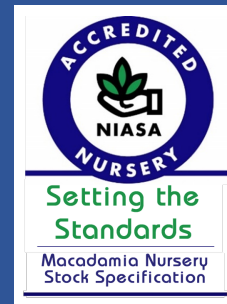


Australian Plant Production Standard (APPS)



Macadamia Nursery Stock Specification

Nursery production of high-quality macadamia planting material and establishing an industry specification is recognised within Australia as playing an important role in supporting the Australian macadamia nut production industry. Purchasers of macadamia nursery stock require assurance that stock purchased meets an industry standard, is true-to-type, and that appropriate steps have been taken to reduce the chance of introduction of serious pests and diseases into the production environment.

Administration and auditing of the technical aspects for macadamia high-quality nursery production are now incorporated into the Nursery Industry Accreditation Scheme, Australia (NIASA) program. Macadamia best practice production requirements have been included into the 8th edition of the NIASA BMP Guidelines in the new Macadamia Nursery Stock Specification Appendix 15.

Macadamia Nursery Stock Specification: The stamp of assurance that provides businesses with:

- A systematic approach for producing 'superior' macadamia planting material
- Consistent product quality meeting the industry standard
- Protection of the production environment from serious pests and pathogens
- Independent audits, guidance and technical support from GIA Auditors and Technical Officers

The Macadamia Nursery Stock Specification

The Macadamia Nursery Stock Specification (APPENDIX 15) in the 8th edition of the NIASA BMP Guidelines provide specialist guidance to macadamia production nurseries and allow an interested business to become NIASA accredited for meeting macadamia nursery production standards.

What is NIASA?

NIASA is the national nursery industry's Best Management Practice (BMP) program for production nurseries, growing media manufacturers and greenlife markets. It is supported by the NIASA BMP Guidelines. Businesses may use the Guidelines as a reference or guidance document to improve their cropping systems without formal accreditation. HOWEVER, a business may also consider formal, annually externally audited, NIASA accreditation to demonstrate to customers that they meet industry best practice standards.

ALL auditable requirements within the Specification (see the audit checklist included within Appendix 15) must be found to have been implemented to at least a satisfactory standard for a business to be considered eligible to be granted accreditation against the specification.



Australian Plant Production Standard (APPS)



Macadamia Nursery Stock Specification

It is important to note the following:

1. NIASA is a continual improvement program under the national framework of the Australian Plant Production Standard (APPS) which includes EcoHort and BioSecure HACCP programs.
2. The NIASA BMP Guidelines are a large document; HOWEVER, it provides best management practice guidance across several industry categories (production nurseries, growing media manufacturers and greenlife markets). For this reason, it is important to note that not all the content of the NIASA BMP Guidelines may apply to you – only relevant areas.
3. For macadamia nursery stock production, the key sections are Chapters 1 to 4 of the Guidelines - and its associated **APPENDIX 5** (the nursery production checklist), **APPENDIX 12** (Freight and logistics) and **APPENDIX 15** (the Macadamia Nursery Stock Specification and its attached audit checklist).
4. Although a business may not necessarily be fully compliant in every area, a business may still be successful in gaining NIASA accreditation – should it be able to demonstrate to an auditor that there are steps being taken to make improvements in those areas. **The exception to this** are criteria highlighted in grey in the audit checklist. For these criteria, a business must be found to comply to these requirements to a satisfactory standard before receiving formal NIASA accreditation.
5. Businesses are audited against each auditable criteria using the checklists in the NIASA BMP Guidelines.

Application for NIASA Macadamia Nursery Stock Specification:

Complete and submit an application for NIASA accreditation form to GIA. Tick the appropriate checkboxes and complete the form in accordance with the instructions provided. To apply for NIASA, or for further enquiries on NIASA Macadamia Nursery Stock Specification accreditation please contact:

- email: biosecure@greenlifeindustry.com.au Phone: (02) 8861 5100

Greenlife Industry Australia

Phone (02) 8861 5100
Email biosecure@greenlifeindustry.com.au
Web <https://www.greenlifeindustry.com.au/>



**Extract from NIASA Best Management Practices
Guidelines**

APPENDIX 15 MACADAMIA NURSERY STOCK SPECIFICATION 235

A.15.1 Introduction 235

A.15.2 General production nursery requirements 235

 A.15.2.1 Water 235

 A.15.2.2 Growing media / propagating media 236

 A.15.2.3 Beds and benching 236

 A.15.2.4 Disinfestation and hygiene 237

A.15.3 Source materials to be used for propagation 240

 A.15.3.1 Source blocks 240

 A.15.3.2 Propagation material collection records 241

 A.15.3.3 Parent tree variety identification 242

A.15.4 Material collection and handling 243

 A.15.4.1 Seed nut 243

 A.15.4.2 Budwood 244

 A.15.4.3 Notes on Cuttings 247

A.15.5 Propagation 248

ACCREDITATION IN THE NURSERY INDUSTRY

CONTENTS

A.15.5.1 Sowing seed.....	248
A.15.5.2 Transplanting / potting up seedlings into a final container	255
A.15.5.3 Grafting.....	258
A.15.5.4 Labelling of grafted trees	260
A.15.6 Plant health monitoring.....	260
A.15.6.1 Inspection and monitoring	260
A.15.6.2 Inspection procedure - Above ground plant parts	262
A.15.6.3 Inspection procedure - Below ground plant parts (Sentinel trees).....	264
A.15.6.4 Maintaining records of inspection.....	266
A.15.7 Pathogen testing.....	267
A.15.7.1 NIASA approved testing laboratories.....	267
A.15.7.2 Maintaining records of testing	267
A.15.8 Product quality and meeting customer expectations.....	267
A.15.9 Auditing for compliance and continual improvement.....	268
SCHEDULE 1: GROUP 1 and GROUP 2 PATHOGENS.....	271
SCHEDULE 2: EXAMPLE RECORD SHEETS.....	272
MACADAMIA NURSERY STOCK SPECIFICATION CHECKLIST	276

APPENDIX 15 MACADAMIA NURSERY STOCK SPECIFICATION

A.15.1 Introduction

Nursery production of high-quality macadamia trees is recognised within Australia and abroad as playing an important role in supporting the macadamia nut production industry.

Purchasers of macadamia nursery stock require assurance that stock purchased meets an industry standard, is true to type, and that appropriate steps have been taken to reduce the chance of introduction of serious pathogens into the production environment.

In order for a production nursery to be eligible to be accredited as meeting the Macadamia Nursery Stock Specification, the production nursery **must** be:

- NIASA accredited; **AND**
- be found at audit to have implemented mandatory procedures (indicated through use of the term **must**) within this Appendix to a **Satisfactory standard** (see Section [A.15.9 Auditing for compliance and continual improvement](#) and the [MACADAMIA NURSERY STOCK SPECIFICATION CHECKLIST](#)).

A.15.2 General production nursery requirements

The production nursery **must** take steps to mitigate the risk of human assisted entry and spread of plant pathogens into and within the production area. High risk entry pathways include water, growing media, and contamination of production areas through movement of people and equipment.

A.15.2.1 Water

Irrigation water **must** be managed in accordance with the requirements provided in NIASA Section [1.1.1 Water](#).

Key requirements – Water

- Water that is obtained from town suppliers, bores free of surface run-off or clean roof catchments does not require disinfestation.
- Other sources of irrigation water (creeks, dams, rivers etc.) **must** be disinfested using an approved NIASA disinfestation procedure.
- Subsequent storage of disinfested/clean water requires facilities and procedures **must** be established and implemented that do not allow for contamination by untreated water, soil, plant debris, dust and animal movement.
- The pH and EC (Electrical Conductivity) of all water sources **must** be checked and recorded at least once per month as even town water supplies can have variations in quality.
- Water from surface supplies, springs, effluents, or water testing positive for the presence of root-rot organisms **must** be disinfested using a NIASA approved method.

- Please note APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST [SECTION 1: Water and irrigation](#) for a complete list of all audited criteria.

A.15.2.2 Growing media / propagating media

Growing media **must** be managed in accordance with the requirements provided in NIASA Section [1.1.2 Growing media/propagating media](#).

Further information

- Production of macadamia trees occurs over a longer duration than most other nut/fruit trees - on average 12 to 24 months. As a result, it is important to ensure that high quality potting media is used to avoid breakdown of the media over this extended time period. The long time period also has the potential to cause problems in other areas such as nutrition and irrigation management.
- A good quality long lasting media designed for macadamias is essential if root health, and therefore tree health, is to be maintained. Of particular importance is air-filled porosity as this will decline over time as the media degrades.

Key requirements – Growing media / propagating media

- Growing media/propagating media that is sourced from a NIASA accredited growing media supplier does not require additional pathogen testing and treatment prior to use.
- Growing media/propagating media that is sourced from a non-NIASA accredited growing media supplier **must** undergo treatment or pathogen testing, and where pathogens are detected – treatment, prior to use.
- Growing media/propagating media prepared on-site which includes components that pose a risk of contamination, for example river sand, **must** be disinfested using an approved NIASA disinfestation procedure.
- Each batch of growing media **must** be tested for EC (Electrical Conductivity) and pH using suitable equipment. Adequate records of all growing media **must** be maintained, including pH and EC.
- Growing media/propagating media **must** be stored in a manner to prevent contamination prior to use.
- Please also note APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST [SECTION 2: Growing media](#) for a complete list of all audited criteria.

A.15.2.3 Beds and benching

Beds and benching **must** be managed in accordance with the requirements provided in NIASA Section [1.1.16 Beds and benching](#).

Key requirements – Beds and benching

- **Ground level propagating beds.** Beds **must** be totally isolated from soil (e.g. with the use of black plastic) and **must** be free draining. Beds **must** not be subject to flooding during periods of heavy rain.

- **Production beds for containerised stock.** The surface of the bed and the pathways adjacent to it *must* prevent contact of the plant, the plant roots or the container, with soil or water contaminated by soil (or growing media) or water draining from other containers or from any other possibly contaminated sources (e.g. road base). Pooling of water is not permitted.

Coarse gravel or crushed rock covered surfaces *must* be well drained and the gravel aggregate (screenings of 10mm to 25mm diameter) *must* be a minimum of 75mm deep and preferably deeper.

Concrete, polythene or bitumen is permitted where they are covering properly consolidated surfaces and exceptionally good drainage occurs, and all other hygiene practices are satisfactory. Beds with these surfaces *must* not pool water and *must* be separated as much as possible from adjacent production sites in terms of water runoff.

- Benches spanning or adjacent to either properly sealed or aggregate surfaced floors and paths need not be higher than 30cm. However, where splash and other methods of contamination are likely to occur, a suitable bench height is 75cm or higher.
- Please also note APPENDIX 5 NIASA PRODUCTION NURSERY CHECKLIST [SECTION 3: Propagation](#) for a complete list of all audited criteria.



Image 1 – Poor drainage creates a serious risk to plant health and quality.

A.15.2.4 Disinfestation and hygiene

To minimise the risk of movement of plant pathogens into and within the production area, disinfestation and hygiene procedures are paramount in any production nursery.

Hygiene means taking steps to prevent things from becoming contaminated where possible. Hygiene steps include avoiding contact of items with potentially infested surfaces, for example keeping hose nozzles and hand tools off the nursery floor.

Disinfestation, or sanitation, means removing contamination from potentially infested items. Chemical disinfectants or detergents and heat treatments are still the most reliable methods for the control of most plant pathogens. When preparing disinfectant or detergent solutions:

- Follow all label requirements and safety precautions when handling chemicals.

the root and if the suture line faces straight down the shoot will emerge and follow the curve of the nut around leading to a bend in the shoot. (see [Image 6](#)).

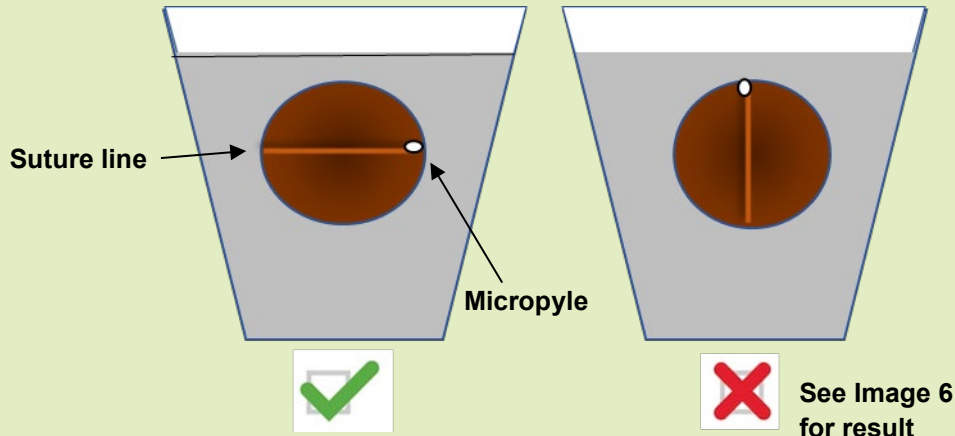


Image 6 – Effect of poor seed orientation. All of these seedlings are unsuitable for use. Courtesy of Chris Searle and Kim Wilson.

When placing the nuts in the sand bed they should be evenly spaced to prevent a nut that rots from contaminating nuts in close proximity and allows the seedlings to be removed from the sand bed with minimal damage.

Further information

- Spacing techniques may vary, however one method of ensuring nuts are evenly spaced is to purchase a piece of 40mm x 40mm weld mesh and press this into the sand before planting. Nuts are then placed evenly in the middle of each square. A 40 x 40mm grid will give a nut density of 400 nuts per square metre of sand bed.



Image 7 – Example of use of mesh sheeting to assist in planting



Image 8 – Example of seedlings ready for removal, inspection and transplanting.

Further Information

- There is some debate as to whether nuts should be placed just below the surface of the sand or at a maximum depth of 25mm above the seed surface. Placing the nuts at a depth of 25mm reduces the chance of them drying out as readily as nuts placed just below the surface.
- Planting the nuts at depths greater than 25mm above the seed surface is not recommended as this increases the germination time which may lead to more nuts rotting. It is also more difficult to remove the seedlings from the sand bed.

Managing the sand bed

The seed nuts in the bed should be kept damp but not wet.

Seed beds **must** be regularly checked for the presence of pest, disease and for weed growth (see Section [A.15.6.1 Inspection and monitoring](#)).

Further information

- The frequency of irrigation required will change with season and with daily weather. Nuts may be checked regularly by digging one or two up to check on the progress of germination and the how wet the nuts are.
- Watering the seed bed late in the afternoon in late autumn or winter may reduce seed bed temperature, through evaporative cooling, and lead to slower germination. A cool wet sand bed is also likely to be more conducive to pathogen development. Similarly, when the seedlings have emerged, they should not 'go to bed' wet at night as this may encourage pathogen development.
- When the seeds have germinated, consider keeping the surface of the sand cool as the emerging shoot tip is very delicate and easily damaged. Sand can easily heat up and retain enough heat to damage the shoot tips.

SCHEDULE 2: EXAMPLE RECORD SHEETS

The following recording sheets are examples of how the mandatory record keeping for NIASA can be achieved.

There is no requirement to use these sheets but they indicate the information that **must** be kept in accordance with the NIASA Macadamia Nursery Stock Specification.

Records **must** be made available to the Auditor when requested.

- Source Block Record - (Example)
- Propagation Material Collection Record – (Example)
- Crop Monitoring Record - (Example)

Accredited Business (Name): _____

Source Block Address: _____

Source Block Reference (Name or Code): _____

SECTION A – Property Ownership Details

Owner name/business name: _____

Other details if applicable: _____

SECTION B – Block Details

Date block record started: _____

Lot on Plan Number OR GPS
coordinate at centre of block: _____

Variety or varieties present: _____

Number of rows present in the
block if more than one variety
present: _____

Map attached with block identified? Yes

SECTION C – Variety identification

How is parent tree variety
determined at or prior to material
collection?

Records are attached (genetic test results, varietal improvement program records, PBR etc.)

AND/OR

Examination of all or a combination of the following morphological trait/s below.

- Tree shape Tree size Tree density
 Leaf length Leaf width Tip shape Leaf spines
 Husk shape Shell features
 Other (specify) - _____

SECTION D – Identification of trees where there is more than one variety present in the source block

Description of how parent trees to
be harvested in a mixed block will
be identified within the block (for
example a tag placed on each tree,
a row number and tree number in
row, GPS or other method): _____

SECTION E – Any other comments

Macadamia Nursery Stock Specification Propagation Material Collection Record

Example Record

Accredited Business (Name): _____

Source Block Address: _____

Source Block Reference (Name or Code): _____

Collection Details						
Date:	Collector name:	Material type:	Variety	Amount:	Batch code:	Comments:
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
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		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				
		<input type="checkbox"/> Seed nut <input type="checkbox"/> Budwood/scion				

CHECKLIST: Macadamia Nursey Stock Specification *Continued*

MATERIAL COLLECTION AND HANDLING

Seed nut

Seed nut is stored under appropriate storage conditions

Stored seed nut batches are labelled to identify variety, block code, collection date and a unique batch code

Batches of seed nut can be traced back to the *propagation material collection record*

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:

Budwood / scion material

Budwood has been girdled

Material is stored under appropriate storage conditions

Stored material is labelled to identify variety, block code, collection date and a unique batch code

Batches of material can be traced to the *propagation material collection record*

Needs Attention	Being Upgraded	Satisfactory	Complies Fully	Doesn't Apply

Comments:
