

# An Investigation of Farmers' Perspective on Biodiversity and Restoring Native Vegetation on Farms Using the Constructivist Approach to Social Inquiry: A Case Study of Beef and Sheep Farmers in Southeastern Gippsland, Australia

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**How to cite this paper:** O'Donnell, P. P. (2023). An Investigation of Farmers' Perspective on Biodiversity and Restoring Native Vegetation on Farms Using the Constructivist Approach to Social Inquiry: A Case Study of Beef and Sheep Farmers in Southeastern Gippsland, Australia. *Sociology Mind*, 13, 193-240.

<https://doi.org/10.4236/sm.2023.134011>

**Received:** July 7, 2023

**Accepted:** September 1, 2023

**Published:** September 4, 2023

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## Abstract

Farmer participation and ecological restoration on farmland is tightly linked. Farmers are key players in increasing habitat heterogeneity, preserving biodiversity and creating sustainable agroecosystems. The perspectives of farmers on restoring native vegetation are shaped by social realities, which are made up of a multitude of mental constructs influenced by their personal goals as well as the political-social-economic-environmental matrix. This study used qualitative approaches to understand farmers' perspectives on biodiversity and restoring native vegetation on farmland. The first step of this project was to recognize and understand that in an agroecosystem, biological and social forces are not mutually exclusive but in fact inextricably intertwined. After this step, a decision was made to pursue an inter-disciplinary project incorporating both the ecological and social dimensions of an agroecosystem. There were two study groups, Social Study A, which was made up of 24 beef and sheep farmers on 20 farms in southeastern Gippsland, and Social Study B, made up of a sub-set of five farmers on four farms from Social Study A. The farmers involved in Social Study A were interviewed about their views, beliefs and experiences regarding land conservation programs, biodiversity on farms, and restoring native vegetation on farmland prior to an ecological study of beneficial invertebrates in pasture. The farmers involved in Social Study B were interviewed after the ecological study on their farms. At the end of the ecological study, farmers in Social Study B and their families attended a presentation on results of the ecological study and given an informative ca-

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lendar that included pictures and information about beneficial invertebrates found on farms. The presentation occurred prior to the interviews for Social Study B. Interviews comprising Social Study B focused on whether participation in the ecological study, attending a presentation on the results, and receiving educational material on beneficial invertebrates influenced farmers' attitudes and planned future behaviours regarding the restoration of native vegetation or the maintenance of on-farm biodiversity. Farmers in the research area were genuinely interested in restoring native vegetation on farmland. However, due to dry weather patterns in the research area, low commodity prices on the world market, and reductions in agricultural funding, farmers lacked the time and money to restore native vegetation on farmland. Farmers expressed interest in learning more about the important role of beneficial invertebrates in controlling pest species in pasture landscapes; and the related role of restored native vegetation in supporting assemblages of beneficial invertebrates on pasturelands. Farmers who are included in agroecological projects and are presented with the results from these projects could be more open to undertaking restoration work on farms.

### **Keywords**

Biodiversity, Rural Sociology, Native Vegetation, Landcare, Beneficial Arthropods, Agroecosystems

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## **1. Introduction**

An important aspect of this project is the merging of two disciplines that will be crucial in ultimately redefining farming in this millennium: ecology and sociology. In the research literature, these two disciplines are often treated separately when discussing or investigating agricultural concerns. Sociology is concerned largely with the human agri-environmental change perspective and ecology is interested in the biological aspects (Hobbs, 1997). Incorporating ecology and sociology into a single project recognises that the agroecosystem is comprised not only of farmers and their needs and actions, but the ecological principles which underpin sustainable farming and which are necessary to understand in order to produce agricultural products in the future. Thus, as Hobbs (1997) contends for landscapes, new farming solutions to old agricultural problems may eventually arise when unique perspectives from different disciplines are brought together.

### **1.1. The Social Environment and the Agroecosystem**

Agricultural intensification has reduced habitat heterogeneity (Concepcion et al., 2008; Wyborn et al., 2012), which has been associated with a loss of native vegetation and identified as a major cause of biodiversity decline in agroecosystems (Gardner, 1996; Stephens et al., 2003; Green et al., 2005). There is evidence of widespread bird decline, as well as declines in other taxa, such as mammals,

arthropods and flowering plants, across Europe and North America following increases in farming intensity (Donald et al., 2001; Benton et al., 2003). In Australia, a reduction in habitat heterogeneity has had a part in at least 19 species of mammals becoming extinct and has adversely affected more than 82% of bird species (Garnett & Crowley, 1995). A more localized study of bird decline in West Gippsland, Victoria, Australia, reported an average decline of approximately nine species of birds per remnant forest patch across 20 forest remnants over a 22 year period, with the main driver for these local extinctions being a loss of habitat heterogeneity associated with clearing of forest and woodland for agriculture (MacHunter et al., 2006).

The loss of habitat heterogeneity occurring in agroecosystems threatens complex interactions by replacing nature's diversity with a small number of domesticated plants and animals (Churchill & Ludwig, 2004; Tsitsilas et al., 2006; Concepcion et al., 2008). Altieri (1999) writes: "The inherent self-regulation characteristics of natural communities are lost when humans modify such communities through the shattering of the fragile thread of community interactions." This process of habitat simplification damages ecosystem functions, which in turn reduces ecosystem services within the agroecosystem. Ecosystem functions refer variously to habitat, biological or system processes of ecosystems, such as soil formation processes, decomposition, element cycling, and trophic-dynamic regulations of populations (Cardinale et al., 2003; Hillebrand & Matthiessen, 2009).

Ecosystem services provided by biodiversity include processes such as recycling of nutrients, control of microclimate, regulation of hydrological processes, regulation of abundance of undesirable organisms, and detoxification of noxious chemicals (Snyder et al., 2006; Chagnon et al., 2015; O'Donnell & Wright, 2021). An example of ecosystem services is the control of insect pest species by natural enemies such as predatory insects and parasitoids. For example, Cardinale et al. (2003) report an increase in the yield of an economically important crop (alfalfa *Medicago sativa* (L.)) due to the predation of a widespread group of herbivorous pests (pea aphid *Acyrtosiphon pisum* (Harris)) by an assemblage of three natural enemy species of the pea aphid: coccinellid beetle *Harmonia axyridis* (Pallas), damsel bug *Nabis* sp. (Costa), and a parasitic wasp *Aphidius ervi* (Haliday). Native vertebrates can also provide ecosystem services (Banaszak, 1992; Fukuda et al., 2011). Loyn et al. (1983) showed that native insectivorous birds utilising a patch of eucalypt forest were able to control a major local insect infestation on farmland in Victoria, Australia.

When ecosystem services are diminished due to the loss of habitat heterogeneity, the economic, social, and environmental costs can be quite serious (Mayfield, 1995; Pimentel et al., 2005; Chagnon et al., 2015). Agroecosystems that lack key ecosystem services are incapable of providing their own soil fertility and pest regulation. Costly external inputs, such as fertilisers and insecticides, need to be applied, causing economic, social and environmental hardships, such as increased cost burden to farmers and a reduction in soil, water and food qual-

ity due to pesticide and/or nitrate contamination (Pimentel et al., 2005).

Reductions in habitat heterogeneity are due in part to socio-economic policies that promote intensive production over long-term sustainable use of farmland, known as the Productionist Paradigm of agriculture (Pimentel et al., 2005; Pannell et al., 2006). Some examples in Australia include early government policies that gave tax concessions for clearing land of native vegetation and bounties to eliminate “pest” native species (Campbell, 1992). Research has shown that, largely as a result of such policies, over 65% of forest and woodland cover in the state of Victoria was cleared during the period 1869 to 1987 (Woodgate & Black, 1988). Also, farming techniques familiar to Europe were encouraged and implemented on a large scale (Barr & Cary, 1992; Stanley & Clouston, 2005; Robb, 2008). Due to climatic extremes and poor soils, the Australian landscape was not suitable for these farming practices, which had devastating effects on the environment (Barr & Cary, 1992; Stanley & Clouston, 2005). Although some of the particulars will be unique to one country or another, many of these production-orientated agricultural policies and their overall negative effects on biodiversity have parallels across national boundaries. Benton et al. (2003) conclude that it is not one particular farming practice that causes current biodiversity decline but the multivariate effects of agricultural intensification strongly interacting with the replacement of heterogeneity in habitat structure by homogeneity in time and space. Therefore, Benton et al. (2003) recommend implementing a universal management objective that promotes habitat heterogeneity widely across food production systems, rather than concentrating on particular farming practices.

Even though the foundation of the agroecosystem is biological and dependent upon the persistence of biodiversity, the human influence on this system cannot be ignored for the simple fact that agroecosystems encompass and are often directed by the human occupants, whose decisions on land management can be influenced by micro-social dynamics, such as the landowner’s beliefs, attitudes and experiences, as well as features of the macro-social environment, such as governmental incentives, the lowering of trade barriers, reliance on market forces and the economic imperatives present at that time (Buller & Morris, 2004; Lawrence, 2005).

Societal relationships and institutional capital, however, are not mutually exclusive and have the potential to influence each other; thus, the line between the two can be blurred (Cocklin & Dibden, 2005). In Australia, for example, Landcare is a voluntary community organization that brings farmers and community members together in an attempt to improve environmental management at the local level (Lockie & Vanclay, 1997), but is also partnered with the federal, state and local government and other non-governmental organizations. Thus, there is an opportunity for farmers/community members to have their voices heard and for the state/local agencies involved to set up guidelines for funding of environmental works.

Interestingly, whether the agricultural sector in a country is heavily subsidised or not, environmental damage and the destabilization of rural communities seem to be persistent problems under productionist policy regimes (Mayfield, 1995; Marsden, 2003; Davison, 2005). Ecologically, it may be that environmental sustainability is not signalled in world commodity markets, meaning there is no direct financial benefit to farmers who use ecologically sensitive farming techniques (Wills, 1997); institutional policies for agriculture are narrowly focused on an unsustainable concept of continual increases in production based on unlimited resources (Lang & Heasman 2015); and ecological and economic processes work under vastly different spatial and temporal frameworks. Socially, Vanclay (2003) discusses how market reform in Australia, in the form of the abolition of subsidies and protection, is having a largely negative impact on rural people and argues that the logic promoting deregulation and structural adjustment fails to consider externalities such as social consequences that escape a market analysis.

Under the Productionist Paradigm, the institutional mechanisms that promote agricultural intensification have been documented as leading to habitat simplification, widespread biodiversity decline, and the instability of rural communities (Hobbs, 2003; Dibden & Cocklin, 2009; Andree et al., 2010).

Increasing habitat heterogeneity by restore native vegetation on farms has agricultural and ecological benefits, such as reducing the loss of topsoil to wind erosion, containing soil salinity, protecting livestock from strong winds (Malcolm et al., 2010), maintaining wildlife populations (Haslem & Bennett, 2008; Bernier-Leduc et al., 2009) and increasing the abundances of beneficial invertebrates (Pontin et al., 2006; Holloway et al., 2008; O'Donnell & Wright, 2021). The restoration of native vegetation in this project means protecting remnant native vegetation with fencing and planting strips of native vegetation protected by fencing in pasture landscapes.

Farmers are key stakeholders in implementing restoration work on farms. Therefore, their cooperation with conservation programs is essential, as is the practical knowledge and expertise they can share (Gurung, 2003; Wyborn et al., 2012). To more fully understand why farmers adopt and implement sustainable land management strategies, it is important to explore motivations and opportunities, as well as barriers, from the farmer's perspective (Farmar-Bowers, 2004; Graymore & Schwarz, 2012). This process can lead to better designed public policy and higher rates of adoption by farmers of sustainable land management strategies.

## 1.2. Barriers to Sustainable Agroecosystems

Change at any level or in any sphere can be difficult to undertake, but especially, when it comes to changing agricultural systems. Pannell (1999) points out that farming systems are very rarely transformed and that the few examples where it does occur are in extreme cases, such as extreme opportunities to exploit or problems to overcome. Beddoe et al. (2009) also gives examples from history of

where entire civilizations collapsed due to a society's inability or unwillingness to adapt agricultural regimes to changing socio-ecological circumstances.

Some of the largest barriers to sustainable agroecosystems will be economic in nature. World markets, for example, do not normally incorporate environmental or societal costs in the price of most agricultural products (Wills, 1997; Vanclay, 2003; Higgins et al., 2008a) and, in fact, encourage Productionist agriculture by directly rewarding intensification and concentration (Buller & Morris, 2004). Farmers most often need to shoulder most of the costs of transition to more sustainable farming practices (Mayfield, 1995).

Another factor that slows the adoption of sustainable agricultural practices is that over the 200 or so years that productionist farming has been in full operation, it has gained in political and economic power due to its format alone: specialization, intensification and consolidation (Marsden, 2003; Lawrence et al., 2004; Dibden & Cocklin, 2005; Lang & Heasman, 2015), whereas sustainable farming practices normally have a more diffuse grassroots approach to farming that promotes small production and low inputs (Lang & Heasman, 2015). Lang & Heasman (2015) and Lawrence et al. (2004) noted that productionist farming has the backing of large corporations, agribusiness, politicians and vested interests, whereas sustainable practices gather support from environmental and consumer groups as well as individuals and local farmers. Sustainable farming systems lack the large sums of money or a direct channel to powerful players in government or the multinational agribusiness corporations (Lawrence et al., 2004). With its access to financial and political power causing technical, institutional and ideological impediments to transition towards more sustainable agroecosystems, many researchers acknowledge that productionist farming is so well entrenched that moves away from it may have to come from a "bottom-up" approach, such as small farms, local communities and non-governmental organizations (Horlings & Marsden, 2011).

Lang & Heasman (2015) found that productionist farming methods were the norm in many countries. As such, a transition would be required if ecologically integrated agricultural methods were to replace conventional ones. It will therefore be necessary to consider farmers' perception of change or transition in agricultural practices. Research has shown that farmer typologies are diverse and cover a wide range of attributes (McElwee & Bosworth, 2010; Guillem et al., 2012). In particular, farmers' attitude towards risk has been investigated thoroughly by other researchers (Bond & Wonder, 1980; Pannell et al., 2006; Guillem et al., 2012). It was found that farmers, as a group, were risk-averse (Bond & Wonder, 1980; Pannell, 1999). They, for example, rarely move towards large-scale adoption of new practices and are more likely to try small-scale trials, scaling up to full adoption or down to disadoption as they gain knowledge and experience about the innovation's performance (Barr & Cary, 1992; Pannell et al., 2006). Researchers have noted that the process of adopting novel innovations by farmers is complex and long so that it may take decades rather than years to move from Productionist farming and adopt more sustainable practices (Barr &

Cary, 1992; Stanley & Clouston, 2005; Cocklin et al., 2007; Pannell et al., 2006). This prolonged decision making process by farmers concerning transition in agricultural practices may pose problems for the adoption of sustainable farming methods, especially where quick adoption is required such as in fragile ecosystems or areas where immediate ecosystem restoration is needed on farmland.

Researchers believe that the major barrier to transitioning from productionist agriculture (high production and high energy systems (Altieri et al., 1983)) to sustainable agroecosystems (labour-intensive and low energy-consuming systems (Altieri et al., 1983)) is most likely to be represented by social complexities and institutional inertia, rather than a lack of technical capabilities (Janzen, 1973; Pannell, 1999; Dibden & Cocklin, 2005).

### 1.3. Socio-Economic, Environmental, and Political-Economic Conditions in Australia

In Australia, researchers have argued that the agroecosystem is threatened by a number of productionist agricultural processes such as the overuse of agricultural chemicals; overgrazing; and tree-clearing, monocropping, and irrigating resulting in widespread soil/nutrient loss and salinisation (Attwood et al., 2005; Lawrence, 2005; Graymore & Schwarz, 2012; Florentine et al., 2013). These processes are drastically altering the landscape by reducing habitat diversity and species numbers (Dorrough et al., 2004; Jellinek et al., 2013; Zhao et al., 2015). They also cause habitat fragmentation, which has been documented as causing unanticipated loss of species over time (MacHunter et al., 2006; Jellinek et al., 2014). It may be anywhere from 50 to 400 years before the full impact of past habitat loss is realized in terms of species loss (Tilman et al., 1994; MacNally & Horrocks, 2002; MacHunter et al., 2006). This phenomenon is termed “extinction debt” (Tilman et al., 1994). As a result of these agricultural processes, biodiversity-mediated renewal processes and ecosystem services are said to be diminishing (Fukuda et al., 2011; Jellinek et al., 2013).

Agricultural policies made in the global and national arena can impact on farms at the farm and regional level. In Australia, farmers are under enormous pressure to increase efficiency in order to compete in global markets which are distorted by subsidised food products and characterized by unstable and low commodity prices (Andree et al., 2010). This pressure can push farmers at the farm and regional level into productivist practices (Lawrence et al., 2004; Andree et al., 2010) and have them feel they are on a production “treadmill”, where they are working harder and conforming to productivity-raising strategies, but feel they are not getting ahead (Lawrence, 2005).

As documented in other research (Vanclay, 2003; Barr, 2009; Andree et al., 2010), the farming philosophies of beef and sheep farmers that were interviewed in this study were shaped by socio-economic and environmental imperatives. These imperatives are formed under the influence of the political-economic realities in Australia. The Australian economy, due to its small domestic market, is an export-driven one where neoliberal government policies hold sway (Dibden

et al., 2009; Andree et al., 2010). The aim of neoliberalist governments is to promote “economic efficiency, transparency and accountability” through the deregulation of the economy that, in neoliberal doctrine, leads to market advantage by relying on market forces and reducing government intervention at all levels, thereby increasing the competitive edge in world markets of that country’s goods and services (Dibden & Cocklin, 2005).

The Australian government has pursued trade liberalization policies in an attempt to overcome trade barriers erected by other countries and enter into trade agreements which allow access for its primary production (Gray & Lawrence, 2001; Cocklin et al., 2006; Dibden et al., 2009). This, however, creates a conundrum when it comes to funding environmental restoration work on farms as it is seen as contrary to free trade policy (Dibden & Cocklin, 2005). Therefore, the Australian government is hesitant in providing financial assistance and instead has promoted a more voluntary approach to environmental restoration work on farms (Curtis & De Lacy, 1998; Dibden & Cocklin, 2005). To compete in world markets, the Australian government promotes high production of agricultural products (Cocklin et al., 2006). Dibden & Cocklin (2005) call this sort of Productionist Paradigm, without government assistance, “competitive productivism”. These political-economic policies impact at the farm level by shaping the choices, options and opinions of Australian farmers when deciding on ecological restoration work (Andree et al., 2010).

Beef and sheep farmers in southeastern Gippsland are exposed to both macro-scale economic policy, such as the opening up of markets to international competition and the liberalisation of agricultural trade, and micro-scale socio-economic policy, such as the promotion of private standards schemes in agri-environmental governance and volunteerism for ecological restoration work on farms (Higgins et al., 2008a; Higgins et al., 2008b; Dibden et al., 2009; Andree et al., 2010). In addition, Gippsland was experiencing a prolong drought at the time of research (Cocklin et al., 2007). This situation provides an opportunity to glean useful insights into the effects of these types of policies and climatic conditions on beef and sheep farmers’ willingness and ability to do native vegetation restoration work on farms.

#### **1.4. Strategies for the Social Research**

The main focus of this study was on the reality constructed by beef and sheep farmers concerning biodiversity and the restoration of native vegetation on farmland. This focus permitted an investigation of the opinions and experiences these types of farmers had with biodiversity and ecological restoration work on farms as well as the impact government policies have on options available to graziers to do restoration work on farms.

In order to investigate the social realities of key actors in restoring native vegetation on farmland, two social studies were undertaken, Social Study A in 2008/2009 and Social Study B in 2010. In Social Study A, 24 beef and sheep farmers (17 individuals, two couples and one group of three farmers) on 20 farms

in southeastern Gippsland, Victoria, Australia were interviewed about their views, beliefs and experiences regarding land conservation programs, biodiversity on farms, and restoring native vegetation on farmland. Social Study A took place prior to an ecological study (i.e., invertebrate surveys); Social Study B was done after the ecological study. A sub-set of four farmers from the initial group agreed to permit an ecological study to take place on their properties.

At the end of the ecological study, farmers, who would later participate in Social Study B, were invited to a presentation on the initial findings of the ecological study done on their land and were given an informative text-based calendar that included pictures and information about beneficial invertebrates found on their farms. After attending the presentation and receiving educational material on beneficial invertebrates, five farmers (3 individuals and one couple) on the four farms in the ecological study were interviewed a second time. Farmers were not chosen to represent the broader community but to provide insight into the influences of various interactions with an ecologist on farmers' land management decisions (Denzin & Lincoln, 2000; Stake, 2000).

Some questions were used in both the first and second interviews. This was done to ensure some continuity so that comparisons could be made between the first and second interviews. Questions unique to the second interview centred on whether participation in the ecological study, attending a presentation on results, and receiving educational material on beneficial invertebrates had influenced farmers' attitudes and planned future behaviours regarding the restoration of native vegetation or maintenance of on-farm biodiversity. This research also explored farmers' thoughts on how ecological research might influence land management decisions by farmers in the future. Farmers were also asked to give their perspectives on which methods could be used by researchers to best encourage farmer participation in ecological studies on farmland and how best to present information from scientific studies about restoring native vegetation and maintaining on-farm biodiversity to farmers.

All farmers were farm owners-operators. The size of farms ranged from 121 ha to 1700 ha, although a majority were more than 500 ha. All of the farmers were at one time Landcare members. The data from these interviews were organised thematically and the results outlined below. For the purposes of reporting, the 16 farm management teams interviewed for Social Study A are allocated a code ranging from SS01 to SS16, and the four management teams interviewed for both Social Study A and B are allocated a code ranging from ES01 to ES04. The lowercase letters "a", "b" and "c" indicate when two or more farmers participated in the same interview (e.g., SS12a, SS12b).

The manual approach of colour coding common themes was done so that the researcher could gather first-hand knowledge from the transcripts. Nvivo (QSR International), which is a software program designed to organise and analyse qualitative data, was chosen as an approach to protect against researcher bias. The results from both approaches were compared to ensure that the analyses were unbiased and comprehensive. NVivo11 also mined the interviews of Social

Studies A and B for important insights and connections that manual coding can overlook. The word frequency query in the NVivo11 software package (QSR International, 2015) was used to find 100 of the most frequently occurring words or concepts in transcripts of 24 farmers for Social Study A. A Word Cloud is used to display this information. Larger words are more frequently found in the transcripts.

Selection of participants was non-random with them being selected using the snowball sampling method (Biernacki & Waldorf, 1981; O'Leary, 2004). The snowball sampling method is basically a referral system where the researcher asks a willing participant to recommend someone who fits certain criteria and may be willing to join the study (Biernacki & Waldorf, 1981; O'Leary, 2004). Thus, the farmers first interviewed were then asked to recommend other farmers who would fit the criteria and be interested in being interviewed.

Biernacki & Waldorf (1981) caution that one limitation of snowball sampling is that it may be difficult to verify whether potential participants actually conform to any of the criteria for inclusion in the project. They argue that snowball sampling "becomes problematic as the sources used to initiate referral chains become more distant and knowledge about the sources less personal" (Biernacki & Waldorf, 1981). In this study, this problem did not arise since the sources were a group of local farmers who were not distant from, and who had personal knowledge of, the people that they suggested as participants. Nevertheless, procedures were followed to ensure that participants fitted the criteria of the study. For example, when discussing various topics, respondents would sometimes mention other participants or would-be participants in the project. This volunteered information was noted and used as an additional source of verification. Moreover, during the referral process, it was common that more than one source would mention the same name of a potential participant. This was also taken as verification of that person's suitability for inclusion in the project. Since the interviews took place at a participant's house, located on the participant's farm, the researcher had ample opportunity to observe whether or not a particular participant, met the main criteria for participating in this project (that is: their role as beef and/or sheep farmer).

Another problem to be aware of when applying a referral sampling method is the forming of a biased chain of participants due to the likelihood of similar people being in close contact (Biernacki & Waldorf, 1981; O'Leary, 2004). In the study region for this project, most of the farmers have at one time or another been members of Landcare. In addition, the referral system used here started with a member of Landcare and followed from there. Although the researcher was aware of a possible bias being introduced, there were not a lot of non-members of Landcare known to the sources making up the network system. Nineteen of the 24 farmers (79%) mentioned that nearly all farmers in the research area have at one time or another been members of the Landcare organisation. This bias, however, may be more apparent than real due to the widespread participation in Landcare in the study region.

Drawing upon the social literature, we examine the role played by governments and farmers in establishing and protecting native vegetation in pasture landscapes. We first provide a brief overview of the socio-economic climate and environmental situation in Australia at the time of research and their impact on farmers. We also discuss the prominent overarching agricultural paradigm moulding agriculture policy. This establishes the context for our Australian case study of farmers' perspective on restoring native vegetation in pasture landscapes, which includes their views and opinions about on-farm biodiversity and their experiences working with environmental organizations (e.g., Landcare and Greening Australia). Finally, we consider, in relation to the case study, methods to improve environmental organizations and increase enthusiasm for restoring native vegetation.

This project is unique in that the researcher interacted with a sub-set of farmers during the invertebrate surveys, and reported the results of those surveys directly to those farmers, then re-interviewed these farmers to discover how their participation in the ecological study influenced their views, opinions and attitudes. The conclusions generated in this project were grounded in the interview data and contribute to elucidating the various influences on farmers' willingness and motivation to restore native vegetation.

In this paper, farmers' motives for restoring or not restoring native vegetation on farmland were investigated using semi-structured interviews to ask open-ended questions relating to their restoration of native vegetation on farmland. This research is unique in that it places the farm-level reality of farmers in the context of the dominant agricultural paradigm and socio-economic climate at the time of research.

Research has shown that farmers value the ecosystem service of pest control provided by beneficial invertebrates (Schellhorn, 2010). Although, many farmers in such distant locales as Australia, North America, South America and New Zealand lacked the necessary skills to identify beneficial invertebrates or the knowledge base about their life cycles that would be essential in maintaining and enhancing beneficial invertebrate populations (Bentley & Thiele, 1999; Tackie et al., 2009; Schellhorn, 2010; Zydenbos et al., 2013). One of the important aspects of this research was to investigate the knowledge farmers had of beneficial invertebrates on farmland. In this paper, farmers are asked about their knowledge of both pest and beneficial invertebrates.

### **1.5. Key Issues and Common Threads in Transcripts**

The 20 interviews were semi-structured, meaning questions were asked to the 24 participants but it was open as to how and to what they responded. Farmers, therefore, could pursue related or unrelated thoughts and concerns regarding the original questions. After analysing the transcripts manually, some common threads and key concepts emerged:

- Feelings of financial stress

- Contending with environmental hardships
- Landcare and its programs
- The importance of funding in land restoration work
- Factors involved in the declining enthusiasm for Landcare
- Increasing enthusiasm for restoring native vegetation on farmland
- Barriers to restoring native vegetation on farms
- Agricultural benefits of restoring native vegetation on farmland

### 1.6. Word Cloud: Word Prevalence in the Transcripts of Social Study A

**Table 1** and **Figure 1** (Word Cloud) display the most frequently occurring words and concepts found by NVivo (QSR International) in the transcript of the 24 farmers interviewed in Social Study A. As the questions for the interviews were open ended, it is interesting to note that many of the words and concepts discussed by farmers were related to restoring native vegetation on farmland.

**Table 1.** Top 8 frequently occurring words or concepts in the transcript of 24 farmers for Social Study A. Word: the most frequently occurring word from the group displayed in the final column; Length: the number of letters in the word; Count: the total number of times the word and similar words occur within the transcript; Weighted Percentage: the frequency of the word and related words relative to the total words counted; Similar Words: words similar in meaning to the word in the first column.

Word	Length	Count	Weighted Percentage (%)	Similar Words
trees	5	331	1.70	tree, trees
farm	4	328	1.39	agricultural, agriculture, farm, farmed, farming, farms, land, lands
Landcare	8	238	1.22	Landcare
fenced	6	192	0.98	fence, fenced, fences, fencing
funding	7	205	0.93	finance, finances, financing, fund, funded, funding, funds, support, supporting
pasture	7	223	0.87	crop, cropping, crops, forage, grass, grasses, graze, grazed, grazing, pastures
government	10	202	0.67	administration, authorities, establishing, governed, governments, organizations, organizers, organizing, political, politically
land	4	207	0.67	acre, acres, earth, ground, land, lands



## 2.1. Financial Hardships for Farmers

Thirty-three percent of beef farmers (4/12; 4 out of 12 beef farmers) lamented that, at the time of the study, beef prices had been stationary for the past 25 to 30 years. One farmer said,

If you take...the cattle, we are still getting the same price that the farm gave us 25 years ago...We don't dictate the price. (SS12b)

This situation causes financial distress due to overhead costs (e.g., super-phosphate, petrol and fodder) continuing to rise and the Australian government providing little financial assistance to farmers (Cocklin et al., 2003; Barr, 2009).

Sheep farmers have not fared much better. Competition from cotton and synthetic fibres in garment manufacturing has reduced the demand for wool (Barr, 2009). In addition, the declining terms of trade for wool and the collapse of such government sponsored protective measures as the Wool Board in the 1990's have kept wool prices low for the past 25 years (Davison, 2005; Barr, 2009). Sixty-four percent of wool farmers (9/14, 9 of 14 wool farmers) in this study voiced concerns about low demand and prices for wool in world markets. Wool farmers were also under financial constraints, as can be seen in the quotes below:

The way that wool prices have been down anything that you use supplementary-wise is just really an extra-cost...And just cutting down on living expenses such as holidays. (ES04)

The world doesn't need our wool certainly at a price that we can produce for. There was a time when synthetics was a negative term but now it's disappeared...And a whole lot of other fabrics that...yeah, look around, who's wearing wool. (SS01)

In contrast, the price of mutton was relatively high compared to past prices. Many wool farmers (87%) in this survey were moving from predominately wool towards an even split of wool and mutton or a slightly higher emphasis on mutton production. This conversion to mutton, however, is not foolproof with farmers having to depend on the vagaries of world markets and without much of a financial support from the state if fortunes change. One farmer spoke about these concerns.

Lamb and mutton have reached a point now which is good...About 60 - 40, I reckon. Sixty percent out of meat and forty percent out of wool...We just got our fingers crossed that the meat industry will continue on the way it is and just hope another 2 or 3 dollars a kilogram for the wool. (SS16)

## 2.2. Environmental Hardships and Lack of Funding Demoralise Farmers

Environmentally, hardships at the time of the research can be attributed to several factors such as drought, soil acidity, salinity and soil erosion (Curtis & De Lacy, 1998). Farmers reported that drought was one of the most pressing envi-

ronmental hardship in the research area. At the time of the interviews (2008/2009), below-average rainfall had been prolonged in Gippsland with drought conditions impacting farms for about the previous seven years (Dibden & Cocklin, 2005; Robb, 2008). The lack of water and fodder lowered the profit margin of farms by forcing the carrying capacity of the land for livestock downward. Extra cost also needed to be expended during the hot dry months of the summer to bring in supplementary feed. Drought conditions also impacted on the desire to restore native vegetation due largely to the fact that time, finance and labour necessary for restoration work falls mostly on the shoulders of farmers. Fifty-eight percent (14/24) of the farmers said it was very disheartening to take their time, money and labour to plant tube stock that had a very low tree survival rate or, in the case of direct seeding, had sparse, patchy or total lack of germination of seeds.

We've done a little on this place, but with the dry times, it's very disconcerting to put in a thousand trees and go back a year later and you got ten alive. It's not much fun. (SS12a)

Did some direct seeding but was total failure due to drought and soil type; keen to redo it in better times. (ES03)

### 2.3. Declining Enthusiasm for Landcare

Landcare has both detractors and supporters. Some, for example, see the organization and its work as a triumph where a partnership between the state and community-supported volunteers work together to manage natural resources (Campbell, 1994; Cary & Webb, 2001). Others, however, note the limitations of the program. Landcare, for example, is heavily reliant on volunteer action. Curtis (2000) observes that with the time and energy that Landcare work requires and already existing commitments that volunteers are saddled with, past levels of enthusiasm for Landcare may not be sustainable into the future. Cocklin et al. (2003) found that many of the participants believed that Landcare was on a decline. This sentiment was also echoed by the farmers interviewed in this study. Many farmers (71%, 17/24) said, for example, enthusiasm today was not as great as when Landcare first began.

Enthusiasm is tailing off because a lot of farmers have had enough with the dry seasons and all. Still quite a few try to support Landcare. Not as strong as it used to be. At one stage everyone was in Landcare. Now the groups have amalgamated. (ES02)

Some of this dissipation of enthusiasm was blamed on the dry seasons experienced in the years preceding this study. With money and effort being spent on hand-feeding livestock during the hot dry summers, there is little time left to do restoration work. Also, with profit margins being tight due to the drought and low commodity prices for wool and beef, supplementary money or resources for conservation projects is lacking (Andree et al., 2010). In addition, low rainfall

reduces tree survival rates and thus makes it less likely for farmers to find it advantageous to do restoration work in these climatic conditions. One farmer summed up the trials farmers were having in the research area and thus the ebbing of enthusiasm and reluctance to restore native vegetation.

You also need to be profitable to do these things. If you're not profitable, you're more worried about earning an income than doing some Landcare or eco-work. And profitability around here, particularly in this dry period, which is almost a decade now...had to hunker down to make ends meet... we had a couple of direct seeding projects fail because of dry years...We ended up with probably 15% to 20% of what you would expect. (ES01)

Other farmers felt that they have done their part with respect to restoring native vegetation. As one farmer put it,

Well, I think the enthusiastic ones have all done their stuff. Ya know, they're sitting back watching the trees grow. (SS01)

So, they may still be members of Landcare but refrain from doing much in the way of restoration work. One farmer, for example, talked about having a 15 to 20 year plan for their farm, which included restoring native vegetation. Now that the farm plan has been completed, this farmer feels a certain goal has been reached and further plantings may not be necessary.

#### **2.4. Lack of Commitment by Australian Government Contributes to Declining Enthusiasm for Landcare**

Cocklin et al. (2007) found that farmers talked about the importance of funding for Landcare projects. Many farmers (79%, 19/24) in this research also talked about funding being important to Landcare work and to enthusiasm for Landcare overall. One farmer, for example, stated

At the local area here, enthusiasm has dropped right out because the funding is not there. (ES03)

Many of the farmers (71%, 17/24) felt that funding had dried up for restoration work. Although professing a keenness to continue to do more restoration work on farms, these farmers said that they lack the necessary funds to do more with low profit margins for beef and wool and a scarcity of other outlets for funding. In fact, one farmer suggested one method to increase enthusiasm again for Landcare is to provide more funding:

More money. More financial incentive. I mean I think more farmers would do it. It's costly to put up fences and put trees in and manage that area separately to the rest of the farm. So maybe paying some incentive. (SS02)

Some of the farmers thought that restoring native vegetation was largely a public good where the farmer gets some agricultural benefits but also some drawbacks. One drawback mentioned was that although Landcare does provide

some funding for the raw materials needed to restore native vegetation, the farmer is responsible to then continuously maintain the fencing and monitor and contend with feral animals and weeds that reside in the restored area. The removal of feral animals and weeds from restored areas requires time and resources at a time when neither are in abundance for farmers in the research area. Moreover, restoring native vegetation is sometimes perceived as more of an environmental project that benefits the community than an actual practical way to boost production on the farm. Therefore, some farmers thought government funding through programs like Landcare was a practical incentive to entice farmers to do something that was considered a conservation project rather than a productivity-related innovation. Most farmers, however, mentioned that more available funding for restoring native vegetation would bring “more people on board” not necessarily because of lack of interest to do restoration work but due to financial duress related to ongoing drought conditions and low market prices for wool and beef.

## 2.5. Bureaucracy Dampens Enthusiasm for Landcare

Farmers (54%, 13/24) also mentioned that an increase in bureaucracy within the Landcare organization has dampened their enthusiasm. As one farmer emphatically stated,

When it was grassroots it was a good program...I was a regional member even prior to Landcare. I saw it change. Bureaucracy. Just a lot of crap! (SS14a)

Landcare as an organization tries to be a local movement focused on community support and development as well as a state sponsored entity to deal with natural resource management (Kelly & Stannus, 2002). Kelly & Stannus (2002) in their review critically evaluate the Landcare dichotomy of a top-down approach that comes with funding from governmental organizations and yet still requiring voluntary participation in environmental remediation work. In this research, some farmers (42%, 10/24) pointed out that farmer enthusiasm for Landcare has diminished because farmers feel as if they are being dictated to and that their voices are not being heard.

I think some farmers felt like they were being dictated on what they could do and what they couldn't do. And I think at the end of the day, some of them would think it easier to go and do what they want to do rather than be told what to do. (SS07)

Kelly & Stannus (2002) also warn that from a participatory standpoint when prescriptions for on-the-ground action for pressing environmental problems are being determined in a top-down format, this can lead to the “disempowerment of the local communities and long term disillusionment of the ideals of Landcare.” A reflection of the “disillusionment of the ideals of Landcare” may be seen in a general decline of enthusiasm for Landcare espoused by many of the farmers

interviewed in the research area. The decline in enthusiasm may be related to a feeling of “disempowerment” by the local community due to funding cuts and a push to centralize Landcare operations. Many of the farmers remember when the organization was simpler, more community based and less bureaucratic. They bemoan the fact that to obtain funding these days for restoration work there is much more complexity involved or as one farmer put it “many more hoops to jump through”. One farmer explained that there is no better way to scare a farmer off from doing something than by putting paperwork in front of him/her at the end of a long day out on the farm:

It's a bit too much paperwork and stuff. Nothing like that to frighten off farmers. We get bombarded with that stuff for one thing or another...And you come home at night and you don't want to do this. (SS01)

At one time, Landcare had facilitators to fill out the paperwork for farmers who were interested in receiving funding for restoration work on farms. Now, due to the cutting of funds, this service offered to farmers has become redundant. As one farmer pointed out:

As a local group, they had facilitators and people to fill out all that paperwork for you, which was fantastic and help. But now with all the slashing of funding, those jobs have become redundant and that's quite sad actually. (ES03)

Wilson (2004) noted that government funded organization that require voluntary participation need an appropriate level of managerial, administrative, and financial staff to assist communities.

Another aspect of Landcare bureaucratization that decreased farmer enthusiasm was that the organization has become more centralised. Local offices in the research area have either been shuttered or staff reduced. Half of the farmers (12/24) mentioned that Landcare seemed less “owned by” the local community; and thus, led to a feeling of what Kelly & Stannus (2002) refer to as “disempowered”. Farmers, for example, felt frustrated that there was no opportunity to deal with Landcare or other governmental agencies on a local level. One farmer shared his frustrations with what he sees as there being “little accountability anymore” within government agencies. How, if something on the farm needs government approval, he is forced to go to the main or regional office, which is often far from rural areas. Otherwise his request will “just be shuffled around and nothing will be done”. Farmers talked fondly about a time when Landcare offices and personnel were readily accessible in their local area to dispense advice, procure a license, or help with obtaining funding for on-farm work such as weed control or restoring native vegetation.

Some of the farmers discussed how agricultural training programs and seminars have changed in recent years. Agricultural extension was once a free service offered by the government on-farm through the Landcare network with a majority of attendees being farmers (Cocklin et al., 2007). Nowadays, however,

agricultural information and training programs are structured in a way where a subsidised fee is required to attend; located off-farm and in a centralised location with non-farmers (e.g., private contractors) dispensing advice; and attended by mostly governmental officials (Cocklin et al., 2007). Some farmers (42%, 10/24) expressed feelings of disappointment with the new approach to dispensing advice or knowledge about innovative farming technology and techniques. Farmers, for instance, did not feel these conferences were helpful and in some cases were just a way for extra money to be spent. Cocklin et al. (2007) also found that this approach dissuade farmers from participating in agricultural extension conferences due to “personal experiences of poor quality training, inappropriate formats, content, or training methods, or trainers who were unable to relate to farmers.”

As other researchers have found, nearly all of the farmers (88%, 21/24) wanted restoration programs to be more flexible, less bureaucracy and have more direct contact with farmers (Pannell et al., 2006; Ong & Barmer, 2011; Januchowski-Hartley et al., 2012).

## 2.6. Increase Enthusiasm for Restoring Native Vegetation

Farmers shared thoughts on ways to increase enthusiasm for restoring native vegetation on farms. One of the most common suggestions (83%, 20/24) was to provide more funding through restoration programs to defray costs.

More money. More financial incentive. I mean I think more farmers would do it. It's costly to put up fences and put trees in and manage that area separately to the rest of the farm. So maybe paying some incentive that you've got that land out of production for the community good...That's what happens overseas and you get paid for those landscape values overseas. (SS02)

When farmers talked about the government “providing more funding” for restoration work, they meant more funding, available more often, and that this funding covers the necessary materials for restoration work such as seedlings and fencing. The farmers would provide the labour and continual upkeep of the restored area at their own expense.

As long as the funding is there because at the end of the day, it's not 100 percent. The farmer's got to carry out his side of the...you know, that you're doing the work. The funding is there for materials but the farmer has to construct the fences and maintain them, so it's not all free sort of thing. (ES03)

Two farmers suggested it would be better if a governmental program would come to their farms and do all the restoration work themselves, meaning the fencing and planting of seedlings. The farmer would then continue the upkeep of fences and control pests within the restored area. The one farmer just was not motivated to do restoration work and was busy running his farm.

I guess, I'm not inspired at the moment. So, it might help if they came to me. If they had a program that came and approached me and said, "Look, you still got some fields you want fenced off. We've got this program whereby we organize the contractors to come and plant the trees." That would mean I would have a lesser role and that would mean I would be able to concentrate on the work I'm doing here. (SS06)

The other farmer claimed lack of time as a reason why his enthusiasm waned for restoring native vegetation. This farmer also pointed out that after the land is fenced off; essentially, it is government land because livestock are excluded. So, he proposed that a government organization comes in and sets up an area of the farmer's choosing for restoring native vegetation.

If it was a package deal where you just said, "There's an area. I want you to go and revegetate it" and they came in, fenced it, and revegetated it, I think that would be the ideal system because it doesn't take up any of the farmer's time and he can go on doing his own work. (SS09)

Some farmers (25%, 6/24) also remarked that the retaining and provision of staff helps to increase enthusiasm for restoration programs. One reason for the reduction in staff is cuts in funding for Landcare. Another reason is that there is very little job security in the local Landcare offices and the pay is low. Individuals interested in a natural resource management career may start at Landcare for experience but move on after a few years of working there. As one farmer explained,

...it was a revolving door and it was very often a first step for someone interested in natural resources to get a job with Landcare. But it was almost a stepping stone to another career. So, you might skill them up, get them a bit of local knowledge and off they go. And local knowledge is very much undervalued. (SS07)

Vanclay (2004) points out that science and agricultural extension do not have immediate legitimacy or credibility in the eyes of farmers. Both factors take time to build and are tied to trust (Pannell et al., 2006; Januchowski-Hartley et al., 2012). Trust is based on whether the farmer sincerely believes the extension officer understands and respects the farmer's goals (Pannell et al., 2006). One farmer's quote is a good example of the lack of trust in restoration-related agent's ability to understand farmers and their needs due to the agent's perceived inexperience concerning the practical aspect of running a farm. This quote also is an example of how extension advice and science is not instantaneously accepted as fact.

The Greening Australia whatever and the Catchment Management fellows told me that wattles are good because they die and created stuff underneath. I said right 'o, we're going to put land aside and have dead trees in. Well, that's bloody stupid. Then, they gave this big long hoo-hah about lizards

and all this sort of thing...Our Landcare coordinator was just a bloody greenie...these Landcare coordinators need to be about 40 or 50 so they've been out and have actually seen it and done it. Not just here's my degree from somewhere and I know all the theory and you must follow me or you're an idiot (SS14b).

Another farmer talked about the need for restoration programs to keep strong connections with the local farming community. He never mentioned "trust" by name but said there could be long term damage in the relationship between farmers and programs intending to restore native vegetation if the rural community is ignored.

Well...most important thing is to make sure they remain...to some extent community based. Because if they come in over the top, just to look at their particular area, with no reference to the general community, there's going to be all sorts of problems that that causes...some of the groups...farmers can go to them to apply for finance for a project, but they don't really interact with the farming community very much. That, in the long term, could be a very serious problem...if you don't interact with farmers then you just don't have any interaction with the people that control the land. (SS13)

Loss of credibility for conservation-related extension in the view of farmers comes with "short-term funding, rapid turnover of staff, the youthfulness and inexperience of many staff, and the lack of technical farming expertise of many staff" (Pannell et al., 2006). All the factors Pannell et al. (2006) mention plague Landcare offices in the research area, according to many farmers. The above farmer's quote (see SS14b), for example, points out that age is a prerequisite for experience, which could mean that younger agents might be perceived as inexperienced or lacking in practical farming expertise. One of the quotes above (SS07) also mentions Landcare offices being "a revolving door," which frustrated farmers because of the continual loss of local knowledge as Landcare officers moved on.

## **2.7. Consistency and Easily Assessable Funding Increases Farmers' Enthusiasm**

Pannell et al. (2006) mentions "short-term funding" as a cause of "conservation-related extension" losing credibility with farmers. In other words, consistency in funding could help boost farmers' enthusiasm for restoration programs. Farmers in the research area would get frustrated with the fact that funding for restoration programs was turned on and off in apparently inexplicable ways. One farmer, for example, describes his frustration with Landcare funding as "farmers plan to do something and then all of a sudden the funding disappears." Another farmer described how the Landcare "system" would often change year after year and that consistency was needed, especially when implementing conservation projects.

We couldn't seem to get a long term system in place. You would have a change of administration somewhere and the whole system would change every so often. The bureaucratic process would almost dictate that nothing was exactly the same as last year. The change in goal posts...was something that people just found frustrating...A key factor to these programs is consistency...And with the natural environment, ten years is a very short time. One year is almost a waste of time and a three year program is a very short time. So, you must have a continued commitment for a longer term. (SS07)

Some factors affecting enthusiasm in restoration projects are not possible to control such as lack of rain. Other factors are more in the control of governmental policy makers. One broad factor is increasing the trust in the social contract that develops between farmers and restoration programs. One approach to increase trust in these programs is to provide consistent funding. It takes planning and preparation on the farmer's part to restore native vegetation. For revegetating strips of land, for example, the farmer needs to choose the best location and determine how much area will be designated for restoration. The farmer, then, has to prepare the site by spraying for weeds and tilling the soil. Next, seeds need to be direct drilled into the soil or seedling planted. Finally, fence posts and wire need to be established. This process is time consuming, labour intensive and costly. As one farmer revealed about establishing restored areas of native vegetation,

It's hard to get them established. So, you want to make sure you get everything right before you put the hard effort in...it's a lot easier to do them once and do them right. (SS07)

If funding is uncertain, a farmer is more likely to postpone restoring native vegetation. Moreover, when the necessary preparations have been done and the area is ready to be planted with native vegetation but the funding suddenly dries up, farmers can become frustrated and uncertain about future funding, which in turn can cause low morale and apathy towards future restoration work. Uncertainty plays a negative role in reducing the rate of adoption of land conservation practices (Feder & Umali, 1993). One farmer pointed this out:

Frustrations. Farmers plan to do something and then all of the sudden the funding disappears. It's a bit like the tail wagging the dog. (SS04)

If funding was provided consistently, it would lessen uncertainty and increase enthusiasm for native vegetation restoration work.

## **2.8. Localising Landcare Increases Enthusiasm**

The government could invest in local Landcare officers by providing more pay and giving more responsibility to agents, essentially offering a stable career option in rural areas. Local Landcare personnel might then be willing to stay longer at their positions, accrue local agricultural knowledge, and build stronger ties with the rural community. This shift to permanent extension advisers located in

rural areas would increase the extent to which farmers deem that Landcare agents actually understand and respect their goals, which, in turn, would increase the trust between farmers and Landcare agents (Anderson, 1981). Another approach to deepen trust between rural communities and Landcare would be to expand the number of local Landcare offices and the personnel there to assist farmers with such requirements as grant writing for funding to restore native vegetation. Moreover, increasing the number of Landcare offices and personnel in rural areas would provide the one-to-one contact farmers desire. One farmer pointed this out by discussing how Landcare started as a local organization but now is centralized and much of the funding gets used for bureaucratic reasons.

When Landcare first started up, it was all governed from the local area. You applied for your funding. Your local area distributed it and...all done locally. And now, it's so called accountable and it's all going from, say, a base like Yarram or Traralgon. And then you have all of these people involved with it who get wages out of it. And people get a bit shitty because they see the funding get gobbled up with wages and people coordinating it all. (SS10)

An increase in local offices would also rejuvenate the grassroots feel of a community owned organization. Farmers may then feel a stronger bond of trust with Landcare, which could potentially lead to more land being restored with native vegetation.

## 2.9. Barriers to Restoring Native Vegetation

All of the farmers interviewed (24/24) expressed a Landcare ethic to one extent or another. Such statements as follows were common:

We have a strong philosophy of Landcare and biodiversity; embraced the Landcare movement and established a lot of native trees and bushes on our farm, which had not one native tree on it (ES01)

I've been involved with Landcare and planting trees and I believe we put in probably 60,000 trees. That stretches over 17 or 18 kilometres and...it is essential to have good shade and good water is part of our theory as good farming practice...we're still getting three feeds a day and I'm nearly 60... So, we think that good farming practice is to make sure that you got a natural balance between elements and your stock. (SS07)

Moreover, all farmers interviewed (24/24) have to some extent restored native vegetation on their farms. The reasons given as to why restoration work has stalled on most farms were attributed to lack of time, labour and money and poor seasons.

I love trees and native animals, and I would like to have more trees. Unfortunately, I put it as a low priority on the list and that's because I just think I'm so busy. (SS06)

When Landcare was helping out and chipping in money along the lines, you could afford to do it...It's not so much the lost land area, it's more the cost of fencing it off and getting it all established and growing. That where the big costs are. (SS09)

The drought and finances are the main things. (ES03)

Some of the farmers (17%, 4/24) interviewed talked about how they had a "whole farm plan" and restoring native vegetation was included within that plan. Now that the farmers were older and the whole farm plan completed, they felt they have done enough restoration work and want to relax and enjoy the trees.

...a lot of people feel they've done a lot. Like us, they sort of done their whole farm plan, they established all the plantations they planned to and perhaps after that okay that's enough. Sit back and enjoy the fruits of their labour. Watch the birds and the trees grow. (ES01)

Another barrier is that fenced off areas of native vegetation could become a harbour for weeds and "vermin" such as rabbits and foxes.

Landcare doesn't give you any money towards ongoing costs. Control of feral animals and weeds is up to the landholder's themselves to keep on top of. And that's the number one problem that comes up with this revegetating things like creeks and things. (SS09)

It would be habitat for rabbits, foxes and whatever...Well, I can just remember when I first started here, we spent days and days with a tractor with a ripper on the back ripping out rabbit warrens and pushing out acacia and scrubby stuff that would harbour them. (SS12a)

It is not the fact that the restored area could become a haven for "vermin" and weeds as such, but the amount of time that is required to maintain the restored area that is more of a concern to farmers. Maintaining the restored area includes such things as spraying for weeds, fixing damaged fences, and controlling feral animal populations; and thus, requires time, labour and money. The lack of time and labour exasperate this particular barrier. With a lack of labour to help with basic farm duties, there is much less time to do supplementary work such as controlling for weeds or feral animals. Additionally, with world markets paying low prices for wool and beef, farmers find recent times financially difficult. And so, herbicides for weed control or poisons for feral animal control are considered added expenses that farmers may not be interested in paying. All of these barriers, combined with the drought situation, make farmers hesitant to restore areas with native vegetation.

## **2.10. Farmers Lack Understanding of the Contribution of Biodiversity to Production**

Farmers discussed the agricultural benefits of restoring native vegetation and some of the ecological benefits such as an increase in biodiversity. They were not, however, well versed in how certain kinds of biodiversity contribute to

production benefits, especially pertaining to beneficial invertebrates.

There's shelter benefits. We've got some covenanted land and we have specified on some of those covenants that we can use it for off-shear shelter if we have rough weather and the sheep are just shorn, well you can put them in shelter...So there's definitely a productive benefit. (SS02)

The pasture hangs on longer behind the windbreaks because then they're not getting dried out as much. Stock benefit from them. And I suppose it is nice to have a few birds and stuff. (SS10)

Many farmers (67%, 16/24) talked about an increase in biodiversity after restoring native vegetation but in terms of aesthetics and not necessarily in a functional role on farms.

There's the warm and fuzzy feeling benefit...It's just a better place to live if there are more species about. (ES01)

...if you have a greater diversity of plants, you'll have a greater diversity of animals and I don't mean farm animals. There's all those insects, birds, reptiles, all the other things that go with it. (SS06)

There seemed to be an intrinsic feeling of importance for biodiversity but not a known functional value on the farm.

It makes you feel better inside. It's a place to live, it's nicer with remnant and shelter and a variety of trees. It's much nicer to go for a walk and have wildlife and birds and a variety of trees around you. (SS02)

Yes, you're talking about the whole gamut. The bird life is obvious to me now. We basically had no bird life here. We even got a few kangaroos here now. Before when there was no vegetation there was nothing. And I missed them. I like the old birds. (SS07)

Some farmers (38%, 9/24) did, however, mention the functional aspect of biodiversity on farms but in more or less general terms or lacking in detail.

Obviously, with a reasonable number of birds and insects and things, you are getting some natural predators on some of our pests. From an environmental point of view, well, obviously, we want to see, as far as we can, in balance with farming, we want to see areas restored. (SS13)

Well, there are obviously benefits because you're going to get those native insects and everything that will stop the bugs and pests. Ya know, the entomology sort of thing is good. (SS14b)

When asked about pest and beneficial invertebrates on the farm, farmers had long lists of known pest insects but few knew much about beneficial invertebrates on farms. One farmer stated

The tea tree is coming back underneath the few little sticks that were there. I mean there's got to be some benefits in having land there that gives shelter

and where you're coming from, maybe it does work. I don't know. What, with your beetles that might eat the other ones that are there eating the pasture. If that was the case, well, we would be fencing more off. (SS12a)

The quotes above demonstrate that farmers have good knowledge about the agricultural and production benefits of trees on farms but not a deep knowledge of the potential benefits of biodiversity on farms.

### **3. Interviews with Farmers after the Ecology Study**

Word Clouds were developed using the word frequency query tab in NVivo11 (QSR International). The queries investigated the 100 most frequently used words as represented in a subset of the transcripts of the four farmers that took part in both Social Study A and B. One of the farmers (ES01b) only participated in Social Study B. Then, the word clouds from interviews conducted prior to exposure to the ecological study (i.e., Social Study A) were compared with word clouds from interviews conducted after the ecological study (i.e., Social Study B). This was done to compare how interacting with an ecologist, having a presentation on the results of the ecology survey and receiving a calendar on beneficial invertebrates affects frequently used words over time.

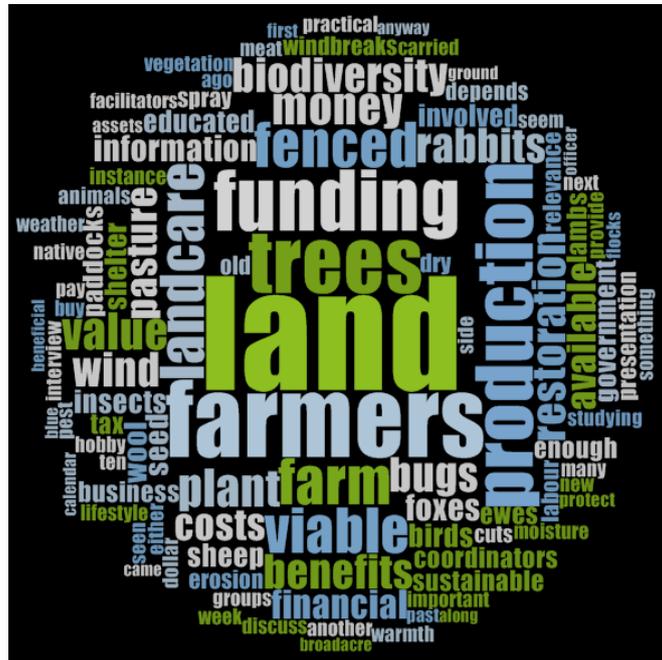
Word Trees were created using the text search tab in NVivo11 (QSR International). Text searches were done on transcripts of the five farmers in Social Study A and B. Word Trees were converted to Excel (Microsoft) tables and compared to determine how the context of key words change after interacting with an ecologist and receiving a presentation and calendar on beneficial invertebrates. The word in the centre of the table is the root term or the word searched for in the transcripts. The words to the left and right of the root term are the context words, meaning the words before and after the root term in the transcripts, respectively. The key words insect, bug, and beneficial were used as root terms.

## **4. Combined Results of Social Study B**

### **4.1. Word Clouds: Word Prevalence in the Transcripts of Social Study A and B by the 5 Farmers Who Were Involved with the Ecology Survey**

The Word Clouds show that certain topics, such as “funding” “trees” and “Landcare”, were important to these five farmers before and after the ecology surveys (**Figure 2**). Interestingly, after the calendars and presentation of Social Study B, the topics “biodiversity,” “insect” and “bugs” appeared more frequently in the transcripts of the second interview.

The first and second interviews had roughly the same amount of questions pertaining to biodiversity and insects. The wording and focus of some of these questions differed between the two interviews, which may have affected the usage frequency of some words in these interviews. Yet, when transcripts were analysed further, it was shown that in Social Study A, “biodiversity” and related words were mentioned 9 times while “insect” and related words were mentioned



**Figure 2.** Word Cloud done in Nvivo11 (QSR International, 2015). One hundred of the most frequently mentioned words in transcripts of Social Study B by the 4 farmers who participated in the ecology survey. The larger the word the more prevalent it was in the data. The grouping used was “with synonyms”.

17 times. One of the words related to “insect” that was mentioned 8 times in Social Study A was “cockchafer”. Cockchafer is a pest insect found in pastures in the research area. In Social Study B, “biodiversity” and related words were mentioned 12 times while “insect” and related words were mentioned 24 times. In Social Study B, farmers’ comments were more focused on beneficial invertebrates and functional biodiversity.

These results indicate that by sharing ecological information, farmers become more interested in sustainable farming practices. Research on beneficial invertebrates could be presented to farmers, which could then lead to discussing restoring native vegetation on pastureland.

#### 4.2. Increasing Restoration Work on Farms

One of the questions that was asked of farmers was how to increase enthusiasm for restoration programs. Responses to this question in Social Study B were similar to Social Study A, where 4 of the 5 farmers reported that increases in funding would be needed to raise enthusiasm for restoration work. “Funding is crucial,” says one farmer. However, one of the farmers complained about the amount of paperwork involved in obtaining funding and thought it was easier to do restoration work himself. Blunden et al. (1996) found that for New Zealand Northland farmers, existing financial and time constraints were more important than funding when considering environmental projects. Farmers interviewed here were focused on funding as an important factor for restoring native vegetation in part due to the location and type of farming that is being done in the research

area. The farmers live and work in an area that has experienced long-term drought conditions and prices for the major commodities being produced (wool and beef) have been depressed for the past thirty years (Cocklin et al., 2003; Dibden et al., 2009). These factors, as well as an increase in the price of off-farm inputs and the state pushing neoliberal agricultural policies, have made it difficult for farmers to appropriate money to restoring native vegetation (Lawrence, 2005; Cocklin et al., 2007). As one farmer states,

It just needs more funding...Because farming is not...profitable at the moment. It's a bit of a struggle...And a lot more would be done if there was more funding. (ES03)

Another response to this question that arose again was that restoration programs need to recruit and keep coordinators over the long-term. Farmers become frustrated and lose their keenness to work with Landcare if every few years a new coordinator arrives and then needs to be educated about the local area. One farmer mentions this frustration with the continuous changing of Landcare officials:

Probably the main one is...every two to three years...we seem to get a young 25 year old...comes in and we have to reinvent the wheel all over again. We pull out the maps and we have to educate them. We just go and get a good relationship with them and then they go off. (ES02)

This feeling of frustration that farmers have with the constant turnover of Landcare officers resonates with the findings of Pannell et al. (2006), who noted that farmers not only appreciate Landcare officers having local knowledge and local residence but also place more trust in the ideas promoted by long-term Landcare officers. Farmers must spend much of their time on farm upkeep and maintenance due to the bad seasons, lack of financial support, and diminished rural labour force (Kelly & Stannus, 2002). Thus, as Cocklin et al. (2003) reported, time is limited for farmers when it comes to applying for grants or filling out forms to obtain funds for restoration work. Landcare coordinators that have been with the program and lived in the area for a long time would have good rapport with farmers, local knowledge and the know-how to efficiently complete paperwork (Campbell, 1992; Vanclay & Lawrence, 1995; Toyne & Farley, 2000). These attributes would encourage farmers to apply for funds for restoring native vegetation on farmland. Since applying for funds is the first step in restoring native vegetation, it is important to make this step as easy and attractive as possible. Employing Landcare officials for the long-term is one way to do this.

Other ways suggested to retain Landcare officers was to provide job security by offering the option of permanent positions, a means for promotion, or periodic increases in salary.

### **4.3. Barriers to Restoring Native Vegetation**

Some of the barriers reported by farmers in restoring native vegetation were re-

peated from the previous interviews. Lack of funding, not only available funding but the amount of funding provided per project, was again mentioned by 4 of the 5 (80%) farmers as a big impediment to restoring native vegetation. [Cocklin et al. \(2003\)](#) also noted that farmers expressed a need for financial assistance with conservation works on farms. One farmer (ES03) pointed out that restoring native vegetation is a large undertaking since farmers are responsible for labour supply (e.g., putting in fences and trees) and upkeep of the area (e.g., controlling for weeds and feral animals); and yet, the farmer (ES03) said “Government provides only enough funding for 30% - 50% of the cost of the fencing and trees.”

[Campbell \(1992\)](#) found that the burden of bureaucracy and paperwork frustrated farmers. In this research, bureaucracy and red tape were mentioned as dampeners on enthusiasm to restoring native vegetation.

It just got too hard. Just too hard. Too much bureaucracy and red tape. It's out of control. (ES02)

Additionally, farmers identified a lack of time as a barrier to restoring native vegetation. Lacking time for conservation work on farms is entwined with a dwindling rural population, which is tied to low market prices for agricultural products and competitive productivism agricultural policies ([Toyne & Farley, 2000](#); [Cocklin et al., 2003](#); [Dibden et al., 2009](#)). This dynamic can be observed in interviews done both before and after the ecological study where farmers explained their concept of “viable”. They said that a farm needs to expand to remain “viable”. Farmers feel pressured financially to expand their farms due to low prices for agricultural products on world markets ([Cocklin et al., 2003](#)). On top of this, the state provides little in the way of price stability for agricultural products or offers little financial assistance in response to the vagaries of nature (e.g., drought and floods) ([Tonts, 2005](#)). These factors make farming less profitable, and so farmers sell their land and leave for towns or cities, and the rural population declines further ([Andree et al., 2010](#)). For example, farmers in the research area have sold large areas of land to the timber industry and then moved to urban areas; thereby lowering an already sparsely populated area ([Robb, 2008](#)). One indicator of the population decline was the merging of two local Landcare groups to form one that was considered sustainable. Farmers that remain have to manage larger farm operations with fewer workers. Consequently, these social and economic factors impact the amount of time farmers have to do restoration activities.

With less government support, a smaller workforce, and yet a need to expand operations to remain “viable”, lack of time becomes a barrier to restoring native vegetation on farmland.

#### **4.4. Farmers' Perspectives on the Benefits of Restoring Native Vegetation**

Farmers were asked again about the benefits of restoring native vegetation. One

of the farmers talked about attracting beneficial wildlife, specifically predatory beetles, to the farm after restoring native vegetation. This was after receiving a calendar describing beneficial invertebrates and a presentation on preliminary research data done on their farms. Many people consider invertebrates as insignificant unless they cause themselves to be known by such disadvantageous things as a bite, sting or annoyance (Gurung, 2003). The evidence here suggests that farmers are interested in learning about the advantages of beneficial invertebrates on farms and how restored native vegetation impacts this type of functional biodiversity. Another farmer mentioned that many people may not be aware of beneficial invertebrates in pasture.

I think you just have more wildlife around. Hopefully more beneficial wildlife. I mean that's something that came out of your talk the other night. I mean you kept emphasizing there are all those good beetles. So, people have always discounted that fact or haven't thought of it. So, you got all those good insects and so to get more biodiversity on farms is a good thing. (ES04)

Another example of farmers' interest in learning about beneficial invertebrates and, really, just how beneficial invertebrates have been overlooked is seen in this statement.

I thought it was really good to see other people down at the hall because of insects. Ya know, I wouldn't have thought that could have happened with insects. You're saying what difference does it make and, Ya know, you had kids down there and I think people are really thinking about insects now (ES01b).

Farmers are generally risk adverse, practical people (Greiner et al., 2009). One method to increase enthusiasm for restoring native vegetation is to have extension officers and researchers discuss with farmers the various beneficial invertebrates found in restored native vegetation in pasture landscapes. They could also emphasize to farmers the functional role of beneficial invertebrates in controlling pest arthropods.

#### **4.5. Farmers' Perspectives on How the Government Could Assist with Restoration Projects**

When asked how the government could assist farmers in restoring native vegetation, many of the responses were similar to the responses when farmers were asked for ways to increase enthusiasm for restoration programs, such as increase the availability of funding and retain knowledgeable Landcare coordinators. Farmers' thoughts were

Well, money for funding and providing seed. (ES03)

Well, definitely by putting these coordinators on that know what grants are available, coordinating meetings, and doing all this because you just can't

be bothered. You haven't got the time. And make funding available because as long as it hits its target, because I know the government wastes a lot of money in a lot of areas. (ES02)

Also, keeping rules consistent and streamlining processes to obtain funding were mentioned as ways for the government to assist farmers in restoring native vegetation. [Toyne & Farley \(2000\)](#) also found that complex and overlapping applications was a deterrent to do environmental works.

Many of the recommendations on how the government could assist farmers in restoring native vegetation relate to the fact that farmers have little time to devote to non-farm activities due to declining prices of commodities, increasing prices of off-farm inputs, smaller available workforce, harsh climatic conditions, and less support from the government ([Davison, 2005](#); [Dibden et al., 2009](#); [Raymond & Brown, 2011](#)).

#### **4.6. The influence of Participation in the Ecological Study on Farmers' Views about Restoring Native Vegetation on Farmland**

When asked if the ecological study carried out on their farms influenced them in any way, the farmers did not specifically mention the ecological study itself or interactions they had with the researcher during the ecological study. Rather, they discussed the communication of results via a presentation and a calendar describing beneficial invertebrates. One farmer said that results from the research in some ways reaffirmed his intuitive feelings about native vegetation on farmland.

It reaffirms our thoughts. There's a feel good factor and now there is some science to back that up (ES01a).

All five farmers interviewed enjoyed learning new aspects about restored native vegetation and beneficial invertebrates. One farmer explains:

Oh yeah, more educated. Certainly more interested in what's crawling around on the ground when you go down there and you're looking at crops and the insects that are on the crops. You think is that a good bug or a bad bug. So, you educated me and that is always a good thing. (ES04)

Another farmer talked about how it was interesting to learn about the impact restored native vegetation had on beneficial invertebrates.

...it's certainly good to see the bugs that are in the regenerated areas are there whereas out in the pasture, they're not. So, at least, they got a haven. (ES02)

These results support [Cocklin et al. \(2003\)](#) assertion that farmers have preferences for voluntary and education-based tools concerning environmental works on farms.

The results here support researchers that found farmers are genuinely inter-

ested in learning about conservation methods that improve farm health and productivity (Lockie & Vanclay, 1997; Ong & Barmer, 2011). Kleijn et al. (2001) mentioned that monitoring biodiversity can be expensive and time consuming, hence having a prohibitive effect on biomonitoring schemes done by farmers. Alternatively, researchers could monitor biodiversity on farms and report the results to farmers, which then could be an important meeting point to discuss the benefits of restoring native vegetation.

#### **4.7. Farmers' Suggestions about Communicating Ecological Study Results**

Farmers reported that a presentation on the ecological results was more informative than a calendar highlighting 12 beneficial invertebrates. The farmers liked that the presentation had statistics to back up assertions made by the researcher. One farmer says,

The calendar has some pictures and a bit of information but your presentation had some stats as well, which gives it a little bit more horsepower. The trends. It's interesting to see the trends. The comparative analysis between different situations (ES01a).

Farmers gave suggestions as to how to make the calendar and other pamphlets more useful to farmers. One farmer suggested that taxonomic keys with photos be disseminated to farming communities to help farmers identify beneficial invertebrates in pasture.

Farmers were interested in learning more about beneficial invertebrates in restored native vegetation on pastureland. Restoring native vegetation is often framed in terms of benefiting biodiversity in general, such as corridors for wildlife or habitat for song birds (Bennett, 1999; MacDonald et al., 2005). To appeal to the practical side of farmers, it is important to also explain the benefits of restoring native vegetation on functional biodiversity that persists in pasture landscapes, such as predatory beetles, spiders, and parasitoid wasps. One farmer says,

It's just by the practical use of biodiversity and the practical studies that are similar to what you are doing. You're doing the study and coming up with the results and letting us know what we need to do. (ES03)

Many farmers lack the time to use taxonomic keys to classify invertebrates down to species. That, however, may not be necessary. Taxonomic keys going down to family of the most important beneficial invertebrates in a farmer's area, pictures of these beneficial invertebrates, and a brief summary of their life history and function in agroecosystems could be distributed to farmers from commonly visited locales, such as Landcare offices. There could then be a presentation to farmers on using the taxonomic keys, a summary of beneficial invertebrates in the farmers' area and their function in agroecosystems. This research shows that farmers are interested in the results of agroecological studies and what they can do to improve the sustainability of their farms.

#### 4.8. The Process That Farmers Find Appealing When Proposing to Do Research on Their Land

The process farmers seemed most comfortable with concerning research on farms was that the researcher would, first, discuss the project with the farmer. The farmer, then, would give his/her approval to the project. The researcher would complete the project and then report the results to the farmers. One farmer explained,

I think, again, you've hit the nail on the head. You've come out and done the interview and then we sent you off and we know you're there and you were able to set up your cages and whatever. (ES02)

Another farmer expresses his thoughts this way,

Well, you did discuss what your ideas were before you came on the farm. And so, if you suggested that you were going to do anything that we, as terribly practical people, thought what you were doing had no relevance or you were going about it wrong, we would have spoken up. So, I think you did spend time with all of us. But you had your own ideas about what this was and the way you were going to approach it, but you discussed all that with me before you went on farm...I think you made an effort to involve us. (ES04)

As other research has found, farmers in this project enjoyed personal contact and follow-ups from researchers (Pannell et al., 2006; Ong & Barmer, 2011).

#### 4.9. Farmers Were Interested in New Knowledge about Functional Biodiversity and Sustainable Farming

The farmers demonstrated a strong interest in new knowledge concerning sustainable farming. One farmer appreciated the educational qualities of the ecology project. He says,

Yeah...you were educating us. So, that was a good thing. (ES04)

There also was strong interest in functional biodiversity in terms of beneficial invertebrates. One farmer explains that before learning about beneficial invertebrates, every "bug" that was seen in pasture needed to be sprayed. It is also interesting to note that farmers dislike spraying and if alternatives exist (e.g., biological control), they would be interested to learn about them.

It was very interesting about the bugs and how they can be beneficial to pasture. We always thought that every time we see a bug we have to get rid of it. It was really interesting that there are bugs that can do the job of spraying. Because we don't like spraying. But sometimes you just have to. (ES03)

Another farmer explains his interest in learning about invertebrates.

And you showed us some bugs and spiders that we didn't even know ex-

isted (ES01a).

As other researchers reported, farmers seemed keen to learn more about scientific research on agriculture, in particular conservation practices on farms, sustainable farming and functional biodiversity in pasture (Cocklin et al., 2003; Ong & Barmer, 2011). Thus, extension officers could emphasize the benefits of restoring native vegetation on functional biodiversity, in particular beneficial invertebrates, when discussing conservation work with farmers.

#### 4.10. Word Trees: Key Words in Context in Social Study A and B Transcripts of the 5 Farmers Involved with the Ecology Survey

The amount of times insects and related topics were mentioned increased after farmers received a presentation and calendars about beneficial invertebrates in pasture (Table 2 and Table 3). There was also a change in tone from Social Study A where the four farmers seemed less confident about the advantages of invertebrates in pasture then to Social Study B where they were more willing to consider the benefits invertebrates provide in a pasture landscape (Table 2 and Table 3). By including farmers in the ecology survey, they became interested about beneficial invertebrates in pasture. The farmers, for example, made comments like “people are really thinking about insects now,” “you got all those good insects,” “certainly more interested in what crawling around on the ground,” and “it was interesting about the bugs and how they can be beneficial to pasture” (Table 3). After listening to the presentation, farmers saw the importance of restored native vegetation on pastureland to maintain beneficial invertebrate populations. For example, one farmer says “...it’s...good to see the bugs...in the regenerated areas...So, at least, they got a haven” (Table 3). Farmers also expressed an interest in restoring native vegetation and biodiversity on farms with comments like “...you got all those good insects and so to get more biodiversity on a farm is a good thing” and “I think you just have more wildlife around. Hopefully more beneficial wildlife...that’s something that came out of your talks the other night” (Table 3).

**Table 2.** Word Tree done in NVivo11 (QSR International, 2015) on Social Study A transcripts of the 4 farmers who participated in the ecology survey. In the middle of the table is the root term or key word. On the left are words that precede the root term. On the right are words that follow the root term. The grouping used was “with synonyms”.

You don't see much evidence of it, but I suppose having a more diverse bunch of birds and		Probably may well control insect pests but I'm not exactly sure. (ES01)
...I guess I'm becoming more convinced all the time that some of these	insects	are good for controlling other insects. (ES03)
(Restoring native vegetation) definitely brings back more bird life and		and things like that. (ES03)
We're probably killing other	beneficial	stuff. (ES02)

**Table 3.** Word tree done in NVivo11 (QSR International, 2015) on Social Study B transcripts of the 4 farmers who participated in the ecology survey. Data was transferred to Excel (Microsoft Word). In the middle of the table is the root term or key word. On the left are words that precede the root term. On the right are words that follow the root term. The grouping used was “with synonyms”.

...it was really good to see other people down at the hall because of		...I wouldn't have thought that could happen... people are really thinking about insects now. (ES01a)
That's something that came out of your talk...you kept emphasising all those good beetles. People have always discounted that fact...So, you got all those good	insects	and so to get more biodiversity on farms is a good thing. (ES04)
Oh yeah, more educated. Certainly more interested in what's crawling around and you're looking at crops and the		on the crops. You think is that a good or a bad bug. You educated me and that is a good thing. (ES04)
It was very interesting about the		and how they can be beneficial to pasture. (ES03)
We always thought that every time we see a bug we have to get rid of it. It was really interesting that there are		that can do the job of spraying. (ES03)
I certainly liked the calendar but...next time if we had photos of what	bugs	we have in our area and that way we can identify them. (ES02)
There's a feel good factor (to restoring native vegetation) and now some science to back that up. And you showed us some		and spiders that we didn't know existed. (ES01a)
...it's certainly good to see the		in the regenerated areas...So, at least, they got a haven. (ES02)
I think you just have more wildlife around. Hopefully more	beneficial	wildlife...that came out of your talk the other night. (ES04)

This research project shows that farmers are interested in learning about functional biodiversity on farms with quotes as “You think, “Is that a good bug or a bad bug?” So, you educated me and that is always a good thing” and “...next time if we had photos of what bugs we have in our area...and that way we can identify them” (Table 3). Thus, there is evidence here to suggest that including farmers in ecology projects has the potential to increase their interest in sustainable farming techniques. As such, extension officers and Landcare agents, as well as researchers, should strive to include farmers in ecology research projects (Gurung, 2003). One method to pursue is researching and then discussing with farmers the ecosystem services provided by functional biodiversity that use restored native vegetation as a haven on farmland.

## 5. Discussion

### 5.1. Restoring Native Vegetation under the Productionist Paradigm and the Socio-Political Climate in Australia

After exploring the main themes identified in the transcript in respect to the farmers in the research area, a broader perspective was then taken to consider how these themes relate to the surrounding social literature.

Curtis & De Lacy (1996) write that the resources involved in fencing off streams and remnant vegetation in Australia has been extensive and attests to

conservation concerns of many farmers, but that relative to the scale of most farm operations the areas are small. A similar case was found for farmers interviewed in the research area with 55% of farms having less than 8% restored native vegetation on farmland and only one farm having slightly more than 25% of restored native vegetation on their farmland. The other 40% of farms had between approximately 10% to 14% of restored native vegetation.

If considered under the influence of the Productionist Paradigm, the low to moderate amounts of native vegetation restoration work done on farms is not out of the ordinary. The Productionist Paradigm is interested mainly in short-term production gains of agricultural products; and thus, conservation techniques that have no immediate benefit to production are often overlooked (Walford, 2003). This overarching paradigm influences farmers and their decision making when it comes to land management practices. For example, in the view of the Productionist Paradigm, the land that native vegetation occupies could be better used to raise more livestock. Thus, conservation-related practices that contribute to farmers' economic goals in the short term and have low establishment costs are more likely to be adopted, such as reduced tillage and liming of acid soils (Mues et al., 1998).

The political climate also needs to be considered. The Australian government is a proponent of "productivism shaped by neo-liberalism" or "competitive productivism" (Dibden & Cocklin, 2005). In this scenario, farmers in Australia are expected to be highly productive and competitive in world markets while contending with environmental regulations enforced by the domestic, as well as the international, market without much assistance from the state (Dibden & Cocklin, 2005). Moreover, farmers strive to meet expectations by the public and of themselves of being "caretakers of the land".

Thus, the statement made by Pannell et al. (2006) that "the relative advantage that drives adoption" of conservation-related practices "may not necessarily relate to the environment," can now be viewed in terms of the farmers in the research area. Many farmers find it hard to allocate time and money to restore native vegetation due to a combination of overlapping factors that negatively affect their bottom line such as low world market prices for wool and beef, drought conditions, a focus on high production rates, and the Australian government's unwillingness to subsidise conservation work on farms (Dibden & Cocklin, 2005; Dibden et al., 2009). One farmer spoke about the difference between European farmers who receive state assistance for conservation works on farms and Australian farmers who do not.

In the trips I made to Europe, you talk to anyone there and they have a great willingness to do things that are green and look after their local environment and that means keep the farmland as it is. So, they have lots of subsidies to look after the land either as forest or as farmland and there's not much of that done here. (SS06)

This farmer seemed to think that because European governments provide as-

sistance to do “green” works, European farmers were more willing to participate in conservation projects on farms. The Australian government, however, seems to do the minimum required to help farmers restore native vegetation. For instance, the state provides money to fence off land, but farmers are responsible for ongoing costs and maintenance of the fenced areas, as well as the fact that the fenced off area will not be producing an income for the farming business.

Pannell et al. (2006) state that “environmental benefits can often be most readily achieved by developing conservation practices that provide a commercial advantage to farmers.” For conservation practices like restoring native vegetation, proving that they provide obvious commercial advantage in the short to mid-term is difficult. It takes up to three to five years for revegetated strips to be at a height to retard wind enough to provide substantial shelter for livestock. There also needs to be a critical percentage of restored native vegetation in the farm landscape for certain conservation benefits to be realized. Bennett et al. (2008), suggest that 30% of the farm landscape should be a network of connected remnant and revegetated vegetation to support healthy populations of many species of native animals.

One other aspect that should be considered is how restoring native vegetation is presented to farmers. Under neoliberal policies, farmers in Australia are asked to look at their farms more as business enterprises than as a vocation (Dibden & Cocklin, 2005). It may not be advantageous, therefore, to present only the ecological benefits of restoring native vegetation without driving home the production benefits to the farm as well. If ecological benefits are the only thing presented, it is possible that the restoration-related agent and the organisation itself may lose credibility in the eyes of some farmers, as the below quote identifies.

Our Landcare coordinator was just a bloody greenie. That had no idea of actually needing to make money, too. Nah, just a university idiot...Just one of those people who have no idea about the practicalities of running a farm... (SS14b)

The approach best suited to promote restoring native vegetation on farmland is to inform farmers about both the agricultural and ecological advantages. Some agricultural advantages to restoring native vegetation are providing shelterbelts for livestock, combating the threat of soil salinity, protecting water quality, and being a reserve for beneficial invertebrates; some ecological ones are benefiting indigenous wildlife and conserving biodiversity (Tsitsilas et al., 2006; Fukuda et al., 2011). Nearly all of the farmers interviewed (96%, 23/24) knew about the agricultural benefits of restoring native vegetation on farmland. However, none of the farmers seemed aware of one particular agricultural benefit: restored native vegetation acting as reserves for beneficial invertebrates.

## 5.2. Importance of Funding in Restoring Native Vegetation on Farmland

Although Jellinek (2012) found that funding was not associated with the likelih-

ood of farmers to restore native vegetation, other researchers have noted that it is a strong motivator for adoption of conservation practices (Thomson & Pepperdine, 2006; Graymore & Schwarz, 2012). Farmers in this research have stated that government funding is crucial to increasing rates of restoring native vegetation on farmland. The Word Clouds made from transcripts of Social Study A and B clearly show that “funding” is an important topic to farmers.

Considering the market realities for beef and wool and the prevailing drought conditions in the research area, a concerted effort by the state to provide consistent, long-term funding that is straightforward to access and implement would encourage farmers to continue to restore native vegetation on pastureland. The state could also increase the budget for the Landcare program, which would address some of the proximate barriers to restoring native vegetation on pastureland that were discussed by farmers. The increased money in the Landcare budget could, for example, be directed at retaining knowledgeable Landcare officers, opening more local Landcare offices, and increasing the availability of grants to cover restoration upkeep costs such as weed and vermin control.

One of the obstacles to increasing funding for restoration work on farms at the time of this research was that the Australian government was committed to open markets and free trade (Dibden & Cocklin, 2009). Funding would therefore be seen as going against free trade mandates. However, policies that limit funding for restoration work on farms should be critically reviewed in light of whether farming without this funding is sustainable under the market pressures and climatic conditions that farmers must face daily.

### **5.3. Retaining Landcare Facilitators Is Important to Farmers**

In both Social Study A and B, farmers in the research area have clearly expressed a desire for permanent Landcare officials with local knowledge and some expertise in farming or experience working with local farmers. Other research has demonstrated that trust is a key component in government-farmer partnerships (Campbell, 1992; Marshall, 2004). Cocklin et al. (2003) reported farmers expressing concerns about a heavy-handed, top-down approach by government regarding environmental works. Landcare officers that are well-known to the local farmers and have hands-on farming experience would garner confidence and trust of the farming community. Recommendations made by these types of Landcare officers pertaining to the restoration of native vegetation would more likely be implemented by farmers.

At the time of the study, Landcare officers lacked job security, which often led to personnel changes at local Landcare offices. The new Landcare officers would have little local knowledge, and so farmers had to continuously educate them about the local area. This situation frustrated farmers and reduced their enthusiasm for working with Landcare on restoration works on farms. It appears that retaining Landcare officers at rural posts over the long-term has the potential to increase farmer participation in Landcare projects such as restoring native vege-

tation on farms. Farmers suggested that Landcare officers could be offered job security in the form of permanent positions or periodic pay increases.

#### **5.4. Farmers Knowledge about the Benefits and Drawbacks of Restored Native Vegetation on Pastureland**

*Farmar-Bowers (2004)* explains that there are farmers which have an intrinsic interest in biodiversity and another type that has personal goals other than an interest in native flora and fauna. For the latter type of farmer, the benefits of restoring native vegetation to production should be emphasized. *Pannell et al. (2006)* also talk about this topic but in different terms:

Among those farmers with a focus on profit, the farm-level economics of a proposed conservation practice will be important. Those conservation practices that are not profitable at the farm level will tend to be adopted only by farmers with stronger conservation goals.

Although nearly all of the farmers interviewed acknowledged the benefits of restored native vegetation on the health of livestock and biodiversity in general, they also mentioned the big cost involved with time, labour and money when setting aside, preparing, and maintaining areas of restored native vegetation. One important aspect of restored native vegetation that farmers seemed not to be aware of was the potential for restored native vegetation to support populations of beneficial invertebrates by acting as a faunal refuge. It is therefore recommended that farmers be informed about the role of restored native vegetation on enhancing the abundance and diversity of beneficial invertebrates in the agroecosystem.

Researchers could go through the Landcare network. The general framework of the presentation could be, first, describe the beneficial invertebrates found in farmers' pastures; then, explain the ecosystem service that these invertebrates provide (e.g., pest suppression); and finally, demonstrate the role that restored native vegetation has in enhancing populations of these beneficial invertebrate in pasture landscapes. To reach a larger audience, these presentations can be done at regional meetings of Landcare; yet to have more intimate interactions, presentations can be done at local Landcare chapters. Researchers could also provide educational packets at local Landcare offices or submit articles to rural newspapers on the results of agriculturally significant research. Farmers prefer education-based, voluntary measures when encouraging conservation work on farms (*Cocklin et al., 2007*). These methods, therefore, have the potential to sway farmers to restore native vegetation on farmland.

## **6. Conclusions**

### **6.1. Obstacles to Restoring Native Vegetation on Farmland**

The social literature points to the Australian government's commitment to an agricultural policy termed "competitive productivist" (*Dibden & Cocklin, 2009*,

Dibden et al., 2009; Andree et al., 2010). Competitive productivist agriculture aims to be highly productive without the intervention of government subsidies (Dibden et al., 2009). As was seen from the interviews with farmers in the research area, minimal government assistance was available for farmers, which decreased their enthusiasm and financial ability to restore native vegetation on farmland (Davison, 2005). To increase the restoration rate of native vegetation on farmland in Australia, it may be time to critically analyse the tenets of competitive productivist agriculture and decide whether this form of agriculture can lead to more sustainable agroecosystems.

## **6.2. Increasing Enthusiasm for Restoring Native Vegetation on Farmland**

These interviews suggest the most obvious approach to increase rates of restoration of native vegetation on farms is to provide easily accessible funding that is awarded on a regular basis with requirements that remain consistent over time. Farmers also complained that the continual upkeep of restored areas, such as weed/vermin control and fence repairs, costs them time and money. To lessen the burden on farmers, the Australian government could offer a stipend for yearly maintenance costs of restored areas. Future government and academic studies could investigate a range of stipend amounts to determine what farmers consider sufficient for accepting the added responsibilities of yearly maintenance of restored areas. These investigations could be done using efficient time and cost techniques, such as mail-in questionnaires or telephone surveys. Such studies would build on work done by CSIRO (Hajkowitz, 2009) and also much work done by Dibden and Higgins with Cocklin and Andree (Dibden et al., 2009; Andree et al., 2010; Higgins et al., 2012) or internationally (Perrot-Maitre, 2006).

Other recommendations to encourage restoration work on farms would be for the Australian government to re-open local Landcare offices, retain local Landcare agents over the long-term, and offer services to farmers that streamline the process of restoring native vegetation on farms, such as having Landcare agents help write grant proposals for land restoration work. These recommendations, if enacted, would strengthen the social bond between Landcare and the local community; thereby, increasing the trust farmers has in Landcare agents. This added trust would help Landcare agents in persuading farmers to restore native vegetation on farms.

## **6.3. Emphasise the Ecosystem Service of Pest Suppression Provided by Beneficial Invertebrates and the Role of Restored Native Vegetation in Sustaining Healthy Populations of Beneficial Invertebrates to Farmers**

This research demonstrated that farmers were lacking in knowledge about beneficial invertebrates and the role that restored native vegetation has in supporting populations of beneficial invertebrates in a pasture landscape. Therefore, it is

suggested that farmers be informed about the agriculturally important ecosystem service of pest suppression provided by beneficial invertebrates and the vital role of restored native vegetation in maintaining and enhancing populations of beneficial invertebrates on pastureland.

One of the major successes of this research was that farmers showed a better appreciation of the role of invertebrates in the agroecosystem following participation in this study. This success indicates that farmers are eager to learn about agroecological farming techniques that can improve farm sustainability and productivity. Farmers seemed especially keen to learn more about the role of beneficial invertebrates on pastureland. Monitoring beneficial invertebrate assemblages on farms and presenting these results to farmers offers the researcher an opportunity to discuss the agricultural advantages of restored native vegetation on pastureland.

This knowledge could be disseminated by universities and extension agents to the farming community through presentations, local agricultural newspapers, and information packets. Once this knowledge becomes well-established in the farming community, it may be easier to persuade farmers to restore native vegetation, which would have the added benefits of increasing sustainability and biodiversity on farms.

#### **6.4. Doing Research on Farms**

Before a research project ensues, farmers suggested that researchers discuss the project with them first. The researcher should also inquire about the needs and wants of farmers and attempt to address those through the research project. After the farmer agrees and the project is completed, the researcher should then report back to the farmers with research results. This step is important so that farmers feel appreciated for their time and effort and will be more likely to allow research on their farms in the future. Other ways researchers can show their gratitude and get farmers involved is to have one-to-one meetings and occasional follow-ups with farmers. Farmers in this research project really valued the personal interaction with the researcher.

#### **Acknowledgements**

We thank Jacqui Dibden (Monash University) and Vaughn Higgins (Charles Sturt University) for their indispensable help and advice. We would also like to thank the farmers, whom without their patience and consideration this study could not have been done. Funding: This project was funded by Monash University and the Holsworth Wildlife Research Endowment, Equity Trustees Charitable Foundation & The Ecological Society of Australia.

#### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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