Final report

Trees on Farm: A Tool for Decision-Making

Project code:P.PSH.1277

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Date published:20 December 2021

PUBLISHED BY
Meat & Livestock Australia Limited
PO Box 1961
NORTH SYDNEY NSW 2059

This is an MLA Donor Company funded project.

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Abstract

This project aimed to address information gaps regarding the co-benefits trees provide to farming systems and to assist farmers in accessing this information and incorporating it into on-farm decisions. Farmers, consultants, and extension officers were the primary audience for a database of co-benefit information and supporting a decision tool. An existing decision matrix was used for the decision tool and two interviews with farmers near Hamilton provided examples to support the use of the tool. The decisions included critical factors related to both environmental and timber plantings. The companion database includes information on the co-benefits of incorporating trees on farms derived from over 90 publications. This project has consolidated information on the co-benefits of trees on farms and has provided real world examples of how to incorporate this information into decision making about planting trees on farms. The database will ease production of informative communications addressing co-benefits. Recommended future work, particularly around expanding the scope of the decision support tool, will be incorporated into Module 4 of the Carbon Storage Partnership.

Executive summary

Background

This work aims to address information gaps regarding the co-benefits trees provide to farm systems and assist farmers in accessing this information and incorporating it into on-farm decisions. Given this objective, farmers and consultants are the primary audience. The results can be used by consultants, extension officers, and interested farmers to find data and apply it to on farm decisions. Additionally, they will form the beginning phases in a broader decision framework that is a deliverable of Module 4 of the Carbon Storage Partnership, *Trees on Farm: Maximising co-benefits*.

Objectives

- Develop a decision-matrix template to guide farms in planting trees on farms in two areas in South East Australia.
- Develop a database of key research on co-benefits and risks of planting trees on farms.
- Provide information to support the use of the decision matrix template for the decisions to establish a timber plantation or environmental plantings in two livestock systems each.

Methodology

This project adopted an existing decision matrix for the decision tool and developed information to support the use of this process for tree-related decisions through farmer interviews. The database was primarily a literature review, including a protocol for what literature to include in the database and fields that would be populated based on the contents of each article.

Results/key findings

The decision matrix was applied to two farms near Hamilton, Victoria. The decisions include critical factors related to both environmental and timber plantings. The initial version of the database includes co-benefit information for over 90 publications. This allows interested users to access a substantial amount of information in one place and eases production of factsheets and other material on the co-benefits of incorporating trees on farm.

Benefits to industry

This project has consolidated information on the productivity and carbon co-benefits of trees on farm along with data on other co-benefits in one place. It has also provided support for incorporating this information into decision making including development of example decision matrices for two farms.

Future research and recommendations

Recommended future work should largely be incorporated into Phase 2 of this project. Additional literature can be added to the database as other updates are made to the database including developing a user-friendly front end. A Tasmanian example of the decision matrix will be completed by February 2022. Lastly, a broader decision framework to guide farmers is already planned.

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1. Background

The benefits of having trees on farm are well established. Integrating trees within productive agricultural enterprises can increase carbon stocks to offset on-farm emissions and provide financial, social, and environmental co-benefits for the farm operation. However, multiple factors deter farmers from integrating trees on their land, including a lack of capacity, the administrative costs and complexity of receiving carbon payments, the difficulties associated with incorporating multiple types of information with varying importance into the decision-making process, and a lack of applicable and accessible information regarding the co-benefits of trees on farms. Available information quantifying these benefits is not easily accessed or incorporated into on-farm decision making.

This project aimed to address this lack of knowledge transfer in two phases. This report describes the activities that addressed Phase 1. These deliverables focus on developing a decision matrix template supported by a database that will allow consultants, extension officers, and farmers to access estimates of various productivity and environmental benefits of planting trees and incorporate them into farm planning decisions. This differs from currently available tools that assist with decision making in at least two important ways; it incorporates all factors a farmer considers critical to establishing trees on-farm so they can be considered simultaneously, and it includes a weighting system that allows farmers to give greater value to factors most important for their situation, priorities, and comfort with risk.

Providing the best available science in an easy-to-access format and a framework to incorporate information into farm planning will reduce uncertainties associated with establishing trees on farm, which will likely lead to greater incorporation of trees into farming systems, lower net farm greenhouse gas emissions and greater farm resilience. The database and templates will be provided to the project stakeholders as well as being made available on the PICCC website.

2. Objectives

1. Develop a decision-matrix template to guide farms in planting trees on farms in two areas in South East Australia.
2. Develop a database of key research on co-benefits and risks of planting trees on farms.
3. Provide information to support the use of the decision matrix template for the decisions to establish a timber plantation or environmental plantings in two livestock systems each.

For objectives 1 and 3, we have developed a decision matrix to guide tree planting with substantial amounts of information to support its use. Support for the use of the decision matrix includes a video and an online decision wizard developed for the use of decision matrices generally and examples of decision matrix applied to trees on farm decisions involving both timber and environmental plantings. The examples are based on two farms, both from near Hamilton, Victoria. We will continue to advertise for participation of Tasmanian farmers until the final report to the Tasmanian Climate Change Office is submitted. At least one example decision matrix resulting from a currently planned interview with a Tasmanian farmer in February will be incorporated into Phase 2 of this project, Module 4 of the Carbon Storage Partnership, *Trees on Farm: Maximising Co-benefits*. There is also a list of potential critical factors to assist farmers in developing their own matrix for tree decisions.

A database of co-benefits and risks of planting trees has been developed. From a total of 1,134 publications, 97 articles will be in the initial published version of the database including data on co-benefits such as productivity, carbon, water, soil, and biodiversity. Summaries of the results of the database will be published in industry publications. Over 700 of the search results were eliminated due to not meeting the criteria and about 30 could not be obtained. Due to time constraints, peer-reviewed articles with information on productivity co-benefits or carbon sequestration were prioritised. Details of this decision are addressed in the methodology (Section 3.2) and results (Section 4.2) sections. Remaining articles will be entered into the database along with ongoing updates including developing a user-friendly front end and addition of new scientific literature and data received from farmers during Phase 2 of this project.

3. Methodology

3.1 Decision matrix development

Decision matrices were based on the framework designed by Cam Nicholson and described as a decision analysis matrix in the GRDC publication *Farm Decision Making: The interaction of personality, farm business and risk to make more informed decisions* (Nicolson et al, 2015). This framework is flexible enough that it can be applied to specific tree planting decisions on any farm. The matrix can be tailored to the specific decision and circumstance, including differing farmer priorities and comfort with risk. An instructional video for using this method is available at: (https://www.youtube.com/watch?v=nsMa2VtnONU). Critical factors and the instructions for applying the decision matrix to tree related decisions are included in Appendix 8.1.

Interviews were conducted with two farmers from the Hamilton area to develop examples of applying the decision matrix to tree-related decisions. The entire interview consisted of working through the process described in Appendix 8.1 for decisions the participant would realistically consider for their farm. No commitment to follow through with the decision result was required to participate. Both volunteers have previous experience making tree-related decisions on farm. This allowed the developed decision matrix to be tested on historic examples as well as potential future plantings.

The variety of decisions farmers may want to make about trees on their farm, the variability in farmer knowledge, as well as the complexity of these decisions necessitates a broader framework that the decision matrix will sit within. The development of this broader framework is underway and will be incorporated into Phase 2 of this project (Module 4 of the Carbon Storage Partnership). Follow ups with farmers that participated in the decision matrix interviews as well as the interviews and focus groups that are part of Phase 2 will allow for this broader tool to be developed in consultation with farmers. Given the early stage of development many of the details are still unknown, but this framework will incorporate factors such as ease of use, type of farming system, peer recommendation between farmers, and, potentially, be tailored to MLA farmer segments.

3.2 Literature review

A broad review of the literature was undertaken to populate a database with published information on values for critical factors. The scope is trees on farms (remnant woody vegetation and planted trees) within livestock systems, including mixed cropping-livestock and dairy, in the Temperate Cool Season Wet, Mediterranean, and temperate sub-humid agroecological zones. This included data from Tasmania, Victoria, southern New South Wales, south west Western Australia, southern South Australia, and New Zealand.

The keywords included in the search of Web of Science and Scopus were:

> (Australia OR "New Zealand") AND ("Temperate cool season wet" OR "Temperate winter rainfall" OR Mediterranean OR Tasmania OR Victoria OR "New South Wales" OR "South Australia" OR "Western Australia") AND (Farm OR Agricultur*) AND (Tree OR Forest OR Timber OR "Environmental planting" OR Landcare) AND (Shade OR Wind OR shelter OR pasture OR welfare OR biodiversity OR carbon OR soil OR "water quality" OR salinity OR "market access" OR "fire risk" OR pest OR fence OR cost OR expens* OR weed OR price OR Agroforest* OR "Socio-economic")

Literature from collaborators and new research highlighted by a search alert based on the keyword search will be considered for inclusion into the database until its finalisation in January. This is subject to the new prioritisation of peer-reviewed articles on productivity and carbon co-benefits. Sources of data were also obtained from relevant literature cited in articles, sources found through various resources for trees on farm, and recommended citations.

A protocol was developed to ensure uniform standards for inclusion into the database. Articles excluded from the database include those that are outside the geographic region, do not address benefits or risks of trees, focus on the impacts of agriculture on forest ecosystems, or use only modelled data, not on-farm data. Reviews are useful for finding new citations but are not included in the database.

Due to the large amount of literature that resulted from this search and time constraints the focus was shifted to productivity and carbon sequestration benefits of trees for the initial published version of the database. Much of the literature that was excluded based on this criterion was focused on biodiversity or water availability or quality including issues of salinity. It is intended that this data will be incorporated into the database in the first half of 2022 as part of the ongoing updating of the database in Phase 2. The list of citations that are included in this version of the database are listed in Appendix 8.2.

3.3 Database development

The database has been developed in Excel and is searchable for many characteristics of farms and decisions, such as state, region, system, major planting objectives, type, and general location of planting (e.g. paddock boundary, paddock trees, riparian zone, etc). These searches return values for all factors in the database that come from articles that report information for the targeted region, system, planting type, etc. Alternatively, searching for values for a particular co-benefit will report values for that benefit across regions, systems, etc.

Articles that met the criteria for inclusion in the database were searched for information based on the contents of their abstract or executive summary. The information that the article contained that addressed variables in the field list were recorded.

An Excel form eases data entry, increases consistency of entries, and reduces data entry errors. The testing of this form was paired with updating of the data fields. Each piece of information on co-benefits or disadvantages included in the database includes a page and paragraph number (e.g., p5#3) to ensure the information can be found again quickly. At completion of the literature survey 50 data points were chosen randomly to ensure the data is accurately recorded in the database. This marked finalisation of the first version of the database for publication.

The first Excel sheet of the database is a tutorial to ease navigation and use, that includes directions on filtering. This allows users with limited Excel experience to get the most out of the database. The Excel version is included as a supplement to this report and will be publicly available at the PICCC and Trees on Farm websites by mid-January 2022. This version has been discussed in two webinars, one for AgVic staff and the Climate and Energy College public webinar. A student from Data Science Department will be designing a web-based front end to increase accessibility. This work is intended for Semester 1 of 2022. Further opportunities to publicize the database will be identified in the first half of 2022. This includes developing summaries of database findings on specific co-benefits for industry focused publications and forums.

4. Results

4.1 Decision matrix

Instructions were developed for using the decision matrix (Appendix 8.1). This includes a list of potential critical factors and links to supporting resources including a video and website. The major contribution of this project was to provide two examples of using this method for systems near Hamilton in southwest Victoria (Appendix 8.3). The examples are available in the decision matrix library at https://decisionwizard.sfs.org.au/matrices#/dashboard and will be made available at the PICCC and Trees on Farm websites.

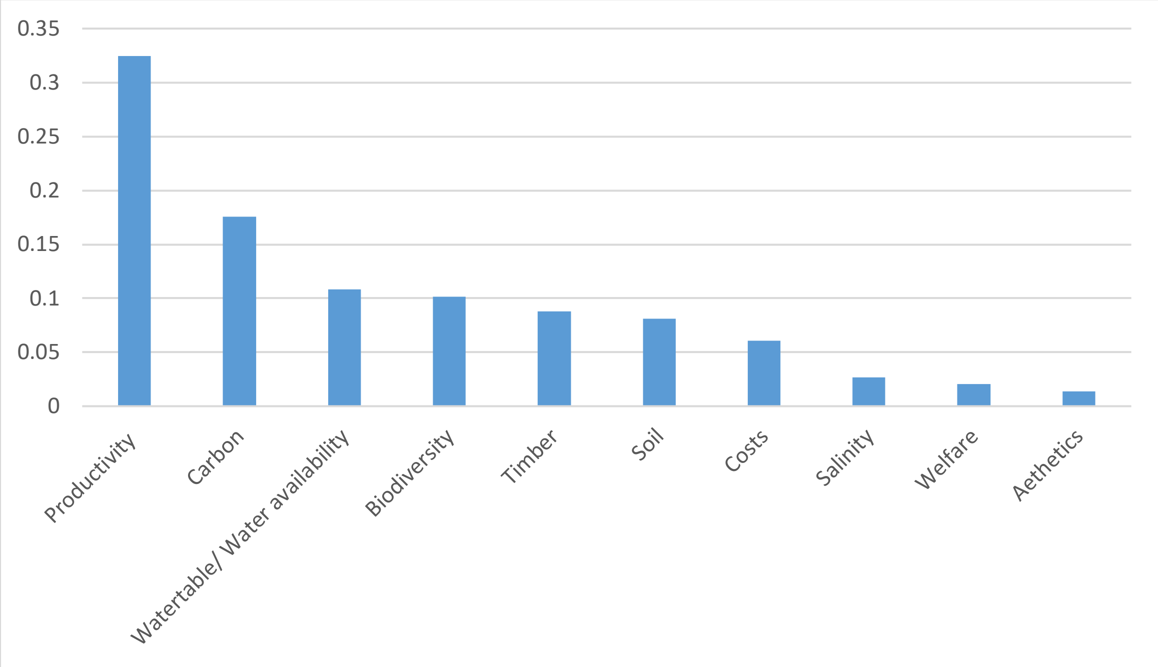
In both interviews the farmers chose to define the tree-related decision in terms of planting at a specific location and both considered plantings that would serve multiple potential uses including increasing productivity and providing environmental benefits. For the first farmer, this also included potential to supply income from timber. The decision matrix process clarified priorities and allowed for comparison with previous plantings. The farmer from the first example was able to compare the scores of potential plantings to scores of a project he is quite satisfied with and another he would not do again. This increased confidence that plans that he has been considering will be viewed positively in the future. The process was flexible enough to allow for differing priorities and comfort with risk. For instance, the second farmer included the mental effort required, carbon sequestration, and fire risk while the first farmer had greater focus on impacts on farm logistics. Both farmers remained with the default risk amount, with the decision changing at about 70% of the maximum score.

These examples demonstrate the flexibility of the decision matrix process to inform tree planting decision for different farmers and farming systems. Additionally, the decision matrix has been designed so that new information, such as that provided in the database, can be readily incorporated into decisions. For instance, the second decision matrix illustrated how information relevant to the balance between carbon sequestration and biodiversity could assist this farmer with planting decisions. We are currently recruiting volunteers to try the process in Tasmania and will be conducting at least one interview with a Tasmanian farmer early in 2022.

4.2 Database

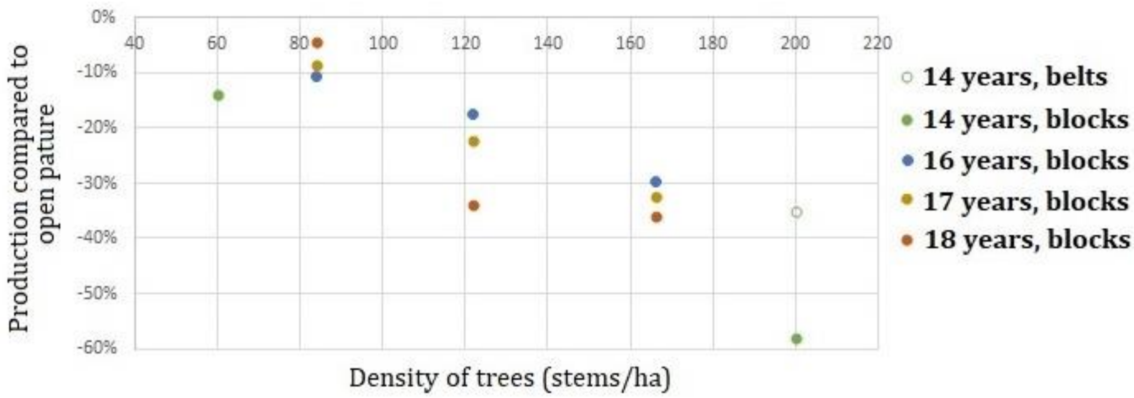
The initial published version of the database includes information on the co-benefits and trade-offs of trees in farming systems from 97 publications (Appendix 8.2). The breakout of topics covered by these articles is shown in Figure 1. Publications on productivity and carbon benefits prioritised in the literature review were nearly 50% of the articles in the database. Other topics include those related to water availability and quality, biodiversity, timber production, soil impacts, animal welfare and property aesthetics. It should be noted several publications are counted in more than one topic area.

Figure 1: The percentage of articles included in the database that address various co-benefits and trade-offs.



The literature demonstrates increases in pasture production with shelterbelts and decreases with agroforestry plantings. A search of the literature on effects of shelter on pasture production at the farm level or entire paddock area range from 6.5% to 16%. No studies reported a decrease in pasture production even when including the area of the shelterbelt that is no longer pasture. Reductions in pasture productions with agroforestry plantings were influenced by density and age. Figure 2 shows reductions in pasture production with increasing density. An experiment that included tree densities of over 1000 stems/ha in blocks produced essentially no pasture after 6 years (Bird et al., 2010). Comprehensive studies of the costs and benefits of agroforestry and effective ways to integrate forestry into farming systems are lacking.

Figure 2: Reductions in pasture production with agroforestry plantings of differing density and age



Most of the available literature on the impacts of trees on livestock focus on sheep carrying capacity and wool production. Much of this information is from agroforestry systems and follows the same general trends as pasture production. In the case of shelter plantings, reductions in mortality were reported and in one case increases in carrying capacity due to improvements to pasture production in salt affected areas (Campbell, 1991). Very little information was available on the effect of trees on Australian beef or dairy cattle.

Carbon sequestration rate varied from 3.6 to 35.1 t CO_2e/ha/year, with several factors influencing the variability. The lowest sequestration rates (3.6-4.5 t CO_2e/ha/year) occurred at a degraded site with the least rainfall (476 mm). This included estimates from several species (Harper et al 2012). Studies examining *Pinus radiata* showed little variation in sequestration rate (22.3 - 23.9 t CO_2e/ha/year) although they occurred on sites with 525 – 1000 mm of rainfall. The site with the greatest sequestration receives 700 mm of rainfall each year on average. The site included 49 ha of *Eucalyptus nitens*, 16 ha of *Pinus radiata*, and 4 ha of mixed native trees (Hall, 2010).

There were approximately 300 articles that likely met the original criteria but were not included in the initial published version of the database. Most of these addressed biodiversity, water, soil, or timber co-benefits. Others were not peer-reviewed. These publications will be reviewed and entered in the database in the first half of 2022 if they are judged to provide useful additional information. An update to the database in 2022 will include a user-friendly front end and any relevant information from new publications and farmer data collected during interviews.

Of a total of 1134 articles found in the literature search, approximately 700 articles did not meet the criteria for inclusion into the database and 29 publications could not be obtained due to insufficient information on the source, obscurity of the publication, dead links, or similar issues.

5. Conclusion

This project has consolidated useful information and provided a system of incorporating relevant information into decisions about integrating trees on farm. In addition to providing specific information to advisors and farmers proficient with Excel, the database will serve as a resource for developing summaries of co-benefits for a wide audience. These outputs are particularly relevant to the Australian Red Meat Industry's Carbon Neutral by 2030 (CN30) goal. The need for a more generalised resource for decision making was clear early in the project. The results from this project will form the basis of a broader framework with wider application. This work will be done as part of Module 4 of the Carbon Storage partnership.

5.1 Key findings

- The decision matrix process provides a flexible mechanism for making and documenting tree-related decisions on farm
- Shelterbelt and agroforestry literature give very different pictures of the production impacts and may lead to some of the confusion about the impacts of trees on farm
- The database provides information on many types of co-benefits in one place and eases identification of knowledge gaps such as impacts of trees on cattle.
- The complexity of the decisions, abundance of information of varying quality, and differing knowledge, priorities, and comfort with risk of farmers necessitates a broader framework to assist with tree-related decision making and implementation on farm.

5.2 Benefits to industry

The centralisation of co-benefit data into one place allows for quick access to information for multiple purposes, including use in conjunction with the matrices to assist with decision making and assisting MLA and other organisations needing to showcase the characteristics of farm trees that improve farm operations. This information will be incorporated into the CarbonEDGE package currently being developed as part of the Carbon Storage Partnership and other outreach material. These outputs are directly applicable to achieving the CN30 goal.

6. Future research and recommendations

The primary requirement following from this work is a broader decision framework that is accessible and applicable to most farmers. This will be developed, tested, and disseminated as part of Module 4 of the Carbon Storage Partnership.

The various aspects of Phase 1 that will be incorporated into this work and the expected delivery times are outlined below:

1) The publicly available version of the Excel database will be available by mid-January 2022.
2) At least one interview that will generate a Tasmanian example of the decision matrix is scheduled to occur in February 2022. We are recruiting for another in the same timeframe.
3) Additions to the database including data obtained from Phase 2 farmer interviews, new literature that is published on the topic, and co-benefit information that remains to be entered will occur in the first half of 2022 and will align with the timing of #4.
4) The web-based front end of the database will be developed during semester 1 with an expected completion mid-2022.
5) The draft decision framework is a Phase 2 output and will be ready for feedback by the second half of 2022.
6) Throughout 2022 awareness of the database, the decision matrices and later, the larger decision framework, will be raised through circulation of summaries in industry publications and extension opportunities identified through researcher networks and including the CSP.

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8. Appendix

8.1 Decision matrix instruction materials

By Cam Nicolson
This is also outlined in a video on YouTube. You can also walk through the process using an online tool at https://decisionwizard.sfs.org.au/matrices#/dashboard. This website contains examples of previous tree related decisions that may assist with any of the following steps.

1. **Identify the decision** you want to make. For instance, Should I establish an environmental planting along the creek? Or How many hectares of timber belts should I plant for shelter and harvest?

2. List the **big considerations** you know should influence the decisions. These become your critical success factors. Usually there are only 4 to 8 critical success factors, the rest will be 'noise'. A list of several possibilities for varying types of decisions are included in the example matrices. Select factors that are critical to your decision making and add any that are not included. Examples that you may want to consider are listed on the next page.

3. Take each big consideration (critical success factor) and ask "at what point would I think a bit differently about my decision"? This will split each critical success factor into two or more **conditions**. Repeat for each critical success factor.

4. Once all critical success factors have conditions described, **assign scores**. Tip - assign all the lowest conditions as 0. Then consider the highest described condition and give them a score relative to the other highest conditions. i.e. if you decide the highest condition in critical success factor 1 is twice as critical as the highest condition in critical success factor 2, then the first needs twice the points. Once the top and bottom are established, it is relatively easy to fill in the remaining condition scores.

5. Calculate the **maximum score** if all conditions were at their highest.

6. Describe the **key decision** you would make under the maximum possible score and the worst possible score (which should be 0). Then, if applicable, fill in a couple of possible decisions you could make in between the two extremes. Don't create too many as this can confuse the decision you need to make.

7. Think of an **extreme historic example** (usually a year, season or known scenario) calculate the score for that example *at the time the decision needed to be made.* Using hindsight, what was the appropriate response for that set of circumstances. Use this to inform a key decision score for that extreme. Repeat with another extreme, but opposite example. Then estimate the scores in between the extremes.

8. Test with a series of **more recent examples** (so you get a combined score) and fine tune the score within each big consideration if required.

Critical consideration	**Comments**
Location	Is it: • On a boundary fence (biosecurity benefit of double fence, privacy, title) • Degraded land – erosion, salinity, waterlogged etc • Protected land e.g. waterway, riparian zone • On a paddock boundary • In the middle of a paddock • Scattered paddock trees • Reducing watertables (salinity recharge)
Establishment method	• Mechanical site preparation or planting into uncultivated soil • Chemical weed control or non-chemical (e.g., weed mats) • Tubestock or direct seeding • Tree guards, watering? • Time of year – autumn, winter, spring?
Species selection (characteristics)	Considerations • Local to area, other Australian native species, exotic? • Suitable for predicted future climate? • Lifespan, time it will take to see the benefits • Used for timber • Used for carbon sequestration • Height around structures e.g. powerlines • Suitability for windbreak • Attract birds / insects
Planting design	• Layout – block, linear, etc • Single species or species mixture • Species arrangement of mixed species planting • Plant spacing • Will it create pest habitat
Costs	Paid out of business profits Tax incentives (e.g., immediate deductions for costs of shelterbelts) Fencing (linear layouts have higher fence cost per area planted) Grants • Labour assistance through community programs e.g. landmate, friends of groups etc
Loss of agricultural land	Direct: • loss of grazing or cropping area (dimensions) Indirect: • change pasture and crop yield because of moisture competition, shading • stock 'camp' in lee of trees = change pasture composition, high fertility weeds, nutrient transfer • linear layouts provide greater shelter benefit but increase the length of tree / pasture interface

Time to see benefits	Will take time to accrue benefits so need a long term view Establish over one or two seasons or spread over a number of years?
Animal welfare	Shelter from wind (lamb survival, off shears) Shade (heat stress)
People welfare	Nicer place to operate (reduced wind) Visual aesthetics Social licence to farm (foil against criticism, access to markets demanding greater environmental credentials) Build relationships with local community by designing tree planting projects across properties to increase landscape connectivity
Influence on capital value	Adds to resale Loss of views reduces sale value
Fire risk	Species resilience to fire

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8.3 Example Decision Matrices

Livestock-cropping system near Hamilton

Decision: Do I plant trees in this location?

			Creek	Pines	50ha pdk	Dam planting
			Historic scenarios		Future scenarios	
Critical factors	**Considerations**	**Value**	**Scenario 1**	**Scenario 2**	**Scenario 1**	**Scenario 2**
Shelter provided (for people and stock)	Provides shelter from critical directions (Sth, east wind) - diversity of height, shape and lifespan & width, big enough to provide corridors but no detremental effects within paddock.	8	8	4	8	8
	Some benefits but also some compromises	4				
	Doesn't provide key benefits (long term shelter, survival - die out, suck water out of paddock, too narrow etc).	0				
Aesthetic value derived from the trees	High - Indigenous to area, has a mix of species and age, can use for recreation (pleasure, enjoyment).	8	8	2	8	8
	Moderate - Not indigenous, the plantation will 'look out of place'.	2				
	None - monoculture, harbours weeds.	0				
Contributes to business aim of 10% tree cover on arable parts of farm (excluding woodlot trees)	Planting will contribute to objective (trees may produce also produce income)	8	8	8	8	8
	Have reached current 10% aim - have shelter everywhere we want it.	0				
Environmental impact - benefit to landscape (replace tree loss, erosion on creek banks, decline of remnants)	Addresses major environmental impacts at or near that location	8	8	0	5	8
	Get some value but not all environmental concerns solved	5				
	Limited or no impact of environmental challenges	0				
Orientation and size of plantation in paddock	Wouldn't have any impact on future in paddock operations (planation location wouldn't affect boom width, parallel operation of machinery)	6	6	6	6	4
	Some impact / hassles but can get around it (accept it)	4				
	Major impact on future paddock use (dimension for machinery use)	0				
Species selection	Location will support indigenous, native specis that provide strong environmental value, have little impact within paddock and provide possible income	5	5	0	5	5
	Location would only support non indigenous, non native species, with little environmental benefit e.g. pines	0				
Impact of trees from plantation to adjacent paddocks	Trees have no impact on paddock productivity (robbing moisture from paddock), allow wind for paddock to dry out	5	5	5	5	5
	Significant impacts - moisture loss or location will prevent wind, making the paddock wetter in winter	0				
Opportunity for alternative income	High - can prune for good trees, using the thinnings for firewood, then 30 yr saw logs with grass understory (grazing)	4	1	4	1	1
	Moderate - some firewood, not much else	1				
	None - trees with no 'value' - not even firewood	0				
		52	**49**	**29**	**46**	**47**

Decision	Score
Yes plant trees here	> 36
No don't plant	36 or less

Mixed livestock system near Hamilton

Decision: Do I plant trees (at this location)

Critical factor	Considerations	Value
Contribution to whole farm goals	High - Matches whole farm plan, providing shelter and shade, along with other values and objectives of farm business	8
	Provides some benefits to the overall farm objectives	4
	Low - Little contribution to overall farm objectives	0
Headspace required to plan and execute the project	Low - Choices / effort around planning and preparation is easy	7
	Some challenges but can be overcome	3.5
	Real challenge to organise what is required (e.g.tree supply, provenance, diversity, sorting out conflicting information)	0
Capacity to sequester carbon (act as a carbon sink)	High - Location enables maximum carbon storage per tree, per hectare because of soil type, water etc	7
	Provides some carbon storage potential	3.5
	Low - Provides minimal carbon sequestration (poor growing environment for trees)	0
Efficiency' with exisitng and planned fences on the farm (paddock sub division, landclass)	High - Matches well with existing or new fencing on the farm (shared fencing benefits)	7
	Matches with other benefits but over time (eventually) - will when future sub division, land class fencing, erosion control, water management is implemented	3.5
	Low - it is a stand alone tree project, so fencing for trees only	0
Productivity of the land	Low - inherent limitation for cropping and grazing	7
	Moderate - Other productive land use possible	3
	High - Other productive land uses	0
Impact on enhancing biodiversity	High - Increases native fauna (as result of native flora creating an ecosystem)	7
	Limited increase in biodiversity but other benefits gained (shelter, shade, firewood etc),	6
	Low - Creates a monoculture	0
Enhances long term 'sustainability' in the landscape (more closely aligns to pre-European settlement landscape)	High - Planting will 'suit' the landscape, through the type and structure of the trees planted, capacity to regenerate from fire etc	5
	Might be a bit out of place, but provides other benefits (environmental protection, diversity income stream)	2.5
	Low - Plantation out of place	0
Competition for resources with other possible investments	Trees a 'good' investment (value of benefits are high for the time, $$ spent)	6
	Trees on a par with other choices	3
	Other technology or approaches are more cost effective than trees to achieve the objective of the planting (e.g drainage rather than trees to remove excess water)	0
Impact on fire risk	Helps to reduce fire threat (protects major infrastructure, slows speed of fire front)	4
	No effect on fire	2
	Increases fire risk (too close to infrastructure, contains flamable species)	0
		58

Past example	Past example	Future example	Future example
Extending the existing 40yr old plantation	8	Planting for erosion control	8
As above	6	Planning wetland and associated trees	4
As above	7	Planting out as per WFP	7
As above	7	Boundary fence against neighbours with bluegums to be harvested & the fence needs fixing anyway	7
As above	6	wetland	7
As above	7	planting trees around weaner yards	6
Improved fencing around covenant area	5	Extending fencing from covenant block	5
Subdivided/invested in Farmo instead of planting trees	1	Putting in wetland that may not include trees initially	1
Extending the existing 40yr old plantation	3	planting trees around weaner yards	1.5
0	**50**	**0**	**46.5**

Decision	Score
Yes, plant trees	Greater than 40
No, don't plant trees	40 or less