

# Macadamia grower's handbook

Reprint – information current in 2004



## REPRINT INFORMATION – PLEASE READ!

For updated information please call 13 25 23 or visit the website [www.deedi.qld.gov.au](http://www.deedi.qld.gov.au)

This publication has been reprinted as a digital book without any changes to the content published in 2004. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research: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](http://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- Financial information—costs and returns listed in this publication are out of date.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.deedi.qld.gov.au](http://www.deedi.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.

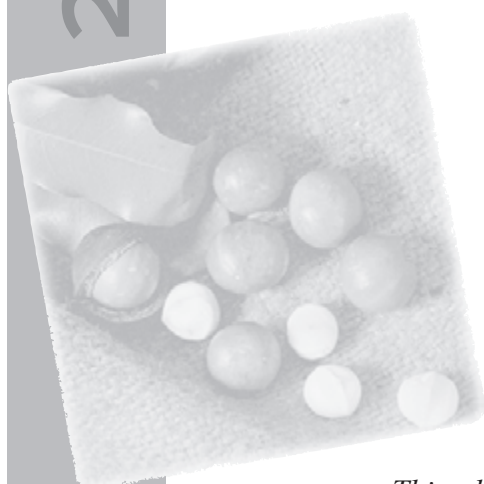
**This publication was last revised in 2004. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.**

This information has been made available to assist users to identify issues involved in macadamia production. 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.

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained in this publication.



Queensland Government



# Common QUESTIONS

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

## **Questions about economics and prospects**

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### **I'm thinking of planting macadamias but am aware that there are a lot of new orchards being established. What are the future prospects?**

It is obviously difficult to speculate on what prices and market prospects are going to be in five to ten years time when new plantations will come into bearing. This is particularly so, given the large plantings both in Australia and in overseas countries. However, the Australian macadamia industry is facing this challenge by undertaking market research and new market development, and building a good reputation for high quality through quality management systems. This means that the Australian product has the potential to continue to expand into the future. It is also worth noting that worldwide sales of macadamia appear to have significant scope for expansion. This is based on the knowledge that it still occupies only a tiny percentage (about 2%) of world tree nut sales.

### **What yields and prices can I expect from my orchard?**

Yields vary with location, season, variety and level of management. Bearing commences in about the fourth or fifth year and reaches a peak at maturity in about the twelfth to fifteenth year. For a well-managed orchard with tree spacings of 8 m x 4 m (312 trees/ha), expected average peak yields at maturity are approximately 3.5 to 4 tonnes of nut-in-shell (NIS) per hectare (12 to 13 kg/tree). Very well-managed orchards may do slightly better than this and

conversely, poorly managed orchards or those on poor sites may fail to reach these figures. Note that with some varieties such as HV A4, which produce higher early yields, peak yields may be reached earlier than indicated above.



See *Yields and Prices* on pages 3 and 4 for more information.

As far as prices are concerned, with inevitable price fluctuations, many experienced growers budget on a long-term future average price of \$2.20 to \$2.60/kg NIS at 33% sound kernel recovery, a maximum of 3.5% unsound kernel recovery and 10% moisture content.

### **What is the wait for a return on macadamias?**

No significant income can be expected until the sixth year. Costs then generally exceed income until about the eighth year. Accumulated costs generally exceed accumulated income until at least the eleventh year.

### **What is the economic life of a macadamia orchard?**

A well-managed orchard could be expected to be highly productive for at least 30 years, although trees may grow for a hundred years or more.

### **Is it possible to grow macadamias organically?**

It is possible, but significantly reduced yields and nut quality would have to be expected. This is because the macadamia, being an Australian native species, has a lot of native insect pests, some of which may cause significant damage if not controlled by strategic sprays. Spotting bugs are the main problem, as there are no highly effective non-chemical alternatives yet available for this pest. Husk spot disease would also be difficult to control effectively in an organic orchard, particularly in more susceptible varieties.

## **Questions about establishing an orchard**

### **What varieties are best to plant?**

There is no simple answer to this question, as it depends on the location of your farm and the spacing and management system you intend to use. The process starts with analysing the data obtained from regional variety trials to identify the varieties that yield best in your general location. Then analyse these varieties for major production and quality problems and then their suitability for your management system—for example spreading varieties are not suitable in close-planted orchards. Then decide how many varieties you require to spread the risk and harvesting workload.



See *Varieties* on page 23 and the more detailed *Selecting varieties* on page 92 for more information to help you through this process.

Two issues in planning the arrangement of varieties in the orchard are cross-pollination and nut drop periods. Research has suggested that cross-pollination between varieties may be important in maintaining yields and nut quality. Current suggestions are that at least two varieties be planted in each block. Plant in alternate sub-blocks of 4 to 10 rows. Do not mix varieties within the same row. When selecting varieties for the sub-blocks, select those with

similar nut drop periods and processing requirements. This maximises efficiency of crop management and harvesting. Note that varieties with very late nut fall (after the end of September) may present problems with control of husk spot and management of the orchard floor.

Don't rely solely on the information in this handbook. Seek opinions from local growers, processors, consultants and nurseries before finalising your selection. However, be careful to distinguish between real experience and unsubstantiated perceptions or opinions.

### How far apart should I plant my trees?

This is a balance between maximising yield during the life of the orchard and minimising cost and management requirements. Location, climate and variety also influence the decision. Closer row spacings, such as 7 m, provide earlier cash flow, but cost more to establish and require side trimming from early in the life of the orchard. These spacings are also only suitable for upright varieties. On the other hand, wide row spacings, such as 10 m, are suitable for most varieties and require little or no side trimming, but take much longer to provide a positive cash flow. Spacings most commonly used are generally between these two extremes—for upright varieties, 8 m between rows, and 4 m between trees, and for spreading varieties, 9 m between rows and 5 m between trees. Note that on steeper slopes, tree rows are usually wider than on flatter ground



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See *Row and tree spacing* on page 25 for more information.

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### How do I prune young trees?

First remove any suckers coming from the rootstock. Then cut back any trees with single shoots that have grown to a height of 80 cm or more without branching. These are topped at this height to get them to branch. For trees that have too many branches coming from the one node, thin these branches to obtain a central leader and only two or three lateral branches coming from any one point. Remove any branches on the trunk below knee height.



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See *Training and pruning* on pages 39 to 40 for illustrations of these pruning processes.

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## Questions about growing the crop

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### Do I need to irrigate macadamias?

Yes, where annual rainfall is less than about 1200 mm or where it is unevenly distributed throughout the year. In other situations, it may not be of any significant benefit except in the odd year with extended dry periods in the spring and early summer. This is particularly so in sites with shallow topsoils.

### How much water do I need?

Mature macadamia trees can quite easily use up to 350 L of water or more a week in hot dry weather. Usage may require up to five megalitres per hectare per year. When irrigating, always use a soil moisture monitoring system such as tensiometers or capacitance probes to ensure water is being applied efficiently.

### When should I do soil and leaf analysis?

Do a soil analysis before the trees are planted to give a guide to the pre-plant fertiliser needs. This is particularly important, as it is difficult to effectively incorporate some fertilisers into the root zone after planting. Start leaf analysis from year four, once the trees have started to crop. It is then best to do leaf analysis every year. For convenience, soil analysis is best done at the same time, but in well-managed orchards, can be deferred to every second year. Soil analysis gives a guide to the availability of nutrients in the soil, and leaf analysis a guide to the uptake of those nutrients by the tree. This means the two can be used together to give a more accurate guide to fertiliser requirements. The recommended time for leaf and soil analysis is from September to November. This is when leaf nutrient levels, particularly for the major nutrients like nitrogen, are most stable.

### When should fertiliser be applied?

The timing of fertiliser application should be largely based on an interpretation of the soil and leaf analysis results. However, as a general rule, split nitrogen fertiliser requirements into as many applications as practicable throughout the year. Apply the bulk of potassium fertiliser requirements in the spring with the rest spread throughout the year. Apply fertilisers of low solubility such as phosphorus fertilisers, gypsum or zinc sulphate before the summer rains to help with incorporation. Where used, apply boron and zinc foliar fertilisers to new growth flushes (boron—spring; zinc—summer).

### Is poultry manure good to use on macadamias?

Organic fertilisers such as poultry manure have the benefit of improving the physical and biological characteristics of the soil, as well as supplying some nutrients. However, it is important that these materials are properly composted for at least three months before use, or applied more than four months before harvesting commences. Do not apply during or near harvesting. This minimises the risk of microbial contamination of nuts on the ground. Also remember that organic fertilisers such as poultry manure are generally lower and more variable in nutrient content than inorganic fertilisers, and are slower in their response.

### What pruning is necessary in bearing trees?

There are two important pruning operations. First, remove the lower branches to a height of about 1 m at the trunk and 1.5 m at the dripline (skirting). This allows easy access underneath for harvesting and for weed control. Skirting



See *Fertilising* on page 45 for more information.



See *On-farm composting* on page 169 for more information on composting nut husk.



See *Canopy management* on page 51 for more information on pruning bearing trees.

is normally done with hand-held equipment such as chainsaws or tractor-mounted hydraulic saws after harvesting is completed. Second, where trees crowd (particularly in closely-spaced orchards), side trimming (commonly known as hedging) will be necessary to maintain machinery access, increase light and spray penetration, and reduce the risk of fungus diseases developing. Regular light trimming is best, as heavy trimming (removal of 1 m or more of foliage), results in vigorous regrowth and crop loss. Side trimming is generally done with tractor-mounted hydraulic saws, and is most practicable after final harvest.

### Is there a suitable ground cover for use in macadamias?

After many years of investigation by macadamia researchers, sweet smother grass has been identified as the most suitable perennial ground cover so far. Living ground covers provide benefits as mulch and in reducing soil erosion. This is very important in macadamias as trees crowd and shade out inter-row grass species, leaving the soil vulnerable to erosion and overland movement of nutrients. Finding suitable ground covers is a big ask, as they need to be shade tolerant, non-climbing, persistent, and relatively non-competitive with the macadamia trees. Ground covers must also be relatively low-growing to suit harvesting and minimise mowing.

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#### NOTE

To use ground covers successfully, specialised under-tree offset mowers are required.

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## Questions about problems

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### My flowers are dying. What is likely to be the problem?

The most common cause is macadamia flower caterpillar, one of the major pests of macadamias. The caterpillars (larvae) festoon the raceme with webbing, insect excrement and remains of damaged buds. The insect pest has the potential to completely ruin all florets on a flower raceme. To avoid significant damage, the flowers need to be monitored for caterpillar eggs and larvae, from when flowering begins. Once the stage is reached where the pest is causing sufficient economic damage, a spray program is commenced. Note that other possible causes of dead flowers include drought, frost damage, raceme blight disease, flower thrips damage, redshouldered leaf beetle damage and felted coccid damage. If you are unsure of the cause, seek advice from pest consultants. Experienced pest and crop consultants are available in most macadamia production areas.

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#### NOTE

Photographs of symptoms of these problems are contained in the *Macadamia problem solver & bug identifier field guide*.

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### What is causing small green nuts to drop?

Early nut drop can be either from natural thinning or from a pest, disease or disorder. Natural thinning results from the trees naturally setting many more nuts than they can carry through to harvest. Most natural thinning occurs when the nuts are pea-sized, when up to 90% of set nuts may fall. This is normal. No treatment is required for this natural nut thinning. Unnatural nut drop is generally caused by damage from spotting bugs, green vegetable bug, nutborer or husk spot. Less common causes are storm damage (wind or hail), and tree decline. Fruitspotting bug affects nut drop in the early stages, while

husk spot and nutborer usually affect nuts at the later stages of development. It is very important to monitor the nuts that are dropping to see if they are damaged by these insects or diseases, and if so, apply appropriate control measures.

### **Some of my trees are looking yellow with leaf fall and twig dieback. What is the problem?**

The most likely cause is tree decline. It is believed to be brought about by a combination of factors that lead to a decline in tree health. These include nutrient deficiencies, low soil organic matter levels, soil erosion exposing surface roots to desiccation, root death in shallow marginal soils, drought, and large crop loads. Treatment involves lightly pruning affected trees to encourage vigorous new growth. When this has occurred, apply a general foliar fertiliser at regular intervals. Also apply mulch up to 5 cm thick on the soil surface under the tree to just outside the dripline—this helps encourage new root growth. Note that trees may take some time to recover.

### **Some of my trees show bark splitting and gumming on the trunks. What is the problem and how should I treat it?**

The most likely cause is trunk canker disease brought about by a fungus. This causes cankers (dark discoloured areas of bark), from which the gum exudes. If the discoloured bark is removed, a brown discolouration of the outer wood can be seen. In young trees, suckers often shoot from the rootstock. Where cankers are small, treatment involves paring back affected bark and wood with a sharp knife, and thoroughly soaking the trunks with an appropriate fungicide. If the label recommends it, apply the fungicide in conjunction with a white, water-based paint, as this helps to maintain contact with the fungicide and seals the wound. Where cankers are more extensive, and paring back affected bark and wood is impracticable, spray affected trees with a systemic fungicide from the *Chemical handy guide*.

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#### **NOTE**

Photographs of symptoms of these problems are contained in the *Macadamia problem solver & bug identifier field guide*.

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## **Questions about harvesting and handling**

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### **How often should I harvest?**

Harvest at least every four weeks wherever possible, particularly during extended wet weather or where nuts are exposed to direct sunlight. Nut quality will be improved and losses reduced the less time the nuts are on the ground.

### **How should nuts be handled after harvest?**

Dehusk the nuts within 24 hours of harvesting. This prevents deterioration from over-heating. This is particularly important where nuts are wet or the husks are green. While the nuts are being dehusked, do an initial sort to remove nuts that have obvious defects such as rat or insect damage, cracked shells or discoloured shells. Unless nuts are being immediately consigned to a processor, they need to be dried. The extent of drying depends on whether

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The Agrilink *Macadamia Sorting Guide* is a useful aid in sorting.

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See *Postharvest handling* on page 63 for more detailed information.

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or not flotation grading (water sorting) of nuts is going to be used to remove immature nuts. If it is, first dry down to about 12 to 17% moisture content (exact level depends on kernel recovery), do the flotation grading and then dry down again to the desired moisture content of about 8 to 10%. If flotation grading is not used, dry down directly to the 8 to 10% moisture content.

Drying needs to be completed within two weeks of harvest. If drying cannot be achieved within this time, contact your processor immediately and consign to them as soon as possible. Drying is achieved by forced-air drying (sometimes including heating), or where nut volumes are smaller, spreading out in thin layers on racks located in a cool, dry location such as a shed. Rake over the nuts on the racks regularly to ensure even drying.

Note that sorting is most important. Most nut buyers apply bonus payments for low levels of unsound nuts and penalties for high levels. This can make a significant difference to the value of a consignment.

### How do I sell my crop?

Nuts are normally sold to macadamia nut buyers (processors or exporters) in bulk, one-tonne bags or bins, after dehusking and partial drying on the farm. There are about 10 major buyers operating in the Australian industry. Cartage costs may be arranged and paid for by the buyer.

## Questions about chemicals

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### Do I need training in the safe use of chemicals?

In some states you cannot buy certain chemicals unless you have a current spray accreditation or have suitable authorisation. An authorised person is one who holds a chemical application certificate under the Australian Qualification Framework (AQF), or whose business is selling or supplying agricultural chemical products, or who is a state licensed spray contractor. Currently, by law in Queensland, you only need training in safe use of chemicals if you are a contractor spraying on other people's land or you want to buy or use restricted chemicals such as endosulfan. In New South Wales, it is a requirement under the NSW Pesticide Regulation that *all* persons applying pesticides as part of their job or business have completed accredited training. Most processors and buyers now see it as highly desirable for their growers to be able to demonstrate safe, responsible use of chemicals. One of the best ways to demonstrate this is to obtain chemical user accreditation. Remember spray accreditations must be renewed every five years.

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#### NOTE

In other states, check State Government regulations as these may differ from those in Queensland and New South Wales.

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See *Contacts* on page 193 for contact details for ChemCert in Queensland and New South Wales.

### How do I get spray accreditation?

Spray accreditation can be obtained by attending a course provided by an accredited ChemCert Australia (or equivalent) trainer. In Queensland the certificate is known as ChemCert Training Queensland Certificate of Agricultural Chemical Application. In New South Wales, there are SMARTtrain and ChemCert certificates. At present, no other certification is recognised by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

### How should I store my chemicals?

The DPI booklet *Farm Chemical Storage Guide* (Q199064) is designed to provide growers with a user-friendly, accurate guide to what is required by law and to comply with safety standards acceptable in today's workplace. The advice given reflects closely the Australian Standards AS 2507, AS 1940 and AS/NZS 4452, as well as the Workplace Health and Safety publication *Code of practice for the storage and handling of chemicals at a rural workplace*. It covers location, construction, management of stock, planning for emergencies and waste disposal. Further information on correct use of chemicals is covered in the ChemCert and SMARTtrain chemical user courses. Employees of farm chemical resellers with ChemCert and SMARTtrain accreditations are also a useful source of information.

### Do I need to keep a diary of spraying records?

At present the only records legally required in Queensland are those kept by chemical resellers to record S7 sales and those required for the usage of endosulfan. In New South Wales, it is law that records of pesticide applications be kept, including herbicides. Properly kept records of chemical applications are a critical documentation to prove your chemical application practices. Many buyers and retailers now expect their suppliers to keep detailed spray records and will require evidence that you are doing so.

It is a requirement of the Macadamia Industry Approved Supplier Program (MIASP) to maintain detailed spray application records. You should record: what block was sprayed and the area; what was applied; how much per 100 L and how much spray volume (L/area); what pest or disease was targeted; what application method was used and by whom; when the application took place and the prevailing weather conditions at the time.



Details of the information that needs to be recorded can be obtained from the NSW EPA (contact details available on page 194).

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#### WARNING

Legal requirements are subject to regular change and are likely to become more stringent over time. Regularly check with authorities for updated requirements.

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