



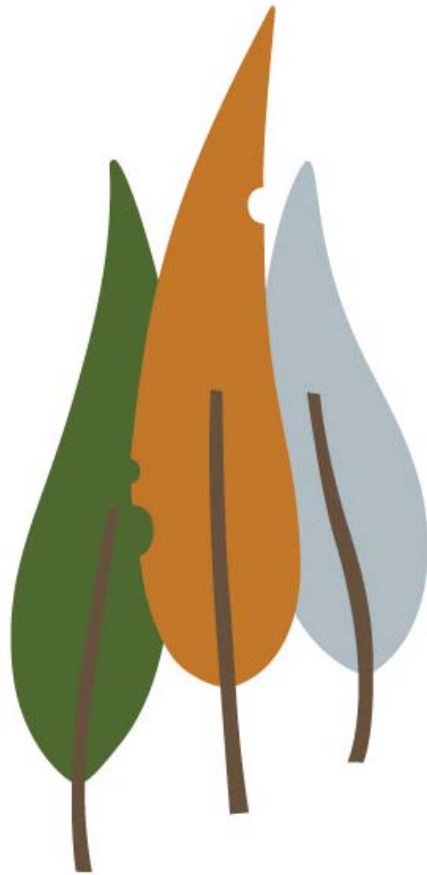
Technical Report 218

**Planting trees for
carbon sequestration:
what do landholders think?**

Jacki Schirmer and Lyndall Bull

CRC for Forestry
Researching sustainable forest landscapes





Technical Report 218
**Planting trees for
carbon sequestration:
what do landholders think?**

J Schirmer^{1,2}, L Bull^{1,2}

Public report

¹ Fenner School of Environment and Society, Australian National University

² Cooperative Research Centre for Forestry

December 2011

COOPERATIVE RESEARCH CENTRE FOR FORESTRY

College Road, Sandy Bay, Tasmania
Private Bag 12, Hobart, Tasmania 7001 Australia

www.crcforestry.com.au

Contents

Acknowledgments.....	ii
Introduction.....	1
Study region	2
Methods.....	2
Results.....	4
Adoption and planned adoption of tree planting for carbon sequestration	5
Characteristics of the rural properties managed by survey respondents	6
Tree planting history	9
Views about land management and planting trees in general	13
Views about markets and financial returns from tree planting for carbon sequestration	17
Beliefs about planting trees for carbon sequestration.....	21
Barriers to planting trees for carbon sequestration.....	23
Incentives for planting trees for carbon sequestration	27
Willingness to plant trees for carbon sequestration under different scenarios	31
Minimum return required to plant trees for carbon sequestration under different scenarios.....	33
Sources of information on tree planting for carbon sequestration.....	35
Demographic characteristics of survey respondents	38
Discussion and conclusions	46
Barriers to adoption	46
Extension strategies.....	47
Design preferences.....	47
Implications	47
References	49
Appendix 1: Questionnaire.....	A1-1
Appendix 2: Analyses	A2-1
Views about planting trees in general.....	A2-1
Views about potential markets and financial returns from planting trees for carbon sequestration	A2-2
Views about planting trees for carbon sequestration.....	A2-3
Barriers to planting trees for carbon sequestration.....	A2-4
Incentives for planting trees for carbon sequestration	A2-5
Willingness to plant trees for carbon sequestration under different scenarios	A2-6
Minimum return required to plant trees for carbon sequestration under different scenarios	A2-7
Sources of information on tree planting for carbon sequestration.....	A2-8

Acknowledgments

We acknowledge the time and effort provided by the many landholders who participated in focus groups and surveys for this project, and thank them for their contributions. This research was funded by (i) a Science and Innovation Award from the Australian Government Department of Agriculture, Fisheries and Forestry, with the award funded by Forest and Wood Products Australia, and (ii) the Cooperative Research Centre for Forestry, Hobart.

Introduction

The general consensus within the scientific community is that human activity is causing the earth to warm. The use of forests as carbon sinks is increasingly recognised as a way to mitigate greenhouse gas emissions, and planting trees for the specific purpose of sequestering carbon forms part of both voluntary and mandatory carbon offset trading schemes.

While planting trees to sequester carbon is in its relative infancy in Australia, it has been widely discussed, and promoted by a number of groups, with 24 firms planting trees for carbon sequestration as of 2010, servicing voluntary carbon markets (Dargusch *et al.* 2010). Adding to interest in this activity, in 2011 the Australian Government introduced the Carbon Farming Initiative (CFI)—a legislative scheme for crediting carbon offsets that provides a framework for regulating carbon credits in the farming and forestry sectors. The CFI is designed to support trade in the voluntary market and to be compatible with any future mandatory market developed in Australia, and as such provides a stronger framework for commercial return from tree planting for carbon sequestration (Hug & Ahammad 2011).

While previous studies have explored the potential land available for tree planting, the carbon sequestration potential of tree planting in different regions, and potential economic returns under different carbon prices (although more remains to be researched in these areas), little is known about the views of the landholders who own and manage the cleared land on which trees will need to be planted for carbon (Bull & Thompson 2011). This is a significant gap in knowledge as the bulk of carbon plantings in Australia will need to take place on private land—and so for this climate change mitigation strategy to deliver its potential, large numbers of landholders will need to be convinced to participate.

Understanding landholder views, and their interest in and willingness to consider planting trees to sequester carbon, requires exploring the factors known to influence landholder adoption of new land management practices. A recent review of several decades of research in this area in Australia (Pannell *et al.* 2006) found that factors influencing adoption of new practices include:

- the relative advantage of the activity—in other words, its perceived benefits versus costs, its compatibility with current farm priorities and activities, and the barriers and incentives it presents
- the values and beliefs held by landholders that influence their willingness to adopt
- the extension strategies used to encourage adoption
- the design of the activity and its perceived riskiness
- familiarity with the activity
- characteristics of the landholder and their farm enterprise.

This study explored landholder perceptions of tree planting for carbon sequestration in rural New South Wales (NSW) via focus groups and a quantitative survey that sought to identify the factors that help and hinder rural landholders in adopting this practice, focusing on the areas identified above. By doing this, we sought to begin addressing the gap in knowledge about landholder willingness to plant trees for carbon sequestration.

The study provides information that can be used to inform both the design of policy supporting tree planting for carbon sequestration, and of specific programs targeted at achieving landholder uptake of this activity. The results of the study are, however, limited. While we provide insights into the decision-making approaches of landholders, these insights are specific to a relatively small region of Australia. In other parts of Australia the relevant issues may differ. This study does provide, however, an important first step in addressing the current information gap, and a framework for replicating research in other areas of Australia and internationally.

Study region

We explored landholder perceptions of tree planting for carbon sequestration in rural New South Wales (NSW), aiming to understand the factors that help and hinder rural landholders in both adopting this practice, and adapting to its presence in their community. The case study region extended through central and southern NSW, from high rainfall traditional forestry regions in the west (Tumut, Tumbarumba) to very low rainfall regions in the east and south in which tree planting is not a common activity and where tree planting for commercial return has not occurred in the past (Hay, Narranderra). Within this region some businesses currently offer landholders options to plant trees for carbon sequestration, operating in the voluntary carbon market. The major group offering landholders paid opportunities for carbon tree planting projects is CO₂ Australia, although it operates in only part of the study region.

Methods

Data collection for the project occurred in two phases. In the first phase, seven qualitative focus groups were held with landholders in the study region, with a total of 32 participants. The focus groups were held in Tumut (two), Narranderra (two), Wagga Wagga (two) and Hay (one). In these focus groups, participants were asked to briefly describe the type of agriculture they were involved in, and then discuss the following topics about planting trees for carbon sequestration:

- their tree planting history, including what types of tree planting they had undertaken and why they had chosen to plant (including any tree planting for carbon offsets, as well as environmental and commercial plantings)
- their current level of interest in planting trees for carbon offsets, and why they had that level of interest
- the benefits they thought they would achieve from planting trees for offsets under two scenarios: planting a substantial area of their landholding, and planting marginal areas of land only
- what barriers might prevent them from considering planting trees for offsets, and any potential negative aspects of tree planting for this purpose
- what types of government or business incentives or policies, or what other factors, would make them more or less likely to plant trees for carbon offsets
- what model of payment they would prefer out of three options (annual payments, a one-off payment at the outset, or a known final payment at an end point), and why
- their current sources of information about planting trees for carbon offsets
- additional information they needed about planting trees for carbon offsets, how they preferred that information to be delivered, and organisations or individuals they regarded as trusted sources of information
- their awareness of currently available programs for planting trees for carbon offsets.

Each interview was transcribed in full, and then analysed to inform the design of a quantitative survey of landholders in the study region. The goal of the survey was to identify the distribution of views amongst landholders about tree planting for carbon sequestration. The results of the focus groups were also subsequently used to assist in interpreting the reasons for patterns of behaviour or attitudes observed in the results of the survey.

Based on the outcomes of the focus groups, a draft questionnaire was designed and tested with two landholders before revision and distribution (see Appendix 1 for a copy of the questionnaire).

A 40.0% response rate, with 352 survey responses, was achieved. The final survey sample was 880 people after 120 of those who initially received the survey were removed due to being ineligible to participate. Reasons for ineligibility included death, retirement, that the individual had shifted to another property, that the property was no longer occupied, or that the address was incorrect.

Data were analysed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were produced, together with bivariate analyses of relationships between two variables. One-way ANOVA tests were used to identify relationships between a categorical independent variable and a dependent interval variable; Kruskal-Wallis H tests were used to explore relationships between categorical and ordinal data; and chi-square tests were used to analyse relationships between two categorical variables.

Results

Results are presented in the following sections:

- adoption and planned adoption of tree planting for carbon sequestration
- characteristics of the rural properties managed by survey respondents
- tree planting history
- views about land management and planting trees in general
- views about markets and financial returns from tree planting for carbon sequestration
- beliefs about planting trees for carbon sequestration
- barriers to planting trees for carbon sequestration
- incentives for planting trees for carbon sequestration
- willingness to plant trees for carbon sequestration under different scenarios
- minimum return required to plant trees for carbon sequestration under different scenarios
- sources of information on tree planting for carbon sequestration
- demographic characteristics of survey respondents.

Adoption and planned adoption of tree planting for carbon sequestration

Respondents were asked about their past and current practices and their intentions regarding planting trees for carbon sequestration. As expected, given the recent emergence of tree planting for carbon sequestration as a land management option, very few (4.1%) reported any past or current experience with this type of tree planting. However, 10.1% of respondents indicated they were actively considering this type of tree planting for the future, and a further 67.2% indicated they might consider it in future (Figure 1). Just under 20% of respondents had no interest in considering this as a future land management activity.

It is possible that these responses incorporate some response bias, with those who have an interest in, or who have already adopted, tree planting for carbon sequestration more likely to respond to the survey than those who have no interest. The extent of this type of response bias could not be estimated, as there is no independent information available on the proportion of landholders who have already adopted this practice, or who are considering it. Despite the potential for some response bias, the relatively high response rate to the survey indicates that a large majority of landholders have an interest in this practice, even if it is in reality somewhat lower than indicated in Figure 1.

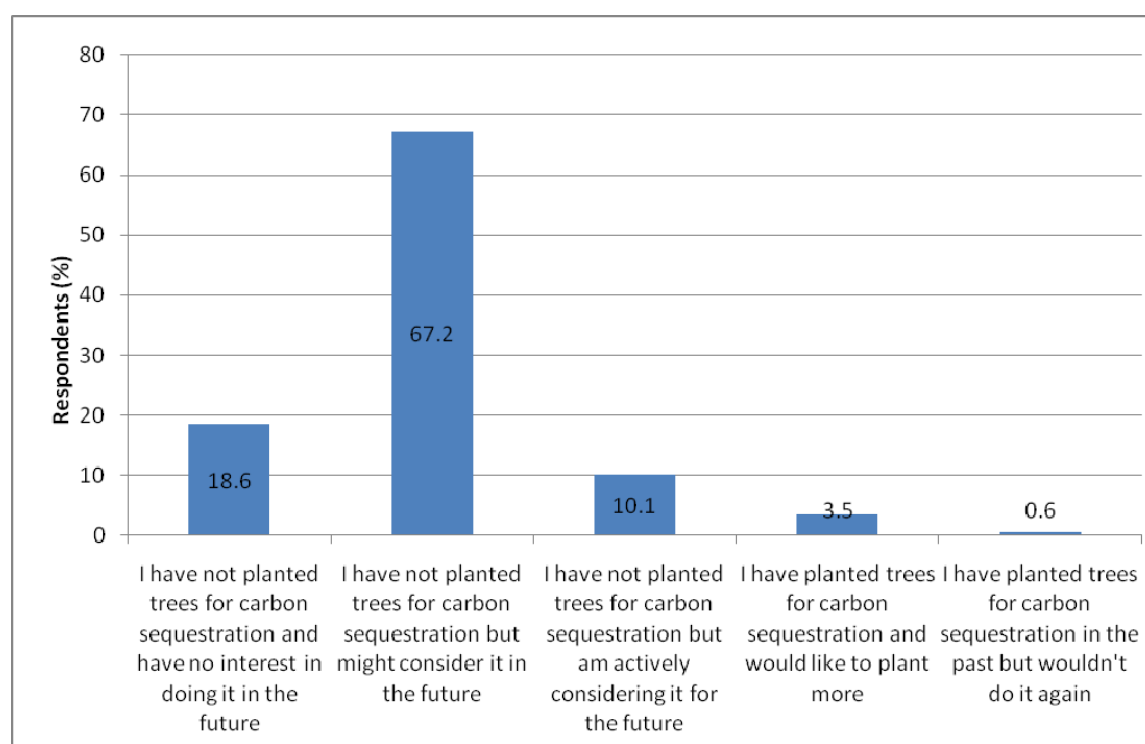


Figure 1: Landholders adoption/planned adoption of tree planting for carbon sequestration (n=345)

The data from this question were used to identify likely characteristics of adopters and non-adopters when analysing the remaining data from the survey. Landholders were categorised into three groups:

- *non-adopters*: those who indicated that they had no interest in planting trees for carbon sequestration in the future
- *possible adopters*: those who indicated that they might consider planting trees for carbon sequestration in the future
- *likely adopters*: those who indicated they were either actively considering planting trees for carbon sequestration, or who had already done so.

It was not feasible to separate those who had adopted from others, as the number of landholders indicating they had adopted was too small to allow meaningful analysis of their characteristics compared to other landholders.

Comparisons of the characteristics of non-adopters, possible adopters and likely adopters are presented throughout the following sections.

Characteristics of the rural properties managed by survey respondents

Survey respondents were asked for information about their rural property, including the purpose it was managed for, the total area managed, their primary agricultural activities, and their estimate of the proportion of the land that was marginal versus highly productive for agriculture.

Of the respondents, 92.9% reported that the primary use of their land was for agricultural production. A further 4.5% reported that their land was primarily used for lifestyle or 'hobby' farming, while 1.1% and 1.4% respectively reported conservation of native plants and animals, or residential use, as the main uses of their property.

We compared those who used their land for agricultural purposes to all others (lifestyle, conservation and residential users) to see if the two groups were different in terms of willingness to adopt. The small numbers of respondents who had a primary purpose other than farming meant that the analysis must be interpreted with caution. A moderately significant relationship was identified using a Pearson chi-square test ($p=0.032$, $df=2$, $\chi=6.874$, $n=343$). Those who did not use land principally for agricultural purposes were more likely to indicate they were currently considering adopting (29.2% versus 12.5% of those who principally used land for agriculture), but were also more likely to indicate they were not willing to adopt (25.0% compared to 18.2%). It is not clear why this group has stronger views both in favour of and opposed to planting trees for carbon sequestration, and this issue should be further explored in future studies.

The total area of land managed by survey respondents varied from one hectare (ha) to 44 500 ha. The average area managed was 1488 ha and the median was 632 ha. Figure 2 shows the proportion of respondents who managed different areas of land.

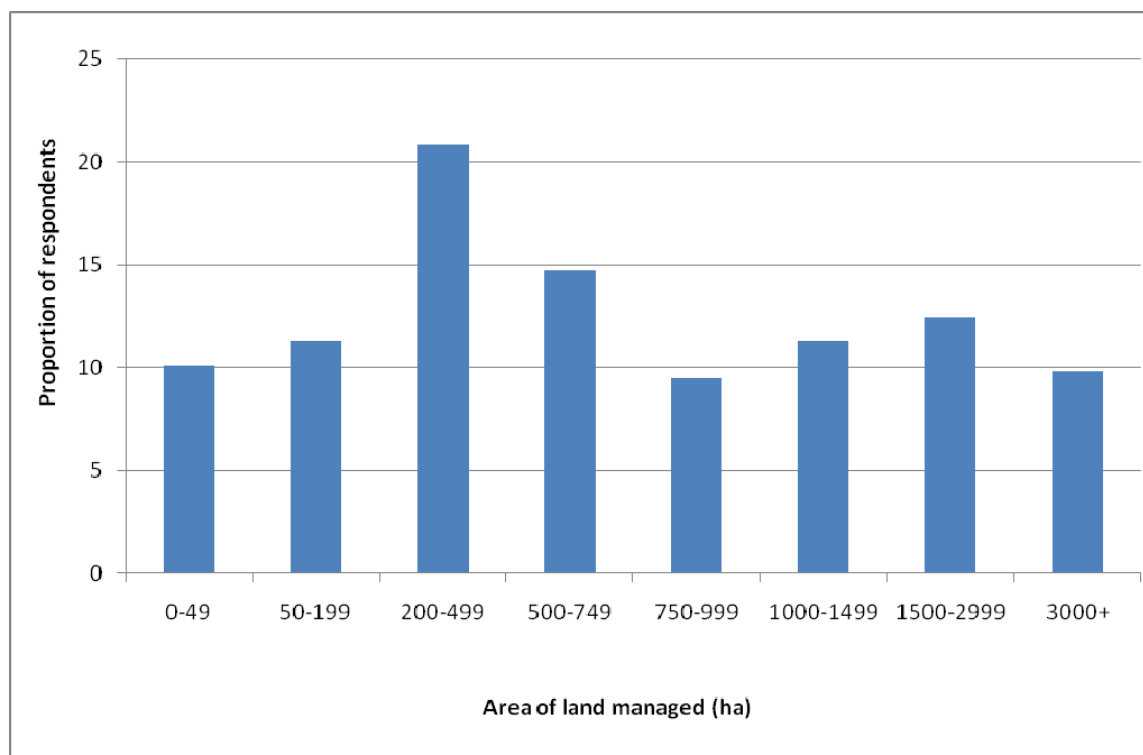


Figure 2: Area of land managed by survey respondents (n=343)

A one-way ANOVA was used to identify whether the area of land a person managed was related to willingness to adopt. No significant relationship was identified ($p=0.381$, $df=2$, $F=0.968$, $n=337$). Following this, landholders were grouped by area of land managed (<50 ha, 50–299 ha, 300–799 ha, 800–1199 ha, 1200–4999 ha, 5000+ ha). Similarly, no significant relationship between category of land area and willingness to adopt was found using a Kruskal-Wallis test ($p=0.530$, chi-square = 1.268, $df=2$, $n=337$).

Respondents were asked what proportion of their land was used for irrigated cropping or grazing, dryland cropping or grazing, native bush/vegetation, or other purposes:

- *Irrigated cropping or grazing:* Of the respondents, 60% had no irrigated land, 20% reported that between 1% and 40% of their land was irrigated, 10% reported that 40–95% of their land was irrigated, and 10% reported that more than 95% of their land was irrigated.
- *Dryland cropping or grazing:* Almost all respondents reported that some of their land was used for dryland cropping or grazing. Of respondents, 50% used 85% or more of their land for this purpose, 30% between 10–85%, and 20% reported that they used less than 10% of their land for dryland cropping.
- *Native bush/vegetation:* 30% of respondents had no native bush or vegetation on their land, and a further 20% reported that less than 5% of their land was covered in bush/vegetation. A further 30% had 5–19% coverage of their land with bush/vegetation, while 20% reported bush/vegetation coverage of 20% or more of their land.
- *Other:* Only 20% of respondents reported land used for other purposes, and the large majority of these reported less than 5% of land being used for other purposes.

If a landholder irrigated more than 10% of their land, they were considered an irrigator; otherwise they were considered to have a dryland agricultural system. These two groups were compared. There were no significant differences in their willingness to adopt when a Pearson chi-square test was used to explore this relationship ($p=0.150$, $df=4$, $\chi=6.753$, $n=343$). The proportion of a landholder’s property covered by native vegetation was not significantly related

to willingness to adopt. A one-way ANOVA was used to explore the relationships between the two ($p=0.413$, $df=2$, $F=0.887$, $n=308$).

Survey respondents were then asked to indicate whether they used their land for grazing sheep, grazing beef cattle, cropping, growing cotton, growing grapes, growing fruit or vegetables, or for other purposes. Respondents could tick multiple options if they undertook more than one activity. Of the respondents:

- 66% grazed sheep on their property. Of those who grazed sheep, the majority (79%) also grew cereal or oilseed crops, and 55% also grazed beef
- 57% grazed beef on their property. Of these, 63% also grazed sheep, and 53% also grew cereal or oilseed crops
- 63% undertook cereal or oilseed cropping. Of these, 48% also grazed beef cattle and 83% also grazed sheep
- 7% grew grapes for commercial sale: The majority of these also reported at least one other agricultural activity, with a mix of sheep grazing, beef grazing, cropping and fruit growing reported
- 7% grew fruit for commercial sale. Similarly to those growing grapes, most also reported undertaking another agricultural activity.
- 12% undertook other activities including vegetable growing, dairy farming, cotton farming or niche agricultural activities. Most of these also reported undertaking sheep or beef grazing, or cropping.

The type of agricultural enterprise a landholder ran was examined to identify any relationships with willingness to adopt. The following enterprise types were compared: sheep grazing ($n=27$), beef grazing ($n=67$), mixed sheep/beef grazing ($n=48$), cropping ($n=44$), mixed sheep grazing and cropping ($n=78$), mixed sheep/beef grazing and cropping ($n=38$) and horticulture ($n=25$). No significant relationships were identified ($p=0.882$, $df=14$, $\chi=8.137$, $n=319$). Following this, landholders were further subclassified into three groups: pure graziers, those who undertook some cropping (including cropping mixed with grazing), and horticulture. Similarly, no significant differences were identified between these groups ($p=0.990$, $df=6$, $\chi=0.871$, $n=319$).

Landholders were asked to provide an estimate of the proportion of their land that was marginal for agriculture, and the proportion that was highly productive. These assessments were based on the individual opinion of the landholder, with no criteria provided by which landholders could judge what was marginal versus productive land. This was deliberate, as in this study we were interested in how a landholder's perception of productivity influenced their views about the acceptability of planting trees for carbon sequestration.

Figure 3 shows the responses received regarding marginal land. Thirty-six per cent of respondents reported having no land that was marginal for agriculture, while a further 19% reported that 1–10% of their land was marginal. Almost 17% of respondents reported that 10–20% of their land was marginal. Only 13.4% reported that 50% or more of their land was marginal.

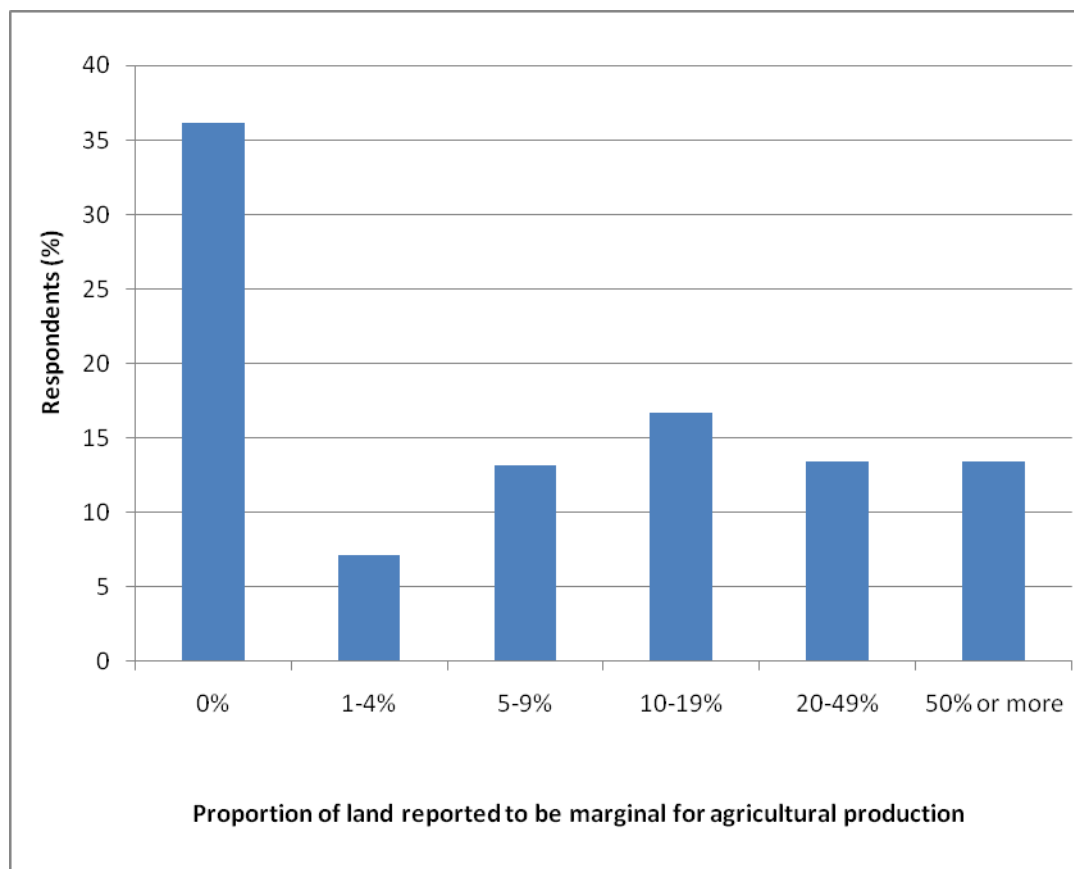


Figure 3: Proportion of land managed that was considered marginal for agriculture (n=335)

There was no significant relationship between willingness to adopt, and the proportion of their land a landholder perceived to be marginal versus productive for agricultural production ($p=0.447$, $df = 2$, $F = 0.807$, $n=326$).

Finally, landholders were asked if they had a conservation covenant over part of their land. Of respondents:

- 80.2% had no conservation covenant on any part of the land they managed
- 13.5% reported having a conservation covenant
- 6.3% were unsure whether they had a conservation covenant.

Landholders who reported having a conservation covenant over part of their land were no more or less likely to be willing to adopt tree planting for carbon sequestration than other landholders ($p=0.359$, $df=2$, $\chi=2.047$, $n=320$).

Tree planting history

Landholders were asked if they had undertaken any tree planting activities in the past, and were asked specifically about their history of planting trees for different purposes, including for shade and shelter for stock, rehabilitating degraded land, producing commercial timber, improving the look of their property, increasing birds and animals, reducing salinity, commercial carbon sequestration, or any other purpose (Figure 4).

The large majority of landholders (96.5%) had planted trees for one or more of the purposes listed above. The most common types of tree planting activities were planting trees to provide shade and shelter for stock, to improve the aesthetics of the property, and to increase birds and animals on the property, with more than half of respondents reporting undertaking one or more of these three activities. Somewhat fewer, but still a significant proportion, reported planting trees for the purpose of rehabilitating degraded land (42.5%) or reducing salinity on their property (20.8%).

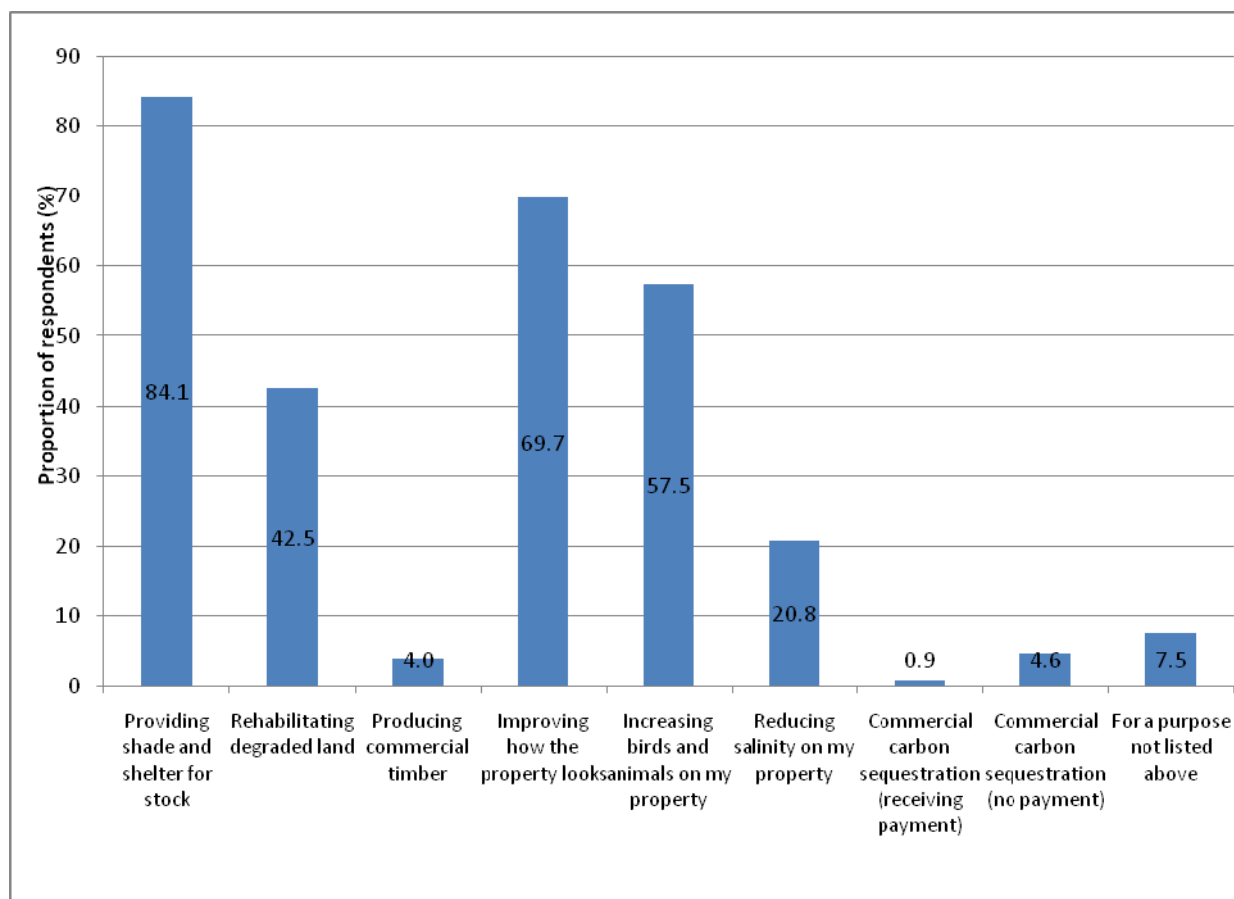


Figure 4: Proportion of respondents who had planted trees for different purposes (n=345)

Respondents were also asked to report whether none, some or most of the trees they had planted for each purpose had survived (Figure 5). The lowest rates of success were reported by those who had planted trees to produce commercial timber or for commercial carbon sequestration with or without payment, with more than half of respondents reporting that no trees grew successfully. However, it should be noted that very few respondents reported growing trees for these purposes, so these data are based on a very small number of responses (less than 15 in all three cases). More than 60% of respondents reported that some or most trees survived for all other types of plantings, with tree plantings intended to rehabilitate degraded land or reduce salinity somewhat less likely to be reported as surviving compared with trees planted for aesthetics, shade and shelter, and encouraging birds and animals.

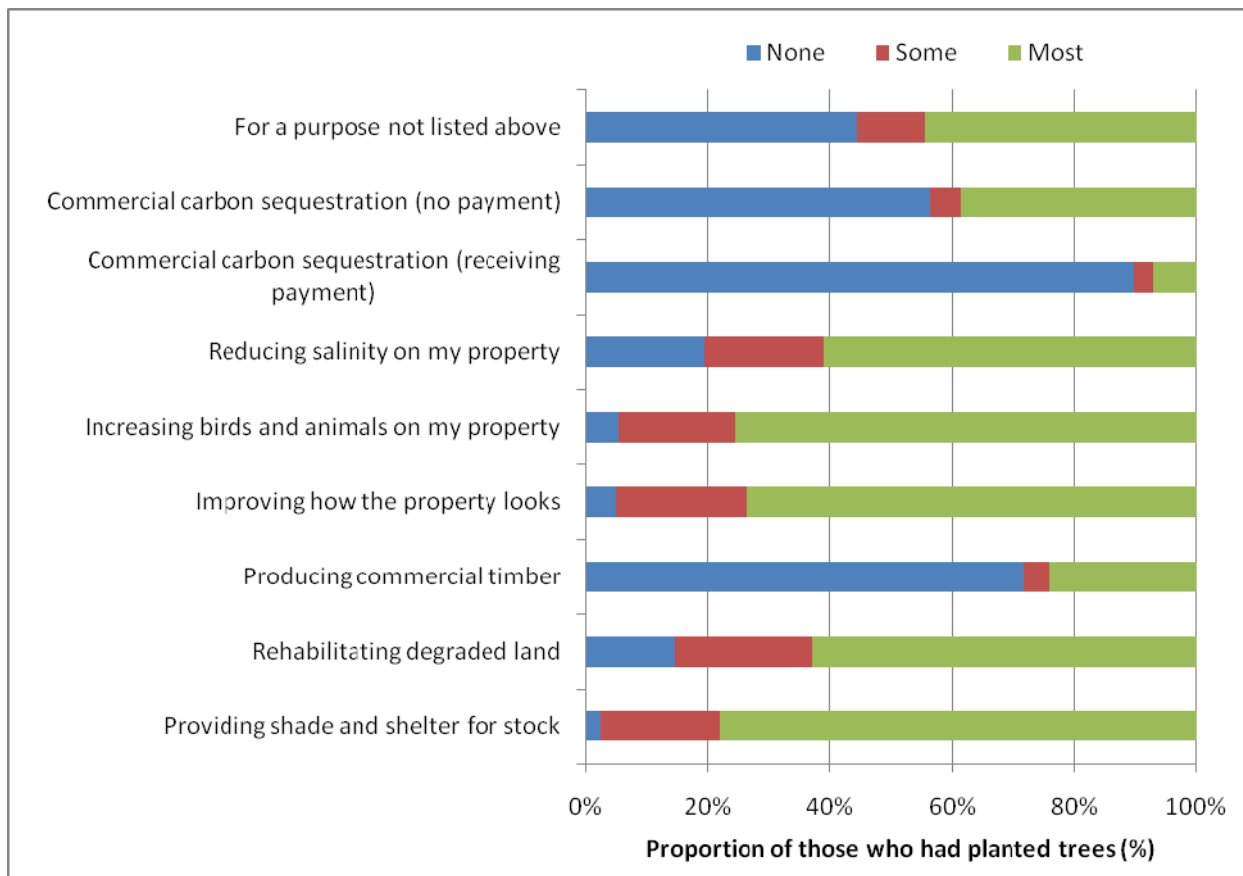


Figure 5: Proportion of trees that had grown successfully, reported by landholders who had planted trees for different purposes (n= 345)

Respondents were then asked to report the nature of the tree planting: did they plant trees in a large or small block, a long strip of trees, or as a few scattered trees on their property? This was asked to identify the typical extent of tree planting, and where landholders feel comfortable planting trees on their property. The results are shown in Figure 6. Trees planted for aesthetics, to increase birds and animals, and for shade and shelter were most likely to be planted as scattered trees or in long strips. Plantings for the purposes of reducing land degradation or salinity were planted in a variety of forms, spread somewhat more evenly across the four spatial arrangements. Commercial tree plantings for timber or carbon were more likely than other types of plantings to be planted in block formats.

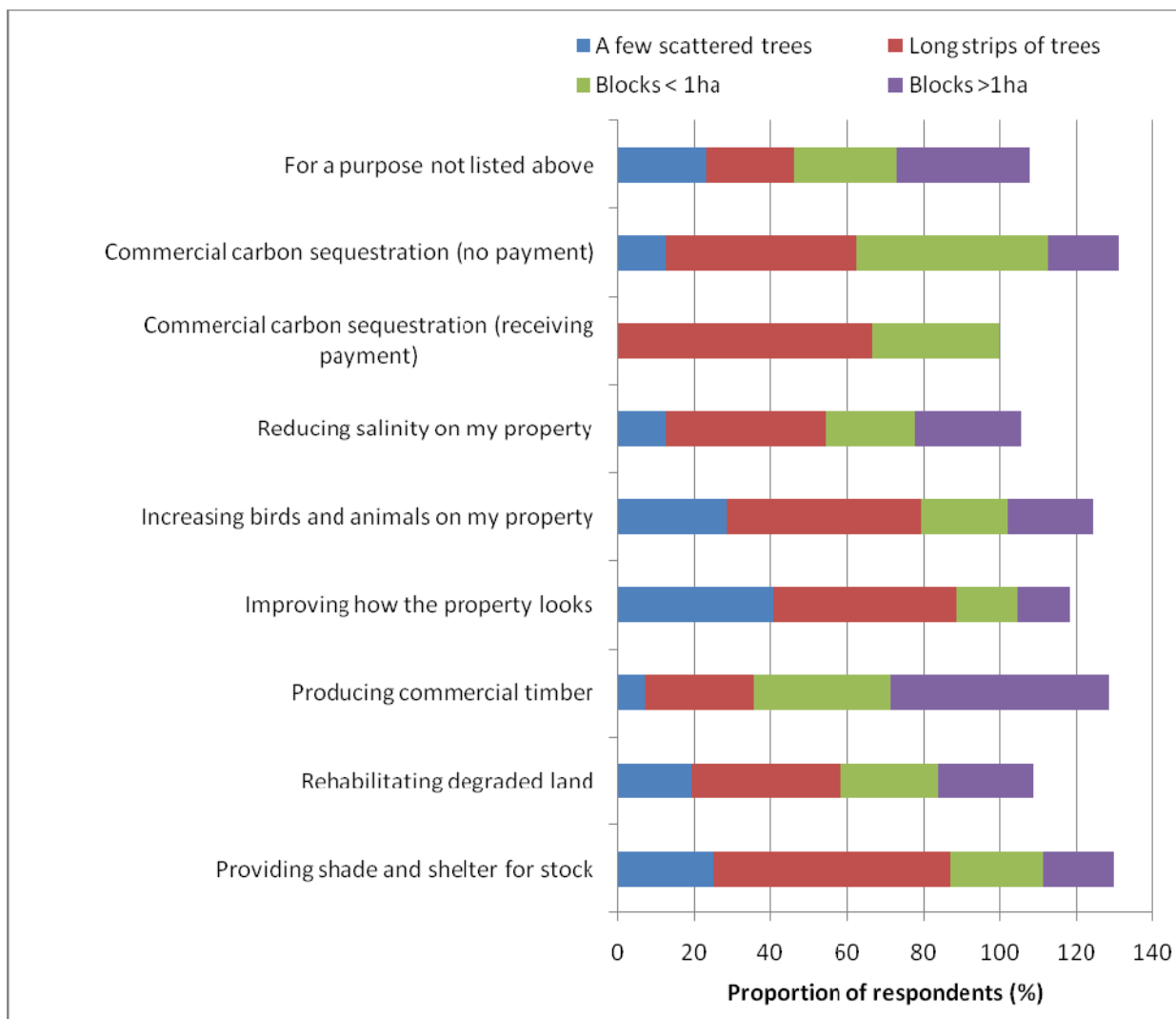


Figure 6: Nature and area of tree planting reported by those landholders who had planted trees (n varied from 5 to 270 for the different types of tree planting)¹

Landholders were asked if they had received government funding to help cover the costs of any of their tree plantings, or if they had received free materials such as seedlings. A total of 41.4% of respondents had received funding or free materials.

They were also asked if any of the trees planted on their property were planted and managed by someone other than themselves, such as a revegetation organisation or forestry business. In total, 6.9% of landholders reported that some of the trees planted on their property were planted and managed by someone other than themselves.

As the large majority of landholders had planted trees for some purpose, it was not possible to analyse whether tree planting history was related to willingness to adopt tree planting for carbon sequestration. With almost all respondents having planted trees for aesthetics, stock shelter or environmental purposes, no statistical relationships were explored. Landholders who had planted trees for the purposes of growing commercial timber, such as a pine plantation, were too few (4.0%) for meaningful analysis of relationships.

¹ Note: Some landholders established trees in more than one spatial arrangement, and so the total adds up to more than 100%.

Views about land management and planting trees in general

A number of questions regarded preferences for growing trees in general, and how respondents preferred tree planting to be managed on their property, were included in the survey (Figure 7). The questions were designed to understand likely landholder receptiveness to different models for tree plantings, and respondents' willingness and interest in future tree planting activities more broadly. Each question was replicated, with two different phrasings of the same concept, to enable analysis of consistency of response. The responses reveal that:

- the majority of respondents preferred to manage tree planting themselves rather than have someone undertake tree planting for them, with fewer than 10% reporting an interest in having someone else plant and manage trees for them
- the large majority believed that trees could be grown on their land, are easy to manage once established, and indicated that they would like to plant more trees on their property
- two questions were asked regarding whether landholders felt management of trees was onerous. A somewhat higher proportion (>30%) agreed with the first statement 'trees require a lot of ongoing management', while only 10% disagreed with the second statement that 'trees are easy to manage once established'. This response is not contradictory, although it may appear so; responses to the first statement would have included consideration of the effort involved in successful establishment of trees, while the second statement only asked about management requirements once trees were well established, when they typically require substantially less management effort compared to the establishment phase.

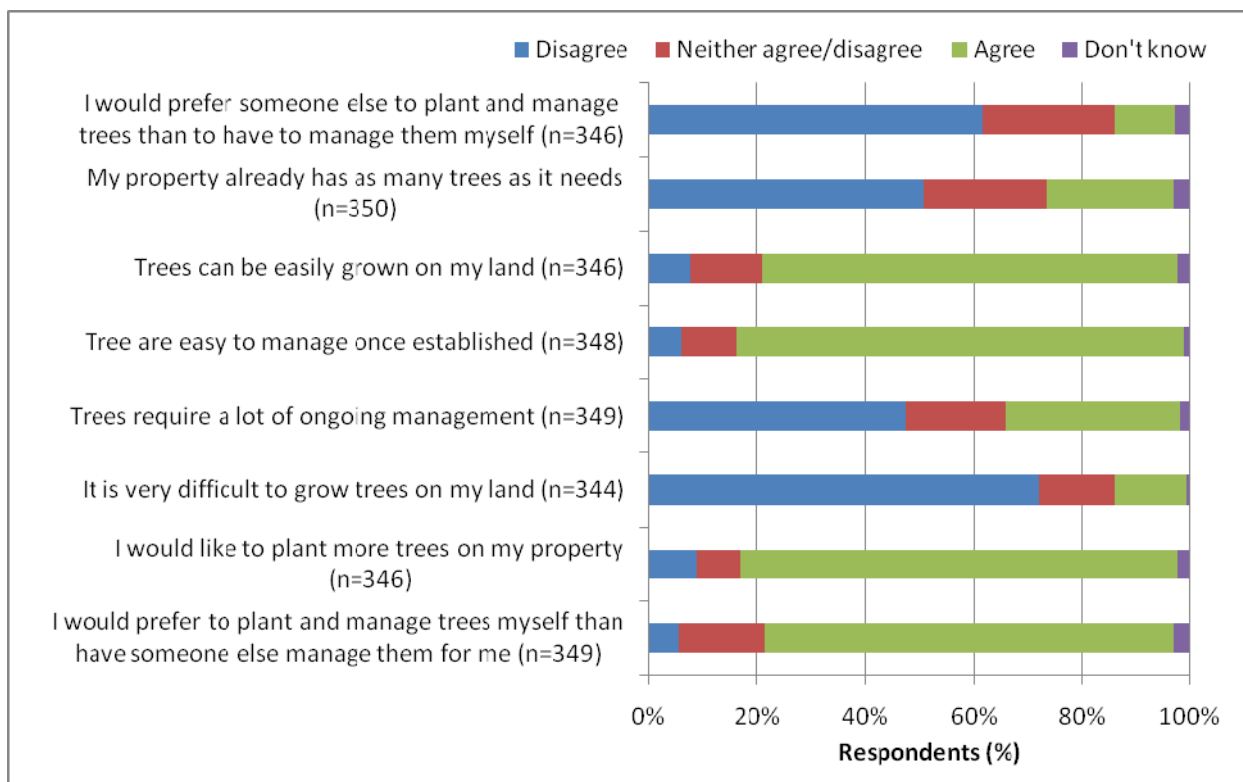


Figure 7: Respondents' views about trees and land management

Respondents were also asked their views regarding the impact of trees on the environment and aesthetics (Figure 8). The large majority (more than 80%) believed that trees offered environmental and aesthetic benefits on and off the property. Almost 80% of landholders preferred to plant native tree species than species not native to their local areas.

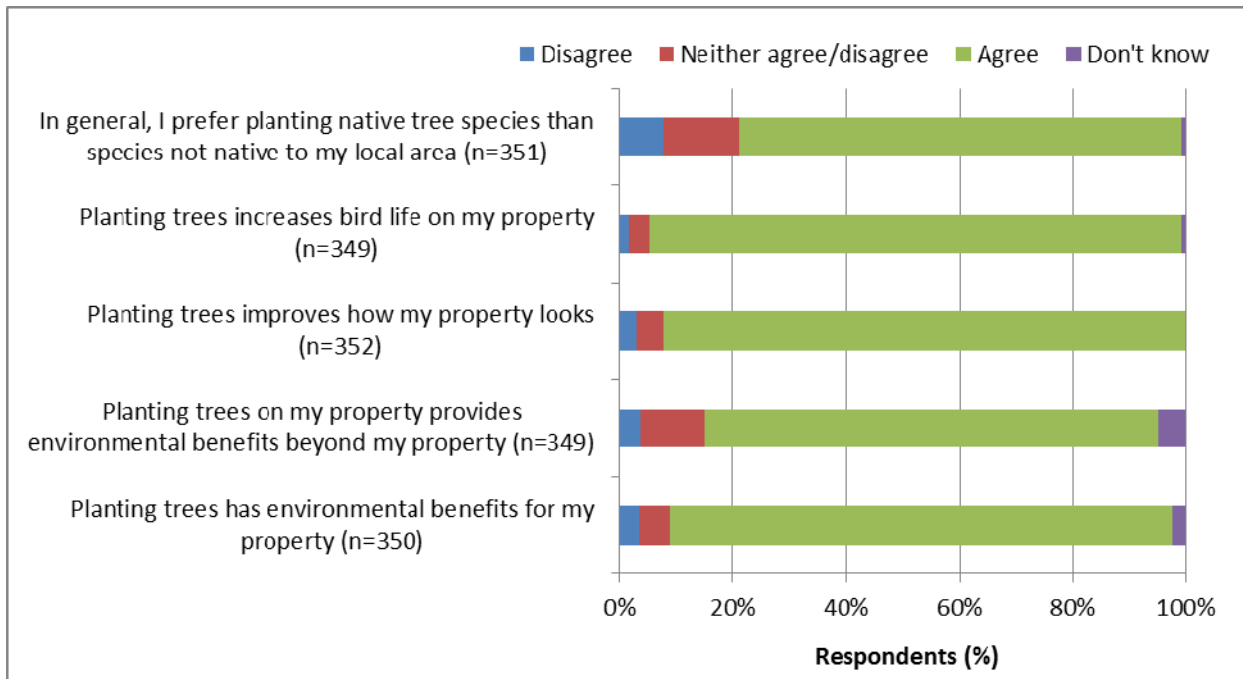


Figure 8: Landholder views about impacts of trees on environment and aesthetics

Views about the impacts of tree planting on the farm enterprise were considerably more varied (Figure 9). While the majority of respondents (almost 90%) believed planting trees had benefits for their stock, respondents were relatively evenly divided regarding whether tree planting increased fire risk. Just over 20% believed planting trees would reduce water availability on their property although over half did not believe this. Almost 40% believed tree planting would increase pest animals on the property. Responses regarding impacts of tree planting on weeds indicate that trees are not seen as having a beneficial effect through weed reduction by most, with less than 15% believing tree planting reduces weeds, while just over 20% believed tree planting would increase weeds on their property.

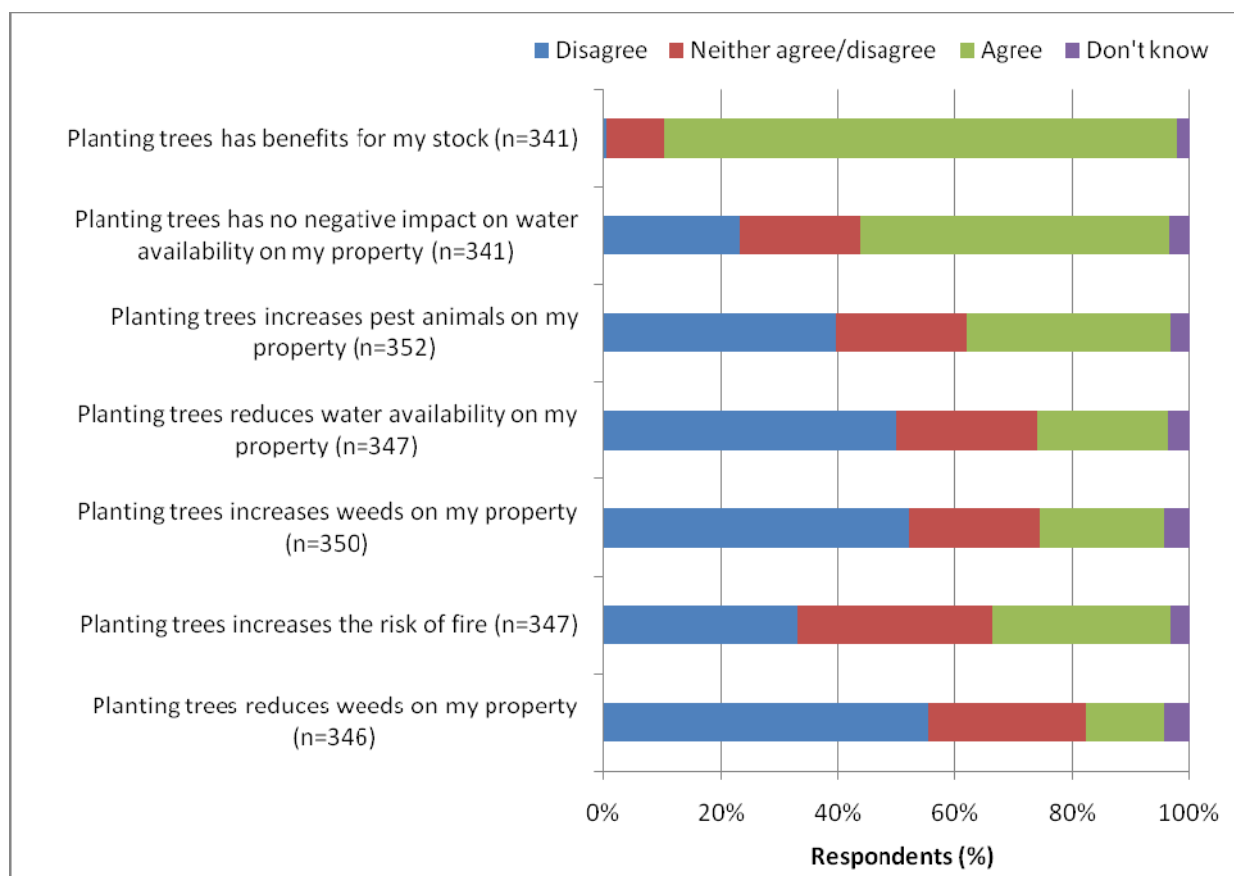


Figure9: Landholder views about impacts of trees on the farm enterprise

Respondents were asked specific questions regarding their views about tree planting, as well as a set of broader questions relating to their values and beliefs about climate change, their land management obligations, and the acceptability of growing trees on good agricultural land (Figure 10).

Respondents were relatively evenly split regarding whether they believed human use of fossil fuels is changing the climate, with a little over 20% disagreeing, agreeing, and neither agreeing nor disagreeing with this statement. More, however, remain unconvinced by the scientific evidence of climate change, with almost 60% believing the science is doubtful.

There was more consensus regarding farm management obligations, with the majority believing that farmers should manage their land to provide benefits for the wider community, but also that they should be paid to do this, and that farmers have to prioritise making an economic return over improving environmental outcomes. These responses are consistent with the differing pressures reported by a small number of participants in the focus groups, who reported a strong ethic towards managing their land for conservation, but struggling to fulfil it given their day-to-day economic needs and constraints.

Most agreed that tree planting is more acceptable when undertaken on marginal land than on good agricultural land. Despite this strong belief, respondents were evenly divided regarding whether it was acceptable to grow trees on good farm land, suggesting the translation of the underlying value into beliefs about acceptability differed depending on the respondent. Finally, a high proportion were concerned about whether they might be prevented from using land in future if they planted trees on it.

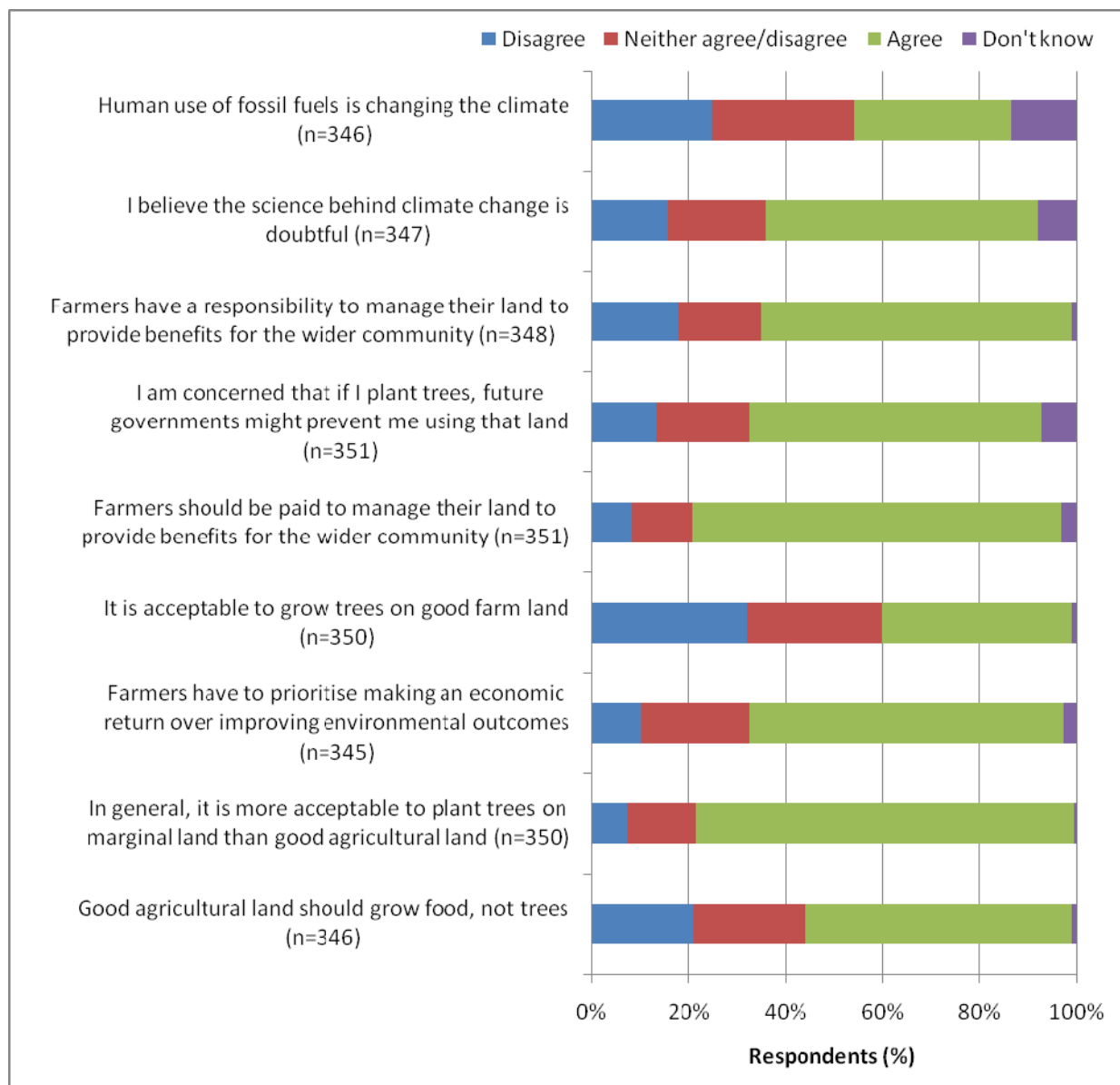


Figure 10: Landholder values regarding agricultural land, trees and climate change

The relationship between willingness to adopt and a landholder's views about land management, climate change and planting trees in general was explored using Kruskal-Wallis tests. Results of the analysis are provided in Appendix 2. Landholders were significantly more likely to be willing to adopt if they:

- did not agree that 'good agricultural land should grow food, not trees' and felt it was acceptable to grow trees on good farm land
- felt strongly that they would either like to plant and manage trees themselves, or have others do this for them, but were not 'neutral' regarding this issue
- felt trees had environmental benefits for their property and beyond it
- believed the science behind climate change was not doubtful and that human use of fossil fuel is changing the climate
- wanted to plant more trees on their property and did not feel their property already had enough trees

- believed planting trees improves how the property looks
- were not concerned ‘that if I plant trees, future governments might prevent me using that land’
- did not believe that ‘farmers should be paid to manage their land to provide benefits for the wider community’.

Views about markets and financial returns from tree planting for carbon sequestration

Landholder perceptions about the certainty and presence of markets and financial returns from carbon sequestration are likely to affect their willingness to plant trees to sequester carbon. A series of questions were asked eliciting landholder views regarding the certainty and nature of financial returns and markets for carbon sequestration (Figure 11).

Perhaps most striking in the results is the high proportion of landholders indicating a lack of knowledge about financial markets and returns. More than 30% of landholders indicated a lack of knowledge about current markets and financial arrangements, with almost 50% not knowing whether there are currently opportunities to sell carbon stored in trees, not having information about potential future prices, or uncertain whether the government was likely to support long-term markets for carbon sequestered in trees. The only questions on which a majority of landholders agreed were those regarding:

- uncertainty of current markets and returns, with a majority agreeing both were uncertain, and that this reduced their willingness to consider tree planting for carbon sequestration
- returns from tree planting for carbon sequestration, with a large proportion—almost 45%—believing returns would never be high enough to be ‘worth taking up’ or to ‘justify planting trees on land instead of using it for agriculture’.

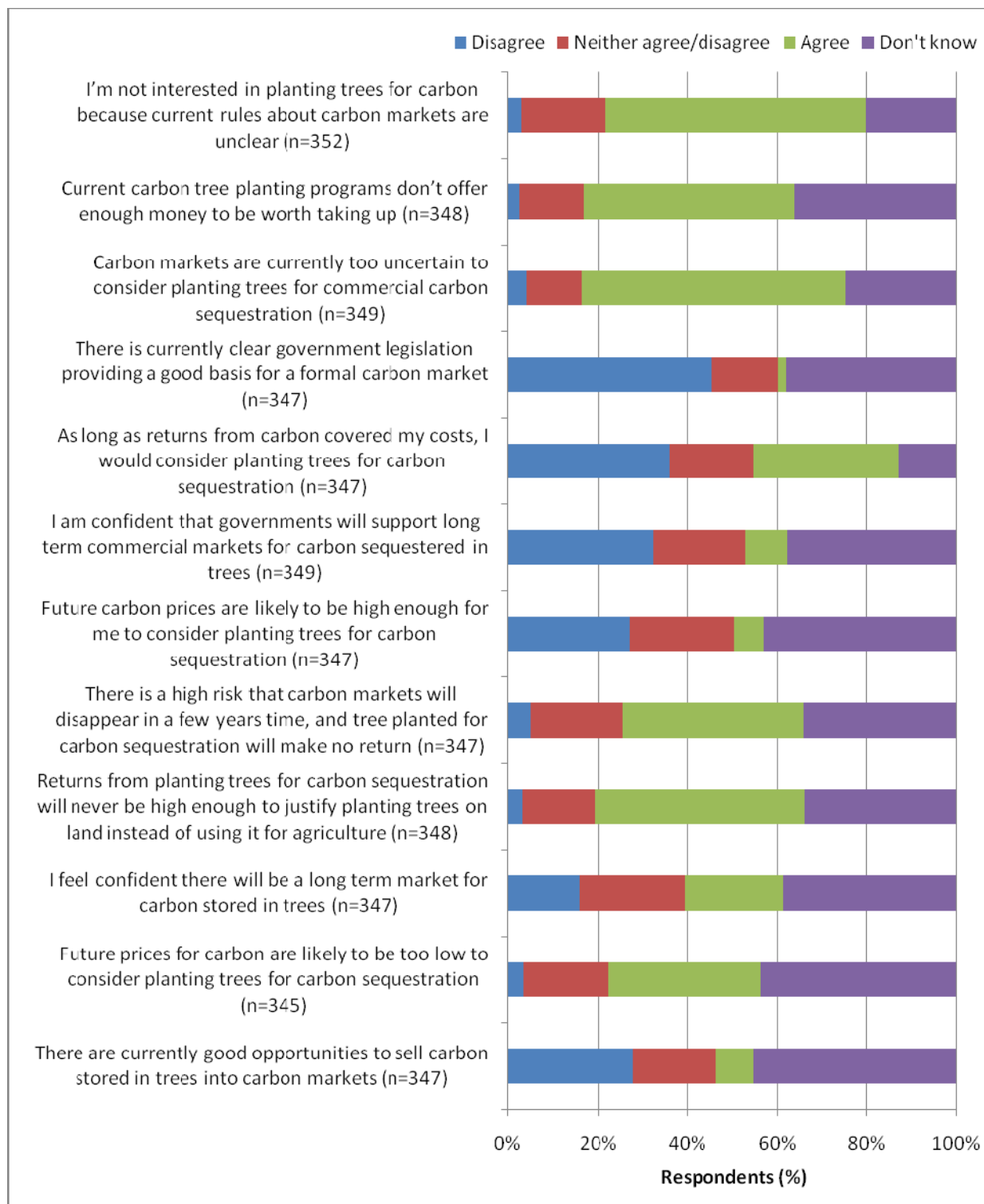


Figure 11: Landholder views about markets and financial returns from planting trees for carbon sequestration—including 'don't know' responses

Figure 12 provides results with ‘don’t know’ responses removed. This shows more clearly the large proportion of landholders who, despite feeling somewhat knowledgeable about financial returns and markets, hold concerns about the riskiness and uncertainty of these returns and markets, and who believe returns are likely to be too low to make adoption worthwhile.

These results indicate a lack of confidence in markets and financial returns, and considerable scepticism regarding whether returns from this activity would be high enough to consider adoption. Uncertainty is not just linked to the current lack of legislation, with responses indicating that many believe any future legislation to establish a market is likely to be at high risk of changing, reducing the certainty of investment and hence incentive to adopt.

Landholders were significantly more likely to be willing to adopt tree planting for carbon sequestration if they:

- felt confident there would be a long-term market for carbon, and that markets would not disappear in a few years
- felt carbon prices and overall returns would be high enough to justify planting trees on land instead of using it for agriculture
- were willing to plant trees as long as returns from carbon covered their costs
- believed there was clear legislation providing a basis for a market.

(See Appendix 2 for full analysis.)



Figure 12: Landholder views about markets and financial returns from planting trees for carbon sequestration—excluding ‘don’t know’ responses

Beliefs about planting trees for carbon sequestration

A series of questions were asked regarding how planting trees for carbon sequestration fitted with landholder beliefs and values, their land management priorities and preferences, and their perceptions of its benefits and risks. Results are shown in Figure 13.

In terms of beliefs and values, respondents were fairly divided regarding the statement ‘farmers shouldn’t be asked to plant trees to fix climate problems caused by other people’, with slightly more agreeing than disagreeing. Similarly divided views were apparent regarding views on whether planting trees on a single property can make a difference, and about the importance of planting trees to contribute to reducing climate change. Very few (only 6.6%) believed that their neighbours would disapprove if they planted trees for carbon sequestration, although only 22.0% agreed that carbon tree plantings were viewed positively by people in their community, with almost as many (19.7%) disagreeing, and the remainder less certain about community views. Landholders were likely to indicate a lack of knowledge when asked their preferences for sequestering carbon in pasture or soils versus trees, but a high proportion believed tree planting is an effective way of removing carbon from the atmosphere.

When asked their perceptions of the impacts of this activity on their farm enterprise, many were unsure about the likely returns from carbon sequestration and whether they would be beneficial, and there was a wide diversity of views about whether planting trees would reduce flexibility and increase complexity of land management, and whether planting trees for carbon sequestration would increase or decrease the value of the property. While relatively few landholders indicated that past failures in tree planting or concerns about tree growth rates reduced their confidence in the viability of carbon tree plantings, a large proportion—50%—indicated they felt more local trials were needed to improve their confidence in the viability of this activity.

Perhaps the greatest barrier identified was the long timeframes involved, which 45.3% indicated reduced their interest in growing trees for carbon sequestration. Respondents typically preferred the idea of planting native tree species to using other species. The risk of trees being killed by drought or fire was a concern for just over 20% of respondents.

Finally, co-benefits appear highly important. While many landholders are uncertain whether financial returns from carbon sequestration are enough on their own to encourage tree planting, 69.5% believed that being paid for carbon sequestration would increase their likelihood of planting trees for purposes such as reducing land degradation, or providing stock shade and shelter.

When beliefs about planting trees for carbon sequestration were analysed to identify whether non-adopters, possible adopters, and likely adopters differed in their beliefs, significant differences were found for all of the beliefs examined except one: the three groups were not significantly different in their beliefs regarding the type of tree species to be planted (Appendix 2). Where significant differences were identified, they were the relationships expected: those who were more interested in adopting had more positive beliefs about planting trees for carbon sequestration compared to non-adopters in all cases (for example, they were more likely to believe planting trees for carbon sequestration would increase the value of their property, and were less likely to believe their neighbours would disapprove if they planted trees for this purpose).

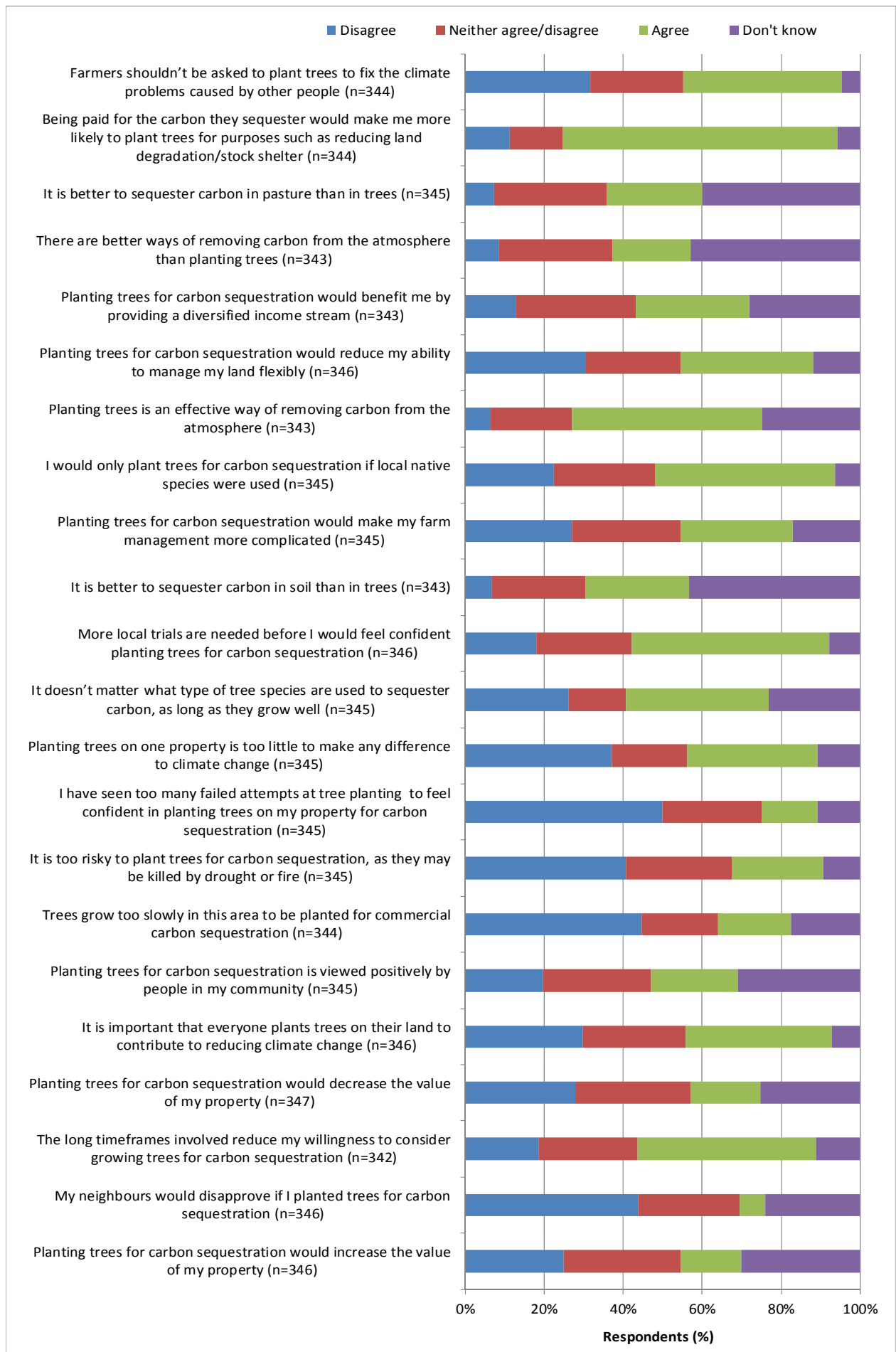


Figure 13: Landholder beliefs about planting trees for carbon sequestration

Barriers to planting trees for carbon sequestration

A series of questions were asked regarding perceived barriers to planting trees for carbon sequestration. These included barriers related to risk and uncertainty; land management and community; information and knowledge; markets, regulation and policy; and location and areas of trees.

Risk and uncertainty in relation to pest animals, tree death, poor growth and water use were not seen as a large barrier by a large proportion of respondents (Figure 14). Nevertheless, 30–45% of respondents did still rate these issues as moderate to large barriers, indicating that they are important to a significant proportion of landholders.

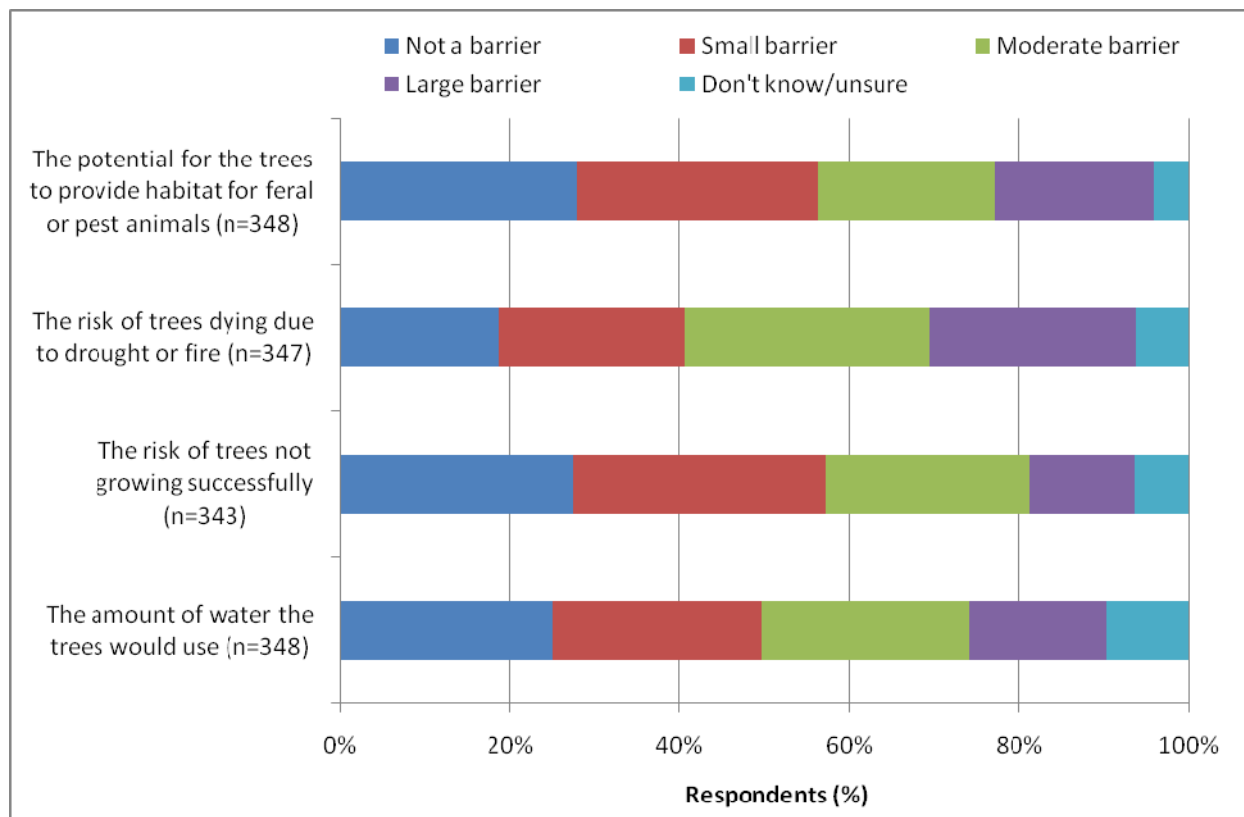


Figure 14: Barriers related to risk and uncertainty

The largest barriers in terms of land management and community issues (Figure 15) were having restrictions placed on how land can be used for 100 or more years, with 60.1% of respondents rating this a large barrier, and a further 16.1% a moderate barrier. The time required to plant and manage trees, and concerns about flexibility of land management, were also of concern to a majority of landholders. The opinions of other landholders were not considered a barrier to adoption.

Information and knowledge barriers (Figure 16) were quite specific: most landholders felt relatively confident in their level of knowledge about planting and managing trees, but lack of knowledge about planting for the specific purpose of carbon sequestration was considered a moderate or large barrier to adoption by 45% of respondents. Lack of information about available programs for adoption was a moderate or large barrier for 69.3% of respondents.

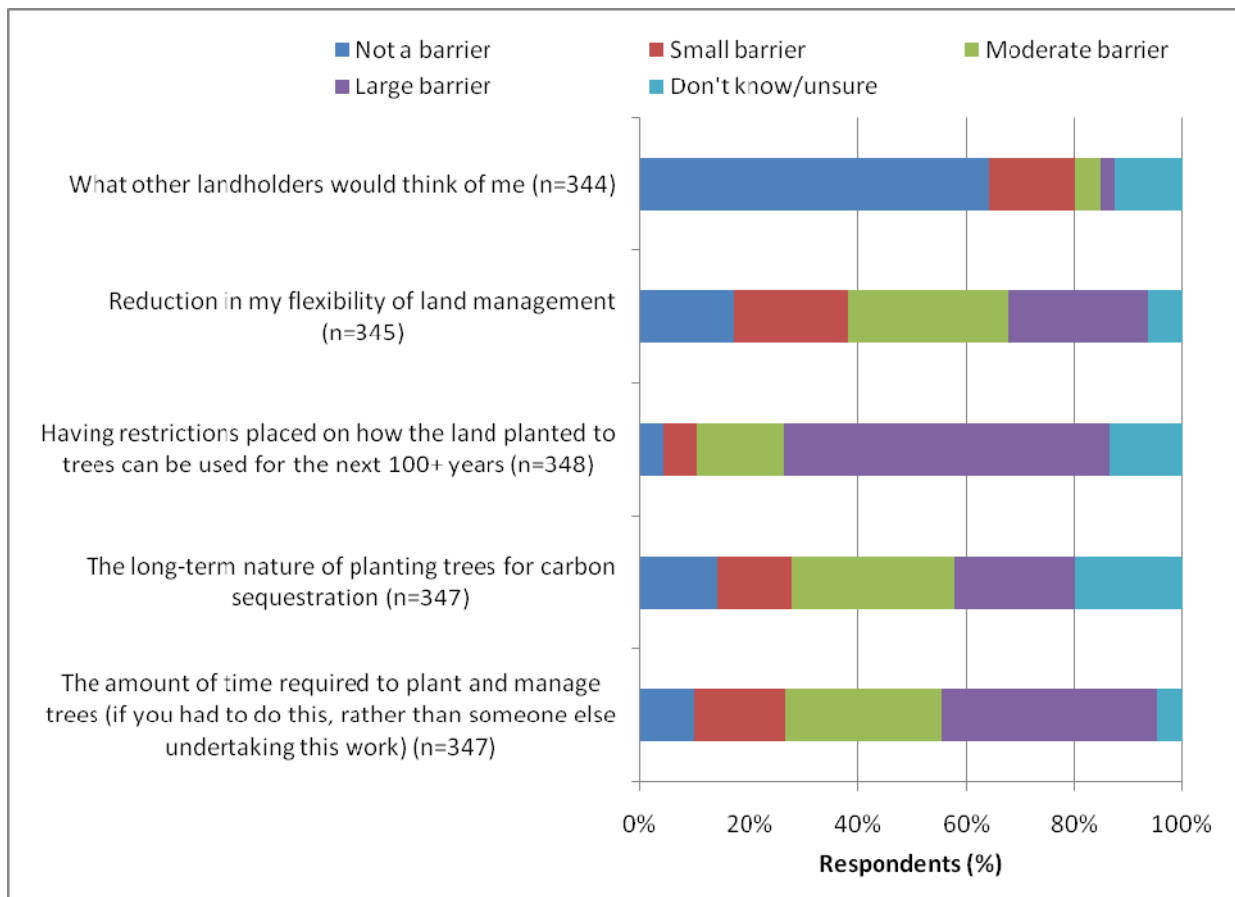


Figure 15: Barriers related to land management and community

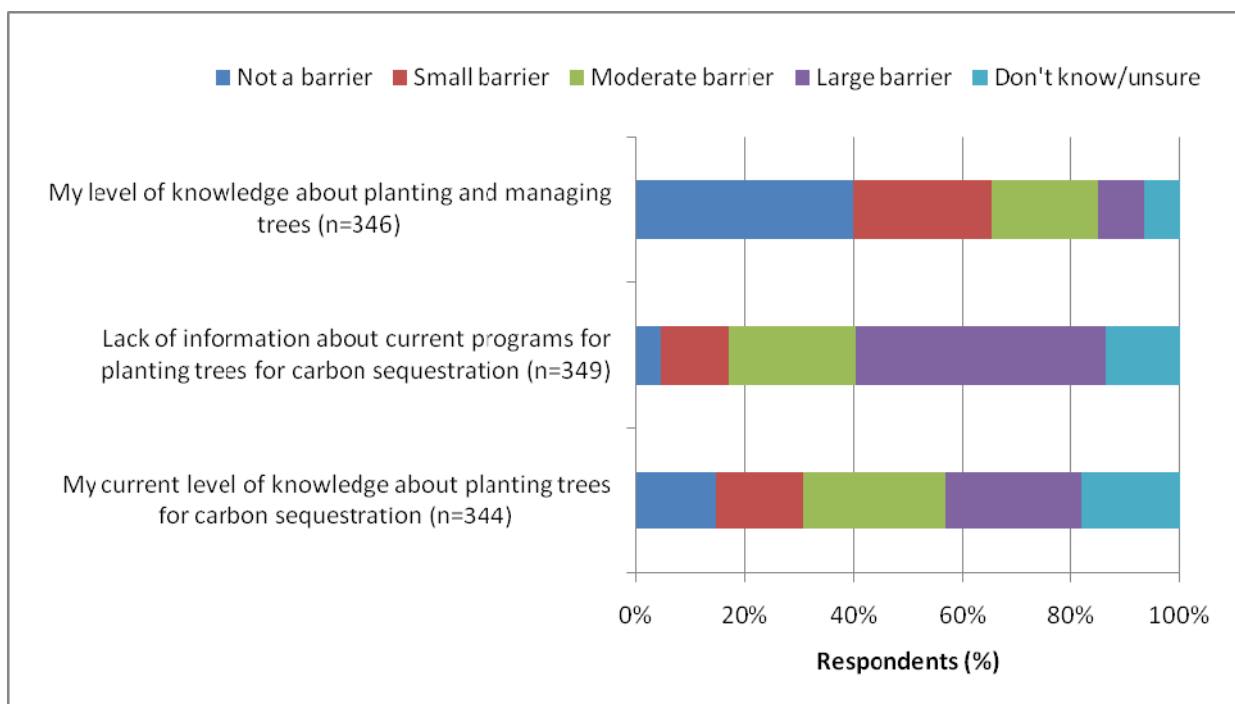


Figure 16: Barriers related to information and knowledge

Market, regulatory and policy issues were most consistently ranked as barriers to adoption: the large majority of landholders rated the costs of planting and management, carbon prices, uncertainty of markets, and risk of governments changing policy settings, as large or moderate barriers to adoption (Figure 17).

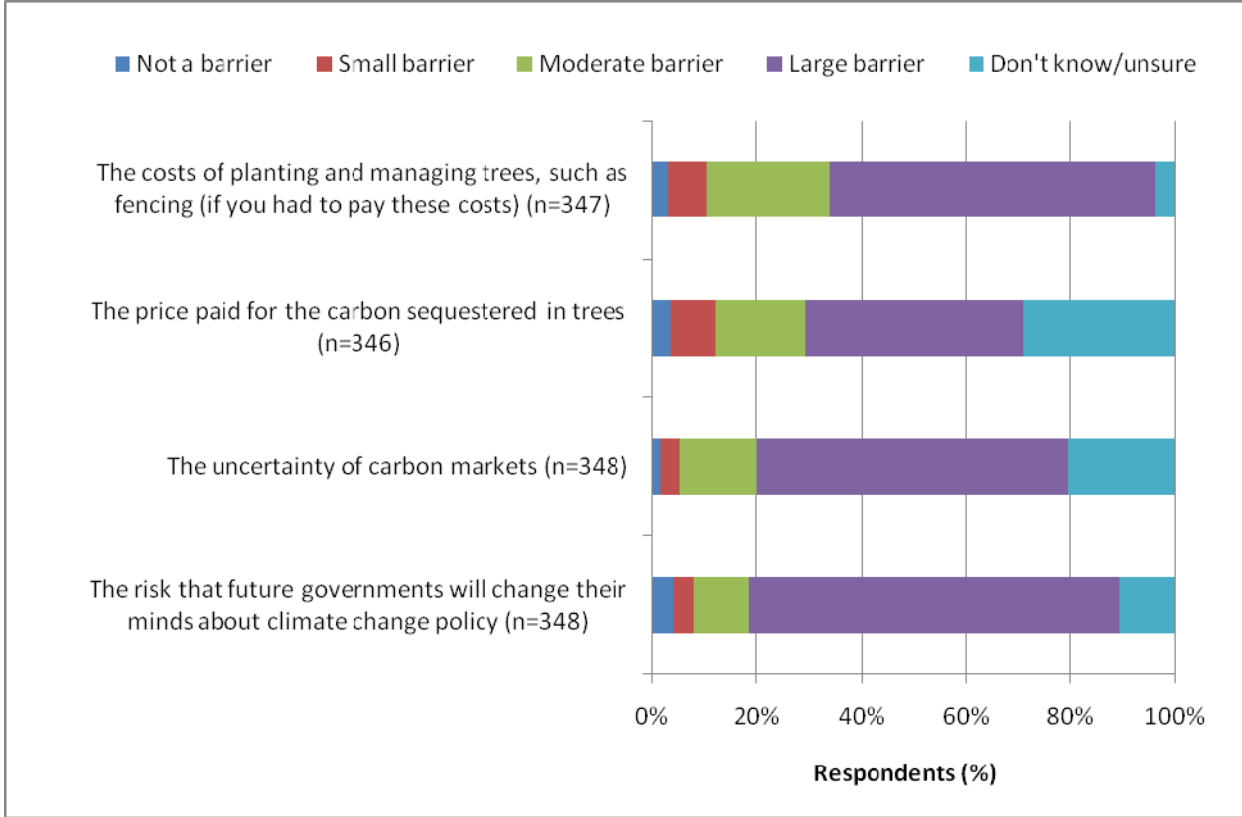


Figure 17: Market, regulatory and policy barriers

When asked about whether particular approaches to tree planting for carbon sequestration would act as barriers to adoption (Figure 18), a majority of respondents indicated that schemes requiring trees to be planted on more-productive land, and with larger minimum areas, would be more of a barrier to adoption than those with a smaller minimum area, or where trees could be planted on marginal land. For some landholders, availability and suitability of land was also a concern, although this varied considerably amongst respondents, most likely due to the considerable variation in the area and type of land managed by different respondents.

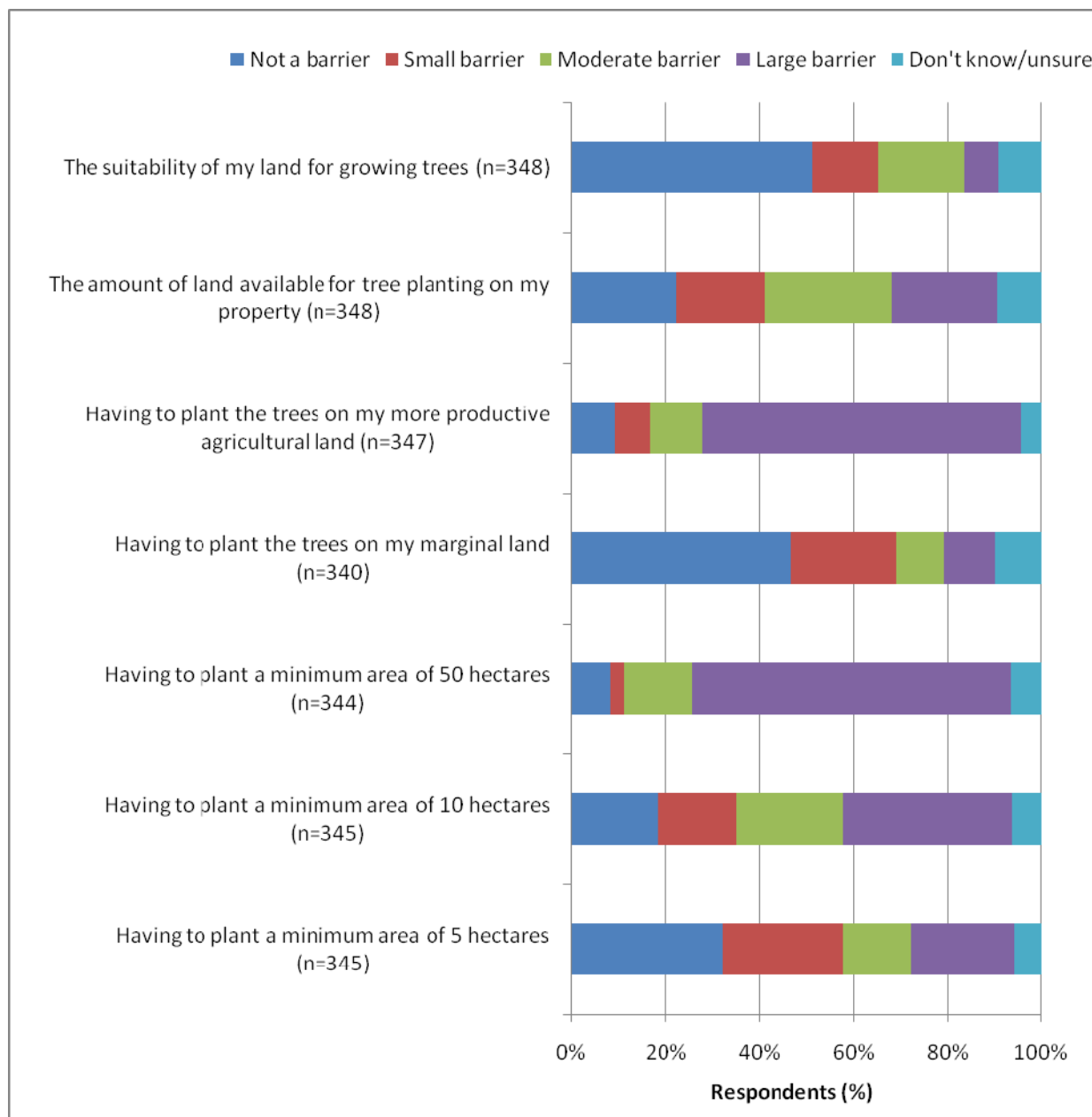


Figure 18: Barriers relating to location and area of trees planted

When differences between non-adopters, possible adopters and likely adopters were explored, the three groups did not vary significantly in their views about issues relating to the suitability of land, or their ability to grow trees successfully, with most in all three groups confident they could grow trees if they chose to, and not viewing risks such as drought or fire as a major impediment. All three groups were similarly likely to view costs of planting and managing trees, and the time required to do so, as a moderate or large barrier (Appendix 2).

Where the three groups varied in their perceptions of barriers was in regard to:

- the amount of land available for tree planting: non-adopters were more likely to view this as a barrier than the other two groups
- current knowledge about planting trees for carbon sequestration: non-adopters and possible adopters were more likely to view this as a barrier compared to likely adopters
- having restrictions placed on land use for a long period and related loss of flexibility of land management: non-adopters were more likely to view this as a barrier

- uncertainty of markets and risk that governments will change the rules: non-adopters were more likely to view this as a barrier
- having to plant minimum areas of 5, 10, or 50 hectares, or having to plant on marginal land: in each case, non-adopters were more likely to view this as a barrier.

Incentives for planting trees for carbon sequestration

As well as asking about barriers to adoption, incentives for adoption were examined. These questions were often, but not always, mirror questions of those about barriers, except where specific actions had been proposed regarding incentivising actions that could overcome barriers.

The provision of insurance, or the availability of an outside organisation to plant and manage trees while paying for use of the land, were an incentive for some but not a majority of landholders (Figure 19). In contrast, provision of more direct funding to landholders to undertake tree planting work themselves was rated a moderate or large incentive by 71.9% of landholders.

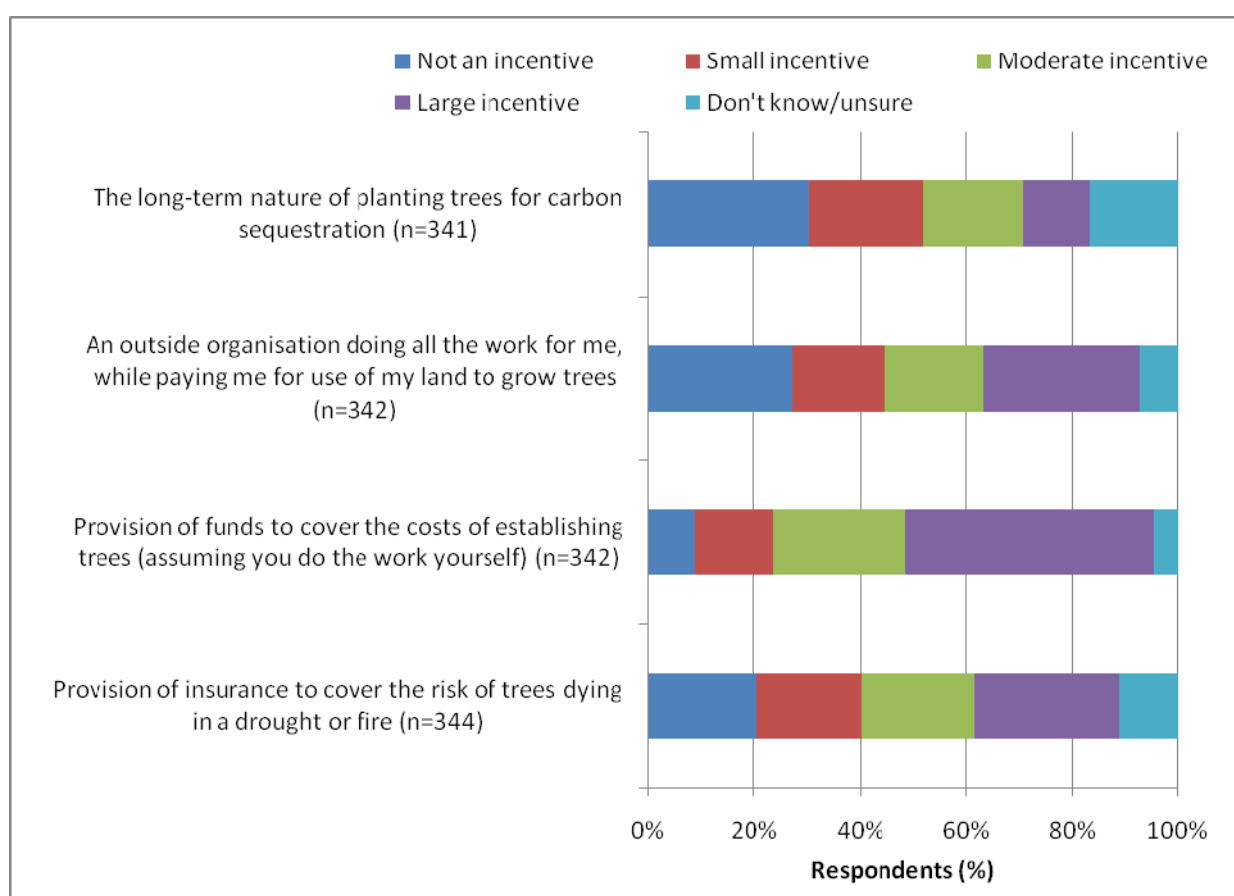


Figure 19: Incentives overcoming risk and uncertainty issues

The greatest incentives for planting trees for carbon sequestration, in terms of land management, community and the environment, were to ensure trees provided co-benefits such as providing shelter for stock, addressing land degradation problems, or providing wildlife habitat (Figure 20). The views of other landholders were not considered an incentive for adoption by the large majority, despite not being viewed as a major barrier.

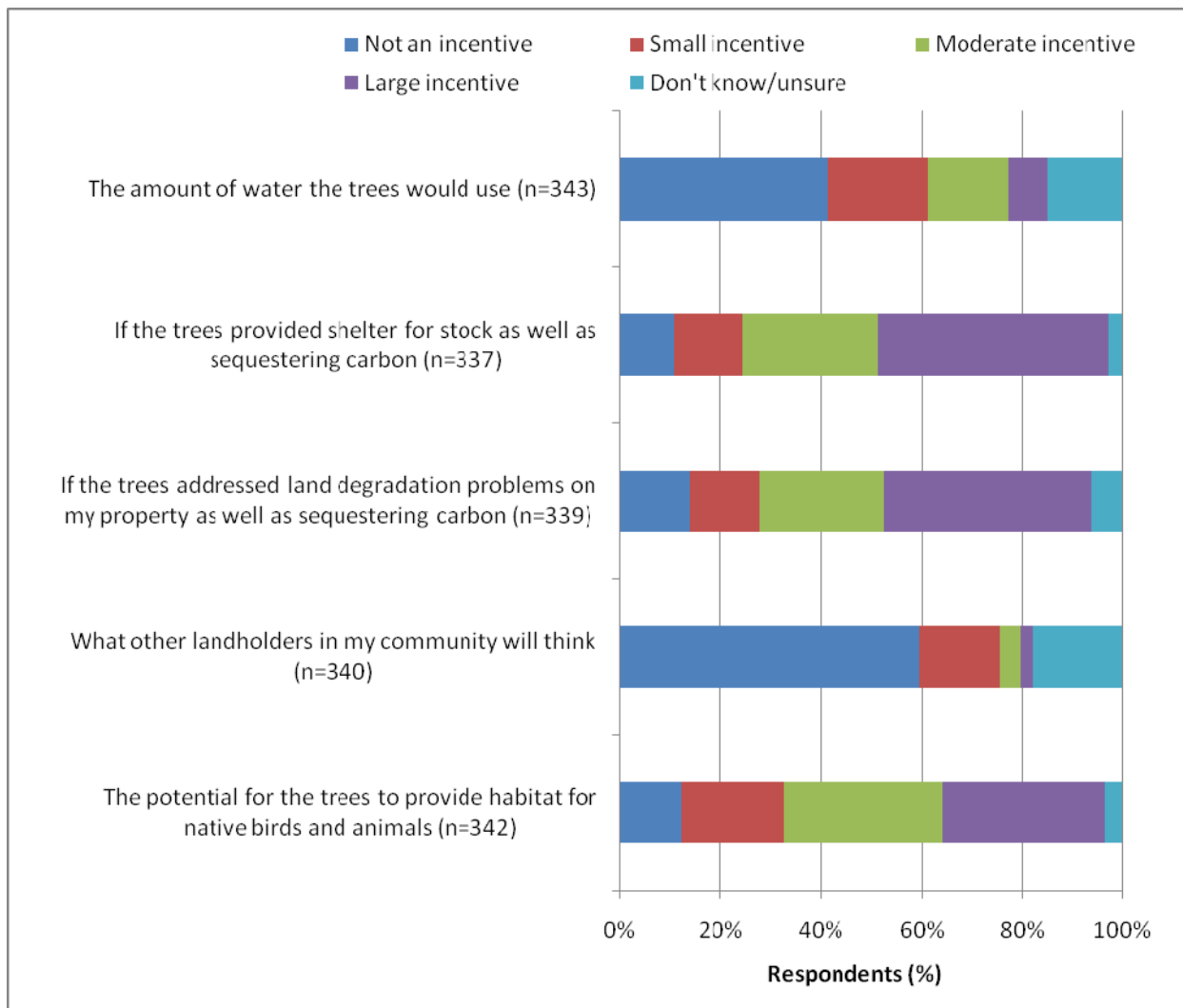


Figure 20: Incentives related to land management, community and the environment

Access to free training on growing trees for carbon was rated as a moderate or large incentive for adoption by 56.1% of respondents, while other forms of information provision were considered an incentive by around half of respondents (Figure 21).

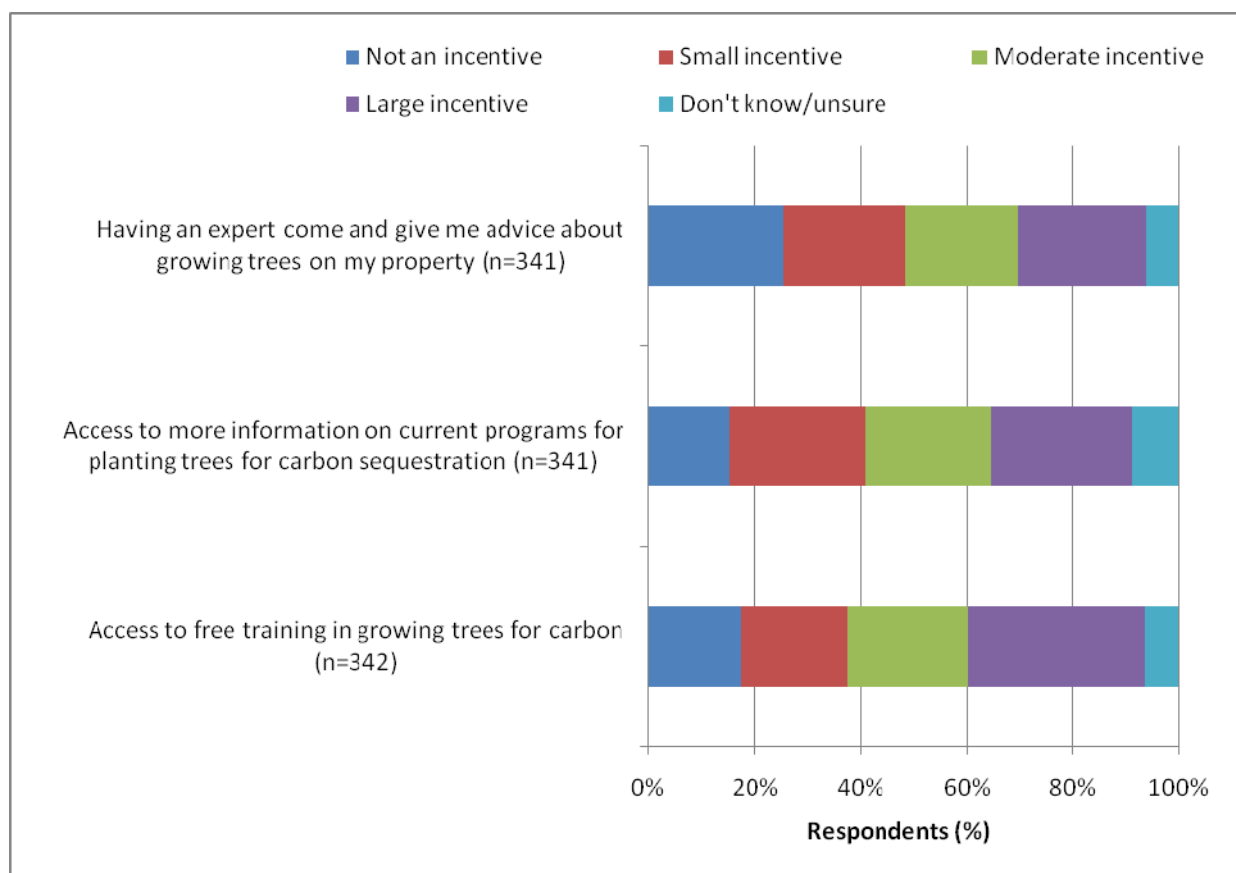


Figure 21: Incentives related to information and knowledge

Addressing market, regulatory and policy barriers through provision of clear, stable carbon markets that support guaranteed payments for carbon was considered a moderate or large incentive for adoption by between 60% and 80% of landholders (Figure 22). In particular, being provided a guaranteed and indexed annual payment was considered an incentive for adoption by 80.8% of respondents.

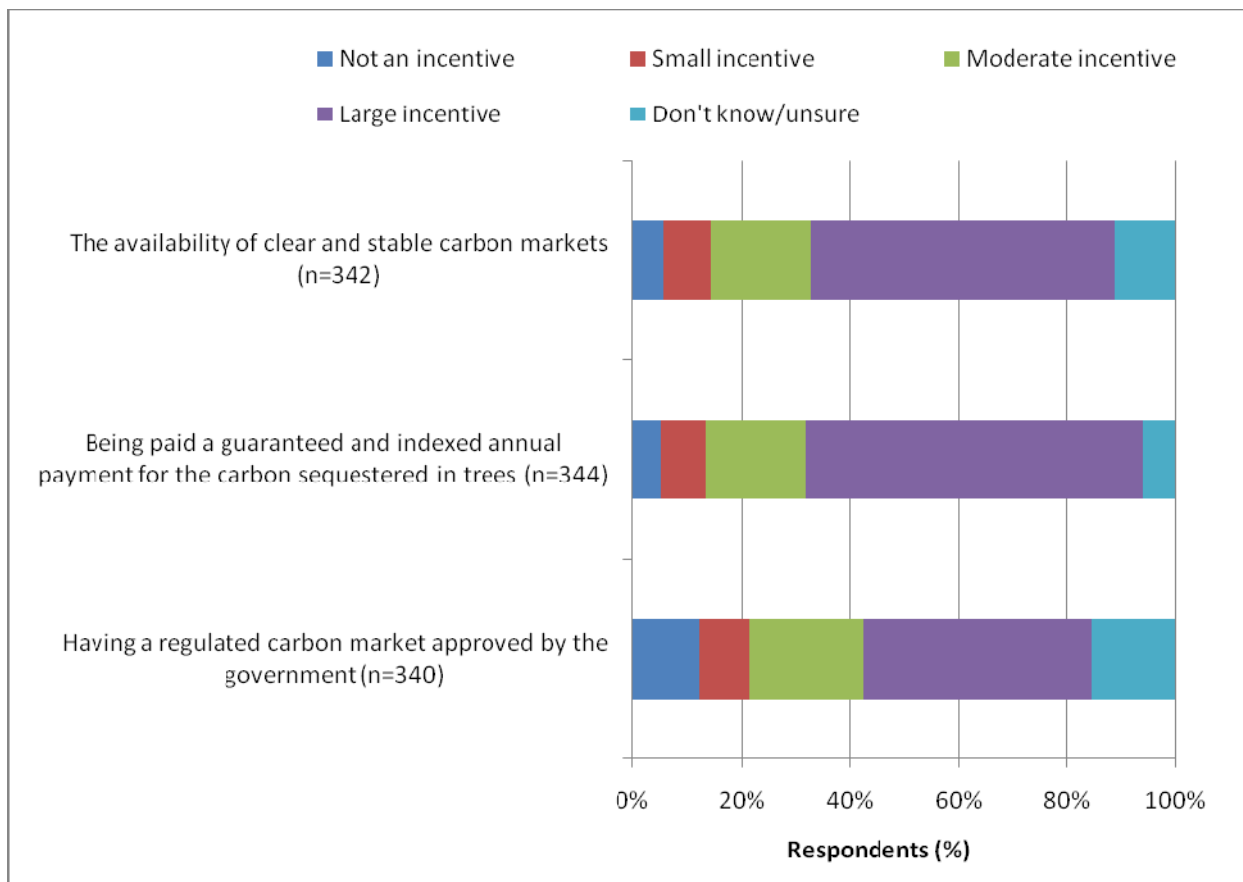


Figure 22: Market, regulatory and policy incentives

Unsurprisingly, given results regarding barriers, reducing the minimum area of land required to be planted and ensuring that trees can be planted on marginal land and that farmers have flexibility to choose the location and area planted all acted as incentives for adoption for many landholders (Figure 23).

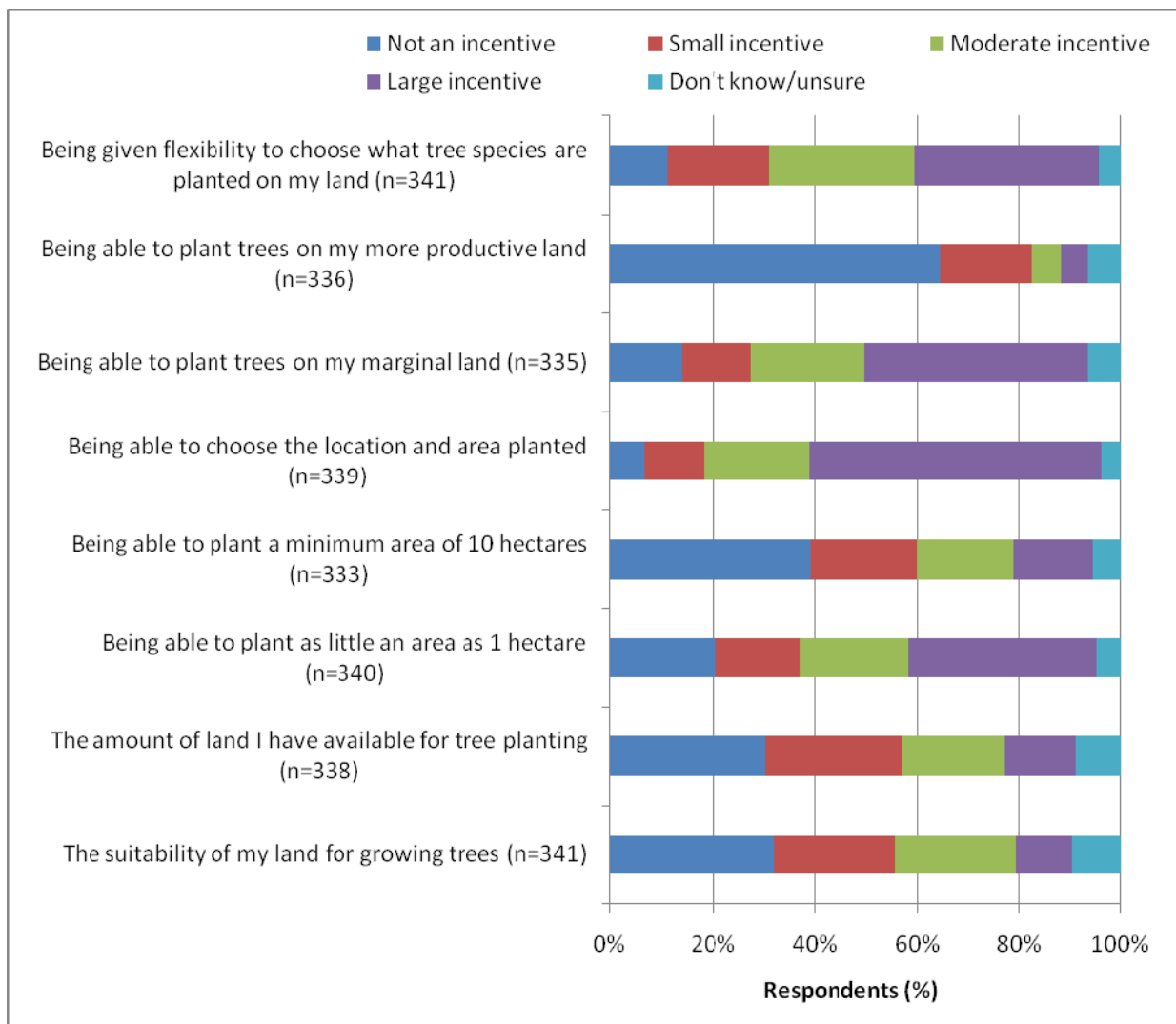


Figure 23: Incentives relating to location and area of trees planted

In almost all cases, non-adopters were significantly less likely to consider each issue an incentive, and likely adopters were more likely to (Appendix 2). The only exception was ‘what other landholders will think of me’, where the groups were not significantly different. This suggests that for many, their existing view about acceptability influenced their willingness to consider different incentives.

Willingness to plant trees for carbon sequestration under different scenarios

To further explore how different approaches to designing carbon tree planting programs influence likely landholder adoption, we asked respondents to identify whether particular scenarios would make them less likely, neither more nor less likely, or more likely to consider planting trees.

The design variations included in the questions were (i) different minimum time requirements for growing trees, (ii) the farmers planting and managing trees versus an outside organisation doing this, (iii) having co-benefits from trees such as commercial timber production, or stock shade and shelter; (iv) the proportion of the property to be planted, (v) the type of land planted, and (vi) the species planted (Figure 24).

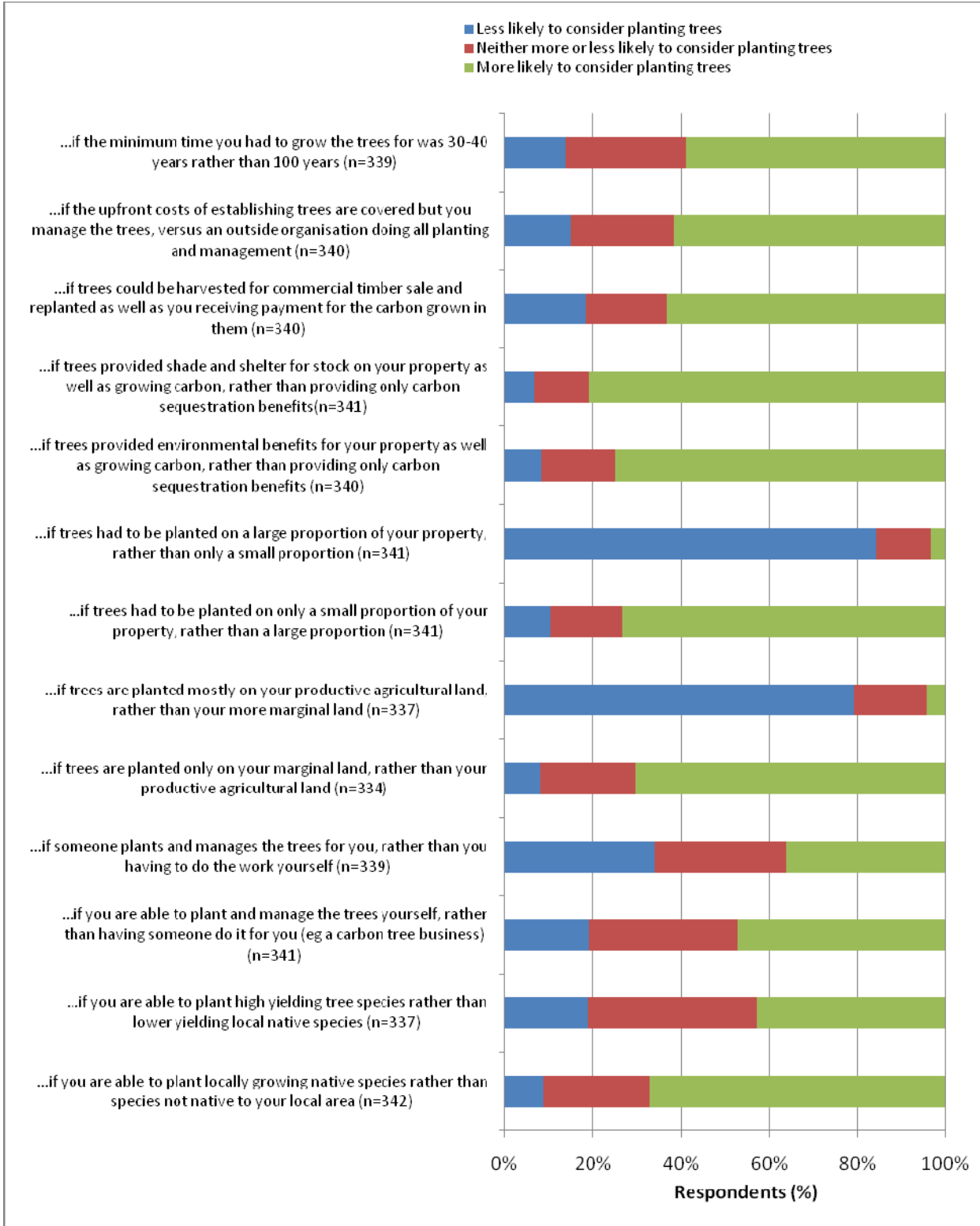


Figure 24: Landholders' likelihood of planting trees for carbon sequestration under different scenarios

In general, adoption was considered more likely when the carbon planting scheme involved growing the trees for a shorter time, when the farmer managed the trees rather than an outside organisation, when the trees provided co-benefits of any type (commercial or environmental), when only a small proportion of the property was planted and this was on marginal land, and when species native to the local area were used. However, a significant proportion of landholders (36.3%) did indicate that having an outside organisation plant and manage trees on their behalf would make them more likely to plant trees compared to having to do the work themselves. This indicates a significant market for third-party organisations to undertake and manage carbon tree plantings on landholder properties despite the majority of landholders preferring to manage trees independently.

Landholders who were willing to consider adopting tree planting for carbon sequestration were significantly more likely than non-adopters to tick the option that they were ‘much more likely to consider planting trees’ for all statements, including those that were contradictory—for example, they were both more likely to be willing to plant trees if the trees were planted only on their marginal land rather than their productive land; and if trees were planted mostly on their productive land rather than their marginal land (see Appendix 2 for full results). This suggests two things: non-adopters tended to state they were much less likely to consider planting trees in response to almost all statements, while possible and likely adopters were more diverse in their views about what would make them more likely to plant.

Minimum return required to plant trees for carbon sequestration under different scenarios

To provide a more nuanced perspective on the effect of introducing different design characteristics, respondents were asked to specify the financial return that would need to be offered to make different approaches to tree planting for carbon sequestration of interest to them (Figure 25). The scenarios examined involved the planting of marginal versus more-productive land; planting a small versus large proportion of their land; and the trees being planted and managed by the landholder versus an outside organisation. Respondents were asked to indicate if they would need to be offered 10% less than their average return, a payment equivalent to their average return, 10% or 20% more, or whether they would be unwilling to adopt tree plantings under a particular scenario for any level of payment.

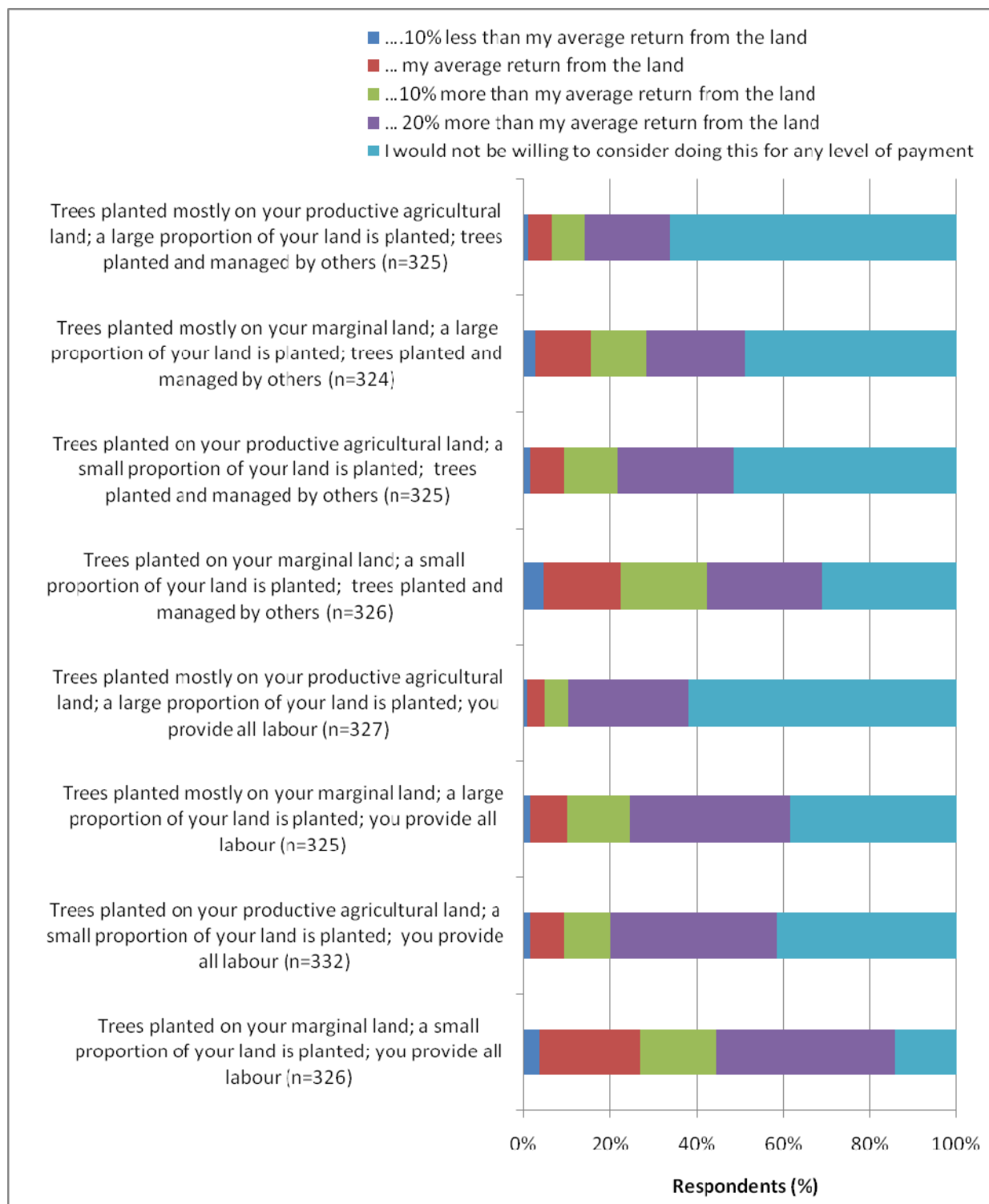


Figure 25: Minimum return landholders would need to be offered to plant trees for carbon sequestration under different scenarios

The least attractive option to landholders was planting a large proportion of their productive agricultural land: more than 60% of respondents indicated they would be unwilling to consider doing this for any level of payment, reflecting a strong ethic that productive land should be used for food production. Conversely, a smaller payment was typically required for trees planted on a small proportion of marginal land, and fewer landholders were unwilling to consider this option, although fewer were willing to consider it if an outside organisation managed the trees.

Non-adopters, possible adopters and likely adopters differed significantly in their response to questions regarding the financial return they would require to adopt tree planting for carbon sequestration under the various scenarios provided. In all cases, non-adopters were more likely to indicate they would be unwilling to plant trees for any level of financial return, while those who would consider adopting or were already considering it were more likely to indicate that they would be willing to plant trees for carbon sequestration for a lower rate of return (see Appendix 2 for analysis).

Sources of information on tree planting for carbon sequestration

A series of questions were asked regarding preferred sources of information on tree planting for carbon sequestration. In general, landholders rated their current awareness and knowledge about different aspects of tree planting for carbon sequestration as poor, with more than 60% rating their knowledge of markets, scientific evidence, government rules and regulations, current carbon tree planting programs, and where they can access these types of information, as poor (Figure 26). Less than 10% rated their knowledge as good.

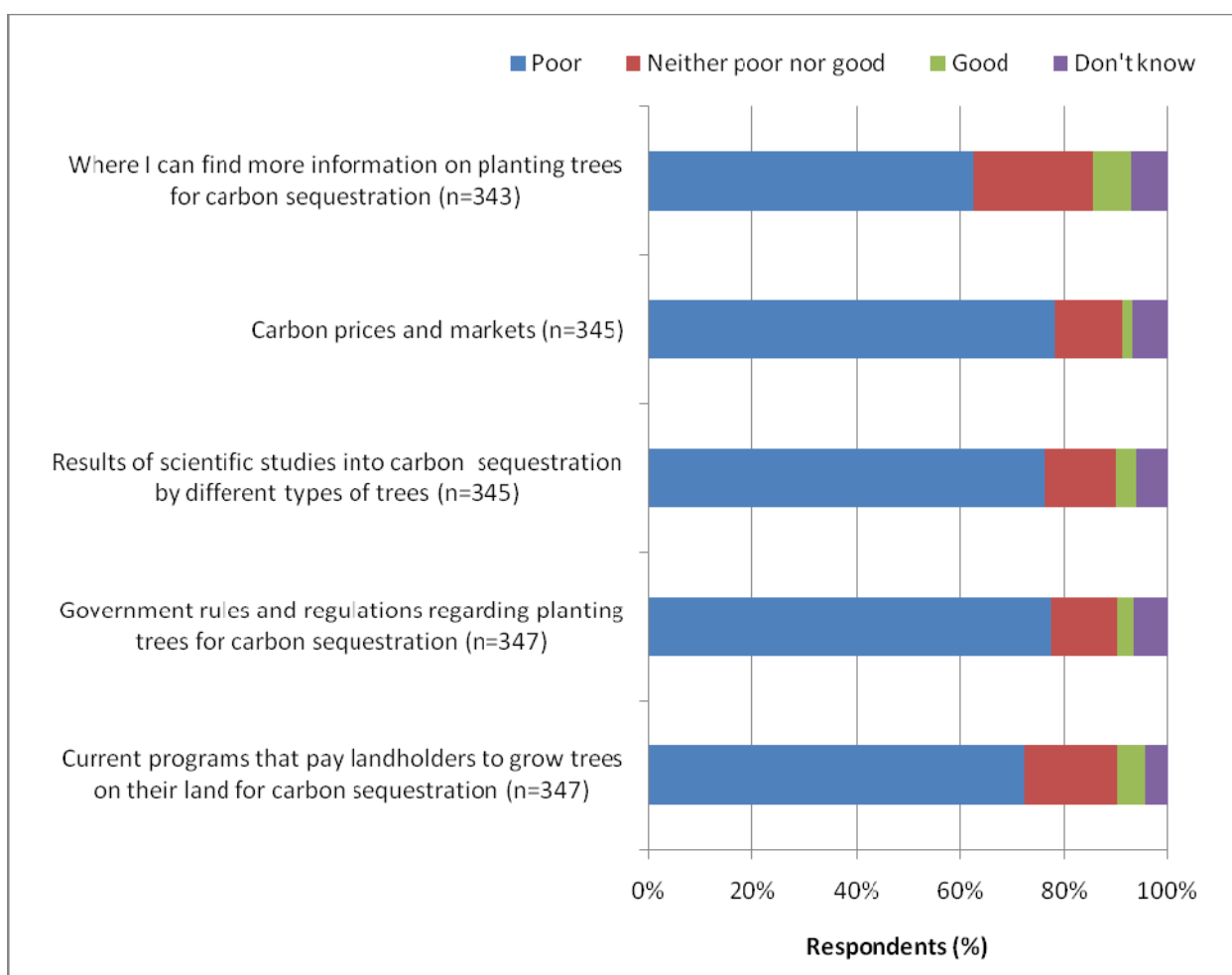


Figure 26: Landholders' current level of awareness and knowledge about tree planting for carbon sequestration

Landholders who were willing to consider adopting were significantly more likely than non-adopters to rate their knowledge as very poor or poor for all types of knowledge asked about, while those not willing to consider adopting were significantly more likely to consider their knowledge as good or very good (Appendix 2).

The information sources viewed as most useful by respondents were one-on-one discussions with an expert and field days, with 78.7% and 73.9% of respondents respectively rating these as moderately or highly useful (Figure 27). These were followed by detailed brochures and books, presentations/seminars, training courses, and short brochures or information sheets, considered moderately or highly useful by between 66% and 72% of respondents. Websites and media articles were considered less useful, although around half of respondents indicated they were moderately or highly useful. Scientific papers and reports were rated least useful, although 42.3% of respondents did rate them moderately or highly useful.

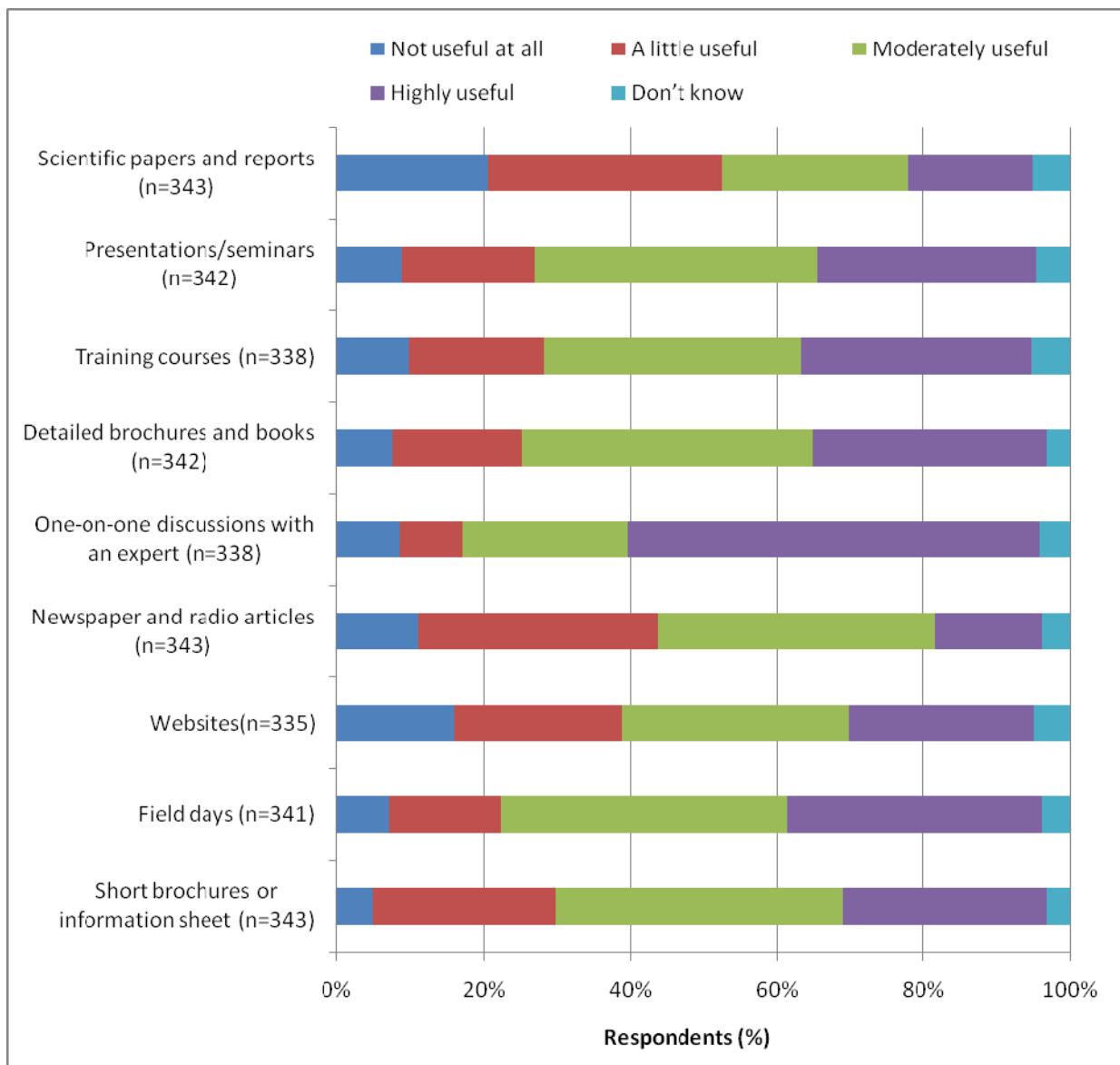


Figure 27: Landholder views on the usefulness of information on tree planting for carbon sequestration delivered in different ways

Non-adopters, possible adopters and likely adopters varied significantly in their views on the usefulness of several types of information (Appendix 2). In general, non-adopters were more likely to rate any type of information other than scientific papers and reports as ‘not useful at all’, while possible and likely adopters varied a little more but were more likely to rate any type of information except scientific papers and reports as moderately or highly useful compared to non-adopters.

Finally, landholders were asked to rate their level of trust in different sources of information from low to high (Figure 28). The most trusted sources of information were local landcare groups, followed by other farmers, and friends and family. Not-for-profit organisations planting trees for carbon sequestration were next most trusted, although only a small proportion of landholders indicated high trust in these organisations, or in state government agencies (the next highest rated). Media outlets, for-profit organisations planting trees for carbon sequestration, and the federal government were ranked as least trusted.

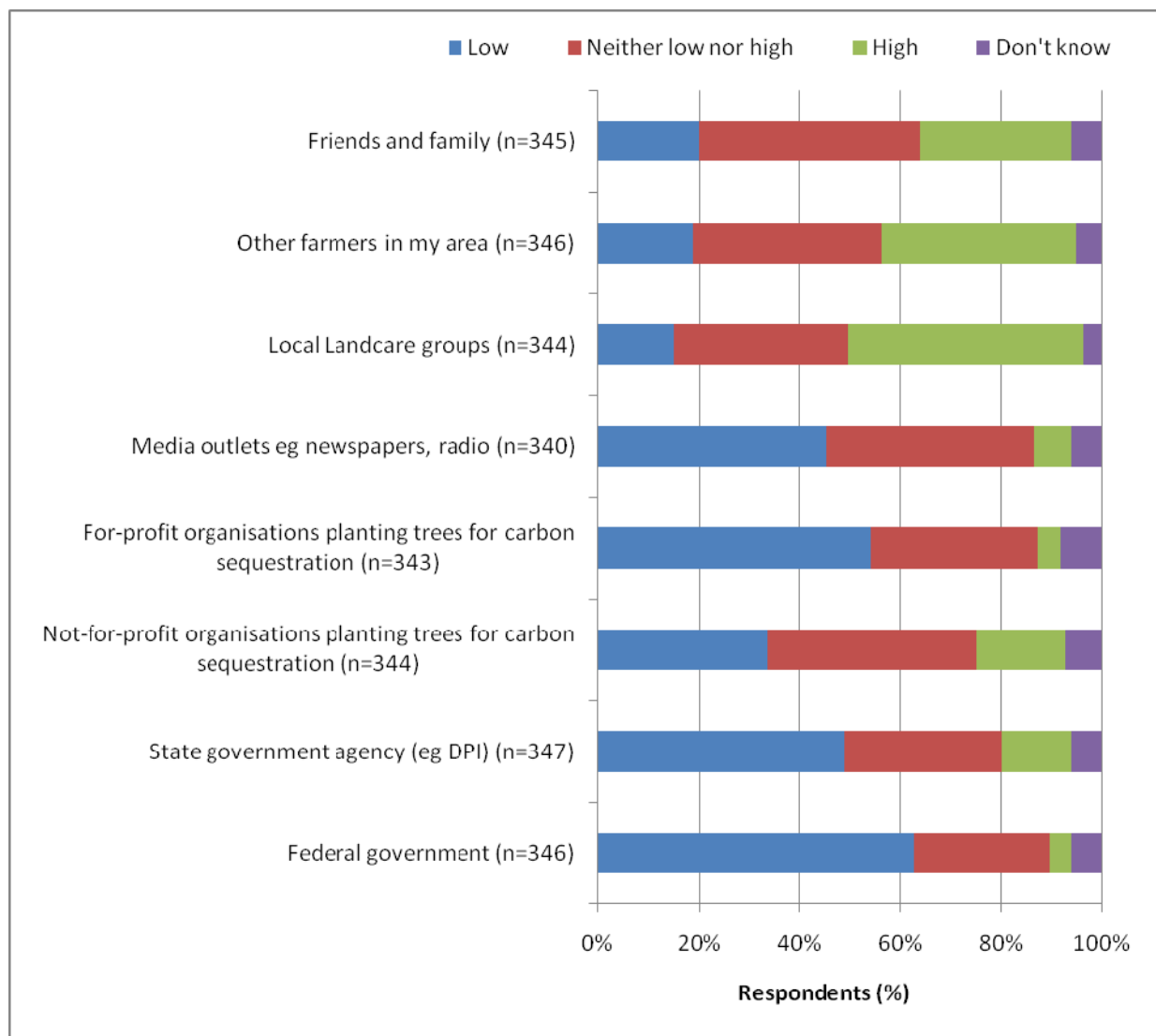


Figure 28: Landholders' level of trust in information about tree planting for carbon sequestration provided from different sources

Non-adopters and possible/likely adopters varied in their level of trust in some information sources (Appendix 2). While the three groups did not differ significantly in their views regarding media outlets, other farmers, friends and family, and the federal government, non-adopters were less likely than possible or likely adopters to trust state government agencies, not-for-profit organisations, for-profit organisations, and local landcare groups.

Demographic characteristics of survey respondents

Respondents were asked to provide a range of information about their demographic characteristics, including their gender, age, primary occupation, level of off-property work, proportion of income earned off-farm, time managing their property, generations of their family involved in farming, future plans for their property, level of education, and gross household income.

Three of these characteristics were used to analyse whether there was any bias in terms of the types of people who responded to the survey. The gender, age and educational attainment of respondents was compared to that of farmers and farm managers living in the study region in 2006, using data from the Australian Bureau of Statistics (ABS) *Census of Population and Housing*. While this is not a perfect comparison—not all survey respondents described themselves as employed primarily in agricultural production, and hence some would not have been recorded as farmers or farm managers in the Census—it does provide the closest approximation of the population being surveyed.

Gender

Of respondents, 83.7% were male and 16.3% were female. In the study region as a whole in 2006, 74.0% of farmers and farm managers were male, and 26.0% female. This indicates that the survey had a bias towards male respondents. This is likely a result of the address database used to identify farmers: in cases where a husband and wife jointly manage an agricultural enterprise, the database typically only included one name—often that of the male partner. This likely led to a higher proportion of men being sent the survey.

Men and women did not differ significantly in their willingness to adopt tree planting for carbon sequestration ($p=0.346$, $df=2$, $\chi=2.124$, $n=340$). There is some need for caution in interpreting this result, given the relatively low number of women responding to the survey.

Age

The majority of respondents were aged between 40 and 70 years, with almost 30% aged 50–59 and just under 25% aged 60–69. Only 6.7% were aged under 40, while 16.0% were aged 70 or more. This age distribution of respondents is older than that of farmers and farm managers in the district (Figure 29). This is likely to reflect that many younger farmers and farm managers are not the land-owner, and hence were less likely to receive the survey, which was addressed to owners of farming properties. It means there is likely some bias in the results towards the views of older landholders, and views of land-owners rather than other types of farm managers.

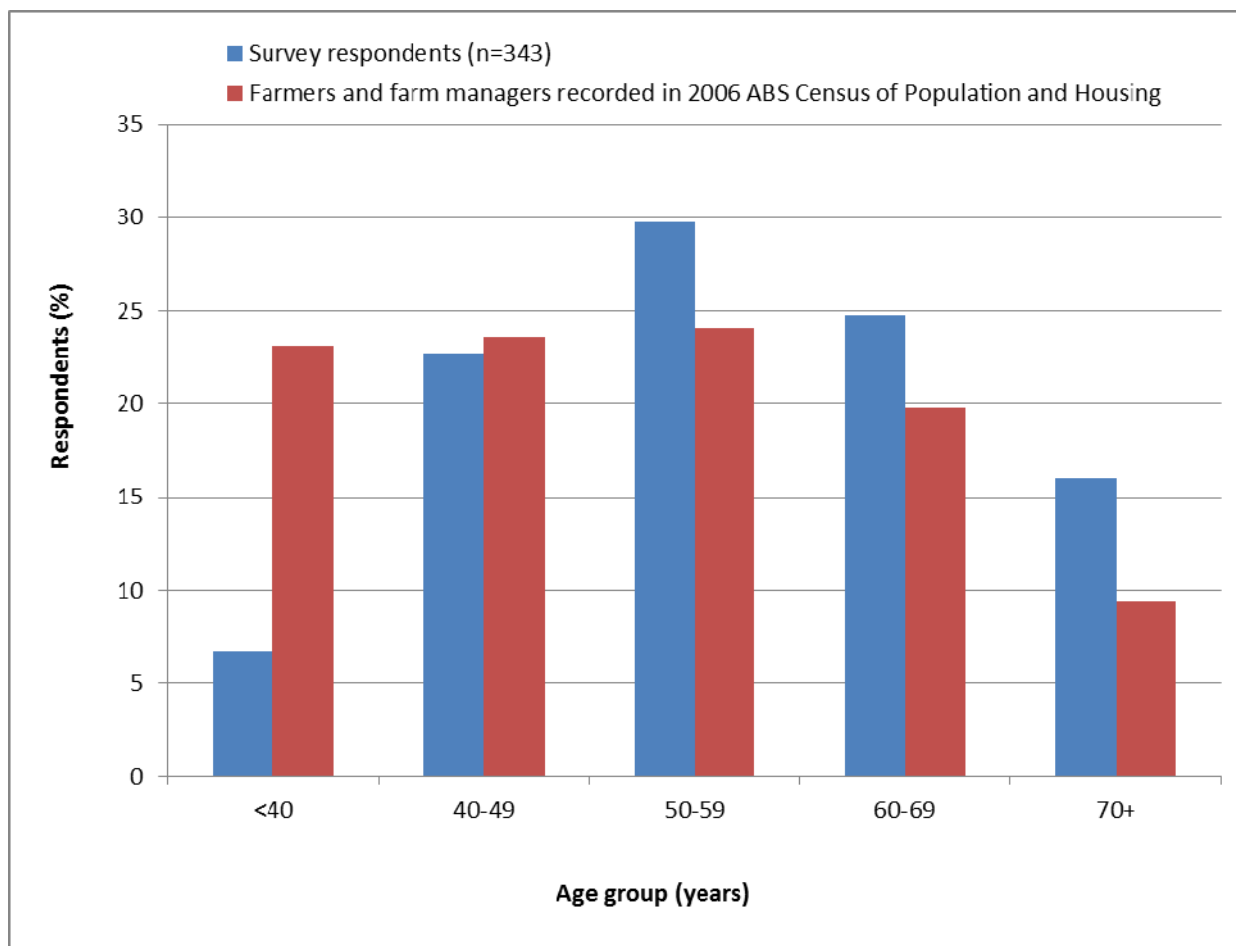


Figure 29: Age distribution of respondents

Age was significantly related to intention to adopt. Non-adopters were significantly more likely to be either aged under 40, or over 60, than possible or likely adopters, as shown in Figure 30 ($p=0.002$, $df=2$, $\chi=12.322$, $n=334$).

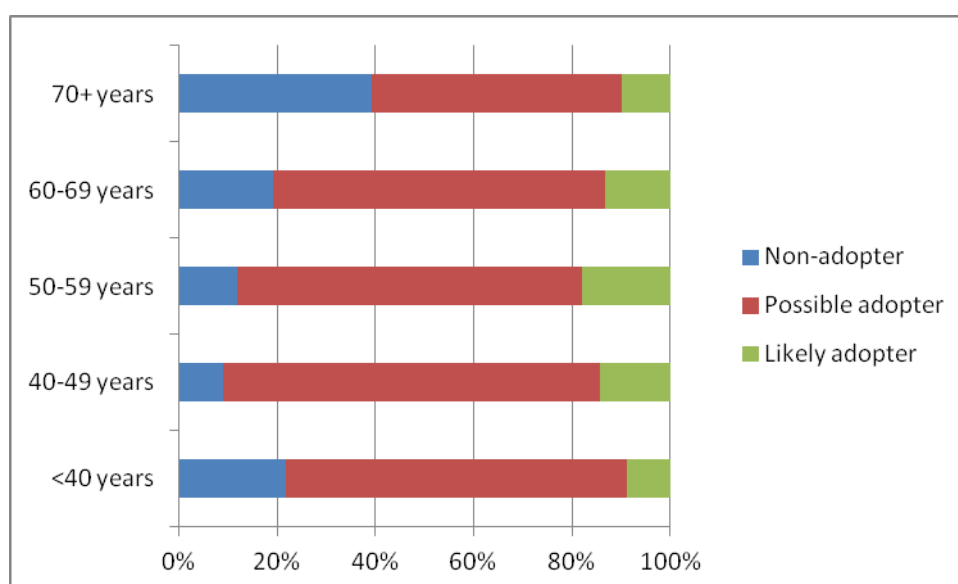


Figure 30: Adoption intent by age group (n=334)

Formal educational attainment

When asked to indicate the highest level of education they had attained, 59.9% of survey respondents indicated that they had completed schooling to a level no higher than Year 12 of high school, compared to 62.6% of farmers and farm managers living in the region in 2006. A small proportion had completed university qualifications (Figure 31).

When characteristics of survey respondents are compared to those of the broader farmer and farm manager population in the region, a slight bias can be seen in the survey respondents, with people who had higher educational attainment slightly more likely to respond to the survey, particularly those with university qualifications.

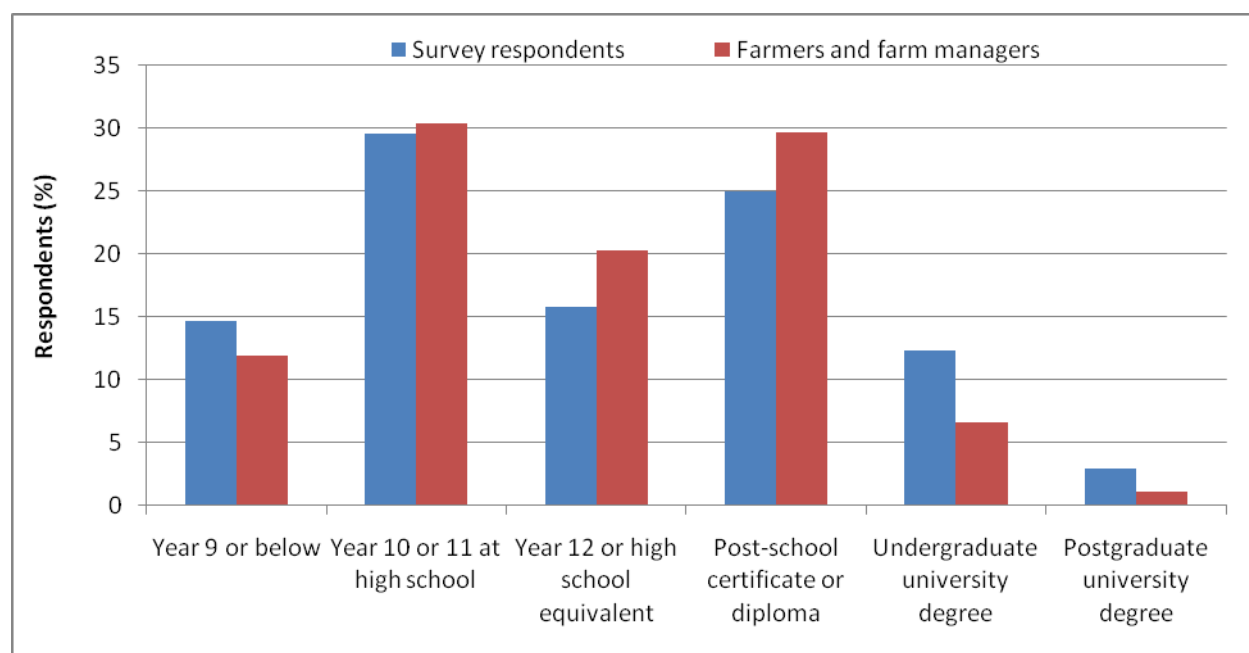


Figure 31: Highest level of formal educational attainment completed by survey respondents (n=349)

Respondents with different levels of formal educational attainment did not differ significantly in their willingness to adopt tree planting for carbon sequestration ($p=0.165$, $df=2$, $\chi=3.599$, $n=344$). However, when explored qualitatively, some differences are apparent, which are worth exploring further in future studies: those with lower educational attainment were more likely to be non-adopters than all others (Figure 32), and were less likely to be possible adopters; likely adopters varied considerably in their formal educational attainment.

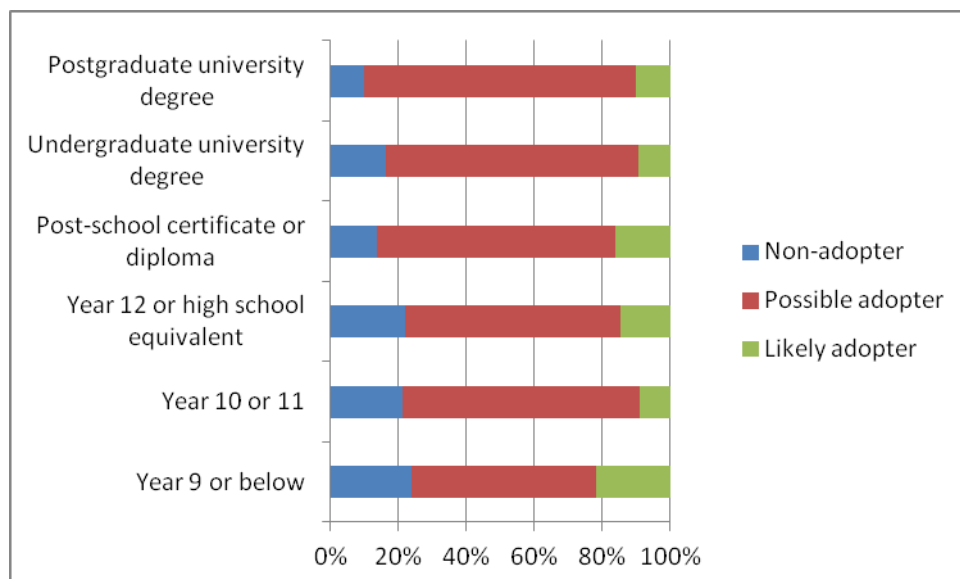


Figure 32: Willingness to adopt of landholders with different levels of educational attainment (n=344)

Occupation

Respondents were asked to describe their main occupation. The large majority—84.9%—described themselves as being farmers or graziers, or otherwise focused on agricultural production (for example, through grape growing or fruit production). Of the remaining 15.1%, a wide variety of occupations were recorded, including teachers, accountants, tradespersons, doctors, agronomists, office clerks, transportation industry workers, engineers and retirees.

Respondents were classified into two groups: agricultural producers, and those with non-agricultural primary occupations. There was no significant difference between respondents who described their primary occupation as farming, and those who described it as something other than farming, in their willingness to adopt tree planting for carbon sequestration ($p=0.357$, $df=2$, $\chi=2.060$, $n=343$). However, this was largely due to the small number of respondents who described their occupation as something other than farming. Those who did not have farming as their main occupation were somewhat more likely to be willing to consider adopting, a relationship that may be significant with a larger sample.

Off-property work

The majority of respondents—64.4%—undertook no off-property work. The remaining 35.6% reported having full-time, part-time or casual employment off the farm (Figure 33). The question about off-property work was only asked of the person responding to the survey; to obtain an understanding of broader household employment on- and off-farm, respondents were also asked what proportion of household income had been earned off-farm in the previous financial year (Figure 34). While 42.9% of households earned no income off the property, the remainder reported some off-farm earnings, with 32.1% earning 40% or more of their income off-farm.

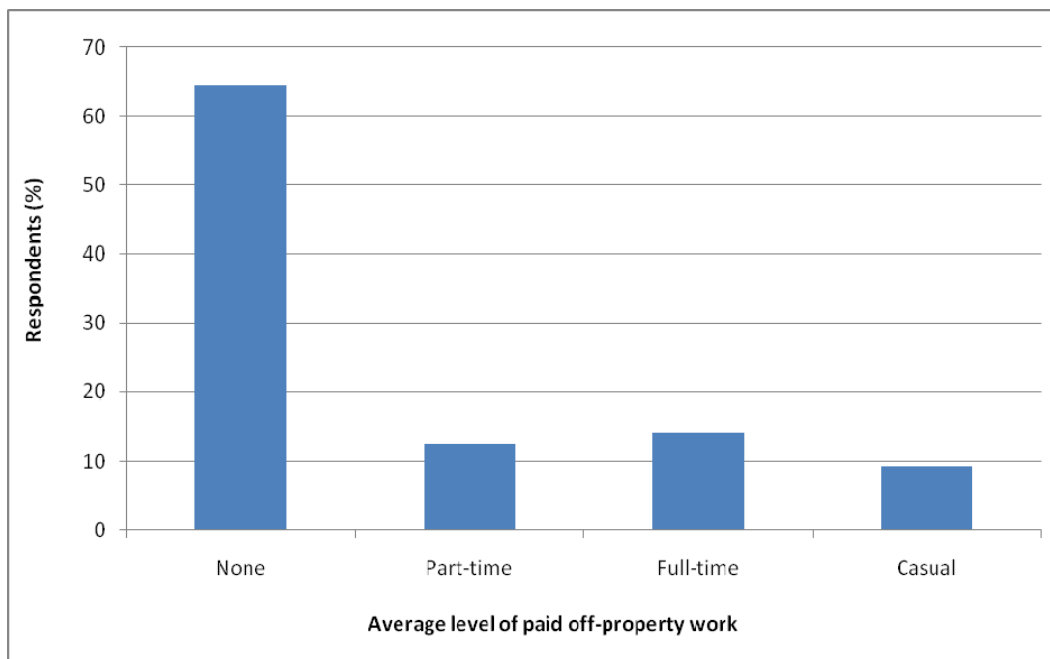


Figure 33: Average level of paid off-property work undertaken by the person who completed the survey (n=348)

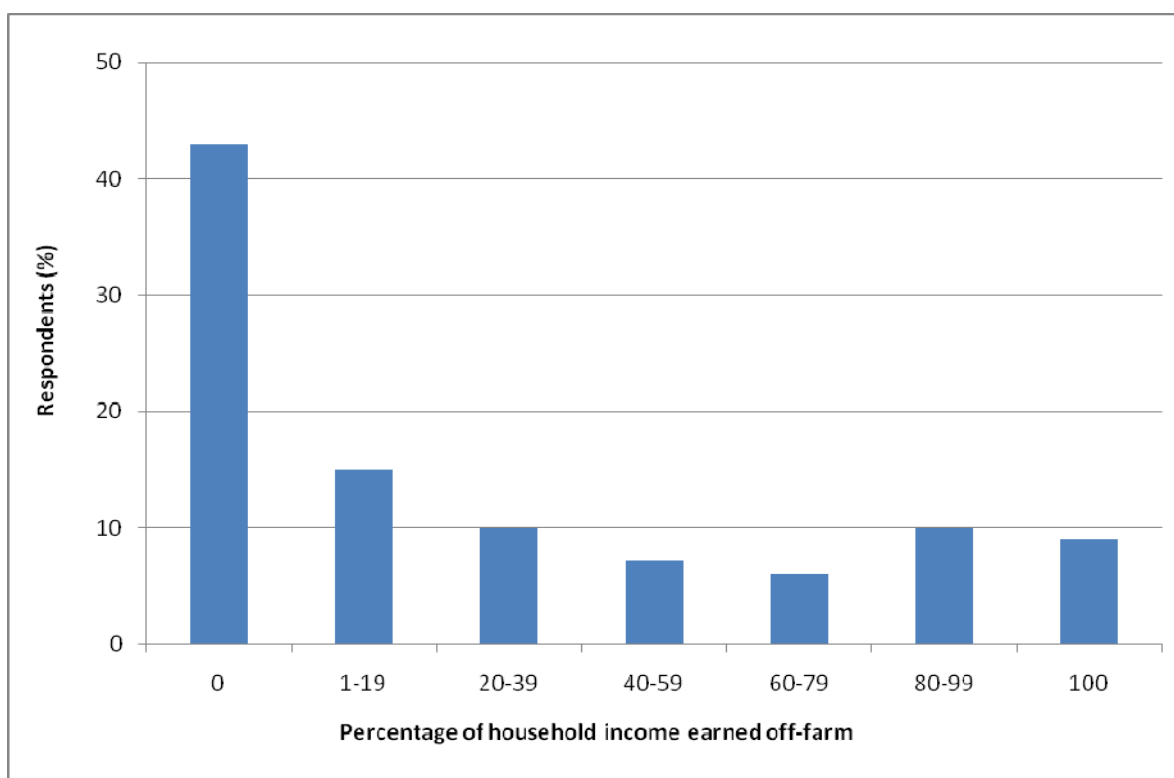


Figure 34: Proportion of household income earned off-farm (n=333)

There was no significant difference between respondents who had no off-farm work, or who worked on a part-time, full-time or casual basis off-farm, in their willingness to adopt tree planting for carbon sequestration ($p=0.150$, $df=6$, $\chi=9.443$, $n=340$). Similarly, the proportion of income earned off-farm was not significantly related to willingness to adopt ($p=0.614$, $df=2$, $F=0.489$, $n=325$).

Farming history and future plans

Respondents were asked how long they had been managing their current property or properties. The majority had managed their property for 20–49 years, and relatively few for less than 10 years (Figure 35). Similarly, there was wide variation in family history of farming, with respondents reporting between one and five generations of their family involved in farming, and most commonly reporting three or four generations of involvement (Figure 36). The number of generations the family had been involved in farming was not significantly related to willingness to adopt ($p=0.878$, $df=2$, $\chi=0.261$, $n=336$).

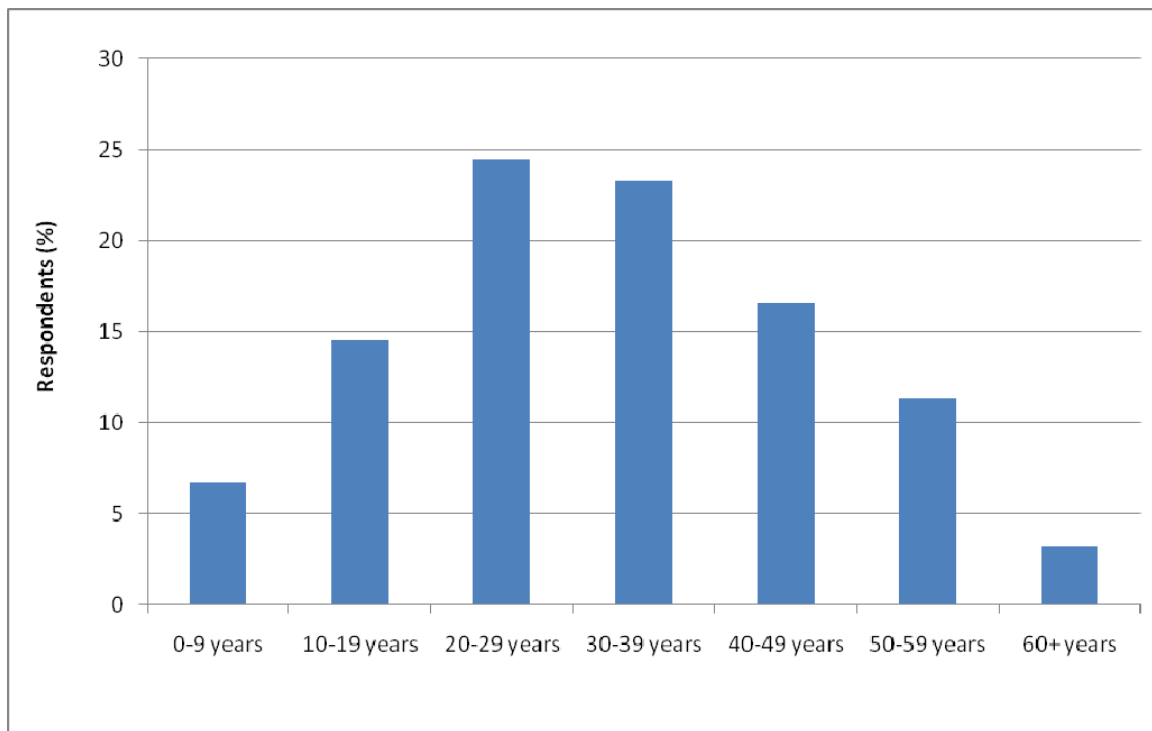


Figure 35: Length of time respondents had owned or managed their current agricultural property/properties (n=344)

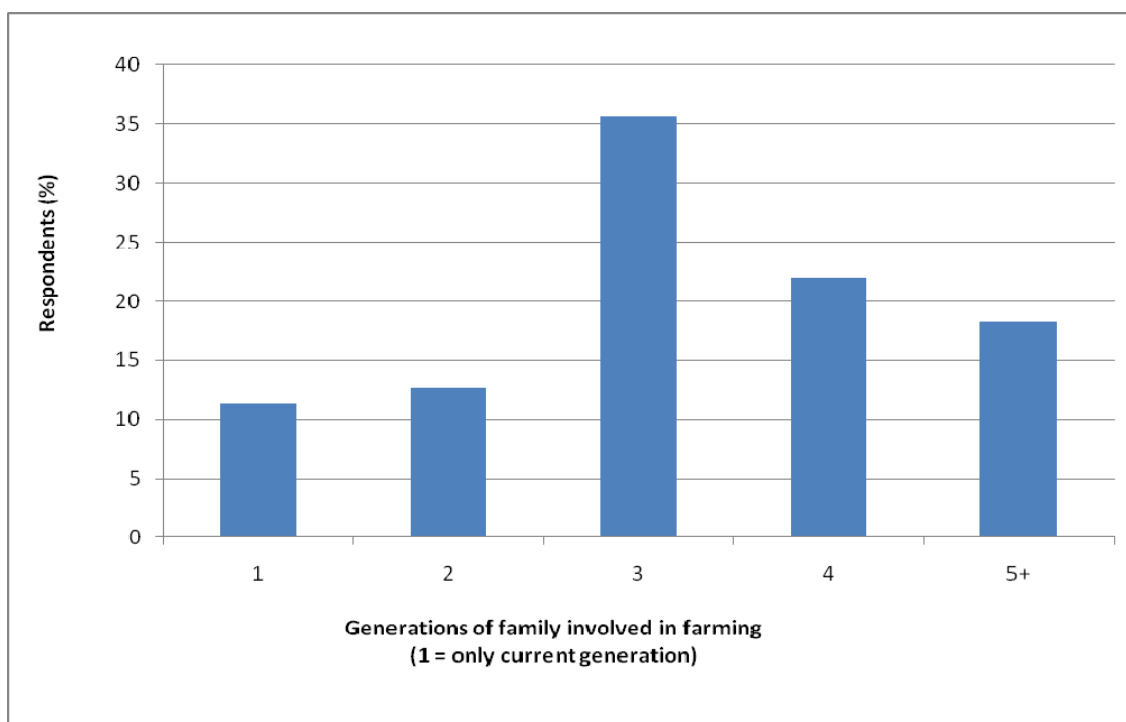


Figure 36: Generations of family involved in farming, as reported by survey respondents (n=345)

Respondents who had owned or managed their current agricultural property/properties for a longer period of time were significantly less likely to be willing to consider adopting tree planting for carbon sequestration compared to those who had owned/managed for a shorter period of time ($p=0.014$, $df=2$, $F=4.344$, $n=335$). Those who had owned/managed their property for more than 40 years were least likely to be willing to consider adopting (Figure 37).

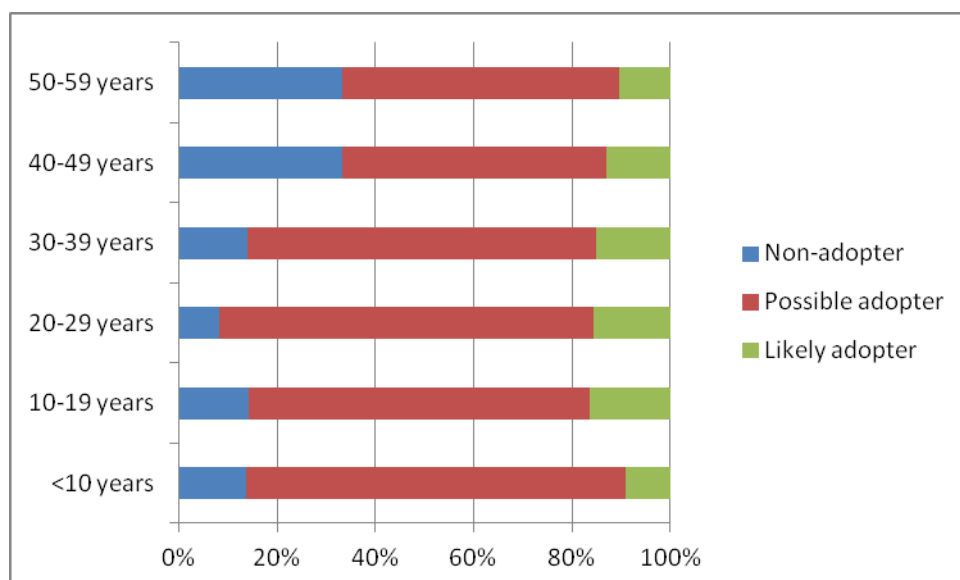


Figure 37: Willingness to adopt of landholders who had owned/managed their property/properties for different lengths of time (n=335)

Half of respondents planned to hand their property down within their family (Figure 38), while the remainder were either unsure or planned to sell their property outside the family, or less commonly within the family.

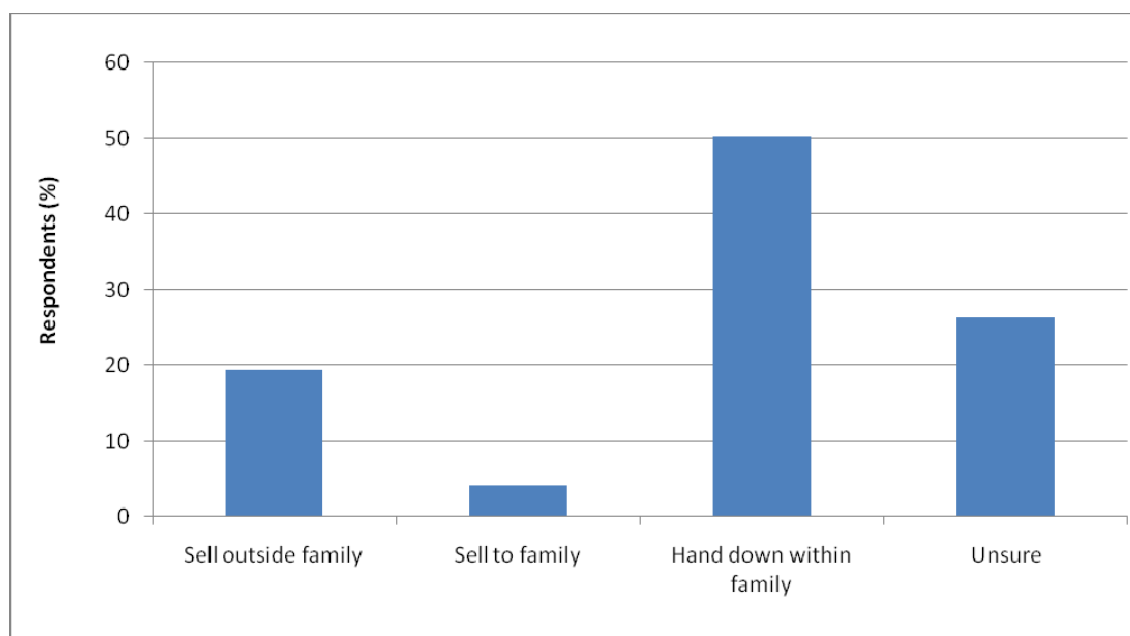


Figure 38: Landholders' future hopes/plans for their farming properties in the future (n=341)

Those who planned to sell their property outside the family were somewhat less likely to be willing to adopt tree planting for carbon sequestration, and those who planned to sell to family were somewhat more likely to (Figure 39), although the differences between groups were not significant at the 5% level ($p=0.055$, $df=4$, $\chi=9.234$, $n=244$).

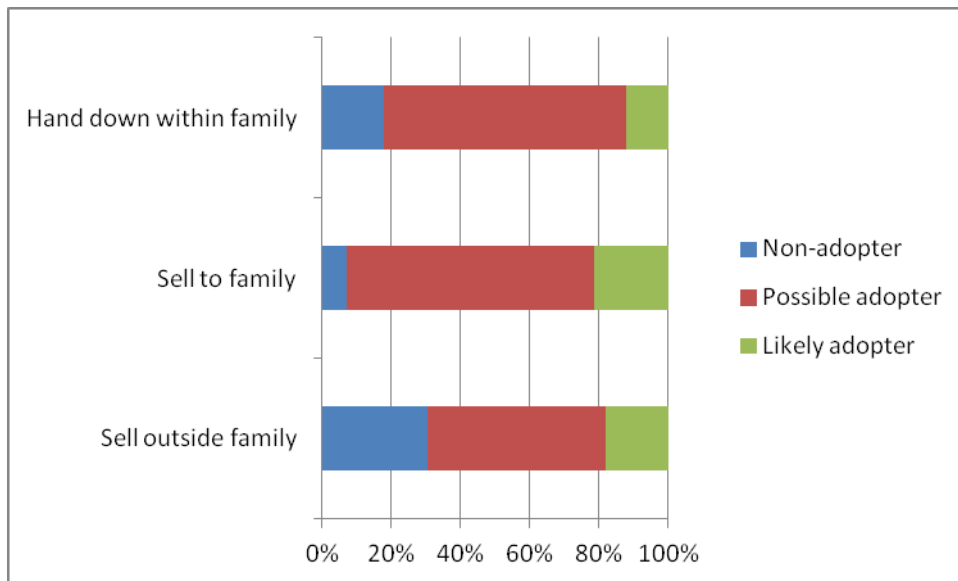


Figure 39: Willingness to adopt of landholders who had different plans for the future of their property (n=244)

Gross household income

Landholders were asked their gross household income in the 2009–10 financial year, including both on- and off-farm income. A wide range of incomes were reported, as can be seen in Figure 40. Those with different levels of household income did not differ significantly in their willingness to adopt tree planting for carbon sequestration ($p=0.311$, $df=2$, $\chi=2.335$, $n=310$).

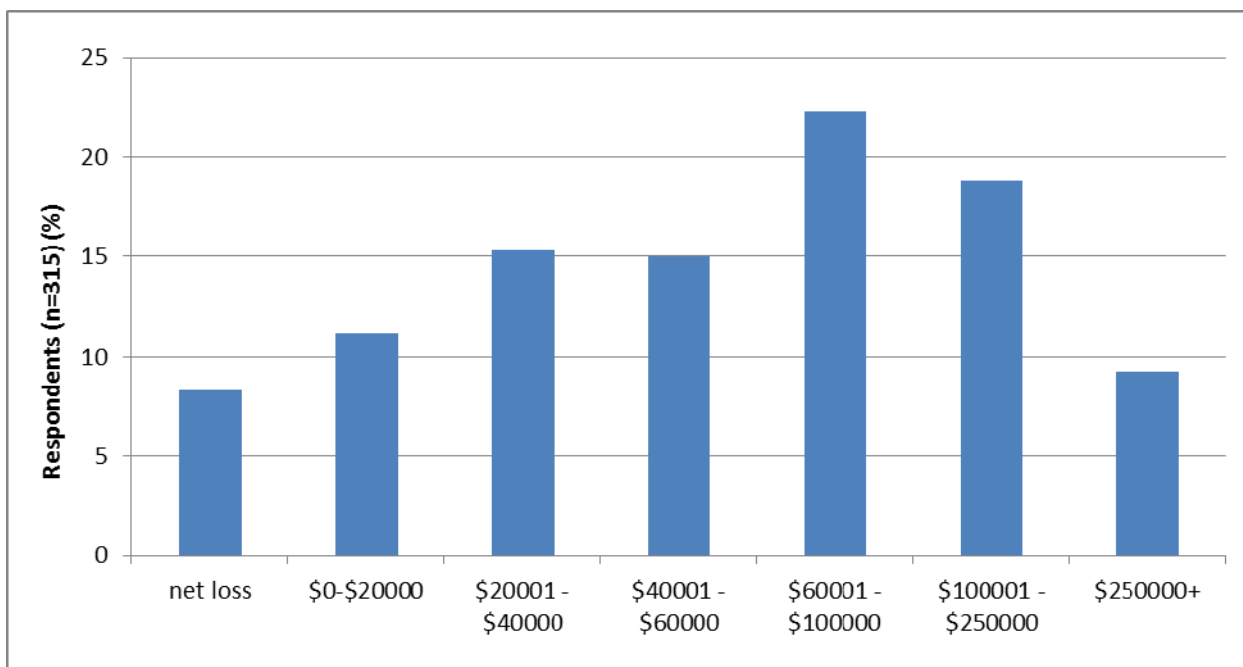


Figure 40: Approximate pre-tax household income in 2009–10 financial year

Discussion and conclusions

The goal of this study was to identify whether landholders are willing to consider planting trees for carbon sequestration on their land, and the factors influencing their willingness. This information is essential to inform the design of policy intended to provide a supportive framework for this activity, and to inform the design of specific programs or schemes aimed at encouraging landholders to participate.

Landholders in our study region are cautiously interested in planting trees for carbon sequestration, with the majority willing to consider adopting it in the future, but not actively doing so at the time of the study. Several issues that commonly present barriers to adoption of new farming activities are not significant challenges when it comes to tree planting for carbon sequestration: landholders feel generally confident in their ability to successfully grow trees on their property, and have positive views about the impacts of tree planting on their property in terms of aesthetics, environmental benefits on- and off-property, and providing shade and shelter for stock. The large majority of landholders who responded to the survey had experience with tree planting, and reported having successfully established trees.

This willingness to consider adopting tree planting for carbon sequestration, and the level of familiarity with the activity of tree planting in general, however, does not mean that landholders will adopt this activity at any stage soon. For widespread adoption to occur:

- a number of key issues must be addressed that currently act as barriers to adoption
- adequate extension is required to provide landholders with the information they need to make decisions
- the activity of tree planting for carbon sequestration needs to be designed in ways that are compatible with landholder preferences.

Barriers to adoption

Currently, almost all landholders—irrespective of their stated level of interest in tree planting for carbon sequestration or previous experience tree planting for other purposes—see multiple barriers to adoption. These need to be overcome to achieve any significant adoption, even by enthusiastic landholders who are currently considering planting trees for carbon. At a minimum, the following are needed:

- a clear market for carbon sequestered in trees with a viable carbon price
- a clear and trusted legislative framework and government policy supporting the activity
- confidence that carbon markets are secure for the long term, and that there is little risk of their collapse.

If these minimum requirements are met, then it is possible to identify the types of landholders that are more and less likely to adopt, and if appropriate, to target outreach to these different groups. Our results, while needing further work to better understand differences between landholders, indicate that the following landholders are more likely to be willing to adopt:

- those aged between 40 and 60
- those who have higher levels of formal education
- those who have an occupation other than farming (e.g. because they work off-farm)
- those who have owned or managed their current property for a shorter period of time
- those who plan to pass their property on to family members through sale or inheritance
- those who felt they had land that could be used for tree planting on their property
- those who felt it was acceptable to grow trees on good farm land
- those who believed in the science of climate change.

While not all of these factors were significantly associated with willingness to adopt, exploratory analysis indicated the potential for significant relationships to be identified if a larger sample were obtained.

Extension strategies

A key challenge faced by those aiming to promote tree planting for carbon sequestration is how to design effective extension strategies that encourage adoption. Our study indicates that this will be simplest for those who are already interested in adopting, although even these landholders have low levels of trust in information received from any groups other than friends, family, other farmers and local landcare groups, and particularly low trust in information provided by for-profit organisations or the federal government. Those with an interest in adopting tend to rank their current knowledge of tree planting for carbon sequestration as low, and are willing to consider using multiple information sources. Those who have no interest in adopting, meanwhile, were least likely to believe they needed any further information on the activity, or to trust most groups to provide such information. It will therefore be difficult to successfully convince those who are not interested to consider adoption.

Design preferences

While this presents a relatively positive view about the potential for adoption, a critical issue is the design of tree planting for carbon. Landholders who are willing to adopt have very strong preferences for design: they are much more likely to consider adopting if it involves planting small areas of trees on their marginal land, using native species, achieving co-benefits, and ideally not having to maintain the trees for 100 years or more. If, however, they are asked to plant large areas on their more-productive agricultural land, using exotic species, having few or no co-benefits, and having to commit for a long period, then adoption is far less likely.

These design preferences have important implications. When considered from the point of view of achieving the lowest cost, most efficient carbon sequestration, landholders' preferred model of tree planting is not ideal. Establishing many small tree plantings, rather than a small number of larger areas, substantially raises transaction costs such as planning, preparing land, monitoring and verifying sequestration, developing contracts with landholders, etc. This means that returns achieved will be lower for both the landholder and any company involved in managing trees planted for carbon sequestration on a landholder's property under this model of planting. In addition, returns will be lower when trees are planted on marginal land, compared to more-productive land, as they will achieve lower growth rates. Finally, the preference of landholders that trees provide co-benefits may prove problematic in relation to the criterion of additionality, which requires that trees be additional to those that would have been planted anyway if they are to contribute to true climate change mitigation. Many of the co-benefits preferred by landholders are those they seek to achieve through their existing tree plantings, and it is arguable that they may have chosen to plant trees for these co-benefits even in the absence of receiving an income from carbon sequestration.

Implications

What are the implications of these issues? Landholders generally prefer designs that would reduce their economic return from carbon plantings, but would the increased return achieved by larger plantings on more-productive land outweigh the lower return on other land? Our results indicate that there is no simple metric in which an increased price for carbon will enable access to larger areas or more-productive land: the reasons landholders preferred small plantings on marginal land are more complex than simple economics. In particular, landholders have strongly held values regarding the importance of using good agricultural land for food production: this

deeply held value is a key driver of the preference for planting trees only on marginal land. It is also likely that, consistent with findings of many adoption studies, landholders are seeking to minimise disruption to their existing activities (Pannell *et al.* 2006); shifting tree planting for carbon sequestration to their marginal land achieves this by ensuring existing land management is not substantially changed.

This means that if there is a desire to plant trees on more-productive agricultural land, issues of concern over whether it is appropriate to use productive land in this way and of disruption to existing activities need to be addressed in addition to the other issues identified above as necessary to achieving adoption. It will also require a substantially higher carbon price to convince landholders to plant trees on their more-productive land. Future studies evaluating the economic feasibility of this activity need to consider the various trade-offs inherent in the design preferences identified in this study, to evaluate whether the reduced transaction costs and higher growth rates achieved by large areas of trees planted on productive land compensate for the higher carbon price and considerably greater investment in extension and information dissemination needed to achieve adoption on this type of land compared to the small areas of marginal land preferred by landholders.

Overall, our study indicates that the barriers to planting trees for carbon are not so much the general willingness of landholders to consider this activity: willingness exists. The barriers to adoption lie more in the specifics of the design of the activity, the need to establish reliable markets that are trusted by landholders, and the need for substantial familiarisation of landholders with the activity through extension and dissemination of information. If these barriers are addressed, and those seeking to promote this activity design options for tree planting compatible with landholder preferences, a substantial proportion of landholders are likely to be willing to adopt.

References

- Bull L & Thompson D (2011) Developing forest sinks in Australia and the United States—a forest owner’s prerogative. *Forest Policy and Economics* **13**, 311–317
- Dargusch P, Harrison S & Herbohn J (2010) How carbon markets have influenced change in the Australian forest industries. *Australian Forestry* **73(3)**, 165–170
- Hug, B & Ahammad H (2011) The economics of Australian agriculture’s participation in carbon offset markets. Outlook 2011. Australian Bureau of Agricultural and Resource Economics and Sciences. (Australian Government, Canberra)
- Pannell DJ, Marshall G, Barr N, Curtis A, Vanclay F & Wilkinson R (2006) Understanding and promoting adoption of conservation practices by rural landholders. *Australian Journal of Experimental Agriculture* **46**, 1407–1424

Appendix 1: Questionnaire

Planting trees for carbon sequestration: what do landholders think?

Background to the survey

In recent years, the idea of landholders being paid to grow trees for carbon sequestration has been promoted by a number of groups, including the Australian Government. While policy makers often promote tree planting as a way of responding to climate change, few people have asked landholders what they think about this idea.

This survey asks about your views on planting trees for carbon sequestration as a commercial land use. We are not trying to promote this practice, but rather to understand whether and why landholders are interested in tree planting for carbon sequestration. The results of this study will be communicated to policy makers, to ensure that governments take into account the realities faced by landholders when they design policies and programs encouraging tree planting for carbon sequestration.

We have sent this survey to you as we understand you are a rural land manager. If you are, we would appreciate it if you would consider completing the survey. Your response will be kept confidential, as explained further in the Information Sheet accompanying the survey. The survey should take approximately 20 minutes to complete.

If you are not a rural land manager, please indicate this on page 1 of the survey or call us on 1800 981 499, and we will remove you from the survey list and ensure you do not receive reminders about the survey. A stamped-self address envelope has been provided.

If you have any questions please contact the survey team (Dr Lyndall Bull and Dr Jacki Schirmer) at the Australian National University on **1800 981 499**.

This survey is being conducted by researchers from the Australian National University, with funding support from the Australian Government Department of Agriculture, Fisheries and Forestry, the Cooperative Research Centre for Forestry, and Forest and Wood Products Australia.

YOUR TREE PLANTING HISTORY

2a. Since this survey is asking about tree planting for carbon, it helps us to know what types of tree planting activity (if any) you have undertaken in the past. Please indicate whether you have undertaken different types of tree planting below, at any time in the past

I have planted trees for the purpose of...	Have you planted trees for this purpose? (tick one)	How many of the trees have grown successfully? (tick one)	How would you describe the total area of trees you have planted for this purpose over time? (tick all that apply)
...providing shade and shelter for stock (eg windbreaks)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
... rehabilitating degraded land (eg for erosion control)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...producing commercial timber (eg pine plantations)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...improving how the property looks (eg for aesthetic purposes)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...increasing birds and animals on my property	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...reducing salinity on my property	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...commercial carbon sequestration for which I already receive payment	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...commercial carbon sequestration for which I do not yet have a market or receive payment	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
...for a purpose not listed above (please describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Most	<input type="checkbox"/> A few scattered trees <input type="checkbox"/> Long strips of trees <input type="checkbox"/> Blocks of trees < 1ha <input type="checkbox"/> Blocks of trees > 1ha
Have you received government funding to help cover the costs of any of these tree plantings, or free materials such as seedlings?			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure
Were any of these trees planted and managed by someone other than yourself, eg a revegetation organisation or forestry business?			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure

2b. To what extent do you agree or disagree with the following statements about land management and planting trees in general (no matter what purpose trees are planted for)?

Please tick one response only for each statement below	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree	Don't know
Good agricultural land should grow food, not trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would prefer to plant and manage trees myself than have someone else manage them for me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees has environmental benefits for my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees on my property provides environmental benefits beyond my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I believe the science behind climate change is doubtful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would like to plant more trees on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is very difficult to grow trees on my land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees require a lot of ongoing management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees reduces weeds on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tree are easy to manage once established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human use of fossil fuels is changing the climate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees increases weeds on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmers have a responsibility to manage their land to provide benefits for the wider community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees reduces water availability on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees improves how my property looks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees increases pest animals on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees increases bird life on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is acceptable to grow trees on good farm land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees can be easily grown on my land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmers have to prioritise making an economic return over improving environmental outcomes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My property already has as many trees as it needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees has no negative impact on water availability on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees has benefits for my stock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In general, it is more acceptable to plant trees on marginal land than good agricultural land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would prefer someone else to plant and manage trees than to have to manage them myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In general, I prefer planting native tree species than species not native to my local area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees increases the risk of fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am concerned that if I plant trees, future governments might prevent me using that land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmers should be paid to manage their land to provide benefits for the wider community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

YOUR VIEWS ON TREE PLANTING FOR CARBON SEQUESTRATION

The following questions ask about your views on tree planting for commercial carbon sequestration. Tree planting for commercial carbon sequestration is defined as ‘trees established with the dedicated purpose of absorbing carbon from the atmosphere, for which you may receive economic return from the carbon sequestered’. In general, this type of tree planting involves committing to growing trees for a long period of time (often 100 years or more).

3a. What best describes your current level of experience planting trees for carbon sequestration?

	Tick ONE option below
I have <u>not</u> planted trees for carbon sequestration and <u>have no interest in doing it</u> in the future	<input type="checkbox"/>
I have <u>not</u> planted trees for carbon sequestration but <u>might consider it</u> in the future	<input type="checkbox"/>
I have <u>not</u> planted trees for carbon sequestration but am <u>actively considering it</u> for the future	<input type="checkbox"/>
I <u>have planted</u> trees for carbon sequestration and would <u>like to plant more</u>	<input type="checkbox"/>
I <u>have planted</u> trees for carbon sequestration in the past but <u>wouldn't do it again</u>	<input type="checkbox"/>

3b. To what extent do you agree or disagree with the following statements about the potential markets and financial returns from planting trees for carbon sequestration?

Please tick one response only for each statement below	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree	Don't know
There are currently good opportunities to sell carbon stored in trees into carbon markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future prices for carbon are likely to be too low to consider planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel confident there will be a long term market for carbon stored in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Returns from planting trees for carbon sequestration will never be high enough to justify planting trees on land instead of using it for agriculture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is a high risk that carbon markets will disappear in a few years time, and tree planted for carbon sequestration will make no return	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future carbon prices are likely to be high enough for me to consider planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am confident that governments will support long term commercial markets for carbon sequestered in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
As long as returns from carbon covered my costs, I would consider planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is currently clear government legislation providing a good basis for a formal carbon market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carbon markets are currently too uncertain to consider planting trees for commercial carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Current carbon tree planting programs don't offer enough money to be worth taking up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I'm not interested in planting trees for carbon because current rules about carbon markets are unclear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3c. To what extent do you agree or disagree with the following statements about planting trees for carbon sequestration?

Please tick one response only for each statement below	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree	Don't know
Planting trees for carbon sequestration would increase the value of my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My neighbours would disapprove if I planted trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The long timeframes involved reduce my willingness to consider growing trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees for carbon sequestration would decrease the value of my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is important that everyone plants trees on their land to contribute to reducing climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees for carbon sequestration is viewed positively by people in my community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees grow too slowly in this area to be planted for commercial carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is too risky to plant trees for carbon sequestration, as they may be killed by drought or fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have seen too many failed attempts at tree planting to feel confident in planting trees on my property for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees on one property is too little to make any difference to climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It doesn't matter what type of tree species are used to sequester carbon, as long as they grow well	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More local trials are needed before I would feel confident planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is better to sequester carbon in soil than in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees for carbon sequestration would make my farm management more complicated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would only plant trees for carbon sequestration if local native species were used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees is an effective way of removing carbon from the atmosphere	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees for carbon sequestration would reduce my ability to manage my land flexibly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees for carbon sequestration would benefit me by providing a diversified income stream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are better ways of removing carbon from the atmosphere than planting trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is better to sequester carbon in pasture than in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being paid for the carbon they sequester would make me more likely to plant trees for purposes such as reducing land degradation or stock shelter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmers shouldn't be asked to plant trees to fix the climate problems caused by other people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3d. How much of a barrier (if any) would the following be to planting trees for carbon sequestration on your property?

Please tick one response only for each statement below	Not a barrier	Small barrier	Moderate barrier	Large barrier	Don't know/unsure
The suitability of my land for growing trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of land available for tree planting on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My current level of knowledge about planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having restrictions placed on how the land planted to trees can be used for the next 100+ years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of water the trees would use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The risk of trees not growing successfully	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The long-term nature of planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The risk of trees dying due to drought or fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The costs of planting and managing trees, such as fencing (if you had to pay these costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The price paid for the carbon sequestered in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of time required to plant and manage trees (if you had to do this, rather than someone else undertaking this work)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The uncertainty of carbon markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What other landholders would think of me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of information about current programs for planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The potential for the trees to provide habitat for feral or pest animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction in my flexibility of land management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having to plant a minimum area of 5 hectares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having to plant a minimum area of 10 hectares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having to plant a minimum area of 50 hectares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having to plant the trees on my marginal land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having to plant the trees on my more productive agricultural land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The risk that future governments will change their minds about climate change policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My level of knowledge about planting and managing trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Would you face any other barriers to planting trees for carbon sequestration? Yes No

If yes, please describe these barriers: _____

3e. How much of an incentive (if any) would the following be for you to plant trees for carbon sequestration on your property?

Please tick one response only for each statement below	Not an incentive	Small incentive	Moderate incentive	Large incentive	Don't know/unsure
The suitability of my land for growing trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of land I have available for tree planting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of water the trees would use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision of insurance to cover the risk of trees dying in a drought or fire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The long-term nature of planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision of funds to cover the costs of establishing trees (assuming you do the work yourself)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being paid a guaranteed and indexed annual payment for the carbon sequestered in trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of clear and stable carbon markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to free training in growing trees for carbon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What other landholders in my community will think	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to more information on current programs for planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The potential for the trees to provide habitat for native birds and animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An outside organisation doing all the work for me, while paying me for use of my land to grow trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having an expert come and give me advice about growing trees on my property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the trees provided shelter for stock as well as sequestering carbon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the trees addressed land degradation problems on my property as well as sequestering carbon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to plant as little an area as 1 hectare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to plant a minimum area of 10 hectares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to choose the location and area planted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to plant trees on my marginal land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to plant trees on my more productive land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being given flexibility to choose what tree species are planted on my land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having a regulated carbon market approved by the government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Would any other incentives help you to plant trees for carbon sequestration? Yes No

If yes, please describe these incentives: _____

3f. Would you be more or less willing to consider planting trees for carbon sequestration in the following situations?

Would you be <u>more</u> or <u>less</u> likely to consider planting trees for carbon sequestration...	Much less likely to consider planting trees	A little less likely to consider planting trees	Neither more or less likely to consider planting trees	A little more likely to consider planting trees	Much more likely to consider planting trees
...if you are able to plant locally growing native species rather than species not native to your local area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if you are able to plant high yielding tree species rather than lower yielding local native species	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if you are able to plant and manage the trees yourself, rather than having someone do it for you (eg a carbon tree business)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if someone plants and manages the trees for you, rather than you having to do the work yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees are planted only on your marginal land, rather than your productive agricultural land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees are planted mostly on your productive agricultural land, rather than your more marginal land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees had to be planted on only a small proportion of your property, rather than a large proportion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees had to be planted on a large proportion of your property, rather than only a small proportion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees provided environmental benefits for your property as well as growing carbon, rather than providing only carbon sequestration benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees provided shade and shelter for stock on your property as well as growing carbon, rather than providing only carbon sequestration benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if trees could be harvested for commercial timber sale and replanted as well as you receiving payment for the carbon grown in them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if the upfront costs of establishing trees are covered but you manage the trees, versus an outside organisation doing all planting and management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...if the minimum time you had to grow the trees for was 30–40 years rather than 100 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3g. What is the minimum return you would need to be offered to be willing to plant trees for carbon sequestration under the following scenarios (assume annual payments would be indexed over time, and the tree species planted would grow successfully on your property)?

I would be willing to consider planting trees for carbon under this scenario if I was offered <u>an annual payment equivalent to...</u> →	...10% less than my average return from the land	... my <u>average return</u> from the land	...10% more than my average return from the land	... 20% more than my average return from the land	I would not be willing to consider doing this for any level of payment
Trees planted on your marginal land; a small proportion of your land is planted; you provide all labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted on your productive agricultural land; a small proportion of your land is planted; you provide all labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted mostly on your marginal land; a large proportion of your land is planted; you provide all labour ³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted mostly on your productive agricultural land; a large proportion of your land is planted; you provide all labour ²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted on your marginal land; a small proportion of your land is planted; trees planted and managed by others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted on your productive agricultural land; a small proportion of your land is planted; trees planted and managed by others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted mostly on your marginal land; a large proportion of your land is planted; trees planted and managed by others ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees planted mostly on your productive agricultural land; a large proportion of your land is planted; trees planted and managed by others ³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

³ Assume that a large proportion of your total property is planted, including the majority of your marginal land as well as productive land if your marginal land covers only a small part of your property.

⁴ Assume that a large proportion of your total property is planted, including the majority of your productive land as well as marginal land if your productive land covers only a small part of your property.

WHERE YOU GET INFORMATION ON TREE PLANTING

4a. How would you rate your current level of awareness and knowledge about the following issues?

My level of awareness and knowledge is...	Very poor	Poor	Neither poor nor good	Good	Very good	Don't know
Current programs that pay landholders to grow trees on their land for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government rules and regulations regarding planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Results of scientific studies into carbon sequestration by different types of trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carbon prices and markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Where I can find more information on planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4b. How useful would you find information delivered in the following ways about tree planting for carbon sequestration?

	Not useful at all	A little useful	Moderately useful	Highly useful	Don't know
Short brochures or information sheet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Websites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Newspaper and radio articles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
One-on-one discussions with an expert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Detailed brochures and books	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training courses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presentations/seminars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scientific papers and reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4c. What is your level of trust in information about tree planting for carbon sequestration provided from the following sources?

My level of trust is...	Very low	Low	Neither low nor high	High	Very high	Don't know
Federal government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State government agency (eg DPI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not-for-profit organisations planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For-profit organisations planting trees for carbon sequestration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Media outlets eg newspapers, radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Landcare groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other farmers in my area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Friends and family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

BACKGROUND INFORMATION

The following questions ask for information about you and your household. If you are uncomfortable answering any of these questions, please leave them blank but we would still appreciate it if you could return the survey with the questions you have completed. Thank you.

5. Demographics

a. Are you male or female?	<input type="checkbox"/> Male <input type="checkbox"/> Female
b. What is your age?	<input style="width: 50px;" type="text"/> years
c. What is your main occupation?	<input style="width: 150px;" type="text"/> (e.g. farmer, accountant, plumber, teacher, retiree)
d. Which of the following best describes your average level of paid off-property work for 2009?	<input type="checkbox"/> None <input type="checkbox"/> Part-time <input type="checkbox"/> Full-time <input type="checkbox"/> Casual
e. What percentage of household income in 2009 was earned off-farm?	<input style="width: 50px;" type="text"/> %
f. How long have you owned/managed your agricultural property/properties?	<input style="width: 50px;" type="text"/> years
g. How many generations has the family been involved in farming (not necessarily on this property)?	<input style="width: 50px;" type="text"/> number of generations (if you are the first generation, put '1', and add 1 for each additional generation involved)
h. What are your hopes or plans for your farming properties in the future? (please tick one only)	<input type="checkbox"/> Sell outside family <input type="checkbox"/> Sell to family <input type="checkbox"/> Hand down within family <input type="checkbox"/> Unsure
i. What is the highest level of formal education you have completed? (please tick one only)	<input type="checkbox"/> Year 9 or below <input type="checkbox"/> Year 10 or 11 at high school <input type="checkbox"/> Year 12 or high school equivalent <input type="checkbox"/> Post-school certificate or diploma <input type="checkbox"/> Bachelor/undergraduate university degree <input type="checkbox"/> Postgraduate university degree
j. What is the approximate figure for your gross household income (including income earned on- and off-property) in the 2009/2010 financial year? (please provide an estimate if the actual figure is not known)	<input type="checkbox"/> net loss <input type="checkbox"/> \$0 – \$20 000 <input type="checkbox"/> \$20 001 – \$40,000 <input type="checkbox"/> \$40 001 – \$60,000 <input type="checkbox"/> \$60 001 – \$100,000 <input type="checkbox"/> \$100 001 – \$250 000 <input type="checkbox"/> \$250 000 +

Thank you for taking the time to complete this survey

If you have any further comments on the topics we ask about in this survey, please include them with the survey when you return it.

Appendix 2: Analyses

This appendix provides the detailed analyses used to identify significant differences between non-adopters, possible adopters and likely adopters.

Views about planting trees in general

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	p	n
Good agricultural land should grow food, not trees	28.514	2	.000	334
I would prefer to plant and manage trees myself than have someone else manage them for me	6.243	2	.044	331
Planting trees has environmental benefits for my property	10.792	2	.005	333
Planting trees on my property provides environmental benefits beyond my property	19.560	2	.000	324
I believe the science behind climate change is doubtful	6.639	2	.036	311
I would like to plant more trees on my property	28.206	2	.000	329
It is very difficult to grow trees on my land	1.328	2	.515	334
Trees require a lot of ongoing management	2.689	2	.261	334
Planting trees reduces weeds on my property	2.787	2	.248	323
Tree are easy to manage once established	5.679	2	.058	335
Human use of fossil fuels is changing the climate	10.397	2	.006	291
Planting trees increases weeds on my property	.302	2	.860	327
Farmers have a responsibility to manage their land to provide benefits for the wider community	1.640	2	.440	337
Planting trees reduces water availability on my property	1.233	2	.540	325
Planting trees improves how my property looks	7.932	2	.019	341
Planting trees increases pest animals on my property	1.157	2	.561	327
Planting trees increases bird life on my property	3.964	2	.138	337
It is acceptable to grow trees on good farm land	37.856	2	.000	338
Trees can be easily grown on my land	2.642	2	.267	329
Farmers have to prioritise making an economic return over improving environmental outcomes	1.867	2	.393	330
My property already has as many trees as it needs	22.911	2	.000	331
Planting trees has no negative impact on water availability on my property	.125	2	.939	320
Planting trees has benefits for my stock	2.778	2	.249	326
In general, it is more acceptable to plant trees on marginal land than good agricultural land	.235	2	.889	339
I would prefer someone else to plant and manage trees than to have to manage them myself	13.556	2	.001	330
In general, I prefer planting native tree species than species not native to my local area	1.843	2	.398	340
Planting trees increases the risk of fire	3.934	2	.140	327
I am concerned that if I plant trees, future governments might prevent me using that land	7.788	2	.020	318
Farmers should be paid to manage their land to provide benefits for the wider community	11.132	2	.004	332

Views about potential markets and financial returns from planting trees for carbon sequestration

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	p	n
There are currently good opportunities to sell carbon stored in trees into carbon markets	4.210	2	.122	185
Future prices for carbon are likely to be too low to consider planting trees for carbon sequestration	5.684	2	.058	189
I feel confident there will be a long term market for carbon stored in trees	23.269	2	.000	207
Returns from planting trees for carbon sequestration will never be high enough to justify planting trees on land instead of using it for agriculture	31.352	2	.000	224
There is a high risk that carbon markets will disappear in a few years time, and tree planted for carbon sequestration will make no return	19.218	2	.000	222
Future carbon prices are likely to be high enough for me to consider planting trees for carbon sequestration	35.496	2	.000	193
I am confident that governments will support long term commercial markets for carbon sequestered in trees	18.309	2	.000	211
As long as returns from carbon covered my costs, I would consider planting trees for carbon sequestration	51.719	2	.000	295
There is currently clear government legislation providing a good basis for a formal carbon market	13.873	2	.001	210
Carbon markets are currently too uncertain to consider planting trees for commercial carbon sequestration	3.018	2	.221	256
Current carbon tree planting programs don't offer enough money to be worth taking up	1.688	2	.430	216
I'm not interested in planting trees for carbon because current rules about carbon markets are unclear	5.837	2	.054	272

Views about planting trees for carbon sequestration

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	p	n
Planting trees for carbon sequestration would increase the value of my property	58.871	2	.000	236
My neighbours would disapprove if I planted trees for carbon sequestration	20.671	2	.000	256
The long timeframes involved reduce my willingness to consider growing trees for carbon sequestration	15.989	2	.000	298
Planting trees for carbon sequestration would decrease the value of my property	35.864	2	.000	254
It is important that everyone plants trees on their land to contribute to reducing climate change	22.204	2	.000	313
Planting trees for carbon sequestration is viewed positively by people in my community	37.111	2	.000	231
Trees grow too slowly in this area to be planted for commercial carbon sequestration	28.091	2	.000	277
It is too risky to plant trees for carbon sequestration, as they may be killed by drought or fire	30.284	2	.000	306
I have seen too many failed attempts at tree planting to feel confident in planting trees on my property for carbon sequestration	11.911	2	.003	301
Planting trees on one property is too little to make any difference to climate change	33.373	2	.000	302
It doesn't matter what type of tree species are used to sequester carbon, as long as they grow well	2.200	2	.333	258
More local trials are needed before I would feel confident planting trees for carbon sequestration	11.647	2	.003	312
It is better to sequester carbon in soil than in trees	14.599	2	.001	191
Planting trees for carbon sequestration would make my farm management more complicated	13.454	2	.001	279
I would only plant trees for carbon sequestration if local native species were used	.770	2	.680	316
Planting trees is an effective way of removing carbon from the atmosphere	9.353	2	.009	252
Planting trees for carbon sequestration would reduce my ability to manage my land flexibly	29.434	2	.000	299
Planting trees for carbon sequestration would benefit me by providing a diversified income stream	47.243	2	.000	240
There are better ways of removing carbon from the atmosphere than planting trees	18.668	2	.000	192
It is better to sequester carbon in pasture than in trees	17.824	2	.000	203
Being paid for the carbon they sequester would make me more likely to plant trees for purposes such as reducing land degradation or stock shelter	21.654	2	.000	316
Farmers shouldn't be asked to plant trees to fix the climate problems caused by other people	21.594	2	.000	320

Barriers to planting trees for carbon sequestration

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	p	n
The suitability of my land for growing trees	.863	2	.650	309
The amount of land available for tree planting on my property	8.333	2	.016	307
My current level of knowledge about planting trees for carbon sequestration	15.911	2	.000	275
Having restrictions placed on how the land planted to trees can be used for the next 100+ years	12.627	2	.002	297
The amount of water the trees would use	4.926	2	.085	307
The risk of trees not growing successfully	.040	2	.980	314
The long-term nature of planting trees for carbon sequestration	41.806	2	.000	272
The risk of trees dying due to drought or fire	4.064	2	.131	317
The costs of planting and managing trees, such as fencing (if you had to pay these costs)	.365	2	.833	326
The price paid for the carbon sequestered in trees	5.140	2	.077	241
The amount of time required to plant and manage trees (if you had to do this, rather than someone else undertaking this work)	.674	2	.714	323
The uncertainty of carbon markets	8.780	2	.012	271
What other landholders would think of me	2.725	2	.256	295
Lack of information about current programs for planting trees for carbon sequestration	.301	2	.860	294
The potential for the trees to provide habitat for feral or pest animals	4.163	2	.125	326
Reduction in my flexibility of land management	19.573	2	.000	317
Having to plant a minimum area of 5 hectares	21.228	2	.000	318
Having to plant a minimum area of 10 hectares	21.639	2	.000	316
Having to plant a minimum area of 50 hectares	14.969	2	.001	313
Having to plant the trees on my marginal land	11.019	2	.004	299
Having to plant the trees on my more productive agricultural land	12.366	2	.002	325
The risk that future governments will change their minds about climate change policy	10.220	2	.006	305
My level of knowledge about planting and managing trees	1.043	2	.594	316

Incentives for planting trees for carbon sequestration

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	Asymp. Sig.	n
The suitability of my land for growing trees	30.936	2	.000	300
The amount of land I have available for tree planting	29.607	2	.000	302
The amount of water the trees would use	13.631	2	.001	287
Provision of insurance to cover the risk of trees dying in a drought or fire	14.583	2	.001	301
The long-term nature of planting trees for carbon sequestration	43.196	2	.000	280
Provision of funds to cover the costs of establishing trees (assuming you do the work yourself)	38.573	2	.000	320
Being paid a guaranteed and indexed annual payment for the carbon sequestered in trees	51.552	2	.000	317
The availability of clear and stable carbon markets	43.172	2	.000	298
Access to free training in growing trees for carbon	42.660	2	.000	314
What other landholders in my community will think	5.464	2	.065	276
Access to more information on current programs for planting trees for carbon sequestration	34.744	2	.000	304
The potential for the trees to provide habitat for native birds and animals	8.362	2	.015	323
An outside organisation doing all the work for me, while paying me for use of my land to grow trees	27.210	2	.000	313
Having an expert come and give me advice about growing trees on my property	31.386	2	.000	314
If the trees provided shelter for stock as well as sequestering carbon	24.028	2	.000	321
If the trees addressed land degradation problems on my property as well as sequestering carbon	21.785	2	.000	311
Being able to plant as little an area as 1 hectare	21.466	2	.000	318
Being able to plant a minimum area of 10 hectares	20.422	2	.000	309
Being able to choose the location and area planted	25.577	2	.000	318
Being able to plant trees on my marginal land	32.561	2	.000	306
Being able to plant trees on my more productive land	14.173	2	.001	310
Being given flexibility to choose what tree species are planted on my land	22.671	2	.000	320
Having a regulated carbon market approved by the government	40.668	2	.000	282

Willingness to plant trees for carbon sequestration under different scenarios

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	Asymp. Sig.	n
...if you are able to plant locally growing native species rather than species not native to your local area	16.304	2	.000	335
...if you are able to plant high yielding tree species rather than lower yielding local native species	15.836	2	.000	330
...if you are able to plant and manage the trees yourself, rather than having someone do it for you (eg a carbon tree business)	11.537	2	.003	334
...if someone plants and manages the trees for you, rather than you having to do the work yourself	22.550	2	.000	332
...if trees are planted only on your marginal land, rather than your productive agricultural land	11.888	2	.003	329
...if trees are planted mostly on your productive agricultural land, rather than your more marginal land	9.914	2	.007	330
...if trees had to be planted on only a small proportion of your property, rather than a large proportion	12.801	2	.002	334
...if trees had to be planted on a large proportion of your property, rather than only a small proportion	3.264	2	.196	334
...if trees provided environmental benefits for your property as well as growing carbon, rather than providing only carbon sequestration benefits	31.616	2	.000	334
...if trees provided shade and shelter for stock on your property as well as growing carbon, rather than providing only carbon sequestration benefits	24.438	2	.000	334
...if trees could be harvested for commercial timber sale and replanted as well as you receiving payment for the carbon grown in them	16.310	2	.000	334
...if the upfront costs of establishing trees are covered but you manage the trees, versus an outside organisation doing all planting and management	22.724	2	.000	334
...if the minimum time you had to grow the trees for was 30–40 years rather than 100 years	31.813	2	.000	332

Minimum return required to plant trees for carbon sequestration under different scenarios

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

	chi-square	df	Asymp . Sig.	n
Trees planted on your marginal land; a small proportion of your land is planted; you provide all labour	18.173	2	.000	319
Trees planted on your productive agricultural land; a small proportion of your land is planted; you provide all labour	36.855	2	.000	324
Trees planted mostly on your marginal land; a large proportion of your land is planted; you provide all labour	35.878	2	.000	318
Trees planted mostly on your productive agricultural land; a large proportion of your land is planted; you provide all labour	24.854	2	.000	320
Trees planted on your marginal land; a small proportion of your land is planted; trees planted and managed by others	26.301	2	.000	318
Trees planted on your productive agricultural land; a small proportion of your land is planted; trees planted and managed by others	30.249	2	.000	319
Trees planted mostly on your marginal land; a large proportion of your land is planted; trees planted and managed by others	25.816	2	.000	318
Trees planted mostly on your productive agricultural land; a large proportion of your land is planted; trees planted and managed by others	18.383	2	.000	320

Sources of information on tree planting for carbon sequestration

Each statement below was analysed to identify if there were significant differences between non-adopters, possible adopters and likely adopters, using the Kruskal-Wallis H test.

i. How would you rate your current level of awareness and knowledge about the following issues?

	chi-square	df	Asymp. Sig.	n
Current programs that pay landholders to grow trees on their land for carbon sequestration	6.554	2	.038	323
Government rules and regulations regarding planting trees for carbon sequestration	6.954	2	.031	316
Results of scientific studies into carbon sequestration by different types of trees	16.328	2	.000	315
Carbon prices and markets	14.076	2	.001	313
Where I can find more information on planting trees for carbon sequestration	6.661	2	.036	311

ii. How useful would you find information delivered in the following ways about tree planting for carbon sequestration?

	chi-square	df	Asymp. Sig.	n
Short brochures or information sheet	15.608	2	.000	324
Field days	18.260	2	.000	320
Websites	10.398	2	.006	312
Newspaper and radio articles	5.343	2	.069	323
One-on-one discussions with an expert	16.026	2	.000	317
Detailed brochures and books	10.745	2	.005	324
Training courses	20.601	2	.000	313
Presentations/seminars	18.972	2	.000	319
Scientific papers and reports	2.543	2	.280	318

iii. What is your level of trust in information about tree planting for carbon sequestration provided from the following sources?

	chi-square	df	Asymp. Sig.	n
Federal government	5.495	2	.064	316
State government agency (eg DPI)	12.902	2	.002	317
Not-for-profit organisations planting trees for carbon sequestration	17.341	2	.000	310
For-profit organisations planting trees for carbon sequestration	10.610	2	.005	308
Media outlets eg newspapers, radio	1.390	2	.499	313
Local landcare groups	8.650	2	.013	323
Other farmers in my area	2.314	2	.314	320
Friends and family	1.439	2	.487	315