into a plantation with the planting material. Many growers in NSW and Queensland use tissue cultured plants and are happy with the results.

Tissue-cultured plants are tough enough to plant directly into the field provided:

- they are a good size (preferably 10 leaves) and in good condition when they are planted
- they are hardened off in full sun with regular watering for two weeks before planting
- they are watered-in well at planting
- if conditions are dry, they are given some follow up water (a few litres per plant is enough to get by)

- banana weevil borer have been eliminated from the site (by spelling the ground).

Remember, order your tissue cultured plants well ahead of planting time (15 to 18 months) to be sure of having them available at the right time.

Choice 2 Nursery blocks

Some banana growers are still wary of paying the upfront costs of buying tissue-cultured plants to establish a plantation and prefer to use conventional corm bits and suckers. If this is the case growers can obtain most of the benefits of clean planting material by establishing a nursery block with tissue-cultured plants in clean ground and harvesting the corm bits and suckers 10 months later. Nursery blocks also allow you to detect and remove any off-types in the nursery block.

Planting material obtained from a nursery block established with tissue-cultured plants is second best to tissue-cultured plants, but much better than material obtained from an established plantation which is likely to carry pests and diseases. See the nursery block publication at www.dpi.nsw.gov.au for more details.

Choice 3 Corm bits and suckers – from your own plantation

Using planting material from your own plantation puts you at risk of spreading existing problems like Panama disease, bunchy top disease, nematodes, rust thrips and weevil borers, which will reduce the productivity of your new patch. However this choice at least ensures you do not introduce new problems to your plantation that you don't already have.

Choice 4 Corm bits and suckers – from another plantation

(Subject to planting regulations)

If planting material from one of the three sources mentioned above isn't available, a less desirable fourth choice is material from a neighbour's plantation. However, this method carries a risk of introducing Panama, bunchy top, nematodes, rust thrips or banana weevil borer into your plantation. You are likely to plant pests and diseases along with your bananas. This really is a poor option.

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

The Panama disease checklist

Avoiding the introduction of Panama disease (caused by the fungus *Fusarium oxysporum* f. sp. *cubense*) is important to all banana growers. If you introduce Panama into your farm on Cavendish suckers it can persist for decades and will make growing susceptible varieties such as ladyfinger unviable for many years to come. To keep Panama disease out you need to note the following points.

- Avoid machinery that has worked in areas where Panama disease may be present. Make sure any machinery coming onto your plantation, such as bulldozers, is clean of soil and trash before entering.
- Make sure your planting material is free of Panama disease (this really means using tissue-cultured plants).
- Put a quarantine notice at your front gate.
- Check who is coming onto your plantation – have they been on other plantations? Are their boots and their vehicles clean of soil which may be contaminated with Panama? It is **not** unreasonable to expect others to take reasonable precautions.
- If you are planning a dam for irrigation try to ensure water from your own or neighbours' plantations does not drain into the dam. If this occurs Panama spores can be washed into the dam and then spread in the water when irrigating. If this is your only water source you need to make sure your foot valve is close to the water surface, which may slow down the spread of spores.
- Help reduce movement of possibly Panama infected soil by protecting all exposed soil, especially waterways, with cover crops. This minimises soil erosion and reduces the chances of spreading Panama around the plantation.
- Keep the movement of vehicles during wet weather to a minimum to limit the movement of soil within the plantation.
- Do not spread discarded bunch stalks in the plantation as they can carry the disease.



A quarantine sign at the entry to a banana farm.

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

- Avoid second hand cartons as they can be contaminated with Panama disease infected soil.

Remember, contaminated planting material and contaminated soil are your two biggest enemies for spreading Panama disease.

The more detailed Agnote *Panama Disease – on-farm management* is available at www.dpi.nsw.gov.au

How to plant

Get the plant spacing right

Plant spacing affects the amount of sunlight and soil available to each plant. Cavendish plants require about 7 sq m per plant and are usually planted at 3.0 m by 2.4 m.

The effects of plant spacing

- Bunch size and grade (plant too close and the bunches will be small with smaller fruit).
- Bunch cycling (plant too close and the followers will be slower bunching and bunches slower filling).
- Disease problems – closer plantings have reduced air circulation, and as a result fungal leaf diseases including *Deightonella* will be worse.

Planting tissue cultured plants

Tissue cultured plants are tougher than they may appear and are quite capable of surviving most field conditions if they are hardened off in full sun for two weeks before planting. Water them several times each day during this period.

Only purchase tissue culture plants from an industry accredited nursery. The plants should preferably have at least 10 leaves; any less and they are hard to check for off-types.

Tissue-cultured plants should be planted approximately one month later than conventional planting material. The reality is that plants are usually not available from the nursery until December anyway.

Cull any suspicious looking plants. If you are uncertain and are not prepared to throw them out, then plant them at the end of a row so that any replacements will not be shaded out.



Tissue cultured plants are planted deep in the hole them backfilled.

PREPARATION AND ESTABLISHMENT – SETTING THE SCENE FOR SUCCESS

To get the best from your tissue-cultured plants try to plant them into well-rested ground – at least two years without banana plants is best. Tissue-cultured plants can be especially susceptible to nematodes and banana weevil borer so a 2-year rest is very important.

- Mark out for the chosen plant spacing. A deep contour rip is good for easy planting and retaining moisture. Do not rip up and down the hill.
- Spray the cover crop out in strips along the slope or circles about 1 metre wide, well before planting time. This will provide mulch at the planting site, conserve moisture and reduce weed growth.
- Pull back the mulch and dig a hole about 35 cm deep.
- Place any fertiliser (usually about 200 g superphosphate) in the hole. Put 5 cm of soil back in the hole and mix in the fertiliser.
- Make sure the plant is well watered before you take it to the patch.
- Slip off the pot without disturbing the roots, place in the hole and back fill, making sure that all clods are broken up. Compact the soil around the root ball to ensure that no air pockets are left. It is a good idea to create a small basin around the plant to catch rainfall and help with hand watering if required later.

Plant deeper than for bits or suckers. Have the top of the potting media 15–20 cm below the top of the hole. The plant needs at least three litres of water to wet the soil and help expel air from around the root ball.

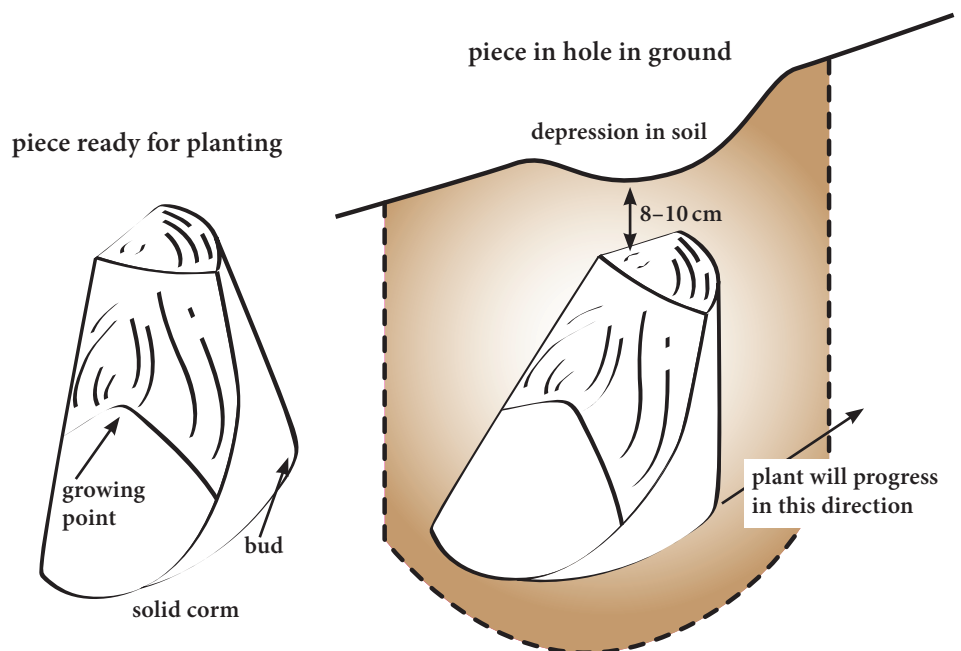
After that the plant will then survive with minimal watering. Regular watering will, however, improve growth and hasten bunching.

Planting bits and suckers

Dig a hole 30 cm deep, place 200 g superphosphate in the bottom and fill in 5 cm of soil. Place the bit in the hole on a 45° angle so the bud points towards the bottom of the hole and faces uphill as shown in the diagram. Fill in the hole with soil and firm the soil around the bit.

Suckers are planted in a similar manner. A hole is dug and fertiliser is placed in the hole the same as for bits. The sucker is placed in the hole on a 45° angle with the most developed bud pointing towards the bottom of the hole and facing uphill.

Remember: before planting bananas in NSW growers must obtain a permit to plant and/or move bananas from their District Regulatory Officer. Movement of banana planting material into and within NSW is subject to restrictions based on disease quarantine zones. The Regulatory Officer will need to know the source of the planting material before a 'permit for movement and planting of banana plant material' can be issued.



Corm bits should be planted with the bud facing uphill.



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<http://www.dpi.nsw.gov.au/agriculture/horticulture/tropical/bananas/cavendish-bananas>