NSW DPI

MANAGEMENT GUIDE

2008

Establishing and managing smothergrass on macadamia orchard floors

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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This guide brings together the best available information on the establishment and ongoing management of smothergrass, a covercrop which reduces erosion in an orchard by up to 99 per cent and allows for nuts to be machine harvested off the ground. Growers share their experiences in this guide on the practices they have found to be the most efficient for successful smothergrass establishment and management. These growers acknowledge the numerous benefits of a smothergrass covercrop, such as stopping erosion and reducing the loss of nuts in run-off water during heavy rain. By combining the collective knowledge of growers and over 20 years of research this guide provides the most up-to-date information available on topics such as how to ensure efficient harvesting is achieved from smothergrass.

This project is facilitated by Horticulture Australia Limited (HAL) in partnership with the Australian Macadamia Industry and funded by voluntary contributions from the Australian Macadamia Society. The Australian Government provides matched funding for all HAL's research and development activities.

ISBN 978 0 7347 1923 2

Check for updates of this Guide at www.dpi.nsw.gov.au

Acknowledgments

We thank the Australian macadamia growers who participated in developing this guide.

Elizabeth Broad	Cliff James	Greg James
Bob Howard	Peter Squires	Frank Spinaze
Ian Savins	Neil Sowerby	David Empson
David Jones	Mark Jones	David Rogers
Ian Hotson	Andrew Seccombe	John Horsey
Kim Wilson	Len McPaul	Merv Dudgeon
Geoff Johns	Graeme Humphreys	Ray Margules

Disclaimer

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

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Contents

Introduction

Mature macadamia orchards become highly shaded, causing grass to die out. The resulting bare soil and high intensity of rainfall can cause significant erosion. This makes the use of covercrops in macadamias an integral part of erosion control. Covercrops provide a vegetative cover that binds the soil, slows water movement within orchards and provides increased traction for machinery during wet periods.

After considerable research by NSW Department of Primary Industries, it has been found that the most suitable species for use is smothergrass (*Dactyloctenium australe*). Consultation with industry members led to the development of a list of criteria to evaluate covercrops against. These were:

- Shade tolerant
- Grow and persist in reasonably shaded orchards
- Low growing
- Requires little mowing in the harvest season
- Allow mechanical harvesting to work effectively
- Withstand orchard traffic.

A bare inter-row due to shading, which is vulnerable to erosion without groundcover.

Water-flow down a tree row during a storm event. Notice how the water is flowing down the drip line and over the exposed soil.

Why use a smothergrass covercrop?

Many benefits arise from using a covercrop, most notably the improved sustainability of an orchard. Some more measurable benefits are:

- Reduced soil erosion – research has found that a covercrop of smothergrass in the inter-row can reduce erosion in mature macadamia orchards by 99%
- Reduced water run-off volume and speed
- Reduced nutrient load in run-off water
- Reduced loss of nuts in run-off water during heavy rain
- Less nuts trapped between exposed roots
- Improved soil structure
- Improved soil organism diversity
- Improved aesthetic value – no more bare earth.

Critical / important factors for success

To successfully establish and maintain smothergrass as a covercrop in macadamias the following needs to be addressed:

- Commitment to managing the covercrop
- Willingness to change management practices to suit the grass
- Preparedness to mow the sward frequently
- Water for irrigating the grass at planting if the weather stays dry

The loss of nuts due to bare soil and storms can result in significant nut loss.

The exposure of roots due to erosion can cause significant harvesting difficulties.

Establishment

When do I establish smothergrass and what planting rates do I use?

Young orchards

Establish smothergrass when trees are 4 to 5 years of age, before shading becomes a problem. This may be modified depending on row spacing and site characteristics. Also consider when you will begin commercial harvesting, which for many varieties is 7 years of age.

For young orchards, the planting density of smothergrass can be low as there should be other grasses growing in the inter-row. This also keeps expenditure low as there is little revenue from the orchard. For example, use of the pot planting machine allows more flexibility for planting location and density. Planting one pot every 4 metres down each side of a tree row would give adequate coverage over an inter-row in 3 to 4 years from planting.

Smothergrass will establish best in areas where other grass is not growing well, even in full sun. It is best to establish it along the drip line and away from tractor tyre tracks during its establishment phase, bearing in mind that this is a high risk area due to herbicide application. A low mulching of the inter-row before sprigging will help planting and establishment of smothergrass.

Handy Hint

Preferably, start planting smothergrass before you have a bare soil problem. This will allow you to plant at a lower density and develop a management system for the cover crop.

A 4-year-old macadamia orchard that is at an ideal stage for planting smothergrass.

A mature orchard before and after smothergrass establishment.

Figures above and below. It is best to carry out drainage works and mounding before planting smothergrass.

Mature orchards

Establish smothergrass when light is available within the orchard. It is almost impossible to establish any covercrop in full shade, such as where tree canopies have grown over the inter-row.

Runners planted in full sun will spread to shaded areas over time. This is a good approach as it allows strong 'mother plants' to be established which will feed the runners as they spread into the shade.

Tyne planters or pot planters can be used in a mature orchard. Where rapid coverage is needed the best option is to plant at a high density (e.g. one pot every 2 metres down each side of the tree row) so the inter-row can be covered more quickly.

Drainage or other earthworks should be carried out prior to establishing smothergrass. Uneven soil surfaces can have depressions that will trap nuts and be difficult to harvest out of. A low mulching prior to planting can alleviate much of this problem.

What time of the year do I plant?

The best time to establish smothergrass is when there is adequate soil moisture and rainfall is likely. For this reason, the best planting period is late January to June on the NSW north coast. This can make the first season's harvest difficult as you are planting and beginning harvest operations at the same time. If there is sufficient rainfall then planting earlier in this period is better because it gives the grass more time to establish before harvesting begins.

Smothergrass can be planted during winter but if the site is prone to frost, it should not be undertaken as the grass just after planting is susceptible to being killed by frost.

Spring planting can be undertaken if there is adequate soil moisture available or you are prepared to water the grass until there is good rainfall. When planting by hand; plant throughout the year following adequate rainfall.

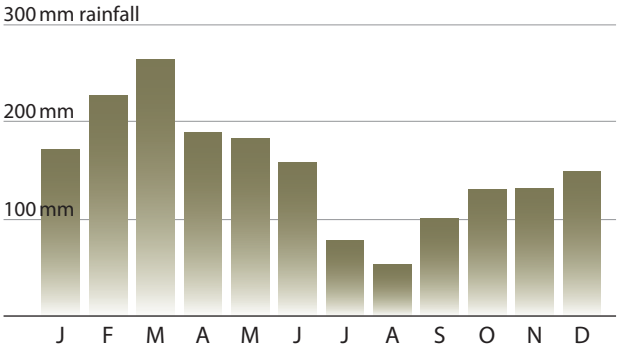

Figure 17. Mean monthly rainfall (mm), Alstonville NSW, 1964 to 2007

What different planting methods are available?

There are many ways to establish smothergrass . You can:

- plant smothergrass as sprigs or pots of grass by hand
- cut turf rolls into thirds and roll out as strips
- cut turf into squares and plant
- use a planting machine.

Below is information on the two most commonly used machine methods, the pot planter and tyne machines.

Handy Hint
Many people have established smothergrass on farm by digging with a hoe and pushing a sprig in when it is raining.

Pot planter

The pot planter system uses a piece of round pipe rotating end over end to cut holes into the soil. A prepared pot of smothergrass is placed into each hole. A set of press wheels behind the machine firms the soil down around the pot of grass removing any air spaces. The pots used are made from paper (e.g. Jiffy pots®) and contain individual plants of smothergrass that have a well developed root system and are actively growing. The whole pot is planted in the ground and the pot breaks down over time. This type of pot reduces handling as standard plastic pots need to be removed before planting.

Two people are required for this operation; a tractor driver and one person on the planting machine. In a typical day, 4000 pots at 2 m spacing can be planted. This equates to 8 km of orchard row (if you are planting a single run down the inter-row).

There are some simple and effective ways to establish smothergrass. The machine options have been outlined here as they have been found to be effective for large scale plantings.

A pot of smothergrass. Notice the well developed root system.

Pots of smothergrass ready for planting.

Tyne based sprigging machines

Two types of tyne based machines are available. Both work on opening a furrow and placing sprigs of smothergrass into the furrow, with press wheels closing over the furrow.

Single tyne machine

The single tyne machine is similar to a vegetable transplanter. An operator sits on the machine towed behind a tractor and tears off sprigs from a turf roll, dropping these down a tube. Press wheels close over the furrow. The distance that a square metre of turf covers can be varied by varying the speed and frequency of sprigs dropped. For faster coverage of the orchard, more than one pass can be made down a row.

Two people are required for this operation; a tractor driver and one person on the planting machine. One square metre of turf will plant approximately 50 m in a single line.

Handy Hint

It is best to offset smothergrass planting lines so they don't line up with tractor tyre paths. This will assist establishment.

The large sprigging machine.

Large 2 tyne machine

This machine is designed to have 2 operators on it to feed turf rolls into a chopper that takes the turf slab and cuts it up into sprigs. These sprigs fall under gravity down a chute to be placed into the ground behind 2 tynes that open furrows. After the sprigs fall into the furrow, press wheels firm earth back around the sprigs.

The machine causes very little soil disturbance. It plants faster than a single tyne machine but is more difficult to operate on steeper slopes.

The chopper inside the large sprigging machine that turns turf rolls into individual sprigs.

Depending on the machine's settings and ground speed, 200 m^2 of turf can plant between 3500 and 5000 lineal metres (for a 7 × 4 orchard this equates to 2.5 – 3.5 ha). In a typical day, 6 km to 9 km of orchard row can be planted.

Planting by hand

Many growers, particularly in smaller orchards, have successfully planted smothergrass by hand, although most of them admit that it is hard work. By establishing a small smothergrass nursery, material is available for planting at the growers' convenience, ideally during or shortly after wet periods which aid establishment. Either pots or sprigs can be planted by hand using a spade or auger. This method is obviously labour intensive but it has been attractive to some growers because there are none of the costs associated with machine planting.

A comparison of planting methods

METHOD	ADVANTAGES	DISADVANTAGES
Pot planter	• Plant an established plant of smothergrass with a strong root system. • Little (if any) watering required • Flexible planting line location due to machine's small size • Flexible planting times – if the weather or other factors are not suitable, then the grass can be kept in pots and watered in the nursery • No rip line created in orchard row • Small horsepower tractor required for pulling planting machine • If sown with soil moisture then little follow up watering or work required	• Higher initial planting costs • Small area can be planted each day compared to sprigging
Large sprigging machine	• Can vary the planting density easily • Lower initial cost of planting • Can sprig large areas quickly	• Requires a lot of planning – 3 day turn around from ordering grass to delivery • Once turf is cut it needs to be planted or rolled out and watered • Requires follow up watering, even in favourable conditions • When first planted a rip line of soft soil is present. Water can follow this and scour out the soil, resulting in erosion and the loss of grass sprigs
Planting by hand	• No machine costs • With an on-site nursery; planting can be undertaken when conditions are suitable for growth	• Labour intensive

I want to do some soil remediation work, should I do this before planting smothergrass?

It is best to grade soil under trees, create spoon drains and complete any other earthwork before planting. This will allow smothergrass to establish most effectively. As you may have loose soil after these works, you can sow a fast growing grass to hold the soil together until the smothergrass establishes.

The two most commonly used grasses for this purpose are annual rye and millet. Rye is sown from autumn to spring and will germinate and grow well during this period. Millet is sown from spring to the end of summer.

An ideal mix is to use both species. The growth of these grasses in the tree-line will need to be controlled. Try to stop millet from growing over 200 mm tall as it will start to develop strong woody stems that can cause problems with harvest equipment.

Suggested seeding rates are the equivalent of 25 kg/ha of millet and 35 kg/ha of annual rye grass. Applying fertiliser to the seeded area can assist germination and growth.

Complete any hedging work before planting smothergrass. Mulch covering a newly planted area will make it difficult for smothergrass to establish.

Mounding as shown in this figure removes the water from the bare tree row and directs the water down the grassed inter-row.

Drains created prior to planting are beneficial for controlling erosion. Notice how a major cross drain has been left and not planted.

Watering requirements

Adequate available soil moisture when planting smothergrass is essential for a good strike. If you use a sprigging machine, watering after planting is crucial, especially for the first week. This helps to improve the success rate. When sprigging, you need one litre of water per lineal metre sprigged. When using the large sprigging machine, this is approximately 3000 L/ha on a 7 × 4 m spacing.

A simple water cart can be created by using the bypass on an air-blast sprayer (ensuring it is thoroughly washed out before use). The operating pressure must be turned down considerably. A piece of hose is run from the bypass to a sprinkler(s) mounted upside down. Another way is to use a piece of poly pipe with holes drilled in it to let the water run out.

The crucial factor is having available soil moisture.

When pot planting, plant when adequate soil moisture is available. This will remove the need for follow up watering. As pots have a well developed root system and the potting medium can retain moisture, they have a reduced chance of drying out. Experience by growers has found that better success rates have been achieved when there is good soil moisture.

A simple watering cart. Notice the two purple sprinklers mounted underneath at the sprig line distance apart.

What do I need to establish smothergrass?

SPRIG PLANTING	POT PLANTING	PLANTING BY HAND
• 4WD tractor to pull the large planter – preferably 60 HP or larger (on steep slopes a larger tractor of at least 80 HP is recommended). • 40 HP tractor for small planter • Forklift for moving/unloading turf pallets (preferably on a second tractor so it can be easily taken to the planting locations) • Watering cart or similar • Water – 1 L per lineal metre sprigged for each sprig line planted. Using the large machine this is approx. 3000 L/ha (7 × 4 m spacing) • 3 people required in total for large planter – 2 feeding turf and a tractor driver (a 4th person is ideal to ferry grass to the planter) • 2 people for small sprig planter, 1 feeding grass and 1 driving tractor • Mulcher to prepare the inter-row before planting	• Tractor – 40 HP is sufficient to pull the planter • 2 people required – 1 to place pots in ground and 1 driving the tractor • Mulcher to prepare the inter-row before planting	• Shovel or auger • A nursery or supply of smothergrass on your farm or nearby

Management

Early grass management

After planting, minimise the amount of traffic on the planting lines. As the tynes on the large sprig planter are close to the same distance apart as many tractor wheels, it is best to offset the positioning of the planting so that when driving a tractor down the row, the wheels straddle the lines of grass.

Smothergrass is robust and can tolerate most farm operations (including harvesting) being performed on it, as long as care is taken during establishment. All normal operations such as spraying and harvesting can be carried out.

Smothergrass, unlike other grasses, does not grow well if mulched too low as it runs over the surface of the soil. If you are mulching after planting, ensure the mulcher is not set too low so as to avoid scalping the sprigs and killing the grass.

In the early stages of establishment, keep leaf off the grass as much as possible. This will allow the smothergrass to establish quickly and not die out. Frequent mowing will help the spread of the grass and help develop a thicker sward.

Smothergrass spreads rapidly. Here is the spread achieved from a sprig line after 12 months.

Using a zero-turn side discharge mower like this can reduce mowing time significantly and allows clippings to be thrown under the tree, providing mulch.

Small spray strips along tree rows will prevent smothergrass runners from wrappng around finger wheels of harvesters.

Ongoing management

Once established, smothergrass will require ongoing management. Like any inter-row covercrop, it will require management to maintain it as an effective cover against erosion. The main extra management needed will be increased mowing to maintain good coverage of smothergrass and to allow efficient harvesting. Mow the inter-row frequently to keep the runners healthy and vigorous to increase the spread of smothergrass. A good practice is to use a side discharge mower to throw clippings under the trees as mulch. This will help to improve organic matter and soil health in your orchard.

Fertiliser applications will need to be adjusted as the sward develops to allow for nutrient stored and used by the grass. If the grass is mowed and clippings removed for composting, then a higher level of nutrition will need to be used.

You can allow smothergrass to grow between trees in the row but if you are unable to cross mow and harvest, a sprayed strip will still need to be maintained to facilitate harvest. Allow smothergrass to grow into the tree row during spring and summer, and spray a narrow band of herbicide in January to stop the grass from growing in the section you are unable to mow during harvest. This will reduce the problem of runners that are sprayed close to harvest being picked up and wrapping around finger wheels of harvesters. This is particularly a problem with harvesters that use small sized finger wheels.

Smothergrass, like all other grasses, does not grow well if mulched too low as it grows over the surface of the soil. If you use a mulcher frequently, it is crucial you ensure it does not scalp the smothergrass.

Harvesting

Is it difficult to harvest from smothergrass?

The easiest surface to harvest from is bare soil. It is more difficult to harvest from smothergrass but there are some things you can do to improve its harvest ability.

Frequent harvesting and mowing is essential for efficient harvesting from smothergrass.

Frequent mowing is crucial

Your ability to harvest will be improved by mowing the sward frequently. Frequent mowing tends to increase the prostrate habit of the smothergrass, reducing the 'spongy' layer that develops. If this spongy layer develops, one short mowing or mulching (taking the grass back to just above the runners) will improve the ability to harvest. You may need to do this once a year.

Harvest frequency

Harvesting frequently will allow frequent mowing. Frequent harvesting will mean more nuts sit on top of the grass rather than become buried in the grass. You will also find that the efficiency of pickup will be greater as the volume of nuts to collect is smaller.

A simple yet effective tool is a sheet of builders mesh that you drag over the smothergrass to help remove nuts that are trapped in the grass.

Dragging mesh

If nuts are trapped within the smothergrass, you can expose some of them by dragging a piece of reinforcing mesh behind a quad-bike (or similar) over the grass. You may need to add a small amount of weight to the mesh to get the best effect. Experience has shown that this operation can be done relatively quickly using a 'quad-bike'.

Large or medium sized finger wheels pick up better from smothergrass than small finger wheels.

Large finger wheels may improve harvesting efficiency.

Harvester setup

Medium or large sized finger wheels give better pickup from smothergrass than small sized finger wheels.

Adding weight to the front of the harvester or increasing the tension on wheel packs may also improve pickup. This adjustment forces the wheel packs further down into the grass.

Adding chains to the front of the harvester will also improve pickup. These chains work in a similar way to the reinforcing mesh, disturbing the grass and exposing the nuts.

Can I sweep or blow nuts out of smothergrass?

It is difficult to blow nuts out of smothergrass. Nuts that are in smothergrass do not roll easily, making blowing difficult.

If you use a sweeper and keep smothergrass short you can sweep nuts off it. This is still not as efficient as sweeping or blowing off bare soil but it is a compromise between erosion losses and ease of harvesting.

How do I deal with immature nuts if I can't mulch the grass?

Smothergrass does not like being mulched low and frequently. Once established, mulching smothergrass once a year prior to harvest can be undertaken.

This pre-harvest cleanup will allow you to remove immature nuts that have fallen and any nuts left from the previous season. The growth rate of smothergrass during summer will allow it to recover prior to the main harvest season.

This one mulching a year will also allow you to remove any spongy layer that has developed, improving harvest efficiency. Make sure your mulcher is not set too low to ensure you do not damage the stolons of the grass.

Harvester with chains attached to the front of the finger wheels to disturb nuts embedded in the smother grass.

Economics of planting smothergrass

The following is a guide to the costs of planting smothergrass using the sprigging machine and pot planting method.

SPRIGGING	
BASIC COSTS ($)	
• Turf – $5.50 per m² (incl. GST) • Large planter – $450 per day (incl. GST) • Freight for turf – $500 per 400 m² (incl. GST) • Freight of large planter – $150 (dependent on distance)	
LARGE MACHINE SPRIGGING COSTS ($)	
Labour • 2 casual staff @ $20/h (includes on costs) for 8 h • 1 tractor driver @ 20/hr • Watering – once per day for the first week (dependent upon weather)	 320 160 800
Turf • 400 m² @ $5.50 m² (this amount of turf will cover 7000 – 10 000 lineal metres, at 7 × 4 m spacing equals 5 – 7 ha)	2200
Freight • $500 per 400 m² delivered from Chambers flat	500
Machine hire	450
Planter freight costs*	150
TOTAL COST	**4580**
TOTAL PER HECTARE	**655–916**

*note: The freight cost is based on using the planter for one day only.

POT PLANTING	
These costs are based on ordering 5000 pots and 2 rows of pots planted per interrow	
Grass in 50 mm biodegradable cardboard pots $0.44 each (incl. GST)	
Mechanical planter – supplied for orders over 5000 pots	
5000 pots at 7 × 4 m spacing will cover approx 3.5 ha (assuming 2 pot runs per row)	
Labour • 1 casual staff @ $20/h (includes on costs) for 10 h • 1 tractor driver @ 20/h	 200 200
TOTAL COST	**2600**
TOTAL PER HECTARE	**743**

These costs are based on 2007 figures and are subject to change.

Grower suggestions/ key comments

Frank Spinaze, *Nari Park*

To effectively establish smothergrass is hard work. After our planting we spent a lot of time watering the grass in and hand sowing bits of grass that the machine did not plant or were removed when it got blocked. But we have had a good rate of establishment as a result. The results of having the grass planted are little nut movement or soil movement in wet weather. The key is to give the grass plenty of water after planting to get it to grow.

Cliff & Greg James, *Deenford*

You must have sunlight reaching the centre of the row to get good smothergrass establishment and coverage. This is crucial for it. Where we have good light, we have good smothergrass patches. You must plant the grass when you have good soil moisture available.

Liz Broad, *Seachange*

We established smothergrass using a vegetable type planter after we had installed drains on our farm. Getting the drainage right before planting is crucial.

It was hard work planting the smothergrass but the results have been great. Two years on from the planting, we had complete coverage of the inter-row and it has stopped the major problems we had with soil erosion in our orchard.

You need some sunlight on the orchard floor to get the grass to start growing. It will grow into the shade but you need the sun to get the 'mother plant' growing to feed the young plants.

Contact list

Turf suppliers

Clifton Park Turf Supplies
Chambers Flat Qld, 07 5546 8899

Greenfield Turf
Kallangur Qld, mob 0411 664 599

Merv Dudgeon
Wollongbar NSW, 02 6628 7129, mob 0415 897 321

Naturelink
Wivanhoe Qld, 02 4578 4588

Turfworld
Kilcoy QLD, 1300 736 009

Sprigging machines dry hire

Daryl Firth
02 6629 1412, mob 0427 100 833

Pot planting machine hire and grass supply

Merv Dudgeon
02 6628 7129, mob 0415 897 321

Contractors

Merv Dudgeon
02 6628 7129, mob 0415 897 321

Daryl Firth
02 6629 1412, mob 0427 100 833

Further reading

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