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**Native Vegetation Management Practices in a South East Farming Community:
A Preliminary Study in Attitudes, Values and Incentives**

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* The views expressed in this report are those of the authors and do not in any way reflect the views of ABARE, or the Australian Government.

INTRODUCTION

Background

Overview

There has been an increasing focus on the conservation of biodiversity in the South Australia's key regional ecosystems over the last two decades. For example, the Biodiversity Plan for the South East of South Australia (1999) provides a strategy for promoting conservation, restoration and management of the region's biodiversity in the long term.

The pre-European environment in the region supported a considerable floristic and faunal diversity, which, largely as a result of clearing and draining for agriculture, has come under increasing threat. Consequently, the native vegetation cover has decreased to 20% of its pre-European level; and extinction events so far have impacted 38 species of mammals, birds and plants. It is well regarded that the management of native vegetation offers an effective strategy to promote biodiversity conservation in the South East.

The *Biodiversity Plan for the South East of South Australia 1999* identifies a number of major threats to the biodiversity of the region. These include:

- Loss of trees
- Loss of understorey plants
- Weed invasion
- Problem animals
- Fire damage
- Human impact

Although human impact is identified as a threat category in its own right, encompassing such factors as dumped rubbish and wood collection, it is evident that human behaviours, or avoidance of behaviours, impact on all threat categories. A range of such behaviours is outlined in the Biodiversity Plan. These include protection and planting of native trees, stock-proof fencing, reduced levels of grazing, weed control, pest and feral animal control, planting of tree and shrub corridors, and reduction of disturbance activities. Further, it is acknowledged in the Biodiversity Plan and subsequent actions supported through regional NRM initiatives that actions in support of biodiversity will encompass individuals, interest groups, regional bodies and local, state and national government agencies.

In this spectrum of interests, local landholders and communities occupy a central place in the management of native vegetation in the region. Vegetation on private property contributes to a range of market and non-market goods and services that accrue to the landholders and society, either directly or indirectly. The landholders, pursuing their legitimate interests to enhance returns on their investment, have the capacity to influence both positively and negatively in the achievement of native vegetation goals of society.

There is a general agreement that much of the negative consequences of land management decisions are indirect and that many landholders directly contribute to enhance the natural vegetation in and around their properties. The motivation of landholders and communities to contribute positively in native vegetation management is, however, not well understood. A better understanding of the attitudes and values of landholders is important in the development of more effective policy and management incentives. The role of these attitudes and values, and their implications for economic and policy analysis, are the foci of this study.

The principal objective of this study is to explore a new approach to engage local landholders in actively promoting native vegetation management in the South-East. Its specific aim is to establish and test a framework that integrates household/farm enterprise scale attitudinal analysis with economic frameworks to guide ongoing study and policy development in native vegetation management practice, which is seen as critical to the effective formulation and implementation of native vegetation management policy in the South-East.

The study was conducted within the Upper South East community associated with the Tatiara Local Government Area, which includes Bordertown, Keith, Mundulla, Padthaway, Wolseley, Willalooka and Western Flat. It derives from work with individual landholders and farmers in this district. It takes a mixed-methods approach, including open-ended interviews and participant observation with individuals and groups representing landholders and communities. Interviews focused on gaining a sophisticated understanding of the way in which the people of these communities view the challenge of native vegetation management, and how public incentives could enhance their potential role in vegetation management for greater public benefit.

A preliminary analysis is then undertaken of a set of economic incentive options. In particular, the results of the research on attitudes and values outlined above are applied to identify and describe the motives of landholders in undertaking on-farm vegetation management from an individual perspective and how those individual values impact on the optimal collective provision of public good environmental benefits to the community. A set of incentive mechanisms that could enhance the participation of landholders is outlined. Analysis is drawn within a total economic valuation framework that incorporates the full range of values, including use and non-use values that underpin the market and non-market benefits in land management.

Understanding attitudes, values and their utility

Attitudes, values and behaviour: concepts

The formal study of attitudes and values, and of their link to individual behaviour, has been a central theme in social psychology, and forms the core elements of the discipline of environmental psychology and behavioural economics. In social psychology environmental 'attitudes' are usually described as tendencies of individuals or groups to evaluate specific entities, objects or ideas in positive or negative ways. Attitudes are seen as having emotional (affective), cognitive and behavioural components. Environmental 'values' are seen as in some way underlying

attitudes; they are more abstract, more general and ethical in character. Values, too, can apply to both individual and groups (Bell et.al. 2001). A distinction is often made in the literature between ‘instrumental values’, which relate to how life is lived, and ‘terminal values’, which relate to purposes or goals. An associated concept is ‘beliefs’, which are seen as more a matter of fact than of values, and which is more subject to question and challenge (Bechtel 1997). The usefulness of trying to distinguish between these concepts for environmental management is questionable. It is sufficient to note that environmental values held by for society reflect underlying environmental orientation, based upon a each individual’s personal worldview (Barr 2002, p.23).

Studies in environmental psychology on attitudes and values has centred on three themes. First, much attention has been given to the development of appropriate models to guide scientific inquiry. Of these, Fishbein and Ajzen’s Theory of Reasoned Action (TRA) is one of the widely accepted models (Bell et al. 2001, p. 33). This model points to both individual and social roots of action and relevance to individual utilities that define economic values (Figure 2):

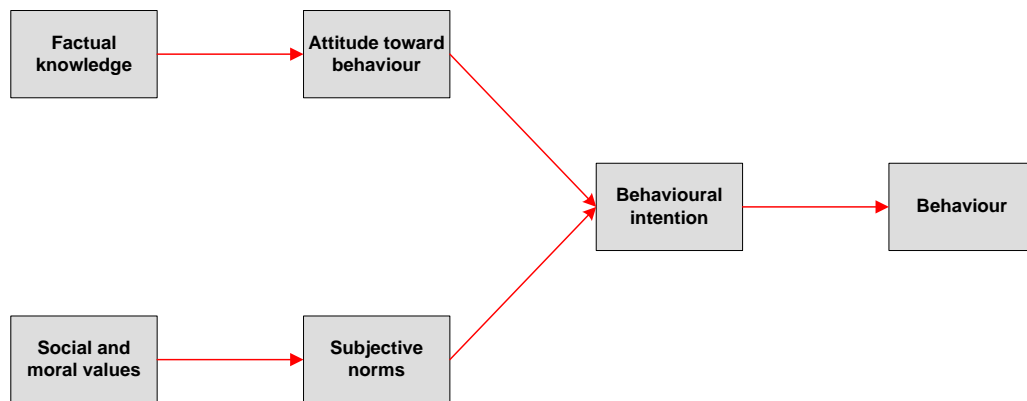


Figure 2: Theory of Reasoned Action

Other models and scales of particular importance include Gray’s Environmental Attitudes Model, McKechnie’s Environmental Response Inventory (ERI), Dunlap and Van Liere’s New Environmental Paradigm (NEP) scale, and Weigel and Weigel’s Environmental Concern (EC) scale.

However, studies centred on these and other environmental attitude models have failed to demonstrate a consistent link with environmental behaviour. It has been noted (Barr 2002, pp.29-34) that environmental behaviours include a range of perspectives and dominant predictors of environmental behaviour are difficult to isolate. These perspectives include socio-demographic variables, environmental attitudes and values, and environmental behaviours. Often this makes incorporating, the triple bottom line concept of economic, environmental and social considerations in policy analysis problematic.

Nevertheless, the contributions of environmental psychology on attitudes and values can be used to better understand a variety of environmental behaviours; including the consideration of attitudes and values within the wider belief system and worldview that govern individual and collective behaviours. Moreover, effective policy design requires the consideration of these central elements of the “ways we have of organizing our knowledge of and responses to the environment around us.” (Bechtel 1997 pp.124-125).

Attitudes, values and behaviour: studies and methodological issues

When considering these different values and value determinations and behaviours, the question that arises is how to identify attitudes and values relevant to conservation behaviour, and how to link them in economic policy and incentive mechanisms. In general such analyses have followed two broad approaches: the quantitative and qualitative. The merits of these two approaches are briefly examined below.

Quantitative methodologies: three representative survey studies

Studies on environmental attitudes and values in Australian rural contexts have predominantly used surveys and questionnaires. Three representative studies of this kind are summarised below, along with a brief evaluation of the underlying methodologies.

Reeve and Black (1993) distributed questionnaires to a representative sample of Australian farmers in all states, utilising farmer organisation membership and other lists. A response rate of 57% gave approximately 2000 questionnaires available for analysis. 100 attitude statements were selected to make up 11 attitudinal scales. The questionnaire was piloted and then distributed. Statistical analysis of responses, using factor analysis and multiple regression, focused on attitudes towards agricultural chemicals, the balance between farming for profit and to maintain environmental quality, openness to external advice, and environmentally protective policy. Correlations were then explored to farm experience, landcare membership, education, off-farm employment, farm size, farm equity, state location, farm enterprise and so on. Overall the study concluded, that despite considerable variation, “the aggregated results indicate a relatively high level of concern among farmers for the environment and a substantial degree of support for various environmentally-related policy instruments.” In particular, support was found for financial incentives to encourage environmentally sound soil management practices, such as rotation and stubble retention. No links to actual behaviour were investigated; as a consequence projections of the effectiveness of policies and incentives to engage attitudes to change conservation behaviour lacked validity.

Jenkins (1998) conducted a survey of 145 farmers in the southern Western Australian wheatbelt. The survey instrument collected information on a large number of factual measures relating to the management of bushland on farms, as well as, in a second section, recorded attitudes of farmers towards native vegetation. This section presented a series of statements about native vegetation and requested participants to say whether or not they agreed with them. Analysis of the results of the survey

indicated that although attitudes had not materially changed in the preceding 10 years—a high level of awareness of the ecological and land conservation values of bush on farms was found in both 1986 and 1996—the actions on farms reported indicated a significant shift in conservation behaviour. For example, in 1986 64% of farmers had replanted trees and shrubs on their farm; in 1996 the figure was 84%. Non-native tree planting, grazing of bushland, and bushland disturbance had decreased by half. Analysis of incentives, such as grants, and tax deductions indicated that, although welcomed, these did not account for the change in behaviour: farmers indicated that they would have initiated these actions with or without grants.

This study shows the shortcomings of research into the link between attitudes and behaviour identified in the theoretical literature, as outlined in the preceding section. The paper suggests that a different methodology of research into attitudes is required. In this study at least, the survey and its analysis did not seem to identify the attitudes and values that were in fact driving the environmental behaviour of these farmers; practices which the farmers themselves were reported as quite capable of identifying and describing when asked outside the survey instrument.

Whitten and Bennett (1998, 2000) carried out two studies, with identical methodologies, of farmers' perceptions of wetlands and wetland management. The first of these (Whitten and Bennett 1998) was conducted in the Upper South East of South Australia. Fifty-one farm owners and managers responded to a questionnaire. Survey items related to wetland benefits and costs, both monetary and non-monetary, and wetland management strategies adopted, or not adopted, in practice. A section of survey considered farmers' attitudes to wetlands, in four groups: non-consumptive uses, production-related uses, indirect uses, and direct uses. Factor analysis of the response pattern confirmed that the direct, indirect and production uses accounted for most of the variation in responses. These groupings were found to be positively correlated with the main wetland types: red gum, tea-tree and shallow open associations. A further correlation was found between the three attitude groupings and certain management practices. In the light of this data a variety of financial incentive proposals were evaluated.

The structure of Whitten and Bennett study, with respect to statistical analysis, is persuasive. However, the key correlations of attitudes to other variables, including practice, rest on the effectiveness of the attitude survey section. Here the four attitude groups were investigated through 15 statements, with responses across a 5-point Likert scale. While these instruments provide limited insights to complex attitudes and values the extent to which carefully designed survey instruments could capture wide ranging beliefs and attitudes that affect individual values that influence behaviour is difficult to gauge. This is particularly the case where, notions governing environmental behaviour are to be captured within statements which can be subjected to factual tests (eg. "My wetlands help native animal movements", "My wetlands reduce water pollution.").

Other recent relevant publications supportive of this conclusion include Aitken (2001), McDougall et. al. (2001), Williams & Cary (2001), Robinson et. al. (2002), Mazur (2004) and Mercer et. al. (2004)

Qualitative approaches: the fieldwork methodology

The limitations of survey-based, quantitative studies such as those outlined above in understanding attitudes and values can be readily predicted from the Theory of Reasoned Action model outlined above. It is clear that only the upper branch of the model is investigated in this kind of research; that is, the links between factual knowledge, attitudes and behaviour. Even these links are not well elucidated by surveys, because of the inherent inflexibilities of presented attitude statements. Community norms and values are not included at all.

Importantly, we believe that attempts to study beliefs and notions to draw reliable conclusions about conservation management policies and incentives will likely be limited by the methodology adopted.

The present study uses a *qualitative* methodology as a complement to quantitative studies. We support the argument that, in order to understand behavioural intentions, and ultimately actual behaviour, it is critical to understand the wider community context of values and norms, as well as their roots in individual attitudes and knowledge. Complexity of this kind can only be handled through well-designed studies that involve quantitative assessments coupled with well-implemented qualitative research that goes into detailed inquiry of the role of attitudes in behavioural patterns.

It has been noted that qualitative research appeals to common sense, connects to the way people make sense of the world around them. The challenge is to make them scientifically robust and rigorous at the same time. The TRA model suggests that research on environmental attitudes and values must be carried out in a *community* context. For example, the branch of qualitative research termed *interpretive* or *ethnographic* method provides a concise description of the key elements of this method (O'Reilly 2005, p.3):

- iterative-inductive research (that evolves through the study), drawing on
- a family of methods
- involving direct and sustained contact with human agents
- within the context of their daily lives (and cultures);
- watching what happens, listening to what is said, asking questions, and
- producing a detailed written account
- that respects the irreducibility of human experience,
- that acknowledges the role of theory
- as well as the researchers own role,
- and that views humans as part object/part subject.

Two principal fieldwork methods are central to this approach. The first is the *interview*. In interpretive research, which includes ethnographic methods, the objective of the interview is to go beyond highly structured questions and answers to the subjective meanings that form the elements of the TRA model, and which drive environmental action. The methodology calls for an unstructured interview style, with open-ended questions, on topics relevant to the research setting, in places and at times that suit the participant. It encourages reflexivity and provides an opportunity for people to explore their more fundamental, and often ambiguous or confused, opinions, attitudes and values. The method is “attempting to learn about people from

their own perspective, to get an insider's view, and this cannot be done by imposing one's own line of questioning on people.” (O'Reilly 2005, pp. 116-117).

The analytic method that accompanies fieldwork is termed *iterative-inductive*. Analysis is ongoing throughout the study: initial hypotheses are evaluated and developed as information and insight accumulates through fieldwork. Analysis and data collection are thus interlinked. Additional research questions can emerge in the course of the work. Analysis involves continual summarising, sorting, translating and organising of the material collected. The product of the research is a fully documented account of that material, evaluated with respect to the theory and research questions guiding the research.

Fieldwork

The qualitative research carried out in this study centres on the Upper South East community associated with the Tatiara Local Government area, which includes Bordertown, Keith, Mundulla, Padthaway, Wolseley, Willalooka and Western Flat.

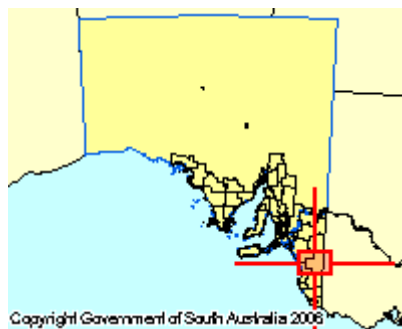


Fig. 1: Location of research area within the State
(Source: Atlas of South Australia)

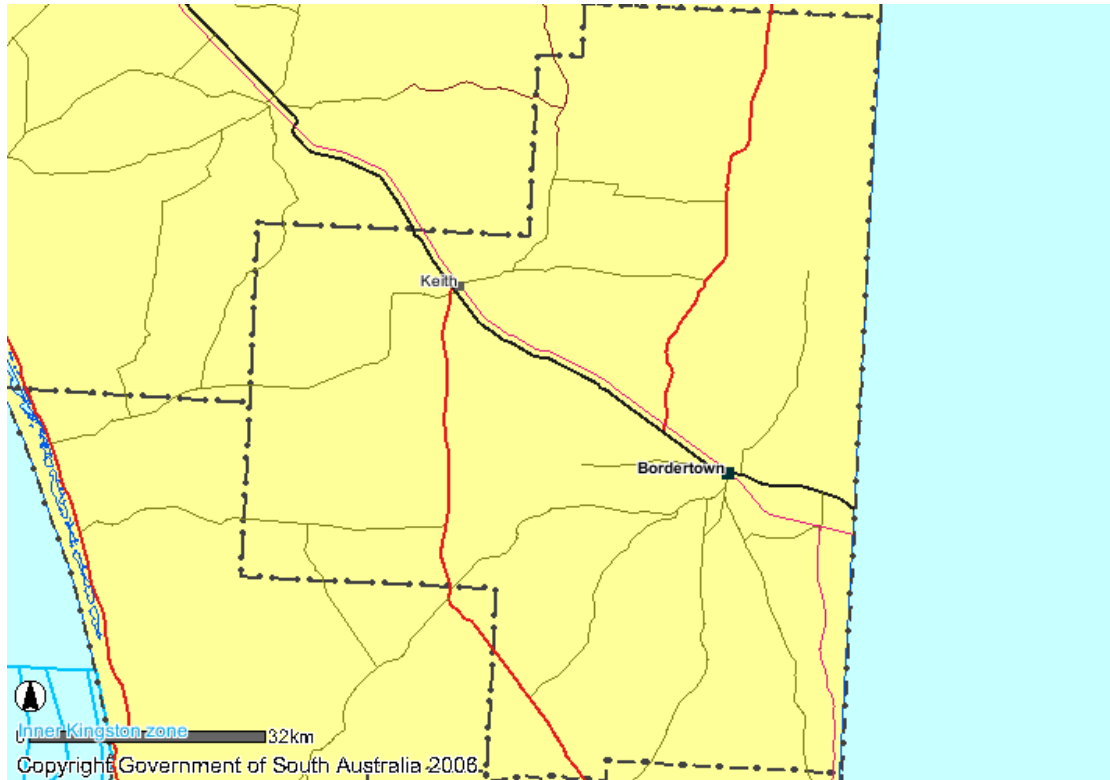


Fig. 2: Tatiara Local Government Area
(Source: Atlas of South Australia)

The study has its foundation on close work with individual landholders and in this district. It utilises open-ended interviews and, to a lesser extent, participant observation with individuals and groups representative of landholders and communities, to provide a deeper understanding of the way in which the people of these communities view the challenge of native vegetation management, and their potential role, as individuals and communities, in the management task.

In this study, the above methodology was directed towards understanding the attitudes and values that underpin individual farmer and community behaviour with respect to environmental management practice. Interviews with four farms in the Tatiara District Council area were carried out. In two cases these conversations extended over a number of separate interview periods, as analysis of the initial interviews raised additional questions that required clarification.

All interviews were recorded in both written and electronic form. Permission was explicitly sought to make the recording. Interviewees were not in any way resistant to this: in most cases, they were interested in the digital technology used. The small size of the recorder, and its absence of moving parts, make it particularly unobtrusive: it was simply placed on the table, along with papers, notebook, coffee mugs and other household items, and quickly became part of the background. All interviews were undertaken at the kitchen table. This is a recognised location in the country for farm-related conversations, and established an atmosphere of informal working collaboration.

Interviewees were introduced briefly to the study by phone, in making the interview time; and then more fully briefed at the outset of the interview on the nature of the study and its purpose. It was emphasised to interviewees that the intention of the interview was to seek their thoughts on the general area of native vegetation issues; a specific commitment was given by the interviewer to *listen* to whatever they wanted to say and to try to *understand* where they were coming from. The study was placed clearly in a policy context: it was emphasised that its purpose was to derive more effective government policy with respect to incentives for native vegetation outcomes by seeking local input. The underlying proposition of the study—that this qualitative approach is a novel way of approaching policy development—was received with interest and approval by interviewees. It was also emphasised that the conversation was relatively informal, and an invitation was extended to them to raise any issues or questions they chose at any time. It was also made clear that they need not answer any question they didn't want to, and that they could terminate the interview at any time they chose. A further commitment to anonymity in writing up the report based on the interviews was given.

Environmental and Natural Resource Economics theory suggests that these *attitudes and values* are likely to span the following range of central categories: Use (eg. shelter, pollination); Non-Use (eg. aesthetic, native plants and animals); Direct (eg. recreation); Indirect (eg. pest control, salt control); Market (eg. farm production-related); Non-Market (eg. corridor biodiversity benefits). Environmental Psychology theory suggests other important attitude domains of potential interest: affective appraisal and perception of native vegetation; environmental and landscape preferences (coherence, distinctiveness, complexity, 'mystery'); restorative beliefs; and place attachment (Bell et. al. 2001, pp.23-53). The development of shared community and group norms and values with respect to these categories were utilised in the framework for the interviews.

With respect to *environmental management practice*, attention was given to actions identified by the SE Biodiversity Plan as central to its objectives: protection and planting of native trees, stock-proof fencing, reduced levels of grazing, weed control, pest and feral animal control, planting of tree and shrub corridors, reduction of disturbance activities. Fire prevention, external sources of management advice on specific problems, native flora and fauna knowledge base development, and incorporation of native vegetation management in wider farm business strategic development are additional dimensions of practice that will be researched. Both individual and collective practice was examined.

Analysis

A preliminary value analysis was then undertaken. In this part of the study, the interviews were analysed to identify the main attitudes and values relevant to the decision-making context, with respect to the native vegetation revegetation or enhancement actions. Clustering and relationships between these values were explored. Priced and unpriced values for both benefits and costs have been identified.

Further analysis was undertaken through the TRA Model and the development of a Logic Model. In the first, the alignment of values derived from the research with the components of the TRA Model was explored. In the second, the dynamic structure of the values derived from the research was developed, and its application to potential

policy interventions explored. This work is embedded in the principles of economic valuation, summarised in the Appendix.

In concluding the report, the forms of further studies to complete the research program initiated in this study were identified.

ON THE FARMS

The Tatiara's vegetation communities

Most of the native vegetation in the Tatiara is classified as 'Heaths and Low Open-forest' communities (Attiwill & Wilson 2003, pp.263-275). In Australia, these communities are linked by the same understorey of sclerophyll shrub species. The heaths are usually less than two metres in height, and characterised by a high number of plant species, including a high proportion of regional endemics. These plants display a considerable diversity of root system forms, directed to water and nutrient capture and uptake. Both heaths and low open-woodlands have many genera in common, including *Acacia*, *Banksia*, *Calytrix*, *Allocasuarina*, *Drosera*, *Hakea*, *Leptospermum*, *Leucopogon*, *Melaleuca*, *Pimelea* and *Xanthorrhoea*. Most low open-woodlands are dominated by two or more species of *Eucalyptus*, usually by different groups within genera. The floristic diversity and complexity of heaths and low open-shrublands derives from a long period of adaptation to the stable environmental factors of particular fire regimes, low nutrient availability and seasonal wet/dry cycles. Its diversity provides an array of habitats for native fauna, both ground-dwelling mammals and birds.

The Heaths and Low Open-forests in Australia have been subject to considerable environmental degradation (Attiwill & Wilson 2003, pp.263-278). Their grasslands and woodlands are among the most endangered of Australian vegetation communities. Substantial areas of clearing, following the discovery of trace elements to remedy soil nutrition deficiencies, has proceeded on a significant scale in the South East. Drainage schemes, implemented since the 1860's, have dramatically reduced the coverage of the pre-settlement wetland vegetation communities.

In the Tatiara are two of the five threatened habitat areas identified as important in the *Biodiversity Plan for the South East of South Australia* (Croft, T., Oppermann, A. and Zubrinich, T. 1999, p. 20). These are the Keith-Willalooka Districts, and the Muldulla-Bordertown-Wolseley-Frances Districts. Critical degraded elements of these areas are described as follows:

- Vegetation types that have been selectively cleared and modified.
- Low habitat remnancy.
- Habitats poorly conserved in government reserves and Heritage Agreements.
- Small blocks of native vegetation.
- Regionally or State threatened plant communities.
- Species of high conservation significance.
- Species populations and ecosystems at threat from extinction in the shorter term (less than 50 years).

Ecological communities in the Tatiara have suffered from habitat loss, habitat degradation, and fragmentation in patches. Although it is difficult to quantify the impact of this order of habitat decline on faunal communities, it has been estimated that 1000-2000 woodland birds permanently lose their habitat for every 100 hectares of woodland cleared, and that the clearing of mallee vegetation for cropping kills more than 85% of reptiles (New 2006).

Pre-settlement and remnant native vegetation associations of importance in the study area include the following (Croft 2003).

Eucalyptus fasciculosa (Pink Gum) woodland—on sandier soils of lower fertility and water retaining ability. Found with sclerophyllous shrubs, on soils of low fertility, and as savannah woodland over native grasses or sedges. Low woodland over Upper South East dunes.

Eucalyptus largiflorens (River Box) woodland—restricted to the Tatiara Creek floodplain from the Victorian border to Bordertown. In its pre-settlement form, a grassy woodland.

Eucalyptus microcarpa (Grey Box) woodland—from Bordertown to Mundulla, on heavier grey and red soils.

Allocasuarina luehmannii (Bulloak) low woodland—north of Naracoorte, as an extension of large areas in the Wimmera district of Western Victoria—on heavier grey and red soils with lime. Over native grasses and reeds.

Banksia marginata (Silver Banksia) low woodland—on interdunal flats, covered in water in winter and holes in summer. Now only remnants along road reserves.

Eucalyptus porosa (Mallee Box) low woodland—north of Keith on porous sandy loam soils, over grassy groundcover.

Eucalyptus incrassata (Ridge-fruited Mallee)—heath shrubland restricted to the Upper South East, extensive areas on light-textured well-drained soils.

Eucalyptus odorata (Peppermint Box Mallee)—isolated pockets of the Upper South East, including the slopes of Mt Monster south of Keith.

Banksia ornata (Desert Banksia) shrubland—sclerophyllous shrub community on deep, well-drained sand of the Upper South East.

Melaleuca brevifolia (Short-Leaved Honey-myrtle) shrubland—on brackish, seasonally waterlogged sandplains of the Upper South East. Extensive loss with rise of salinity.

Farmers were interviewed in three areas of the study area: Willalooka, Keith and Bordertown. These three areas are clearly differentiated in their physical characteristics, and include some of the main farming environments found in the Upper South East region. They therefore present different challenges of integrating farming enterprises with native vegetation programs.

WILLALOOKA

The farm and its enterprise

The Willalooka district lies approximately 35 Km almost due south of Keith. It is centred on the intersection of the Riddoch Highway, which runs from Keith to Padthaway and Naracoorte, and Petherick Road, which runs almost due west across the ranges to meet the Princes Highway near the Coorong between Salt Creek and Kingston. The area occupies one of the interdune corridors, and is very flat, lying at about the 30 metre contour. The geological substrate of the ranges to the west and east is the ubiquitous Bridgewater Formation, a Pleistocene deposition of marine sediments resulting in the stranded coastal dunes, beach ridges and beach deposits characteristic of the South East landscape.

Jamie and Josie Jackson farm approximately 764 Ha (1887 acres) of the flat. They took up the property in 1983. At that time it was 1416 Ha (3,500) acres in extent. Josie's family owned the property, and for the first six years the Jacksons were employed to manage the sheep operation that was already running on it. In 1985 they raised a loan to buy a little over half the property. The rest of the property was sold in 1989. For the past twenty-four years they have been running primarily a wool sheep farming operation, with additional income streams from meat sheep, a few beef cattle (to break the worm cycle), tree seedling sales, direct seeding services and timber trees (discussed in detail below). There has been no cropping.

The farm looks prosperous and well-managed: it is, in the phrase of the district, land 'in good heart.' Even following a record drought the pasture is intact, the sheep healthy and in good condition. Over the entire property, in laneways, along fence lines, in larger fenced-off areas and in what were waterlogged depressions are magnificent stands of native vegetation, in a full structure of trees and shrubs. Some of the rises are planted out to Lucerne Trees (*Tagasaste*—see below). At the edge of the farm the contrast with the neighbouring property is striking: extensive cleared runs, isolated individual trees scattered patches of grazed scrub, and more dust than pasture.

Both the Jacksons brought strong agricultural backgrounds to their property. Jamie had been raised in 'station country', near Wilcannia, and Josie had been raised in the Keith district. Both had been educated at Roseworthy Agricultural College in Adelaide. They managed a property in Western Australia, south of Geraldton, before coming to the South East.

Their commitment to farming as a lifestyle and as a profession is very strong:

I like farming, with all the problems involved in farming. . .even though if you wanted to just be mercenary and only think about money you'd sell your farm and invest it in houses in Adelaide and go and live in Adelaide, it's not something I want to do, I couldn't stand it, I'd rather shoot myself than go and live in a city. . .[Josie]

The decision to finance the property purchase was no small one and was conducted in a way that was consistent with this commitment to farming as a profession—even a

craft profession—rather than first and foremost as an investment which requires maximum return:

. . .we borrowed all of our money at about thirteen percent and about a year later we were paying twenty-two percent. It goes against the grain of people to get big or get out. So in '89 when we owed [so much money], and we had to relinquish half the farm to [family members] we didn't try to borrow another million, we let it go. And we've got a smaller farm so it's probably not as economically viable as a bigger property, but because we've got it paid for, the farm only has to make so much money to keep the pasture renovation going and pay our bills—if you don't expect to be a multi-millionaire it doesn't really matter. . [Josie]

That is not, however, to understate the importance of the business side of the operation, which has remained a powerful influence on farm management actions.

Early days

When Jamie and Josie first came to the property, nearly quarter of a century ago, they were in their middle twenties and had not yet started their family. The property itself they describe as having relatively little scrub remaining on it: scattered Pink Gums [*E. fasciculosa*], perimeter scrub paddocks, 49 hectares (20 acres) of scrub around the house, and 404 hectares (1000 acres) in the middle of the property entirely cleared. They attribute this pattern to the days before motorised clearing, where the bigger, older trees were left standing because they were too big to clear with horse and bullock power.¹

This large cleared area had a visual and emotional impact:

. . .from our back door to the boundary we could see the whole distance. There were not any trees in the middle of our farm—none—and it was absolutely miserable having ewes lambing here in the middle of winter—so we started planting trees.

There are photos of this view, and the above description does not exaggerate its bleakness. As noted above, the character bleakness is apparent in the neighbour's farm where, unlike the Jackson farm, the original clearing pattern is intact and very little revegetation has been undertaken.

This statement presents two important and pervasive motivations for native revegetation and enhancement. The first is the idea that the visual impact of the landscape is of real value to farmers, which was repeatedly affirmed in these discussions. For example, Josie refers to the “scene” as a central organising element: “all of our past problems with overclearing” and the need to “get native vegetation back into the scene.” Jamie evokes the impact of both the degraded and the

¹ Williams (1974, pp.161-171) describes the use of steam-traction engines for rolling scrub around 1908 in the Tintinara district, although horse and bullock logging (dragging a heavy log through scrub) and chaining continued well into the 1920's, when tractors were first introduced into the district.

revegetated areas on farmers as they drive around the district, noting, as they do, all the changes that occur week by week:

But in more recent years I think there's been such a marked decline in tree numbers out in people's paddocks. Just general tree health, and people, once they start driving around, can see dead trees in the paddock and think, "this is not going to look good"—

Also I think on the flip side the aesthetic side is still quite important, and they're driving along the road and they've seen some of the really good sites, they think "that looks fantastic, I wouldn't mind that as a shelter block for my place"—but it's the aesthetics, the look of it that gets people in, I think.

Second, the need for shelter was a key driver of tree planting in their early days. The lack of shelter in the large cleared areas was causing substantial lambing losses. The Jacksons report losses of 20-25% in their early years, losses which, as they point out, were regarded as standard: "it was just traditional." As will be described, these losses steadily reduced over the twenty-four years of their occupation to almost zero at the present time.

As is well known, the South East landscape in its natural state was dominated by swamps and standing water, which historically has represented the major challenge to farming development.² A third motivating factor for the planting of vegetation in the early days of the Jacksons' farming was therefore provided by the standing water that accumulated in depressions every winter:

And then we had a run of wet years and we needed to do something about planting trees to soak up the water. So we started doing bigger belts of reveg on wetter flats and planting timber trees on the sandhills. [Josie]

The standing winter water severely damaged the pasture, mimicking the conditions of a drought:

At that stage our winters used to be sodden and we used to have water droughts. Everything was so wet, big ponds there, hot in the springtime, it would cook all the vegetation, the clover that was still managing to grow through it. And then you end up with these big bare areas. That's how the salinity starts, because it's bare, no growth on it. [Jamie]

One response to this was to build drains, as had been done throughout the past century; but this was dependent on government action. At the local level, on one's own property, trees could be planted:

² The original landscape of the district was a complex of wetlands, produced by a combination of relatively high rainfall; the sequence of north-south sand ridges, which impeded natural drainage to the coast; and the flat topography, with its slight fall of land. There is an extensive underground drainage system though porous rocks, and a wide occurrence of natural springs. There was a continuous history of drain implementation from 1864 on, from the initial coastal cuts, coastal swamp drainage, inland drainage along Baker's Range in the 1880's and 1890's, through to the modern drainage system implemented between 1900 and 1943, centred on the K-L and M drains draining into outlets at Kingston and Beachport respectively, and connecting to an extended network of smaller inland drains, including the eastern swamps nearer the border (Williams 1974, ch.5).

Everybody in the area wanted a drainage scheme, but they wanted a shallow surface water drainage scheme to just keep water moving towards the Coorong and stop ponding. Realistically other than that you could fix any of your problems by planting deep-rooted perennials everywhere. Timber trees on your sandhills and good quality pasture on your flats. [Josie]

Development: trees and the farm enterprise

First initiatives

The Jacksons are firm about the main purpose for which tree planting on their own property has been carried out:

We planted trees to become more productive. In farming, because of the shelter effect, with lamb losses, and also having paddocks that were sheltered even for pasture or crops, it's been proven. [Jamie]

The first tree-planting initiatives were carried out in the laneways (the fenced-off corridors connecting paddocks for the movement of stock). Jamie wryly notes the influence of his own background in this first approach:

In recent years there's been a whole psyche change. Because back when I first came here—I'm from station country—I didn't want to put trees out in the paddocks, and the laneways were all fenced, nice big forty metre laneways—put a couple of rows of trees down and you think you're doing a fantastic job, and that's what most people did.

A second factor was the influence of the early Federal revegetation schemes, notably Greening Australia, which was looking for demonstration sites at that time. A third factor was, as might be expected for a young couple on a new property, financial:

Planting in laneways we didn't have to spend money putting up fences. We had huge borrowings and really no spare cash, it was all disappearing in interest. [Josie]

The design of the shelter belts was therefore determined by the existing fence lines, particularly those oriented north-south, which offered the possibility of establishing shelter from the west and south-west winds—the prevailing winter winds. No additional fences were put in for shelter belt purposes, although they were for stock and pasture management.

In the first year, tree stocks were obtained from an Adelaide Hills nursery, but in the second year Josie had already realised she could undertake seedling propagation on the property. She obtained trees, tube and seed from the 'Trees for Life' organisation, which were free up to 500 tubes. Then the operation began to expand:

Then I went out and bought the plastic bags and potting mix and made up my own potting mix, but on the Trees for Life mixture—I used their mixture, but I bought all the materials, started collecting seed, and started growing our own

tube stock. . . I can remember sitting down and doing fifty to sixty boxes of those great big boxes with the cement mixture down in the stables. So there were definitely five or six years that I grew trees in tubes and planted them out around the laneways. . . Eventually I got to the stage that I was growing four to five thousand Trees for Life trees [each year]. [Josie]

In addition to planting in the laneways, some of the trees were planted in odd corners, where other farming enterprise was not planned:

There were a few little plots that eventually Jamie would say we can have this little patch in this paddock, and fence it off, a little inundated place, and it would fit a hundred trees in it. [Josie]

It was a significant commitment of Josie's time—more than 10%, on average—particularly as the tree stock in summer had to be watered every day, on a purpose-built stand. And yet, as they see it now, their lack of experience in planting design resulted in shelter outcomes that were far from satisfactory:

Those ones never really helped us. They looked nice, aesthetically, and made you feel a bit better, as if you were actually doing something. . . it was only two rows of trees and you were just planting trees and not shrubs. So you didn't have that low bush effect. I just eventually got to the stage that I thought, there's actually got to be a better way. Because it might look all right but you still hadn't got that shelter effect. [Josie]

Direct seeding of native vegetation, discussed below, was in part a response.

It is worth noting that, at this stage of the development of the farm, the tree planting work was primarily Josie's:

I can remember Luke would be a toddler and I'd be pregnant with Matilda and I'd be out there with the truck and the trailer, for hours, weeks on end.

This is a theme we will come back to: revegetation work in the district is often undertaken by women, men taking on more responsibility for the traditional operations of the farm, in wool and meat. This is not a value-laden action, simply a division of labour. But, as noted, it carries with it particular gender dimensions.

Managing water has been a priority of farm management on the Jackson farm from the beginning. The challenge has been of two opposite kinds. On the one hand, the standing water noted above has been handled through tree and shrub planting on low-lying areas. On the sandy rises Lucerne Tree, or Tagasaste, has been widely planted, to prevent soil erosion and provide additional stock fodder.³ On the other hand, the

³ Tagasaste, or Tree Lucerne, is the name given on the island of La Palma, in the Canary Islands, to an indigenous plant, *Chamaecytisus palmensis*. It is a small shrubby tree which grows to a height and crown diameter of about 5 metres. It is widely planted in the district, as it thrives on gravels, loams, limestone, sands and laterites. It is a good fertiliser of deep acid sands, provides shelter and shade for stock, provides a "green haystack" in summer and autumn, controls salinity by increasing use of soil water, and reduces erosion when planted in rows against the prevailing wind (Stokes and Masters 2005).

incapacity of the non-wetting soils⁴ that cover a substantial amount of the farm to hold water has been addressed through ‘claying’, Although originally developed through harrowing in clays, on the Jackson farm it took the form of deep ripping of soils through to the underlying clay horizons, distributing clay throughout the surface horizons, and a crop of barley before laying down pasture.

Trees have been planted for timber, as well as for shelter and water management. Some of these were trials conducted in association with the State Department of Agriculture. Good quality hardwoods, such as *E.globulus* (Tasmanian Blue Gum), *E.saligna*, *E.viminalis* (Manna Gum), and *Corymbia maculata* (Spotted Gum), were planted. These have not yet yielded significant income for the farm. However, they have grown well and their potential for expansion is apparent.

Direct seeding

Jamie and Josie began the direct seeding of native vegetation in the late 1980’s. They had seen some early experiments in Western Victoria where Sugar Gum had been seeded in wheat combines. The planting of shelter belts was the immediate stimulus. The early planting of seedlings had shown that one or two rows of trees, without a shrub understory, did not provide the shelter to lambing ewes that they were seeking. Direct seeding would allow multiple rows and a variety of species to be planted, and on a much more extensive scale.

The early experiments used a ‘bait layer’, designed originally for rabbit control. Their early efforts met with mixed success:

Our first few efforts all failed. One year we had a success but it failed because of black frost. Another year it was the chemical I think that killed it. And ants took a lot away. [Jamie]

It was the introduction of Federal funding that provided the impetus for the move into significant operations:

Greening Australia came out wanting to do pilot schemes, demonstration sites, throughout the area. So we jumped on it. . . They demonstrated a seeding machine—we’d just been using a bait-layer—then Jamie built a better seeding machine, which could be towed by a four-wheel bike, and I collected all the seeds and then we just drilled it all in. [Josie]

Behind that simple description of the operation lay a substantial amount of work, a major commitment of time and resources for both. To begin with, large volumes of native vegetation seed were not available for purchase: they had to be gathered from the remnant vegetation in the district. With other interested landholders (see below) they combed the district, looking for potential seeding trees on private property, on back-roads, near national parks, along the fenced-off areas along the drains:

⁴ ‘Non-wetting’ is the term given to the property of water repellence, common in the sandy soils throughout the district. It is caused by waxes that are produced when plant leaves decay, which coat the sand grain and prevent water from penetrating or wetting the soil when it is dry. This increases evaporation and surface run off, and favours weed germination. Non-wetting soils are also fast drying, with low fertility and high root disease loads (University of Adelaide 1990).

By that stage once you started doing say thirty jobs a year, and you're on people's places, every back track that you're driving on you're looking at roadside vegetation. Or you see patches of scrub in so-and-so's place, and you might be doing seeding for them and you say, you've got some lovely trees here, do you mind if we get some seed off it? And they say, fine. [Josie]

The collecting was physically demanding, and carried out through the summer, the hottest time of the year:

Acacia seeds you have to do at the right time, around Xmas, New Year, so you're flat out doing that then. And then all your other trees you just try and do in the summer time. Then there's a lot of little Melaleuca's or Leptospermum in our scrub at home that might fall out in March, and you know it will be April further south. [Josie]

There was trial and error in developing the collecting and storing methods:

[We began by] putting branches out on black plastic and dragging it into the shearing shed. But over the years we've developed that. We took the branches full of gumnuts and put them on weed mat out in the open, and then a week later, in the middle of summer when it's very hot, you go out and bang the branches out and throw them away. Then you sieve all the seed and store it all in airtight containers with some insecticide powder. We kept it all in individual buckets. [Josie]

Then the ground had to be prepared, with pre-spraying for weed control. The seeding operation was carried out by purpose built machinery, designed and built by. It was towed behind a four-wheel motor-bike. The machine had its origins in a field day run by a local authority and enthusiast in native vegetation work, Neville Bonney, where an early version of the machine was displayed. The idea was picked up by one of the Jackson's friends (see below, 'Other Interviews') and passed on to Jamie. His machine was modified to be a level lift machine: that is, it adjusted over uneven ground and enabled them to work mounded or banked sites. It cost some \$2500 to develop, and "three months in the workshop, swearing and cursing", as Josie remembered it.

The planting design settled into a belt approximately twenty metres wide, with up to eight rows of plants. They had learned from earlier plantings that the inclusion of an understory of plants was critical to providing effective shelter. Once these design parameters were met, the results were quick and beyond expectations:

Within two years, we'd have trees that were about as high as us and thick as fur on a cat's back, birds in them, it was just amazing. It changed our whole outlook. [Josie]

The effect on lambing percentages was dramatic. From the early days of inherited 75% lambing survivals, the steady provision of shelter increased the percentages to nearly full survival:

Our lambing now is generally around about one hundred percent and honestly we can put sheep in just about every paddock. It was so noticeable this year. We had ewes that were scanned in lamb to twins, and they were in an open paddock. A lot of the wind came from the north. The only reason [we had them there] was that after this drought that paddock actually had better feed: we wanted to look after those twin lambing ewes. We ended up with ninety-five percent across the whole property after the worst drought in history. [Josie]

Their experience indicated a principle that was born out again and again, as planting across the district took hold:

Most people really did it for shelter for stock more than anything else. Those that are wise enough work out that if you have a shelter belt on one side of the paddock the productivity in the rest of the paddock increases by about twenty to thirty percent. It makes so much difference to ewes lambing. We can put sheep in any paddock now for lambing. [Jamie]

The transformation in stock management achieved by effective shelter belts was dramatically displayed in a severe cold snap. In November 1996 the Jacksons had recently shorn sheep when a strong cold front, accompanied by unseasonably low temperatures, swept through. They lost only two sheep, out of their flock of 2000, in contrast to the losses of others who had not established shelter belts, even though many of those sheep were better established in wool:

We had people in the district lost up to three hundred sheep, and a month off shears. And we had bare shorn sheep, pink as. We put them in this paddock where there was a shelter belt running east-west and two shelter belts running north south. And honestly I wished I'd taken a photo, because there were two thousand sheep, we jammed them all in this one paddock, and they stood with their backs to that shelter belt, they didn't get driven away, and we didn't lose one. [Josie]

Sheep were selling for about \$30 at that time, so the saving was considerable. To the suggestion that perhaps they had recouped their planting outlay in that one event, "Absolutely," Josie agrees. "Way in front."

Tree planting enterprise

Having established the value of planting trees on their own property, the Jacksons were quick to see that other landholders would be looking to follow suit, and that direct seeding could be an income stream in its own right. This business was developed in collaboration friends (see below). Initially the expansion was near to their own farm:

That's how things have got better over the years—first we went contracting, three or four neighbours, we did twenty kilometres, and we thought, that was a big year—but our biggest year was a bit over one thousand kilometres! [Jamie]

That was in the late 1990's. The Jacksons attribute this demand to the availability of government subsidies. (In recent years these funds have been withdrawn, and,

particularly after the drought of the last two years, demand for direct seeding has declined.)

All of this expansion multiplied dramatically the demands of seed collecting. And alongside the direct seeding business, Josie also built up her tree propagation business:

At that stage I used to grow on my tree stand thirty to forty thousand trees a year. I went from tubes to trays, the quick pot trays—and it used to take me about two weeks of December for filling up trays and seeding everything on the stand. Then it would take me just about all of February, five or six hours a day thinning them out. And then you didn't go anywhere because you were watering trees on the stand.

Josie estimates that 30% of her time was dedicated to the tree business, and at its height that business was generating 30% of the farm's total income. In addition, it was a highly profitable business, with gross margins above 50%. This compared to a gross margin on the general farming business of “about ten percent, if you're lucky.”

The key to the tree business, the Jacksons believe, was the availability of funds. To the suggestion that people only spend money on trees when they have discretionary income available in good farming years, Jamie responds:

That's dead right. . . Then there were no droughts like we've had the last few years. We were actually doing tree seeding at a time when farming was reasonably profitable. Unfortunately tree seeding has been null and void the last few years because [with the drought] farming has as well.

These trends were reinforced, and will continue to be, by the availability or non-availability of government funding:

It's going to [continue to] be like that now because they've got no funding. Back in those days we had all that funding availability, so that was making people do it as well. They were getting subsidised: they weren't getting the full one hundred percent but they were getting maybe forty or fifty percent [Jamie]

The specific government schemes and subsidies are discussed in detail below.

Off-farm planting was also opportunistic, sometimes driven by the Jacksons themselves, in talking with other farmers:

Some people might have an old rocky ridge or something like that with two remaining dryland ti-trees left on them and think, oh, the country's starting to look pretty terrible, maybe I'd better preserve that couple of trees; so I'd say, I suggest you fence off this whole hill-top and try and do a bit of revegetation in amongst the stones of what used to be there. Or someone might have an old hill with only six or seven stringybarks left on it and all the rest are dead from cattle, and you think well if you keep grazing it they're all going to die, why not fence it off, and in the big open areas just do little pockets of tree revegetation so that you've got a nice piece of scrub left there. [Josie]

Remediating saline land has not been as urgent in this district as it has been further north and west. From the Jacksons' perspective, however, this is an incomplete view. In their opinion it represents rather the impact of tree planting in pre-empting the development of salinity as a major farming challenge:

The majority of people for many years said that salinity just did not exist in Willalooka: we didn't want to recognise the fact. A lot of our country could have been borderline salty, but we've filled it up with trees. We were hoping to get in before it happened—it could have happened. [Jamie]

The local dimension

The Jacksons were early movers in native revegetation in the Willalooka district. As outlined above, their initiatives were motivated first by the urgent need for shelter for their stock, the lack of which was materially impacting farm productivity, and second by a desire to improve the landscape value of their land. At that time they did not have an explicit goal of influencing others to follow their lead. However, that the normal local social interaction of a farm community spontaneously transmitted the success of their revegetation enterprise, and motivated other in the same direction.

For example, stock agents, who primarily sell the inputs required for modern farming, such as seed, fertiliser and materials, move round the properties on regular schedules. In addition to providing their products and services, they act as active transmitters of new farm practice and the discussion that goes with them. They were in a good position to notice landscape change with revegetation, just because they came to the property at intervals—the incremental change of daily observation is less easy to appreciate:

Stock agents at the time used to come round. This was when we first began the planting down around the main road. Because we used to see it every day we didn't really appreciate it. He'd come one month, and then over the whole period of time we might not sell any stock, so he wouldn't be here for several months. And when he came back, he'd say "Your place is just starting to look really fantastic." [Jamie]

As noted here, although planting may be going on in the internal areas of the property, or in its back blocks, it is the planting along the main road, readily open to the view of those driving past, that has the largest effect on members of the local community; and again it is the 'look of the place' that is most significant.

It was the look of it—I think the aesthetic side of it—it just looked good, if people could see shelter belts. [Jamie]

In the early days, the Jacksons were able to draw upon community assistance in hand planting seedlings. In this activity they were drawing upon a well-established community structure which was accustomed to fund-raising activities for local clubs and associations. Here initiative was taken by the Jacksons, rather than by the Association, but the activity and the benefit were similar:

We used to get the local community group, the Progress Association, to help plant the trees. It was a community thing, and it gave them a couple of hundred dollars for the kitty. We'd go and plant a thousand trees. We'd have a couple of people going along with shovels, and a couple of people going along with trees, and somebody else coming along watering them in, a bit of a gang scenario. Like stump picking for your hockey club. [Jamie]

When direct seeding became available, again it was the landscape of the growing trees that provided the impetus to consider doing something similar, although there was often a lag time, even of years, before the decision was finally made:

They thought direct seeding would not work, but they'd look over the neighbour's fence and then they'd get us in a few years later, because they'd see their neighbour's trees were so much better than hand planting, which was just gum trees, no understory. . . just planting trees was so much harder work [Josie]

Josie is here referring to the ability of direct seeding to provide a close planting of many species, so that the resulting shelter belt was vertically layered, providing effective shelter at all levels of the profile. For practical people, 'seeing is believing.'

Although shelter and landscape were repeatedly expressed by the Jacksons as the main motivations for planting, for themselves and for others in the district, they also described the pleasure gained from the restoration of local bird populations as the shelter belts—particularly those with shrub layers—grew. This provided a marked contrast to the clear-felled open land that so many landholders inherited, or had created, where birds were few:

So many people within a couple of years of having trees on their place, the amount of wrens, of little honeyeaters, just in that windbreak, they're unbelievable—where your farm has been pretty devoid of birds, suddenly they've got birds back there, twenty plus species in a belt, and it's just because they've got trees there, a decent variety. [Josie]

Those landholders in the district who took up native revegetation collectively identified the enterprise. Direct seeding, in particular, was a new technique, developed, as with many of the on-farm innovations in South Australia, by trial and error.⁵ The tree planting community shared that information, and shared also the successes that came from applying it. Here the pleasure—even a "passion"—associated with planting trees, and the transformation it effected for the look and feel of the properties, could be communicated:

We used to get people emailing photos of their tree seeding. There'd be little trees coming up and that was like little babies to them, they'd be talking, 'my tree site is doing fantastically'. People used to send us emails, 'you've got to come and have a look at our tree seedlings'—we've seen hundreds of tree seeding sites, but people are excited and then they'll talk. And then when you get a really good site up and going, we've had some that have been along the main

⁵ The development of clearing techniques, such as the scrub roller and the stump-jump plough, and of soil treatments, such as superphosphate spreading, are well-known pioneer achievements, based on innovation, trial and error, and informal lines of communication. (Williams 1974, chs.4, 7)

roads and people hear, ‘Did you do so-and-so’s site?—it looks fantastic—must get you to come and do some.’ [Josie]

The Federal government program Landcare, developed in the 1980’s and still active, subsidised tree planting activity, and local schools were actively recruited to the project:

I know when [friend] and myself were involved with doing trees with all the school-kids, that was all Landcare, in the middle of the 80’s. Landcare was definitely big then and you could apply for Landcare grants to do little projects with schools and community groups. It was all community group stuff. I called ourselves the Willalooka Tree Group which really was a loose affiliation.

Although the Jacksons found that their tree planting activity had a clear influence in the local farming community, and lead to others taking it up on their own properties, not everyone had a favourable attitude to it. The most immediate concern was for a potential increase in pests:

We have heard of some people ‘that’s all we get now, foxes hide in the tree lines’, or forestry plots. They hide down the main roads too. Pretty negative people to think that way. [Jamie]

In part this opposition was associated with a different view of farming, one rooted in more traditional agribusiness paradigm that was focused largely on controlling inputs and maximising production:

There are definitely some people that only want to have three pivots, and vineyards and no trees—they don’t want trees with the vineyards because the birds will eat the grapes—different mentality altogether. [Josie]

Their estimates of the proportions of farmers across the curve, from most committed to revegetation to actively opposed to it, followed a roughly normal distribution:

I think the really negative people will be in a minority. The passionate people are probably maybe a third, maybe a bit more than that. There are probably better than a half, say sixty percent who say “I really like to look at trees and I wouldn’t mind doing some trees one day.” And then there’s probably ten percent at the most would be really negative. [Jamie]

Of those segments, however, the Jacksons emphasise that it is only the leading one third for whom revegetation is relevant. That relates both to the initiation of a revegetation project, and to the ongoing maintenance of it, so critical to success:

It’s hard to get people. If people aren’t passionate about it there’s a fair chance that the site will fail, because they couldn’t be bothered about maintaining weeds, [dealing with] insects and vermin, and all that that goes with it. If they’re not passionate about it, it won’t work. [Jamie]

The government dimension

Government funding of native vegetation schemes

Over the past ten years, farmers in the Tatiara have worked under a wide range of plans or schemes relating to native vegetation initiated by governments. Programmes have been mounted by departments and agencies of Federal, State and local governments. Some programmes, such as the Upper South East Regional Revegetation Strategy (1998), have addressed native vegetation enhancement or revegetation directly. The South Australian Dryland Salinity Strategy (2001) includes native vegetation work as a central component of its strategies. Others, such as the Joint USE Program Board and Environmental Management Advisory Group, have placed native vegetation work in the context of land and biodiversity conservation. Farmers have had to operate within frameworks of national scope (such as Greening Australia), state scope (such as the State Dryland Salinity Strategy) and regional scope (such as the Upper South East Regional Revegetation Strategy).

As might be expected, this array of programs has its own internal confusions and inconsistencies. There is a marked lack of historical continuity from one plan to another over time. At any given time, even at the State level, several plans may be operating, apparently independently of each other. Even today (2007), with the South East Natural Resources Management Board having been established for the express purpose of providing a coordinated framework for land management in the region, there are still key areas of policy and implementation, such as for irrigation, soils and pest control, that are not fully integrated within the Board's direct management responsibility. For many farmers in the Tatiara, particularly those who have been motivated to undertake revegetation or enhancement, understanding and interacting with this, multi-layered government framework has been a source of continued frustration. Farmers' attitudes and values to government, as expressed to us, are discussed at some length below.

The main government programs and documents available to the Jacksons over the past ten years or so are briefly described in Appendix B. It is important to note that this is not a survey of the government programs actually in place over that time, or of the documents available to Tatiara farmers, but of the program documents that had been kept and worked with by the Jacksons, as one of the key proponents of native vegetation revegetation and enhancement in the district. It therefore provides a indication of the communication materials that had filtered through to Tatiara farmers, and which provided the concrete, written elements of the governmental framework they see as most relevant to them.

The Landcare and Greening Australia government programs were early programs that supported revegetation work, and in which the Jacksons were actively involved, as outlined above. A third program of this kind was the One Million Trees mounted in the early 1990's, a program which reportedly put hundreds of thousands of trees in the ground but failed to reach its target because of inability to maintain the trees planted.

The most successful government program, in the Jacksons eyes, was 1998 ‘Salt to Success’. This was a Federal government scheme, funded and administered through the Natural Heritage Trust. Some \$575,000 was targeted to 22,500 hectares from Naracoorte to Tintinara, and out to the coast, and focused on increasing the region's cover of bushland to help address dryland salinity. From the local landholder's perspective the program was seen this way:

Some of the money that was meant to help biodiversity in the Upper South East dryland salinity area got put into the Salt to Success scheme. It offered people funding to fence off pieces of scrub, to do a bit of revegetation, to plant lucerne trees, do some clayeying. There was far greater allocation of money towards revegetation and fencing off scrub than there was to clayeying, so it still got used up, and it was a huge success. [Josie]

The Jacksons are unambiguous about the unique success of this program, and the reasons for that success—close monitoring of revegetation success factors and funding made available only on demonstrated results:

Salt to Success, and that was fantastic—it was the only scheme, as far as I'm concerned that was worth having. All the rest were a waste of time. It was the only one where people only got subsidised if they got results. . .to get the actual funding people would actually come out and check your fencing, germination rate, and weed control. [They would] make sure you hadn't let stock in. And they would expect to see seedlings in the ground before they actually funded the farmer: it made the landholder conscientious enough to look after his site to get the funding. So generally most of the people that got the funding were fairly genuine. [Josie]

A tough approach to the failure of seedlings was also taken in this scheme, and approved of by the Jacksons:

The other thing with Salt to Success was that if for some reason it was a failure—we might have had a heap of black frosts or gone through a real dry spell—whatever reason, if the seedlings failed they were expected to redo it—and only rarely funded for redoing it. [Josie]

The main government scheme with which the Jacksons currently interact is The Upper South East Project Levy/Biodiversity Offset Scheme. Under this scheme, which is voluntary, landholders are offered “the opportunity to offset their drainage levies (their ‘project levy’ under the Upper South East Dryland Salinity and Flood Management Act) by placing assessed biodiversity assets under a management agreement and a long-term (fifteen year) plan of management that specifies the biodiversity conservation objectives. This is a reasonably complex scheme, requiring the scoring of native vegetation with a Biodiversity Significance Index (BSI. There are various incentive rates, depending on how much stewardship is undertaken: higher rates are available for addition grazing, pest and fire management, for example. (Willis and Johnson 2004).

The Jacksons participate in this scheme, and accept the financial value of it in offsetting their drainage levies. They are unimpressed, however, with its lack of impact on revegetation: it aims to protect existing areas of vegetation, but “it doesn’t put another tree in the ground.” Their description of the scheme is as follows:

We’ve got a hundred acres of scrub here, if we want to trade that for our levees we have to then put that scrub under lock and key basically, re-fence it, be prepared to sign a management agreement to keep rabbits and weeds out of it, whatever, but we can trade that scrub for our levies. But the thing that really worries me is that it’s already there, that scrub. [Josie]

Moreover, they are not happy with some of the requirements under the management agreement, particularly when applied to landholders like themselves who have been managing native vegetation on a large scale for many years:

They’ve valued it and they’re now saying our piece of scrub has enough value that we can actually trade it for our levy—you offset your levy. It just means if we’re prepared to fence off this piece of scrub and take care of it—which we’d already been doing anyway. We had the highest biodiversity index in the area, we look after it. But no, that’s not quite good enough, you have to put another fence up and you have to do the extra. [Josie]

Bureaucratic barriers

A theme that the Jacksons repeatedly return to, in discussing the role of government and government funding schemes over the years, is their dissatisfaction with the way government schemes are conceived and implemented. The term ‘bureaucracy’ is used to describe a range of these frustrations. One is the difficulty of complying with the procedures of application for native vegetation funding. For example, with respect to the One Million Trees scheme:

It was so hard to get money out of them, absolutely just about impossible, and to fill out all the paperwork for the few dollars it was a nightmare.

There is a clear perception of lack of transparency and apparent arbitrariness in decision-making about programs, without reference to conditions at the local level. For example, the decision to end the Salt to Success scheme, which was, as indicated above, seen locally as producing outstanding results:

But whenever there’s something really good that is worthwhile and works and all the money isn’t just being swallowed by the bureaucracy it gets hit on the head. [Josie]

Expressed here is also a view (held widely in the general Australian population, of which country people are no exception) that money spent on government administration would be better applied to support the people directly affected.

A serious concern is the charge that governments have not met their commitments, even, perhaps, their legal commitments. For example, the Jacksons are highly critical of the way in which the drainage levies and the building of drains has been handled.

Although this is an issue which is not directly connected to native vegetation, the attitudes it creates generalises from drainage to vegetation. The way in which the Jacksons and other locals understood the commitments around the building of drains and the levies associated with them is as follows:

[The government said] you pay for your drains now and we'll put them in. And that's what's been the funding over the years. Six years later, no drains in the area still, but we just need another six years of levies at double the rate to finish the drainage scheme. [Josie]

This was the understanding of the local people of government representations:

We thought we would be paying levies for six years for the whole drainage scheme, that was what we were lead to believe—everybody in the area thought that—they got out of it by saying that six years of levies was the start of the pilot scheme—the costs rose, it was not necessarily to complete the scheme. [Jamie]

They bluntly express their conclusion about the whole transaction:

And they lied because we signed pieces of paper which was for the completion of the drainage scheme which was the beginning of the six years. [Josie]

No doubt government representatives would want to respond to some of these claims; but in a sense that is beside the point. The clear fact is that this is the Jackson's perception, and the attitudes that have been engendered by it are strongly negative towards the government and must hamper the development and implementation of other programs, both now and in the future.

Another constant theme is the opposition between government and local experts. The complex interaction between surface water, underground water, drainage and native vegetation is a prime example. There is unhappiness at recent decisions to continue deep drainage in the district, despite the impact of tree planting, of existing drainage and of the recent drought:

It's been a couple of dry years and things could change if we have a couple of wet ones again. But planting deep rooted trees has been excellent for using up the water. And [government experts] have blindfolded themselves in the lower south east by saying 'they don't tap into the underground water', which is rubbish—in about eighteen months they're into the underground water and they suddenly start growing like weeds—even up here our underground water was actually close enough for our timber trees to do really well. It's only been in the last couple of years with this drought that there are problems in the area now that the actual drainage people didn't actually want to think were there. But our water tables are lowering and people are having to deepen bores for irrigation and stock water. And they've still been trying to say, to get the last of the deep drains through, that our underground water table is rising, and it's not true—it's just the way you can be manipulated by the scientists wanting to get a job finished [Josie]

Their dissatisfaction with the government was shared by others. It is an element with which they have had to deal in their direct seeding work:

The hardest thing I think, though, over the years—there have been a few people that we've had to deal with to put trees in the form of the pivots or whatever, and they just absolutely blast me about this. For landholders, the compulsory requirement is that when you knock down trees you have to plant in set aside areas.⁶ And when they ring me up to get some tree seeding done, because they have to do it, they really start jumping down my throat as if I was an ogre, and in the end I say, 'I'm only here to try and help you.' [Josie]

This attitude, in the Jackson's view, derives from interactions between landholders and Government representatives, where regulations have been applied to local properties with a degree of inflexibility, and without what landholders would see as due regard for local requirements. This approach is summarised in the single term, 'hamfisted':

There have been instances in the past where the native vegetation authorities haven't trodden carefully enough, or they've come down hamfisted on someone because he's taken two trees out. So then he's got his back up. [Josie]

In explaining how this situation can arise, they point to the importance of taking into account the whole farm, and looking to achieve a good outcome overall, even at the expense of the strict application of the regulations. This graphic example presents the counter-productive actions that can result, as against a different set of trade-offs that could achieve much better native vegetation outcomes:

I know of some vineyards that have wiped out two hectares of magnificent fifty-year old red gums down on the corner of the swamp and planted vineyards there because the native vegetation authority wouldn't let them take out one tree with hollows in it up on the hill [for vineyard development]. So the vineyard owners then really get their back up and think, oh well, I'll clear all of that because I'm allowed to. Although in the long run they're going to dynamite this old tree anyway and get rid of it. Whereas the native vegetation authority, if they were wise enough to allow one tree on the top of the hill that was going to be in the middle of a development disappear then the vineyard owner would probably have been far happier to leave that two hectares of beautiful fifty-year old red gums that are our future down there and plant another two hectares around the other side of his trough. But there was no negotiation. [Josie]

This kind of bureaucratic attitude is identified with a separation from the demands of the concrete farm environment, and an ignorance of farmers' motivations and range of possible actions, and probably responses:

They just would not ever think about the real world: do you think it might be a good idea to save that twenty acres of trees down there rather than have the farmer bulldoze them because you've got their back up?—just a bit dumb. [Josie]

⁶ The reference here is to the Native Vegetation Regulations 2003 5(1)(d), which allows for minor clearance of native vegetation incidental to a proposed development, provided that it meets certain environmental criteria, and provided the development is associated with an equivalent environmental benefit created elsewhere on the property and the region. (The Native Vegetation Council, 2006)

Overriding this is the demand of the farmer for his rights, priorities and knowledge to be respected, in the context of the design and application of the regulations:

They were too militant in what they were asking—they didn't actually treat the farmer as if he actually owns that land: you will do this and this and this. But sometimes there wasn't scope for change. [Josie]

The Jacksons also see bureaucratic barriers as being responsible for major native vegetation opportunities not being taken up. Over the past two decades, as drains were being put in, it would have been relatively simple, they point out, to take advantage of the fencing that was going in around the drains to underpin a major revegetation project: "We could have had a corridor right through to the Coorong," Josie observes. "But it didn't happen—and we never understood why."

Local ownership of native vegetation initiatives

In contrast to the sometimes 'hamfisted' action of Government representatives, the Jacksons strongly supported the value of local initiatives: establishing local needs and priorities, incorporating local knowledge, and even extending to local control of funding allocation. Some of the Government schemes were able to be approached in this way:

When we did things like the Mid- and Upper SE Action Plan we had people from the council and farmers and people who were on other committees sit around a table and work out what we actually wanted.⁷ . . . And then there was government funding under the National Action Plan, started in late 1990's a lot of on ground people, local people, put a lot of work into getting that scheme up and running with the help of Primary Industries. [Josie]

It is clear from this description that in these schemes local involvement covered many areas. In the Salt to Success scheme a proportion of the revenues from the drainage levies were made available for a broad range of sustainable farming measures:

So many millions was meant to go towards funding looking after the environment, conservation. . . And that wasn't just native vegetation—things like claying, lucerne trees, all the associated things, anything to do with water. . . So many dollars were allocated every year. We used to sit around a table and we were knocking farmers back, that was how popular it was. [Jamie, Josie]

Under the earlier National Heritage Trust schemes funding was only made available to approved farming groups. So the local farmers simply gave their local farm

⁷ The reference here is to the Upper South East Regional Revegetation Strategy, Primary Industry and Resources, SA, and Department of Environmental Heritage and Aboriginal Affairs, Government of South Australia, 1998. The Upper South East Regional Revegetation Strategy was a major initiative intended to bring together cross-departmental state expertise and experience in the generic and specific issues relating to revegetation in the region. PIRSA was the prime mover, with DEHAA the supporting department. The initiative was funded by the National Landcare program. The USERRC also attempted to incorporate input from local farmers and local government staff, as well as members of the Nature Conservation Council of SA. (Upper South East Regional Revegetation Committee 1998a,b)

management group, which was already operating informally, a name, and used it to access the funding being made available:

Back then though you could not apply for any funding as an individual landholder, you had to be a group. I formed this group called the Willalooka Tree Group. I think it might have even been our local farm management group, and we were involved in management, planning days and things like that. [Josie]

Once the funding was in hand, the group then made decisions on how the funds were to be allocated, to members of the group for sustainable farming initiatives, according to their collective view of the priorities:

That group actually had to go through all the applications, and it allocated the money out. For native vegetation, which was a public good, you could get two-thirds of the cost funded. But for things like claying people only got about ten percent of the cost, because it was a private farming good. [Josie]

Direct seeding had been developed by the Jacksons at about this time, so some of the funds were distributed to this revegetation activity. It was a substantial project, and it was used by the local farms to generate significant wider interest, in both hand planting and direct seeding:

We got an amount of ten thousand dollars at one stage. I had ten farmers in the group and I did some direct seeding for all of them. After we'd done all that we had a big field day—we ended up with about one hundred and seventy people here. That was early days then. We guessed that we seeded about three hundred and forty thousand trees and we planted eight thousand tube stock for our money. We had to work out cash in kind. [Josie]

It is clear, then, that given the opportunity for local ownership of schemes, the local farming community was highly effective in organising its membership, in working with PIRSA to apply for and administer funds, and in leveraging the on-farm impact to promote revegetation throughout the district.

The Jacksons emphasise the important of local knowledge, about species of vegetation, soils, topography, water and wind—the factors that make for successful revegetation outcomes. Local knowledge is seen as particularly important in the South East, where soil conditions can change abruptly within relatively short distances, from terra rossa's, to non-wetting sands, to limestone ridges, or sandy rises, to black soils and to loams. Under these conditions, local knowledge is seen to be critical.

For example, in the context of direct seeding, when they took on a contracting job the Jacksons meticulously researched which species to plant and made comprehensive recommendations to their clients:

I go to the site, either the year before, or in the autumn, and look at the native vegetation in the area, and the soil types and things like that and write myself a list of species to plant. [Josie]

And Jamie remarks:

Just general knowledge, she knows what grows on what soils. . .

It is just the lack of coordination between this detailed local knowledge and those in Government departments who develop the revegetation schemes which, Jamie goes on, produces poor outcomes:

And this is where you get into a lot of trouble with the native vegetation people. There have been times where we've done work for vineyards or potato growers, or people that have knocked down trees and have got to plant back 35 to 1— somebody sits in Adelaide and says, 'oh, that's Naracoorte, they've got to have all of these species in there, in the mix'. [And yet] some of them don't even exist in the area, some of them don't even suit the soil type.

The local people themselves are well aware of the Jackson's expertise. For example, during an interview, in the Jackson's kitchen, Josie took a phone call from a neighbour who wanted to seed in some waterlogged areas: Josie outlined a mounding technique to cope with these conditions. She is also in demand to accompany other landholders to native plant nurseries to advise on purchasing.

The Jacksons' overall perspective on government support for native vegetation work going forward is unambiguous:

The farmers down here do need government help with funding revegetation, if it's going to continue. Our terms of trade are worsening, and we're still battling the drought. It's not realistic to think that revegetation will happen without that support. [Josie]

The future

The Jacksons are widely informed about current national and global issues that bear on agriculture and their farming operation, as well as on native vegetation revegetation and enhancement.

GMO crops

One such issue is the likely approval of genetically-modified canola by the South Australian government. The Jacksons are wary of this development, on a number of grounds. One is its potential for damaging existing native vegetation patches:

I was just reading in last week's 'Stock Journal' [about potential release of GM canola]—it will be interesting to see what happens there because there's been a huge anti-GM movement. It really, really worries me, with things like the Roundup Ready canola. It's not just from the farming point of view—because what happens if that canola ends up in our scrub, and becomes yet another bad

weed like bridle-creeper, and you can't just go and spray it with Roundup and kill it and it becomes invasive. [Josie]

At the same time, in the context of farming, the Jacksons are open to the selective use of GM technology to produce particular crop properties:

If they bred a crop that was going to tolerate the drought better, or saline soils better, or something like that, that should be looked at. [Opposition to GM is] not just a blanket thing, because they might be able to breed a crop that is going to thrive on saline country. [Josie]

I think there are good positives that can come out of . For example, in the cotton industry, if they could produce a plant that didn't require any of the pesticides, that would be sensational. [Jamie]

They understand clearly, however, that the technology is not without risk, not least to human health:

But if they got a gene out of there that mimicked or did something that peanuts produces then all of a sudden you've got this huge dynamics of people's allergies. [Jamie]

Climate change

Climate change is of real concern to the Jacksons, not just in its impact on their farm but in an intergenerational context:

Well, I just think the whole world has got to start looking at—in the broad context, what are we handing on. [Josie]

They are widely informed on the developing market for carbon credits, and report discussions about it that have been going on in the district for ten years. This an interesting observation, in the light of the fact that the international focus only began to be widely publicised only four or five years ago: before that time the information was emerging only in scientific journals. It indicates the close attention given by the Jacksons and by the farming community of the district to relevant scientific issues, even as they are in the early stages of forming. Despite the potential of the carbon credit market for native vegetation being canvassed, they are frustrated by the slow speed of its development:

I can't understand why over the years carbon credits haven't been available to farmers planting trees—there's been talk about it for ten years and nothing's ever happened. People keep coming around and preaching different schemes—[they say] we'll only have to get 30,000 hectares of trees and we'll be able to have carbon credits. Well, we keep putting trees in but there's no talk of the credits coming with it. [Josie]

Nevertheless, it is an active item of discussion at informal events, and the Jacksons keep close eye on initiatives elsewhere in the country:

Interestingly at a birthday party in Melbourne a week ago one of the guys there works for a vineyard. He was picking Jose's brain [on revegetation techniques] because they are in the process of buying a farm up in the riverland to revegetate for carbon credits for their vineyard, to offset their winery [operation], so that they can market that they are becoming carbon neutral. [Jamie]

A recent UK survey, which indicated that people don't really believe in the large claims of climate change science, was mentioned. "How could they not?" said Josie simply. Jamie remarked that the recent UK floods were being proposed as an anomaly, a hundred year event. Josie was not impressed: "Look at the polar caps melting, and the glaciers."

The recent extended drought is seen to be slowly changing attitudes to climate change:

I think possibly people are a bit more worried because we've really had about ten dry years, less than average—and more cyclones in the north. So people are starting to think maybe climate change is real. A lot of sections of Queensland, New South Wales and Victoria have been in such bad drought for so many years that it must be making them think it's not just a one-off. [Josie]

The changing distribution of annual rainfall, in time and space, has not gone unnoticed, and there is uneasiness associated with it:

It is a strange one because some areas of South Australia have had average or above average rain—and in January, February, at the wrong time—the seasons have definitely changed a bit. [Jamie]

The recent droughts have left the Jacksons deeply concerned about recent and continuing government actions to continue the drainage schemes that have been associated with farming in the South East for generations:

The farmers here only ever wanted shallow drains, to keep the water moving. The deep drains they're putting in now are threatening the underground water, which is a precious resource. [Josie]

Life plans

Although working full-time as active, engaged and committed farmers, the Jacksons are entering their fifties and looking to focus their work. One activity which they see themselves reducing is direct seeding. This projection is connected to the decline in funding, and to a desire to reduce the level of seed collection, the most demanding part of the operation:

We've always really thought, when we've been doing the tree seeding, that we might as well stick the hard yards in now and just do it while all this funding's around. Because once the funding stops we always thought that tree seeding would drop from an average of say 800 kilometres a year to say 300 kilometres a year. That would be more than enough for us. It was getting to the stage where it was just too much work. [Jamie]

They reflect on the way the tree seeding operation arose, in a opportunistic way, fitted into the template of the annual farming routine:

Farming wise we didn't have to change anything to go and do the tree seeding—we didn't have to shift lambing time or shearing time, it slotted in perfectly to a time frame that was a slow time for us on the farm. [Jamie]

The additional income it generated also helped to meet the financial demands of that stage in their life, which was focused on raising and educating their children:

It was a means to an end at a time when we actually needed the money putting kids through boarding school, pay off our farm. [Jamie]

Now, with their children grown up and more or less financially independent, with the trees on their farm fully planted out and thriving, they see themselves moving back towards the profession and the lifestyle choices they originally made and most value:

At three hundred kilometres a year [of direct seeding] it's not that hard to collect that amount of seed. and still enjoy life. Because really we'd rather be farmers. I like farming, with all the problems involved in farming. I'd still just rather be a farmer. [Josie]

SUPPORTING INTERVIEWS FROM THREE FARMS

The Jacksons are recognised throughout the district as leaders in native vegetation work. They have been in the forefront of new initiatives, leaders in technical innovation and repositories of specialised knowledge. They were among the founders of direct seeding. They have also lead the local interaction with government and government schemes. For more than two decades they have been actively engaged in native vegetation work, as a significant part of their farming enterprise. The interviews with them present the core attitudes and values on which the development of native vegetation depend among those for whom native vegetation revegetation and enhancement is a priority. For this reason the qualitative work with them in this study has been presented and analysed in depth.

Qualitative work with three other South East farms were also carried out in this study. Two of these contacts came from networking from the Jacksons: one was their main direct seeding partner (Keith north), and one a family member (Keith south). The other was known within the district for a different kind of native vegetation work (Bordertown). These three farms also presented quite different farm enterprises, different physical conditions, and different histories, and spanned different age cohorts.

The central themes that arose from interviews with them are summarised in the sections below. Their contributions are organised by the framework of analysis derived from the Jackson interviews, as outlined above. The three farms are discussed

together, in order to facilitate the drawing of parallels and contrasts between them. The main thrust of the analysis here is to reflect on the conclusions derived from the Jackson interviews from the different perspectives these farms and farmers provide.

The farms and their enterprises

Keith north

Peter and Mig Brookman occupy an 728 hectares (1800 acres) property ten kilometres north of Keith, the Tintinara side, bordering the Duke's Highway. The geology here is distinct from those of the Jackson property in Willalooka. Although bordered by the Bridgewater Formation, the underlying soil substrate is composed mainly of medium grained grey to cream quartzitic sands with clay cement (the Coomandook Formation), in places veneered by quartz sands, sand sheets and east-South East trending dunes (the Molineux sands). The topography is flat, with sandy rises, and it sits between the 10 and 20 metre contour lines. Peter describes it as "sandhill country, with deep, non-wetting sands over limestone.

Standing water is not found in this part of the district, which sits west of the formerly flooded areas in the interdune corridors. The underground bore levels (static, that is, when not pumping) have dropped from fifteen feet in 1980 to thirty feet at the present time. The salt content of the water has not changed greatly, remaining at approximately 2500EC, which is at the upper end of the Low-Medium classification: water at this level of salinity is drinkable, although salty to the taste, and does preclude some crops, such as peas, apricots and grapes (Waterwatch SA 2005).

The Brookmans have occupied the property since 1980. When they first arrived, they say, the country was in bad shape. It had been cropped continuously, with wheat, barley and lupins, and the sandy soils were an advanced state of drift. Their extensive native vegetation plantings (see below) were a response to this. They run a self-replacing merino flock of about 2000, with 1000 of these breeding ewes, and 60 to 70 dairy heifers when the season permits. Tagasaste has been established on 60 hectares (150) acres to provide cattle feed. Some clay spreading has been carried out (a technique which was reportedly invented in Mundulla, as a result of some removal of clay from flats and its dumping on nearby hills, followed by unexpected benefits to the pastures and trial-and-error follow up). This farming enterprise structure has remained quite stable over the twenty-seven years of its operation on the property.

The Brookmans worked closely with the Jacksons on native revegetation work. They revegetated their own property, and then moved into direct seeding. Their experience provides many elements that are parallel to the Jacksons, with some important differences and additions. Together the accounts provided by the Jacksons and the Brookmans present a reasonably complete picture of farmers strongly committed to revegetation, on their own properties and throughout the district.⁸

Keith south

Bill and Sally Hood occupy a 740 hectare (1828 acres) property ten kilometres south of Keith, the Bordertown side, bordering the Duke's Highway. The property is

⁸ For logistical reasons under time constraints, the interview work here was conducted with Peter Brookman, although his wife Mig was also a prime mover in the operation.

predominantly situated in a low ridge of hills to the east of the highway. The topography includes rises, gullies and flats. The hills are usually capped with limestone. The soil displays considerable variability across the property, from the heavier soils of the flat, to the lighter soils of the hills, with a narrow seam of terra rossa soil threading the property and then across the district to the Coonawarra region near the eastern border of the state.

The Hoods lease the property from Sally's family under an arrangement which allows for the increased value they create. They have occupied the property for nine years, the first two years as station hands, the last seven years as lessees. At the time they took the property over it was primarily a sheep and lucerne seed property. Lucerne seed continued to be grown until 2003, when prices declined. They undertook significant pasture renovation and water system repairs in the early years.

The Hoods have primarily run beef cattle since leasing the property in 2000. Initially they ran their own stock (mainly bulls) for meat, but now agist nearly all their cattle, in addition to buying bull calves for rearing and resale within a year. They are paid a flat rate per kilogram gain during the agistment period. No crops are grown for fodder, pasture being given priority.

This enterprise structure, as they see it, offers two important advantages. The first is the minimisation of capital investment, as capital wasn't easily available: essentially it is a cash enterprise, and all the improvements to pasture and water have been paid out of cash earnings. The second is an approach to farming that is "kinder to your country"—that is, it is more flexible in adjusting stocking rates to seasonal variation:

We try to only have stock on here when we've got grass: if we're not growing grass we won't grow kilos. . .It's kinder to your country and it sort of fits: all we're trying to do is match our stocking rate to our carrying capacity. That way we don't have to do any supplementary feeding. It seems to be working—although the last two years have been pretty tough. [Sally, Bill]

We spent a large amount of money in the first couple of years developing cell grazing systems, to utilise the pastures properly. . .Most of it was pretty run-down so we put the infrastructure in to allow us to match the stock rate and the carrying capacity. [Bill]

This flexibility proved its worth in the recent drought: the Hoods were able to de-stock, and didn't need to refinance, unlike many in the district. They made a living off-farm and waited for the drought to pass.

Bordertown

Jamie and Jo Edwards run 809 hectares (2000 acres) to the east of Bordertown, near the Victorian border. The property has been in the family since the 1880's. The Edwards have been running the property for twenty-one years, having taken it over from Jamie's grandparents. They describe the property as being somewhat in need of renovation down at that time, and undertook substantial work on fencing and pastures.

The property is undulating, with black soils on the flats and sandier rises. It sits between the 100 and 120 metres contour lines. Geologically this is a Tertiary region,

and therefore older than either the Keith or Willalooka farms, which are Quaternary. Here the predominant geological feature is the Parilla sand, a red-brown medium-grained quartz sand, with some clay cement and some coarse sand and grit. The flats are heavier soils, the rises sandier. The Edwards' neighbour runs a sandwashing enterprise on one of the rises.

The more fertile soils allow the Edwards to include cropping in a mixed farming operation. They crop wheat, barley, beans and canola, using a conventional farming approach. Alongside the cropping operation they run 2500 breeding ewes. In addition they supplement the farm income with a 'Bed & Breakfast', located in one of the historic buildings on the property. They also have other property interests in one of the South East seaside towns. Although they are farmers by family and profession, they describe themselves as "not obsessed" by farming: they enjoy doing other things, and recently spent a year driving round Australia.

There are no significant water issues on the property. Salinity levels are low and the water table isn't falling much. However, by regulation no irrigation can occur within a twenty kilometre belt on the border. The rainfall in the area is about 460 mm (18 inches) per year, but that doesn't make the property immune to the effects of drought. This is the first year in the last ten that their dams have been full.

Native vegetation management

Keith north

As with the Jacksons, on the Brookman's property much of the impetus for planting comes from the female side. Peter associates this motivation with his wife's national origin:

When we came here, Mig comes from New Zealand, and found it a bit desolate. I think she was interested in planting out trees just to try to make it look a bit better.

Again key motivations were in increase the shelter for stock and to enhance the look of the land. Peter, like Jamie Jackson, describes the second factor as 'aesthetics':

A lot of it was driven because we wanted to make the place look better. Really 99% of it was aesthetics. We read a lot and went to many workshops and got involved with Greening Australia, trying to promote the idea of revegetation even from the early days . . . Just making the place look better, that was probably the major thing. By planting trees you hope you're going to have shelter, which we've proven, just by observation, makes a lot of difference to your stock, because they hang around among them.

A third factor was the reduction of drift, particularly in the deeper sands of the hilltops:

Certainly the hilltops were drifting—you can't do anything with a hill unless you put something on it. Fencing off is the first and best thing to do, but even if you do that nothing much will grow—eventually you'll get grass and veldt grass and

that kind of thing on it—but because it is a useless area and you're not producing anything on it why not put trees on it? It looks nice and then sheep come up and shelter there.

As noted above, the management of standing water isn't the issue on this property that it is on properties to the west. However, as the Brookmans contracted out their tree planting (see below) water-related motivations for native revegetation were recognised as priorities on other properties:

[Shelter, aesthetics and drift] were the major things for us here, but in other areas where we're working, doing contract work, it has definitely been for reclaiming saline areas, and also trying to reduce waterlogging. We've seen the results of that, a combination of putting in pastures and trees around those areas. We've seen examples round the back of Tintinara where it's quite obvious.

Peter spoke of the history of clearing native vegetation in the South East, which has led to the landscape these farmers have inherited:

When the first AMP scheme⁹ came they got their big tractors in and all these farmers got together and they flattened the whole area, did ten farms in one year. The same with my father's place up at Meningie . . . after about twenty years of clearing they suddenly realised that there was not much scrub left. They still had a few areas to clear, further out. So they started leaving a bit of mallee, along the fence lines, without fencing it off. Well, that all died anyway, a waste of time. . . They didn't leave enough, it was hopeless. [My father] has a couple of blocks of scrub there which weren't touched. But I remember in my younger days they'd burn it and log it, and then [the contractor] would come in with the big ploughs and huge caterpillars and rip it all up twelve inches deep. . .

Although the Brookmans inherited a block which had been widely cleared and heavily cropped, they had the initial advantage of a 70 hectares (173 acres) block of native vegetation which had been left uncleared. This provided some shelter for stock in the early days, both in amongst the trees and by acting as a barrier to winds from the west. Then began the work of revegetation:

The rest of it had basically been over-cleared: the hills had all been cleared. . . We had these hollows in the tops, they just got blown out, because they had sheep going over them. . . Since then we've started doing a few things. One was just planting trees mainly around the house area and in a few paddocks. Then we moved out onto hills and fenced off the hills, or the tops of the rises. We planted trees initially by using tube stock and various bits of equipment we had, a posthole digger with a dish to scoop out, pretty hard work.

⁹ The reference here is to a development which began in 1949 approximately 15 kilometres south of Keith, after the discovery of trace elements had made pastures viable on the infertile soils. The AMP provided initial finance to clear the land, and then the blocks were leased by soldier settlers under a twenty year contract system. After the initial seeding, the land was divided into five paddocks designed to carry 1500 DSE (800 to 1000 acres). Fences, bores, a home and shearing shed were put on each allotment. The blocks were then allotted by ballot in 1953; each new lessee had then to purchase his own sheep. (Department of Primary Industries and Resources of South Australia, 1995)

Initially the trees stock came from Trees for Life, but then the Brookmans started growing the seedlings themselves. They planted a variety of trees and shrubs, not necessarily only local species:

What naturally grows here is not much, really—the stringbark and the scrubby stuff, mallee—but we went a bit further and put in lots of varieties, all sorts of things can be grown here. . .Banksias (which was a bit of a mistake, lovely to look at but the rabbits get into them) and various other shrubs, acacias, everything you can think of.

As with so many of the farming innovations of the district, they developed their knowledge about species that would work as they went along:

Experimenting, really, learning and talking to other people. [My wife] coming from New Zealand didn't know anything about native trees, but she's a bit of an authority on it now; she and Josie worked together, and they were the ones who get asked to do all the different things.

The revegetation was integrated with the replacement of the fences for their farming operation:

The fences on the property weren't too good anyway and we had to eventually replace some. What we usually did, especially along fence lines, was to put a new fence inside, leave the old one there and that would mostly keep the stock out. On the rises we had to do each side. . .Just about every fence line on our property has got them. . .We ended up going in both directions, wherever it suited us really. Since then we've put pivot circles in here and we've gone around those.

The Brookmans used Tagasaste for stabilising soil, water management and stock feed. It became one of the first planting jobs they contracted for on other properties, with mixed results:

One key factor is getting the site clean enough without silver grass—it's usually done on the worst country, so that makes it a bit more of a challenge.

Over the first ten years, native vegetation seedlings were grown both for their own property and for sale. They sold seedlings, up to 50,000 a year, at 50 cents each, but it didn't deliver a return on the amount of work required. In the early '90's they began direct seeding, and found the returns much better, since income streams were available from both selling the seed and the contract seeding:

You do out a price per kilometre including the seed mix. So that's how we sold our seed, we've got that priced into our structure.

They travelled widely in the district, particularly near Meningie and the mallee country, until realising that the success rate was low in such a low rainfall area. Travel costs, too, were prohibitive.

Zita Stokes, one of PIRSA's main revegetation proponents, became an important communication channel to prospective clients:

We were one of the people [she referred farmers to]. Funding applications were quite often through her and she'd go out promoting it at field days and workshops. We organised a lot of small workshops on our place, and other independent places around where we'd turn up as contractors and bring our equipment and park it there and show people.

In their best year (2003), like the Jacksons, the Brookmans direct seeded about one thousand kilometres of trees. The jobs themselves became larger, up to two or three hundred kilometres each.

Peter built machines for tree seeding, working through several models, modifying his approach through trial and error:

I also modified our direct tree seedling planter, a rough country direct seeder. I built a whole new platform—I take the tree planter off and use a delver and borrow a tractor usually from the Parks and Wildlife—and we did all the rough country around Morella with that and Mig did all the stuff she could get over with a bike and the little seeder—and we bent every bit of machinery. The first year was a disaster—we were going to stay over there and work but we had to bring the machinery home each time.

Seed collection, they confirm, was the most demanding part of the direct seeding operation, carried out through the hottest part of the year. Seed collecting permits were introduced by local councils, to control the stripping of trees:

I know the reason they had it because there was some indiscriminate seed collectors which came into the business for a while to make a quick quid—they're all out of it now—they would go to an area and strip every bush, because it's easier to collect it. You're meant to only take 10% of any one bush—we were pretty responsible.

They found the permit system irritating, forced on them by irresponsible, small-scale seeders, and were clear with their council clients:

We do work for councils, too, Coorong Council, Tatiara Council. They get us to do their work, our argument is, if you want us to do it we will just collect the seed where we feel like it.

Peter defers to his wife on the detailed knowledge of species. She worked with Josie to develop a formidable depth of local native vegetation knowledge:

I don't know anything about varieties, I'm hopeless, I just do it. . . Mig knows all these things. They've made a bit of a study of it, she and Josie. Josie probably had a bit more of a head start having lived here, being an Australian, Most of it they would have learned from those days onwards, when they decided to get into trees, reading books. Now they're consultants on it.

State and local governments became substantial clients of the Brookmans. As the drains were established, the revegetation of some of the drain banks was undertaken by them. Again they have had to develop novel methods for the physical challenges of seeding on banked surfaces over long distances:

We did a lot of reveg on the Coorong drain. . . We loaded up the super-spreader plane and mixed the seed up with chick crumbles, a kilo of seed to one bag of chick crumbles. We put it in his hopper, it was all guesswork. We flew it on, a fifteen kilometre stretch. . . It was quite successful, a bit patchy, and I don't know what the long term prospect is. . . This year we're going to try to blow some seed on it with wallpaper paste.

The direct seeding business integrated well with the sheep farming yearly routine:

We do a bit of preparation in May, mainly organising people, ringing around, getting them to do the spraying in about late May, early June. And then we start seeding when we finish shearing, in late June and all through July to early August.

At its height the direct seeding business generated up to half of the farm's total income. However, in the last several years the business has dropped off, from a combination of the reduced availability of government funding, the drought, and the adoption of competitive practices by larger agribusiness enterprises:

The big companies found they could get a team of people with Pottiputki planters¹⁰ and a bucket of seed. One man can plant two thousand seedlings in a day if they are really going. Our machine was a one-pass machine, and it was good for what we were doing but in the bigger areas we couldn't compete. And they were doing it on mounded ground, too.

Rabbits were an ever-present threat to the survival of seedlings, and are seen as an endemic threat that could be controlled but not eradicated:

You're never going to get rid of rabbits in this country because it's too easy for them. We rip¹¹ them, but then they're very hard to get out of your tree lanes. I do fumigating¹² and also 1080¹³ oats—if you get it right you can knock the numbers right back, but they come back. . . The Calici¹⁴ virus is spasmodic, it still comes through, usually if you get a warm damp spring is the best time, October

¹⁰ A Pottiputki Planter consists of a hollow tube with a duck-bill end that is driven into the ground and levered open to create a hole suitable for the seedling. The seedling is then dropped down the tube into the hole and pressed into place with foot pressure.

¹¹ Areas where warrens have been destroyed by cross-ripping the soil are much less likely to be recolonised by rabbits. A tractor-mounted ripper operating at about sixty centimetres, is used.

¹² Fumigation is used as a control measure when a few rabbits live in widely scattered warrens or inaccessible areas. Fumigant tablets are placed in burrows to release poisonous phosphine gas.

¹³ Compound 1080, sodium monofluoroacetate, is a naturally occurring compound produced by many species of Australian plants. It is a white powder, odourless and tasteless. It was first produced in Europe and used in the USA against mice plagues during the 1940s. It was first used as a rabbit poison in Tasmania in 1952. It is now widely used in Australia and New Zealand to control pest animals.

¹⁴ Calici virus causes haemorrhagic diseases in rabbits. This disease rapidly kills mature but not young rabbits, but affects no other animal species. It was accidentally released from a test site into wild populations of rabbits in 1995, and officially released in 1996.

and November, and sometimes in January. Usually Myxi¹⁵ comes through in about January and that has an effect.

Overall, however, the Brookmans are take a pragmatic view about the factors that drive the direct seeding business. It is driven, they say, mainly by the dynamics of discretionary income:

A lot of the people we work for want to put trees on their property, probably for the same reason as us, it feels better—but the biggest thing is that when the funding stops it usually stops the work. I know these programs are set up to get people into it, and you hope it's going to be self-motivating. Well, from the day it started we have seen that it never will—because people don't have spare money. If they do, they go on holiday or buy a house at Robe, and do something for themselves, or retirement or superannuation. It's very hard to see the cash value in trees, although we know they feel good.

Keith south

An important motivation on the Hoods' property for native vegetation preservation or planting has always been shelter:

There's research that has been done on paddocks that have got shelter belts within them—they do a lot of it in Victoria—and the stock do a lot better, the pasture does a lot better. So people would knock all the trees out in the middle of their paddock and plant trees right round the outside of it, because it makes it a better paddock. [Bill]

The rearing of young calves straight from the dairies, as an important part of the farm's enterprise, has underscored this factor. However, the amount of remnant vegetation on the property is substantial for this district, and the gullies and topography provide shelter from the westerly gales, so stock have usually been able to find some kind of shelter. Hence revegetation has not been as critical to the farm enterprise as it has been, for example, on the Jacksons' property.

Landscape has been a second value for the Hoods. Treeless land is seen by them as land that doesn't look good and hasn't been treated well. They expressed appreciation for the variety and quantity of bird life in the vegetation tree lines.

Direct seeding, which would allow revegetation on a large scale, is regarded as problematic on the limestone rises, or where the red soil is shallow over limestone, which is where they would be looking to plant trees. The flats, where direct seeding might occur, are reserved for pasture. The rises are seen as potential planting areas, but only of the smaller brush.

¹⁵Myxomatosis is a highly infectious disease caused by the myxoma virus, which produces a high mortality when first introduced into a susceptible rabbit population. The virus is spread by mosquitoes and rabbit fleas. Myxomatosis was introduced to the wild rabbit population in Australia in 1951.

The Hoods made initial attempts to preserve the native vegetation on the property five years ago. An area of about 10 hectares in the eastern gullies of the property was fenced. The vegetation thickened quickly, particularly in the understory, but rabbits proliferated equally rapidly, eating out into the paddocks for several hundred metres. Attempts to eradicate and control the rabbits were ineffective, because of the difficulty of access. Eventually the fence was taken down and the stock let in, to eat out the understory and provide access to the rabbits for baiting.

I let stock back in because they're good at filling in the rabbit holes. Then I go back out there and poison them. That patch of scrub is so thick you can barely walk through it. [Bill]

They see restrictions in the conditions of the state funding as partly responsible for this outcome:

The funding at the time was only for so many dollars and certain type of fence. . . It would have been ideal if we'd put a netting fence up but there weren't enough dollars per kilometre to put one up. [Bill]

The planting of native vegetation has since focused on the planting of individual seedlings. With good opening rains, Sally is planting ninety to one hundred trees this year. These consist of Red Gums (*E. camaldulensis*) for the flats, Round-Leafed Moort (*E. platypus*) and Hakea (small to medium-sized shrubs, with flower clusters and spiky leaves) for the fence lines. There are also plans to run tree lines along the check banks of the flats.

The focus of the current plantings is the replacing of dead trees. Even though it is accepted that for the purposes of shelter, a single tree is not significant, their wider landscape values are recognised, and are factors in promoting planting activities:

One tree in the middle of a paddock does nothing for anybody. And that old tree just dies of old age anyway, it doesn't have a chance to get something else going. A lot of the trees around here are fairly old—you've got to wonder what's going to happen. [Bill]

Their good fortune in having inherited larger trees on their property is recognised, and contrasted their absence in neighbouring areas, resulting from the variability of the local soils:

Yes, good trees. And it's only on this side of the place. There's none of this sort of timber further out the back, you run into more of the mallee sort of scrub. It's just this flat—I would imagine that from here right through to the Naracoorte highway would have been covered with these big trees. It would just be the soil. But they stop, you've only got to go another five hundred metres that way and there isn't any. [Bill]

The Hoods are very aware of the factors constraining revegetation. The time resource looms large: there are simply so many demands on their time in the farming business that they find it difficult to put aside time for large scale revegetation. The rearing of calves, for example, as a seven-day a week occupation, and physically demanding.

The time constraints have been particularly acute in recent years, where simply surviving the drought has been the priority. In the absence of government funding spending significant amounts of money on the discretionary activity of revegetation has been out of the question.

Bordertown

For the Edwards's enterprise there has been little need to plant additional vegetation as shelter for stock. Their cleared paddocks were left with substantial number of trees, which, in many areas, have retained some understory, so that stock can readily find shelter in adverse conditions. One paddock of 58 hectares, where trees and shrubs are particularly abundant, and where the topography provides additional shelter, is a preferred area for lambing ewes.

Nevertheless one area of 88 hectares has been set aside under a State Heritage Agreement.¹⁶ As they describe it, this was achieved thirteen years ago by a 'reverse' strategy: they applied to have the area cleared, which was refused, and they were paid to list the block as protected under the Heritage Agreement. The area is on a sandy rise, and thus is of little use for cropping or pasture: taking it out of production doesn't impact on the economics of the farm. There are some large stringybarks in the area, together with a significant amount of regrowth and large amount of fallen litter. It has had stock in it from time to time over the history of the property. There is a significant infestation of Bridal Creeper in the area: the Edwards have tried biological control without much success.¹⁷ The Edwards have had a list of native birds in the protected area compiled, and would like to establish a walking trail for visitors, potentially supporting their Bed and Breakfast business. They enjoy the area for picnics and walking.

To the south of the property are two areas of approximately ten hectares and thirty-four hectares that have well developed Bulloak (*Allocasuarina luehmannii*) communities, fenced off from stock. These areas were in the past cleared and grazed, although the trees are denser than in other areas. The Edwards are in discussion with the State authorities to use these areas as biodiversity offsets. They have proposed corridors along fence lines to link up some of the southern scrub, but a counter proposal for the protection of larger areas has been proposed by the State government. This is still the subject of negotiation.

¹⁶ The Heritage Agreement Scheme is a program of the SA Department of Environment and Heritage which assists landholders in conserving native vegetation on their properties. The agreement between a landholder and the State Government protects in perpetuity an area of native vegetation. In signing the agreement the landowner becomes eligible to receive financial assistance for the management of the land, rates and fencing. In its early stages of the Scheme, as here, landholders were paid compensation for income foregone to place vegetated areas under the protection of an Agreement. This provision is no longer available to landholders. (personal communication, Department of Environment and Heritage, 2007)

¹⁷ Bridal Creeper (*Asparagus asparagoides*) is a South African invader which infests native vegetation in all southern Australian states. The tuber mats prevent native plant seedlings from establishing and birds eating fruits spread seeds of the weed. Three biological control agents have been released in Australia; a leafhopper (1999), a rust fungus (2000) and a leaf beetle (2002).

The Edwards indicated that it is difficult financially to take areas out of cropping for environmental purposes. They point out that they were being offered about \$400 per hectare, against what the land was worth on the open market, about \$1000 per hectare. This doesn't include opportunity cost of not cropping for the life of the agreement, an open-ended time period.

Some individual tree planting is being undertaken along one of the boundaries of the property. The tube stock comes from Trees for Life through the local Agricultural Bureau. The Edwards have considered planting pines for timber in The Scrub block, but haven't gone ahead with that. They haven't considered planting native vegetation for timber.

They are concerned about the death of older individual trees in the paddocks. When they used to burn stubble (not common practice at the present time) some of these trees were damaged or killed.

There are significant numbers of rabbits and kangaroos in the protected area (these were both identified as 'pests'). The Edwards have baited the rabbits but don't think they have the situation under control. They live with the kangaroos and don't cull them.

On the Edwards property, all decisions about native vegetation occur in the context of the farm enterprise. The priority is to maintain the income levels that derive first from cropping and second from sheep. They would not consider making land available for native vegetation revegetation if it was land that could be utilised in these enterprises. An important reason for native vegetation being protected under the Heritage Agreement is that the area is located on sandy, infertile soil that is not particularly suitable for crops or pasture—along with the compensation paid for it.

Government

Keith north

The Brookmans have been drawing on government revegetation funding from the early days of these schemes, more than three decades ago. Over time they developed the application skills necessary to secure funding, skills which in subsequent years they extended to others seeking the same kind of support:

Before 'One Million Trees', before Bob Hawke got into it. I can't remember what the schemes were now, only a matter of a few hundred dollars, but that helped buy the materials. We learned after a while how to fill in application forms, and now we do it for everybody else. We never got anything for a long time and suddenly we started getting a few grants and we realised what they wanted to hear, not what we want to tell them; and that's what you do, you answer their questions in the right way and it will work.

They worked with a local state agronomist to promote native revegetation through a field day event, 'Salt Sands Success' (which they see as a forerunner to 'Salt to

Success'). Interestingly, this was not popular with local people, because of the association of the district with salt, but it did attract wider interest:

There is a program called 'Salt to Success'. Prior to that we thought of this. Bob Peake [a state agronomist] was a great friend of ours, and he was very enthusiastic about Tagasaste and revegetation. . . We put on a field day called 'Salt Sands Success'. It had a lot of negative press with local people because they didn't want the word 'salt' in it, they didn't like to hear it. We were on the positive side trying to say, well look, it's there, use it. . . It was a very successful field day. People came from other areas, but not many locals, who shunned it. We actually raised money through grants to run it and it was quite expensive—we put on tours and overnight accommodation and all sorts of things, and about 100 people came.

On their own property, their interaction with government has been focused on the 70 hectare block of intact native vegetation, for the protection of which they are negotiating biodiversity offsets (although drainage is not a significant feature of the district in which they are located, they still pay drainage levies to the Tatiara District Council, which administers drains in other areas). Like the Hoods, they emphasize that the funds available to them aren't sufficient to fence the area properly, without some input from their side. If a new fence went in, the money available would only pay for the netting, not posts, or labour and other materials. They intend to keep the netting from the old fence in place and strain it to new posts, which will work within the budget of the funds they have been given.

As noted above, the Brookmans have had close contacts with particular government representatives working in the district. They believe there is much government work that has been done over the years that could be useful but which has not been effectively communicated:

You go through all those piles of books that have been written for the last forty-five years, there's stuff probably back in the 1940's that's been written that we're only just discovering now.

In addition, they are concerned about the shift in the availability of advice from government agronomists from a free service to a consulting service driven by a policy of cost-recovery:

That's one of my beefs about the Primary Industries—when we first came here everything was free, you go in there, and I think it was a terrific access point. You had your agronomists, you had a few people and everything was free. But now they're on a cost recovery. If you have one-on-one you've almost got to get them as a consultant. And I think it's killed it, because there are plenty of private consultants around.

Although they value the different government officers who have come through the district, their perception is that money has been wasted on inadequately conceived projects and constantly changing priorities—money that could, they believe, have been better spent:

That's where the money goes, they all do the same thing—reports and paperwork. Most of them were printed and have never been used, and then they fund another one. . . It's all political. . . The way you have to get the funding, what the projects are, and they change, and the emphasis changes.

Like the Jacksons, the Brookmans are concerned at the results of inflexible application of native vegetation policies. Agricultural developments on properties, such as the installation of pivots, have been ruled out because of isolated tree protection, and have lead on occasions to tree poisoning (since the policies don't apply to dead trees). More importantly, perhaps, this has generated a generalised resentment about the unwillingness of governments and their representatives to consider local conditions and local advice.

The building of the drains created significant opportunities for revegetation which, in the Brookman's view, were not taken. New drains need to be fenced, to exclude stock. It would have been relatively simple to negotiate with landholders to place the fences sufficiently wide to allow revegetation. The drains extend across the South East, to the coast—a corridor of native vegetation could have resulted:

They put in these drains, and there was a lot of waste in planning with fencing. They're putting it close to the edge of the drain because they don't want to encroach on private property. They could go out a bit further, but there's no revegetation. When they talked about drains ten years ago, there was supposed to be a revegetation component, and it's just been cut out of it. We've done a few jobs around the back of Tintinara where you can barely get one row of trees in. Well, they'll never survive—you need at least three rows because trees will live in colonies.

This fencing could have been extended to protect small wetlands near the drains:

The other thing to be said about the drains, they spent all this money on fencing, but there's also natural ti-tree bits around the drains and they made no attempt to protect those as part of the drainage scheme. They've actually fenced them outside, which means stock are still in on them and they'll kill them anyway. I suppose the drains will dry them out.

The Brookmans have been involved over the years with many of the consultative committees set up to guide the various native vegetation schemes, but have become increasingly disillusioned with them. For one thing, they feel that local input has been largely ignored:

A lot of these Boards, Mig's been on a few of them, and you lose interest in a while, because you just get hammered the whole time, and the government makes its regulations and you drop out. Whatever you're putting up doesn't get anywhere, really: they listen to it, but there's too many of them [ie. outvoted].

Over time, local members resign as they become disillusioned with the outcomes and increasingly see the process as a token one. The balance of decision-making then shifts to government representatives:

You've got to have one [a consultative committee] so you've been consulted. But Mig resigned after quite a few years of it, and the board changed, people get off it, and it went into something else. And then they don't get any applications because everything thinks, well, it's a waste of time, so they put a few more government people on—we've had so many people on it, and that's what happens all the time.

The Brookmans are less than impressed with the limited local knowledge of government representatives and their consultants in developing revegetation plans:

A lot of the stuff that we see is being planted and people are paying for it, even some private schemes—big money, government money thing, business money—but they were paying consultants for these plans, we had a look at the plans and it's a load of rubbish.

Faced with government input or requirements they know, from their extensive local experience, won't deliver the outcomes demanded either by the government or by the local farmers, they have found a way round, by separating revegetation activity from reporting:

You tell them what they want to hear, but you put in what you think is suitable, and that happens quite often. People put in irrigation, or they want to clear land, so they've got to compensate and put in some vegetation. Well, they're usually told what to plant, and we looked at some of these varieties and said, how would you ever want to plant those? They've never been here and they're useless trees. So we'd tell the owners, look, they're not going to know whether their varieties are in there or not, and if they come back you just say, oh well, they just never grew. We tell them what they should have, and that's usually what we do.

As with government, so with business. They see some Managed Investment Schemes, for example, based on tree planting, can lead to absurd native vegetation outcomes:

A friend of mine at Naracoorte is friends with a chopper pilot down there. He asked the pilot the other day, what are you doing? And he said I'm spraying out trees. There's a company that had a bluegum plantation there, went bankrupt, they've got trees three or four years old. They got bought out by another company. But they've got investor money, so they have to replant it—they've got money to put into it, it's just a tax thing. So they rang up the helicopter pilot and said come and spray out the trees, three or four hundred of them—they're going to kill all those trees and replant.

Keith south

The Hoods reflect many of the attitudes concerning government voiced in other interviews. There is a degree of cynicism. They note, for example, in their account of their failed native vegetation fencing initiative, that the funding shortfall (outlined above) for proper fencing wasn't always the case in the district:

I mean it was absolutely useless. The only place I hear they put netting fences up is out in Gillap which is against a national park—they'll put netting fences up there. [Bill]

The unwillingness of government agencies to negotiate sensibly with landholders about development projects, for better native vegetation outcomes, is again identified:

Well, people are prepared to do that, landholders aren't fools. They're going to say well, I'll knock that tree out and I'll put the pivot there, and I'll plant five hundred trees over here; but that doesn't cut it. . . They set unrealistic goals. [Bill, Sally]

The difficulty of the funding application process hasn't changed over the years, and still presents a formidable barrier:

So complex that we don't even think about it—you don't bother now, it's just too hard, we don't even know where to go. [Sally]

The Hoods have considerable respect for the expertise of local people, such as the Jacksons and the Brookmans, who have spent decades in revegetation projects, both on their own properties and throughout the district. They don't understand why the government doesn't routinely draw on this hardly acquired knowledge, which is known and valued by local landholders:

And why don't they pay people like the Jacksons and the Brookmans top dollar to do that, because if anyone knows it's those people. . . You shouldn't be allowed to establish trees unless you use someone like that because they know how to do it. It's not just a case of planting a tree here and there and spraying a few things, they'll tell you how to do it, you need them to do it. Someone like them that has got hands on experience. You know, you put a government person down here, you don't listen to them anyway. [Sally, Bill]

When asked what the priority for government assistance for native vegetation projects would be, they specify assistance with baiting of rabbits, and weed control. Such a program is offered by the Lacepede Tatiara Animal and Plant Control Board, as a fee-for-service program, and they take advantage of it when the Board's officers are operating in their area.

The Hoods are positive about the services offered by state officers in agribusiness. They speak enthusiastically about the work of a particular local officer, who has a strong reputation in the district for the detailed financial analysis of farming operations. The key to that kind of collaboration, they point out, is the recognition of professional competence, on both sides:

That's it, there needs to be that respect, for our people to listen to them. [Sally]

At the same time, they are self-motivated in seeking out new ways of thinking and new approaches to farming that can build the enterprise:

We're looking at different ways of doing things. There's a lot of information but it's all contradictory, that's probably the problem. . . I think basically you've got to school yourself. [Bill]

The future

Keith north

The Brookmans see a trend towards large agribusinesses buying up properties and putting manager on them, with a priority to maximise return on investment, rather than to farm sustainably. They believe that revegetation is closely tied to government funding, particularly during these drought years, and don't believe the majority of farmers will continue with it without that funding:

There's no doubt the funding has generated most of the work. And I don't believe it's going to be self-sustaining. There are people who are committed to it, like ourselves and a few who have pines, but we did it before the funding.

Even with their strong commitment to native vegetation work, and the extent of their plantings over several decades, they are uncertain about the ultimate benefit of what has been achieved:

Sometimes you get frustrated when you think about it. I fly quite a lot around here, gliding on weekends, and in aeroplanes, and I take photographs. When you look from the air, there's a lot of country that's bare, and you can see there's been revegetation work going on, but how much benefit are those little lines of trees here, when you look at the whole thing—you think, what effect is it having? It will have an effect locally on those areas, and it's all helping, but. . .

They have been keeping a close eye on the development of the market in carbon credits, but are sceptical about its essential motivations and impact on global warming:

There's a lot of talk about it, but I think it's a load of rubbish, that's my personal view. How are they going to work it? It's political. So you're going to have a factory up in Adelaide that can pump out pollution and go and buy some trees off you down here to compensate for it, rather than getting rid of the pollution. It's all big business and politics trying to keep going.

Moreover, even if implemented in a carbon trading scheme, they doubt the effectiveness of the practical steps that would be required to implement it, and offer cautious support to alternative approaches to biofuels:

You're meant to maintain it for one hundred years—well in twenty-five years they're going to cut them down, because they're going to pulp them. The track is really environmentally-made fuel: use a bit of our stuff that's lying around instead of dumping it, fats and things like that, and biofuel providing you not going to clear half of South America to grow canola to make the oil.

The Brookmans don't themselves have much doubt about the reality of climate change, but note the diversity of views in the district, which are influenced by the opinions of experts:

There are so many different views— people speculate. You hear an expert say history doesn't go back far enough—we might have ten year cycles and we suddenly have gone into a twenty year cycle.

They see this as having a detrimental effect on drainage policy, with a damaging impact on wetland ecosystems:

That's why the drains people are saying, we're going to get wet again, otherwise it makes them look a bit silly—and who knows. . . .there will be another big fight coming up soon when they dig parts of the wetlands towards the coast—they'll drain the water out of those and they'll turn to salt pans, and that will be another one.

Like the Jacksons, they don't see themselves continuing with direct seeding at the same pace, because of the intensive nature of the work, the decline of funding, and the reduced need for additional income with the completion of their children's education.

Keith south

Looking after the land is a primary value for the Hoods. It is something that has become increasingly important to them. They take pride in not forcing maximum grazing pressure on the land, through large inputs. They don't approve of large scale irrigation, particularly during a drought. They are increasingly reluctant to use pesticides. They believe a long-term focus should be replacing a short-term focus in Australian agriculture. They have a real concern about the implications of climate change for agriculture. They are interested in the emerging market for carbon credits, and have been researching it on the Internet. Overall this attitude is seen as not thrashing the land, of 'being kind' to it. They see a transition occurring in Australian agriculture as a whole towards sustainable agriculture, reflected perhaps in the transition they are themselves making.

It's interesting that this feeling is not driven, as so often on the land, by a family factor. They are not necessarily thinking of passing this block on to children. They see it as possible that they will move at some point to another block. So the commitment would seem to be to a system of farming itself, not to family tradition or other kinds of continuity.

The Hoods see themselves as being in transition, from standard, though highly efficient, agribusiness to a more sustainable kind of farming, still within the agribusiness model. In this they are feeling their way, keeping a viable enterprise going while increasingly not wanting to keep doing things the way they have. They are looking to phase out pesticide use. It's a balancing act, however, and in times of stress sustainable farming elements, such as revegetation, must, as they see it, take second place, simply in order to survive. As the economic environment becomes more favourable, they look for more ways to loosen the constraints of agribusiness farming in the direction of a more sustainable model, in which native vegetation plays

more of a part. They are having to build knowledge of this model, however, as they go, as with knowledge about tree species and carbon credits.

They are thoughtful about the development of farming, as they know it. For example, they reflect on the way attitudes to clearing have changed over the generations, and speculate on its form in an environment of climate change:

It's interesting talking to Sally's father. He got his place when it was scrub and cleared it, and he'll quite readily tell you the stories about clearing it. But now when he comes over here and he sees some suckers suckering somewhere he sticks a row of mesh around it. Those blokes have gone full circle—they say, we cleared too much in those days, we need to go back and get these trees to reseed. . . It was part of the deal to keep their blocks. . . It's done now, there's no point looking back and pointing the finger and saying you shouldn't have done this and shouldn't have done that. [Bill]

You can correct those problems, everything can be corrected. But I think maybe some of the pushers are a bit too far one way. The extreme is to put it all back to scrub—it wouldn't go back to scrub, the rainfall's not there anyway. [Bill]

So they see some value in retaining options, and in not investing too much time and money where they are. They're still young—in their mid-30's—and they see things as likely to change.

Bordertown

There is a much discussion in the district about climate change, but the Edwards hold the more traditional view that even ten years of low rainfall is not unprecedented. They don't see themselves changing the way they farm as a result of climate trends.

Carbon credits are also an active area of discussion in the district. There is some interest in the potential financial benefits of it. The Edwards are sceptical that they are likely to be paid for retaining the native vegetation that is already there, without planting new trees.

They are strongly opposed to genetically-modified crops. Jo is applying for a Nuffield grant to go to the US and research the farming implications of the technology. She is well informed about the issues. She mentions specifically the inadequacy of health research and concerns expressed by local apiarists, even with buffers of five to seven kilometres. She sees the European market as moving greener and away from GMO products. She is concerned that farmers, such as themselves, who don't want to grown GMO crops, will have to pay the costs of segregation, and doesn't see an effective system for preserving clean seed. The Edwards stay in touch with overseas farmers who have had experience with GMO crops:

We've got friends in Canada that are growing GM and they didn't know that there were any questions or issues with growing it. They just went with the flow. So I asked, do you feed your corn to your pigs, and they say no, we're not allowed to—isn't that strange?

However, Jo believes the weight of both farmer and political opinion is moving in favour of GMO release, although her perception is that when local farmers have the information they will change their minds and oppose it.

Despite the fact that the property has been in the family for nearly one hundred years, the Edwards don't see themselves as being committed to it for that reason alone. They have thought about selling it when things became difficult some years back. They discussed the possibility with Jamie's mother, who handed the decision over to them. But they are well aware of the asset they have and don't at this point readily see anything to replace it.

DISCUSSION

Theory, methodology and analysis

Attitudes and values in decisions and behaviour

In the Introduction to this study, Fishbein and Ajzen's Theory of Reasoned Action (TRA) was identified as a primary theoretical framework for the study's research. This framework proposes that attitudes and values are primary determinants of decisions and the behaviour that flows from them. The central principles of this view are:

. . . that attitudes and values do predict a variety of environmental behaviours; that a consideration of attitudes and values must extend to an understanding of the wider belief system and worldview within which they are embedded; and that effective policy initiatives cannot be developed without considering these central elements of the "ways we have of organizing our knowledge of and responses to the environment around us." (Bechtel 1997 pp.124-125).

These principles were applied to the question of how to achieve better outcomes in native vegetation enhancement and revegetation practice among farmers in the Tatiara. It was argued that:

- Farmer attitudes and value are central to the decision of whether or not to engage in native vegetation work.
- The effectiveness of funding policies supporting native vegetation enhancement and replanting may be improved by a better understanding of these attitudes and values.
- Qualitative field work methods are designed specifically to develop understanding of such attitudes and values.

The nature of qualitative research

O'Reilly's (2005) account of the ethnographic methods used in this study was outlined in the Introduction. She further notes:

It is only by being in context, being there to talk with and listen to the people you are researching as they experience things and as they go about their daily lives, that you can get them to tell you about how they think and feel (p. 10).

The ethnographic approach, concisely described, is thus

. . .the close study, over time, using participation and observation, of a group of people, with the emphasis on obtaining the insider view (p. 21-22).

Taylor (2002) elaborates on the nature of this ‘insider’ view:

The ethnographic researcher is said to obtain an insider's view of a society and so to understand other people's own worldview, instead of taking the outsider's perspective of the conventional scientist. Ethnographic research is said to produce situated knowledge rather than universals and to capture the detail of social life. . .rather than abstracting from this detail to produce reductive models (p. 3).

Atkinson & Hammersley (1994), reviewing the development of ethnography and participant observation over several decades, conclude that the following features are central to the social research task of seeking situational knowledge:

- A strong emphasis on exploring the nature of particular social phenomena, rather than setting out to test hypotheses about them.
- A tendency to work primarily with “unstructured” data, that is, data that have not been coded at the point of data collection in terms of a closed set of analytic categories.
- Investigation of a small number of cases, perhaps just one case, in detail.
- Analysis of data that involves explicit interpretation of the meanings and functions of human actions, the product of which mainly takes the form of verbal descriptions and explanations, with quantification and statistical analysis playing a subordinate role at most.

The qualitative research carried out in this study, and the reporting of it, conforms closely to this description.

The writing up of qualitative research results presents conceptual and technical challenges which have been the subject of wide discussion. Ethnographic reporting, in particular, has been intensively examined. A classic statement is that of Geertz (1973), who termed such reporting “thick description”: direct or indirect and summarised speech of informants, together with parenthetical additions by the researcher. In this task, the interpretative role of the researcher is embedded. The analysis of the data gathered is directed towards “sorting out the structures of signification. . .and determining their social ground and import” (p. 9). It is “a reading of what happens” (p. 18).

Along similar lines, Lederman (1990) observes:

The point of ethnography is. . .to enable one’s audience to understand something of interest about a corner of the world they have not experienced directly themselves; to share that to which one’s field experience has given one access (p. 82).

Clifford (1990, p. 59) quotes Clark Wissler to this effect: “. . .the ideal thing would be to publish all the statements of informants together with an estimate and summary by the investigator”. Clifford goes on to provide this influential account of the interpretative nature of ethnographic reporting:

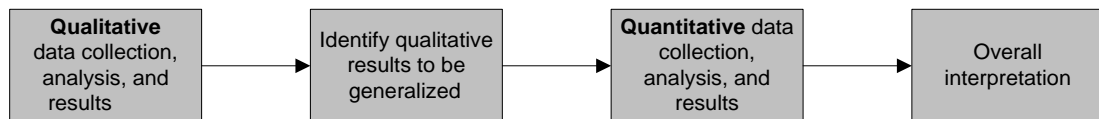
One form of ethnographic writing, description, has too often been made to stand for the entire ethnographic process. But whether it is writing down, writing over or writing up, the work of the ethnographer is intertextual, collaborative, and rhetorical (p. 68).

The study reported here draws explicitly on these methodological principles.

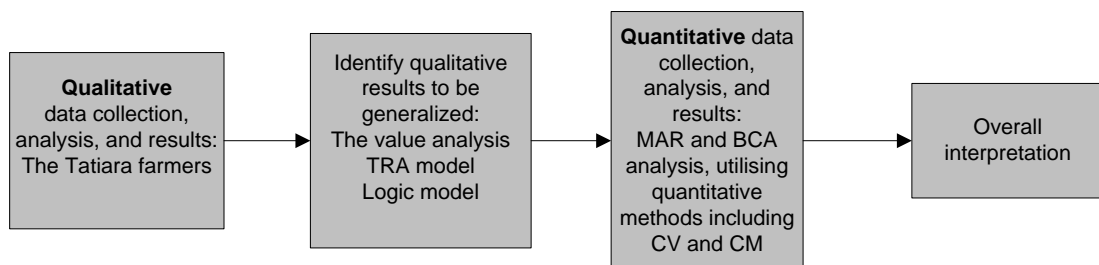
The mixed methods context

As noted in the Introduction, qualitative research can be combined with other kinds of research, particularly quantitative and modelling work. Mixed methods approaches offer the possibility of obtaining more robust conclusions; of examining different aspects of a phenomenon; of capturing multiple perspectives or levels within a system; and of facilitating the incremental building of knowledge if used in sequence (Clark et al. 2008, p. 366).

Among the four principal mixed methods frameworks, the Exploratory Design framework (p. 372) is most relevant to the current study:



The exploratory qualitative results of this study may therefore be taken as the first part of an ongoing mixed methods research program. Under such a program, these results would become the foundation of subsequent quantitative survey work in the context of the modelling of economic values.



Following this schema the qualitative research carried out with Tatiara farmers is collated, organised and presented, as in the body of this report. These data are then analysed through a value analysis, placed in the context of the TRA framework and weighted and ranked through Multi-attribute Rating Analysis (MRA). A Logic Model is developed to analyse the dynamic structure of these values.

This work then becomes a platform for quantitative work through Benefit-Cost Analysis (BCA), including the survey-based techniques of Contingent Valuation and Choice Modelling.

Multi-attribute Rating Analysis

Decision-making in this environment—specifically, decisions relating to native vegetation revegetation or enhancement—is thus complex and interactive. One important path for taking the results of this study forward is through decision analysis (Goodwin & Wright 2004). In particular, it seems useful to utilise the heuristics of decisions which involve multiple objectives.

In this kind of decision analysis, the intention is forward-looking: given certain goals and alternative courses of action, the methodology of decision analysis attempts to analyse relevant attributes and to identify their associations in decision-makers with particular values. By eliciting weights on attributes from decision-makers, a decision can be arrived at.

In this study, the research problem is reversed. The decision—whether to engage in native vegetation work—has been made, and has given rise to the patterns of behaviour of the past. The challenge is to reconstruct the attitudes and values that have given rise to this decision. It may then be possible to explore ways of using or changing these underlying factors (for example, by policy, regulation or economic incentives, or some combination of these) to generate a different decision—to engage more in native vegetation work—in the future.

Multi-attribute analysis has been formalised as Simple Multi-Attribute Rating Technique (SMART) by Edwards (1971), and extended by Goodwin and Wright (2004). Its application to this study is proposed as follows:

Stages	Application
Stage 1: Identify the decision maker (or decision makers).	The landholder, farmer or manager responsible for management actions on the farm.
Stage 2: Identify the alternative courses of action.	Behaviours with respect to native vegetation actions, primarily revegetation or enhancement.
Stage 3: Identify the attributes which are relevant to the decision problem.	Benefit and cost value categories.
Stage 4: For each attribute, assign values to measure the performance of alternatives on that attribute.	Values derived from the analysis of a particular farm enterprise. Aggregation through the construction of enterprise classes.

Stage 5: Determine a weight for each attribute (swing weighting).	This reflects how important the attribute is to the decision-maker.
Stage 6: For each alternative, take a weighted average of the values assigned to that alternative.	A comparative measure of how well each alternative performs over all the attributes.
Stage 7: Derive the implied decision.	Comparing the scores of alternative actions.
Stage 8: Perform sensitivity analysis.	How robust the decision is to changes in the figures supplied by the decision maker.
Stage 9: Align the decision with actual practice on the farm.	Sensitivity analysis to construct possible configurations of values on attributes that would better account for the observed practice.

This is an iterative process, whose objective is to obtain a ‘best fit’ outcome between values, attributes, weightings on the one side, and observed practice on the other. Note that Stage 9 is not part of the standard SMART modelling, but is required for this study. Stages 1-4 have been completed in the present study. Stages 5-9 are included in ‘Completing the research program’ (see below).

Quantitative methods of economic modelling and Benefit-Cost Analysis

Economic modelling works with monetary estimates of valued goods and services. Modelling economic options—in this case, the benefits and costs to farmers of engaging in native vegetation work—requires monetarisation of all significant values. The modern best-practice framework for this task is Benefit-Cost Analysis (BCA) (Perman et al. 2003).

As noted, most direct-use benefits and costs are priced in markets. The challenges of quantifying these priced values are predominantly ones of information and measurement. Where the costs and benefits relate to non-market values, a variety of methods is used, depending on the value category. These observe, directly or indirectly, the amounts of money individuals are willing to pay for a benefit, or the amounts they are willing to accept to bear a cost. In this way individual supply and demand curves are generated. The willingness to pay and willingness to accept compensation are aggregated across individual supply and demand curves to yield market demand and supply curves (see Appendix).

The time dimension is handled by valuing the stream of net monetary values generated by the analysis of benefits and costs over multiple periods. Central to this approach is the use of a discounting rate, which gives greater financial weight to amounts nearer in time, compared with amounts further off in time.

BCA can be supplemented by, or placed in parallel with, other analytic and decision-making frameworks, including Multi-Attribute Rating (MAR).

Analysis of values derived from research

As discussed above, completion of the first phase of this research program requires qualitative results to be analysed and described in such a way that they constitute a platform for the quantification and valuation methodologies of subsequent research. That is the task of this section.

The results of the qualitative fieldwork undertaken, as described above, demonstrate clearly that these farmers in the Tatiara have strong attitudes and values with respect to native vegetation work, and that these attitudes and values are both individual and collectively developed. The 'factual knowledge' base includes not only knowledge of the physical land systems farmers are responsible for, but also the farm enterprise, with its combination of economic and physical demands.

The benefits and cost value categories, each analysed in terms of priced and unpriced values, emerging from the results of the fieldwork, are displayed in Figs. 2 and 3:

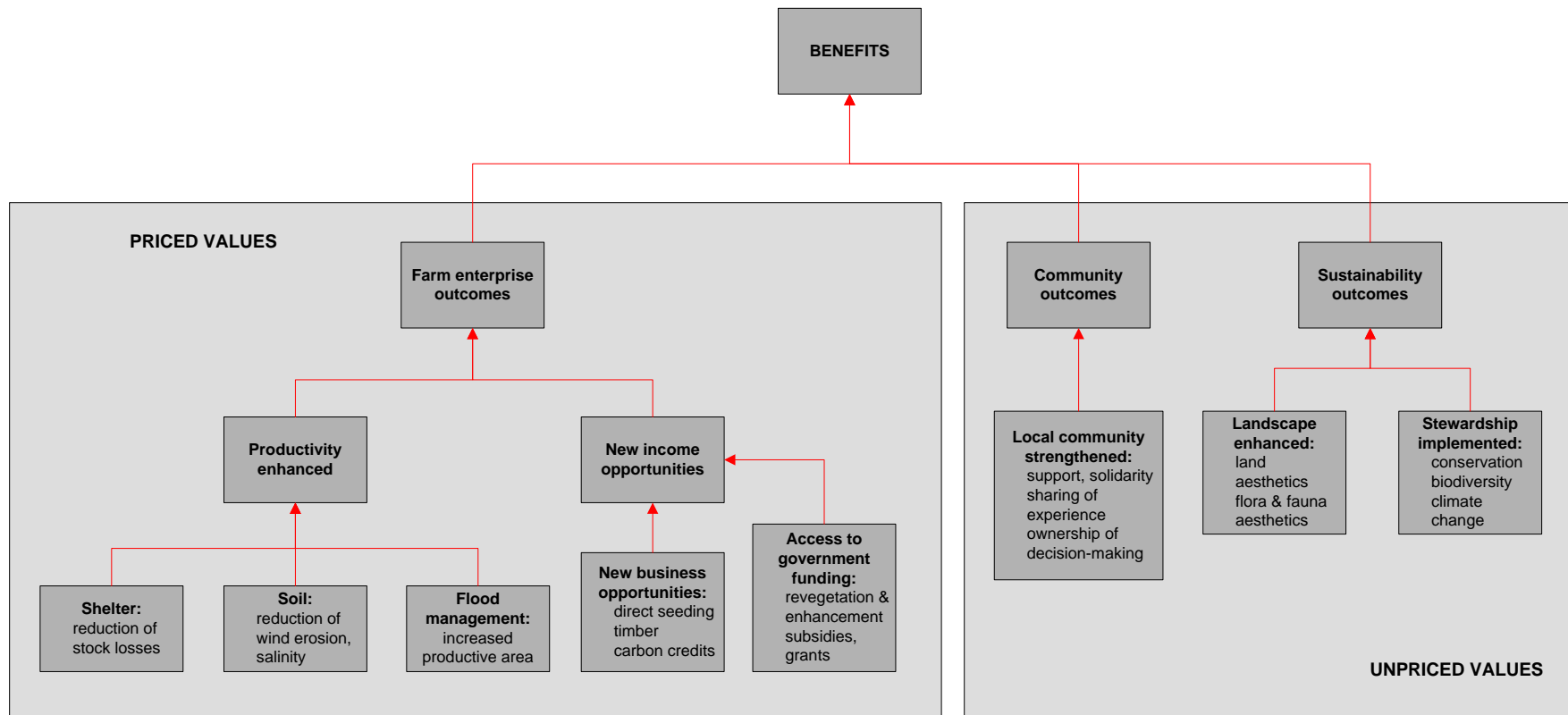


Fig. 3: Derived Priced and Unpriced Benefit Values

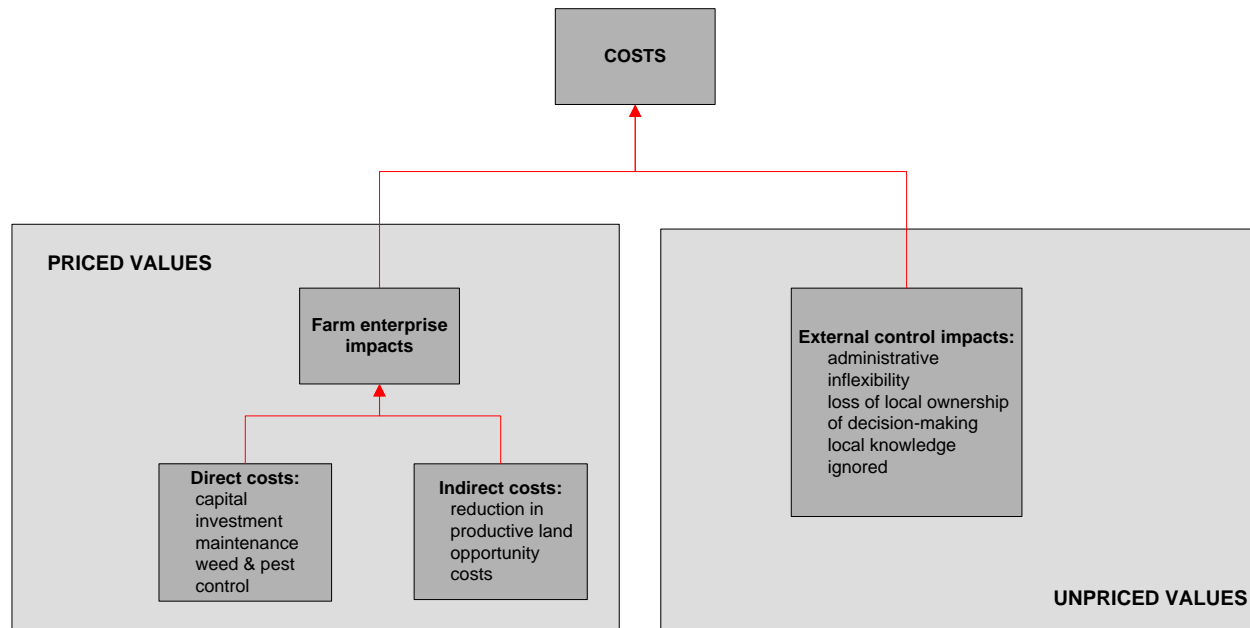


Fig. 4: Derived Priced and Unpriced Cost Values

Benefits

Priced values

All interviewees viewed the decision on native vegetation work in the context of their farm enterprise. On the benefit side, those who were strongly committed to native vegetation management, revegetation or enhancement saw potential economic benefits from enhanced productivity. Such benefits have been acknowledged in previous studies (see for example, Mallawaarachchi & Szakiel 2007).

Farmers have also seen new income opportunities in native vegetation work. These include opportunities for raising native vegetation for timber as well as the potential for developing market for carbon credits as the proposed National Emissions Trading Schemes is implemented.

Finally, government schemes have been critical in underpinning native vegetation work in the district. It is clear that some planting will go on without these subsidies, driven by the non-market values discussed below. But significant private plantings on the scale may not occur unless government incentives are available. Those farmers most experienced in native vegetation work made it clear that although they understood the strategy of providing government support as an initial incentive, in the hope that some momentum for planting would be generated and persist once subsidies ceased, this has not happened, and is not seen as likely to happen. For most Tatiara farmers, native vegetation work is still seen as discretionary. There is evidence from the interviews to suggest that the current approach, through biodiversity offsets of drainage levies, although it is generating some native vegetation work, is unlikely to result in work on the scale that the *Biodiversity Plan* (Croft, Oppermann & Zubrinich 1999) sees as necessary to protect and rehabilitate threatened areas.

Unpriced values

A purely social research view of attitudes and values might want to focus solely on non-market values, as conforming more to the values with which social research deals. For these Tatiara farmers, however, decision-making and behaviour with respect to native vegetation work drew on a complex of both market and non-market values—a finding that is consistent with the assumptions of both BCA and MAR. In this complex of values non-market values were influential

The interviews demonstrated that, in certain parts of the district, and at particular times, a community dimension was part of the benefit structure. The community structures were either pre-existing (as in farm management groups) or were brought together around funding requirements. In these instances, community and native vegetation work reinforced each other. The fabric of community was enriched by the native vegetation planting: by a shared experience of the pleasures of seeing trees grow and birds return, or of planting trees together on each other's properties. Community norms in turn began to develop around the revegetation work, and were communicated more widely, motivating

others to undertake native vegetation planting—when funding was available. In some programs, the local schools became a focus for native vegetation work. Where community ownership and decision-making was enabled, this too was seen as a benefit in its own right, and in turn facilitated the expansion of revegetation work.

What interviewees often described as an ‘aesthetic’ factor to be an important benefit. One dimension of this is related to the visual landscape: the ‘look’ of the land. Properties with little or degraded vegetation are seen as ‘not looking good’: well-timbered properties ‘look good’. There is land management judgement about this, as well: properties without trees are seen as not having been looked after; those with trees as well looked after. Interviews often spoke of the experience of living on a property without trees as ‘miserable’, especially in the winters. The aesthetic factor extended, too, to native fauna: one of the highly motivating pleasures of native vegetation plantings, particularly where a shrub understorey is included, as in direct seeding, is in the return to the property of the native birds.

Finally, for all these Tatiara farmers, wider issues of conservation and stewardship are very real. They are well informed about biodiversity challenges, as well as climate change. The recent extended drought is seen increasingly in the context of climate change. They are concerned about what we as a society are handing on—not necessarily just to their own children, but to the next generation as a whole. In differing degrees they are wary about the way in which some agricultural technologies have been used: drainage, stocking rates, GMO crop development, irrigation, salinity, and wetland conservation are central concerns. They understand clearly the importance of native vegetation work to all these concerns, and all want, in their different circumstances and different ways, to make a difference on this broadest scale.

Costs

Priced values

The enterprise costs associated with native vegetation revegetation and enhancement are material, and for all Tatiara farmers are an important part of the decision-making. Direct costs include capital investment in fencing, tree stocks (where tube stocks are used), and machinery for those working in direct seeding, such as the Brookmans and the Jacksons. In that situation, the capital investment required to mount the direct seeding enterprise is also applied to the domestic tree planting operation. Where direct seeding is not operating, as part of the farm enterprise, the capital required becomes part of the general farm enterprise accounting.

For all farmers, where tree planting has occurred, or where existing remnant vegetation is being protected, on whatever scale, significant maintenance costs are incurred. This may include watering over initial summers, a time-intensive operation. Weed and pest control are significant costs, particularly within shelter belts. Local government programs are utilised, but more often this is carried out by the farmers. In some cases, as in the Keith South example, these costs are eventually prohibitive and protection cannot continue. The largest direct cost in all native vegetation work is without doubt the labour of the

farmers themselves. Direct seeding has a very significant labour input, from the collection of seeds, to the scoping and preparation of site, the seeding itself, and the ongoing maintenance, much of it undertaken during the hottest months.

Indirect enterprise costs are mainly those associated with productive farm enterprise. Areas fenced off for native vegetation planting represent land that has been withdrawn from production. Cropping cannot be carried out there, and stock cannot graze there, without destroying its integrity. Shelter belts may look relatively insignificant, compared with the paddock space as a whole, but with an eight-row design, for example, around a paddock of half a kilometre square (25 hectares), an area of approximately 4 hectares (16%) is fenced off in the shelter belt. In a similar manner, areas of protected remnant native vegetation existing on the property—for example, the 70 hectare block on the Keith North property, or the 88 hectare block on the Bordertown property—represent areas that are not stocked or cropped, and therefore carry opportunity costs, in addition to the direct maintenance costs.

Unpriced values

The intangible costs, deriving from non-market values, associated with native vegetation work on these Tatiara farms are less easy to specify but no less important to farmers. They have to do with the nature of the interaction between farmers and government. The financial benefits of government incentives and subsidies is weighed against the degree of control that farmers are required to cede in these programs.

For example, in negotiating with government representatives the land management agreements to put biodiversity drainage offsets in place, the Willalooka, Keith North and Bordertown farms all reported difficult negotiations and a degree of frustration that their own efforts, views and experience were not being recognised. In particular, the inability of farmers to apply their knowledge of local conditions in these programs gives rise to resentment concerning outcomes that are, from the farmers’ point of view, flawed and inadequate. There are both personal (in having their expertise overridden or ignored) and professional (in deficient outcomes) dimensions to this non-market cost.

TRA Model

It is evident that the primary results of the fieldwork are well aligned with the TRA Model. Fig. 5 displays a preliminary view of this alignment, which is as follows:

TRA Model key elements	Research study
Factual knowledge	Primary factual knowledge input relates to new income streams from grants or new business, and improvements in farm management. Secondary factual elements relate to other factors, such as decision-making structures and

	environmental values.
Attitude toward behaviour	Primary attitude oriented towards action in landscape aesthetics.
Social and moral values	Social values from alignment with community integrity and growth, and with government support for local input into and ownership of the project.
Subjective norms	Subjective norms, linked to moral values, from environmental values, particularly intergenerational commitments.
Behavioural intention	Evaluation of total benefits, direct-use, indirect-use and non-use as positive as an aggregated basis for behavioural intention.
Behaviour	Action native vegetation revegetation and enhancement precipitated from intention.

Preliminary support for TRA theory thus emerges from the qualitative research. However, in order for these findings to form a robust platform for policy development and implementation, clarification of a number of issues is required:

1. *How are the values and attitudes identified related to each other in a dynamic decision-making structure? What interventions for policy does this structural analysis identify?*
A provisional approach to these questions is provided in the Logic Model of the next section.
2. *What is the relative weighting of values and attitudes identified in the final action decision?*
This question points to a completion of the MAR analysis, as detailed below in ‘Completing the research program’.
3. *Can these values be monetarised through market prices or shadow prices to allow for a commensurable estimate of their value to farmers?*
This question points to the quantitative research project outlined in ‘Completing the research program’.
4. *Can the aggregated net benefits of native vegetation work be captured in a BCA framework? Does this framework accurately reflect farmer’s decision-making on native vegetation work?*
This question points to the BCA research project outlined in ‘Completing the research program’.

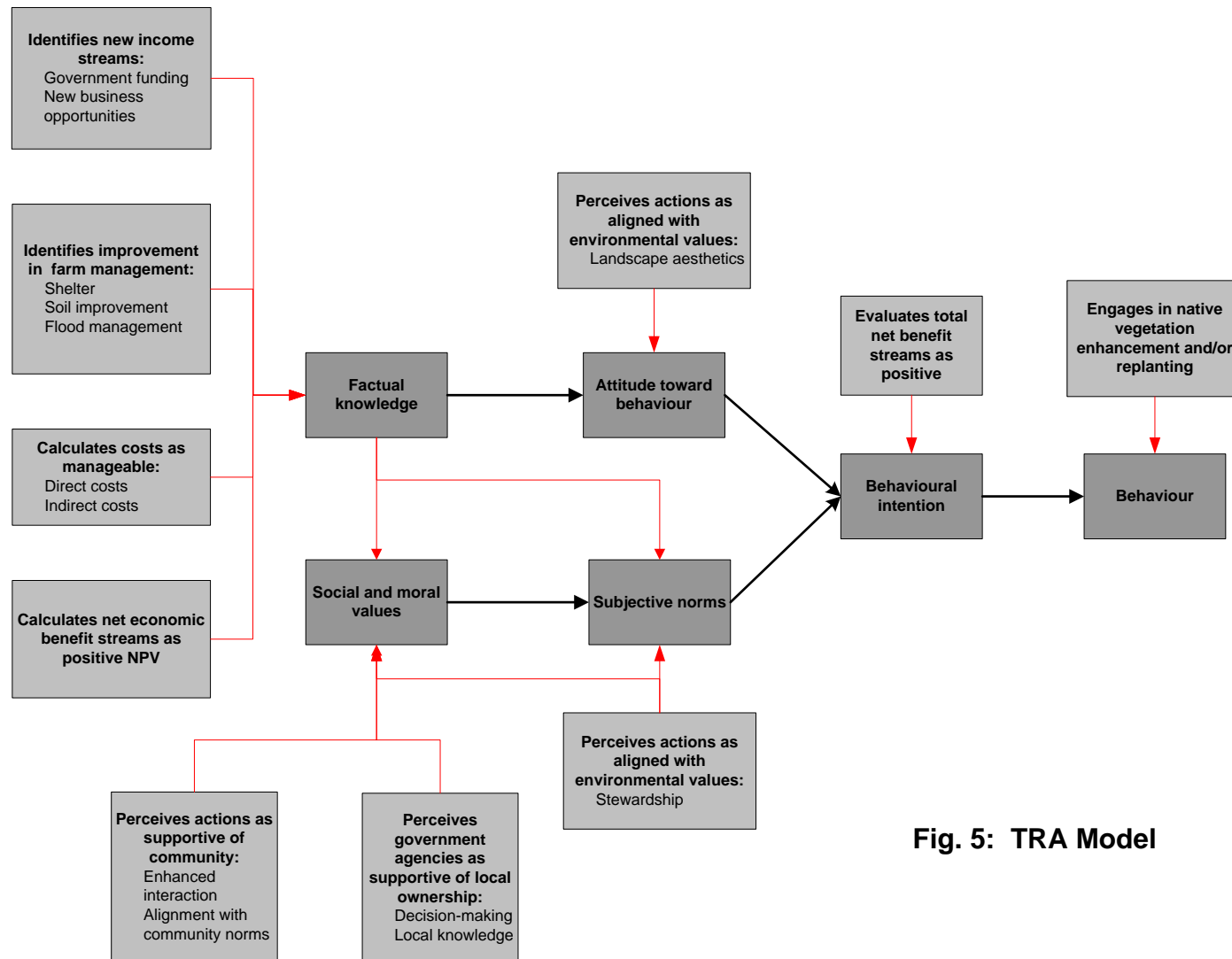


Fig. 5: TRA Model

Logic Model

The use of logic models in analysing qualitative results is discussed by Lin (2003). Logic models display complex chains of events that occur over time, in order to locate repeated cause and effect patterns. Logic models are particularly useful where multiple stages exist over extended periods of time, and where feedback effects are significant. Logic models are also used to identify events where public program intervention could be valuable in influencing a particular outcome or sequence of outcomes. The *Individual-level logical model* depicts the behavioural course of events, or stages of behaviour, for a hypothetical individual type of interest in the study.

Fig. 6 presents an Individual-level logical model of values generated from the qualitative results of the study. A number of observations about the model can be made.

The research suggests that the first decision-making framework undertaken by farmers concerns the economics of the farm enterprise. Here estimates are made of the economic potential from native vegetation work of improvements in farm management, through shelter, reduced salinity and flood water management, and of new income streams, from government funding and new business opportunities, such as timber harvesting or direct seeding. Costs associated with the native vegetation work are also estimated. These are *direct-use* (priced) and *indirect-use* (unpriced, primarily environmental services) values.

Whether explicitly or implicitly, if farmers come to a view that the present value of future net economic benefits flowing from native vegetation work are positive, farmers will move to consider further values. If the present value is seen as negative, no further movement towards native vegetation work will occur.

In the second stage of decision-making two sets of values come into play. These are *non-use* values. The first relates to environmental values: landscape aesthetics; and stewardship, the responsibility both to future generations of the family on the farm, and to future generations in general. The second relates to the potential support provided by native vegetation work, in enhancing social interaction and in aligning and strengthening community norms. Where positive feedback from the environment supports these values, movement towards the next stage will occur. Where these values are strongly held, and where feedback from the environment is perceived as being positive, farmers will move to consider further values. Where these conditions are not present, further movement towards native vegetation work is unlikely.

The third stage relates to the decision-making context itself. This also is classified as a *non-use* value. Where government agencies, in particular, are seen as supportive of local decision-making, including allocation of funding, implementation and monitoring of outcomes, farmers are more likely to move towards native vegetation work. Where this is perceived not to be the case, through socially transmitted information and values, or through personal experience, such movement is less likely.

Although farmers do not undertake a full analysis of all benefits and costs, priced and unpriced, associated with these values, an informal aggregation is undertaken which results in a positive or negative evaluation of total net benefits. Where this evaluation yields a positive outcome, native vegetation is likely to go ahead.

Each of the main categories of values and factors that go to make up the dynamic structure of farmer decision-making has implications for the design of funding and incentives of native vegetation programs. Some examples of these interventions which could be considered are as follows:

	Logic model step	Potential design intervention
1.	Identifies new income streams.	Communication on new funding opportunities and application procedures. Assistance in identifying and modelling new native vegetation business opportunities.
2.	Identifies improvement in farm management.	Provision of focused native vegetation farm management advice. Supported networking. Field days.
3. 4.	Calculates costs as manageable. Calculates net economic benefit streams as positive NPV.	Support for business modelling. Software availability and support. Training of agricultural financial advisors (consultants, banks).
5.	Perceives actions as aligned with environmental values.	Pro-active provision of information on environmental benefits, both indirect-use and non-use. Scientific and economic rationales made explicit. Australian case studies made available.
6.	Perceives actions as supportive of community.	Community briefings and workshops. Community experience from other native vegetation projects made available.
7.	Perceives government agencies as supportive of local program ownership.	Clear definition of roles of local farmers and central government agencies. Incorporation of deliberative processes and local decision-making in funding allocation and monitoring. Provision for flexible and emergent structures of local/central collaboration.
8.	Evaluates total net benefit streams as positive.	Advisory role in multi-attribute decision-making. Availability of software and training. Facilitate sharing of views and experience

		within the community.
9.	Engages in native vegetation enhancement and/or replanting.	Detailed planning of operational implementation in collaboration with farmers.

It should also be noted that feedback relationships (2-5) can strengthen the decision to continue to engage in native vegetation work. These, too, offer the opportunity for intervention in the form of information facilitation to further support these relationships and enhance their effects. The forms of these interventions, and their relative effectiveness, is a focus of future research. Some examples of the ongoing interventions which could be considered are as follows:

	Logic model feedback influence	Potential ongoing intervention
A	Achievement of landscape and environmental improvements.	Ongoing provision of information concerning environmental and inter-generational issues and international best practice with respect to native vegetation management.
B	Achievement of greater social interaction at the community level.	Support of local community initiatives to undertake collaborative native vegetation work and to communicate achievements.
C	Achievement of outcomes reinforcing effectiveness of local decision-making.	Ongoing support for communities to establish and refine effective deliberative processes of local decision-making.
D	Achievement of economic outcomes.	Supporting farmers in analysing economic results to identify the contribution of native vegetation work to earnings and the growth of enterprise value.

The above provisional indications for intervention and policy development are given as examples only. Robust intervention design requires the completion of the research program, as outlined below.

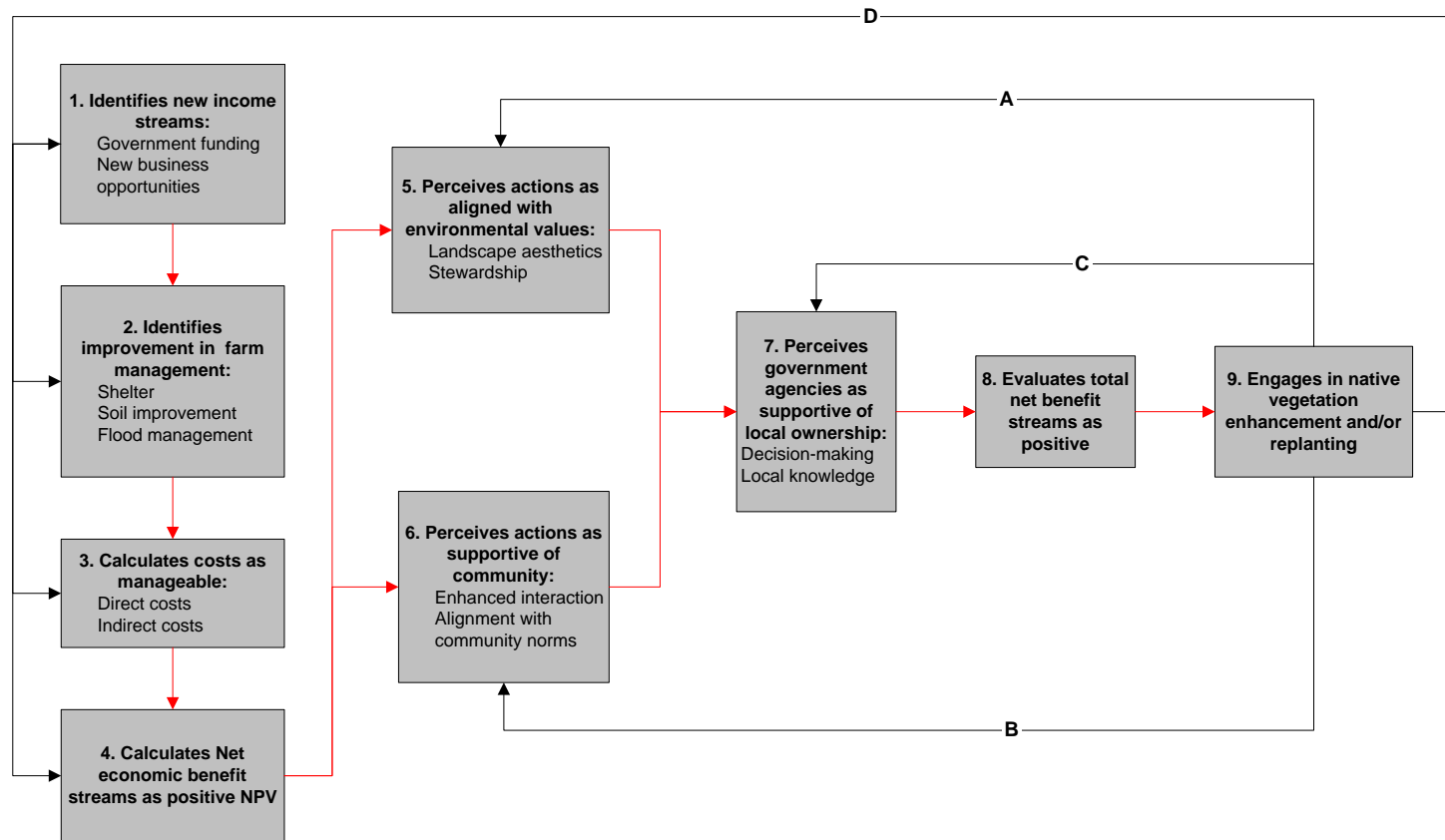


Fig. 6: Logic Model

Completing the research program

Working from the platform of this study, a future studies, following the mixed methods and economic modelling approach suggested above, are as follows:

1. Completing the qualitative analysis:

As noted, Stages 1-4 of the MAR modelling have been completed in this study. Stages 5-9 would be the subject of a further research study. Once completed, the priced and unpriced values identified above can be ranked by influence in the native vegetation decision-making of farmers. These results will refine the Logic Model, and could materially enhance or modify the interventions emerging from the study.

2. Quantitative research:

The set of most significant factors, as determined by the value analysis and MAR modelling, can then become the basis for developing and administering well-constructed, robust survey instruments. Direct-use values will be derived from prices available in the relevant markets. According to the specific values identified, survey methods such as Contingent Valuation (CV) or Choice Modelling (CM) can be used to elucidate unpriced values.

3. Economic modelling:

The results of this mixed methods research can then be applied to the BCA economic modelling task, in which the status quo (no action) is compared with on-farm actions taken to improve vegetation enhancement and revegetation. The model can then be used to develop appropriate policy recommendations, including types and quantities of economic incentives (see Appendix).

APPENDIX

Values and the economic analysis of vegetation management: a commentary

Economic measures of ecosystems values

In this section, the concept of total economic value is used to illustrate how economic analysis could support environmental decision-making, particularly when all sources of values cannot be quantified. For example, quantification of values is not necessary if comparisons are made in physical units (for example, when based on habitat units). However, when policies involve tradeoffs between market goods commonly valued in dollar terms and ecosystem services that are not traded in markets, estimating the value of these non-market benefits using the same metric (dollar terms) could allow a more informed assessment of tradeoffs based on individuals' preferences for nature (Mallawaarachchi et al. 2001). In particular, it is helpful to understand the tradeoffs between tangible benefits of potential economic developments and intangible benefits derived from existing natural resources in their current form.

Total economic value

The total economic value of a natural resource includes use and non-use values. Use values involve the direct consumption of various attributes of a resource, which may or may not preclude the generation of further benefits in the future. The resources that have the propensity to regenerate (such as a natural vegetation), for example, can continue to produce such benefits indefinitely if their use is managed sustainably. In the case of a woodland lot, the value of timber, evaluated in terms of market prices is the direct use value. Whereas, the hydrological benefits of a forested water catchment that indirectly support the production of goods and services may represent indirect use values. Many such indirect values were discussed during the farm interviews.

Indirect use values and the option value are two commonly cited resource use values often encountered in vegetation management.

The society can derive indirect use value from natural vegetation and its interaction with other parts of the natural environment. For example, natural vegetation has indirect use value in terms of absorbing carbon dioxide from atmosphere, providing habitat and regulating temperature. However, some direct and indirect use values may be exclusive in that the use of the resource for one purpose may diminish the benefits derived for another use. For example, clearing may reduce direct use values associated with a forest because the new land use may not permit forest regrowth. This implies a tradeoff between changes in direct use values and the value of the other uses of natural vegetation. Management options that are designed with an understanding of the functions of vegetation in a particular location and over time are more likely to lead to a choice that provides the highest net benefit to society from alternative uses of vegetation.

The option value of a resource is the welfare derived by society from retaining the resource for possible use at some future date. For example, society may benefit if a medical use of a plant species is discovered in the future. To the extent that a particular resource use prevents this potential future benefit, an opportunity cost is imposed on society.

There are also values which may be independent of the consumption or functioning of a resource and which, in some cases, may require the exclusion of that resource from many forms of consumption. These non-use values are often categorised as either existence or bequest values.

Existence values, or the benefit derived from the knowledge of the existence of a resource independent of any ability to use the resource for example, arise when individuals place a value on the continued presence of a resource in its current state or in its natural or pre-use state. Consequently, resource use decisions may involve a significant tradeoff between the existence values and their direct use values.

A bequest value occurs when benefit is derived from the knowledge that a resource will be available for the experience or satisfaction of future generations. This is unrelated to any option value that is attributed to the resource, because the bequest value derives from the knowledge of continued existence of the resource. Option values may imply future use. Again, the tradeoff between existence value and direct use values of a resource can be significant.

These nonuse values, which include the value of knowing the existence of the resource or those indirect use values such as scenic beauty, uniqueness and genetic diversity of flora and fauna that are associated with its existence, are important determinants of social value of resources (Smith 1996)(Smith 1996, Mallawaarachchi 2000). Because these different entities of value are not mutually exclusive, care need to be taken in aggregating these different categories of value as they could not be added to form a single value, without encountering double counting. Some important examples of nonuse values were found in the interviews comprising the present study, as summarised in the Value Tree.

Economic assessment of ecosystems values

Economic assessment of ecosystem values attempts to provide an empirical account of the value to people of the services and amenities derived from ecosystems (Randall 2002). Consideration of ecosystem values in economic assessments may take several forms. Some environmental assessment approaches focus on applying economic methods to value goods and services derived from ecosystems based on willingness-to-pay. Other approaches such as bio-economic modelling consider ecosystems from a multi-disciplinary perspective to determine forgone benefits in alternative uses. In both these approaches the focus is on understanding the relative costs and benefits of using available resources. Appropriate uses on the other hand are to be determined in the context of other information such as ecological indicators or performance measures that indicate value, determine the ecosystem integrity, or reflect other management objectives. When

information on both costs and benefits can be estimated, a cost–benefit analysis may provide a means of combining multiple views of what is desirable. When that is not feasible, properly constructed cost-effective analysis and multi-criteria decision analysis may provide useful guidance for efficient resource allocation decisions.

Non-market valuation

In the absence of direct market prices to estimate the values placed by consumers on non-market goods such as natural vegetation, willingness-to-pay can be derived using preference elicitation techniques that rely on responses to hypothetical circumstances. These methods are founded on the concept of value, which states that tradeoffs people make as they choose less of one good and for more of some other good reveal the value people place on these goods.

The role of economic valuation in environmental decision-making depends on the specific criteria used to choose among policy alternatives. If policy choices are based primarily on intrinsic values, quantifying environmental values through economic valuation has little or no purpose. In such cases, the ‘benefit’ of preservation is the protection of the resource although such protection could also provide ancillary economic benefits in terms of use and nonuse values such as recreation. A case in point is the protection of the Great Barrier Reef, or a national park.

Economic values of environmental resources become particularly useful when policymakers consider tradeoffs in terms of benefits and costs of alternative policy decisions. For example, appropriate consideration of the economic value of ecosystems in policy analysis is helpful in evaluating changes to natural resource management and to demonstrate the economic–environmental interdependence. Because actual prices do not exist, these virtual prices of environmental services and amenities should lead to more efficient resource allocations (Randall 2002) and in particular avoid the difficulties associated with the implicit assignment of a value of zero for forgone environmental values in cost-benefit assessments (Mallawaarachchi and Quiggin 2001). When different resource management options are being assessed, these approaches can assist in achieving economic efficiency by providing an understanding of economic tradeoffs people make and would make to assure the continued availability of natural amenities.

Market incentives for ecosystem services

Most of the services derived from ecosystems, compared to goods and services exchanged in the market, are unaccounted, unpriced and therefore remain outside the domain of market exchange. In these circumstances, those who supply ecosystem services—in this study, the farmers of SE South Australia—are not rewarded for the full benefits they provide to others, and those who reduce ecosystem services do not bear the full costs they impose on others. As a result, the full social cost of resource use in production, consumption and conservation are not reflected in prices and a divergence of social and private costs will occur. In economics, such problems are treated as externalities and a cause of market failure that lead to inappropriate resource allocations.

Modern social policies attempt to correct such market failure by creating a market-like situation where non-market goods could be traded and their costs and benefits to the economy could be realised. This process, that defines characteristics of tradeable commodities in natural resource stocks, is often regarded as commoditisation of a natural resource. The preference for market based approaches arises from one of the fundamental insights into the operation of a competitive market economy: under certain conditions markets will align individual and collective interest of society and provide incentives that lead to an efficient outcome.

Market based approaches are often preferred to direct regulation, as market approaches provide voluntary mechanisms that can increase mutual benefits. They are also considered advantageous in that they can be conveniently linked to quantity based instruments such as quotas and rights, or price based instruments, taxes and subsidies. However, these instruments are not universally applicable when the total costs of institutional arrangements that represent the designing, implementing and monitoring of these market based approaches are considered. It is more appropriate to consider that market based approaches and regulations could work in tandem, particularly because the operation of market based instruments such as cap and trade and offsets require enabling regulations to function as legally enforceable instruments (Rousseau and Proost 2005).

Moreover, in policy design, it is important to first understand why markets for ecosystems do not exist, and what impedes their natural development. The main barriers, from an economic perspective, to the creation of markets for ecosystem services include:

- high uncertainty over the attributes and values of ecosystem services;
- the high degree of interdependency among ecosystem services and the consequent difficulty to try and allocate a value to each service;
- asymmetric information between buyers and sellers, leading to divergent values;
- lack of a critical mass of buyers and sellers;
- high transaction costs; and
- the nonexclusive nature of environmental public goods and the difficulty to define and enforce ownership of ecosystem services at reasonable costs (Murtough, Aretino et al. 2002; Kumar 2005).

In a close examination, it reveals that all the above factors could erode potential gains from trade, thus negating the viable existence of a market. Of particular interest are the uncertainty attached to ecosystem services and the difficulties in defining and enforcing ownership, primarily because of the public good aspect of environmental benefits. Public goods are those that benefit everybody, but are in no individual's self interest to provide. For example, biodiversity that may be preserved on private land through protecting vegetation from clearance may not be a preferred option for a farmer because farmers are not able to capture the full returns from their investment because of its non-exclusive nature. The society that collectively values the biodiversity services as important do not essentially bears the costs farmers face as forgone income from an alternative use of land. This divergence in relative value placed by landowners and society means that under a competitive market, non-market goods and services such as biodiversity may not be

provided at a level that seems satisfactory by the community. The current study confirms the importance of this divergence from the perspective of the farmers interviewed.

All the values of vegetation that are currently not included in market values largely represent non-exclusive public goods. Many aspects of a well maintained and healthy production landscape have the characteristics of a non-exclusive good. Some public goods are called non-exclusive when it is impossible to exclude people from consuming them when they do not bear the costs of providing them (for instance, non-paying passers-by). In particular, non-exclusivity could lead to free-rider problems, discouraging private investment, where people can consume a non-exclusive good that was paid for by others. Because these goods are also non-rival as they provide joint or repeated consumption opportunities, non-exclusive benefits can still be private, such as in the case of a golf club. Essentially vegetated landscapes offer non-exclusive benefits permitting concurrent private and public benefits. Because providers of environmental goods often have no exclusive rights, these forms of goods tend to be underprovided (or in some case overprovided) in a market-based economy.

The challenge for vegetation policy is whether the potential economic contributions of biodiversity can be used as a lever to generate real income opportunities to the providers of biodiversity. That will provide them with incentives to conserve it. The question is 'Can policies make conserving native vegetation on private land more attractive than clearing them for agriculture and other developments?'

In seeking answers to this question, it is important to reiterate that landholders do not conserve vegetation because it is important to society: they conserve it because they can benefit from so doing. Therefore, we need to know to what extent the increasing social values for biodiversity and related ecosystem services can form a basis for profits, or a factor that motivates land holders to conserve vegetation on their land (Heal 1999). The nature of these 'benefits' and 'motivation', construed as values and attitudes, is a principal focus of this study.

Mallawaarachchi and Szakiel (2006) found that profitability, asset value and life-style concerns are three primary motives for vegetation management on farm land. The study also showed that the environmental benefits so provided by the farmers surveyed largely represented joint outputs of agricultural production. These motives are consistent with the utility maximising behaviour of individuals. The study noted that some of these benefits also accrue to the wider community as complementary benefits of sustainable farm production.

Priority setting and tradeoffs

Resource management decisions entail choices, and often choices between competing objectives. Although economic values can provide useful guidance about resource management decisions, because it is neither feasible nor appropriate to include all social and environmental values within economic criteria, resource management decisions inevitably involve tradeoffs. In particular, tradeoffs between intrinsic values and economic values are difficult to reconcile and may result in choice conflicts. On the other hand, tradeoffs that occur when alternative land management objectives are mutually

exclusive and involve exclusive private goods represent private opportunity costs. When multiple values are at stake and when multiple stakeholders are involved, such as in the case of land management on production landscapes, the choice among alternative uses becomes difficult. The opportunity costs represented by utility attached to each option in these situations may entail tradeoffs between private and public values.

Opportunity costs, as perceived by each individual, provide a basis for ranking among alternative courses of action. However, in determining priorities for alternative action such as policies, programs and on-ground work on vegetation management that affect benefits to society as a whole, tradeoffs between collective choice and individual values require conciliation. In general, the disparity between these choices – the social and private opportunity costs, reflects differences in preferences and knowledge. For this reason, resource allocation decisions often require formal assessment of net social benefits as a guide to determine relative priorities. These assessments, such as the cost-benefit analysis involve various forms of aggregating individual values into social criteria.

In determining appropriate strategies to aggregate net benefits across communities, the tradeoffs associated with alternative choices can be examined in consideration of the interplay between supply and demand. First, the supply, that involves production tradeoffs, determines feasible combinations of outputs that can be produced, and second the demand, reflects the relative values placed by beneficiaries on the outputs generated. A decision-analysis framework for understanding these values has been proposed in this study.

Tools for managing natural vegetation for greater social benefit

Efficient policy intervention to improve environmental benefits on private land requires that the greatest expected social gain is achieved in public expenditure. This requires that:

- the activities are effective in delivering the targeted environmental benefits;
- these actions deliver the benefits sought at least cost; and,
- the expected benefits of any actions are greater than the costs incurred.

Meeting these criteria in project delivery, however, is possible to the extent that the available information permits the identification of priorities and the costs and benefits of alternative delivery mechanisms to meet those priorities. As highlighted in this report, difficulties arise mainly because of the complexities of real landscapes. Not only are landscapes heterogeneous but actions and effects are often linked through a number of biophysical processes operating at different scales, over different timelines and are often imperfectly understood. Ignoring such complexity, or lack of current knowledge, runs a high risk of continuing to damage underlying ecosystem services.

Given these uncertainties and information gaps, spatial decision support tools integrating biophysical and economic understanding of land use systems, and in particular handling economic and environmental tradeoffs at relevant scales, can facilitate more objective

assessment of priorities and to achieve cost effective delivery of outcomes sought. The case studies examined in this report provide evidence of the need for a better understanding of the tradeoffs involved. More detailed studies of greater geographical scope, integrating production and the environmental motives of land management, are required to understand the complexities at a level sufficient for the development of public policy in native vegetation management and the design of economic instruments capable of implementing it effectively.

REFERENCES

- Aitken, L 2001, *Social and community dimensions of natural resource management*, Consortium for Integrated Resources Management (CIRM), Queensland Department of Natural Resources and Mines.
- Atkinson, P, & Hammersley M 1994, 'Ethnography and participant observation' in N. & L. Denzin, Y eds. *Handbook of qualitative research*, Sage Publications, Thousand Oaks, California, Sage Publications, pp. 248-261.
- Attiwill, P, & Wilson, B, 2003, *Ecology: an Australian perspective*, Oxford University Press, Melbourne. Australian Government.
- Barr, S 2002, *Household waste in social perspective : values, attitudes, situation and behaviour*, Ashgate, Aldershot, UK.
- Bechtel, R.1997, *Environment and behavior: an introduction*, Sage Publications, Thousand Oaks, California.
- Bell, P, Greene, T, Fisher, J. & Baum, A 2001, *Environmental psychology* 5th edn., Harcourt College Publishers, Orlando, Florida.
- Bennett, J and Blamey, R eds. 2001, *Choice modeling approach to environmental valuation*, Cheltenham, Edward Elgar.
- Carruthers, S & Smith, K 1996, *Identification of strategic link lands for conservation: a GIS approach*, Geographic Analysis and Research Unit, Information and Data Analysis Branch, South Australian Department of Housing and Urban Development.
- Clarke, I 2005, *Revegetation assessment and design for biodiversity: Upper South East Region*, The Department of Water, Land and Biodiversity Conservation, Government of South Australia.
- Clark, V, Creswell, J, Green, D & Shope, R 2008, 'Mixing quantitative and qualitative approaches: an introduction to emergent mixed methods research' in N. Hess-Biber & P Levy eds., *Handbook of emergent methods*, The Guildford Press, New York, pp. 363-387.
- Clifford, J 1990, 'Notes on (field) notes' in R. Sanjek ed., *Fieldnotes: the makings of anthropology*, Cornell University Press, Ithaca, New York, pp. 52-68.
- Commonwealth Scientific and Industrial Research Organisation Land and Water 2002, *Review of the status and condition of perennial vegetation in the Upper South East region of South Australia*, CSIRO.

Cork, S & Shelton, D 2000, 'The nature and value of Australia's ecosystem services: a framework for sustainable environmental solutions' in *Sustainable environmental solutions for industry and government: proceedings of the 3rd Queensland environmental conference*, Brisbane, Environmental Engineering Society, Queensland Chapter, The Institution of Engineers, Australia, Queensland Division, and Queensland Chamber of Commerce and Industry.

Croft, T 2003, 'Historical vegetation communities' in Foulkes, J & Heard, L eds, *A biological survey of the South East of South Australia 1991 and 1997*, Department for Environment and Heritage, Government of South Australia.

Croft, T, Oppermann, A & Zubrinich, T 1999, *Biodiversity plan for the South East of South Australia*, Department for Environment, Heritage and Aboriginal Affairs.

Department of Primary Industries and Resources of South Australia 1995, *Coorong soil conservation district plan*, Government of South Australia.

Denzin, N & Lincoln Y eds. 2008, *Strategies of qualitative inquiry*, Sage Publications, Thousand Oaks, California.

Edwards, W 1971, 'Social utilities', *Engineering Economist*, Summer Symposium Series, 6.

Geertz, C 1973, *The interpretation of cultures: selected essays*, Basic Books, New York.

Geoscience Australia 2004, *Australian Surface Water Management Areas (ASWMA)*, Canberra, National Mapping Division, Geoscience Australia.

Gooday, P & Timcke D 1999, *Managing ocean resources: a risk management perspective*, ABARE Report Prepared for the Fisheries Resource Research Fund. Canberra.

Goodwin, P & Wright, G 2004, *Decision analysis for management judgement*, 3rd edn., John Wiley & Sons, Chichester, United Kingdom.

Grafton, R 2005, *Evaluation of round one of the market based instrument pilot program*, Canberra, National Market Based Pilot Program: 35.

Heal, G 1999, *Biodiversity as a commodity*, Paine Webber Working Paper Series in Money, Economics and Finance, Graduate School of Business, Columbia University, New York.

Jenkins, S 1998, *Native vegetation on farms survey 1996—a survey of farmers attitudes to native vegetation and landcare in the wheatbelt of Western Australia*, National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 3/98.

Kumar, P 2005, *Market for ecosystem services*, International Institute for Sustainable Development, No. 32, Manitoba.

Lederman, R 1990, 'Pretexts for ethnography: on reading fieldnotes' in R. Sanjek ed., *Fieldnotes: the makings of anthropology*, Cornell University Press, Ithaca, New York, pp. 73-86.

Mallawaarachchi, T & Quiggin, J 2001, 'Modelling socially optimal land allocations for sugar cane growing in North Queensland: a linked mathematical programming and Choice Modelling study', *Australian Journal of Agricultural and Resource Economics* Vol.45, No. 3, pp. 383-409.

Mallawaarachchi, T & Szakiel, S 2006, *Economic issues in the management of native vegetation on farm land: non-broadscale land clearing in Southern Australia*, ABARE Report for the Natural Resource Management Division, Department of Agriculture, Fisheries and Forestry, Canberra, 2006.

Mazur, N 2004, *Community perceptions of aquaculture: related social research*, Social Sciences Program, Bureau of Rural Research, ACT.

McDougall, D, Longneck, N, Marsh, S & Smith, F 2001, Attitudes of pulse farmers in Western Australia towards genetically modified organisms in agriculture, *Australasian Biotechnology*. Vol. 11, No. 3, pp. 36-39.

Mercer, K 2003, 'Community and conservation: malleefowl conservation in South Australia', *Proceedings of the National Malleefowl Forum*, February 2004.

Murtough, G, Aretino B & Matysek, A 2002, *Creating markets for ecosystem services*, Productivity Commission Staff Research Paper, Canberra.

Natural Resource Economics team Rural Solutions SA 2002, *Review of benefit-cost analysis, cost sharing frameworks and valuation of landholder environmental activity for the USEDSEMP*, Department of Water, Land and Biodiversity Conservation, Government of South Australia, 2002.

New, T 2006, *Conservation biology in Australia: an introduction*. 2nd edn., Oxford University Press, Melbourne.

O'Reilly, K 2005, *Ethnographic methods*, Routledge, New York.

Perman, R, Ma, Y, McGilvray, J & Common, M 2003, *Natural resource and environmental economics*, Pearson Education Ltd., Essex.

Primary Industries and Resources SA 1999, *Upper South East dryland salinity and flood management plan: progress report*, Government of South Australia.

Primary Industries and Resources SA 2001, *South Australian dryland salinity strategy*, Government of South Australia.

Primary Industries South Australia 1994, *Direct seeding research workshop*, Government of South Australia.

Randall, A 2002, 'Valuing the output of multifunctional agriculture', *European Review of Agricultural Economics*, Vol. 29, No. 3, pp. 289-307.

Reeve, I & Black, A 1993, *Australian farmers' attitudes to rural environmental issues*, The Rural Development Centre, Department of Sociology, University of Armidale, NSW.

Robinson, J, Crouton, B & Such, J 2002, 'Using a citizen's jury and choice modelling: a case study on the Bremer River Catchments', *Coast to Coast 2002*.

Rousseau, S & Proost, S 2005, 'comparing environmental policy instruments in the presence of imperfect compliance - a case study', *Environmental and Resource Economics* Vol. 32, No. 3, pp. 337-365.

Rural Solutions SA 2002a, *Review of the 20% native vegetation cover target of the Upper South East dryland salinity and flood management plan*, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Rural Solutions SA 2002b, *Review of the USE program revegetation and native vegetation enhancement achievements—supplement report*, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Rural Solutions SA 2002c, *USE revegetation strategy and regional targets: hydrological considerations*, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Rural Solutions SA 2002d, *USE revegetation strategy and regional targets 2002--synopsis*, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Sinclair-Hannocks, S 2002a, *Use cost-benefit and cost sharing analyses*, USE Program, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Sinclair-Hannocks, S 2002b, *USE revegetation strategy and regional targets NAP priority project brief*, USE Program, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

Sinclair-Hannocks, S 2002c, *Joint USE program board and environmental management advisory group report NAP priority project 1: USE workshop*, Department of Water, Land and Biodiversity Conservation, Government of South Australia.

South East Catchment Water Management Board 2001a, *Water allocation plan for the Tatiara prescribed wells area*, Department of Water Resources, Government of South Australia.

South East Catchment Water Management Board 2001b, *Companion to the water allocation plan*, Department of Water Resources, Government of South Australia.

South East Natural Resource Consultative Committee 2003, *South East region of South Australia, natural resource management rolling investment strategy: draft for public consultation*, Government of South Australia.

Stokes, Z & Masters, B 2005, 'Tagasaste: a fodder shrub', *Fact Sheet No. 64/00*, Primary Industries and Resources SA.

Taylor, S 2002, 'Researching the social: an introduction to ethnographic research', in S. Taylor ed. *Ethnographic research: a reader*, Sage Publications, London, pp. 1-12.

The Native Vegetation Council 2006, *A Guide to the regulations under the Native Vegetation Act 1991*, Department for Water, Land and Biodiversity Conservation, Adelaide, SA.

University of Adelaide 1990, *Non-wetting sands: the problems, causes, remedies and research*, Brochure produced by Office of Planning and Communication, University of Adelaide.

Upper South East Regional Revegetation Committee 1998a, *Background document to Upper South East regional revegetation strategy*, Primary Industry and Resources, SA, and Department of Environmental Heritage and Aboriginal Affairs, Government of South Australia.

Upper South East Regional Revegetation Committee 1998b, *Upper South East regional revegetation strategy*, Department of Environmental Heritage and Aboriginal Affairs, Government of South Australia, 1998.

Waterwatch SA 2005, *Saltwatch fact sheet 2005*, Government of South Australia.

Weatherstone, J 2003, 'Lyndfield Park: looking back - moving forward', *Land and Water Australia* Vol. 20.

Whitten, S & Salzman, J 2003, *Markets for ecosystem services: applying the concepts*, 47th Annual Conference of the Australian Agricultural and Resource Economics Society, Fremantle.

Whitten, S & Bennett, J 1998, *Farmer perceptions of wetlands and wetland management in the Upper South East of South Australia*, Research Report No. 2, National Wetland Research and Development Program, Land & Water Resources Research and Development Corporation, and Environment Australia.

Whitten, S & Bennett, J 2000, *Farmer Perceptions of wetlands and wetland management on the Murrumbidgee River Between Wagga Waga and Hay Including Mirrool Creek*, Research Report No. 5, National Wetland Research and Development Program, Land & Water Resources Research and Development Corporation, and Environment Australia.

Williams, K & Cary, J 2001, 'Project Review: perception of native grassland in southeastern Australia', *Ecological Management & Restoration* Vol. 2, No. 2, pp. 139-144.

Williams, M 1974, *The making of the South Australian landscape: a study in the historical geography of Australia*, Academic Press, London.

Willis, D & Johnson, A 2004, 'How to pay for a drain: the South Australian biodiversity trading arrangement', *1st National Salinity Engineering Conference, 9-12 November, 2004*, Perth, WA.

Yin, R 2003, *Case study research: design and methods*, 3rd edn., Sage Publications, Thousand Oaks, California.