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Macadamia culture in NSW

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INTRODUCTION

Macadamia is the most successful Australian native plant developed as a commercial food crop. It is a member of the *Proteaceae* family, with 2 major botanical varieties *Macadamia tetraphylla* and *M. integrifolia*. These originate from coastal areas of northern NSW and southeast Queensland respectively. Natural hybrids of the two species can be found near the NSW Queensland border. Commercial plantings are generally of the species *M.integrifolia*.

The oil content of kernel regularly exceeds 72 %, which is the highest for any oil-yielding nut. The nuts are eaten raw, dry roasted as a snack food, used in bakery products, ice cream, confectionary products and in the restaurant and food service industries. Although the macadamia is an Australian native plant, the cultivation of the plant was commercialised in Hawaii in the 1930s.

Many commercial cultivars that were selected in Hawaii are being grown in Australia. It was not until the early 1970s that the industry gained impetus in Australia when 120 hectares (ha) of grafted *integrifolia* trees were established at Dunoon. Over the past three decades macadamia plantings have expanded dramatically in northern New South Wales and southern Queensland and further development is likely as the demand for macadamias throughout the world increases.

INDUSTRY SIZE

Australia is the world's largest producer of macadamias. It is estimated that 5 million macadamia trees are planted in Australia, covering over 15 000 ha of land. Approximately 33 000 tonnes of nut in shell (NIS) was produced in 2003, with NSW producing 65% of the total crop. Table 1 shows the production of the major macadamia producing countries.

Table 1: World macadamia production statistics (2003)**

Country	Production tonnes (NIS)
Australia	33 000
Hawaii	22 000
Central America	17 000
South Africa	12 500
Kenya	8 800
Malawi	4 000

****Statistics courtesy of the Australian Macadamia Society**

LOCAL DEVELOPMENT

Expansion of the industry in northern NSW has been rapid and plantings now cover over 7 000 ha, mainly on red basaltic (Krasnozem) soil within 30 km of Alstonville. Smaller plantings are located on shallow podsolic soils south of Coffs Harbour. Isolated plantings in frost-free locations extend to the southern border and as far west as Quirindi. There are also extensive plantings in Queensland; in the Bundaberg, Gympie, Glasshouse Mountains and Atherton Tablelands regions.

SPECIES AND CULTIVARS

There are many cultivars of macadamia available. Approximately 80 % of those grown in Australia are Hawaiian selections and the remainder Australian selections. Common features sought in commercial cultivars include:

- early and regular bearing (often referred to as precocious)
- high kernel recovery
- kernels with high oil content and long shelf life
- adaptability to high density plantings
- complete nut fall at maturity (no 'stick tights' or nuts left in trees late in the season)
- strong limb structure
- resistance to insect and disease attack

Cultivar selection can have a major influence on macadamia profitability due to the long-term nature of tree crops. Select cultivars that are appropriate for the site and geographical location.

With any new plantings, a good approach is to plant a mixture of known reliable cultivars plus some newer ones with higher kernel recovery. Planting of at least 5 different cultivars is best. Planting more than 50 % new cultivars is not recommended, 30 % is considered ideal. It can take 10 years to fully evaluate a cultivar under local conditions, so take this into consideration when selecting very new cultivars..

Cross-pollination is important when growing macadamias so plant at least two cultivars with overlapping flowering time in a block. Avoid planting more than one cultivar in the same row as this may lead to disease, harvesting and storage problems.

Below is a summary of some commercial cultivars (Table 2). Before planting seek advice from experienced consultants, nurseries, growers and NSW Agriculture. Further information on commercial macadamia cultivars is detailed in the '*Macadamia AgrilinkKit'* and '*Macadamia Variety Identifier'* booklet.

Table 2. Commercially grown cultivar information.

HAWAIIAN SELECTIONS

Variety	Tree Shape	Canopy Density	Drop Pattern	Kernel Recovery (%)	Comments
246	spreading	moderate	mid season	30-36	Susceptible to wind damage
344	upright	dense	early	30-34	Fruit prone to nutborer
660	upright	moderate	very early	33-39	Small nut size, good for chocolate coating
741	upright	open	early	34-48	Susceptible to moisture stress
814	upright	open	mid season	34-38	Small tree
816	upright	Moderate	Early to mid season	39-45	
842	upright	open	mid to late	35-42	
849	spreading	moderate	mid to late	40-45	

AUSTRALIAN SELECTIONS

Variety	Tree Shape	Canopy Density	Drop Pattern	Kernel Recovery (%)	Comments
A4	spreading	open	mid season	40-45	Very precocious
A16	upright	dense	late	38-42	Precocious
A38	very upright	very open	mid season	approx 36	

SITE SELECTION

Selecting a suitable site for macadamia production is extremely important. The orchard site and design should allow for safe mechanical and cultural operations. By selecting a suitable site many potential problems can be avoided, such as the inability to harvest in prolonged wet weather.

Specialist assistance in orchard design is available from Department of Infrastructure, Planning and Natural Resources (DIPNR).

SOILS

Macadamias will grow on a wide range of soils but perform best on well-drained soils,

preferably 1-2 m deep and high in organic matter. Although macadamias will grow on steep hill sides and rocky sites, slopes of 15% or less are preferred for commercial operations. Machinery operation, cultural and harvesting operations are difficult and costly on sloping sites. Avoid steep slopes to minimise the risk of soil erosion. Avoid heavy clay soils, as they are prone to water logging during prolonged wet periods, which may result in root diseases and tree death.

CLIMATE

Select frost free areas, as even light frosts can damage young trees. Young trees can be protected from light frosts using tree wraps placed around the trunk to a height of 45 cm. Heavy frosts can affect flowers and leaves on mature trees, so it is best to avoid planting in frost prone areas.

Avoid locations where temperatures regularly exceed 38ºC. High temperatures reduce vegetative growth, increase premature nut drop, reduce oil accumulation and cause leaf burn.

WATER, RAINFALL AND IRRIGATION

Macadamias grow well in a climate where there are distinct wet and dry seasons. Irrigation is essential in the early tree establishment phase. However, research in NSW over 10 years indicated when annual rainfall ranged between 1200 mm and 2300 mm supplementary irrigation did not benefit producing trees. Irrigation increased nut number but decreased nut size and did not change total yield.

In low rainfall areas, particularly if evaporation rates are high, irrigation is needed during dry periods usually from October to March. Five megalitres per hectare is suggested, so access to permanent water is important.

Macadamia is sensitive to saline water. Water with a salt reading less than 1.2 dS/m (decisiemens per metre) is best for irrigation. Test irrigation water before and during use, as salt levels can vary.

WIND

Areas that do not experience strong winds are ideal. Macadamia trees do not have a clearly defined taproot and this makes young trees particularly sensitive to blow-downs in strong winds. Tree limbs also break easily. In windy locations select varieties accordingly and plant windbreaks. It is important to plant windbreaks around the exposed boundaries and along ridgelines. These windbreaks may also serve as a buffer to intercept spray drift and assist in noise reduction. It is preferable to establish windbreaks a few years before planting an orchard. Plant perimeter windbreaks at least 15 m from any macadamia trees. If there is space available, multi-row windbreaks (usually 3 rows of trees) are more effective. It is important to choose species that do not interfere with macadamia operations.

Trees with poor crutch angles like this one are prone to splitting, even in moderate winds.

Further information on suitable windbreaks is detailed in the NSW Agriculture book ‘Trees for the North Coast’ and Lismore City Council *‘Development Control Plan No. 27. Buffer Areas’*.

ROW DIRECTION

North-South row orientation is preferred to allow sunlight on both sides of the tree row. It is essential in designing row direction to allow for safe operation of machinery. Long rows maximise land use and efficient machinery operations. For more specific information on row direction and orchard design refer to the Macadamia grower’s handbook section *‘Establishing an orchard’*.

PLANTING DENSITY

Planting density depends on varieties, topography and future economic and management systems. Close plantings such as 7 m x 4 m have higher establishment costs but reach an earlier positive cash flow. Higher densities require pruning earlier in the orchard's life to allow machinery access. Wider spacing, such as 10 m x 5 m may be easier to manage as they will require pruning later, but the orchard will take longer to reach a positive cash flow. Most row and tree spacing’s are between the two examples, although there is interest in even higher densities.

PREPARING YOUR LAND

Establishing a macadamia orchard can be costly, and this investment can be jeopardised if sound planning and management strategies are not adopted.

The first activity is to take soil samples for chemical analysis, to determine available nutrients. Use these results to develop a soil amendment and fertiliser program. A fertiliser program can be developed from the soil analysis results.

Information on soil sampling can be obtained in NSW Agriculture Agdex 533 *'How to take a soil sample*'.

Well designed drains can help control runoff water. Uncontrolled runoff can result in soil loss, pollution of waterways and exposure of surface roots, washing away nuts and a general decline in tree health. It is far easier and cheaper to construct drains and watercourses before planting an orchard. Do not plant trees in drainage channels or low lying areas where runoff concentrates. For information on how to design and construct on-farm drainage refer to the Agfact *'Reducing erosion and other soil degradation in macadamia orchards'*.

Growing a green manure crop prior to planting has the benefit of increasing organic matter.

PLANTING TIME

Autumn is the optimum time for planting to avoid extreme temperatures and moisture stress. Avoid planting in the hottest part of the day. If a spring planting is required hand watering will be needed because of the likelihood of dry weather.

TREE MANAGEMENT

TREE PROTECTION

In areas where frost may be a problem, wrap the trunk of young trees in builder's foil, cardboard or use plastic tree guards. This will also protect the trunk from herbicide damage and sunburn. This will be needed for three to four seasons. Suckers below the graft union need to be removed several times each year.

NUTRITION

Young Trees

Young trees respond better to small more frequent feeding than a single large dose of fertiliser. Excessive fertiliser may kill young trees. Wait until the young trees have put on new growth before fertilising. Fertilise little and often, every 2-3 months from September to May. This is good for the trees and reduces the potential for fertiliser leaching and run-off. Apply fertilisers at least 10 cm from the trunk and spread evenly under the canopy and water in well.

Young trees have a high requirement for nitrogen and phosphorus but a relatively low requirement for potassium until bearing commences. Table 3 shows a suggested fertiliser program for young trees. It is best to use this as a guide but also monitor soil and leaf levels to fine-tune the program.

Soil and leaf analyses are valuable tools in the management of a bearing macadamia orchard. Soil analysis provides a snapshot of the presence and quantity of nutrients in the soil. Leaf analysis provides an insight into the uptake by the plant of available soil nutrients.

The optimum time for soil sampling is immediately after harvest and before flowering. Do not take a soil sample after fertiliser application. Soil needs to be tested at various locations throughout the orchard, especially where there are suspected differences in soil types or fertiliser history.

Table 3. Fertiliser program for non-bearing trees in phosphorus-fixing soils (eg Ferrosols of northern NSW).

Tree age	Number of applications	Rate DAP / application (g)	Total N applied / year (g)	Total P applied / year (g)
1	3	50	27	30
2	4	50	36	40
3	4	75	54	60
4	4	100	72	80
5	4	125	90	100
6	4	150	108	120

It should be clearly understood that this is a guide and growers should rely on leaf and soil analysis to adjust fertiliser requirements to their situation

Leaf sampling is best between September and November, before the spring leaf flush. For information on how to take a leaf sample refer to the *'Nutrition'* section of the *'Macadamia grower's handbook*'.

Bearing Trees

For bearing trees, base all fertiliser applications on leaf and soil analysis together with an allowance for nutrient removal. In addition, factor in the nitrogen requirement for tree vigour. Some cultivars such as the A series require a higher plane of nutrition to maintain tree health. Do leaf and soil analysis each year to guide nutrition management. Maintain records of fertilisers applied and yield responses. This allows fine-tuning of fertiliser programs for different blocks and different cultivars.

Soil pH should be maintained at 5 to 5.5 (1:5 water) or 4.5 to 5 (1:5 $CaCl_2$). Lime or dolomite may need to be applied occasionally (every 3-5 years) to adjust soil pH. Further information on managing the soil is available in NSW Agriculture publication *'Soil Sense. Soil Management for NSW North Coast Farmers'*.

There is a choice of fertiliser types, straight (single compound) or blends (mixed compounds) and organic or inorganic. The choice of these is a matter of personal preference. More detailed information on the major elements required by macadamia trees is available in the Queensland DPI publication, *'Growing Macadamias in Australia*'.

IRRIGATION

In the first year if conditions are dry apply up to 40 litres per tree each week. Increase this amount for older trees. Most growers in NSW do not irrigate trees after year four. Mulch is a useful method of maintaining soil moisture under trees and can be provided using a side delivery slasher on the interrow.

PRUNING AND TREE TRAINING

Tree training to develop a central leader should start in the nursery and continue after planting. Remove any growth below the graft. Prune any laterals below knee height as they will restrict machinery access. Inspect young trees regularly during the first few years and if needed remove some internal limbs to open up trees and allow wind movement through the canopy. This is especially important for upright varieties.

As trees become crowded, branch pruning, side pruning (hedging), top working or possibly tree removal in closely spaced orchards will be necessary to maintain machinery access and provide adequate light for tree productivity. All of these techniques form part of canopy management. Canopy management will be necessary from year 10 onwards to maintain a 2 m wide alley width for machinery access in narrow rows and year 13 for wider rows.

NSW Agriculture research has shown that a light biannual side pruning can be used to maintain orchard access without significantly affecting short term yield. Long term yield effects are still being assessed.

The most practical time to hedge is immediately after harvest. The pruned material can then be mulched and spread under trees. Mulch helps to suppress weeds and improves tree yield and health. Also skirt trees (hedging the lower canopy) to allow for ease of harvesting and weed control. Hedging also helps in maintaining light to the orchard floor, this helps with groundcover growth to protect the soil.

Side trimming is common to allow access for orchard machinery.

Topworking, or field grafting, involves changing the cultivar of mature trees by grafting new varieties onto the existing rootstock. It is used in a number of tree crops to change from one variety to a newer more productive variety. It can be used to reduce crowding and to rejuvenate trees. The alternative is to remove trees and replace them with new nursery stock.

WEED CONTROL AND UNDER TREE GROUNDCOVERS

Avoid spraying Glyphosate close to young trees as they are easily killed at low concentrations. Do not allow herbicides to come into contact with any part of the tree or trunk. Remove all suckers and leaves below the graft prior to weed spraying.

It is important not to have a bare earth approach to weed control. Only spray weeds when and where it is really necessary.

Maintaining a grassed interrow area with kikuyu *(Pennisetum clandestinum)* in the early stages and sweet smother grass *(Dactyloctenium australea)* in the mature orchard provides a valuable source of mulch, helps to control weeds and reduces soil erosion. Use of side delivery slashers to divert mown grass from the interrow area ensures mulch is built up where it is most needed, in the tree rows. Mulch not only aids in soil moisture retention but it also improves soil structure, moderates temperatures and helps to control weeds. Alternative mulches include composted nut husks, macadamia leaf and straw. Ensure the mulch does not come into direct contact with the tree trunk as this may cause collar rot.

As orchards mature the canopy closes over and the heavy shading causes light preferring groundcover species to die out. This leaves a bare interrow area which is vulnerable to soil erosion. Nutrients may be lost with the soil. This may cause a decline in tree health. Exposed roots may cause difficulties in mechanical harvesting.

The effectiveness of groundcovers for erosion control has been well demonstrated. Smother grass is currently the best groundcover species for stabilising soil in very low light conditions in mature orchards. More detailed information is available in NSW Agriculture Agnote DPI-331 *'Reducing erosion and other soil degradation in macadamia orchards'* an Agnote DPI-382 *'Sweet smother grass- a perennial groundcover for subtropical orchards'*.

PESTS AND DISEASES

In all horticultural production Integrated Pest and Disease Management (IPDM) is the preferred approach. IPDM in macadamias is based on effective monitoring, with a high level of knowledge on the biology of the pests and diseases and their controls. Monitor pest and disease populations weekly from flowering to nut maturity. Decisions can then be made on the need of treating pests or diseases. Excellent information on pests and diseases can be found in the 'Macadamia grower's handbook' and *'Macadamia problem solver and bug identifier'*.

Do not adopt a 'spray insect on sight' approach. Many insects pests when present in low numbers are effectively controlled by predators and do not require spraying. Avoid overuse of broad spectrum insecticides as they may induce an explosion in pest numbers by killing off predators.

RODENT DAMAGE

Rats are fond of macadamia nuts and are adept at gnawing through the hard shell to eat the kernel. The black rat *Rattus rattus* is the most common rat species found in macadamias in NSW. Remove surrounding overgrowth (eg Lantana) and maintain grass headlands which can be a haven for rats. Predators such as owls, hawks and snakes help keep numbers down. A control program for rats using poison baits in waterproof enclosures may be necessary.

DISEASES

Trunk canker caused by the fungus *Phytophthora cinnamomi* can severely damage or kill trees in the nursery as well as weaken trees in the orchard. The fungus usually enters through bark damaged by orchard equipment. Infection causes red gum to exude. This

progresses to deep furrowed cankers which, if left unchecked, will ring bark and kill the tree. Infected trees usually have yellow leaves and are stunted, often setting heavy crops of low quality nuts.

Treat the trunks of infected trees with a mixture of fungicide and a white water based paint. Avoid poorly drained sites.

Husk spot, caused by the fungus *Psuedocercospora macadamiae.* is a serious problem in macadamia orchards. Infected nuts drop prematurely, giving poor kernel quality. Control has been achieved by applying fungicides such as copper sprays and fungicides from early fruit set onwards.

A husk spot lesion on a nut in husk. If not controlled, this disease can cause immature nuts to fall.

Blossom blight caused by the fungus *Botrytis cinerea* can cause economic damage to flowers during prolonged wet conditions in late winter and spring. The fungus has a wide host range and powder like spores can travel in air currents over many kilometres. The wet conditions which induce the disease make application of sprays difficult and reduce effectiveness of the fungicides.

INSECT PESTS

Macadamia flower caterpillar *(Homoeosoma vagella)* can severely reduce a nut crop if left uncontrolled. The adult moth is most active during the main flowering period from July to October. Eggs are laid on the flower buds and can be confused with immature scale insects. Larval feeding destroys buds and flowers leaving the raceme covered by webbing.

Fruit spotting bug and **green vegetable bug** *(Amblypelta nitida, A. lutescens* and *Nezaria virdula)* feed by puncturing the nuts. If small nuts are damaged they will shed but older nuts do not drop and damage may not be detected until processing. A small number of insects can cause considerable damage.

A heavy fall of green nuts prior to the end of natural thinning may be a sign of insect activity. Dissect nuts to see if it is bug damage or just natural thinning. Damage can occur from early nut set until early harvest.

Macadamia nut borer *(Cryptophlebia ombrodelta)* is an important pest of macadamia. Larvae penetrate to the forming kernel of young nuts, and develop in the husk of nuts after shell hardening. The latter causes premature nut drop and immature kernel. Eggs are white to red, scale-like about 1 mm in size and are often found in the join of the husk. Monitoring is required from November to March.

Macadamia feltid coccid and **latania scale** *(Eriococcus ironsidei* and *Hemiberlesia lataniae)* are a problem in orchards where infested propagating material has been introduced and where natural enemies do not keep them under control. Heavy infestation can distort and stunt new tree growth and cause dieback and/or death of nursery trees. Sometimes infested trees can be detected by a dull bronze colour in the foliage. Latania scale can cause death of tips and small laterals.

Macadamia twig girdler *(Neodrepta luteotactella)* can be active from spring to autumn. The larva girdles twigs at forks or leaf whorls and often web leaves together. In young trees it can cause severe stunting and even death. Larvae can tunnel into nuts of bearing trees although this is usually a minor problem.

Macadamia leafminer *(Acrocercops chionosema)* tunnels under the surface layer of leaves, sometimes on both sides of the leaf, causing young foliage to crumple. It is most severe on the new flush of young trees and during the spring growth flush of mature trees.

MACADAMIA DECLINE

Macadamia decline is a condition of unknown cause. It appears to be caused by a combination of related soil conditions which lead to the rundown of tree function. Trees eight years or older on marginal soils are most affected by decline, which is usually worse on steeper eroded slopes, following stress. Leaves turn bronze or yellow and fall prematurely. Some cultivars are more affected by decline than others.

Trials with trees showing severe decline indicated heavy mulching restored root health vigour and reduced decline symptoms. Maintaining a permanent groundcover reduces root exposure and encourages fine feeder

roots which in turn reduces macadamia decline. Further information is contained in the NSW Agriculture Agfact *'Macadamia Decline*'.

FLOWERING

Flower initiation occurs during May with cool weather and shortening day length. In some years there is an early flowering and later flowering. The flower cluster is a raceme with 200 or more flowers. The flower has four stamens and an ovary with two ovules. The flowers first open from the basal end of the inflorescence and may take up to one week to fully open. After flowering only one ovule is fertilised. Although macadamias flower profusely, rarely more than 1% of these set nuts.

Although flowering profusely, only a small percentage set nuts.

About five to eight weeks after flowering, considerable nut drop occurs when nuts are about pea size. This is the trees natural adjustment of crop load. Shell hardening takes place in early December followed by rapid oil accumulation in late December and January.

HARVESTING, DEHUSKING AND SORTING

Preparation for machine harvesting begins in late summer with a pre-harvest cleanup before mature nut drop begins. This consists of mulching immature early fallen nuts and grass to aid in harvesting. Mature nuts begin to drop in mid February and continue until August/September. A range of mechanical harvesters are available to suit different sized orchards. All use finger wheels to pick up nuts. Early season rounds of harvesting often produce high levels of immature nuts and other quality problems. It is therefore important to keep nuts separate from different rounds of harvesting.

Most fallen nuts are still enclosed in a husk. This needs to be removed within 24 hours of harvesting to prevent deterioration in kernel quality. This is particularly important where nut in husk is green or wet. Husks can be removed and composted away from sheds for later spreading as mulch under trees.

Finger-wheel harvesters like this one are commonly used to harvest nuts.

After dehusking, inspect and remove all nuts with rat and insect damage, cracks, open micropyle, germination, dark or discolouration and any foreign matter. Nuts are generally also water sorted to remove immature nuts that can not be detected during visual sorting. Different varieties have different optimum moisture contents for water sorting and these need to be used to get optimum results. After water sorting, nuts can be delivered immediately to the processor or dried on farm. When handling nut in shell, ensure that drop heights are less than 2 metres to avoid bruising and fracturing of kernels. Further information on sorting and maintaining quality can be found in the 'macadamia grower's handbook'.

Nut in shell (NIS) is consigned to processors where they crack and dry kernel to 1.5% moisture. Growers are paid for percentage kernel recovery, quality and weight of nut in shell adjusted to 10 % moisture. Deductions are made for unsound kernel. Problems may include shrivelled kernel, insect, discolouration and mould damage.

YIELDS

Average NIS yield at 10 percent moisture for mature trees is about 3-3.5 t/ha. Table 4 shows indicative yields of macadamias. These yields can vary dependent upon seasonal conditions and orchard management.

Table 4. Expected Yield (kg nut in shell from 250 trees/ha)

Year	yield per tree	yield per hectare
1	0	0
2	0	0
3	0	0
4	0	0
5	1	250
6	2	500
7	4	1000
8	6	1500
9	8	2000
10	10	2500
11	12	3000
12	14	3500

MARKETING AND PRODUCTION

Macadamias compete in the luxury end of the international nut market. In excess of 70% of macadamia production in Australia is exported. Annual production continues to grow and to accommodate this increased production the industry has an active marketing campaign to increase sales in Europe, Japan, North Asia and the USA.

Figure 1 indicates average gross returns to growers for NIS based on 33% sound kernel recovery and 10 % moisture content.

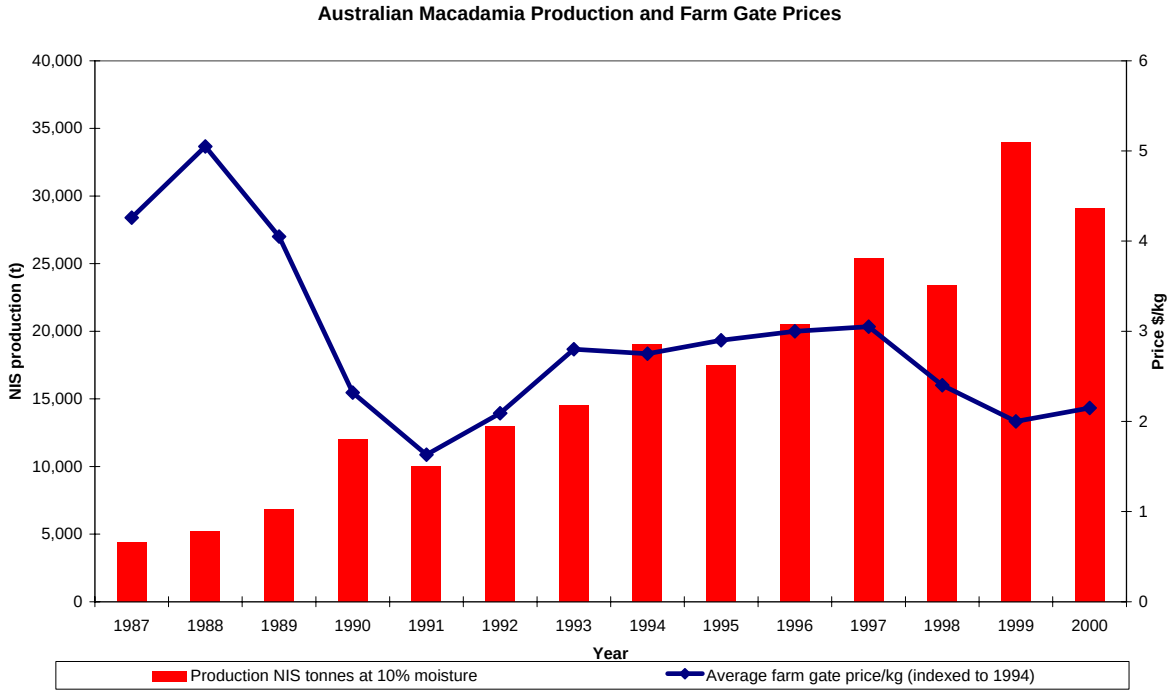

Figure 1. Macadamia production and the price of nut in shell received by growers.

BUSINESS MANAGEMENT AND RECORD KEEPING

Maintaining records is an important part of management in macadamia orchards. Detailed records enable the orchard to be run cost effectively and efficiently. They enable the grower to satisfy both processor and regulatory requirements. Trends can be observed and annual performance monitored to help in

decision making. A macadamia farm record keeping system, MacMan has been developed. MacMan is a complete farm recording system which will satisfy requirements for both processors and regulatory authorities. It is computer based and has many powerful functions. For more information see http://www.dpi.qld.gov.au/macman.

QUALITY ASSURANCE

Quality assurance (QA) is a term used to describe all of the practices in a business that provide both the business and its customer's with confidence that produce will consistently meet the specified food safety and quality requirements. The Macadamia industry has developed an Approved Supplier Program (ASP) for macadamia growers that will meet the requirements of the major users of macadamias around the world. Processors have in place higher levels of quality assurance programs such as HACCP and ISO 9002.

FURTHER INFORMATION

Growers can become members of the Australian Macadamia Society (AMS), which is the peak national industry body, representing the interests of macadamia growers. The AMS publishes a news bulletin six times annually, providing the industry with current information on research and other relevant issues. All growers contribute to research and marketing through a national compulsory levy program.

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.

ALWAYS READ THE LABEL

Users of agricultural or veterinary chemical products must always read the label and any permit, before using the product, and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from compliance with the directions on the label or the conditions of the permit by reason of any statement made or not made in this publication.

FURTHER INFORMATION

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (May 2005). 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 New South Wales Department of Primary Industries or the user's independent adviser.