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**Abstract** Farm forestry is promoted in many Australian regions as a strategy to address environmental decline on farmland, add to farm incomes, and contribute to regional forest industries. At the core of the Commonwealth and State governments' policies on farm forestry is the assumption that a large proportion of landholders will be able to grow trees profitably for timber. Results from a mail survey of landholders in three catchments in Victoria ' Goulburn-Broken, Ovens and Wimmera during 1999 to 2002, revealed low levels of farm forestry adoption. Landholders are concerned about what they see as uncertain and uncompetitive regional markets for small-scale growers. Analysis of survey data suggests that high levels of property turnover will occur over the next 10 years. The authors' view is that these trends are serious impediments to the widespread adoption of farm forestry in these catchments and have important implications for Commonwealth and State policies. We conclude with some practical suggestions about how farm forestry policy and programs can be more effective by responding more directly to the concerns and values of landholders.

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# Adoption of farm forestry in Victoria: Linking policy with practice

Digby Race and Allan Curtis

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## **Summary**

*Farm forestry is promoted in many Australian regions as a strategy to address environmental decline on farmland, add to farm incomes, and contribute to regional forest industries. At the core of the Commonwealth and State governments' policies on farm forestry is the assumption that a large proportion of landholders will be able to grow trees profitably for timber. Results from a mail survey of landholders in three catchments in Victoria – Goulburn-Broken, Ovens and Wimmera during 1999 to 2002, revealed low levels of farm forestry adoption. Landholders are concerned about what they see as uncertain and uncompetitive regional markets for small-scale growers. Analysis of survey data suggests that high levels of property turnover will occur over the next 10 years. The authors' view is that these trends are serious impediments to the widespread adoption of farm forestry in these catchments and have important implications for Commonwealth and State policies. We conclude with some practical suggestions about how farm forestry policy and programs can be more effective by responding more directly to the concerns and values of landholders.*

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## ***Interest in farm forestry***

Most of Australia's farmland has been cleared of its original native vegetation and has become the source of increasing environmental degradation – declining water quality, loss of fertile topsoil, loss of biodiversity, and decline in important landscape functions (e.g. carbon sequestration) (Australia's State of the Environment Report 2001). Commercial forest plantations, including small-scale farm forests, offer the potential to address environmental degradation, supply the fibre needed by a range of processing industries, diversify the incomes of farmers, and contribute to industrial development and associated employment – particularly outside capital cities (Commonwealth of Australia 2004). This situation is reflected at the international level, where it is common for national governments to provide strong policy support to increase the area of trees on farmland – for environmental and commercial reasons (Food and Agriculture Organisation 2003).

Despite strong support expressed by Australia's Commonwealth and State governments in policies (e.g. *Plantations 2020 Vision*), adoption of farm forestry by landholders – the management of trees on farms for commercial and other benefits – is very slow in many regions. The National Forest Inventory indicates that in some regions farm forestry comprises up to 20% of private forestry established since 1995 (e.g. south-west Western Australia, south-west Victoria), yet in many other regions farm forestry makes a negligible contribution (National Forest Inventory 2005). Part of the explanation for this contradiction between policy and practice is that the opportunities for farm forestry are largely determined at the regional or local level (Herbohn and Harrison 2004), not the national level.

At the farm level, it seems that many landholders are unwilling to change the mix of their farm enterprises to include farm forestry if the prevailing regional markets are uncompetitive and risky (Curtis and Race 1997, Schirmer *et al.* 1999, Alexander *et al.* 2000, Emtage *et al.* 2001). When commercial forestry is perceived as undermining the social, economic and aesthetic values of local communities, there are additional impediments to the uptake of farm forestry (Petheram *et al.* 2000, Tonts *et al.* 2001). In this paper, the authors' draw on findings from separate questionnaires completed by a random sample of rural landholders in three Victorian catchments – the Goulburn-Broken, Ovens and Wimmera catchments (illustrated in Figure 1), to explain the apparent contradiction between farm forestry policy and landholder behaviour. We then draw upon these findings to identify some of the ingredients that are likely to make farm forestry more attractive to landholders.

## ***Context of Australian farm forestry policy***

While there is broad policy support by the Commonwealth and State governments to increase investment in private forestry, the detail on how such policies should be implemented remains contentious. For example, the conversion of degraded native forests to plantations, harvesting of private native forests, water use of an expanding plantation estate, and changes in amenity values of rural landscapes remain highly contentious for some individuals and organisations (Dargavel 1995, Coakes 1998, Schirmer and Tonts 2003, Williams *et al.* 2003).

Notwithstanding these concerns, the Australian government has increased its support for forestry in pursuit of the multi-functionality that it can offer, including:

- arresting land degradation that occurs on much of Australia's farmland – it was recently estimated that 5.7 million hectares of farmland is at a high risk of dryland salinity, with this forecast to increase to 17 million hectares by the year 2050, with suggestions that it may require revegetation of at least 40% of farmland if this is to be averted (National Land and Water Resources Audit 2001);
- rejuvenating agriculture by developing an alternate income stream for farmers – if 5% of the wheat-sheep zone and 10% of high-rainfall farmland was planted with farm forestry, it could generate a gross value turnover of \$3.1 billion per year once a sustainable harvest is reached and add up to 20% to farm incomes (Centre for International Economics 1996); and
- developing forest industries – Australia's forest industries employ 80,000 people and generate an annual business turnover of \$12.2 billion (Commonwealth of Australia 2003).

Government support for farm forestry has steadily increased since the early 1990s, reflected in a series of national policies, namely the:

- *National Forestry Policy Statement* (NFPS) (1992),
- *Wood and Paper Industry Strategy* (WAPIS) (1995), and

- *Plantations for Australia: The 2020 Vision* (Plantations 2020 Vision) (1997), which has the notional goal of expanding Australia's plantation estate to a total of 3 million hectares by the year 2020.

The elements of farm forestry in these policies have been implemented and supported through the:

- Commonwealth's Farm Forestry Program – managed by the Department of Agriculture, Fisheries and Forestry (DAFF), with \$49.2 million allocated since the program's inception in 1993;
- Agroforestry Australia's research program (formerly the Joint Venture Agroforestry Program) – a consortium of Commonwealth agencies and industry associations that has allocated about \$3 million per year since the early 1990s for farm forestry research; and
- State government initiatives addressing NRM issues (e.g. salinity, water quality) through activities to stimulate the uptake of commercial forestry on farmland (e.g. *Private Forestry Victoria: Growing the future of forestry* launched in 2002).

The Victorian government has continued to encourage the adoption of farm forestry to provide '...economic, social and environmental benefits for all Victorians' (Department of Natural Resources and Environment 2002: 2). Despite the government's encouragement, including through the release of its most recent strategy – *Growing the Future in Forestry: Growing private forests, 2002-05*, and nominating a target of 300,000 ha of farm forestry by the year 2020 (Department of Primary Industries 2004), farm forestry continues to play a minor role, if any, on most Victorian properties (National Forest Inventory 2005). However, farm forestry does feature in many of the Regional Catchment Strategies for the Catchment Management Authorities (CMA) in Victoria, established in 1997 as the organisations with the primary responsibility for catalysing on-ground action to repair land and water degradation.

To assist national programs take account of the varying characteristics of forestry at the regional level, since the mid-1990s, the Commonwealth and State governments have funded Private Forestry Development Committees (PFDC) in regions considered to have the most potential for growth in commercial forestry. The PFDCs (formerly termed Regional Plantation Committees) provide a forum for representatives of regional forestry interests (private and public organisations) and are authorised to foster commercial forestry on private land, beyond large-scale industrial plantations (public forests remain under the sole authority of State government agencies) (Commonwealth of Australia 2003). In October 2005, the Australian Government's Minister for Forestry announced funding of \$3.5 million

to support the 21 PFDCs to continue work over the next two years to promote private forestry (DAFF 2005). The regions of two PFDCs overlap in area with the surveys of the three catchments discussed in this paper: the area of the Green Triangle Plantation Committee covers the south-west area of the Wimmera catchment (further details available at [www.gtplantations.org](http://www.gtplantations.org)) and Plantations North East covers a considerable part of the Ovens and Goulburn-Broken catchments (further details available at [www.plantationsnortheast.com.au](http://www.plantationsnortheast.com.au)) (refer to Figure 1).

**Figure 1: Map of Victoria indicating boundaries of Catchment Management Authorities (CMA) and two Private Forest Development Committees**

*... insert Figure 1 about here ...*

### ***Growth of farm forestry in Australia***

Out of the long history of harvesting from native forests and establishing softwood plantations, emerged two segments of farm forestry in the 1980s: plantations through joint ventures with timber companies and government forest departments; and small, scattered mixed-species plantings for environmental repair and agricultural benefits (e.g. shelterbelts for livestock) (Dargavel 1995, Gerrand *et al.* 2003, Herbohn *et al.* 2001, Herbohn and Harrison 2004). The emerging interest in farm forestry was scaled up considerably during the 1990s, principally as a result of:

- galvanising the sentiment for 'Landcare' which popularised trees as a component of 'good' farming (recent estimates indicate that 40% of commercial farmers or 40,000

people in Victoria are active members of local Landcare groups) (Curtis and Van Nouhuys 1999);

- overseas and domestic investment to establish eucalypt woodlots, mainly in South Australia, Tasmania, Victoria and Western Australia, to meet the increased global demand for eucalypt pulp to produce high-quality paper (Japan being the major export market) (Bureau of Rural Sciences 2004); and
- investment brokers responding to the needs of overseas and domestic investment funds for a delayed return (e.g. in 10 to 20 years) coupled with an immediate taxation benefit. The 'up-front' cash flow of such investment allowed management companies to purchase farmland (appealing for many farmers wishing to retire from farming), or secure long-term access rights (usually 20 to 30 years) to farmland by negotiating joint ventures with annuity payments to landholders. During 1995-2000, an average of 86,000 ha per year were established (Figure 2), the majority being eucalypts planted on farmland by management companies (approximately 20% of the total area established is via joint ventures in some form with landholders, according to the National Forest Inventory 2005).

**Figure 2: Area of new plantations, 1995 to 2004**

Source: National Forest Inventory (2005).

*... insert Figure 2 about here ...*

South-west Western Australia, south-east South Australia, southern Victoria and Tasmania are well suited to growing blue gum (*Eucalyptus globulus*), a preferred species for producing high quality paper products. Those investing in eucalypt plantations in these areas can take advantage of the availability of large areas of cleared farmland with proximity to deep-sea



ports and competitive financial returns compared to many agricultural commodities (particularly wool). Recent analysis by the Australian Bureau of Agricultural and Resource Economics (ABARE) of farm enterprises indicates that farm forestry can be competitive with broadacre grazing enterprises (e.g. sheep and cattle) in selected regions (Burns *et al.* 1999).

There is evidence that forestry has added appreciably to the economies of key regional centres where it is concentrated, including Albany and Bunbury (Western Australia), Mount Gambier (South Australia), Hamilton and Portland (Victoria), and Devonport (Tasmania) (Stephens *et al.* 1998, Bureau of Rural Sciences 2004). However, the economic benefits of the recent investment in forestry have largely been restricted to the medium-high rainfall areas (greater than 700 mm per year) of the temperate coastal regions with deep-sea ports (Race 2000). Most of Australia's vast wheat-sheep zone with its medium-low rainfall (less than 700 mm per year), and large distances to processing and export hubs, has failed to attract any appreciable private investment in tree-based industries (CSIRO *et al.* 2001). This zone includes most of the Murray-Darling Basin, which generates 60% of Australia's agricultural produce, yet is under increasing threat of dryland salinity (Murray-Darling Basin Commission 2001).

Despite a widespread willingness for farm forestry to 'succeed', the opportunities vary considerably within and between regions (CSIRO *et al.* 2001). The regions and landholders that have the best potential for farm forestry have the following characteristics (Race *et al.* 1998; Schirmer *et al.* 1999, Race 2000, Race *et al.* 2004):

- sufficient land, labour or capital to invest in new enterprises/industries;
- conducive and accessible natural resources (e.g. suitable soils, rainfall);
- good economies of scale for themselves or in clusters;
- accessibility with current infrastructure (rail or road, air for people);
- low operating and harvesting costs;
- close proximity to processing facilities;
- access to competitive markets for a range of products and services (reduce economic vulnerability when relying on a single market); and
- opportunities for integrating farm forestry with current farming enterprises.

Our earlier research explored landholder and industry assessments of the farm forestry arrangements offered by the processing industry (Curtis and Race 1996, Race and Curtis 1997). This research identified some of the key factors influencing landholder decisions to invest in farm forestry, including their concerns about:

- the increased time and financial commitment involved to make forestry a successful farm enterprise;
- uncertain future markets and returns;
- becoming price-takers by being locked into long-term contracts with large companies; and
- prevailing negative community perceptions about the impacts of farm forestry.

Aside from this research focused on partnerships between small-scale growers and companies, there is increasing analysis of the prospects for farm forestry in regions where viable farm forestry industries have not developed despite appearing to possess many conditions favouring farm forestry, including adequate rainfall, access to markets, the need to address land and water degradation, and the need to diversify and increase farm incomes (Emtage *et al.* 2001, Herbohn *et al.* 2005). Such regions include the Goulburn-Broken, Ovens and Wimmera catchments in Victoria. This article draws on our local knowledge of farm forestry and the regions studied, and the findings of three comprehensive mail questionnaires sent to landholders in these catchments during 1999 to 2002. The questionnaires explored the level and rate of adoption of farm forestry and the importance of constraints identified in the literature as likely to affect adoption. Several research reports provide additional information to that presented in this article, and are available from the authors (Curtis *et al.* 2000 and 2002, Curtis and Byron 2002).

## **Overview of the three Victorian study areas**

The Goulburn-Broken, Ovens and Wimmera areas discussed in this article are bounded by water catchments. The Goulburn-Broken and Ovens are adjoining catchments in the north east of Victoria, and the Wimmera is located in the western part of the state (Figure 1). Given the close proximity of the Goulburn-Broken and the Ovens catchments, the description of these catchments has been combined.

The Goulburn Broken Catchment covers 2.3 million ha (17 per cent of Victoria), including 1.9 million ha of non-irrigated land that is referred to as the Goulburn Broken Dryland (GBD). The research reported in this paper was undertaken in the GBD, part of the Goulburn-Broken Catchment Management Authority (GBCMA) region. The Ovens catchment is part of the North East CMA region and covers 780,000 hectares of largely non-irrigated land.

Both the GBD and Ovens catchments begin on the continental side of the Australian Alps at elevations about 2,000 metres ASL, and fall through a series of river valleys towards the westerly flowing Murray River at around 200 metres ASL. The climate is typical of south-eastern Australia, with hot, dry summers and cool, wet winters, but there are large variations with altitude, in that temperatures are lower and rainfall higher in the mountains. Much of the mountains and foothills are covered in eucalypt forests and most of these areas are publicly owned. European systems of agriculture on privately owned land dominate the lower elevations and this land has little remaining native vegetation. There are important areas of irrigated agriculture, mostly horticulture and dairying, but dryland farming for sheep and cattle grazing and broadacre cropping (canola, wheat) occupy most cleared land. Primary production and associated processing industries, and tourism are the main contributors to economic wealth. Agricultural production from these watersheds contributes more than 25 per cent of Victoria's total export income.

In both the GBD and Ovens catchments there are numerous small towns with populations less than 3,000 and at least one regional city (Benalla in the GBD with a population of 6,000 and Wangaratta with a population of 15,000 in the Ovens). There has been considerable rural subdivision, mainly due to the proximity of the areas to Melbourne, which has a population of 3.5 million and is between two and four hours away by car. As a consequence, a substantial proportion of rural land in both catchments is primarily owned for lifestyle reasons rather than the economic potential of farming enterprises. Both the GBD and Ovens catchments support major agricultural industries, food processing, forestry (including pine plantations) and tourism activities. Soil erosion, waterlogging and dryland salinity have been some of the unintended consequence of land clearing in both watersheds.

The Wimmera catchment covers approximately three million hectares (20 per cent of Victoria). Landform in the Wimmera is typically gentle rolling plains interspersed in the south with a series of isolated volcanic hills and small mountains (maximum elevation of 750 m). The Wimmera River runs inland from these isolated mountains in the south to a series of large terminal lakes in the north. The climate is typical of south-eastern Australia, with

hot, dry summers and cool, moist winters, and winter rainfall is higher and summer temperatures lower towards the coast in the south. Eighty-five per cent of the native eucalypt forests and grasslands have been cleared to make way for European agriculture, mainly dryland crop and livestock farming based on cereals and sheep for wool and meat. Isolated but important pockets of native vegetation are protected in the public lands of the Little Desert and Grampians national parks and the Hindmarsh and Albacutya terminal lakes. Primary production and associated processing industries are the main contributors to economic wealth. Tourism focussed on the national parks and wineries is also an important industry. The population of the Wimmera catchment is about 50,000, with almost a third living on family farms or in small towns. The major townships include Horsham, with a population of 15,000. The Wimmera CMA has identified the priority resource management issues as water erosion, dryland salinity, soil structure and soil fertility decline, increasing soil acidity, and introduced pest animals and weeds.

## **Methodology**

### **The mail survey process**

Rural properties in the three catchments were identified using either the relevant Country Fire Authority (CFA) rural property maps (GBD) or local government ratepayer lists (Ovens and Wimmera). These property listings were entered into a spreadsheet and a random sample of between 1,000 – 1,500 properties was generated for each study area. Some re-weighting of the random sample was conducted to ensure that all land management units (LMU) in each catchment had a statistically useful number of landholders.

The questionnaire design and mail out process was undertaken using an approach adapted from Dillman's (1979) *Total Design Method* (Curtis *et al.* 2005). Testing of each questionnaire was undertaken in two-hour workshops with a small group of local

stakeholders (agency staff and landholders) – resulting in minor variations between the three questionnaires. The first mailout of each questionnaire was followed by a second reminder card mailed ten days later. Six weeks after the initial questionnaire mailout, another copy of the questionnaire and a brief letter was sent to landholders that had not responded. The second mailout was followed by another two reminder cards, each 10 days apart.

Questionnaires that were returned to sender or sent back, due to the landholder no longer residing at the property, were taken off the original sample along with those where the landholder was too ill to complete the questionnaire. This left a final sample for the three regions of:

- GBD with 1021 properties sent questionnaires in 1999, with 480 completed (47% response rate);
- Ovens with 854 properties sent questionnaires in 2001, with 568 completed (67% response rate); and
- Wimmera with 956 properties sent questionnaires in 2002, with 698 completed (73% response rate).

### ***Survey topics***

Exploring landholder capacity and willingness to change is a complex and difficult task; however, there is a large body of literature on this topic. From this literature, the key lessons about the adoption of farm forestry have been distilled (Race and Curtis 1998, Cary *et al.* 2002, Curtis and Robertson 2003a and 2003b, Thomson and Pepperdine 2003, Pannell *et al.* 2006). This research suggests landholders will adopt conservation practices, including farm forestry, that are consistent with them achieving their individual and family goals or objectives, including their need for financial security and social acceptance. In turn, willingness and ability to take up a practice will depend on a number of additional factors encompassed in the following topics:

1. Personal characteristics of landholder and their immediate family
  - Education levels; knowledge; skills; duration of farming experience in the area; primary occupation; risk taker; introvert or extrovert; income; stage of life; family succession; and personal network.
2. Social context of landholder
  - Prevailing norms about 'best practice' farming; information flows through networks; education and training opportunities; local organisations; and level of trust in extension agents.
3. Nature of the practice
  - Including its trialability; observability; complexity and extent of re-skilling required; whether the practice fits with existing farming systems and lifestyle; the cost and time for returns to accrue; and the extent the practice is a substantial improvement on what is already being done.
4. The extent landholder engagement involves a process that matches each landholder's preferred learning style.

What is clear is that programs must focus on those topics that are within their sphere of influence or capacity to change and they need to address landholder needs and aspirations, and communicate in ways that are consistent with landholder values, preferred learning styles and information networks.

Taking into account the focus on farm forestry and the limitations of a mail survey, the following topics were explored in the three surveys:

- extent landholders are moving into new enterprises such as farm forestry;
- extent that landholders have sufficient information to make sound natural resource management decisions, including about farm forestry;
- landholder attitudes towards community cooperation, working with government, and interest in biodiversity conservation;
- on and off-property income;
- property size;
- age of landholders;

- family succession planning;
- extent that landholders see themselves as farmers (i.e. working on-property for an average of 30 hours or more per week over the past 12 months); and
- perceptions of up to 20 constraints identified as likely to affect the capacity of landholders to adopt farm forestry.

The decision to trial a practice is not the same as adoption and it is important to acknowledge that the low levels of farm forestry reported in the survey results may more accurately be considered trialling of farm forestry rather than adoption. Although the data from the surveys are presented as the level of farm forestry 'adopted', the true level of adoption – the acceptance of, and investment in farm forestry as a farm enterprise – may well be much lower than these data indicate.

### ***Data analysis***

Chi-square ( $X^2$ ) and Kruskal-Wallis tests were used to establish whether variations between scores of different groups (e.g. farmers and non-farmers) on a particular variable (e.g. adoption of farm forestry) could be declared to be different, rather than due to chance. In addition, multivariate analyses were undertaken using stepwise multiple linear regression to determine the extent two or more independent variables (e.g. age, occupation, property size) contributed to changes in another variable (e.g. adoption of farm forestry). All statistical analyses were performed using the SPSS statistical package.

### **Survey findings**

#### ***Current and future extent of farm forestry***

Results indicate relatively few landholders in the three catchments had invested in farm forestry, and the area of farm forestry typically represents a small proportion of their property. In each of the three catchments no more than 10 per cent of respondents had established farm forestry, with small median areas of farm forestry compared to the median property size in the catchments (Table 1). For example, the median area of farm forestry represented eight per cent (Ovens), three per cent (GBD) and one per cent (Wimmera) of the median property size in those catchments. Adoption on this scale is unlikely to bring the environmental repair, appreciable increase in farm income and capacity to invest in improved farm management, or lay the foundation for a viable regional forest industry.

Survey data provide some encouragement for those agencies promoting farm forestry in that an increasing number of landholders said they were willing to be involved in farm forestry and would increase the scale of their farm forestry plantings, compared to the current number who had established farm forestry. For example, in the current context increased proportions of respondents said they would be involved in farm forestry in the next five years (10 to 33 per cent increase in the proportion of landholders currently involved in farm forestry in the three catchments surveyed) and the median area of farm forestry that respondents expected to have in five years time also increased (an increase in the median of 1 to 4 ha) (Table 1).

While the above figures indicate some room for optimism for those promoting the adoption of farm forestry, caution needs to be applied when interpreting these data as the absolute numbers of landholders involved in farm forestry are relatively low compared to the total number of landholders in the study areas, and it is unclear whether the median area of farm forestry reflects the level of adoption of farm forestry (i.e. accepted enterprise within the farm business), or whether this area also includes farm forestry trials. Also, the median area of farm forestry is about 10 ha in the Ovens and Wimmera catchments, which is generally considered the minimum forest area for commercial timber production given the economies of scale that the industry operates at for harvesting and transport (Turner *et al.* 2004), it is not clear what proportion of this area is comprised of the preferred species managed with appropriate silviculture for commercial timber production. There can be a great variation in what is interpreted as farm forestry and the resulting long-term outcomes. For example, farm forestry comprised of mixed species with uneven growth rates and irregular silviculture can be highly desirable for enhancing biodiversity on farmland (Race and



Freudenberger 2003, Salt *et al.* 2004), but can add to the management complexity and reduce direct income from forest products (Gerrand *et al.* 2003).

**Table 1: Current and future extent of farm forestry in the Goulburn-Broken Dryland, Ovens and Wimmera catchments as identified by questionnaire respondents**

Catchment	Median property size (ha)	Current land use		Intended land use in 5 years	
		% respondents with farm forestry	Median area of farm forestry (ha)	% respondents with farm forestry	Median area of farm forestry (ha)
Ovens (2001) n = 568	130 ha	10%	10 ha	11%	14 ha
Wimmera (2002) n = 619	900 ha	6%	12 ha	8%	13 ha
Goulburn-Broken (1999) n = 480	128 ha	9%	4 ha	11%	N/A

### ***Variables linked to farm forestry adoption***

Questionnaire respondents were asked to provide information on more than 20 topics, covering farm management, socio-demographic attributes, concerns about the ecological quality of properties, and their level of knowledge about land and water management issues. Specific questions within these topics were treated as independent variables for multivariate analyses exploring factors linked to adoption of farm forestry.

Investment in farm forestry is significantly correlated with a small number of social and farming variables (Table 2). These findings offer 'sign posts' to the attributes of landholders more likely to adopt farm forestry. For example, there was a positive link between landholders in the three regions who had invested in 'best practice' farming activities (e.g. sown perennial pastures, limed acid topsoil, fenced livestock out of remnant bush) and those who had established farm forestry (Table 2). That is, landholders who had undertaken 'best practice' activities were also likely to have invested in farm forestry. Also, in two regions (Wimmera and GBD), there was a positive correlation between landholders' concern about a decline in the productive capacity of their farmland and/or loss of ecological qualities and the establishment of farm forestry (Table 2). These results suggest that some landholders view farm forestry as part of the suite of 'best practice' options for improving or protecting their farmland, and that if landholders are willing and have the capacity to undertake 'best practice' activities (Pannell *et al.* 2006), then farm forestry may well be part of the range of activities undertaken.

While the uptake of farm forestry was not significantly linked to occupation (i.e. farmer or non-farmer), farmers were more likely to adopt practices associated with a commercial production orientation, including those addressing soil acidity and establishing perennial pastures. Many respondents indicated they intended to sell or subdivide their farmland (36 per cent in the Goulburn-Broken, 29 per cent in the Ovens, and 18 per cent in the Wimmera), yet increasing property size is a critical ingredient in maintaining the viability of cropping and grazing enterprises (the principal farm enterprises in these regions). It therefore seems reasonable to assume that there will be an increased proportion of non-farmers in these regions in the future. Non-farmers already comprise a substantial proportion of the landholders surveyed in each catchment (46 per cent in the Goulburn-Broken, 42 per cent in the Ovens, and 20 per cent in the Wimmera). If non-farmers are less inclined to adopt production-oriented enterprises, then there may be less adoption of commercially-focused farm forestry (ie. farm forestry primarily for commercial wood production) given the trend for increased numbers of landholders considered non-farmers.

Other results from the survey revealed a positive correlation between landholders who had established farm forestry and those people who:

- had also undertaken on-ground works funded (or likely to be funded) in part by government (Ovens and Wimmera);
- have a written property plan (GBD); and
- report higher levels of knowledge about the likely returns from farm forestry (Ovens ) (refer to Table 2).

These results suggest that those promoting farm forestry have a major challenge to move beyond the cohort of landholders who are innovators and already engaged in government programs (Rogers 2003, Pannell *et al.* 2006). On a positive note, given that farm forestry is coming off such a low base of adoption, then it may pay to focus on innovators and participants in other programs.

Given the long timeframes for farm forestry (i.e. tree rotation for timber production of 10-30 years; Turner *et al.* 2004), it was not surprising that data analysis revealed a positive correlation between farm forestry and those landholders who planned to live on their properties in the long-term (Ovens and Wimmera) (Table 2). We modelled property turnover using respondents' stated long-term intentions (to sell, stay on or pass on the property in their family), plus their current age and Australian Bureau of Statistics life expectancy tables (Australian Bureau of Statistics 2001). This analysis suggested that 36 per cent of Wimmera, 47 per cent of Ovens and 45 per cent of GBD properties would transfer to a different land manager within the next 10 years – the minimum period in which a full tree crop rotation is usually realised. As the median age of rural landholders increases, it is expected that there will be an increased rate of property turnover and greater reluctance to take on a long term enterprises (Cary *et al.* 2002), such as farm forestry.

**Table 2: Social and economic factors linked to adoption of farm forestry\* in the Ovens, Wimmera and Goulburn-Broken Dryland catchments**

<b>Factors</b>	<b>Ovens (2001)</b> n = 568	<b>Wimmera (2002)</b> n = 619	<b>Goulburn-Broken (1999) n = 480</b>
Proportion of property under 'best-practice'	Wald=9.802, p<0.001	$\chi^2=16.750$ , p=0.002	t=3.705, p<0.001
Concern about decline in productive and/or ecological attributes of property		$\chi^2=14.677$ , p=0.005	t=2.073, p=0.040
Work on property funded/likely to be funded by government	Wald=8.472, p=0.004	$\chi^2=4.349$ , p=0.037	
Plan to live on property in the long-term	Wald=5.054, p=0.025	Wald=13.064, p<0.001	
Have a written property plan			t=2.747, p=0.007
Knowledge about likely returns from farm forestry	Wald=29.854, p<0.001		

\* = 'total area of trees planted' in the Goulburn-Broken Dryland and 'number of trees and shrubs planted' in the Wimmera (farm forestry + other trees, excluding remnant bush), rather than 'farm forestry' exclusively.

### ***Factors influencing farm forestry decisions***

Questionnaire respondents were asked to rate the importance of factors affecting their decision making about farm forestry. In the GBD, questionnaire respondents were asked to indicate how important listed topics would be as influences on their decision about establishing an (additional) area of farm forestry. Respondents were provided with a list of 15 topics and asked to indicate the importance on a five point scale, from 'very unimportant' to 'very important'. The number of respondents who nominated a topic as an

‘important’ or ‘very important’ influence was then expressed as a percentage of all responses for each topic. In the GBD, the higher rating factors were:

1. Insufficient income to invest in any new property enterprise/land-use (66 per cent);
2. Markets dominated by industry and not confident growers will receive fair returns (62 per cent);
3. Higher returns available from off-property investments (62 per cent);
4. High uncertainty about long-term markets (62 per cent); and
5. Need a large investment of additional funds (60 per cent) (Table 3).

The financial factors were rated much higher than factors such as concern about the time and effort required to acquire new knowledge and skills (27 per cent); there being few examples of farm forestry in the area (27 per cent); or there have been bad experiences with farm forestry in the area (21 per cent) (refer to Table 3). It is interesting that ‘Better returns from off-property investments’ was the third highest rating factor affecting farm forestry decisions. As explained, just under half of the GBD respondents were not farmers and across the catchment, off-property income exceeded on-property (farm) income by a factor of 3.5 times. It seems that non-farmers, and probably farmers, are unwilling to invest off-property income in farm forestry, which may seem a risky enterprise to many landholders.

**Table 3: Factors affecting decision making regarding farm forestry**

**Rated ‘important’ and ‘very important’**

**Goulburn-Broken Dryland catchment, 1999 (N=480)**

<b>Factors that may influence decision making</b>	<b>n</b>	<b>Farm forestry*</b>
Markets dominated by industry & not confident growers will receive fair returns	334	62%

Insufficient income to invest in any new property enterprise/ land use	341	66%
Better returns available from off-property investments	336	62%
Uncertainty about longer term markets	335	62%
Need a large investment of additional funds	336	60%
Investment would push debt level too high	336	59%
Returns too far in the future at stage of life	339	51%
With less access to government field staff it is more difficult to make informed decisions	334	48%
Would require extensive reorganisation of paddocks	337	45%
This industry may lead to smaller rural populations	331	40%
Soil fertility low or acidity high on property	339	39%
No need to change as existing mix of enterprises provide sufficient returns	319	39%
Too much time & effort to acquire new knowledge & skills	335	27%
Hesitant because there are not many people doing this in area	336	27%
Earlier bad experience with this in area	314	21%

Landholders surveyed in the Ovens (in 2001) and Wimmera (in 2002) were asked to identify the three most important factors influencing their capacity to invest in farm forestry. Again, questionnaire respondents were provided with a list of factors. This time there were 18 items that covered social, environmental, and economic/ commercial topics similar to those posed to landholders in the GBD survey. Table 4 reports the proportion of all respondents who rated each topic as a high priority in their consideration of farm forestry.

Economic and commercial factors were nominated as the major constraints to making an investment in farm forestry by Ovens and Wimmera landholders, similar to results in the GBD. High establishment costs, uncertain and uncompetitive markets, and the long period before returns appear as critical obstacles to the widespread adoption of farm forestry in these regions. Landholders in the Wimmera region also nominated the limited availability of water and unsuitable soils as major constraints to their investment in farm forestry (Table 4).

**Table 4: Importance of factors influencing decisions about investing in farm forestry  
Ovens and Wimmera catchments**

<b>Respondents indicating topic is 'most important' (%)</b>		
<b>Topic</b>	<b>Ovens (2001) n =568</b>	<b>Wimmera (2002) n =619</b>
Needs a large investment of additional funds	19%	15%
Income from enterprise does not come on-stream for at least five years	12%	13%
Uncertainty about the existence of long-term market	10%	9%
Extent new enterprise fits with your existing lifestyle	12%	4%
Reluctance to change things at your stage-of-life	14%	4%
Low rainfall and/or limited water storage capacity on your property	5%	16%
Your soils are unsuitable	N/A	10%

## Discussion and conclusions: Linking policy with practice

Every research instrument has its strengths and weaknesses. A mail survey allows researchers to collect information across a large number of respondents and at a much lower cost than would be possible with face-to-face interviews. However, the mail survey does not allow for researchers to use follow-up questions to explore respondent's motivations. Without previous studies with baseline data it was not possible to identify trends over time. This is an important limitation given the results of Barr *et al.* (2000) that identified important temporal trends across the Murray-Darling Basin.

Nonetheless, the findings from the survey discussed in this article raise important issues for those promoting farm forestry, particularly in regions with uncertain or uncompetitive markets. Few landholders are undertaking farm forestry or plan to do so in the GBD, Ovens and Wimmera catchments of Victoria. It seems that a perception of the poor commercial potential of farm forestry (eg. high establishment costs, long-term investment cycle, uncompetitive markets) in these catchments is limiting landholders' interest in farm forestry. This is understandable given that small-scale growers are often required to make a substantial initial investment (establishment costs can be \$1,200/ha in temperate regions), absorb the opportunity cost of lost agricultural production (e.g. gross margin of beef cattle can be \$125/ha/year), and then wait at least 10 years before receiving a financial return (Bulman 2004). Indeed, in some regions firewood may well be a more profitable investment than mature plantations for sawn timber (Bulman 2004: 37).

Analysis of questionnaire data revealed that landholders who plan to live on properties in the long-term are more likely to adopt farm forestry, which is understandable given the long timeframe for farm forestry. Survey results also suggest there will be substantial change in property ownership in the next 10 years. Landholders planning to transfer the ownership of their property within the next 10 years are unlikely to be interested in farm forestry, if promoted primarily for the benefits from commercial timber production. However, if farm



forestry can add substantially to the capital value of a farming property in the medium-term (e.g. in the next five to 10 years), such as via aesthetic design and complementary layout for other landuses (e.g. shelterbelts for grazing and horticultural enterprises), then it may be a more appealing land use option (Walpole *et al.* 1998).

If the commercial prospects for farm forestry remain problematic in the catchments reviewed above, then re-designing farm forestry to emphasise the environmental and aesthetic benefits may have more appeal to landholders, particularly amongst the increasing number of landholders who consider themselves as 'non-farmers' and are less likely to be motivated by production oriented land-use strategies. Earlier research suggests that making a capital gain is an important reason for investing in rural property for many landholders (Curtis and Robertson 2003a and b), so one way to encourage landholders to invest in farm forestry may be to design and promote opportunities for farm forestry to enhance the capital value of properties. This may require drawing more on the expertise of landscape architects rather than forest industry analysts to optimise the aesthetic value of tree plantings.

While there appears to be increasing interest amongst landholders in the GBD, Ovens and Wimmera catchments in establishing farm forestry, the survey results indicate the level of adoption is likely to remain low in the short term (i.e. in the next five to 10 years) – presumably with little impact on the environmental challenges in these regions, local economies or landholder incomes. Although knowledge of returns from farm forestry appears linked to adoption and there are signs that there is more credible and relevant information being made available to landholders (e.g. Plantations North East's website at [www.plantationsnortheast.com.au](http://www.plantationsnortheast.com.au)), the high level of concern about farm forestry markets and commercial returns appears likely to overwhelm any communication efforts that are not linked to more substantive changes in the structure of the farm forestry industry.

If farm forestry is to match the socio-economic and market context in the GBD, Ovens and Wimmera catchments, then the industry will need to make substantial changes to current approaches to farm forestry, such as by:

1. Meeting the demand of diverse regional markets (e.g. providing environmental services, specialised timber products), rather than being focussed on distant commodity markets;
2. Offering joint-venture partnerships that link the financial capital and forestry expertise of industry with landholders, so to reduce the establishment and on-going silvicultural costs for landholders;
3. Arranging joint-venture partnerships to reduce the workload of farm forestry for landholders (e.g. silviculture undertaken by contractors), while enabling landholders to maintain a sense of involvement through regular oversight of activities on their properties (e.g. farmers contracted to monitor for pests and diseases);
4. Contributing to the environmental goals of landholders and catchment groups at the same time as satisfying productivity requirements (e.g. silvicultural practices that deliver downstream/off-site benefits, yet maintain forest quality); and
5. Designing farm forestry so that it adds considerably to the capital value and saleability of a property in the medium-term (say five to 10 years), so that it encourages investment by those landholders who are considering transferring the ownership of the property within 10 years.

This research has implications for policies relating to farm forestry. While the Commonwealth and State governments play an important role in facilitating industry development and rural land use, much of the tensions and trade-offs that arise with farm forestry manifest at the local level. One way to move ahead is to ensure that regional organisations (e.g. Private Forestry Development Committees, Catchment Management Authorities) are given substantial opportunity to contribute to governments' private forestry policies and programs, and also play a major role in developing farm forestry that is consistent with regional realities. There are numerous examples where forest companies have forged mutually beneficial partnerships with local landholders – in Australia (Curtis and Race 1997) and internationally (Race and Desmond 2000, Mayer and Vermeulen 2003,

Nawir *et al.* 2003), occurring by thoughtful design rather than incidentally. Programs need to be realistic about the likelihood and nature of benefits for landholders and others from farm forestry, particularly given the major concerns about uncertain and uncompetitive forest product markets.

To date, much of the expansion of farm forestry has been driven by managed investment schemes (MIS) attracting funds for plantations destined for export markets. This demand has in turn allowed MIS companies to offer landholders annuity rates as high as \$320 per hectare per year with secure 10 to 20-year contracts, or to purchase farmland at prices far higher than could be justified for conventional wool/livestock production. However, this demand is confined to regions with available farmland, suitable growing conditions and close proximity to processing and export facilities (National Forest Inventory 2005). In the current context, it is unrealistic to expect markets to create sufficiently high prices for small-scale wood production in regions remote from processing and export facilities, as appears the case in the Goulburn-Broken, Ovens and Wimmera catchments. For these catchments, part of the approach to establishing viable farm forestry industry is likely to include payments to landholders for environmental services attributed to farm forestry (eg. increased biodiversity, carbon sequestration) (Park and Weston 2004) and exploring the potential contribution that can be made to increasing the capital value of rural properties. In summary then, those seeking to achieve the optimistic vision for farm forestry expressed in Commonwealth and State policies need to tailor policies and programs to match the social, economic and environmental context of different catchments and address the realities of farm forestry as landholders perceive them.

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