



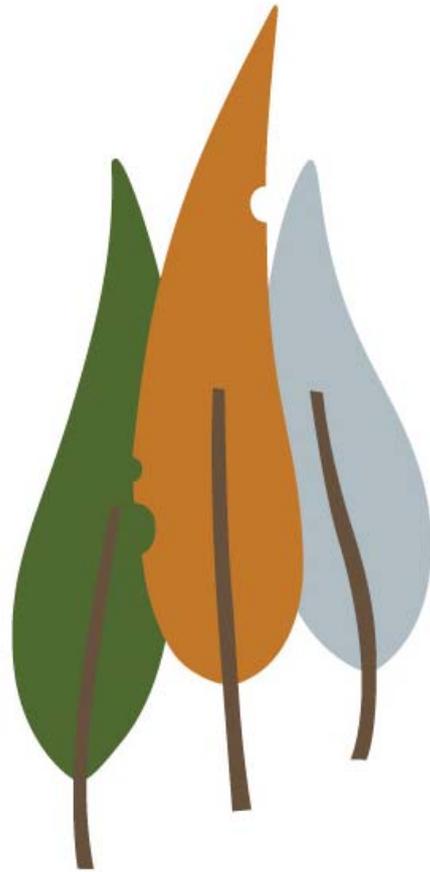
**Summary report**

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

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**CRC** for Forestry  
Researching sustainable forest landscapes





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

L Bull<sup>1,2</sup>, J Schirmer<sup>1,2</sup>

Summary report

<sup>1</sup> Fenner School of Environment and Society, Australian National University

<sup>2</sup> Cooperative Research Centre for Forestry

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**COOPERATIVE RESEARCH CENTRE FOR FORESTRY**

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

[www.crcforestry.com.au](http://www.crcforestry.com.au)

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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.

## **Why do we need to understand landholder views about tree planting for carbon sequestration?**

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

Tree planting for carbon sequestration needs to occur on cleared land. In Australia, it will primarily take place on land currently used for agriculture. This means that, to occur on a large scale, landholders need to be willing to either plant trees on their own land, or permit others to do so, for example, through leasing land to carbon companies.

Little is known about whether Australian landholders are interested in or willing to consider planting trees for carbon sequestration. This study aims to address this knowledge gap, through a study of landholders in New South Wales.

## Study region

We explored landholder perceptions of tree planting for carbon sequestration in rural New South Wales (NSW), Australia, 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 commercial tree planting had not occurred in the past (Hay, Naranderra). Within this region, some businesses currently offer landholders options to plant trees for carbon sequestration, operating in the voluntary carbon market.

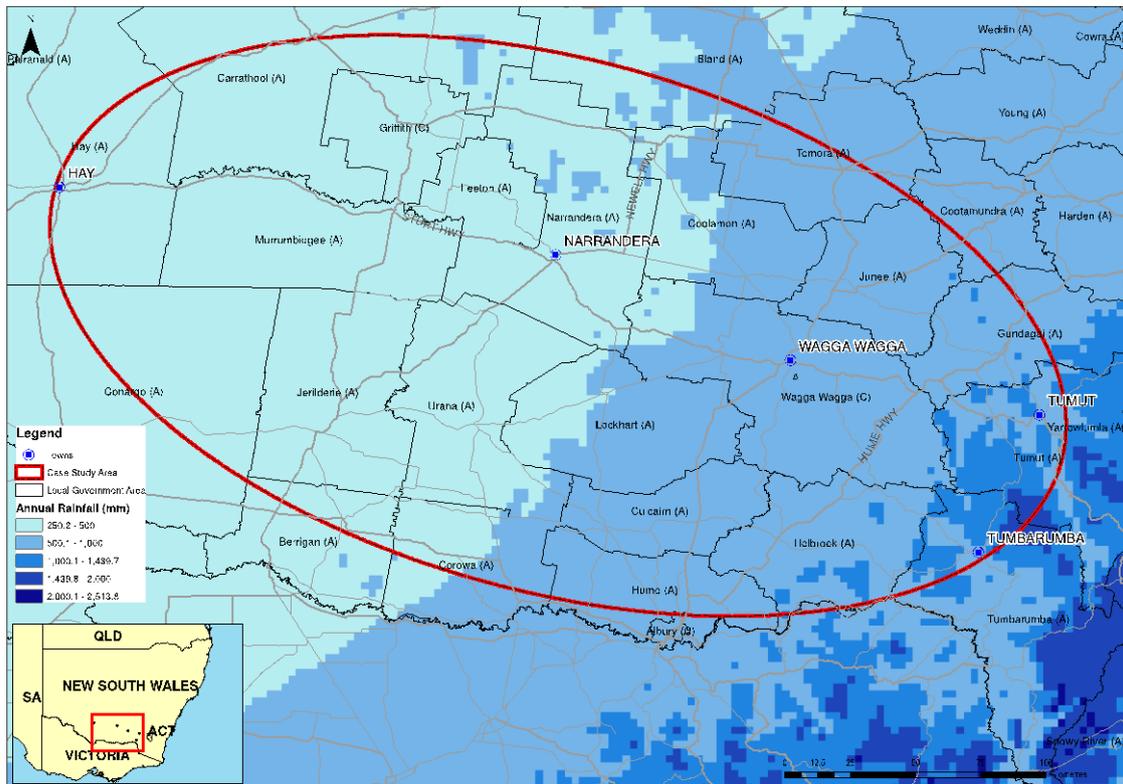


Figure 1. Case study region showing annual rainfall levels

## Methods

From May to September 2010, we explored landholders' views about tree planting for carbon sequestration through:

- Seven focus groups, attended by 32 landholders. The focus groups were held in Tumut (two), Narrandera (two), Wagga Wagga (two) and Hay (one).
- A postal survey that achieved a 40% response rate, with 352 survey responses received.

Most of our results took the form of what is known as exploratory data analysis, in which we identified the proportion of landholders responding to the survey expressing particular views, and undertook bivariate statistical analysis examining the relationship between landholder willingness to adopt tree planting for carbon sequestration, and their characteristics, values and beliefs about a range of issues. This means that, while we know some landholder characteristics are highly correlated with their willingness to adopt, we don't know why—to establish the full reasons why these factors are correlated with interest in adoption requires further study.

For more detail, information on the methods used, and references to the literature referred to in the study, see the full technical report of this research, available at:

<http://crcforestry.com.au/publications/technical-reports/index.html>.

## Are landholders willing to consider adopting tree planting for carbon sequestration?

While very few landholders have actually planted trees for the purpose of sequestering carbon, the majority are willing to consider adopting the activity in future. In our study, 10% indicated they were actively considering planting trees for carbon sequestration (*likely adopters*), and a further 67% indicated they might consider it in future (*possible adopters*) (Figure 2). Just under 20% of respondents were unwilling to consider participating in this type of tree planting (*non-adopters*). These results suggest a high level of interest in adoption, but it may take considerable effort to translate this willingness to consider adoption into on-ground tree planting.

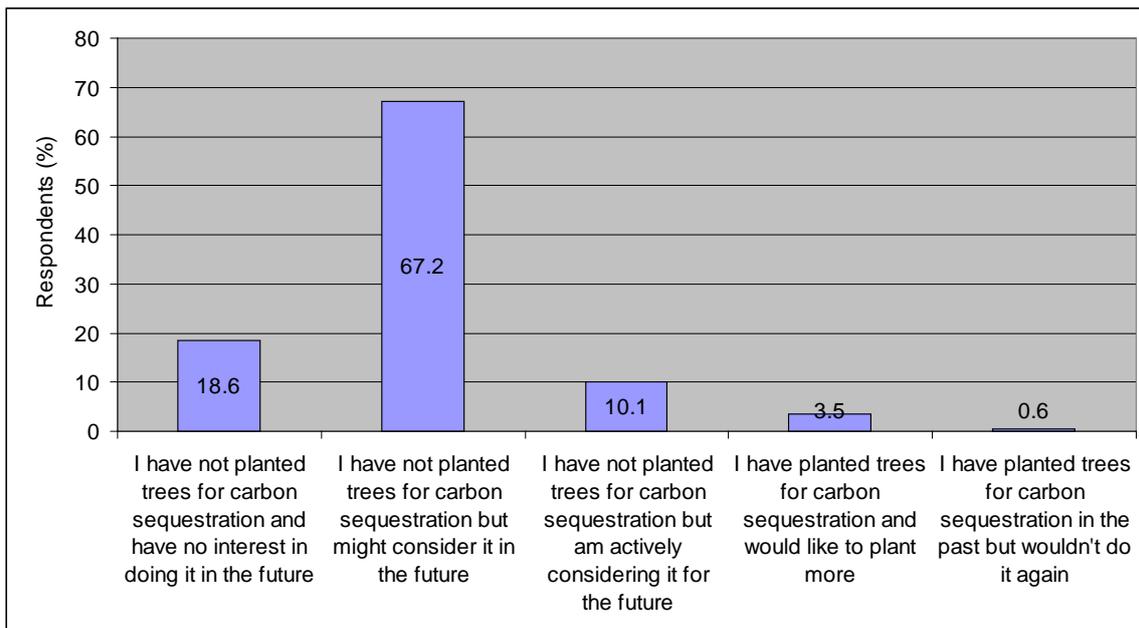


Figure 2. Landholder willingness to adopt tree planting for carbon sequestration (n=345)

## What factors influence landholder's willingness to adopt?

We compared characteristics of likely adopters, possible adopters, and non-adopters to identify which types of landholders are more likely to fall into each category.

### (i) *The nature of the farm enterprise*

Landholders who managed their property for 'hobby' or 'lifestyle' purposes were more likely to be interested in planting trees for carbon sequestration than those who managed their land primarily for agricultural production.

Factors that *were not* associated with differences in willingness to adopt were the size of a landholder's property; the proportion of land a landholder considered to be 'marginal' for agricultural production; whether landholders were primarily involved in dry land agriculture or irrigated agriculture; the proportion of property covered in native vegetation; the type of agriculture undertaken (e.g. sheep farming, beef farming, cropping, horticulture); and whether a landholder had a conservation covenant over some or all of their property.

### (ii) *Values and beliefs about how land should be managed, climate change and a farmer's obligations*

Amongst other factors, landholders were significantly more likely to be willing to plant trees for carbon sequestration if they:

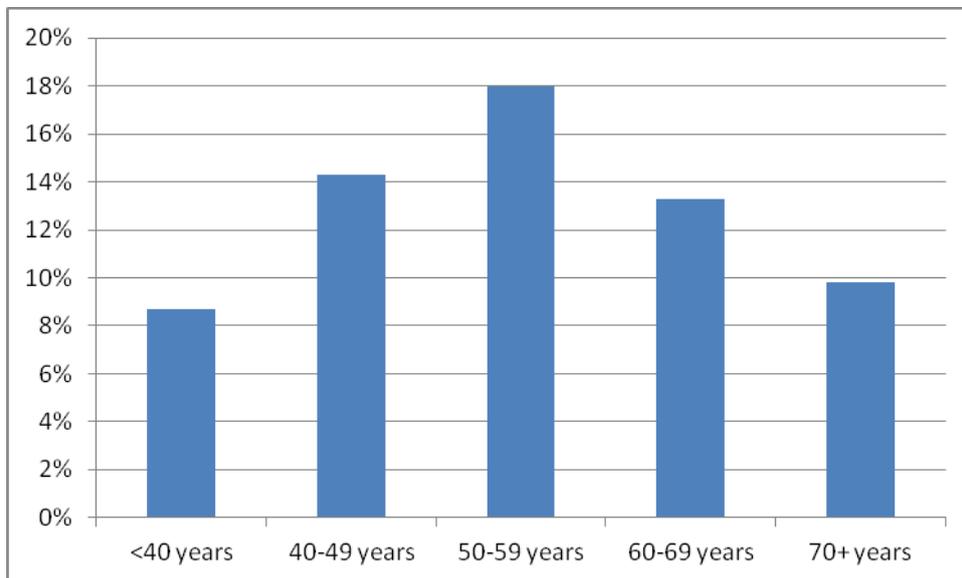
- Deemed that it was acceptable to grow trees on good farm land
- Believed trees had environmental benefits for their property and beyond it
- Believed that human use of fossil fuel is changing the climate
- Wanted to plant more trees on their property and did not feel their property already had enough trees
- Believed planting trees improves how their property looks
- Did not believe that future governments might prevent them using the land on which they plant trees
- Did not believe that farmers should be paid to manage their land to provide benefits for the wider community.

### (iii) *Socio-demographic characteristics of landholders*

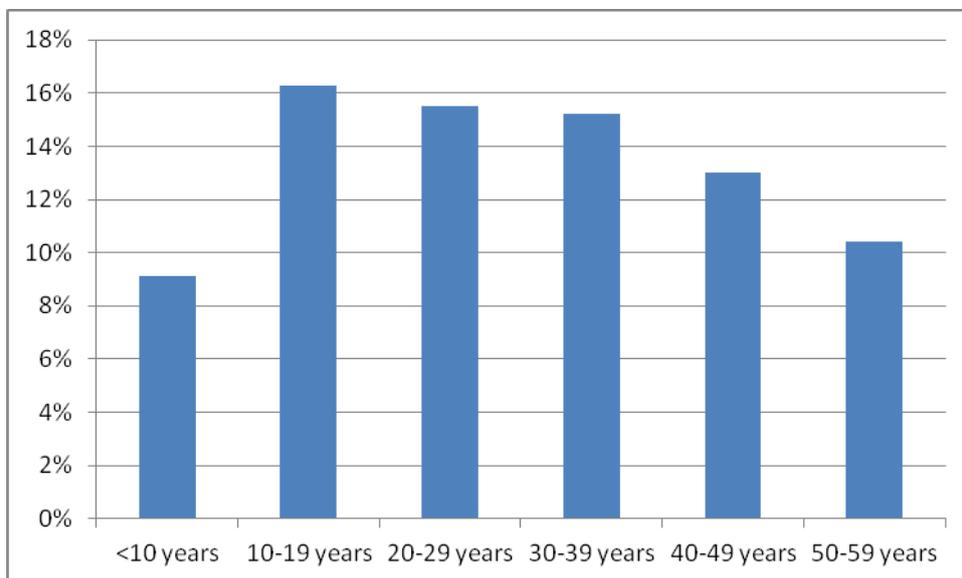
Landholders with the following characteristics were somewhat more likely to be willing to consider planting trees for carbon sequestration compared with others:

- Those aged between 40 and 60 (Figure 3)
- Those with lower levels of formal educational attainment, although the differences were not statistically significant
- Those who described their primary occupation as being a job other than farming
- Those who had owned or managed their current property for a shorter period of time, with the exception of those who had managed it for less than 10 years (Figure 4)
- Those who planned to hand down or sell their property to family members, rather than sell it outside the family.

Socio-demographic characteristics that were *not* associated with differences in willingness to adopt tree planting for carbon sequestration were gender, participation in off-farm work, the proportion of household income earned off-farm, the number of generations a landholder’s family had been involved in farming, and the household income earned by the landholder.



**Figure 3.** Adoption intent by age group: proportion of landholders in different age groups who were ‘likely adopters’



**Figure 4.** Adoption intent by property history: proportion of landholders who had owned their property for different period of time who were ‘likely adopters’

## Familiarity with tree planting

A landholder’s familiarity with an activity is known to influence their willingness to adopt that activity. With little history of tree planting for carbon sequestration in the study region, we asked landholders about their familiarity with tree planting more broadly.

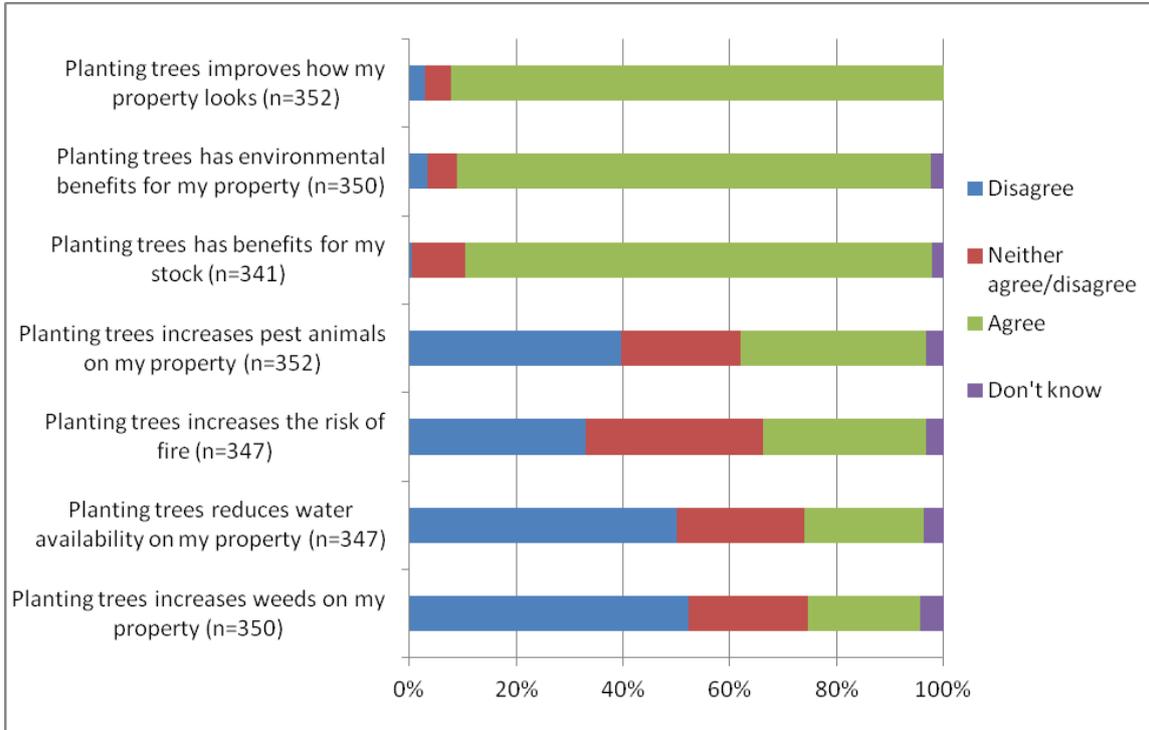
The large majority of landholders—97%—had experience with planting trees for one or more of the following purposes:

- Shade and shelter for stock (84%)
- Improving the aesthetics of the property (70%)
- Increasing birds and animals on the property (58%)
- Rehabilitating degraded land (43%)
- Reducing salinity on their property (21%).

Additionally, 4% had planted trees to produce commercial timber, and 5% to sequester carbon (usually for no payment).

Landholders feel positively about the benefits of planting trees on the environment and the aesthetics of their property, and for providing stock shade and shelter. Some are concerned about the risk of fire and the potential for the presence of trees to attract pest animals (Figure 5).

These results suggest that familiarity with and views about tree planting in general are not a barrier to planting trees for carbon sequestration.



**Figure 5.** Landholder views about tree planting in general

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

Our survey was circulated in 2010, before the Australian government announced its Carbon Farming Initiative, and at a time when there was no clear government framework for enabling trading of carbon sequestered in trees. Unsurprisingly, most survey respondents felt that carbon markets were uncertain. They also lacked confidence that there would be a reliable carbon market in the future, which suggests that developing clear market frameworks is critical to achieving adoption (Figure 6).

A high proportion of landholders indicated a lack of knowledge about financial markets and returns associated with carbon sequestration. Over 30% of landholders indicated a lack of knowledge about current market and financial arrangements, and almost 50% lacked knowledge about whether there were currently opportunities to sell carbon stored in trees, what potential carbon prices might be, or whether the government was likely to support long-term markets for carbon sequestered in trees.

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, felt financial returns would be high enough to justify planting trees on land instead of using it for agriculture, would be satisfied with a financial return that covered their costs, and believed there was clear legislation providing a basis for a market. Therefore, these issues are critical to achieving any widespread adoption.

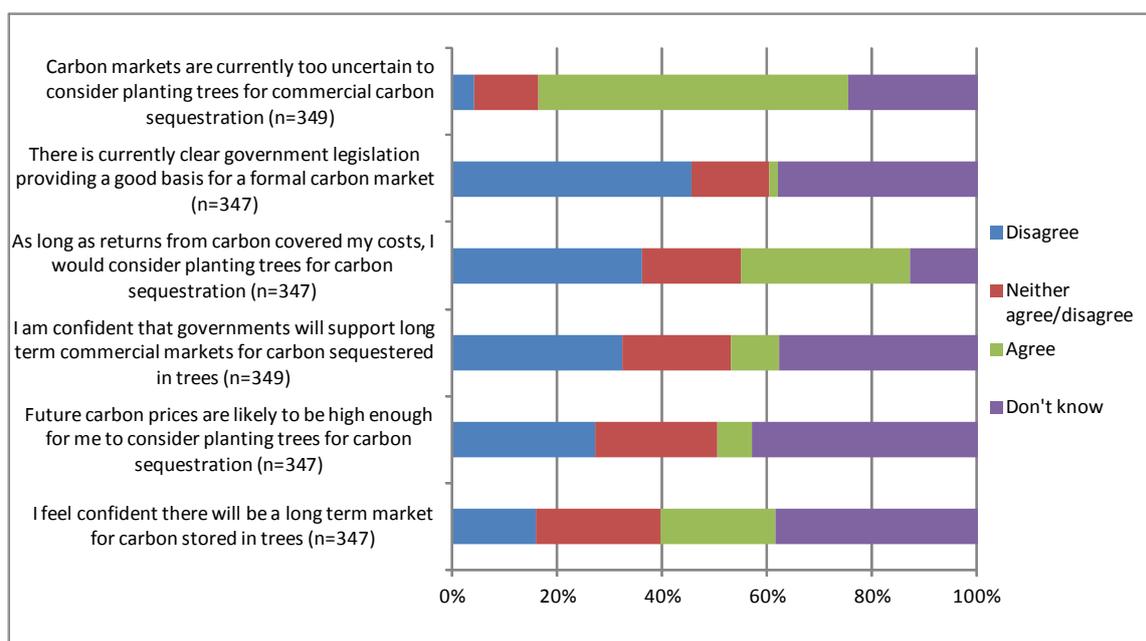
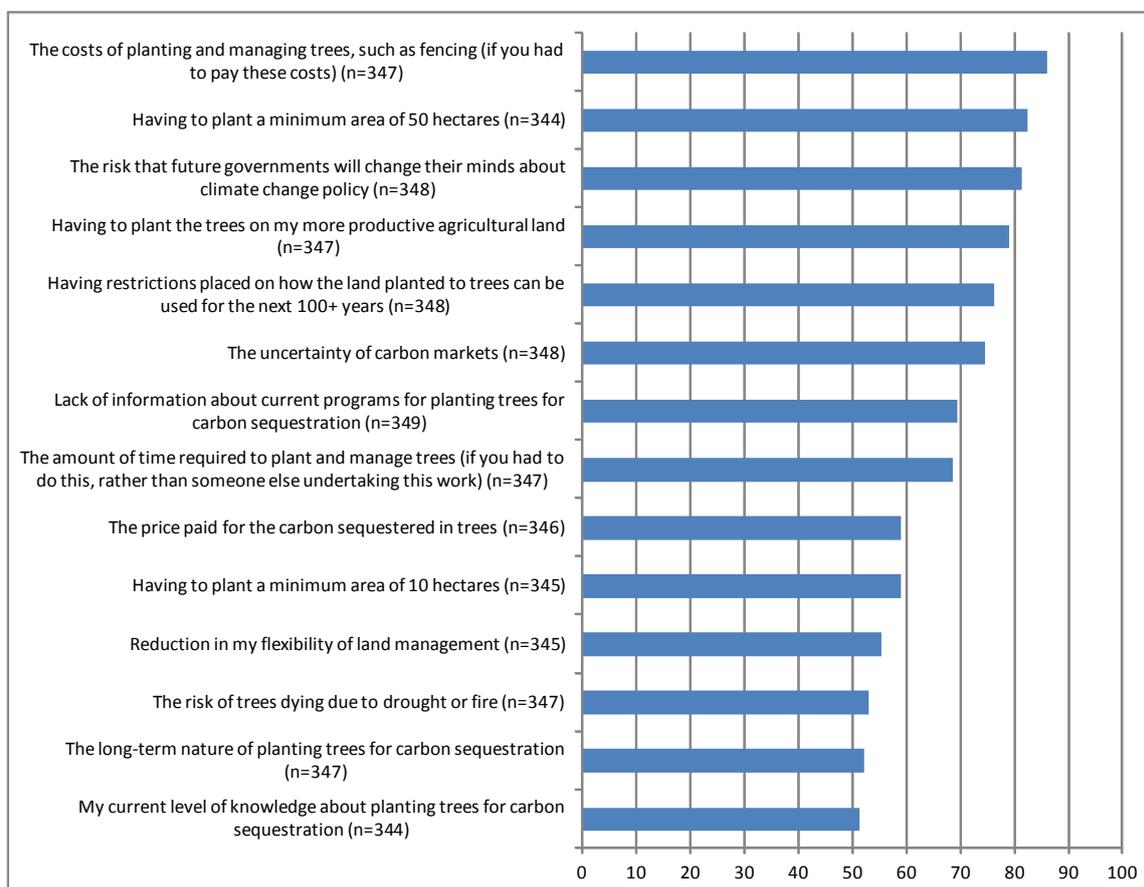


Figure 6. Landholder views about markets and financial returns

## Barriers to planting trees for carbon sequestration

Landholders were asked whether a number of issues in the following areas presented a barrier to adopting tree planting for carbon sequestration: risk and uncertainty; land management and community; information and knowledge; markets, regulation and policy; and location and areas of trees. Figure 7 shows the issues that more than 50% of respondents considered ‘moderate’ or ‘large’ barriers.



**Figure 7.** Proportion of landholders who rate an issue as a ‘moderate’ or ‘large’ barrier to adoption

Other issues that presented barriers to less than 50% of respondents included the views of other landholders, the amount of suitable land available on their property for growing trees, their level of knowledge about planting and managing trees, the water use of trees or potential to provide habitat for pests, or the risk of trees not growing successfully.

Overall, market, regulatory and policy issues were most consistently ranked as barriers to adoption, together with concerns about loss of flexibility in land use. Issues related to physical dimensions of growing trees and the risk of them dying were considered less of a barrier, as were information and knowledge barriers.

## Incentives for planting trees for carbon sequestration

As well as asking about barriers to adoption, incentives for adoption were also examined. Figure 8 shows the issues that more than 50% of respondents considered ‘moderate’ or ‘large’ incentives to adopt tree planting for carbon sequestration. These primarily involved having appropriate financial incentives and stable markets; having flexibility on where trees are planted on the property; and having the trees produce co-benefits for the property, such as shade and shelter for stock.

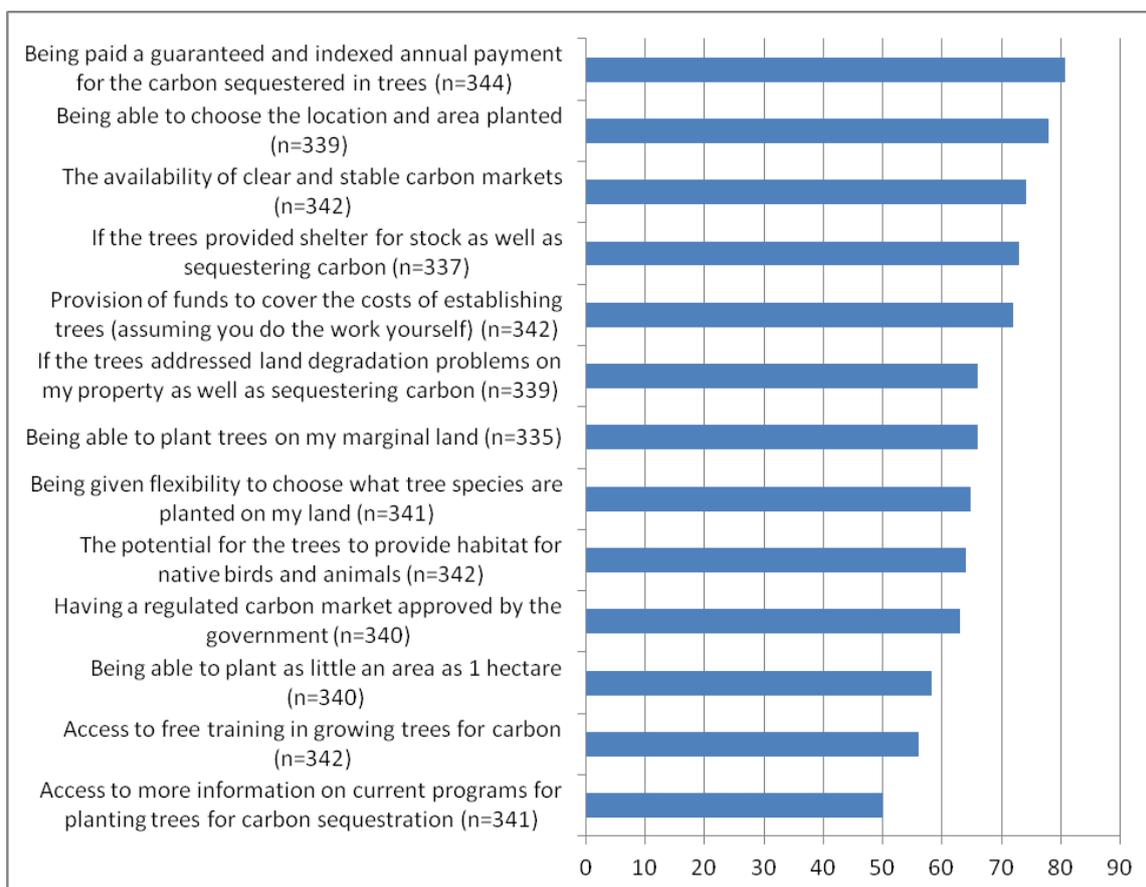


Figure 8. Issues that more than 50% of respondents considered ‘moderate’ or ‘large’ incentives to adopt tree planting for carbon sequestration.

Other issues that presented incentives to less than 50% of respondents included the views of other landholders, having an outside organisation undertake all work while paying the farmer for use of their land, and having an expert provide advice about growing trees on the landholder’s property.

Overall, incentives related to financial return, flexibility of land use, and markets were the most critical for encouraging adoption.

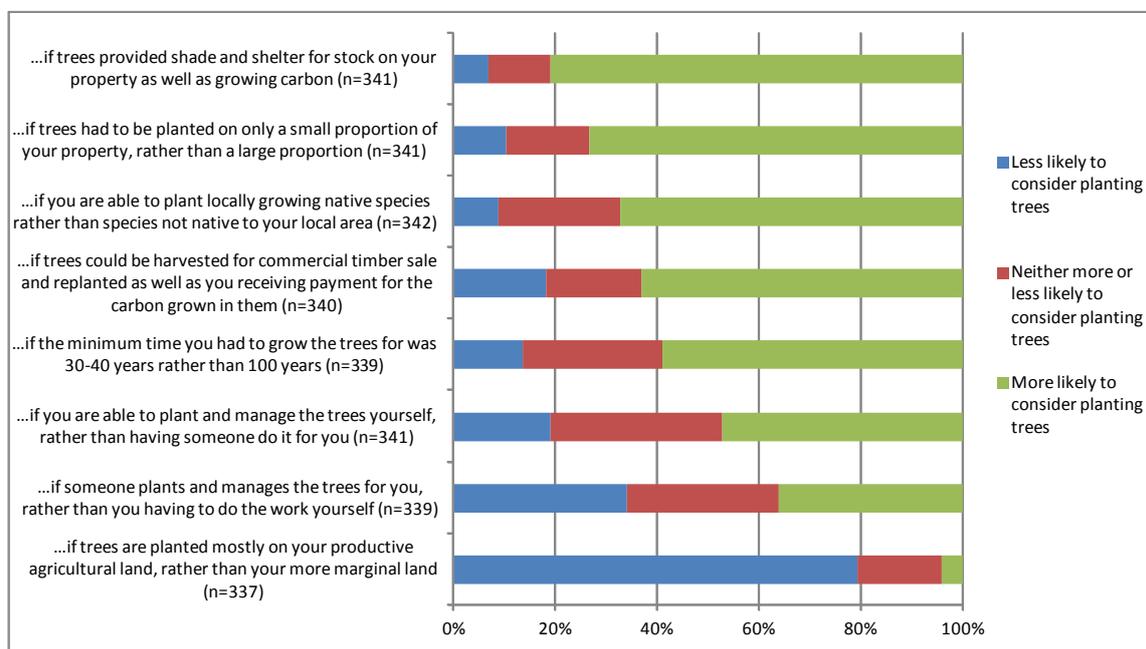
## Willingness to plant trees for carbon sequestration under different scenarios

To further explore how different design approaches to carbon tree planting programs influence likely landholder adoption, we asked respondents to identify whether having particular characteristics would make them less likely, neither more or less likely, or more likely to consider planting trees. They were asked both for their general preferences (Figure 9), and what level of financial incentive would make them willing to plant under differing circumstances (Figure 10).

Landholders who were willing to consider adopting tree planting for carbon sequestration were significantly more likely than non-adopters to be willing to plant under any of the scenarios examined.

Going beyond this general trend, willingness to adopt is significantly higher when only a small proportion of the property is planted and this is marginal land; when the carbon planting scheme involves growing trees for a shorter time; when the farmer manages the trees rather than an outside organisation; when the trees provide co-benefits of any type (commercial or environmental); and when species native to the local area are used.

However, a significant proportion of landholders (36%) did indicate that having an outside organisation plant and manage trees on their behalf would make them more likely to plant trees, compared with 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.



**Figure 9.** Landholder willingness to adopt under different scenarios

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. 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 external organisation managed the trees.

Non-adopters, possible adopters and likely adopters differed significantly in their responses 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. 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.

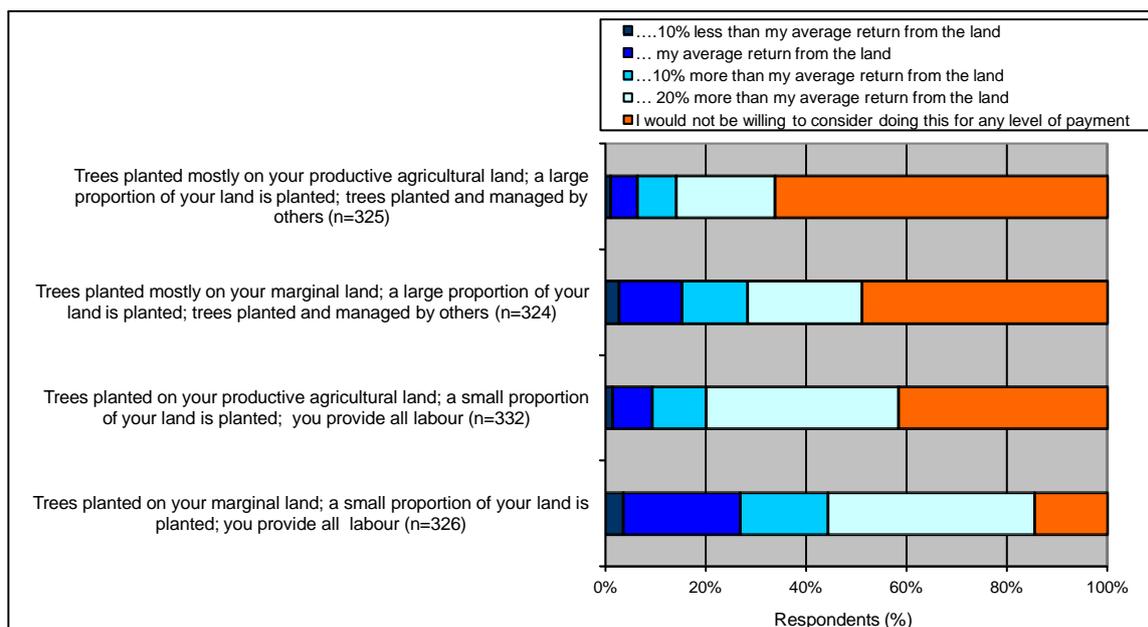


Figure 10. Financial incentive needed to adopt under different scenarios<sup>1</sup>

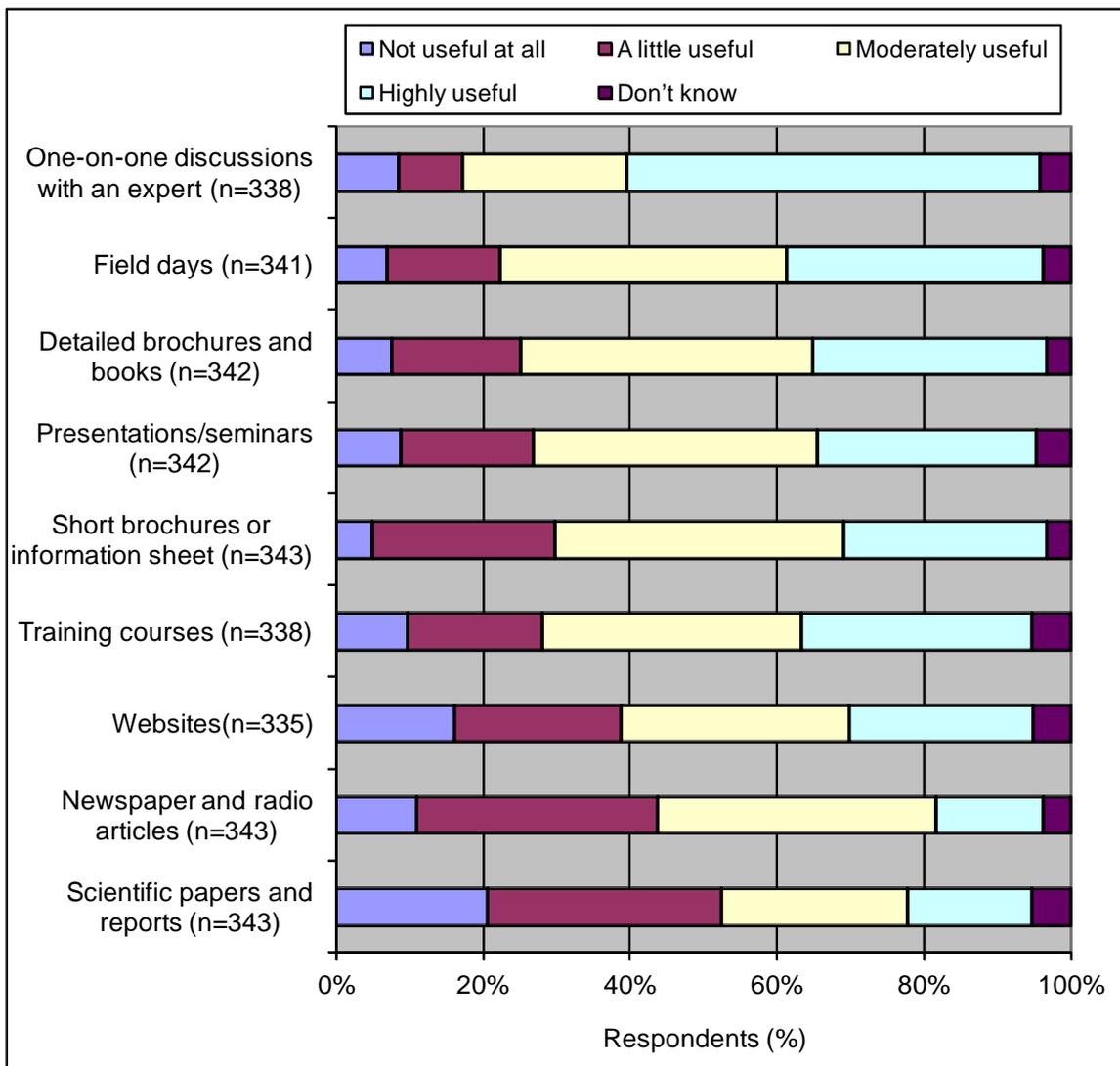
<sup>1</sup> Note: A larger number of scenarios were assessed; see the [technical report](#) for full details of these.

## How do landholders prefer to learn about tree planting for carbon sequestration?

Almost all landholders felt that their current level of knowledge about tree planting for carbon sequestration was poor. More than 60 per cent regarded their knowledge as poor in relation to markets, scientific evidence, government rules and regulations, current carbon tree planting programs, and even where they can access these types of information. Less than 10% rated their knowledge as good.

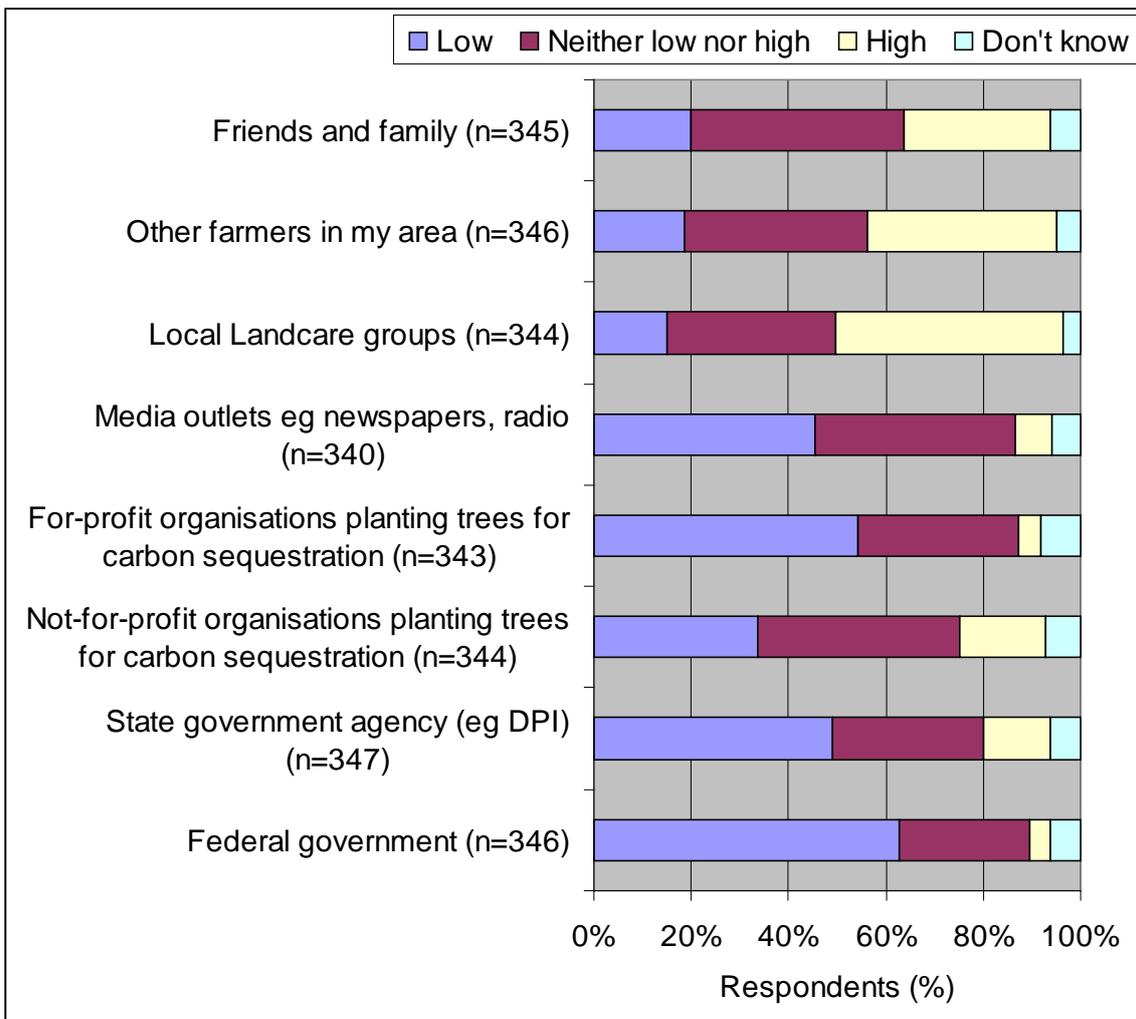
Landholders who were willing to consider adopting tree planting were significantly more likely than non-adopters to rate their knowledge as very poor or poor, while those not willing to consider adopting were significantly more likely to consider their knowledge as good or very good. This suggests non-adopters will be much less likely to seek information about this activity.

The information sources viewed as most useful by respondents were one-on-one discussions with an expert and field days, followed by detailed brochures and books. Websites, media articles and scientific papers and reports were rated least useful, although 42% or more landholders did rate them moderately or highly useful.



**Figure 11.** Landholder views on the usefulness of information on tree planting for carbon sequestration delivered in different ways

Landholders' 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, nor 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 12).



**Figure 12.** Landholders' level of trust in information about tree planting for carbon sequestration provided from different sources

## Conclusions

Landholders in our study region are cautiously interested in tree planting for carbon sequestration, with the majority willing to consider adopting it. For widespread adoption to occur, a number of issues need to be addressed. In particular, a clear and stable carbon market needs to be developed that is supported by an appropriate legislative framework. If this occurs, then landholders with an interest in adoption can be reached through a range of extension strategies; our results show there are various avenues available to ensure information is tailor-made to reach landholders. However, landholders who expressed no interest in adoption are unlikely to be easily convinced by activities like information dissemination.

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.

When considered from the point of view of achieving the lowest cost and most efficient carbon sequestration, landholders' preferred model of tree planting is not ideal. This is because establishing many small tree plantings increases transaction costs, and planting on marginal land often involves a lower rate of carbon sequestration than does planting trees on productive land. However, our results suggest that convincing landholders to plant large areas of productive land is highly unlikely. To do so will require not only higher returns, but also necessitates overcoming strongly held values about how good agricultural land should be used.

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

### More information

For more information you can download the full report at:

<http://crcforestry.com.au/publications/technical-reports/index.html>