Australian landholders' willingness to pay for trees on farms

Sorada Tapsuwan, Tim Capon, Murni Po, and Daniel Mendham

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Research questions

- What are the cultural benefits that trees provide?
- What types of trees on farms do landholders prefer?
  - Shelter belts or block planting?
  - Native or exotic species?
  - Harvest or keep?
  - *** Willingness to pay used as a proxy to understand preferences ***
- What are the other factors that may affect preferences?
  - Goals?
  - Concerns?
  - Demographics/Farm characteristics?
  - Visitation of parks?

METHODOLOGY

Socio-psychological pathways for cultural ecosystem services benefits

Pathways	Common language
Cognitive/Education	Contributes to knowledge and understanding
Creative/Inspire	Contributes to scenery, aesthetic, artistic, or creative appreciation and inspiration
Intuitive/Connection	Contributes to a sense of insight into life and nature or feelings of connectedness with life, nature, or the wider world
Retrospective	Reminds you of your own memories and personal history or inspires you to reflect on the past and history more generally
Regenerative/Wellness	Contributes to opportunities to improve your physical and mental wellbeing through recreation and leisure or by helping reduce stress and fatigue
Communicative	Helps facilitate social interactions, cultural identity, and a sense of place
Exist	Value the existence of trees independently of the contributions they make to people
Bequest	Value the contribution of trees to others and future generations

(King et al. 2017)

Perception of cultural ecosystem services benefits

Cognitive
Creative
Intuitive
Retrospective
Regenerative
Communicative

Trees contribute to my knowledge and understanding of …

… the natural environment

… the history and origins of places

… how landscapes and the environment change over time

… environmental management

Trees contribute to …

… the education of children

… science and research about the natural environment

1. Strongly disagree	2. Disagree	3. Neither agree nor disagree	4. Agree	5. Strongly agree

Social, environmental and political issues

Social/Political issues

- The cost of living
- The Australian economy
- Health
- Government and politics
- Education
- Crime and justice
- Other social problems

Environmental/Political issues

- Pollution
- Deforestation
- Climate change
- Salinity
- Water Quality
- Water Shortages
- Accumulation and disposal of household waste
- Drought

1. Not at all concerned	2. Slightly concerned	3. Moderately concerned	4. Very concerned	5. Extremely concerned

Goals

Economic/Financial

- Build up land and property assets
- Build up size of livestock herd
- Build up wealth and family assets
- Earn a high income
- Maximise company profit
- Minimise tax
- Financial independence
- Produce high quality products

Social

- Be appreciated by society
- Be appreciated by colleagues
- Continue family tradition
- Have social contacts
- Help feed the world
- Look after family heritage
- Put children through school or university
- Employee well-being
- Look after social/cultural heritage

1. Not at all important	2. Low importance	3. Moderately important	4. Very important	5. Extremely important

Goals

Lifestyle

- Work with animals or nature
- Enjoy farm work
- Flexible work hours
- Have time for family and hobbies
- Live in nice surroundings
- Work life balance
- Recreation (e.g. nature walks)
- Improve views or look of property
- Increase sense of connection with the land
- Improve educational outcomes for children (e.g. tree planting experiences)

Environmental

- Conserve biodiversity on farm
- Pass on land in good condition for the environment
- Minimise environmental impacts
- Look after environment
- Habitat for wildlife
- Animal welfare for livestock
- Species diversity in pasture
- Improve global climate outcomes (e.g. carbon sequestration)
- Improve water quality

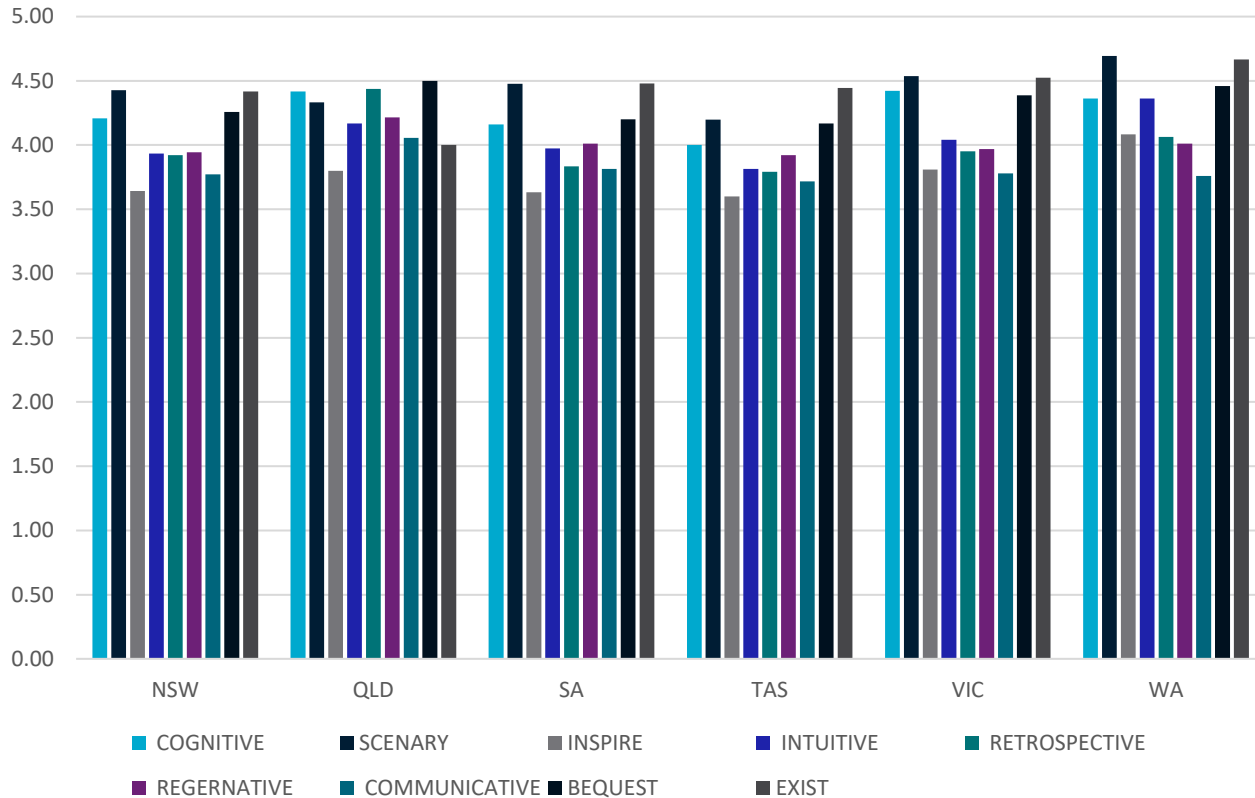| 1. Not at all important | 2. Low importance | 3. Moderately important | 4. Very important | 5. Extremely important |

Willingness to pay choice cards

RESULTS

Descriptive statistics – Cultural ecosystem services

Relatively high:
- Scenery
- Bequest
- Existence

Relatively low:
- Inspire
- Regenerate wellness

Legend: COGNITIVE, SCENARY, INSPIRE, INTUITIVE, RETROSPECTIVE, REGERNATIVE, COMMUNICATIVE, BEQUEST, EXIST

Descriptive statistics – Concerns and goals

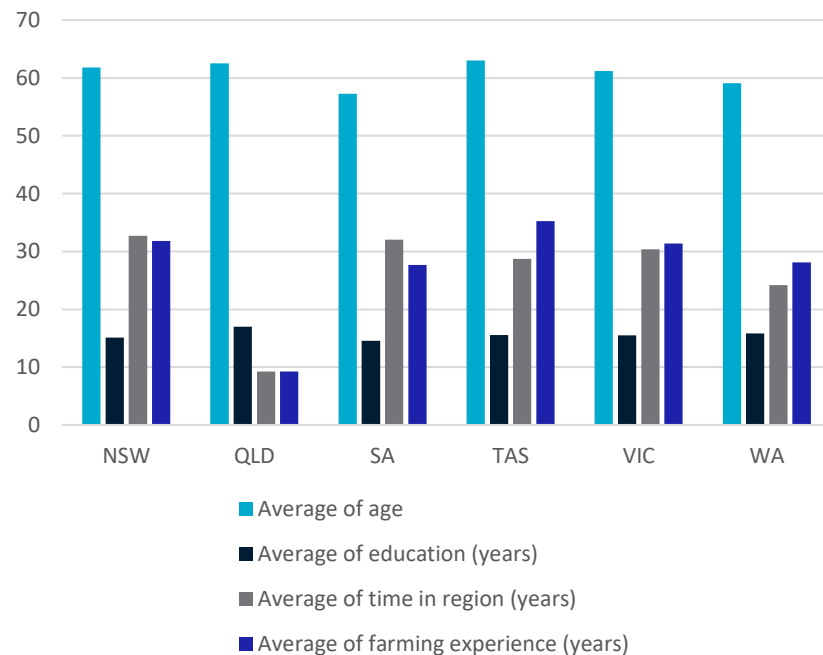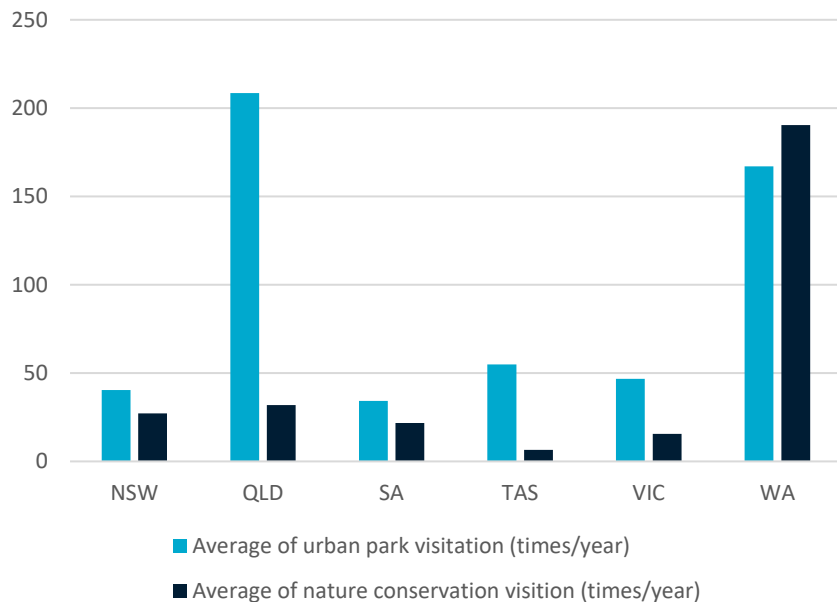Relatively high:
- Environmental goals
- Lifestyle goals
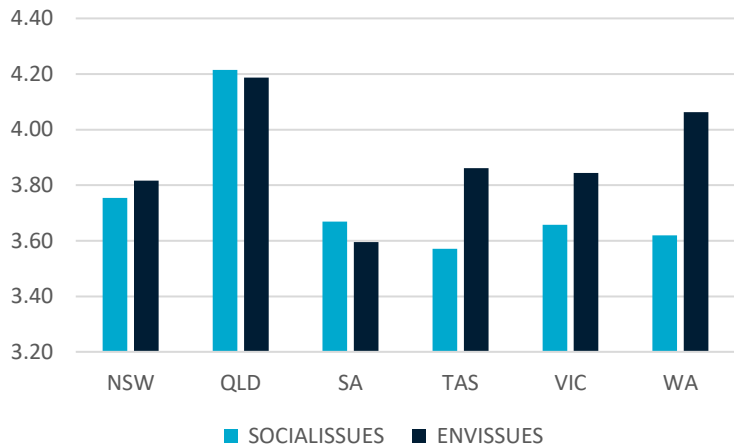
Relatively high:
- Environmental concerns
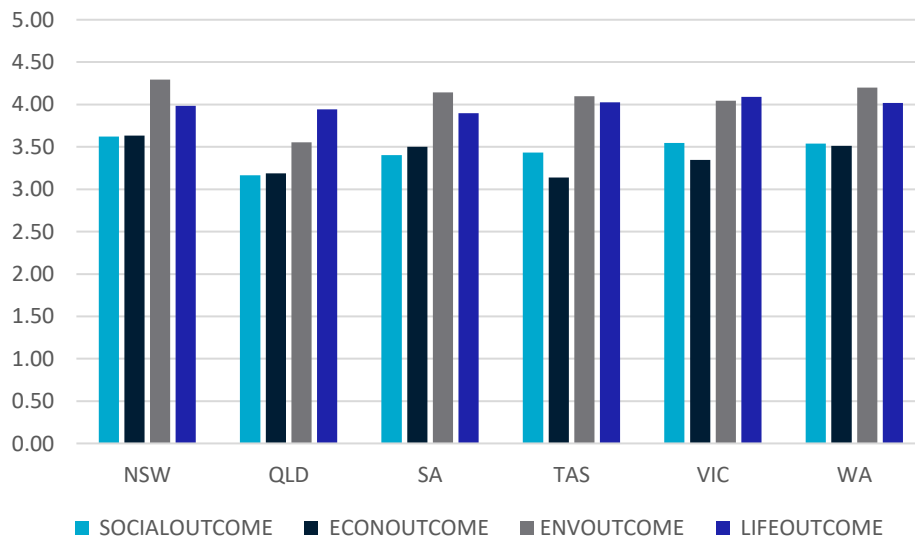
Descriptive statistics by state

Latent class model results

	Class 1	Class 2	Class 3	Class 4
Class share (%)	28.4	16.7	36.4	18.6
Variable	**Coef. (Std.Err)**	**Coef. (Std.Err)**	**Coef. (Std.Err)**	**Coef. (Std.Err)**
Attributes by class				
Block planting	0.9528 (0.2360)***	1.4926 (0.2330)***	0.5190 (0.1973)***	0.3975 (0.3470)
Shelter	-0.2615 (0.2396)	-2.0070 (0.5050)***	2.3744 (0.1897)***	1.5812 (0.2901)***
Mixed native	3.8309 (0.3365)***	0.6656 (0.2824)**	1.1788 (0.1882)***	0.1320 (0.2806)
Single native	2.0469 (0.3124)***	-0.1671 (0.2929)	0.9864 (0.1936)***	-0.1158 (0.2830)
Harvest	0.4001 (0.1950)**	1.2230 (0.2569)***	0.8049 (0.1490)***	0.4514 (0.2432)*
Extent	0.0203 (0.0105)*	0.0254 (0.0120)**	-0.0034 (0.0086)	-0.0789 (0.0139)***
Membership by class				
Liberal/National	-2.0492 (0.8846)**	-1.2907 (1.0193)	-2.5091 (0.8224)***	
Education (years)	0.4129 (0.1726)**	0.1460 (0.1924)	0.0758 (0.1593)	
ECONOUTCOME	-2.7029 (0.8576)***	-2.2877 (0.9301)**	-1.4408 (0.7916)*	
LIFEOUTCOME	2.6284 (0.8592)***	1.8457 (0.8978)**	1.6227 (0.7747)**	
SOCIALISSUES	-0.7967 (0.7626)	-2.3775 (0.8689)***	-1.6141 (0.7183)**	
NSW	0.9869 (1.0292)	3.8109 (1.2534)***	2.5746 (0.9315)***	
SA	1.3425 (0.9245)	1.3755 (1.2462)	0.6852 (0.9241)	
Constant	-2.8635 (4.3329)	6.6655 (4.7867)	5.2311 (3.9606)	
Fixed across classes				
Status quo	0.5192 (0.2374)**			
Total cost ($)	-3.35E-05 (8.53E-06)***			

Willingness to pay estimates

.... For 10ha of land
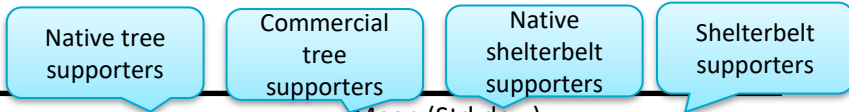
	Native tree supporters	Commercial tree supporters	Native shelterbelt supporters	Shelterbelt supporters
	WTP [95% Conf. Interval]			
	Class 1 (28.4%)	**Class 2 (16.7%)**	**Class 3 (36.4%)**	**Class 4 (18.6%)**
Preferred configuration (as compared to Wide-spaced block planting)				
Block planting (1,200 stems/ha)	0	29,057.11 *** [10,475.98, 47,638.24]	0	0
Shelter	0	-75,411.99 *** [-129,151.60, -21,672.38]	55,378.88 *** [29,814.54, 80,943.23]	31,701.74 *** [10,926.50, 52,476.98]
Preferred species (as compared to Single exotic)				
Mixed native	98,857.91 *** [51,698.47, 146,017.30]	0	19,687.57 ** [4,519.89, 34,855.25]	0
Single native	45,601.57 *** [20,196.17, 71,006.98]	0	0	0
Option to harvest				
Yes	0	21,007.69 ** [2,661.94, 39,353.45]	0	0
Extent of trees on the block (as % of land)				
Extent	0	0	0	0

Differences between classes

Native tree supporters — Class 1
Commercial tree supporters — Class 2
Native shelterbelt supporters — Class 3
Shelterbelt supporters — Class 4

Mean (Std.dev.)

	Class 1	Class 2	Class 3	Class 4
Liberal/National	0.29 (0.45)	0.60 (0.49)	0.34 (0.47)	0.53 (0.50)
Education (years)	15.94 (2.00)	15.10 (2.14)	14.86 (2.23)	15.09 (2.43)
ECONOUTCOME	3.32 (0.59)	3.33 (0.65)	3.51 (0.65)	3.65 (0.63)
LIFEOUTCOME	4.19 (0.48)	3.94 (0.52)	4.03 (0.60)	3.87 (0.69)
SOCIALISSUES	3.75 (0.60)	3.23 (0.77)	3.67 (0.67)	3.88 (0.68)
NSW	0.14 (0.35)	0.65 (0.48)	0.50 (0.50)	0.39 (0.49)
SA	0.26 (0.44)	0.15 (0.36)	0.14 (0.34)	0.14 (0.34)

Pairwise t-test

	Class 1-2	Class 1-3	Class 1-4	Class 2-3	Class 2-4	Class 3-4
Liberal/National	-0.31***	-0.06***	-0.24***	0.26***	0.07***	-0.19***
Education (years)	0.84***	1.08***	0.85***	0.24**	0.01	-0.23***
ECONOUTCOME	0.00	-0.19***	-0.32***	-0.19***	-0.32***	-0.13***
LIFEOUTCOME	0.24***	0.16***	0.32***	-0.09***	0.07***	0.16***
SOCIALISSUES	0.52***	0.08***	-0.14***	-0.44***	-0.65***	-0.22***
NSW	-0.51***	-0.36***	-0.25***	0.15***	0.26***	0.11***
SA	0.11***	0.12***	0.12***	0.01	0.01	0.00

Summary of findings

- Landholder preferences are heterogenous
- Preferences for trees on farms varies with
  - Economic outcomes,
  - lifestyle outcomes, and
  - Social issues
- Preferences did not vary with perceived cultural benefits
- Preferences did not vary with green space use

Plug

- Study of Tasmanian resident's willingness to pay for trees on
  - Farms
  - Nature conservation areas
  - Rural roads
  - Urban spaces

Thank you

CSIRO Environment
Dr Sorada Tapsuwan

+61 2 6276 6730
sorada.tapsuwan@csiro.au
research.csiro.au/economics/

Introduction

- Trees on farms have multiple benefits, including:
  - Carbon sequestration
  - Stormwater prevention
  - Soil erosion prevention
  - Amenity
  - Biodiversity, and
  - Increasing the productivity of adjacent crops and livestock through shelter
- Benefits from trees can start to accrue not long after they are planted
- Add monetary value to the farm enterprise if properly accounted for

Problems

- Despite the benefits, farmers are not planting more trees on farms because:
  - The upfront cost is high
  - The outcome is long-term and uncertain
  - The opportunity cost of the land for other activities
  - The lack of knowledge/expertise
  - Traditional practices do not encourage more trees
  - Funding sources have too many lock in conditions

Research question

1. What do farmers like about trees on farms?

2. How much are landholders prepared to pay for trees on farms?

3. How much cultural ecosystem services values effect the willingness to pay for trees on farms?

4. How much do other values effect the willingness to pay for trees on farms?
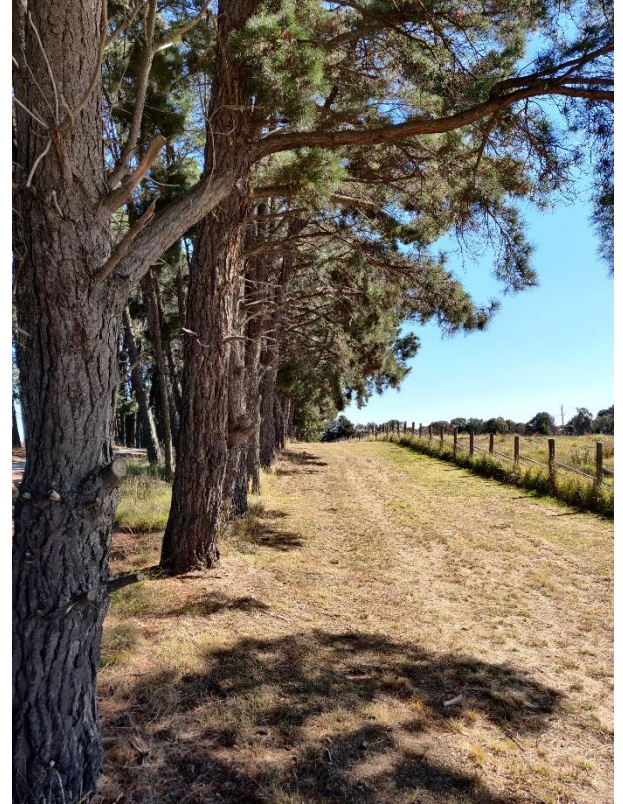
Attributes and levels

Attributes	Levels
Configuration	• Shelterbelt (perpendicular to the wind) • Block planting (1200 stems/ha) • Wide-spaced block planting with pasture (250 stem/ha)
Species composition	• Single native species • Mixed native species • Single exotic species
Use	• Harvest and sale • Not harvested
Extent	10%, 20%, 30%
Cost	$100,000, $104,000, $108,000, $112,000, $116,000, $120,000

Methodology

- Literature review
- Interviews and pilot survey
- Survey design
- Data collection
- Factor analysis and constructing latent variables
- Latent class analysis of willingness to pay

Questionnaire

- Part 1: Attitude towards cultural benefits of trees
- Part 2: Concerns about social and environmental issues
- Part 3: Personal, social, economic, and environmental goals
- Part 4: Willingness to pay
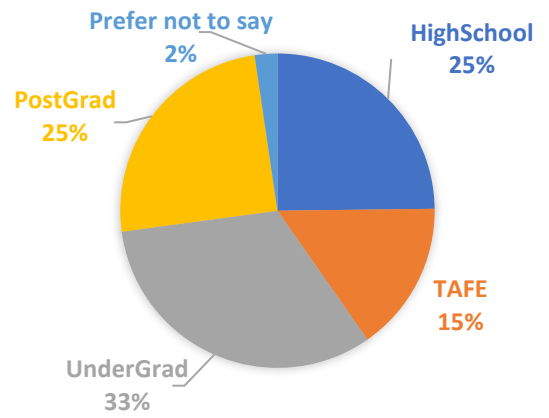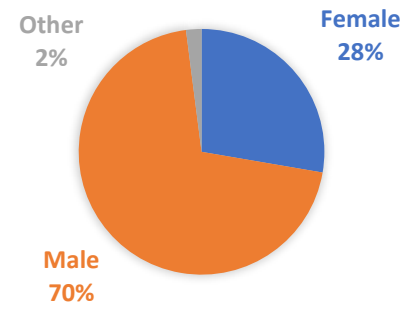- Part 5: Farm characteristics
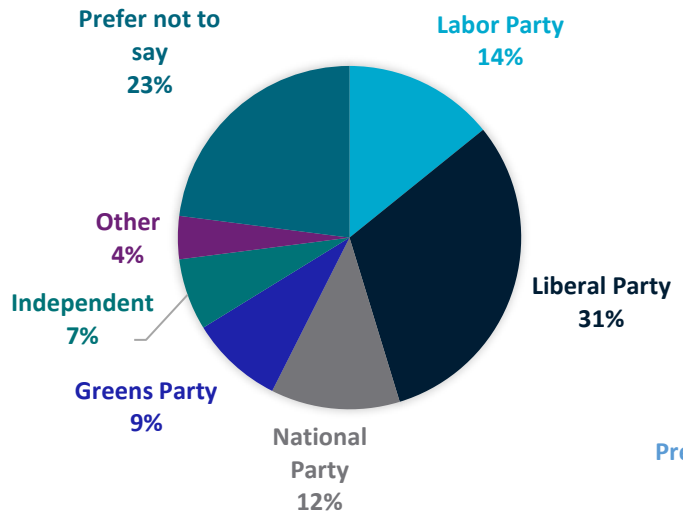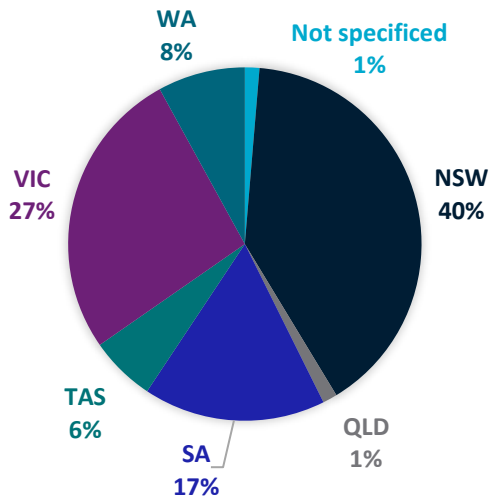- Part 6: Demographics
- Part 7: Green space use

Data collection

- Online choice modelling survey (Sawtooth Software)
  - 9 choice cards per landholder
  - 3 options + do nothing per choice card
- Panel recruitment of Australian landholders (Q&A Research)
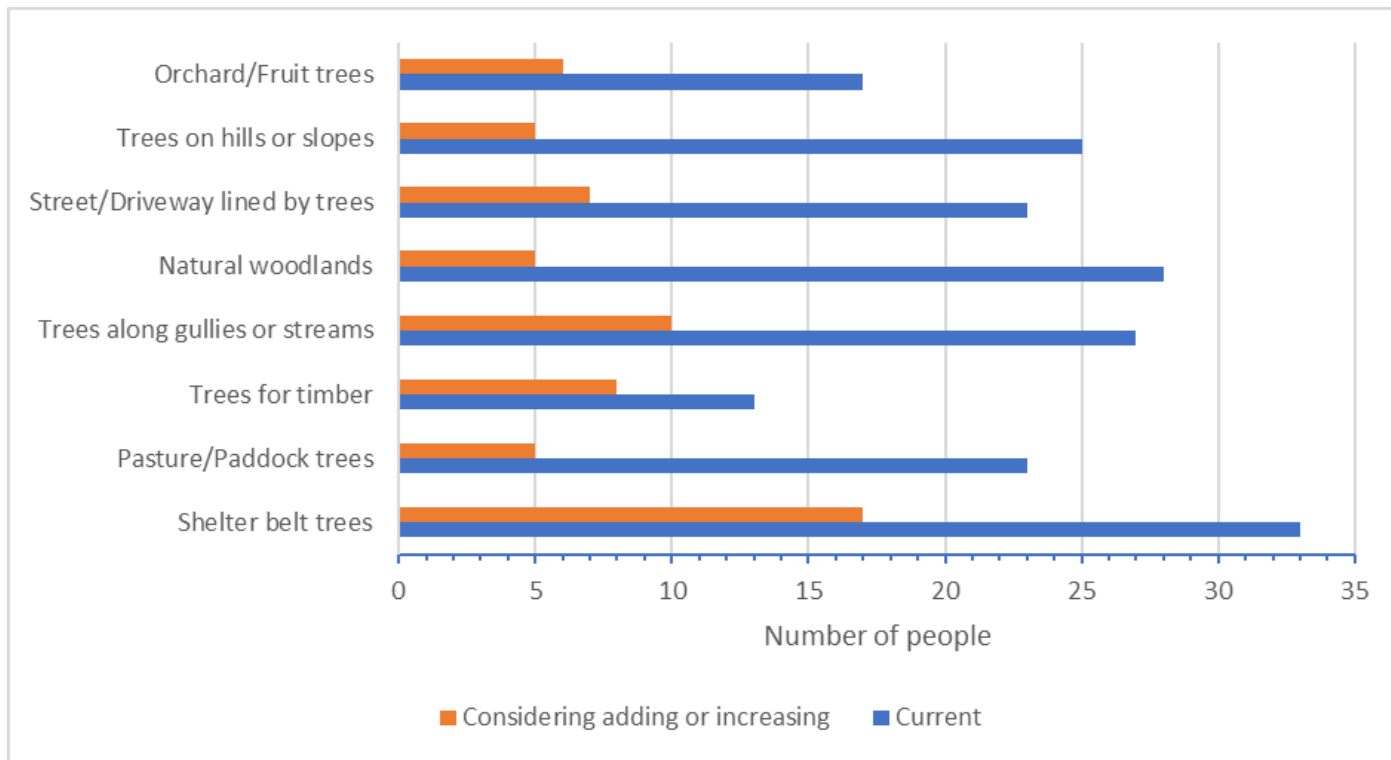- N=150
- September 2022

Descriptive statistics

Tree planting systems

The number of respondents who currently have each tree planting system and the number of respondents who are considering adding or increasing each type of tree planting system

Descriptive statistics by state