Growing the future

Tree Alliance

SPRING 2020

treealliance.com.au

Farmers who plant trees will grow the future.

Why plant trees on your property?

Capitalise on the extensive benefits of trees.

Be part of Growing the future

Advance Tasmania and help the planet

Private Forests Tasmania

Andrew Colvin
Tasmanian farmer
Nosswick

“It’s hard to put a dollar figure on it. But my observation of how livestock move in cold weather is that there are great benefits from having trees.”

Tree Alliance
Farmer

SPRING 2020
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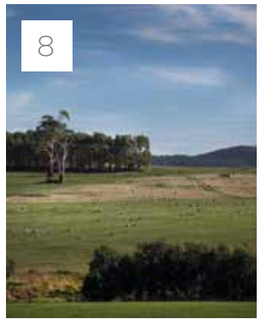
Contents.



For further information please contact:
Private Forests Tasmania, Tel: (03) 6777 7389, Email: admin@pft.tas.gov.au

Penny Wells
Chief Executive Officer

Farmers who plant trees will grow the future...

It's no secret that I love trees. So, it's little wonder that my life and career have been inextricably linked to them. And I am no stranger to planting them. Thirty years ago, my partner Pav and I bought a block of land at Cygnet. When we bought the property in 1988 it was just a paddock full of old car bodies, blackberries and rocks. So, we started planting trees. Our property, now called Crawleighwood, is full of an incredible variety of rare and spectacular trees from all over the world, and it recently featured on Gardening Australia as Crawleighwood Arboretum. The experience of growing trees is incredibly rewarding for me for a variety of reasons. There is no doubt that the trees have added great value to our property, both aesthetically and economically. But the benefits of trees, particularly for farmers are far more diverse.

Planting trees in the right place on farms can increase farm productivity; improve water efficiency and water quality; improve the carbon balance; protect the land for the future; and create high value timber and wood products. Growing our wood products here, provides broader benefit to the Tasmanian economy and reduces our carbon footprint.

Planting commercially viable trees on farms is often perceived to be unprofitable or associated with high opportunity cost, forming a significant barrier to adoption. But farmers with this perception are missing an enormous opportunity.

Case studies from across the globe support the extensive benefits of trees on farms. Published case studies in a range of farming systems across southern Australia have proven that enterprises including trees are more profitable than agriculture only enterprises with typical internal rates of return at around 8%.

In addition, there is a global shortage of wood and fibre, and farmers are the key to delivering the commercially viable resource of the future. Demand is expected to quadruple by 2050, and to meet Australian demand alone, we will need to plant a billion additional trees by 2030. Now is the time to be planting these trees.

We have spoken to farmers to understand their perceptions about trees and their concerns about farming. We discovered that farmers concerns can in part, if not fully, be addressed by trees – but not everyone knows this! they just don't know it. So, we created the Tree Alliance.

The Tree Alliance is a campaign to educate, encourage and facilitate integration of commercially viable trees into the Tasmanian agricultural landscape, so that farmers and our community can harness the extensive benefits that our most renewable resource has to offer.

Trees and farmers will grow the future. And we'd love to help make this happen.

Penny.

Tree Alliance:

A Rallying Cry

By 2050 the human population is forecast to expand from 7.5 to 9.6 billion people. This means that by 2050 we will require 70% more food[1], 50% more fuel[2], and 50% more water[3]. We also need to reduce CO2 emissions by over 80%[4]. All of these things will have to be achieved to ensure our economic, social, political, climate, food, water and fuel security[5].

There's no silver bullet, but there is one thing that we can do to produce more food, improve water quality and efficiency, create biofuel, and improve the carbon balance – plant trees.

The right trees planted in the right place can improve both our ecology and our economy.

Be part of Growing the future

And we need to plant them now. We have a global shortage of timber and demand is set to quadruple by 2050.

Within Australia that demand is being driven by the home building market and the desire to replace carbon intensive materials and plastics with natural, recyclable and renewable products. It is estimated that we will need 2 billion square meters of new building stock every year between 2020 and 2025, especially for housing.
The Australian government states that we will need to plant a billion new trees by 2030.

Achievement of this goal will both rely on and reward our farmers.

The land available for planting trees in Australia is primarily on farmland. But our farmers cannot achieve this ambitious goal alone.

We must work together to significantly increase new forestry plantings in the agricultural landscape that will help farmers to achieve their own objectives as well as those of our country.

Investing in trees today will pay dividends for current and future generations, because the resource of choice in our time is renewable. And trees are The Ultimate Renewable.

In addition to the economic benefits, trees also protect the land for the future, reducing erosion and salinity, they make our environment more beautiful and our communities and animals happier and healthier. Within homes and our workplaces, the presence of timber is proven to improve wellness, and, in our landscape, they add considerably to the amenity and value of the land and improve our animal welfare and biodiversity outcomes.

Planting a billion trees by 2030 won't be an easy task.

We must unite – for mutual benefit.

So, we have created an alliance - a union or association formed for mutual benefit. Ours is a Tree Alliance. Because the planting of trees will benefit us all.

The Tree Alliance brings together the individuals, organisations and landowners who are interested in harnessing the benefits of trees on farms.

Our 'treety' is to collaborate to grow our future economy and ecology through trees.

By working together, we can:

- Accomplish objectives beyond the scope of one individual or organisation;
- Conserve resources;
- Achieve a more widespread reach;
- Create greater credibility than individual organisations;
- Provide a forum for sharing information; and
- Offer a broad range of advice and support for landowners.

Together, we can grow the future.

Contact or **Speak** to us today about how you can join the Tree Alliance and help our farmers and Australia to grow.
Phone 1300 661 009

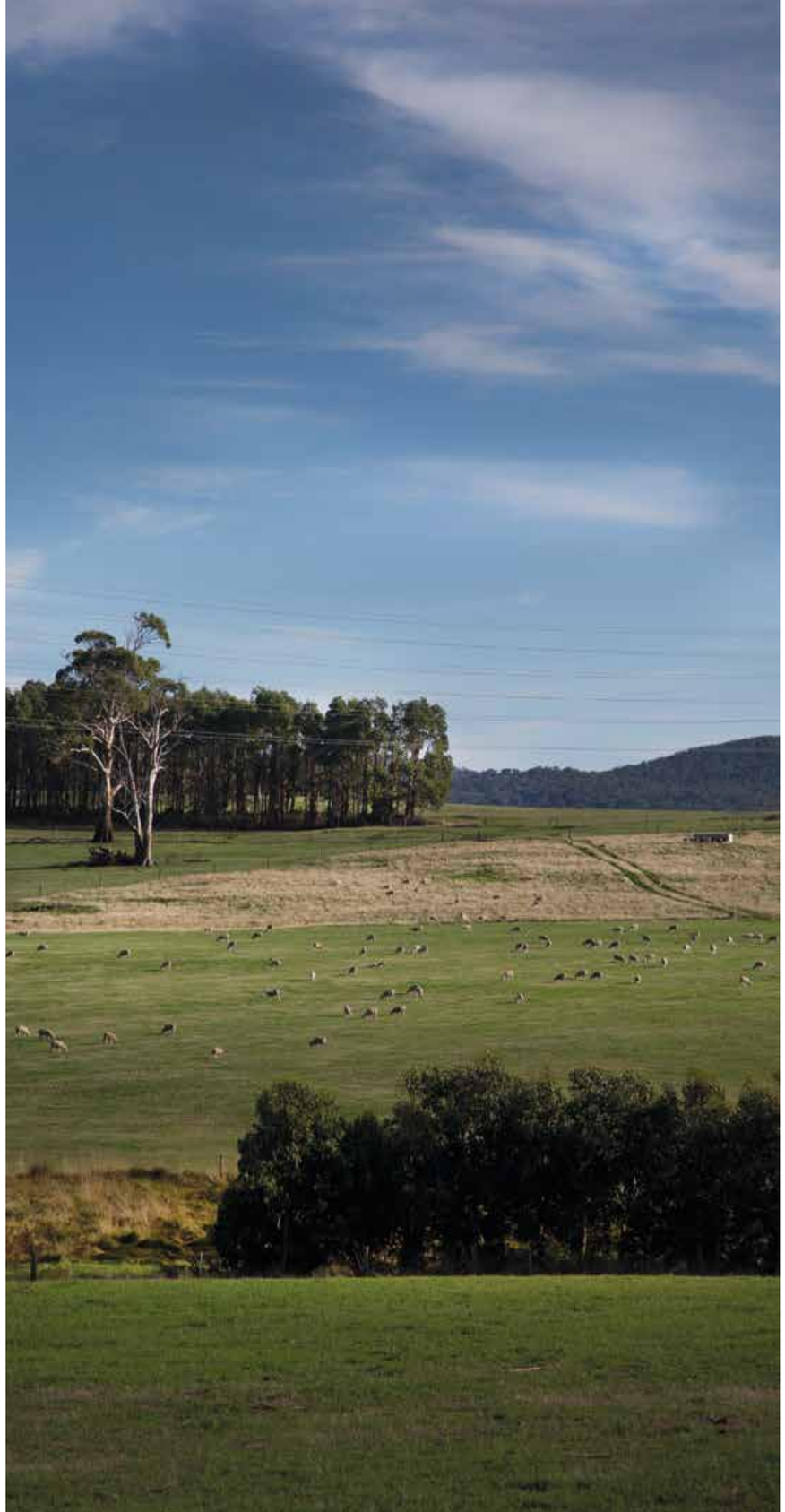
References

1. United Nations
2. International Energy Agency
3. Organization for Economic Co-operation and Development
4. Intergovernmental Panel on Climate Change
5. Institute for Molecular Bioscience (2019)

INTERVIEW

Greenhythe: This Tamar Valley farm is a perfect example of the multiple benefits of trees.

Ed Archer
Tasmanian farmer



Ed Archer is a fifth-generation Tasmanian farmer. Owner and operator of his 1,400-hectare Tamar Valley farm, Greenhythe, Ed's predominate enterprise is grazing livestock and seedstock. Ed's father began diversifying the family farm with plantations over 20 years ago and has since continued the practice. Offering a range of benefits to the farm including providing shelter for livestock, a reduction in lamb mortality during the region's harsh springs and serving as a long-term family investment, Ed explains he'll continue to keep up the plantations for the future of his farm, family and the environment.

While the plantations were originally planted for farm diversification, Ed says the strategically placed trees have proven to be a success across different areas of his farm.

Plantations for protection

Making the decision to plant his own plantations later on in 2005, Ed explains it was done primarily for livestock protection.

"On this farm we've really focused on a reproduction system, so we've got a lot of cows calving and ewes lambing. We can have some pretty rough cold weather in the early springtime so any added protection that we could offer is quite beneficial. In today's livestock markets when lamb's worth $8/kg and there's contracts out there for $10/kg, every extra lamb you can produce adds up quite quickly to your gross margin."

"There's a real productivity gain we can make around lamb survival rates. The sheep that we breed today are really fertile and when we ultrasound scan for pregnancy, there's lots of lambs but when it comes to marking them, for a lot of different reasons, there's less there. A lot of it has to do with exposure around lambing time, so that's an area where trees can be really beneficial."

Ed explains that another benefit for having those trees and plantation areas, which are normally fenced off to livestock, is that in those tougher times it gives a bit of extra land with some sort of feed source underneath them that livestock can go in and graze.

"We're right on the banks of the Tamar River and close to the north coast, so we get fairly strong prevailing northwesterly wind. The plantations were strategically planted to offer some stock shelter and others were used as buffer zones between neighbours for our seedstock operation so there wasn't any wasted land."

The Archers also had issues with stock health from a condition called grass tetany, which is a magnesium imbalance in cattle.

The imbalance is usually caused by rough weather that causes the livestock to stop eating. When the imbalance occurs cattle can be dead within half an hour if not treated.

"We were able to utilize the plantations to offer shelter to the cattle quite quickly. Within one-two years we had decent shelter and the cattle continued eating under that shelter in the rough weather, which solved the problem."

Ed explains that in a genetic enterprise like theirs the economic loss from losing one animal can be significant.

"We know exactly what that animal is and the genetic potential they can offer us, so if its one of the better ones it hurts quite a bit."

Carbon, sustainability and consumers

In addition to the livestock benefits, Ed says trees also help soften his farm's carbon footprint and meet the demand from consumers wanting environmentally conscious products.

"There's been a real push against red meat because of the methane emissions and other fossil fuels we use. But I think we can quite easily integrate some trees into all of our properties and not lose any productivity and also have the benefit of offsetting some carbon."

Ed says in today's market, there's growing concern from consumers.

"From my time on the back of the counter in the retail shop, the consumer is more and more concerned about where their food comes from, what environment it's produced in and if it's sustainable.

"A lot of people that buy from our retail outlet know who we are, they know our properties and they can see how we manage them. They're happy about buying our product because we are doing positive things and trying to be sustainable."

Improved water outcomes

A key part of sustainability on farms is water management. Ed says that while the trees themselves do use some water; the overall benefits of moisture retention are positive.

"For an area around the trees you probably grow less grass, but definitely across the paddock for a certain distance after the trees the grass grows for longer," says Ed.

The same benefits are seen around certain types of irrigation systems.

"In areas where we're using gun irrigators, we've found that if we can protect those areas from wind we get much higher water use efficiency."

"From a practical point of view, we've got all of these irrigator circles now that we've put into squares, so we have all these dead corners. I think it's a perfect opportunity for us to plant some trees in those areas that aren't going to be irrigated."

In addition to water efficiency gains, trees have been used on Greenhythe for water quality management.

"We have a big gulley with irrigation dams to capture the runoff. Traditionally stock were allowed to get into those areas which led to some erosion issues." We were ending up with more and more of our topsoil down in the irrigation dam." We were able to fence that area off and grow some trees on the banks, so we didn't lose that area to any sort of income stream, but it protected it as well." Ed says the water quality in the irrigation dams has improved as a result.

Tree Management

Greenhythe's proximity to the export mill means they were able to enter into an agreement with a forestry company.

"It was an attractive option for us to do a joint venture because there was minimal cost outlay for us. We basically had to supply the land, do the fencing and the forestry company did the rest," says Ed.

Unlike crops and livestock, Ed says trees are quite simple to maintain. "One big advantage with trees is there's not a lot of day to day management. It's one of those enterprises that [once they are established] you can forget about and it's nice to know that they're still growing and you're not putting any effort into them."

Ed says he's relied on Private Forests Tasmania for guidance and considered advice.

"Private Forests have been a really good resource for me. Any questions I've got, if they don't know the answer, they'll point me in the right direction. There is a really good resource there in Private Forests and they're more than happy to help you."

Looking to the future

While trees may not provide an immediate return, Ed explains that it's important to consider planting trees for the longer term - both for the family and the business.

"[Trees] can actually be really valuable in a succession plan for a farming family because they can provide a lump sum of money down the track. A crop of trees can be strategically planted early and then harvested around the time that money's needed."

Greenhythe also has some areas that are due to be replanted so, Ed says he's considering options with pine trees, seeking carbon credits or selling the carbon out of those trees which might cover the establishment costs.

He's also considering planting trees to manage for higher value sawlogs.

"With the talk about a growing demand for sawn timber, down the track there's going to be a strong business case to put some money towards growing timber that can be sawn and used in building products."

On a final note, Ed talks of the beauty of trees in the landscape.

"And for me as well, aesthetically the trees add to the landscape. You know, it feels good – it creates a much nicer work environment. And I think it definitely adds to the value of the land, if you were ever to sell it."

Trees improve the carbon balance

Planting commercially viable trees can improve the carbon balance. There are two ways to address rising atmospheric CO2: reducing emissions and absorbing and storing CO2. Trees and wood products can do both.

When trees grow, they actively absorb carbon from the atmosphere and store it as wood. When wood from sustainably managed sources is used in place of other materials such as metal, concrete and plastic, that return more CO2 to the atmosphere over their lifecycle, there are also carbon emission reduction benefits. The trees can then be replanted, and the cycle starts again.

Call the helpline with any questions
1300 661 009

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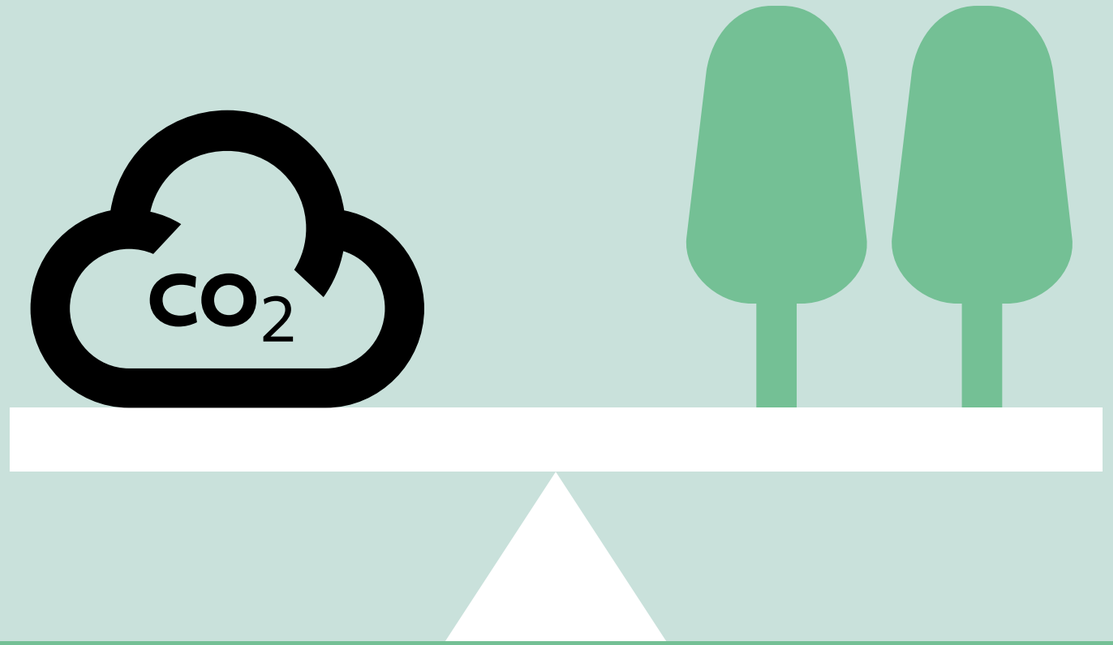

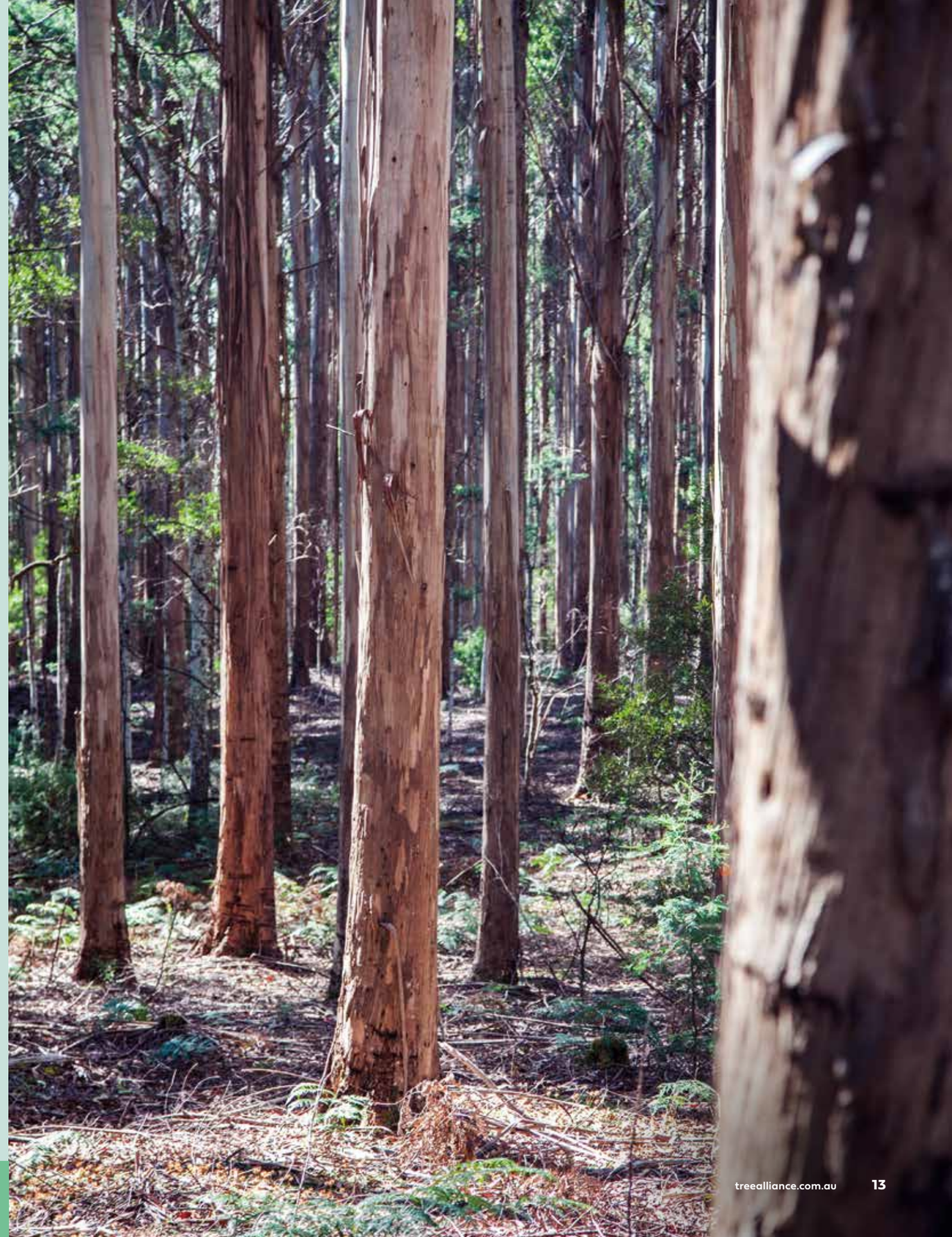

FACT SHEET

Why plant trees on your property?

The right trees in the right place are an investment in your property, business and future income.

Planting trees in the right place on farms with the intention of harvesting and replanting is a win-win for the environment, society and landowners. Trees can deliver increased primary production productivity while simultaneously growing high value timber products, delivering biofuel, improving water quality and efficiency, and improving the carbon balance. Trees also protect the land for future generations while growing high value products. Trees on farms will grow the future.

- Trees in the right place increase farm productivity
- Trees improve water efficiency and water quality
- Trees improve the carbon balance
- Trees protect the land for the future
- The global demand for timber is expected to quadruple by 2050

How growing trees will help your farm

INCREASE YOUR FARM PRODUCTIVITY

- Trees provide shade and shelter
- Trees play a part in modifying the microclimate
- Trees protect crops from wind = less damage to leaves on crops & less water evaporation
- Trees provide protection for livestock = less livestock mortality
- Trees will help diversify your income stream

Case studies have found that farm systems that included trees were more productive and profitable than agriculture only enterprises with internal rates of return typically around 8%.

Source: Formosa Case Study 4 – August 2018, "How Profitable is Agroforestry?", Private Forests Tasmania Page 92

IMPROVE WATER EFFICIENCY ON THE FARM

- Trees provide a buffer from evaporation when planted alongside crops
- When planted near streams, trees help improve water quality and reduce turbidity

Case-study: In the Tasmanian midlands, the potential water evaporation reduction over one year for a 25-hectare paddock was 20-35ml.

Source: Trees Reduce Paddock Water Loss evaporation, Mendham, D O'Grady, A & Moroni, M, Private Forests Tasmania Page 96

Protect your land – it's your most important asset...

Planting trees can help protect your land against extreme weather events

Increase the biomass of your pastures. Extended dry periods can expose soil to compaction and wind and water erosion

Increase the value of your land by increasing biodiversity and amenity with trees

woodfire pellets

BECOME PART OF A SUSTAINABLE MARKET

- In a report by Pollinate in 2019 it was revealed that 66% of the Tasmanian Voting Public are either very or extremely concerned about the environment and 83% are concerned about climate change
- Many consumers prefer a sustainable brand and according to a report done by Nielsen (a global provider of market research) in 2019, consumers are putting their dollars where their values are
- Between 2014 and 2017, products in the sustainable category grew by nearly 3%, while conventional products dropped by 4%

"... it's soon to be the decade of the sustainable shopper, making sustainability a consistent growth opportunity for manufacturing"

**Source: Nielsen 2018, "Was 2018 the year of the influential sustainable consumer?"*

PLANTING TREES ON YOUR PROPERTY WILL IMPROVE THE CARBON BALANCE

- There is worldwide concern about the impacts of climate change. Consumers and retailers are adjusting their sourcing policies and seeking products with carbon footprint labelling
- When trees grow, they absorb carbon from the atmosphere and turn it into wood
- By using sustainably grown timber, instead of metal, concrete or plastic (which produce a lot of CO2), you are reducing carbon emissions
- Biomass from trees can be used for biofuels, such as woodfire pellets
- Non-toxic 'green' chemicals that are derived from timber fibre are becoming highly sought after commercially

THERE HAS NEVER BEEN A BETTER TIME TO PLANT TREES

- There's a global shortage of timber

  The demand for timber is expected to quadruple worldwide by 2050
- The home building market is in constant need for timber
- Businesses are recognising the need to replace plastics and other carbon-intensive materials with natural, recyclable and renewable products
- New markets for materials from trees are becoming commercially popular, such as biofuel (eg. woodfire pellets) and green chemicals
- Growing commercially viable trees on your property could be a great opportunity for another income stream

Think and plan

Think about what you want from planting trees on your farm.

- Do you want to diversify your crops and potential income instead of relying on one income source from the land?
- Are you concerned about the impacts of climate on your land, and want to improve soil quality and lessen water erosion?
- Do you have a sloping piece of land that you don't use for anything resourceful?

Next steps

Arrange an appointment

Arrange an appointment with a Private Forester to talk about what you want to achieve from growing trees on your property. See if a consultant can come and assess your land and find out what is possible

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Call the helpline

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Join the online community

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https://www.facebook.com/groups/596397397623294

Bringing more value to everything Tasmanian through renewability

Watch online
https://youtu.be/yVZ8Z-u1Cpc

Todd Babiak
CEO of Brand Tasmania

In 2022, Tasmania will be one of the only places in the world that has 100% renewable energy. According to Todd Babiak, CEO of Brand Tasmania, being 100% renewable is a huge opportunity for Tasmania for almost all of our products. What if, in addition to 100% renewable energy, we could also have zero-net emissions on farms through methods like planting trees? According to Babiak, we could actually deliver the product that the whole world is looking for. He says, if our job is to bring more value to everything Tasmanian, renewability is a key way to do it.

Telling the Tasmanian Story

"Place-branding is really about bringing focus and discipline to our economic development, our cultural and our social efforts so that we're all telling a singular story and using it not only to make decisions, but to sell whatever it is we're building," says Babiak.

Put into context for Tasmania, Babiak further explains that place brand is a unifying cultural expression that the farming and agriculture community can use to help tell and sell the Tasmanian story to market their products at a premium.

"I think the culture of farming and agriculture is very powerful. When people come together as they could here in Tasmania on an island, we can do something very special that few other places around the world can do. It's difficult to compete on price, from a place like Tasmania, so we've moved in many ways from commodity to premium. And we can do even more."

Tasmanian produce, products and tourism have developed reputations that are highly regarded across Australia and across the international market. And Babiak says we shouldn't stop there.

"In 2022, Tasmania will be among the only places in the world that has 100% renewable energy, and in the coming years, by 2040-2050 we'd like to be 200%. That's a remarkable story to tell, a 100-year-old story of struggle, hard work, and invention. Our job is to make Tasmanian renewable about more than electricity, to make it cultural. Everything we do can have sustainability and that metaphor of renewable at its core. And timber [and agriculture] is a big part of that."

How Tasmanian farmers can leverage our brand story

While Tasmania's renewable story is one that Brand Tasmania will work to tell, Babiak says the messaging must start from the ground up, with all stakeholders doing their part to share and live the story, including Tasmania's farmers.

"Most of the decisions we make, as consumers, are emotional decisions. We want to help Tasmanian farmers use narrative to create strong connections with their customers."

Babiak explains that if people can choose from five or six products and they see a Tasmanian product with an aura of sustainability and the feeling of wilderness, the feeling of cleanliness and the feeling of sophistication that comes with hard work, artisanal quality and care for the land – they'll choose Tasmanian over others.

"The decisions we make about the food we eat are among the most important decisions we make. And if, in addition to adding the land and the water and the air and the culture that we have here in Tasmania to these premium products, we also add trees and net-zero or carbon-free, it gives consumers another reason to choose Tasmanian and to pay more for it," he says.

"What we can do here in Tasmania is something really special. We will have 100% renewable energy. We can also have zero-net emissions on farms through methods like planting trees. We could actually deliver the product that the whole world is looking for. If our job is to bring more value to everything Tasmanian, this is a key way to do it."

FACT SHEET

Start your plan.

Think about the purpose of the trees you are going to plant. Will they be providing shelter for crops and cattle? Are they for future pulp and sawlogs? Are they being planted on a slope?

Plan checklist

Here's a checklist of things to assess on your property when planning:

- Check soil type and depths for nutrition, erosion and weeds
- Assess the topography, taking into account access, maintenance, cultivation and weeds
- Map out location of services, such as water pipes, powerlines, cables, and easements
- Map out paddock design – note the fences, gates, roads and tracks
- Check location of buildings, stockyards and other assets that might affect cultivation
- Note the location of creeks, springs and dams that might be impacted by the planting
- Potential for pests and diseases – what are your control options?
- Layout of the paddock/space of planting – size, shape and row spacing

Financial & business checklist

Here's a checklist of financial and business considerations:

- Plan out initial costs, ongoing costs and returns
- Calculate resources needed to establish and manage the trees over a long period (10-45 years depending on species)
- Taxation considerations – speak to your accountant
- Enquire about whether you should register for a Forestry Right on the title. This may be necessary to secure your interest in the forest if you later sell the land
- Do you need planning approval?
- Check if you should apply for a Private Timber Reserve for the proposed plantation
- Consult the Forest Practices Code

The government states that working with farmers to create a long-term 'wood bank' by integrating trees on farms will be an economic win-win for all parties if the trees are planted in the right quantities and in the right location.

Size matters

When deciding the size of your plantation, take into account the existing and planned resources you are willing to commit to make it a success.

SELF-MANAGED PLANTATION

A single person could manage about 2 ha a year, especially where trees can be pruned up to 6 metres. Factor in the time and labour required to establish and maintain the trees and how this will work with your day-to-day running of the farm. Consider planting a few hectares per year over a number of years to ensure a regular work program and consistent return and income.

SMALL PLANTATIONS

If you choose to grow a small plantation of exotic timber species, establish a marketing plan. Exotic timber species can bring in a great return if you know the potential market of the species you are planting to ensure you get the return on investment.

SMALLER PLANTATIONS

You can organise to harvest and transport the timber from your small plantation to large commercial processors. You can also try to sell to a smaller processor. The portable sawmill technology is improving rapidly, so it's possible to add value to your timber before going to market. Your plantation might also be useful for products on the farm.

LARGE PLANTATIONS

Plantations or native forests need to be at least 20 ha and have good access to keep harvesting and transport costs down. Best commercial returns occur where the trees are well managed and include species that are commonly processed in Tasmania. Consider entering a Joint Venture or Lease with a large processor or forest management company. This will help with time, costs and resources to achieve these requirements. Keep in mind when negotiating that these agreements will be in place for at least 20 years, so they could also benefit and impact the next generation.

Location, location

The location of the forest on your farm is important for weed management, harvesting and transport operations. When planning, take into account:

EXISTING ROADS

— Is there good access?
— Do all-weather roads need to be constructed?
— Can log trucks access the plantation at harvest time?

WATER QUALITY

Water supply and quality. How will your plantation effect the water flow on the farm? Forests usually improve water quality.

> **On Willowbend farm at Cygnet the CSIRO found that trees reduced E.coli contamination and decreased major turbidity**

**Source: PFT Case Study 1, July 2016. Page 86*

LAYOUT OF THE LAND

If you plan to use a steep slope for your plantation, check the technology available to help at harvest time.

Next steps

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INTERVIEW

How strategically planted trees have transformed Nosswick

Andrew Colvin
Tasmanian farmer

When Andrew Colvin purchased his farm, Nosswick, at Blackwood Creek in Tasmania's north in 1981 it was basically bare. There was minimal fencing and scattered trees. Like a lot of farmers at the time, Andrew needed to increase production, so he put in a lot of infrastructure that required removal of many trees. After the first five years of development, most of the scattered trees on the property were gone. Forty years later, after four decades of strategic planting, Nosswick is heavily treed, which has made Nosswick more profitable, far more beautiful and a haven for wildlife as well as prime lambs.

Andrew farms pasture and prime lambs, both of which he explains, benefit from companion planting with trees.

"My requirements for growing trees are different from some people because the woodlot is not the primary reason why I grow trees. Firstly, I want to shelter the livestock, particularly in the exposed pivot circles for the lambing ewes. Secondly, I want trees for water management."

Nosswick has a perched water table, which means that the water sits right at the surface. In wintertime, the property was traditionally very wet. Andrew has used strategically planted trees to help reduce the water level during wet times and improve water efficiency when irrigating in dryer times.

"So, drainage is very important, and shelter. Those two things are my top priorities. The trees have certainly made a very big difference," says Andrew.

"We originally started out just planting out the corners of circles, which is an oxymoron, but you get the picture square paddock, the corners.

"We've since gone into quite large-scale plantings of trees. At one stage, we were putting in 10,000 trees a year just in corners around circles. We've got some woodlots, but the majority of our plantings now are mixed species with Blackwood's and right down to, sedges, hakeas and shrubs."

Watch online
https://youtu.be/VSpyaszg85U

The economics

Some farmers believe that they're going to get a better return by having no trees and running stock on that pasture. They think there's a loss of productivity as a result of planting trees. Andrew says, "I would argue strongly against that."

"It's hard to put a dollar figure on it. But my observation of how livestock move in cold weather is that there are great benefits from having trees."

"I don't really want to grow the trees and then chop them down and start again. I'm very happy to put them in once and get the economic benefit from increased stocking rates, and things like that."

Andrew's son Scott has returned home with a University Degree in Agricultural Economics and has taken over management of the farm.

"Scott's probably more economically driven than I am or have been. The bottom line is particularly important. That happens with most people that are in their thirties, they're driving the business so, everything is worked out to the last cent, which is great. But at the same time, he's very happy to plant trees."

Start early – plant when you're developing

Andrew says, that his observation has been that farmers who are developing their properties all want to plant trees, but it's something that gets pushed to down the track.

"They've got to get the pivots in and then another pivot in. I look at it slightly differently, having gone exactly down that road. It was pretty tough at the end of the wool boom. Nobody had any money and we were trying to develop and put in irrigation.

"I put my trees in at the same time as I was putting in the irrigation because I could see that there was going to be a benefit. You think at the time it's a struggle to do it, but you get the benefit virtually from year one onwards. So, try to do it at the same time, is my advice."

The secret to success? Preparation.

The secret to getting a successful outcome with trees, according to Andrew, is ground preparation. "It's absolutely critical to do it properly," he says.

"If I was going to be planting trees in the corners of pivots again, I'd start early, and firstly do a bit of research into what species grow well in my district.

"Then, and I stress this to a lot of people that ask me about trees, the more work you put in to ground preparation the more successful you will be - spraying it off in advance, ripping it in advance in the summertime, creating a good seed bed. Do these things well and the quicker your trees will grow.

Conservation, Habitat and Aesthetics

Andrew says that he has to admit to being a bit of a conservationist. In addition to the productivity benefits on the farm, he wanted to provide habitat for wildlife, linking some of the farms remaining areas of native bush to the trees around the pivot circles with wildlife corridors.

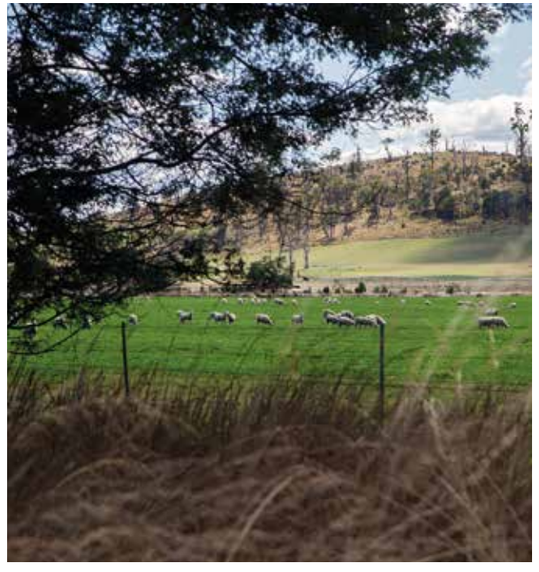
"We wanted to get a complete ecosystem back into the environment," explains Andrew.

"We've collected a lot of seed from around the area, so we're putting the providence back in and it's working very well."

He also explains that whilst it might seem obvious, he really values the aesthetics of having trees on the farm.

"You know, for me a barren landscape in rural Tasmania, is neither appropriate nor particularly attractive."

And Andrew has certainly achieved an aesthetically beautiful property. Driving into Nosswick you are met with a stunning vista of manicured parkland where not a blade of grass seems out of place and fat lambs luxuriate in what must certainly be the poster farm for happy livestock.



FACT SHEET

How to develop an establishment plan

Now that you have decided on the size and location of the plantation, you will need to set up an establishment plan.

Establishment can take 12 to 18 months. Key planning actions include the following steps:

Step 1 – Check site quality 1

- Have you got the right site?
  Visit: www.treealliance.com.au/resources for a checklist on what to take into account for the chosen site in terms of temperature, available moisture and nutrients, and weeds
- Check soil suitability. Dig a hole (at least 50cm deep) to look at the soil structure. Make a note of the amount of silt, sand and clay. Are there a lot of rocks? Can you see evidence of compacted layers and hard pans? Check the drainage and general soil health

... Is your site right? Check if your site has the minimum requirements to grow trees commercially:

- Mean annual rainfall greater than 800mm
- Less than 800m above sea level
- Soils deeper than 65cm
- No frost hollows or waterlogged areas general soil health

Fencing is critical to keeping livestock and browsing animals out of the plantation

Step 2 – Select the species and order the plants 2

- Plant stock needs to be ordered 9-12 months in advance
- Make sure the stock you are ordering has been grown to quality standard
- Carefully select the tree species to match your soil and temperature conditions
- See the full list of plants suited to Tasmania

Visit: www.treealliance.com.au for more information

Step 3 – Prepare the site 3

- Clear the site, either mechanically, by hand or monitored burning
- When the soil is dry (usually summer), deep-rip planting lines with a winged ripper to shatter heavier sub soils to help improve tree growth
- Mounding top-soil over the ripline can help with grass control and conserving moisture
- Allow time for the soil to settle
- Once the ground preparation has been done, it's time to fence

FACT SHEET

Step 4 – Clear the weeds

4

- Develop a weed strategy from the get-go. Control of grasses and weeds is essential in the first two years of planting
- Use a combination of knock-down and residual herbicides before planting, and then after planting to control emerging weeds
- Ensure there is a one-metre radius around each tree that is completely free of weeds and grass. This radius needs to be clear for at least the first two years after planting
- Find out more information on weed management on Page 44.

... Did you know? Grass competition is responsible for the failure of more farm plantations than any other cause

Step 5 – Vermin control

5

- Fencing is essential to keep out browsing vermin
- Bait, fumigation or shooting may be required before planting
- Follow-up control is essential for survival of the young plants

Next steps

Arrange an appointment

Arrange an appointment with a private forester to talk about what you want to achieve from growing trees on your property. See if a consultant can come and assess your land and find out what is possible

contact@treealliance.com.au

Call the helpline

Call the helpline with any questions

Tel: 1300 661 009

Join the online community

Join our private Facebook group, the Growing the Future Online Community. Find out what other farmers are doing, chat to an expert, ask questions and share ideas.
https://www.facebook.com/groups/596397397623294

Trees increase farm productivity

Trees in the right place on farms can modify the local microclimate providing benefits to crops and livestock that are grown or raised alongside trees. Trees provide wind reduction and shade.

Tasmanian case studies have found that farm systems that include trees are more productive and profitable than agriculture only enterprises. Case studies, in agroforestry systems across southern Australia, indicate internal rates of return typically around 8%.

Call the helpline with any questions
1300 661 009

Tree Alliance

treealliance.com.au

Private Forests Tasmania

FACT SHEET

What to check for your site

For the best results from your farm forest, climate and soil should match the requirements of the tree species you intend to plant.

Factor in the following:

Temperature

- Minimum temperatures and frequency of frosts must be considered
- Inland species provenances often tolerate frosts better than coastal ones
- Elevation is often used to determine frost tolerance. Generally the higher a tree naturally grows, the higher its frost tolerance

Moisture Availability

- Trees require moisture throughout spring, summer and autumn to grow. The ability of soil to hold moisture is important especially where summer rainfall is infrequent or low
- Sites with perched water tables or fairly stable local water tables may favour tree growth in low rainfall areas
- Soils containing organic matter and clay hold water better than sands
- Water requirements may be supplemented by irrigation, ground water or use of sites with wetter (southern) aspects

Nutrient Availability

- Nutrients, particularly phosphorous, nitrogen and organic carbon, need to be available in the top 10 centimetres for good tree growth. (Even so, starter fertilisers are often applied at planting to promote initial tree growth)
- Sites with a long history of heavy fertiliser use may require specially bred tree stock to avoid abnormal growth due to high site fertility

Drainage

- Tree roots need oxygen for growth
- Avoid seasonally water logged sites unless the species chosen requires, or is tolerant of, such conditions for growth
- Water logged sites are difficult to establish and logging may cause deterioration of soil and water quality
- Caution should be exercised where water tables markedly rise and fall during the year because tree roots will either be unable to access water or be drowned

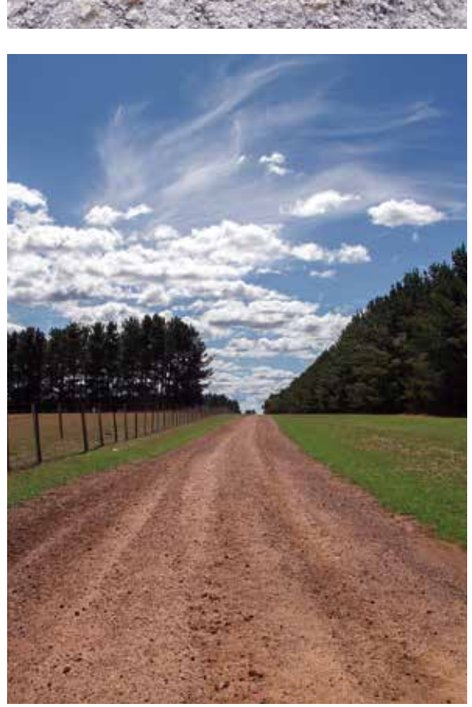
Rooting Conditions
(Effective Rooting Depth)

- Tree roots need to be able to explore soil over a large area and to a considerable depth
- Tree roots occupy about the same space as the trunk and branches of a tree. Soil depth should, if possible, exceed 50 centimetres for good tree growth. Avoid hard pans or heavily compacted soils unless you can deep rip or cultivate them. Avoid soils with lots of rock or very heavy clays

Weeds

- Sites with lots of different weeds or heavy weed cover can be difficult and costly to establish to trees and maintain
- Land free of persistent woody weeds (e.g. gorse) is easy to plant to trees and pasture grasses are easily and cheaply controlled

Other factors to consider:



Aspect

- Influences temperature, moisture availability and effects of wind
- Exposed aspects have greater impact on tree growth
- Very steep slopes can be more costly to establish, road and harvest

Access

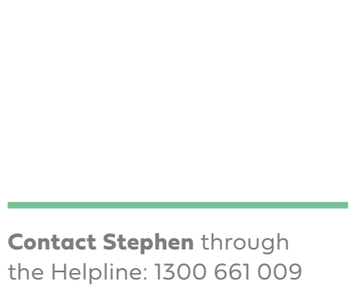
- A good access route, capable of carrying about 40 tonnes, is needed between the farm gate and proposed site
- Land is best located close to existing industry processing plants, export ports or other large plantations to avoid excess transportation costs

Natural hazards

- Avoid sites prone to flooding
- Check sites for erosion to avoid possible landslide hazards
- Sites should be surrounded by an accessible firebreak and be able to facilitate fire-fighting

Stephen Clarke can help you capitalise on the extensive benefits of trees

Stephen Clarke
Senior Private Forester



Senior Private Forester Stephen Clarke is a professional Forester (BScFor (Stell) MBA MIFA RFP) with extensive experience. Zimbabwean born, Stephen studied forestry at the University of Stellenbosch, before working in New Zealand and now Tasmania.

Contact Stephen through the Helpline: 1300 661 009

During his career, Stephen has gained considerable experience and expertise in integrated management systems and certification, tactical and operational planning, logistics, industrial engineering, nursery, establishment, maintenance, harvesting, transport, fire protection, natural ecosystem maintenance and enhancement, general estate management and security. The key take away from all his experience? The best time to plant trees was yesterday.

Stephen says his career was born quite simply from a love of trees.

"From an aesthetic point of view, I love trees. But forestry is not necessarily about trees. It is about how trees can look after the land and simultaneously enrich the lives of people," explains Stephen.

"Trees are a great solution to a lot of the environmental problems that we face, and that is well understood, but I also see them as an integral part of the economy, particularly the rural economy."

According to Stephen, trees can solve a lot of problems.

"The benefits of trees have been proven time and time again all over the world. The challenge we have as foresters and farmers is to seek and find the opportunities to capitalise on these potential benefits," he says.

Stephen explains that trees need to be incorporated into the agricultural landscape as part of the mix alongside other crops and land uses.

"Wood is an incredible material. But to gain the benefits, farmers don't need to be planting wall to wall trees, they just have to examine the role trees can play in their overall objectives while also helping them to be good stewards of the land.

"Without question if farmers bring trees into their landscape, they will improve their overall returns. The best time to plant trees was yesterday."

As an expert Private Forester at Tree Alliance, Stephen says 'We're as much a part of the community as anyone else, and we have a real role to play.'

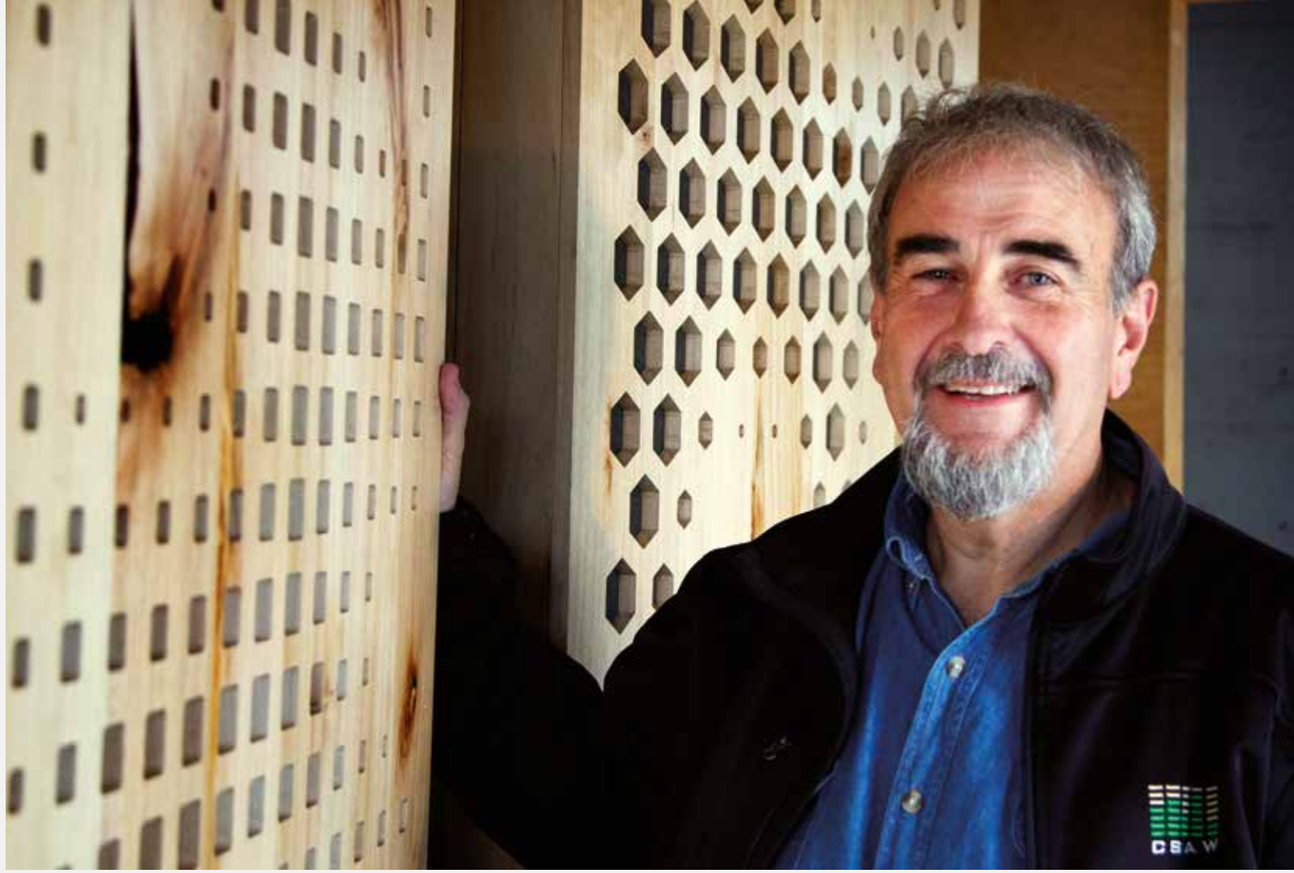
"I get a lot of satisfaction out of helping farmers find solutions to their problems and maximising opportunities, particularly helping people work productively together."

Michael Lee
Technical Officer at the Centre for Sustainable Architecture with Wood at the University of Tasmania

There has never been a better time to plant trees

There is a global shortage of timber, and farmers are the key to delivering the commercially viable resource of the future. In fact, the global demand for timber is expected to quadruple by 2050. Within Australia demand is being driven by the home building market and the desire to replace carbon intensive materials and plastics with natural, recyclable and renewable products. In Tasmania, research into plantation grown hardwood is now coming to fruition with new high-value products close to hitting the marketplace. Technology is also unlocking new uses for materials derived from trees, like 'green' chemicals and biofuel. Providing enough timber and fibre to meet this increased demand presents both a challenge and an opportunity. Farmers are in the box seat to capitalise on this opportunity – there has never been a better time to plant trees.

**Source: The World Bank, 2016.*



The Building Market

It is estimated that 2 billion square metres of new building stock will be needed every year between 2020 and 2025, especially for housing. The outcome of numerous studies show that 400,000 hectares of new plantations are required over the next decade to meet the demand for timber and wood fibre in Australia alone. This amounts to a billion new trees in the ground. This target is in addition to the 70 million trees planted every year in Australian plantations to replace those that have been harvested.

As well as the home building market, the high demand for sustainable timber in Australia is fuelled by the desire to replace carbon intensive materials and plastics with natural, recyclable and renewable products.
The construction industry alone produces around 15% of global carbon dioxide emissions. Timber is a natural, traditional, beautiful and renewable construction material. It is less carbon intensive to manufacture, transport and erect than structures made of other common materials. It's no wonder we are now seeing construction of high-rise buildings made completely out of wood.

In recognition of these benefits, Tasmania was the first state to launch a Wood Encouragement Policy, which ensures sustainably sourced wood is fully considered, where feasible, in Tasmanian government procurement, particularly for new buildings and refurbishment projects.

New Products Derived from Plantation Grown Hardwood

In Tasmania, research into plantation grown hardwood is set to result in a range of new high-value, renewable products to hit the marketplace in coming years. In their quest to add value and waste nothing, Tasmanian timber processors and researchers in collaboration with the National Institute for Forest Products Innovation have been working to produce high-value plantation grown hardwood products for nearly two decades. Engineered wood products in particular are now coming to fruition.

Tasmania has two types of plantation hardwood - thinned and pruned for solid and appearance grade wood products and fibre-managed material, which is primarily grown for pulp. All of Tasmania's major timber processors are now working with thinned and pruned material through several trials to develop products for commercial application.

The research trials include:

- Using sensing technology and digital tools to predict moisture content during air-drying with a view to improving timber value;
- Testing the feasibility of commercial scale treatment and modification of *Eucalyptus nitens* and *Eucalyptus globulus* sawn boards, and eucalypt wood panel samples, to improve durability and fire resistance;
- Developing a new generation of Tasmanian appearance hardwood products for in-state design and manufacturing – including flooring and linings that can be applied in domestic and commercial buildings;
- Using sensor technology to examine how plantation grown material may vary through the supply chain; and
- Developing laminated structural elements from fibre-managed plantation hardwood.

Michael Lee, Technical Officer at the Centre for Sustainable Architecture with Wood at the University of Tasmania says, "we have had some very encouraging results and we're about 80% of the way to commercial production."

Fibre-managed plantations are now also being used for structural purposes through Cross Laminated Timber (CLT), Glue Laminated Timber (glulam) and plywood products for the Australian and international market. Glulam is an engineered wood product made from structural adhesives that are bonded with the timber to create a moisture resistant and highly durable timber product.

"You can make anything you like of any structural size with Glulam products. It's making a larger piece of timber out of smaller pieces of timber through finger jointing and gluing pieces together," says Lee.

Using state-of-the-art technologies Lee explains that if you can dream it, you can do it when it comes to glulam products.

"We have the ability to make any shape or any form that you would like through computer numerical controlled (CNC) routing with 5-axis routers and other bits and pieces."

Extracting Greater Value from all Parts of the Tree

The unprecedented demand for sustainable products is driving research and innovation across the world. Research and new technology have uncovered new and exciting ways to use materials derived from native and plantation trees such as 'green' chemicals, biofuels to replace fossil fuels, food additives, pharmaceutical and medical applications, and wood plastics that can be turned into anything from car components to recyclable replacement plastic bags. These new technologies are helping to extract greater value from all parts of the tree.

Biofuels

Utilising tree residues for bioenergy can substitute fossil fuels such as coal, NPG and LNG. Biofuel is the way of the future and Tasmania is well placed to become an industry leader in this field. A state-of-the-art pellet mill has been commissioned at Mowbray, near Launceston, to turn all timber waste from the production process into value added bio energy pellets for the Australian heating market. Wood waste previously destined for land fill is now a precious resource. The Tasmanian heating market, which has relied on importing pellets from New Zealand and Victoria, can now source competitively priced pure hardwood heating pellets locally. A feasibility study is currently underway for a much larger pellet mill in Tasmania's south.

Biochemicals

Local businesses are now producing bio-chemicals such as the new industrial solvent called Cyrene, from wood. The global market for polar aprotic solvents such as Cyrene is presently around 900,000 tonnes. In fact, four of the six major polar aprotic solvents used in pharma and agri-chemical industries that Cyrene can displace are being phased out by health and environmental regulations.

Plantation Growth will Rely on and Reward Farmers

The next generation of plantation growth in Australia will rely on and reward our farmers. The sustainable revolution is only just beginning. It's not a fad. Technological advances will come thick and fast, with an array of exciting new ways to use the natural materials derived from trees.

Investments in planting trees today will pay dividends for future generations as these trees mature and become available for wood and fibre supply. Just as forward-thinking scientists and entrepreneurs harnessed coal to create opportunity towards the end of the previous millennium, it will be those that come up with sustainable alternatives that are most successful in this one. The resource of choice in our time is renewable.

According to the Australian Department of Agriculture, forest industries' working with farmers to secure a long-term 'wood bank' for the future will be an economic win for all the parties involved.
There has never been a better time to plant trees.

Step-by-step guide to planting

PLANTING POTTED STOCK

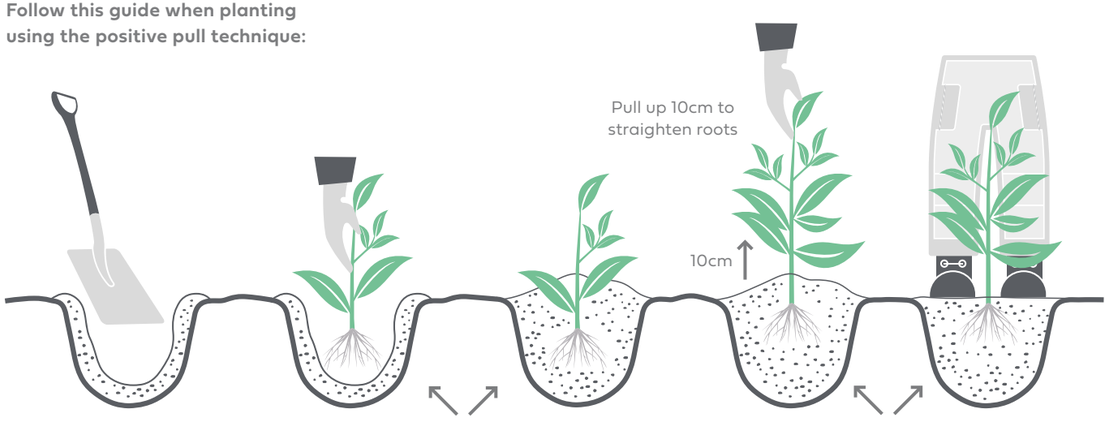
1. Make a simple spade slit and place stock in the slit beside the spade
2. Remove spade at the same time as lowering stock to the bottom of the slit
3. Gently raise the seedling to the correct position
4. Compress soil around seedling to close the slit
5. Firm down the soil with your heel on the spade side of the slit, then use the sole of your foot to firm down rest of soil
6. Paper-potted stock must be wet at planting
7. If you tear the paper this may assist the roots to explore the soil faster
8. Ensure no part of the paper pot is above the soil as it may act as a wick to evaporate water

POSITIVE PULL PLANTING

The positive pull planting technique has several advantages:

- Avoids the development of J-roots
- Avoids air pockets
- The trees are firmed in and straight trees are planted
- Prevents stem damage

Follow this guide when planting using the positive pull technique:

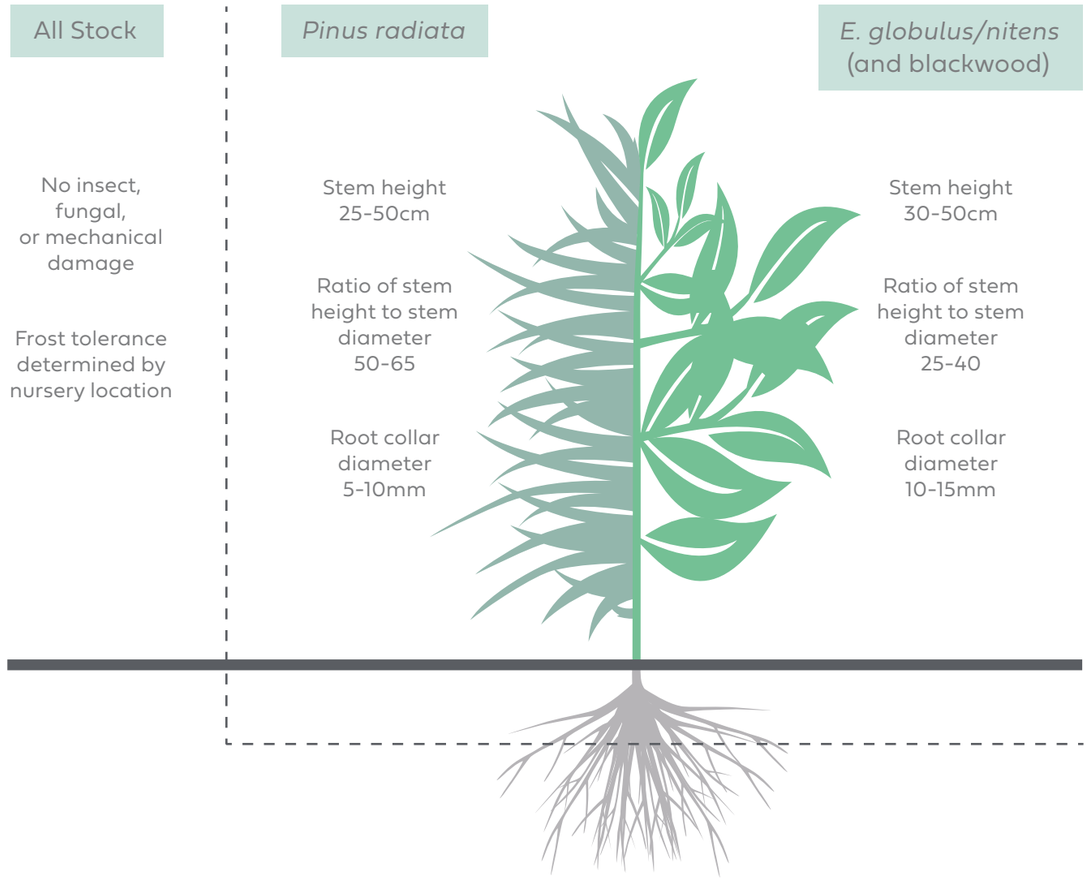


a. Open up planting hole

b. Place planting stock and fill

c. Positive pull and firm

Qualities you want in open-rooted stock



FACT SHEET

Weeds – managing the competition

Weeds will aggressively compete with your trees for water, nutrients and light. They can also contribute to increased frost damage, browsing susceptibility, fungal diseases and insect attack.

Weeds can affect the growth of the trees and reduce the effectiveness of shelterbelts or amenity plantings around roads, reserves and creeks.

Develop a strategy

A good weed strategy will allow the planted trees to grow as quickly as possible so they occupy the site, rather than the weeds occupying the site. **There are two methods of weed control:**

NON-CHEMICAL

The following methods can provide a short-term solution, however require careful implementation and monitoring to be successful.

Burning –

Often used to control bracken and gorse. Be aware that fire can encourage seed germination or sprouting from underground rhizomes, so burning could increase the amount and variety of weeds in the future.

Slashing –

Good for access and to help reduce fire risk in older plantations. As an initial form of weed control, it cuts the weeds back but the roots can still survive, providing competition for water and nutrients.

Mulching –

Effective once the weeds have been suppressed or removed initially. Cultivation can be used to remove woody weeds. Do a second cultivation in spring to get on top of any new invasion weeds on the site. Don't apply fresh manure directly to plantations.

Grazing –

Appropriate before chemical weed control in grassy areas. Well-managed grazing is effective in controlling pasture weeds in strips between tree rows once the trees are established. Grazing needs to be carefully managed. If animals graze on wet soil they can cause damage to the roots. Cattle need to be monitored to ensure they don't eat the seedlings or rub against the trees.

CHEMICAL

If you plan well, a chemical weed control regimen can be a low-cost effective method. There are three categories of agriculture chemicals:

1. Translocated or systemic chemicals

Sometimes referred to as knock-down herbicides, the liquid formula is absorbed (usually through spraying) by the foliage and translocated through the plant.

2. Root-absorbed chemicals

Often referred to as residual herbicides, these chemicals are usually applied directly to the ground as liquid formulations or dry granules. They require moist soil and can remain in the ground for long periods.

3. Germination inhibitors

Work best if applied to bare moist soil so that the active ingredient can bind to the soil particles in the top few centimetres of soil. They kill seedlings as they germinate and remain active for 3-6 months.

NOTE: It's crucial to use the right chemical for the right job. Labels on chemicals are legal documents and must be followed exactly. Seek professional advice before embarking on a weed control strategy. Ensure you are adhering to the relevant Chemical Acts and Regulations.

SPECIES TIPS

Eucalypts are sensitive to grass competition. Ensure there is a weed-free strip of one metre in width around young seedlings. This should be maintained until the canopy suppresses the weed growth

Pine plantations may only need a one-metre diameter spot around the seedling in the first year. Strip application could be necessary in the second year where aggressive grasses may have grown throughout the year

Helpful hints for weed control:

- Check out native forest sites before clearing your land so you can anticipate the weed spectrum that will germinate in spring. Keep in mind that wattle seed can lie dormant and then germinate when there is soil disturbance or burning
- Spray bracken areas in autumn before the first frosts. Leave undisturbed for at least four weeks (ideally until the spring). Slash any re-sprouting in the spring, allow a new canopy and spray again
- If you plan to cultivate the entire plantation area, it's best to apply the herbicide before cultivation. Apply residual herbicide to bare ground for longer control
- Cultivate the soil in strips to achieve a fine tilth. Cloddy soils or turf will make managing weeds more difficult
- On ex-pasture sites, concentrate the weed control on cultivated strips about one-metre wide. Leave the area in between strips undisturbed to help with erosion control, prevent invasion of problem weeds and provide fodder for grazing
- Apply herbicides before the weeds go to seed

Planting the seedlings

Now that you have prepared the site and have a solid weed control strategy, it's time to get planting. Schedule the planting in late winter to mid-spring to avoid the risk of drought stress or severe frosts.

CHOOSING YOUR STOCK

Seedlings should be grown from genetically improved seed collected from a seed orchard, as this will give you a better quality tree with a uniform growth rate

Cuttings from the same mother tree will be the most uniform in growth and size at harvest. Be aware that as there is little genetic variability amongst cuttings, there is a risk of greater damage to the plantation following a single stress (frost, insects, disease) if the cuttings are susceptible

Potted/container stock is supplied in paper or plastic pots or most commonly in trays. Check that the roots are not bound within the pot or container – there should be no spiralling of roots

Open-rooted stock has been raised in nursery beds. The stock is lifted from the beds just before delivery. These plants tend to be larger than potted stock as they have been growing in beds for longer. **Visit: www.treealliance.com.au for more information** on the attributes of desirable open-rooted planting stock

Good to know

- Hardening can increase the resistance of your stock to frost, drought and animal browsing
- The nursery can harden stock by exposing it to cold nights
- Check your stock has not been exposed to dry conditions or been squashed during delivery
- Plant stock as soon as possible. If storage is required ensure it is in cool moist conditions. Avoid temperatures greater than 4 degrees as this can cause de-hardening
- Don't expose seedlings to full sunlight and avoid exposure to wind
- Avoid plastic bags for storage. If the open-rooted stock cannot be planted for at least three days, heel into moist loose soil without separating the plants

Get planting

It is essential for the survival and growth of your trees to get the planting right. Tractor-mounted planting machines are suited to well-prepared ex-pasture sites or you can use hand-held devices, such as a Pottiputki. Custom-made planting spades are effective and suited to the scale of farm forestry. Make sure the planting hole accommodates the total root volume without distorting it in any way.

Next steps

Arrange an appointment

Arrange an appointment with a private forester to talk about what you want to achieve from growing trees on your property. See if a consultant can come and assess your land and find out what is possible

contact@treealliance.com.au

Call the helpline

Call the helpline with any questions

Tel: 1300 661 009

Join the online community

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Registered Herbicides

Herbicides registered for forestry use in Tasmania

Active Ingredient	Mode of action	Uses
Armitole	Foliar absorbed and translocated	Knock-down grasses and broadleaf weeds.
Atrazine	Root absorbed	Residual control of grasses and some broadleaf weeds in pine and eucalypt plantations. Best use a germination inhibitor.
Clorpyralid	Foliar absorbed and translocated	Knock-down of wattle and some bush species. Can be sprayed over eucalypt at low rates.
Dichlobenyl	Root absorbed	Spring or early Summer control of grasses and some annuals. Post planting grass control in eucalypts.
Glyphosate	Foliar absorbed and translocated	Knock-down grasses and broadleaf weeds and some brush species.
Haloxyfop	Foliar absorbed and translocated	Post planting grass control in eucalypt plantations.
Hexazinone	Root absorbed, some foliar absorbed in liquid form	Knock-down and residual control of grasses, broadleaf and woody weeds in pine plantations. Foliar absorbed and translocated.
Metsulfuron methyl	Foliar absorbed and translocated	Knock-down of bracken, gorse and brush weeds prior to planting. Damages young eucalypts so withholding period required before planting.
Picloram	Foliar absorbed and translocated	Knock-down and residual effect with woody weeds. Tordon used for stem injection.
Simazine	Root absorbed	Residual control of grasses and broadleaf weeds in pine and eucalypt plantations.
Sulfmeturon methyl	Root absorbed	On its own, primarily used as a germination inhibitor. See below for combination with Terbacial.
Terbacil	Root absorbed	Usually used in granule form for grass control in >1 year old eucalypt plantations.
Triclopyr	Foliar absorbed and translocated	Knock-down and residual control of woody weeds.

Remember the label is a legal document and must be followed when using any agricultural chemical. It is illegal to use a chemical for a purpose which is not described on the label. In addition you must adhere to the relevant Chemicals Acts and Regulations.

Looking to improve water quality? Plant trees.

Dr Philip Smethurst

As a soil and water scientist at the CSIRO, Dr Philip Smethurst has been studying the effects on water quality of plantation forestry in streamside management zones on Tasmanian farms. His conclusions? If all farmers were using trees for water quality management, drastic improvements to water quality could be made for the greater good. Plantations in riparian zones improve water quality, create almost non-detectable effects on stream flows, and neither planting nor harvesting along stream sides increased contaminants. In fact, not only do plantations improve water quality, they also decrease evapotranspiration overall for the adjacent pastures.

"Worldwide, it's recognized that water quality coming out of farmed areas, both cropping land and grazing land, presents water quality problems. A very sensible sort of solution is to keep the stock out of the stream, or manage the sediments that might be washing off the cropland soil, by having a stream side buffer, also called a stream side management zone or area.

"You need a fence to keep the stock out, as well as vegetation in that space and surface roughness to capture any overland flow that's coming off the upland areas of the farm. If you can do that, it is well known worldwide that you'll see water quality improvements."

Applying the research locally

Dr Smethurst explains how he set up his research experiment by looking at two different farms in Tasmania. What he discovered surprised him.

"We chose to work at low-input, extensive agriculture sites, where it would be easiest to detect an increase in contaminants due to forestry.

"Concerns were mainly around doing plantation forestry right next to streams. "Plantation forestry involves some soil disturbance at both the harvesting stage, when you actually have a plantation to harvest, and whenever you establish a new plantation. So, cultivation and harvesting are the main disturbances that present risks to stream water quality when using streamside zones of plantations. We focused on both of those phases.

"We did the plantation establishment phase on the Willowbend Farm in the south of the state with Chris White and Private Forest Tasmania. We also studied water quality during harvesting of a 20-year-old plantation that was right next to the Pet River, which is part of the Burnie water supply in the Northwest of the state."

"But what we actually found were further improvements to water quality by using streamside management zones containing plantations, despite disturbances during both plantation establishment and harvesting.

"We saw no increase in sediment delivery to the stream compared to the other sorts of practices that were going on around the farm, which are most importantly roadside drainage and direct stock access. Both processes lead to water contamination."

Water quality improvement

Drawing conclusions from his research, Dr Smethurst explains that, if all farmers were using trees for water quality management, drastic improvements to water quality could be made on-farm and for the broader community.

"Generally, it's a very good practice for improving water quality that comes out of small headwater streams that drain a farm. If every farmer in the catchment did it, or a large proportion of those farmers, you would have substantial improvements in the water quality of the larger streams that flow through farms and delivery into estuaries and seas."

While the results might be surprising to some, Smethurst says it's all about following the Forest Practices Code that has been set up to serve as a guideline.

"If you follow the Forest Practices Code, you'll be right. The machinery that's available and practices available these days allow you to work very close to streams without causing much disturbance at all."

But what about water losses due to usage by pastures and trees?

For micro-climate, Smethurst also says that early findings point to more good news.

"There's good evidence developing that, even in Tasmania, plantations decrease evapotranspiration overall from adjacent pastures.

"There's light, water and nutrient competition going on close to the plantation, but further out, if the configuration of the plantation is appropriate, you'll see decreased wind speeds that lead to decreased evapotranspiration from the pastures, and better water use, water retention, and water use efficiency can result."

Smethurst goes on to explain that the worry for water use by plantations next to streams should be of little concern.

"Some people might be concerned about water use by the plantations in the streamside management zone leading to reduced stream flows. We measured that here and found an almost non-detectable effect."

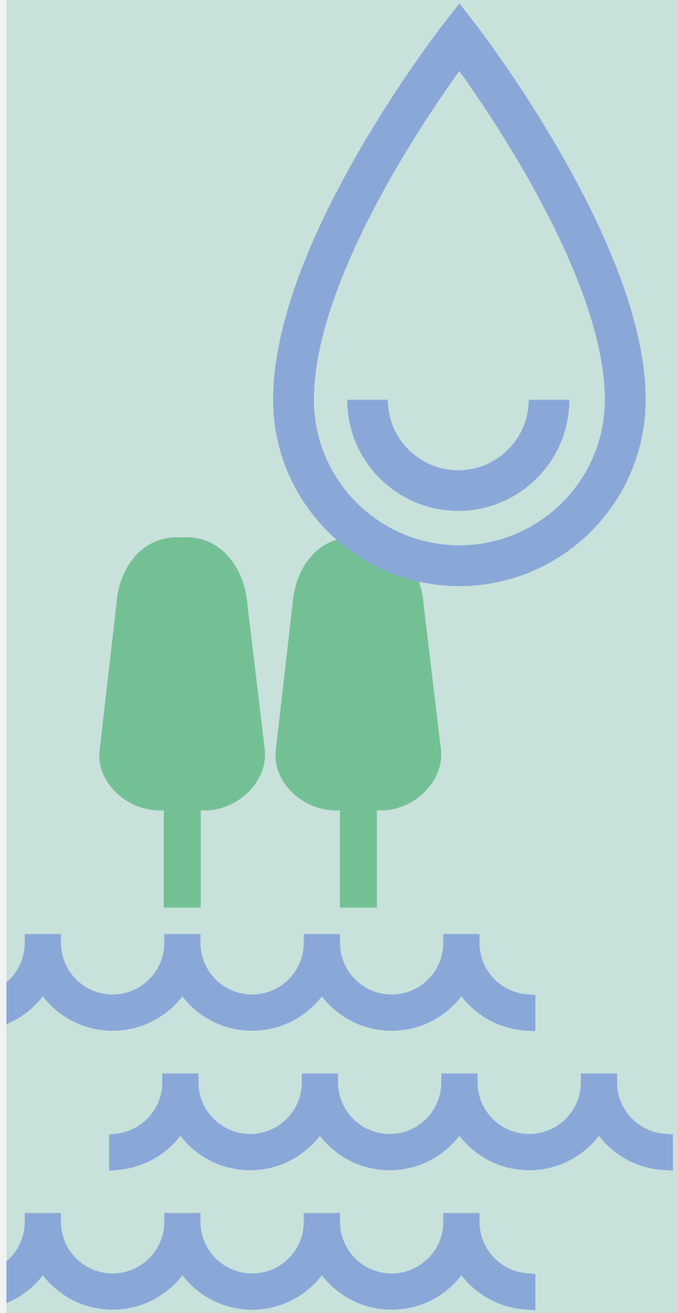
Reducing tunnel erosion

Stream side plantations may also be useful in dealing with tunnel erosion, Dr Smethurst explains. In regions of Tasmania receiving 650 to 800 millimeters of annual rainfall, dispersive soils are common, which can cause tunnel erosion, leading to holes in the soil that both farm machinery and stock can sink into, and which therefore presents a safety issue. But stream side plantations can help.

"The science is not fully in on this because it's a very long term issue, but I've seen examples, two here in Tasmania and one in Victoria, where those farmers who did put plantations in these areas thought it was a very useful practice to make use of land affected by tunnel erosion."

"[A plantation] stabilizes the tunnel erosion and tends to dry out the landscape, which helps ease the problem."

Dr Philip Smethurst is a soil and water scientist at CSIRO. His work at both plot and catchment scales improves our understanding of plantation and agricultural production, catchment water management, and codes of practice. Using advanced research methods to gather data including real-time sensor technologies, Smethurst seeks to provide situational awareness and forecasting for practice change. With operationally-focused research and development experience in the forest plantation sector, Dr Smethurst has led assessments of codes of practice for plantation forestry in all Australian states and territories.



Trees improve water efficiency and water quality

When trees are strategically planted alongside other crops, they provide a buffer from evaporation, which improves water efficiency.

In the Tasmanian midlands, the potential water evaporation reduction over one year for a 25-hectare paddock was 20-35ml. When planted around streams, trees also improve water quality.

Call the helpline with any questions
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Private Forests Tasmania

INTERVIEW

Diversification, protecting the land, leaving a legacy. How Chris White is Growing the Future.

Watch online
https://youtu.be/BLk9pkvbUOc

Chris & Guiliana White
Tasmanian farmers

When Chris and Guiliana White bought Willowbend Dairy Farm in Wattle Grove there was barely a tree in sight. The gullies were eroding, there was mud everywhere, the soil was washing away, and there was a lot of undermining in the dispersive soils. They wanted a solution that would retain the gullies as farming area but protect the land for the future. With the help of Private Forests Tasmania, they put in place a riparian plan that is paying dividends.

"Dairy farms are pretty well denuded of trees," says Chris. "And so, when we came here there were hardly any trees in the gullies at all.

"Cattle are a very heavy animal, so they were breaking up the gullies and there were a lot of environmental and animal health issues that came as a result of that."

Chris explains that the gullies were a mess. There was mud everywhere, the cattle were breaking up the soil and causing all sorts of problems.

"During winter in particular, the gullies were eroding more and more. A lot of water was running away, and with it a lot of sediment. We were very unhappy watching our soil just wash out to the sea."

The White's decided to see what they could do to protect the gullies and their farm for the future. They didn't want to bank the gullies up or dam them because they didn't want to lose the land to farming.

They spoke with Private Forest Tasmania about creating riparian areas, by putting trees into the gullies where it is damp and wet.

Around 8,000 trees were planted with *Eucalyptus globulus* planted on the outside of the gullies and Blackwood in the centre. The gullies were fenced around the trees to keep the animals out at certain times.

"We took advantage of the experience of Private Forests Tasmania. It would have been difficult to get this right without their guidance and leadership," says Chris.

Riparian Areas: Solving problems and delivering a range of benefits

According to Chris, the forested gullies have delivered a broad range of benefits both environmental and economic.

"The trees have stabilized these areas, which were a real concern to us. They have slowed down the erosion. And, you don't actually lose any of your farm at all. We simply open the gate to these forested areas and the cattle graze amongst the trees."

Chris says the shelter is proving to be of great benefit to the cows and their calves.

"The forested gullies provide shelter for the animals, especially for the mothers when they are giving birth and for the calves. The shelterbelts have created an area where the calves are supported and not hit too hard by the bad weather in wintertime."

"The other good thing, and I know it's strange for a farmer to say this, but it does actually create a beautiful environment for native animals. We've created a little microcosm. We have birds now throughout the property, and all sorts of animals that use this as their own little habitat."

In addition to providing shelter for the animals, the trees are also providing beneficial shelter for the surrounding pasture.

The CSIRO conducted research over a number of years to examine the impact that the trees had on the surrounding paddocks.

"We thought the trees might rob the surrounding paddocks of nutrients and moisture," says Chris, "but it just isn't the case. In fact, they add a little bit more shelter to the paddocks, which helps us."

The economics

Trees are a healthy addition to any farm, and not just for environmental reasons. Chris says the riparian areas are looking pretty good for them in terms of a commercial investment as well.

"When these trees grow a bit more, say in another 10 years, we'll be able to selectively log them, and I believe they are in very good condition for prime sawlogs," says Chris.

"I don't think there's any doubt that these trees will be worth good money in the future.

"And that's the beauty of it... with selective logging, you can just keep on growing. And in terms of carbon, we're doing our little bit as well, which is important."

The trees are also adding to the future value of the farm as a whole.

"Another benefit of the trees is that they actually beautify the farm. Any farmer will know that there's something lovely about having a farm that is quite pretty. But it goes beyond that. One day, if ever I wanted pass on or sell the farm, it will be valued higher as a result of the trees."

In addition to the economic improvements for the future, Chris says there is another legacy:

"That as a farmer, I would prefer to leave the farm in a condition better than I found it."

FACT SHEET

Managing your plantation

Proper attention to controlling pests and diseases, pruning at the right time and thinning to alleviate competition amongst your trees will ensure your plantation thrives.

Pests and diseases

To ensure your plants grow and flourish, ongoing management and maintenance is essential. This includes ongoing vigilance with pests and diseases and browsing wildlife and cattle, as well as pruning and thinning of the trees.

It's important to do a regular check for both native and introduced pests and diseases.

Look for these signs:

- Yellowing of the foliage may be a sign of ill health and a nutrient imbalance (unless it is a deciduous tree in autumn)
- Indications that the leaves have been eaten, especially where the soft new foliage develops in spring
- Insects, caterpillars, black mold or a sticky coverage on the foliage
- Extensive lumps and bumps on the foliage or limbs
- Dead branches around the crown

If more than 10% of the foliage of a tree is affected, you must investigate the cause!

WHAT TO DO

- Affected single trees can be treated with insecticide or if the infestation is small, you can pick off the bugs and squash them. Soapy water can be sprayed on the foliage to discourage insects and browsing animals, though will wash off in rain so you would need to reapply
- If a tree is severely affected, cut it down and burn it all to reduce the spread
- Spray large plantations. If the trees are high it may need to be done by air. Be careful to avoid waterways or other sensitive areas and always seek advice before using chemicals

BROWSING DAMAGE

- Control of browsing animals is essential to protect the growth of seedlings. Animals can affect the growth rate and the form of your plants, reducing the chance of a successful harvest. Seedlings are vulnerable until they have reached between one and two metres in height. The species of tree you plant will influence the growth time. A safe option is to plant larger seedlings.

WHICH ANIMALS?

It's important to monitor your seedlings regularly. If you notice the leaves have scalloped edges or holes in them, it is most likely insect damage. Mammal browsing results in jagged leaf edges and the stems are often eaten. In Tasmania, the key mammals that like to browse on seedlings are:

Brushtail possum – prefer shining gum and blue gum seedlings, however will also eat foliage from older trees. Usually a possum will target the apical bud and a few side leaves

Pademelons – tend to avoid eating the apical bud and eat the side leaves

Bennett's wallaby – may eat foliage and break or damage the stem

Rabbits/hares – often snap seedlings off at the base and leave a few leaves lying around

Deer – strip the bark

HOW TO PROTECT YOUR SEEDLINGS

Fencing

There are several fencing options available. Fencing that has been erected for livestock won't prevent native browsers from getting to the plants. For more details on the types of fencing to protect your plantation **visit: www.treealliance.com.au**

Any trapping of a native species requires a permit. Only live-trapping is allowed and can be disruptive and cruel to the animal. It is only effective against small populations and is time consuming

Repellents

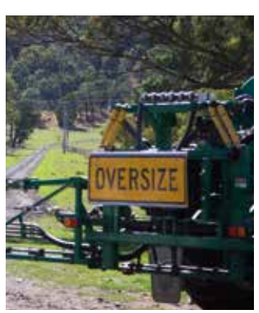
Protection can be limited to 6-8 weeks and any new foliage that grows in this period won't be protected. Repellents may also damage leaves and reduce growth

Palatability

Choose a species that will be less tempting to the browsing mammals you have on your property. Also, planting a desirable species on the outskirts of the plantation could lure the browsing mammals away from the plantation. Retaining some weed cover between rows can provide an alternative source of food. Hardened seedlings are less attractive than unhardened seedlings

Tree guards

These are more suited to small plantations due to the expense. The fluted extruded plastic tubes that are 1.2m high are the most effective, although their effectiveness against possums is unknown. The guards need to remain until the trees are just above the tree guard level. This is roughly 12-18 months for eucalypts and 18-24 months for pines and blackwood



Pruning

Pruning your trees will improve the growth form of the trees and increase the value of the timber. Log value is determined by size and straightness of the tree trunk and the number of knots and branches. Large, straight, knot-free trees get the highest price. A harvestable log of six metres is the preferred length for sawmilling and for peeling for veneer. It is crucial that pruning is done on time. Premature pruning can reduce tree rate growth and delayed pruning damages tree form and can result in loss of valuable clearwood.

There are two types of pruning that need to be done – form pruning and clearwood pruning.

- Form pruning will help produce a straight trunk and control branch size
- Clearwood pruning produces the maximum amount of knot-free wood

Select the larger trees (dominants or co-dominants) with the best, straightest form for pruning. Apply the following rules for the region of the stem you are pruning:

- Single stem and free of secondary leaders
- Straight stem with no lean from the vertical of more than 5 centimetres (5cm)
- Stem free of wounds and splits
- Branches not making an acute angle (less than 30 degrees) with the stem
- Butt sweep limited to the bottom 0.3m of the stem
- In eucalypts, branches should be less than 3cm in diameter at the junction with the stem

Tools you will need

Secateurs for smaller branches

Shears for medium-sized branches

Saw for the larger branches and for a close cut to the stem

Ladder to reach the higher branches

Extension poles for the saw or shears to reach the higher branches

Chainsaw for the larger branches, however be careful not to damage the stem

Hydraulic/air-powered saws/shears are useful for some larger commercial jobs

Thinning

Trees compete for basic resources, light, water and nutrients. The process of thinning, which is the selective removal of some trees from a plantation, helps to alleviate the competition and provides more resources for the remaining trees. In plantations grown for solid wood, establishing more trees than are required at final harvest occupies the site with trees early on, reducing the competition from weeds. It also allows for the selection of the very best trees for final crop.

COMMERCIAL THINNING

There are two approaches: ground-based or cable thinning.

- Ground-based operations are usually done with an excavator with a reach of about eight metres. This can be carried out on slopes up to 25%
- Cable thinning can be done on steeper slopes
- From the out-row, the machine or cable can remove selected trees from each side of the out-row
- Depending on the machine you use, the bark can be removed and the log cut to lengths at the stump. Other machines need to carry the trees out of the stand for processing
- In native forests, logs are often taken out of the forest along snig tracks
- Consult Private Forests Tasmania for advice on which approach would work best for your plantation

How to thin

How you thin your plantation will depend on if the trees are being thinned for commercial use or for waste (non-commercial). Access is essential for commercial-thinning operations. The occasional row of trees (called an out-row) is removed to provide this access. Out-rows should be selected before pruning as trees in this row won't be selected for retention. Ideally, every fourth or fifth row should be removed.

Which trees to thin?

- Poorly formed, forked or diseased trees
- Smaller trees
- Ensure remaining trees are even spaced for equal light, soil moisture and nutrient allocation
- For commercial thinning, a row of trees (out-row) may need to be removed for machinery access
- Don't over thin or the remaining trees may bend or be blown over

NON-COMMERCIAL THINNING

- Ground-based machinery or a chainsaw can be used
- A preferred successful method is stem injection of glyphosate
- The amount of chemical needed depends on the size of the tree. With glyphosate 360, it is given in 1ml hits per 5cm of DBHob at injection points placed evenly around the stem

Top tips for thinning

- Be careful not to damage the stem or crown of crop trees as this will reduce the quality and value of the thinned stand
- Avoid damage to bark as it provides an entry point for decay pathogens
- Plan the direction of falling trees to avoid crop trees
- Don't leave dead branches and trees around as they can cause a fire hazard once dry
- Monitor stem growth for best results

Next steps

Learn more

Visit **www.treealliance.com.au** to find more information, articles and case studies.

Call the helpline

Call the helpline with any questions

Tel: 1300 661 009

Join the online community

Join our private Facebook group, the Growing the Future Online Community. Find out what other farmers are doing, chat to an expert, ask questions and share ideas. **https://www.facebook.com/groups/596397397623294**

FACT SHEET

The most common pests and diseases found on plantations:

ARMILLARIA ROOT AND BUTT ROT -

Most commonly attacks eucalypts. The fungus develops under the bark and crown dieback is a major sign

DOTHISTROMA NEEDLE BLIGHT –

A fungus that infects the needles of the radiata pine. It can cause the needles to shed prematurely and several infections can cause defoliation, loss of growth and eventual death. Look for a red-brown discolouration in the crown. The infected needles have distinctive red bands

CHRYSOMELID LEAF BEETLES –

This beetle looks like a large dull green ladybird and has a voracious appetite. They often attack new spring growth and leave the leaf with a scalloped edge. Eucalypts are particularly susceptible

GUM LEAF SKELTONIZER MOTH –

A hairy yellow and brown caterpillar that will eat a leaf until it has a lace-like appearance. They often appear in large numbers and especially like young stringybarks and peppermint eucalypts

AUTUMN GUM MOTH –

Large caterpillars that defoliate young blue gums in plantations. Usually only the leaf mid rib is left and a larval shelter can be found at the tip of the leaf concealing the caterpillars

SIREX WASP –

The female wasp bores into the trunk of radiata pine trees. Needles wilt and resin beads may be seen around the entry holes on the bark. Unthinned or drought-stressed plantations older than 10 years are most vulnerable

SAWFLIES –

Commonly known as spitfire grubs, they cluster together on mass and when disturbed they rear up and emit a yellow fluid. They are usually found on the foliage of stringybarks and white gum. Individual trees can be completely defoliated though large areas of damage are not usual

CINNAMON FUNGUS –

A root rot fungus that targets the fine roots, progressively starving the tree of water and nutrients. Trees under stress due to waterlogging, major bark loss or following fire are particularly susceptible. Look for signs of dieback from the crown downwards

Fencing

While effective fencing may be expensive to set up, the cost per hectare should decline as the area enclosed increases. The following fencing will help keep out native animals and livestock:

NETTING WITH ELECTRIC WIRE

This will help to exclude possums and other ground-based browsing mammals. The bottom 100mm of the 1m netting is buried and a high tensile electrified wire is placed 100mm above the top of the wire netting. A barbed wire can be placed 10cm above the electric wire to also keep out Bennett's wallaby.

ELECTRIC PLAIN WIRE

An electric fence uses insultimber posts about 20m apart with droppers in between. Several of the strand wires are 'hot'. The bottom wire is 50mm above the ground and if electrified, the area underneath will need to remain weed free.

ELECTRIFIED RINGLOCK

Treated pine posts are placed at 30m intervals and two 1.5m insultimber droppers are driven in between the posts. The bottom strand is earth wire and is 50mm above the ground. The ringlock is hung 50mm above this wire with another earth wire 120mm above the ringlock. Three 'hot' wires are looped around the backs of the strainer posts to prevent possum access. This is a very effective method of fencing.

WALLABY WIRE

Provides a non-electrified alternative to electric fencing. It will exclude most animals except possum and deer.

The global demand for timber is expected to **quadruple** by 2050

There is a global shortage of timber, and farmers are the key to delivering the commercially viable resource of the future. Within Australia demand is being driven by the home building market and the desire to replace carbon intensive materials and plastics with natural, recyclable and renewable products.

Technology is unlocking new uses for materials derived from trees, like 'green' chemicals and biofuel. Providing enough timber and fibre to meet this increased demand presents both a challenge and an opportunity.

Farmers can capitalise on the opportunity – there has never been a better time to plant trees.

Call the helpline with any questions
1300 661 009

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This Evandale Farm is maximising productivity and custodianship through trees

Clare Peltzer
Three generations of tree planting on Logan, a family run farm at Evandale, has delivered increased water efficiency, increased lamb survivability, and enhanced farm aesthetics. After two generations of planting, Clare Peltzer explains why she and her brother, Angus, will continue the family tradition of planting trees for the future.

Clare Peltzer's great grandfather, Pier Grandjean, came to Tasmania from Belgium in 1950 as a businessman and developed Logan as a Merino farm. More recently, under the management of Clare's father, Michael, and due to access to gravity-fed irrigation, the farm moved to prime lamb production for the export and domestic market, a business that continues today. Regardless of what the farm produces, trees have always been highly regarded as a tool to maximise productivity and hence, the bottom line.

"My great grandfather recognised that trees were a necessary addition to the farm," says Clare.

"He chose the pine tree because pines are successful in our soils and sufficiently block the wind, which he knew was going to be very beneficial. We've got predominantly north-westerly winds that from spring through summer can be fairly persistent."

Clare explains that decreasing the wind speed meant they could increase yields, by reducing evapo-transpiration of the pasture and providing shelter for the lambing ewes.

"Trees are another tool that we can use on the farm to help us become more profitable by looking after the animal's health and wellbeing, which is the main profit driver."

"When you plant trees, you do get the initial loss in pasture, but if we're putting in 20 hectares of trees and we're lambing down 8,600 ewes, the 5% to 10% increase in lambing survivability definitely outweighs any hectares lost in the current market."

Observing the increased yields in the sheltered paddocks over many years, Clare's father continued to plant through his tenue on Logan.

"Dad planted a lot of pine trees with the help of Private Forests Tasmania in the early 2000's and now my brother and I have decided that it's our turn to plant trees. With the help of Private Forests Tasmania again, we're going to be planting our trees to also benefit the next generation."

Increased water efficiency

The Peltzer's grow white clover and brassicas as sources of fodder for their prime lambs under irrigation. Clare explains that in areas where trees block the prevailing winds, less irrigation is needed over the growing season.

"In the parts of the pivot area that we've got the trees slowing that north-westerly wind our irrigation requirements are substantially less than the un-protected quarters. Shelter from trees helps to hold that moisture in the soil. This allows the plant to not feel stressed at all because it always has access to water so continues to produce dry matter without plateauing."

Increased lamb survivability

With lambing, the Peltzer's scan their ewes to determine exactly what each ewe is carrying, multiples or singles. Then at lambing time, they count the ewes, and count the lambs and calculate a survivability percentage based on each paddock.

"We know that we have a higher percentage of survival in our lambs in these paddocks with the protection from the pine trees."

Custodians of the land

When calculating value, Clare notes that sometimes the benefits of improved aesthetics is forgotten, along with the creating wildlife habitats and sequestering carbon.

"We are sharing the land. As farmers we think that it is ours, but in fact we are custodians of the land, and we are sharing it with native flora and fauna and looking after it for future generations. So, I think we do need to replace the trees we removed for our own business ventures," says Clare.

"We need to look after the assets that we have been fortunate to receive from our families or purchased. And then to hand it on in better condition. That's what my brother and I think anyway."

Where carbon sequestration is concerned, Claire explains that anything that is photosynthesizing on farms, including perennial pasture, is sinking carbon. Planting trees is another thing that farmers can do to maximise that.

Soil protection – the top ten centimetres is everything

The best farming practices ensure that pastures never get to the point where the soil can be eroded. They always ensure full ground cover with pasture to keep the soil in place. But in extreme weather events, like drought, farmers have less control.

"If there's just absolutely no water, the plants can't survive. So, trying to keep trees in the landscape is really important to protect the topsoil.

"The trees hold the soil close to them down and reduce the wind speed over adjacent paddocks which not only keeps as much moisture in the soil as possible, but it stops dry soil from being blown away.

"For us, the top 10 centimetres is where everything's growing from. So, we need to make sure that that's being protected and retained.

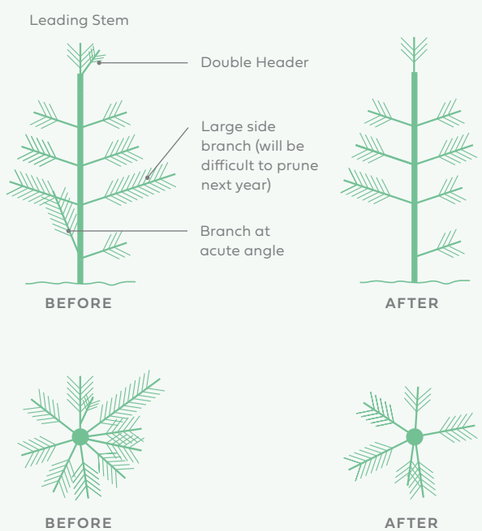
Clare notes that trees are really beneficial for the biology of the soil as well. We have a symbiotic relationship with the soil as the microbes will help our pasture if we protect them from disturbance or drying out. "The pasture stays greener into the summer months and then when it does get that rain, like in autumn, it's able to bounce back more quickly."

FACT SHEET

Form pruning

- Assists the tree to meet the rules for tree selection
- Begin two to four years after planting and continue until the tree trunk is pruned to the desired harvest height
- Involves the removal of branches from the crown. These branches may be large branches which are competing with the main stem or those that are developing at a steep angle
- Branches radiate from the trunk like spokes in a wheel on a radiata pine. This is called a whorl
- Whorls crowded with branches are called basket whorls. These often occur between two to six years of growth and lead to poor quality timber
- Reduce the number of branches to four per whorl
- Concentrate on basket whorls first when form pruning a radiata pine. Then remove acute branches and tip prune the large branches. **Never remove more than 50% of the green crown as tree growth will be adversely effected**
- Form pruning may be essential in hardwood species and eucalypts as control of branch size is critical to minimise the risk of decay entry in eucalypts
- In fast-growing *Eucalyptus globulus* and *Eucalyptus nitens* lower branches may be retained for a long time even after they have died. Pruning is essential if clearwood is to develop

Form pruning of young radiata pine:



Clearwood pruning

In uniform stands clearwood pruning is usually conducted in a series of 'lifts' to 2.4m, 4.4m and finally to 6.4m. In stands of variable growth rates containing short and tall trees, prune each tree as it reaches the desired height.

RADIATA PINE

- Begin when the trees are 4-6m tall
- Prune lowest branches first, working up the trunk
- Leave 3-4m of green crown at the top of the tree. As a guide, remove only the branches below the point where the trunk diameter exceeds 10cm in slow-growing trees and 8cm in fast-growing trees
- Form prune above the clearwood pruned trunk to ensure a single straight stem and to control large acutely angled branches
- Prune the trunk to the desired saleable log length
- Remove epicormics shoots and sprouts on the stems of pruned trees
- Record the diameter over stubs (DOS) of the largest pruned whorl. Maintain a uniform DOS from first to last pruning. The DOS (or defect core) determines log quality. Keeping records of DOS can be beneficial for pruning accreditation

Pruning guidelines for radiata pine:

Pruning Visit	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Type of Pruning	**Form Pruning**		**Form and Clearwood Pruning**			**Clearwood Pruning**	
Tree Height (metres)	**1.0 - 2.5**	**2.5 - 3.5**	**4 - 5**	**5 - 6**	**6 - 7**	**7 - 8**	**8 - 9**
Pruned Height (metres)	**-**	**-**	**1 - 2**	**2 - 3**	**3 - 4**	**4 - 5**	**5 - 6**
9 -							
8 -							
7 -							
6 -							
5 -							
4 -							
3 -							
2 -							
1 -							
Pruning visits will be every 6-8 months depending on tree growth rate and quality of timber desired to be produced	**Prune** - Large branches - Acute branches - Double leaders - Basket whorls *Using pruning shears*		- Prune up the trunk leaving 3 to 4 metres of green crown - At each visit never remove more than 50% of the green crown - Continue to form prune large and acutely angled branches and basket whorls - Rub off any shoots on the pruned trunk between visits - Continue clearwood pruning until the desired log length is reached - this may take 3 to 6 pruning visits *Using pruning shears and saws and pruning where necessary*				

EUCALYPTS

- Prune in early spring to coincide with the start of a period of rapid diameter growth as this will allow rapid occlusion (growing over) of branch stubs
- In blocks of trees planted at 800-1300 stems per hectare, first-lift pruning can coincide with canopy closure. At this time, the tree has a natural tendency for crowns to lose their lower foliage. The tree is able to compensate for this loss in growth potential by increasing the activity of the retained crown for several months after pruning
- In fast-growing *E. nitens* up to 50% of green crown length can be removed without significant impact on height and diameter growth of the pruned trees compared to unpruned trees
- In slower-growing trees, this ability to compensate for loss of growth potential is reduced. Therefore, be more conservative and remove less green crown length when pruning

Preventing disease and decay in eucalypts:

Decay may invade the stem through the cut face of branch stubs following pruning. Take these steps to minimise the risk:

- If pruning in summer to mid-autumn avoid warm to hot days with the potential for rain. Moist, warm conditions are ideal for the spread and survival of decay fungi
- Prune branches before they reach 3cm in diameter
- Avoid trees that have branches forming an acute angle (less than 30%) with the stem
- Do not damage the branch collar
- Make an undercut on the branch to avoid tearing bark from the branch collar if using a pruning saw. Undercuts need to be closer to the stem than the final cut from above to prevent a ridge being formed on the cut face
- The table below outlines a procedure that can be followed for eucalypts based on DBHob and/or height of dominant trees. It will result in a DOS or defect core of about 15cm diameter:

Age	Stand Conditions	Operation
0	Initial stocking	Plant 800-1,200 stems/ha
3 or 4	250 prunable trees/ha DBHob of prunable trees 8-10cm Height of dominants >9.5m	Select and low prune best 250 stems/ha to 2.7m height
4 or 5	DBHob of pruned trees 10-12cm Height of dominants >9.5m	Prune selected stems to 4.5m height
5 or 6	DBHob of pruned trees 11-13cm Height of dominants >12m	Prune selected stems to 6.4m height

INTERVIEW

Matching corporate investment with potential growers, Tasmania's customised approach to help grow the future

Private forests are the dominant source of forest products, providing more than half of Tasmania's annual wood harvest. The bulk of that supply comes from private plantations, managed largely for wood fibre production and export. The future growth potential for wood resource in Tasmania is likely limited to rural private properties but is nevertheless significant. With the global demand for timber expected to quadruple by 2050, every hectare of land counts. Private Forests Tasmania will be releasing a Matching Project, aiming to connect investors with farmers and landowners to create not only a win for each party, but also our environment as we try and help reach our nation's objective of 1 billion trees planted by 2030.

In response to this lofty goal, PFT's Farm Forestry Engagement Plan has the stated objective of facilitating the planting of more trees on farm each year. Investment will play a key role in the future development of the industry, particularly in growing trees, value added processing, the commercial application of new technologies and connecting investors with landowners. Facilitating this project is Dr. David Monckton, Investment Manager at Private Forests Tasmania.

A sustainable relationship

The objective of this project is to identify a suite of practical financial mechanisms that could most cost effectively expand farm forestry in Tasmania. This will potentially include matching corporate investors with private forest landowners. Monckton explains why this is so important.

"We've identified a real need to connect investors with farmers. Farmers often have limited resources and if they have any spare cash, chances are it's not being spent to put trees in the ground. But if we match the right investor with the right farmer and create a lasting relationship, there would be a number of beneficiaries in putting trees in the ground," explains Monckton.

"We've had joint ventures in the past, but they haven't always persisted due to different interests. We need to develop models that are clear and obvious to everyone to ensure sustainability," says Monckton.

Benefits for farmers and land owners

For private land owners and farmers, planting trees in the right place on farms can increase farm productivity, improve water quality and efficiency, improve the carbon balance and protect the land for the future, all benefits which Monckton explains would have a positive impact on farmers.

"Shelterbelts have the greatest benefits to farmers because they protect the property from wind, assist with moisture retention in the soil and greater growth in pasture crops.

Dr. David Monckton
Investment Manager at
Private Forests Tasmania

We've found this in past Tasmanian studies, showing that farmers make a net gain. Farmers also get an improved property value from aesthetics and potential increase in income if the timber is chosen to be harvested. It's a no brainer," says Monckton.

Dispelling negative perceptions

The message to get trees planted on farms and private land is not new. With various schemes being implemented in the past that have adverse outcomes for some, Monckton explains that while he understands there may be some negative perceptions, this Matching Project is not pushing an industry line.

"We need to debunk the negative perceptions in the tree growing landscape. People's fingers have been burnt in the past. This project works and communicates with the farmer and takes a holistic perspective with honest and transparent objectives working in with the farmer's own objectives."

With several stakeholders involved to execute a positive outcome, Monckton explains that Private Forests Tasmania is a logical facilitator for the project.

"PFT is the statutory body, and honest broker with no investment return. We are here to encourage planting trees for all parties, who everyone can trust. While we may not provide commercial advice, we can point farmers to consultants and offer a list of credible names for professional help and advice."

Benefits for investors

While farmers may be one of the key players in the Matching Project, investors are key to the success of this plan and getting trees in the ground. The project will seek specific opportunities and funding mechanisms to encourage new commercial tree plantings on private property, targeting direct investors (such as super funds) and passive investors (such as carbon investors) and the forestry industry (growers, processors). Each will require specific targeted approaches working together with Tree Alliance to create strategies and supporting policies to find matching opportunities with mutual benefit. Communication with these groups will involve research and consultation to understand their strategic goals and where commercial tree planting can have mutual benefits. This information will then be used to develop opportunities with collaborating parties for landowners to establish commercial tree plantings.

"There's a wide range of investor benefits. Whether you're a superfund or bank considering putting money behind trees to a carbon investor seeking an offsetting program by putting trees in the ground to timber processor looking to expand your resource, this program will be able to match you with a landowner that will also align with what your objectives are. This program is not a one size fits all but a completely customised approach," says Monckton.

Ensuring that this project is meeting the interests of all parties involved, Monckton says all stakeholder groups will be involved throughout the process.

"We're setting up a steering group of people from the Tree Alliance, the forestry industry, landholder organizations and potential investors to help guide this project and act as a sounding board for what's going on to make this a workable program to be continued into the future."

FACT SHEET

Your private forest – how to use it

The possibilities and options of how to use and manufacture timber or produce fibre from a plantation or native forest is continually growing for the private forest owner.

While traditionally the products from plantations have been used for pulpwood, fuelwood, treated posts, sawlog, veneer log and stock shelters, products made from non-wood, such as bush foods, seeds, native plants and landscape materials are becoming increasingly popular and opening up the market further.

The ever-expanding market

Whether you are growing your timber for a large commercial venture, special species woodlot or a shelterbelt for the farm, there are many ways to utilise your private forest. **Here are a few:**

VINEYARDS

As the wine industry grows in Tasmania, so does the need for non-treated ground durable posts. Ground durable posts could be purpose grown or form part of the vineyard shelter

ROUND POLES FOR CONSTRUCTION

This is an efficient way to use the thinned timber from your plantation

PURPOSE-GROWN FIREWOOD

A good opportunity for on-site sales and a cleaner burning product, especially if close to urban areas

CHARACTER TIMBER

Highly figured eucalypt, traditionally chipped or mechanically split for firewood, is emerging as a special timber resource

TREATED POSTS FOR FARMS

Management regimens may be developed to purpose-grow posts in lower rainfall areas. This may be especially important where a pulp market is not available and may provide farm post requirements. Post processors require uniform material of little taper with fewer knots

ON-SITE MILLING

The use of portable sawmills to produce timber on farms is becoming popular. There are a number of options from chainsaw mills to twin sawmills and horizontal bandsaws

SEEDS

The market for a variety of seeds is expanding, making seed collection from your native forest a financially attractive proposition. Seed can vary in value from $100's/kg to $1,000's/kg and greater. Minimum capital is required and the collection of non-destructive seeds is a sustainable forest enterprise. It is essential to keep good records – species, date, location, grid reference, altitude and description. Seeds can be sun-dried or kiln-dried and are best stored in dry, sealed, labelled containers at a constant temperature of two degrees

NON-WOOD PRODUCTS

There is an existing market for foliage, bush foods and landscape material. A business plan is essential to take into account the available resources, future demands and costs of production

INCREASING BIOECONOMY

As the desire to replace petroleum-based products increases, so will the demand for alternative fuels, pharmaceuticals and industrial chemicals

Time to sell

There are three main types of wood buyers:

- Large industrial forestry companies
- Independent forest management/timber brokerage companies
- Rural sawmillers, portable sawmillers and harvesting contractors

The most common method in Tasmania is for forest owners to negotiate with potential buyers, either directly or through a wood broker or forest management company, so they can achieve the best deal or advice on their circumstances.

Step-by-step guide to selling your timber:

- You're ready to offer your timber for sale - Contact Tree Alliance for advice. Find a supplier in the comprehensive Directory of Tasmanian Forestry Services
- The potential wood buyers will inspect the forest and assess the likely quantities of each grade of log. They will also assess any access requirements and forest practices that might be important
- You should then receive a written and itemised offer for each log grade.
  The most important figure is the stumpage.
  See page 80
- The offer will include an estimate of the number of tonnes of each grade. Payment should ultimately be based on tonnes measured over a weighbridge. The dollar per tonne figure is the one that counts
- Discuss and negotiate with potential buyers on log grades, stumpage (prices) and timing. It's important you understand exactly what is being offered.
  Get independent advice or ask the buyer if you are unsure about any aspect of the negotiation
- Before agreeing on the sales terms and type of contract, seek advice from your accountant, lawyer or an experienced timber sales consultant to ensure you have the best agreement and contract. Check that the contract specifies the information you will receive about the amount of wood removed from your property and when payment will be received
- After the agreement has been signed by both parties, the wood purchaser will manage the process moving forward, including the preparation of a FOREST PRACTICES PLAN and any compliance reporting relating to the plan. You will be informed of any compliance reporting you may be required to do

Next steps

Find a local processor

Explore the Directory of Tasmanian Forestry Services online at **www.treealliance.com.au**

Contact Tree Alliance

contact@treealliance.com.au

Call the helpline

Call the helpline with any questions

Tel: 1300 661 009

Join the online community

Join our private Facebook group, the Growing the Future Online Community. Find out what other farmers are doing, chat to an expert, ask questions and share ideas. **https://www.facebook.com/groups/596397397623294**

FACT SHEET

What is stumpage?

Stumpage is the amount a buyer will pay the forest owner for each grade of log recovered after harvest from the standing trees. It's usually quoted as dollars per green tonne. The purchaser is responsible for all planning, roads, harvesting and trucking the forest products to a processing plant. The forest owner is not usually responsible for any costs for the harvesting operation, except for a few minor regulatory fees and levies triggered by the Forest Practices Plan.

Stumpage is influenced by:

- Market opportunities at the time
- Volume and area to be harvested
- The log grade
- Access and harvesting challenges
- Cartage distance to the processor

Even for agreements based on stumpages, there can be variations as to how payments are made:

- Standard stumpage agreement – payment will be at regular intervals based on weighbridge records
- Lump sum agreement – can include options for additional quantities of wood
- Advance payments agreement – offered as a proportion of the estimated total payment with a final reconciliation when the operation has been completed

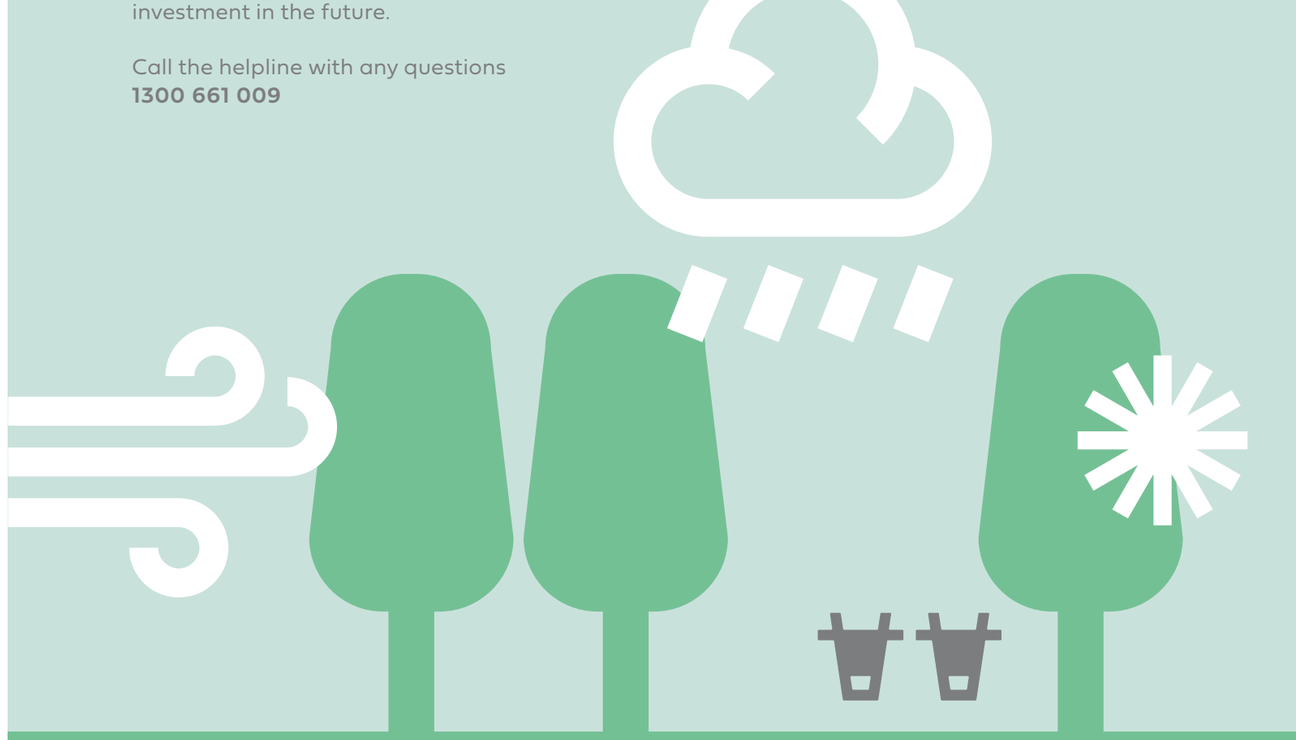
Trees protect the land for the future

Trees in the right place prevent farmland degradation, which is being exacerbated due to the warming climate. During extended dry periods, depleted pastures have minimal biomass which exposes more soil to compaction and wind and water erosion, and creek banks become fragile and mobile. Planting trees can act as a form of insurance against extreme weather events. Trees also increase biodiversity, amenity and land values which is an investment in the future.

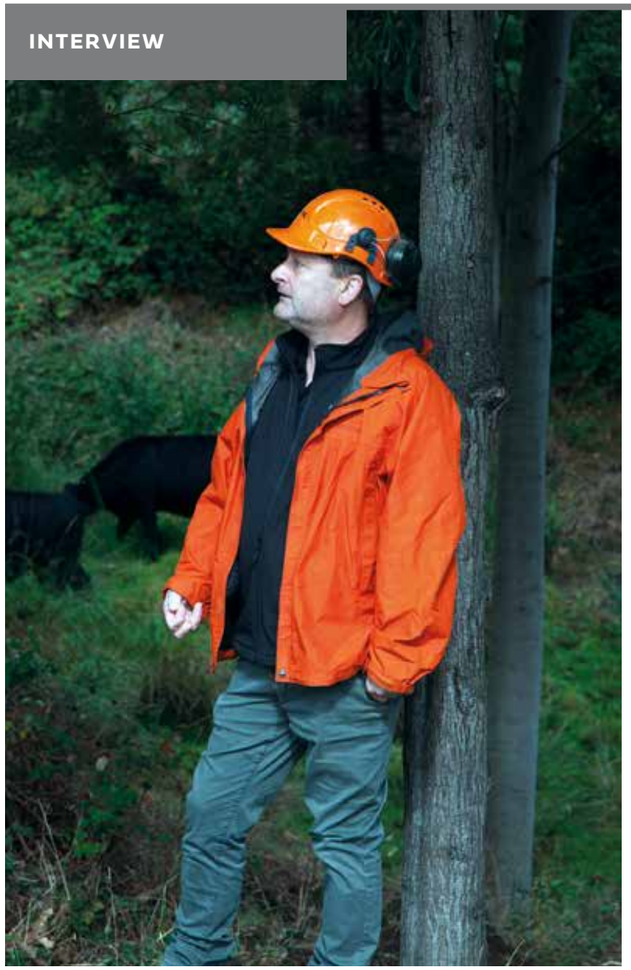
Call the helpline with any questions
1300 661 009

Tree Alliance

treealliance.com.au



Private Forests Tasmania



Rob Smith
Originally from the UK, Rob Smith has been a Private Forester with Private Forests Tasmania for the last 15 years. Bringing his passion for forests and the outdoors to Tree Alliance, Rob was in similar roles in Northern New South Wales and before that, across the UK. Combining his extensive knowledge in forestry, his love for nature and eagerness to help farmers and landowners, Rob's enthusiasm for the message he has around planting trees is encouraging for landowners and the planet.

Rob Smith offers his expertise to advance Tasmania and help the planet at the same time

Growing up in rural and remote properties around the UK, as a young child, Rob sought out adventure in the outdoors. His fondness for nature led him to study forestry at university, receiving a national diploma in forestry and later receiving his Masters in Forest Products Technology. Ever since, Rob's been in various positions around the UK and Australia, encouraging the planting of trees.

With decades of experience in forestry, fostering and advising the planting of trees on private land, Rob says he's seen the industry transform, particularly in Tasmania.

"What used to be quite a contentious topic, forestry in now based around innovation. Formerly centred around native harvesting, modern forestry has transformed into a conversation around plantations and how they can be installed and managed for a multitude of benefits," he says.

"Forestry has gone through its peaks and troughs but what we're seeing now, especially in the south of Tasmania is a lucrative industry that we just didn't have before. Thankfully, our industry has hardly been touched by COVID-19 allowing regional parts of Tasmania to keep going. The forestry industry has paid back in dividends over the last ten years and has been essential to the economy in these rural areas."

As forestry has become an important part of the Southern Tasmanian economy, Rob says it's more important than ever to be planting trees- anywhere in Tasmania.

"I don't even know where to begin in sharing the benefits of having trees planted on your farm or private land. Trees are a valuable source of shelter, offer protection of soil and riparian areas, increase biodiversity, improve the landscape and can be a great source of income when harvested. These benefits can be seen across the agricultural industry and for private landowners."

Connecting with farmers across Tasmania, one common misconception that he'd like to be put to rest is the idea that trees take up the space of productive farming land.

"This idea could not be further from the truth. The pros of having trees on farms greatly outweigh the cons and this has been proven and quantified on a national and international level. Agriculture productivity is greatly increased by having trees in the landscape."

Rob says the success of having a thriving plantation begins with the landowner taking ownership of the venture, but he says PFT is there to offer guidance and support along the way.

"Each landowner should identify their own unique objectives they'd like to see from planting trees. Growing a plantation is not a 'one size fits all' method, but a highly individualised process where different circumstances need to be considered. From topography to climate to soil and available resources, there is so much that needs to be taken into consideration. And that's where we can come in to help."

Offering assistance to farms big and small and landowners of all sizes across the state, Rob says one thing is consistent.

"Tasmania is perfect for growing trees. It has everything- a great climate, lots of space and a receptive landowner base. The state has a history rich in forestry and I'm proud to progress it in this modern and sustainable way that's helping farmers and the planet."

Case Studies

The benefits of trees in the agricultural landscape have been proven time and time again all over the world.
But we're on a mission to prove them here in Tasmania. Here is a collection of case studies that provide clear evidence of the benefits of trees.
Follow the Tasmanian demonstration site project on **www.treealliance.com.au** to discover more.

Case Study 01.
Agroforestry

Willowbend
Cygnet,
Huon Valley

At a Glance

Owner
Chris and Guiliana White

Property Size
61 hectares

Enterprise
Dairy, garlic and timber production

Rainfall
1050 mm (average)

Soil types
Duplex soils - sandy loams / light clays

Key Points

- A planned approach encompassing site preparation, tree planting and maintenance delivers best outcomes.
- Trees deliver multiple benefits initially restoration of riparian area, but also shelter and aesthetics.
- An income from wood is planned.

Strategic tree planting to restore eroded gullies and improve farm productivity

Background

Chris and Guiliana planted trees to improve farm productivity, water quality and biodiversity as well as produce timber.
They prepared a property management plan to integrate trees into their farm with their main aim to protect streams from livestock and revegetate the stream sides. They planted 3 hectares of trees in 2007 and 2008.

Chris says....

"The trees are already benefiting the farm. Cattle tend to gather to find shelter in the lee of the trees, pastures appear to be far healthier and bird life has improved. There is a supply of firewood after 5 years. CSIRO reported that water quality has improved. I expect these benefits to increase as the trees grow."

Willowbend property 2007 prior to planting

Willowbend 2012. Eroded gullies restored and aesthetics improved

Monitoring of the protected streams by CSIRO has found:

- Stream water phosphate concentration and Escherichia coli (E.coli) contamination decreased;
- Minor turbidity increased after first major storm following cultivation for tree planting but not subsequently;
- Major turbidity decreased in wet winters even after storms and periods of heavy grazing; and
- The trees had no detrimental effects on the stream sides.

Species	Features	Biodiversity	Management	Wood Products
Blue gum	Native species good for timber, honey & habitat	Habitat for endangered Swift Parrot	Prune & thin. Will regrow after harvest	Clearwood, sawlogs & firewood
Shining gum	Robust species with good timber properties	Possums & native birdlife enjoy new plantings	Prune & thin	Clearwood, sawlogs & firewood
Blackwood	Native species good for timber & habitat	Habitat for range of native species	Prune & thin	Clearwood, sawlogs & firewood

Watch online
https://youtu.be/BLk9pkvbUOc

2007 -
Cattle had access to streams

2013 -
Streams well protected

Case Study 02.
Agroforestry

Bowsden
Jericho, Southern Midlands

At a Glance

Owner
Damian Burbury

Property Size
1,600 hectares

Enterprise
Grazing / Pastoral - not irrigated

Rainfall
520 mm (average)

Soil types
Duplex soils - sandy loams / light clays

Key Points

- Good tree establishment including site preparation, tree planting and maintenance are essential.
- Ideal site preparation is provided by the Savannah forestry mound plough.
- Trees provide shelter in hot and dry and wet and cold conditions.

Planting trees in the harsh Midlands provides much needed shelter

Background

The Burbury family recognised the benefits of trees to their farming enterprise many years ago. Initially Damian's father started the process to integrate trees into their farm and now Damian has continued to establish shelterbelts primarily to provide shelter for the pasture and the livestock which is particularly useful for lambing ewes and freshly shorn sheep.

Bowsden property, near Mud Walls Rd, 2013 prior to roadside shelterbelt planting

Bowsden property, near Mud Walls Rd, 2016 after roadside planting using Private Forests Tasmania's mound plough

Damian says.... **"Luckily my father had the foresight to plant the shelterbelts around the farm; they provide shelter from the hot and dry in the summer, and the cold and wet in the winter for both pasture and livestock. However, in order to get really good results in the harsh Midland conditions, it is essential to get the tree establishment correct."**

Creating mounds for shelterbelt planting

Planting site mounded and sprayed, ready for planting

Doing it right - site preparation:

Weed control is the most significant work you can do. It is likely to determine the success or failure of most projects. Provide a weed free zone at least 1.0-1.5m in diameter around the tree, or a strip 1.5-2.0m wide along the planting mound.

Cultivate the soil

- Disc or rotary hoe strips (1.8m wide) when soils are dry and at least 3 weeks after spraying weeds.
- Ideally, rip and mound planting lines over summer or autumn.
- The soil should be dry or slightly moist but not wet.
- Mound spacing should be 3m to 4m centres. (You may need to allow for vehicle access).
- Steep slopes, soil type and soil and water conservation needs may limit cultivation to ripping only, spot cultivation or no mechanical cultivation.

Weed control after cultivation:

- Keep cultivated soil weed free for two growing seasons after planting.
- After cultivation, one or more knock-down applications may be required before planting, depending on germination of weed seeds.
- Application of residual herbicides before planting will inhibit the germination of most weeds for 6 to 9 months.
- Applying herbicides after trees are planted is both difficult and costly.

Good weed control

Good weed control

Poor weed control

Case Study 03.
Agroforestry

Woorak
Epping Forest, Northern Midlands

At a Glance

Owner
Daniel Fish

Property Size
12.5 hectare paddock

Enterprise
Livestock (sheep) and cropping

Rainfall
550 mm (long term annual rainfall)

Soil types
Brown Chromosol: sandy loam over heavy clay

Summary

Lucerne hay yields were estimated to have increased by up to 300% due to reduced wind speeds in the lee of a pine shelterbelt. This equated to over $1,000 of additional benefit across the sheltered area of the paddock (about $147/ha).

Shelter improves Lucerne yield

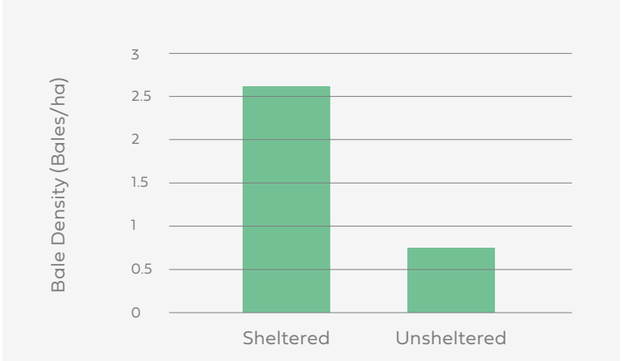
Introduction

Round bales of Lucerne hay that had been dropped in a paddock in the Northern Midlands in the lee and outside of the lee of a N/S belt of *Pinus radiata* were measured. The baling started close to the tree line and followed a zig-zag pattern from tree line to furthest part of the paddock away from the tree line. Thus, the bales are likely to be close to the point where their hay was grown, especially in relation to the trees.

Value of Shelter

While there are several assumptions surrounding the assessment of the shelter benefit to the Lucerne hay production in this case, if a new hay bale value of $80/bale is assumed, and the bale density is assumed to accurately reflect the effects of shelter, then the net benefit of shelter is around an extra $147/ha for this harvest, or $1,133 across the sheltered 7.7ha of the paddock.

Bale density in the sheltered verses unsheltered area



Wind

The wind at the site for Spring 2017 (the growing season for Lucerne) was measured in a nearby paddock, where the agroforestry research project has an automatic continuously monitoring weather station. The results from the wind monitoring clearly show that the vast majority of the wind comes from the NW and NNW (50% of all wind), another 9% of the wind originated from the north, and 7% from the WNW. All other directions contributed to 5% or less of the total wind over this time period.

The 30+ year old, unmanaged, multi-row, pine shelterbelt

Viewed from the South. The net paddock area is around 12ha (420 x 290 metres) and the belt is 420 metres in length.

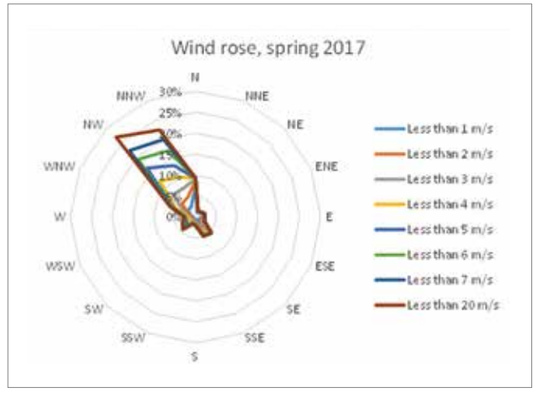
Locations of the hay bales as dropped

Dropped 16 November 2017. The red arrow represents the average predominant wind direction (between NW and NNW), in relation to the top end of the belt. Bales to the south of the line are in the portion of the paddock.

Hay bale locations

The locations of each bale were assessed and plotted. An arrow showing the sheltered and unsheltered parts of the paddock is drawn with approximately 7.7ha in the sheltered zone (64% of paddock area), and 5.3ha (36%) in the unsheltered zone, to the north of the shelter line. A total of 20 bales were in the sheltered zone (17% of the hay). This equates to 2.6 bales of hay/ha in the sheltered zone and 0.75 bales of hay/ha in the unsheltered zone, or more than 3-fold the hay production (on an area basis) in the sheltered zone.

Wind rose at 'Woorak' for most of Spring 2017, up to the week before harvest (Sept 1st to Nov 9th)



Conclusions

There was a much greater bale density in the sheltered area compared to the unsheltered area of the paddock with a 3-fold increase in bale density in the sheltered area, and an estimated value of the shelter to the hay production of over $1,000.
The results are an indication of the benefits of shelter but do not form a definitive assessment of the shelter effect on hay production.
This is because it was a one-off measure and uncontrolled factors such as baler path and how far the hay was moved from the point of growing to the point of bale drop introduce uncertainty.
In the more productive areas, the bales would be dropped close to the point of hay production, but in the sparse areas, bales may be some distance from their hay source.

Case Study 04.
Agroforestry

Formosa
Cressy Road, Cressy

At a Glance

Owner
Family owned

Property Size
25ha paddock

Enterprise
Dryland and irrigated mixed farming

Rainfall
550—600mm per year

Soil types
Brown Chromosol

Summary

When timber and non-timber values are accounted for, carefully integrating trees into agricultural landscapes can be a profitable and attractive option with strongly competitive internal rates of return.

Agroforestry improves enterprise income

Introduction

Agroforestry is the incorporation of woody perennial vegetation into agricultural systems. Agroforestry often involves planting commercial forestry species for harvest, but also includes planting stream-side buffers, shelterbelts of native species or even species that produce high-value products for harvest, such as energy, fruits, nuts, oils and honey. The benefits of agroforestry to the farming enterprise include diversification, increasing overall productivity and improving the sustainability and resilience of farm systems.
Trees integrated into agricultural systems have many benefits to other parts of the farming enterprise that are rarely accounted for in farm balance sheets so we:

- Quantified and integrated the direct and indirect benefits of trees to the farming system.
- Sought to understand the most profitable configurations of trees on farms.
- Explored farmer motivations and barriers to adoption of trees on farms.
- Demonstrated a strong economic argument to include trees in agricultural landscapes.

How profitable is agroforestry?

Agroforestry is often perceived to be unprofitable or associated with high opportunity costs forming a significant barrier to adoption. However, there is a paucity of financial analyses examining the profitability of agroforestry systems in Australia.
Published case studies in a range of farming systems across southern Australia (livestock, cropping, dairy) indicate that agroforestry is a profitable option.

- Internal rates of return of agroforestry systems are typically around 8%.
- Enterprises with agroforestry were more profitable than agriculture only or forestry only enterprises.
- Benefit: cost rations were highly variable, but generally greater than one, ranging from 1.3—17.4.

Accounting for the co-benefits: "why wouldn't you plant trees?"

Explicit recognition of co-benefits is important for understanding the full value of agroforestry.

- Shade and shelter for stock, for reducing mortality and stress in hot and cold weather.
- Shelter for crop and pasture production.
- Carbon that can be traded in carbon markets.
- Co-products such as biomass thinnings/prunings, oils, and honey can generate extra income.
- Improved amenity and land values, typically by 4 to 15%.
- Specialty timbers can be profitable. However, longer rotation lengths (and discount times), and greater market uncertainty may require more proactive commitment from farmers.
- Increases biodiversity and sustainability, managed water flows and reduced wind and water erosion.

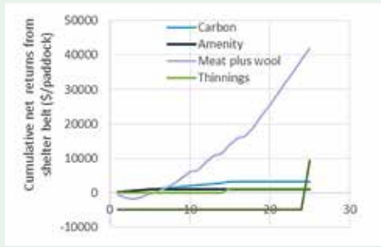
Optimising Returns

- Design the configuration of the trees to maximise shelter benefits.
- Choose species with low market uncertainty.
- Minimising harvest and logistics costs by ensuring sufficient scale of resource.
- Integrate the value of co-benefits into decision making, e.g. shelter, carbon.
- Develop systems that generate returns earlier.

In Brief

- Agroforestry can bring positive economic returns to the whole farm enterprise.
- A case study shelterbelt on Formosa conveyed shelter values (including pasture production and reduced mortality) exceeding the value of the timber by 2-3 fold.
- Internal rates of return on the shelterbelt equate to around 19% because of the direct and indirect benefits that the trees convey.

Modelled net cumulative returns from a 1ha P. radiata shelterbelt in 25ha pasture paddock at Cressy



Gross returns over 25 years were calculated to be $56,560 as follows:

- Tree harvest (age 25): $14,300.
- Shelter benefits for meat and wool production: $42,007.
- Carbon sequestration: $3,090.
- Amenity/land value: $1,000.

After accounting for the establishment cost of around $6,000/ha, the internal rate of return was 19%.

Plantation assumptions: wood price of $40/m3, fencing costs of $7/m, establishment costs of $1.80 per seedling, plus site prep and weed control cost of $375/ha.

Pasture assumptions: A self-replacing flock of sheep producing wool and meat, stocked at 18 DSE, with feed costs of $300/tonne, wool prices of $16-$18/kg and sheep sale values of $85-$119/head.

Shelter assumptions: shelter benefits on pasture production were 60% of those measured at Formosa and reduction in livestock mortality of 50%.

Case Study 05.
Agroforestry

Formosa
Cressy Road, Cressy

At a Glance

Owner
Family owned

Property Size
25ha paddock

Enterprise
Dryland and irrigated mixed farming

Rainfall
550—600mm per year

Soil types
Brown Chromosol

Summary

Pasture productivity in Spring 2017 was on average 30% higher in the sheltered half of a paddock compared to the unsheltered half. A *Pinus radiata* shelterbelt occupied approximately 1 ha of the paddock (4%), but induced a 15% increase in pasture growth over the remaining 24 ha, and effectively increased the pasture production to the equivalent of a 29 ha paddock. The impact of shelter on gross margin is likely to be around $63/ha, or $1500 in total across the paddock. Any financial benefits for stock survival, carbon and forest products are in addition to this.

Shelter increased pasture production by 30%

Introduction

Formosa is one of four Tasmanian properties where the benefits of treed shelterbelts on pasture growth and the environment are being measured by Private Forests Tasmania, CSIRO and the University of Tasmania. During the spring of 2017, stock were excluded from the Formosa paddock, and pasture was measured and mapped across the paddock, from sheltered to unsheltered areas, using a GrassMaster Pro pasture biomass meter.

Site Description

The paddock is 500 x 500m, with a north/south oriented shelterbelt of *Pinus radiata* on the windward western edge. The 5-row shelterbelt was planted in 2001 and was 17 year old at the time of measurement with trees approximately 15m tall and 24cm diameter at breast height. The shelterbelt contains around 250 m3/ha of wood. The porosity of the belt is around 30%. The paddock was sown with a cocksfoot and clover mix in the autumn of 2015 and the pasture at the time of the study was 2 years old and relatively uniform. The paddock is flat and level and has minimal variation in soils (based on an EM38 map).

"Trees are an integral part of what we do. Future farm planning includes agroforestry."

- John Heard, 'Formosa' Farm Manager

Photo credit: Arthur Lyons, Private Forests Tasmania

Pasture Measurements

The paddock was grazed down to a relatively uniform starting point in the autumn and winter of 2017, and stock were excluded from the paddock in mid-August. The pasture was allowed to grow for around 7 weeks until early October. Pasture biomass was measured on October 3rd, 2017. A total of 7 transects running perpendicular from the shelterbelt were established across the paddock. Measurements were taken every 10 m along each transect.

Wind

The wind at the site for spring 2017 was measured directly in an open unsheltered part of the paddock, where an automatic weather station continuously monitored wind direction and speed. The vast majority of the wind came from the NW and NNW (50% of all wind), another 9% of the wind came from the north, and 6% from the SE. All other directions contributed to 5% or less of the total wind over this time period. The shelterbelt was close to perpendicular to the bulk of the wind and reduced wind speed on average by around 50% over the sheltered half of the paddock.

Value of Shelter

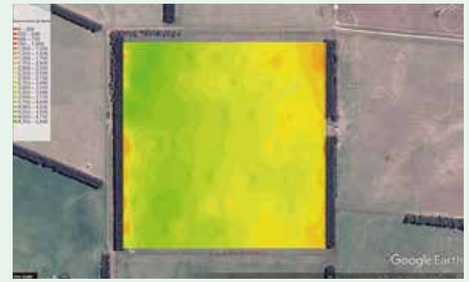
Shelter lifted overall pasture production of the 24 ha paddock by approximately 15%, equivalent to the increase in hay yield, and/or the stock that can be carried on the paddock. If the gross margin of the grazing enterprise is $420/ha, and the increase of 15% productivity translated directly into gross margin, this would be increased by 15%, or around $63/ha, or an additional $1,512 over the 24 ha of the pasture. This effect is in addition to shelter benefits of increased stock survival and weight gain, as well as returns from wood sales when the shelterbelt is harvested, income from selling carbon credits associated with the net carbon increase from changing land use from pasture to trees, and increased land value.

Conclusions

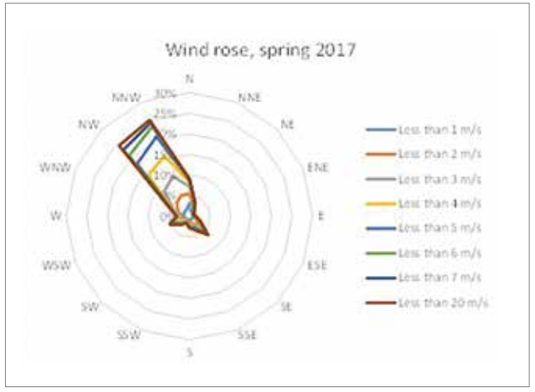
The shelterbelt at Formosa has conveyed a substantial benefit to the pasture production across the paddock, with 30% more pasture in the sheltered half of the paddock. One hectare of trees effectively increase the production of pasture from the paddock to the equivalent of a 29 ha unsheltered paddock. If this increase in pasture growth translated directly to the gross margin, it increased the net returns to the farmer from the paddock by around $1500. This is in addition to other benefits that the trees can provide, including timber production, carbon, biodiversity and amenity.

Shelter impact on pasture biomass

Map of pasture biomass in October 2017, after 7 weeks of stock exclusion. The western half of the paddock had 30% more pasture biomass than the eastern half of the paddock.



Pasture biomass was around 30% higher on the western (sheltered) half of the paddock (3.3 t/ha) compared to the eastern (unsheltered) half of the paddock (2.6 t/ha). While pasture production was lower within the first 10 m adjacent to the shelterbelt, the shelter increased pasture productivity compared to the open paddock from 1.5 to around 12 tree heights (~22 to ~180 m) from the shelterbelt.



Case Study 06.
Agroforestry

Trees reduce paddock water loss (evaporation)

Shelterbelts of trees reduce windspeed and evapotranspiration across large areas of sheltered paddocks

At a Glance

While trees compete for water directly adjacent to them, the sheltered zone extends for at least 20 tree heights into the paddock (300 m in the case of 15 m tall trees).

A belt of trees every 500 m can reduce average windspeed by 30% across the land surface.

Reduced windspeed can reduce potential evapotranspiration, by 15-20% across the full 300 m sheltered zone.

Potential water saved over a year at Formosa was equivalent to 240 mm, or 35.9 ML of saved potential ET across the paddock.

5-row belt of P. radiata at Formosa - porosity of around 27%.

Introduction

Agroforestry is the integration of trees into agricultural enterprises. The establishment of trees can bring multiple benefits, including a reduction in windspeed across the paddock, which translates to reduced potential evapotranspiration.

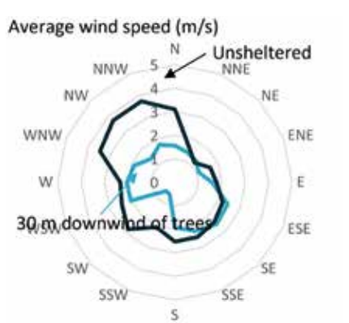
At the case study paddock on the Formosa property (Cressy):

- A 5-row belt of *Pinus radiata* occupies 1 ha along the western paddock edge. The remainder of the paddock has 24 ha of pasture.
- The trees are 15 m tall, so the shelter effect extends to around 300 m into the paddock.
- Wind speed monitors and evaporimeters were established along a transect away from the trees to assess the impact of the trees on the entire area of the sheltered zone.

Windspeed is reduced by the trees:

Speed reduced by 20-30% across the full 300 m transect to the eastern (leeward) side of the belt.

50-80% windspeed reduction between 30 and 100 m from the trees, where windspeed was reduced the most.



Shelter and irrigation

- Establishment of shelter markedly reduces windspeed, especially in the zone equivalent to 2-8 tree heights (30-120m at our site).
- Wind reduction improves sprinkler evenness and efficiency, particularly for the vulnerable end-gun of a centre-pivot irrigator.

How much water can be saved?

- Potential evapotranspiration at Formosa (with no shelter) was measured to be 1778 mm over the study period.
- The sheltered 300 m (15 ha of the 25 ha) experienced 240 mm less potential evaporation.
- This equates to 35.9 ML of saved potential evapotranspiration across the entire paddock.
- Note that potential evaporation is going to be much higher than actual evaporation because evaporation can only occur at potential rates when water is freely available at the soil surface.

Google Earth image of the study paddock at Formosa, taken 27 October 2015. The pasture in the sheltered zone remains green

Want to find out more?
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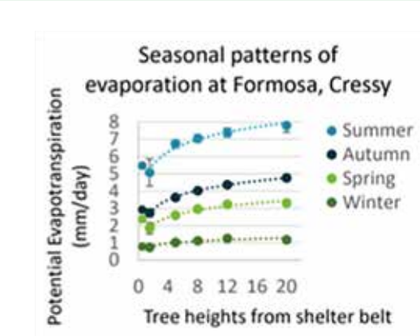
Impact of shelter on evapotranspiration

Shelter reduced evapotranspiration by 15-20% over the full 300 m sheltered zone, irrespective of season



Potential vs actual evapotranspiration

Potential evapotranspiration is the evaporation that would occur if sufficient water is available at all times. Pan evaporation is a measure of potential evapotranspiration.

Actual evapotranspiration is the water that is actually evaporated/transpired, and is lower than potential because water is not always available. Evapotranspiration will typically occur at potential until the soil surface (to rooting depth) starts to dry out.

Conclusions

Trees reduced water loss through evaporation.

1 ha of 15 m tall trees on the windward edge of a 25 ha paddock provided shelter from the prevailing wind. This resulted in:

- Shelter for more than half of the paddock,
- measured wind velocity reductions of 15-20%, &
- commensurate reductions in potential evapotranspiration, equating to 35.9 ML.

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Directory

Clare Peltzer
Tasmanian farmer
Evandale

“Trees are another tool that we can use on the farm to help us become more profitable by looking after the animal’s health and wellbeing, which is the main profit driver.”

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