

Climate change mitigation in the Australian agricultural sector: How can public policy drive adoption of greenhouse gas abatement measures by farmers?

by

Ishbel Cullen



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Candidate's Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of the author's knowledge, it contains no material previously published or written by another person, except where due reference is made in the text.

Ishbel Cullen

Date:

Acknowledgements

I have learnt much more during this project than is contained in this thesis. Having the opportunity to observe, interact and reflect has been very rewarding. Driving through vast rural landscapes, eating pub meals in sleepy country towns and meeting with farmers in inherited homesteads. Legacies of ecological and social change are so visible; the past is so present and yet the future bears down on much of rural Australia. I have deeply enjoyed engaging with these issues. I am very grateful to have had the time and resources to do this and recognise the many ways in which I am privileged.

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Abstract

Climate change mitigation in the agricultural sector will be a key component of any pathway to deep emissions reduction in Australia. The recent Beyond Zero Emissions Land Use Plan demonstrates how dramatic emission reductions in the agricultural sector could occur by presenting six areas for greenhouse gas (GHG) abatement. This thesis investigates how public policy could begin to operationalise this vision. It addresses three central aims: 1) to identify barriers to adopting further GHG abatement measures for the six case study farmers from the Beyond Zero Emissions Land Use Plan 2) to assess the strengths and weaknesses of policy efforts to overcome these barriers to-date and 3) to provide recommendations for key aspects of policy design to help overcome these barriers in the future. These aims were addressed through a literature review, a policy review and semi-structured interviews with the six case study farmers and nine policy officials from Commonwealth and State government departments, as well as NRM Regions Australia and the National Farmers Federation.

Seven key barriers to farmers adopting GHG abatement measures were identified. These were: 1. Financial costs of the change; 2. Complexity or novelty of the change; 3. Lack of capacity to change due to other pressures; 4. Inadequate level of information; 5. Sociocultural context not conducive to change; 6. Inconsistent government policy (policy goals and delivery); and 7. Complexity of government policy. While recent decades have seen important developments in natural resource management policy, and more recently the introduction of the *Carbon Farming* Initiative and *Emissions Reduction Fund*, policy efforts to-date do not adequately address these barriers and often act to reinforce them.

To overcome the barriers to behavioural change amongst farmers, and achieve the scale of emission reduction proposed in the Beyond Zero Emissions Land Use Plan, policy efforts with increased ambition and resolve are required. This thesis provides recommendations to this effect, considering key aspects of policy design including policy framing, policy instruments and policy delivery, as well as policy integration.

Table of Contents

Candidate's Declaration	ii
Acknowledgements	iii
Abstract	iv
Table of Contents	v
List of Figures	vii
List of Tables	vii
List of Boxes	viii
Chapter 1: Introduction	1
1.1 Research questions and scope	5
1.2 Thesis structure.....	6
Chapter 2: Methods	7
2.1 Research design.....	7
2.1.1 Policy and literature review	7
2.1.2 Primary data collection	9
2.1.3 Data analysis and interpretation	13
2.2 Conducting ethical research	14
Chapter 3: Literature Review	15
3.1 Barriers to change	15
3.2 Current policy and future directions.....	17
3.2.1 Effective policy design	18
3.2.2 Policy framing	20
3.2.3 Policy Instruments	22
3.2.4 Policy delivery.....	24
Chapter 4: Policy Review	26
4.1 Historical policy context	26
4.2 Current policy context	28
Chapter 5: Results and Discussion	36
5.1 Barriers to change: Insights from farmer interviews	36
5.1.1 Characteristics of the change	37
5.1.2 Circumstances of the farmer	39
5.1.3 Characteristics of relevant policy efforts.....	42
5.2 Current policy and future directions.....	44
5.2.1 Policy framing	44
5.2.2 Policy instruments	50
5.2.3 Policy delivery.....	60
5.2.4 Policy integration.....	65
Chapter 6: Conclusion.....	75
6.1 Key findings.....	75
6.1.1 Policy recommendations	77
6.2 Contribution and further research.....	78

References	80
Appendix 1: Interview schedules	91
Appendix 2: Data analysis.....	103
Appendix 3: Participant information sheet and consent form	107

List of Figures

Figure 1: Average annual agricultural emissions

Figure 2: Agricultural emissions and abatement by activity

Figure 3: Factors influencing adoption of new practices by farmers

List of Tables

Table 1: GHG abatement measures from the BZE Land Use Plan

Table 2: The sequence of research

Table 3: The farmer sample

Table 4: The policy official sample

Table 5: Effective policy design

Table 6: Commonwealth NRM programs

Table 7: Current policy for abatement measures from the BZE Land Use Plan (1-3)

Table 8: Current policy for abatement measures from the BZE Land Use Plan (4-6)

Table 9: Barriers to adopting GHG abatement measures for farmers

Table 10: Summarised findings for Research Questions 1 and 2 (Barriers 1-4)

Table 11: Summarised findings for Research Questions 1 and 2 (Barriers 4-7)

Table 12: Summarised findings for Research Question 3 (Policy framing and policy instruments)

Table 13: Summarised findings for Research Question 3 (Policy delivery and policy integration)

List of Boxes

Box 1 - Quotes from farmers supporting Barrier 1: Financial costs of the change

Box 2 - Quotes from farmers supporting Barrier 2: Lack of capacity to change due to other pressures

Box 3 - Quotes from farmers and policy official supporting Barrier 4: Inadequate level of information

Box 4 - Quotes from farmers supporting Barrier 5: Sociocultural context not conducive to change

Box 5 - Quotes from farmers supporting Barrier 6: Inconsistent government policy

Box 6 - Quotes from policy officials addressing the productivity objective

Box 7 - Quotes from farmer and policy official explaining framing co-benefits

Box 8 - Quotes from farmers explaining experiences of Landcare

Box 9 - Quotes from policy officials and Farmer 5 regarding regulatory approaches.

Box 10 - Quotes from policy officials regarding the Emissions Reduction Fund

Box 11- Quotes from farmers and Policy Official 3 regarding policy delivery

Box 12 - Quotes from farmers supporting long-term, decentralised delivery

Box 13 - Quotes from policy officials regarding regional NRM bodies as aggregators of carbon credits

Box 14 - Quotes from policy officials regarding integrating NRM and climate change mitigation

List of acronyms and abbreviations

BZE: Beyond Zero Emissions

LUP: Land Use Plan

IPCC: International Panel on Climate Change

GHG: Greenhouse Gas

NRM: Natural Resource Management

CFI: Carbon Farming Initiative

ERF: Emissions Reduction Fund

NLP: National Landcare Programme

CfoC: Caring for our Country

CFF: Carbon Farming Futures

NHT: Natural Heritage Trust

CEF: Clean Energy Future

LSP: Land Sector Package

ACWP: Agricultural Competitiveness White Paper

NCOS: National Carbon Offset Standard

Cth DoA: Commonwealth Department of Agriculture

Cth DoE: Commonwealth Department of Environment

NSW DPI: New South Wales Department of Primary Industries

NFF: National Farmers Federation

MBI: Market- Based Instrument

PES: Payment for Ecosystem Services

R & D: Research and Development

RD & E: Research, Development and Extension

"Farming is a lifestyle thing...But every year there is a little bit less lifestyle. When I grew up around here we never worked on a Sunday. We rarely worked after dark.... Now my farm is open 16hrs a day, seven days a week, every day of the year...I'd like to have more time to follow up this grant and that grant, but it just doesn't happen." (Farmer 5)

"The prices get squeezed and you have to cut corners all the time. And maybe the first thing you cut is your environmental type work." (Farmer 4)

"Providing education and funding for on ground works has changed the mindset of farmers...Ten years ago it (Landcare) reached a point where it did stagnate, but that's no reason to get rid of it, that's a reason to reinvent it, to get some other direction." (Farmer 1)

"People know that it (climate change) is occurring but feel like it is out of their control. Nobody really knows how to act on it." (Farmer 2)

"Nothing makes us more receptive than seeing our crops die." (Farmer 5)

"You need to get in touch with the expertise and that drives enthusiasm. If knowledge and confidence reach a certain level, I'd just go and borrow the money and do it myself (install a biogas plant). I don't have the time or energy to track it all down and do all the homework..." (Farmer 6)

"It has to be a genuine overall policy, not just a little gimmick on the side." (Farmer 3)

Chapter 1: Introduction

The International Panel on Climate Change (IPCC) has recently stated that greenhouse gas (GHG) emissions must be near zero by 2100 if global warming is likely to stay below a two degree Celsius temperature increase (IPCC AR5). Subsequently, rapid decarbonisation of the global economy is necessary in the coming decades to avoid dangerous climate change and its profound implications. This project focuses on climate change mitigation in Australia's agricultural sector. The role of the agricultural sector in achieving dramatic emissions reduction is addressed in the Beyond Zero Emissions (BZE) Land Use Plan (LUP), authored by Longmire *et al.* (2014), which demonstrates how the agriculture sector could reach net zero emissions. This project has been done in collaboration with BZE and the LUP provides the context for this research.

The Australian agricultural sector is a significant source of GHG emissions, contributing 33% (189.5 Mt Co₂-e/ yr.) of Australia's domestic emissions, when land clearing for agriculture is included (Longmire *et al.*, 2014). The sources of agricultural emissions are, in order of magnitude (using 2006-2010 data): land clearing for agriculture (51%), enteric fermentation from ruminants (30%), emissions from agricultural crops and soils (8.6%), emissions from biomass burning (5.7%), manure management (1.7%) and on-farm energy generation (2.4%) (Longmire *et al.*, 2014). These activities emit a range of GHGs including methane, nitrous oxide, nitric oxide, carbon monoxide, and non-methane volatile organic compounds. Sources of GHG emissions from the agricultural sector are shown in Figure 1.

The BZE LUP outlines six areas of GHG abatement, and corresponding measures, which are summarised in Table 1. Implementation of these abatement measures is modelled in the BZE LUP, resulting in a net zero emissions scenario, which is presented in Figure 2.

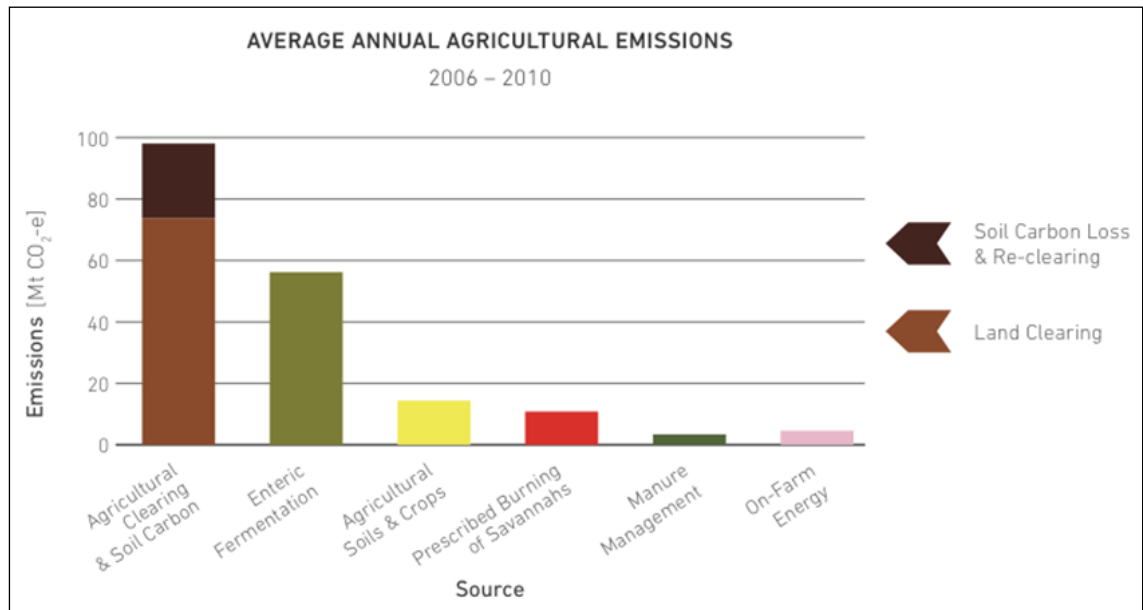


Figure 1: GHG emissions from the Australian agricultural sector. Sourced from Longmire *et al.* (2014).

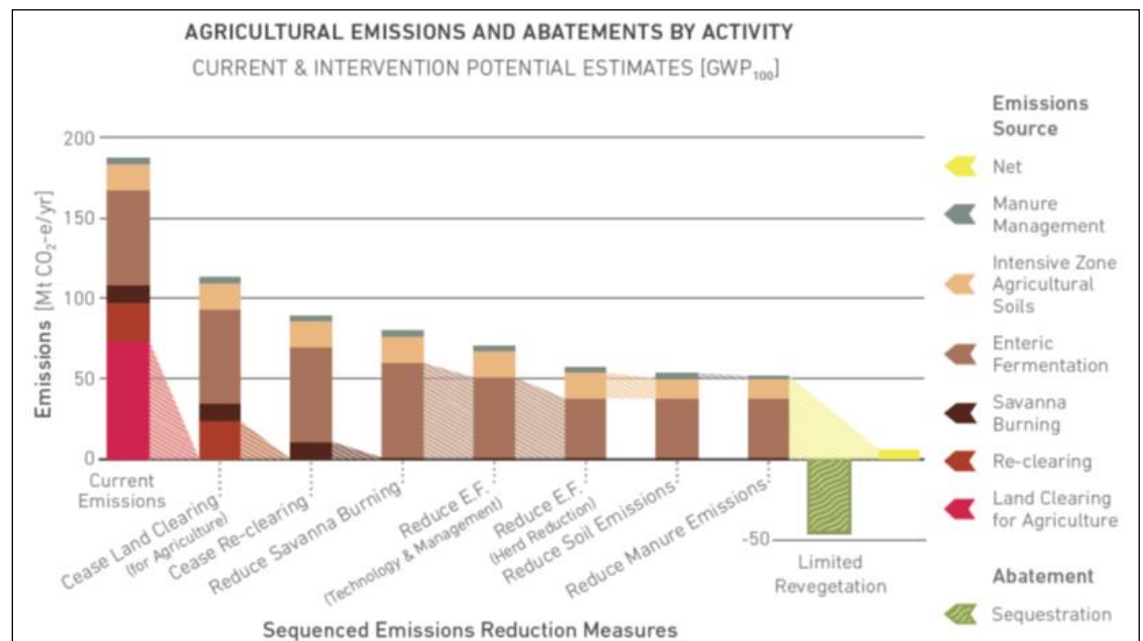


Figure 2: Pathway to net zero emissions agriculture, proposed in the BZE Land Use Plan. Sourced from Longmire *et al.* (2014).

Table 1: GHG abatement measures from the BZE Land Use Plan

Six areas for GHG abatement in the agricultural sector	GHG abatement measures
1. Carbon sequestration in biomass	1.1 Increasing carbon stored in soils and plants through revegetation in agricultural landscapes.
2. Abatement of emissions from agricultural land clearing and soil carbon loss	2.1 Cease land clearing and re-clearing for agriculture.
3. Abatement of emissions from enteric fermentation	3.1 Reduce enteric fermentation (technology and management).
	3.2 Reduce enteric fermentation (reduce herd numbers).
4. Abatement of emissions from agricultural crops and soils	4.1 Reduce synthetic fertilizer application, enabled by alternative cropping and grazing regimes (e.g.: conservation tillage) that maintain nutrient levels.
5. Abatement of emissions from biomass burning	5.1 Reduce savannah burning.
	5.2 Reduce burning of crop residues.
6. Abatement of manure management emissions and bioenergy opportunities	6.1 Adopt on-farm energy generation using bioenergy.
	6.2 Reduce manure stockpiling.

The BZE LUP outlines a substantive problem and then provides substantive solutions. However, the policy problem and possible policy solutions will take a different form (Dovers and Hussey, 2013). While the substantive problem is the context, the policy problem is the focus of this thesis. Here, the policy problem is changing the behaviour leading to GHG emissions from the agriculture sector and policy solutions will involve designing mechanisms that will support that change.

Climate change mitigation in the agricultural sector has been the focus of recent policy initiatives: most notably, the Commonwealth government's *Carbon Farming Initiative* (CFI), now the *Emission Reduction Fund* (ERF). More established natural resource management (NRM) policy, such as the *National Landcare Programme*, is also directly relevant to GHG abatement. Despite these efforts, current policy frameworks have acknowledged limitations and will not realise the scale and pace of change required (Longmire *et al.*, 2014; Van Oosterzee, 2012).

This thesis aims to identify opportunities for policy to facilitate upscaling GHG abatement activity by farmers. To address this broader objective, this thesis has three distinct foci 1) to identify barriers to adopting further GHG abatement measures for the six case study farmers from the BZE LUP 2) to assess the strengths and weaknesses of policy efforts to-date in overcoming those barriers and 3) to provide recommendations for key aspects of policy design to help overcome those barriers in the future. In order to address these aims, a qualitative approach was taken, involving a literature review, a policy review and semi-structured interviews with six farmers, whose properties were case studies in the BZE LUP, and nine policy officials from Commonwealth and State government departments, as well as NRM Regions Australia and the National Farmers Federation.

This thesis builds on a wide range of existing research. There is a large body of multi-disciplinary literature investigating barriers to pro-environmental behaviours broadly (e.g.: Kollmuss and Agyeman, 2002; Tanner, 1999), and specifically relating to how farmers make decisions and implement pro-environmental practices on their properties (e.g.: Pannell *et al.*, 2006; Farman-Bowers and Lane, 2009; Greiner and Gregg, 2011). A wealth of research also exists considering effective policy design for environmental and sustainability outcomes (e.g.: Dovers and Hussey, 2013; Gunningham and Young, 1997). Climate change mitigation policy for the agricultural sector is often considered from an international perspective (e.g.: Smith *et al.*, 2007), however research for the Australian context is limited (e.g.: Saddler and King, 2008). While NRM policy in Australia has been widely discussed (e.g.: Lane *et al.* 2009; Mitchell *et al.*, 2007; Hajkowicz, 2009), interactions between NRM and the recent developments in the climate change mitigation policy have received less academic attention (e.g.: Van Oosterzee *et al.*, 2014). Several discussion papers, which chart possible future policy directions for a more sustainable agricultural sector are also relevant here (e.g.: Ogilvy *et al.*, 2015; Eckersley, 2013).

In light of this existing scholarly work, there are three aspects of this thesis which are important and innovative. Firstly, it reaffirms literature considering barriers to behaviour change for farmers, farmers' experiences of NRM policy efforts to-date

and ideas for future directions in sustainable agriculture and land management policy. Secondly, it complements existing research by providing a climate change mitigation perspective on these broader land use policy themes. Thirdly, it suggests a suite of measures to upscale mitigation outcomes in the agricultural sector, drawn from unique insights from both recipients and administrators of public policy.

1.1 *Research questions and scope*

The research questions guiding this thesis are:

1. What are the barriers to wider adoption of GHG abatement measures for the six farmer case studies in the Beyond Zero Emissions Land Use Plan (BZE LUP)?
2. How has government policy to-date addressed the barriers highlighted by the farmer case studies?
3. How can these barriers be overcome through effective policy design?

The ‘barriers’ considered here are external contextual factors, rather than internal psychological impediments, as explained further in *Chapter 2: Methods*. ‘GHG abatement measures’ refers to the six areas of abatement outlined in the BZE LUP. ‘Government policy’ refers to the public policy landscape, with a focus on policy framing, policy instruments and policy delivery. This project will primarily consider Commonwealth government policy and state government policy for Queensland, New South Wales and Victoria in less detail. ‘Effective policy design’ refers to key criteria drawn from scholarly work, which are established in the *Chapter 3: Literature Review*. This thesis is future-orientated and does not systematically examine effectiveness of existing policy. Rather, the current policy landscape is considered as the platform on which more ambitious policy should be built.

The assumptions that underpin this thesis are that GHG abatement in the agricultural sector *should* occur as soon as possible and that governments *should* have a central role in facilitating this change; however, it is acknowledged that

government is not the only driver of change. Therefore, this thesis has both empirical and normative dimensions, in that barriers to change and characteristics of current policy are identified and then interpreted to draw conclusions about what *should* happen.

1.2 Thesis structure

The introductory chapter has established the research questions, scope and purpose guiding this honours project.

Chapter 2, *Methods*, outlines the analytical frameworks used to structure the project and details the research design.

Chapter 3, *Literature Review*, engages relevant scholarly work covering the barriers to farmers changing management practices, introduces key aspects and principles of effective policy design and reviews existing literature considering current policy relevant to climate change mitigation, as well as possible future directions.

Chapter 4, *Policy Review*, summarises the history of relevant policy development and the current Commonwealth and state policy landscape. This chapter provides greater details to support *Chapter 3: Literature Review* and *Chapter 5: Results and Discussion*.

Chapter 5, *Results and Discussion*, first presents the seven barriers to further adoption of GHG abatement measures that emerged from the farmer interviews. Second, current policy is discussed in relation to these barriers, highlighting implications for future policy framing, policy instruments and policy delivery.

Chapter 6, *Conclusion*, summarises the findings for each of the research questions and suggests further research.

Chapter 2: Methods

2.1 Research design

This research involved three stages: 1) a literature and policy review, 2) primary data collection and 3) data analysis and interpretation. Two analytical frameworks established through the literature review guided the progression of the research. To answer research question one, a framework of barriers to farmer behaviour change was applied and adapted from Greiner and Gregg (2011). To answer research questions two and three, a policy analysis framework was adapted from Dovers and Hussey (2013), consisting of policy framing, policy instruments and policy delivery. These frameworks were used to structure the literature review, interview questions and data analysis and form the structure of this thesis. Table 2 outlines the three stages of research, with further detail provided in the following sections.

2.1.1 Policy and literature review

The policy review summarises all policy activity relevant to the six areas of GHG abatement from the BZE LUP, providing the context for *Chapter 4: Literature Review* and *Chapter 5: Results and Discussion*. It was conducted using scholarly work, legislation and grey literature, including government publications and websites. Commonwealth policy is primarily considered, with NSW, VIC and QLD policy covered at a high level. This is appropriate given the Commonwealth responsibility for climate change policy and prominence in NRM policy. States investigated cover the distribution of the participants and given the scope of the thesis, give an adequate indication of state-based policy. The literature review engages relevant frameworks and scholarly work for each of the research questions (see Table 2). The policy and literature review provide the theoretical foundations and practical context for this project.

Table 2: The sequence of research

	Stage 1: Policy review and Literature review	Stage 2: Primary data collection	Stage 3: Data analysis & interpretation
RQ 1) What are the barriers to wider adoption of GHG abatement measures for the six farmer case studies in the Beyond Zero Emissions Land Use Plan?	• <i>Framework 1</i> established: Typology of factors influencing adoption of conservation practices by farmers adapted from Greiner & Gregg (2011). Factor categories separated into external & internal, (Kollmuss and Agyeman 2002); with only external factors considered here. ○ <u>1) Characteristics of the change</u> (external), <u>2) Larger-scale variables</u> (external), <u>3) Circumstances of the farmer</u> (external), <u>4) Characteristics of the farmer</u> (internal). • Literature reviewed according to each category.	• Interview questions developed around: <u>1) Characteristics of the change</u>, <u>2) Larger-scale variables</u>, <u>3) Circumstances of the farmer</u>. <i>Indicative question:</i> - (Farmers) Considering the abatement activities relevant to your property, what characteristics of these activities would make them unattractive to implement?	• According to data, the three categories from the literature were adapted to primary codes: <u>1) Characteristics of the change</u>, <u>2) Circumstances of the farmer</u> and <u>3) Characteristics of relevant policy efforts</u>. • Secondary coding identified key barriers for each primary code, creating an original seven barrier framework. • Findings interpreted in relation to existing literature.
RQ 2) How has government policy to-date addressed the barriers highlighted by farmer case studies?	• Policy review established 'policy to-date'. • <i>Framework 2</i> established: Policy analysis framework adapted from Dovers and Hussey (2013): <u>1) Policy framing</u>, <u>2) Policy instruments – facilitate, induce, compel</u> (Bromley 1997), & <u>3) Policy delivery</u>. • Literature reviewed according to strengths & weaknesses of each category.	• Interview questions developed around: <u>1) Policy framing</u>, <u>2) Policy instruments</u> & <u>3) Policy delivery</u>. <i>Indicative question:</i> - (Policy officials) How does climate change mitigation policy (CFI/ ERF) relate to regional NRM bodies & Landcare networks?	• Data organised into strengths/ weaknesses for primary codes: <u>1) Policy framing</u>, <u>2) Policy instruments</u> & <u>3) Policy delivery</u>. • Strengths/ weaknesses were aligned with relevant barriers (RQ 1). • Findings interpreted in relation to existing literature.
RQ 3) How can these barriers be overcome through effective policy design?	• Effective policy design principles, drawn from a range of authors for <i>Framework 2</i>: <u>1) Policy framing</u>, <u>2) Policy instruments – facilitate, induce, compel</u> (Bromley 1997), & <u>3) Policy delivery</u>. • Literature reviewed possible future policy directions identified by previous authors, according to each category.	• Interview questions developed around: <u>1) Policy framing</u>, <u>2) Policy instruments</u> & <u>3) Policy delivery</u>. <i>Indicative question:</i> - (Policy officials) Do you think the role of regional NRM bodies could be better utilised?	• Data organised into future directions for primary codes: <u>1) Policy framing</u>, <u>2) Policy instruments</u> & <u>3) Policy delivery</u>. • Future directions were aligned with relevant barriers (RQ 1) & strengths/ weaknesses of policy to-date (RQ2). • Findings interpreted in relation to existing literature.

2.1.2 Primary data collection

Method

Primary data collection involved semi-structured interviews with the six farmers whose properties were used as case studies in the BZE LUP and nine policy officials from government and industry. Using semi-structured interviews enabled targeted data collection, while also giving freedom to the participants to discuss issues outside of direct questioning (Dunn, 2005). The interview schedules (Appendix 1) were developed using the pyramid technique where participants were first asked introductory questions, to ease them into the interview, before covering more difficult questions (Dunn, 2005). For farmers, interview questions were introduced with the findings from the BZE LUP for their property, including emissions profiles and the relevant abatement measures. This established the context for the rest of the interview. The schedules all involved a series of primary and secondary questions structured around the three research questions, informed by the literature review (see Table 2).

Contact details for farmers were provided by BZE and policy officials were contacted through supervisors or emailed independently. Two of the farmer interviews and two of the policy official interviews were completed over Skype and the remainder in person on the farmer's property or offices in Canberra. Interviews ranged in length from 40 – 90 minutes. Farmers were interviewed first, so that barriers to adopting GHG abatement measures could be established and then discussed with policy officials.

Sample

The farmers interviewed are referred to as the 'case studies from the BZE LUP'. However, in this thesis they are considered as a sample rather than case studies. The individual experience and situation of each farmer is not explored discreetly or in enough detail to constitute a case study approach. Building on the BZE LUP did allow farm-specific carbon abatement scenarios to be used to encourage relevant discussion in the interviews. However, the data from the

farmer sample is analysed collectively and at a level of abstraction sufficient to identify themes that have broader relevance.

The farmers from the BZE LUP are from deliberately heterogeneous biophysical contexts, located in different regions of eastern Australia, with different production types. However, for this research the sample is considered more similar than different. All the farmers were originally contacted through BZE networks, have implemented some form of GHG abatement measures on their property, are concerned about climate change and want to see further action. They are all family farmers and indicated that environmental values were key personal motivations. Through past actions, they have demonstrated that they are 'innovators' or 'early adopters' of pro-environmental agricultural practices (Ryan and Gross, 1943).

This similarity in personal motivations and a common understanding of the problem is central to the design of this research and represents a purposive sampling technique, which is deliberately biased. This research aimed to investigate 'external' barriers, rather than 'internal' psychological barriers, such as not believing in climate change or indifference regarding the environmental impacts of production (Fleming and Vanclay, 2011). This is an important distinction, as previous research has shown the most significant factors influencing a farmer's decision-making are their personal goals and motivations (Farmer-Bowers and Lane, 2009). However, given the sample of this project, it is assumed that the will to change already exists. Subsequently, the focus of this research can shift to how external factors, influenced by policy activity, can enable sentiment to translate into wider implementation of GHG abatement measures.

A disadvantage of the sample is that all the farmers are located in the intensive agricultural zone in south-east Australia. This means that widespread land clearing and savannah burning (prevalent in northern Australia) are not investigated, despite these being some of the largest sources of emissions. The farmer sample, and relevant GHG abatement measures are introduced in Table 3. From here, farmers will be referred to using the numbering outlined in Table

3. For more information about the case studies, and GHG abatement measures, refer to the BZE LUP.

The ‘farmer sample’ are considered primary actors, as they are most closely associated with the policy problem. Nine policy officials from government and industry, considered proximate actors, were also interviewed. As policy practitioners, these interviews allowed a better understanding of past and current policy settings, as well as the opportunities and constraints for future policy directions. These policy officials were selected purposively according to level of government or organisation and relevant experience. This sample allowed perspectives from Commonwealth and state governments, NRM regions and industry. Table 4 introduces the ‘policy official sample’, while withholding details that would make individuals identifiable. From here, policy officials will be referred to using numbering outlined in Table 4.

Table 4: The policy official sample

Organisation	Relevant areas of experience & expertise
<i>Commonwealth Department of Agriculture (Cth. DoA): Policy officials 1,2,3 & 4</i>	Drought policy, sustainable agriculture, exports, Landcare & NRM policy.
<i>Commonwealth Department of Environment (Cth. DoE): Policy officials 5 & 6</i>	Carbon Farming Initiative/ Emissions Reduction Fund, Landcare, biodiversity policy.
<i>NSW Department of Primary Industries (NSW DPI): Policy Official 7</i>	Climate change adaptation, research and development.
<i>NRM Regions Australia (NRM Regions Australia): Policy official 8</i>	Regional NRM bodies and planning processes.
<i>National Farmers Federation (NFF): Policy official 9</i>	Industry sentiment and effect of policy on farmers.

2.1.3 Data analysis and interpretation

All interviews were transcribed and analysed through a process of inductive and deductive thematic coding, using both descriptive and analytical codes. Frameworks outlined in Table 2 were used for primary coding and further themes from the literature were used to guide secondary coding, while also allowing emergent themes. The coding process is detailed further in Appendix 2.

Participant quotes are presented both in text and in boxes to clearly organise evidence against key themes and allow easy navigation. A large quantity of interview data was collected and presents rich opportunities for further analysis, holding many valuable insights that could not be included within the scope of this thesis.

2.2 Conducting ethical research

This project was approved by the Human Research Ethics Committee at the Australian National University (protocol 2015/165). As such, interview questions and style were respectful of possible sensitivities and aim to empower participants to share their experience (Dunn, 2005). All participants were sent transcripts of their interview to allow an opportunity to verify or change the content. Copies of the participant information sheet and consent form can be seen in Appendix 3.

Chapter 3: Literature Review

This chapter reviews literature relevant to the three research questions. First, the factors that influence adoption by farmers are outlined and three barrier categories established. Second, principles for effective policy design are introduced for policy framing, policy instruments and policy delivery, and views from the literature are canvassed on current and future policy for climate change mitigation in the agricultural sector.

3.1 *Barriers to change*

There is a wealth of literature, from multiple disciplines, investigating the barriers to pro-environmental behaviours (Kollmuss and Agyeman, 2002; Tanner, 1999), and specifically the factors that determine adoption of conservation practices by farmers (Pannell *et al.*, 2006). Factors that influence adoption can be summarised into four categories: characteristics of the change, characteristics of the farmer and circumstances of the farmer and larger-scale variables (adapted from Greiner and Gregg, 2011).

As illustrated in Figure 3, the factors influencing adoption are complex and interconnected. To simplify, barriers can be separated into *internal* and *external* (Kollmuss and Agyeman, 2002). In Figure 3, this distinction is applied to a conceptual framework adapted from Greiner and Gregg (2011). The internal barriers associated with the characteristics of the farmer, relating to personal goals and motivations, have been well established as the most important in farmer decision-making (Pannell *et al.*, 2006). Personal goals and motivations differ significantly between individuals (Kuehne *et al.*, 2007). Despite these differences, personal goals and motivations invariably relate to financial gains, social acceptance, environmental protection and family well-being (Farmar-Bowers and Lane, 2009). Age, level of education and personality have also been shown to influence adoption (Kilpatrick, 2000). As outlined in *Chapter 2*:

Methods, given the nature of the sample, internal barriers are not considered explicitly any further.

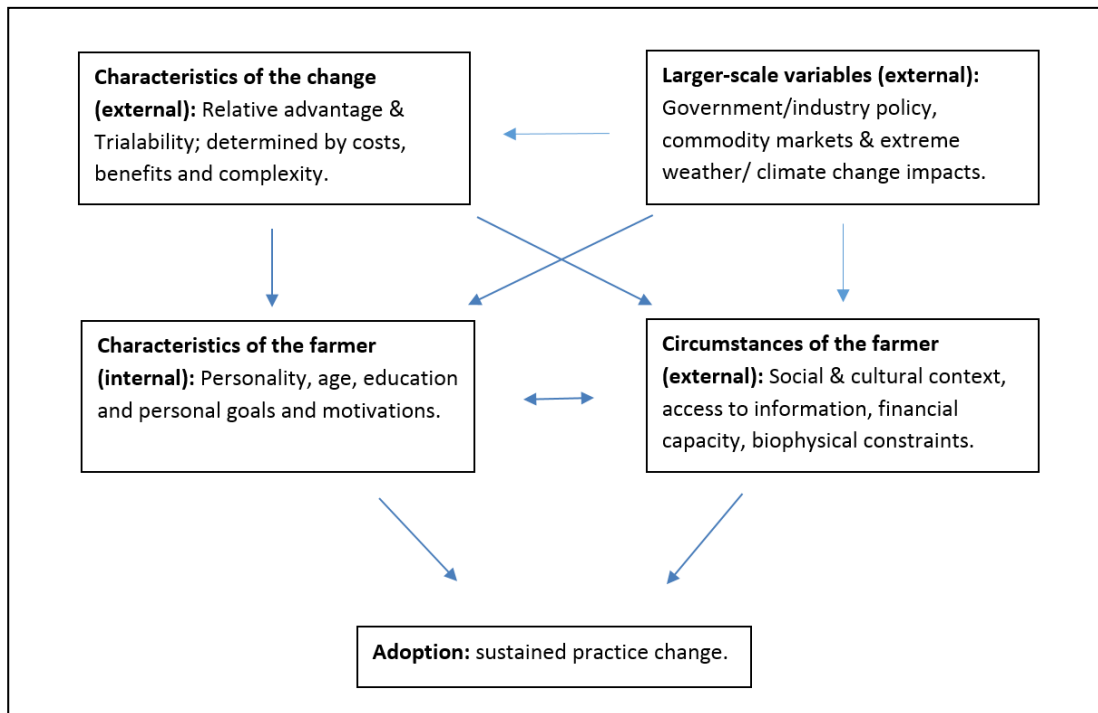


Figure 3: Factors influencing adoption of new practices by farmers, showing the complex interplay between factors. Adapted from Greiner and Gregg (2011).

External barriers to change relate to the characteristics of the change, the circumstances of the farmer and larger-scale variables. Pannell *et al.*, (2006) conclude that there are two relevant aspects of characteristics of the change: the relative advantage and the trialability. Relative advantage refers to the costs and benefits of the change, relative to alternatives. This will be decided primarily by economic factors, however, complexity of the practice and non-financial costs and benefits are also influential (Reeson, 2008). Trialability relates to complexity, divisibility and observability of the change (Öhlmer *et al.*, 1998). Research considering the characteristics of individual GHG mitigation measures, such as revegetation (Schirmer *et al.*, 2012), conservation tillage (D'Emden *et al.*, 2006), nitrogen fertiliser (Stuart *et al.*, 2014), as well as conservation practices more broadly (Greiner and Gregg, 2011), have shown the relevance of costs and complexity barriers to adoption.

The circumstances of the farmer refers to the sociocultural context, access to information, capacity and the biopsychical characteristics of the farm. Established social norms, reinforced by networks of friends and family can prohibit change in farming practices (Stoyles, 1992; Janis and Mann, 1977). This is particularly relevant for climate change issues, when many in rural communities do not 'believe' in anthropogenic global warming (Fleming and Vanclay, 2011; Buys *et al.*, 2012; Evans *et al.*, 2011). While information doesn't always lead to change in behaviour (Potter and Oster, 2008), research has shown that proximity from those that have adopted (D'Emden *et al.*, 2006), distance from extension services (Marsh *et al.*, 2000) and level of awareness (Vanclay, 1992) all effect adoption of conservation practices. Time and labor capacity has also been shown to be a barrier to change (Greiner and Gregg, 2011). The immediate circumstances farmers operate in can present many constraints to behaviour change.

Both the characteristics of the change and the circumstances of the farmer can be effected by larger-scale variables including government and industry policy, markets and extreme weather. The vulnerable position of Australian farmers due to volatile market forces and increasing climate change impacts is widely acknowledged (Hogan and Young, 2013; Smith and Pritchard, 2012; Rickards and Howden, 2012). Ogilvy *et al.* (2015) argue many farmers are in a 'vicious cycle', where they are compelled to use practices that erode natural resources, but deliver short-term production increases, in order to stay viable in a time of uncertain prices and outputs. The influence of government policy as a larger-scale variable, is explored in the following section.

3.2 Current policy and future directions

Climate change mitigation in the agricultural sector has only recently become a policy priority (Macintosh and Waugh, 2012). However, many of the activities now being promoted for mitigation benefits also represent good land management for local environmental, social and long-term economic outcomes (Van Oosterzee, 2012). In most cases, GHG abatement, natural resource

management (NRM) and sustainable agricultural practices are closely aligned. Revegetation, preventing land clearing, minimising fertiliser use, reducing biomass burning and improving manure management are all existing priorities. Addressing enteric fermentation and some aspects of manure management are the only GHG mitigation-specific measures and even these are being found to have co-benefits (Beauchemin *et al.*, 2008). Subsequently, while this thesis uses a climate change mitigation 'lens', all literature related to broader NRM policy and sustainable agricultural practice is also considered. First, key aspects and principles of effective policy design are established as a point of reference for the remainder of the thesis.

3.2.1 Effective policy design

This thesis considers three distinct aspects of policy design: policy framing, policy instruments and policy delivery (adapted from Dovers and Hussey 2013). Table 4 defines these terms and introduces key principles of effective policy design for each aspect. Unless otherwise stated, the content of Table 4 is sourced from Dovers and Hussey (2013). These aspects and principles are used to structure and inform discussion around the research question aims. They are therefore not comprehensive and are not used to systematically assess effectiveness.

Table 5: Effective policy design

Aspect of policy design	Key principles of effective policy design
<i>Policy framing:</i> Problem/ response definition and policy objectives. - This refers to “the process of selecting, emphasizing and organizing aspects of complex issues” (Daviter 2007:654) and involves the use of language to engage with public discourses. - Policy objectives here refer to qualitative goals rather than quantitative targets.	- Define macro and micro problems in relation to larger meta and macro problems, with awareness of consistency and connections between problems. - Decide clear policy objectives that reflect diverse range of values held by the community and communicate relevance accordingly (Vigar and Healey, 2002). - Tailor emphasis to influential public discourses (Fleming and Vanclay, 2011), while shaping public discourse in-line with policy objectives (Bacchi, 2009). - Faciliate broader policy integration: coordinate policy activity so that objectives are complementary rather than conflicting.
<i>Policy instruments:</i> Mechanisms for enacting change; facilitate, induce or compel (Bromley, 1997). - Policy that <i>facilitates</i> encourages voluntary change through education, community involvement, RD & E and policy reform. - Policy that <i>induces</i> incentivises voluntary change through motivational tools or market mechanisms. - Policy that <i>compels</i> enforces change through regulation.	- Preference targeted mixes of policy instruments, for a range of policy goals (Gunningham and Young, 1997). - Consider the following key criteria when deciding instrument mix: dependability; corrective vs antidotal focus; systemic potential; flexibility; efficiency; complexity and cross-sectoral influence; equity; cost; social/ political feasibility; institutional feasibility; enforceability and communicability. - In considering above criteria, evaluate distribution of public and private benefits to accurately identify impediments (Pannell, 2008).
<i>Policy delivery:</i> Human, financial and organisational resources, structure of governance and consistency in delivery.	- Ensure adequate human, financial and organizational resources and capacity. - Clearly define roles and responsibilities between levels of government, organisations and individuals. - Provide accesible opportunites for participation and observe the subsidiarity principle, where action is decentralised to the lowest level of governance possible (Marshall, 2007), with a mix of top-down and bottom-up approaches (Gunningham and Young, 1997). - Adopt long-term goals, supported by the resources and institutional settings required to support consistent policy implementation over long time-frames. - Employ robust but not onerous monitoring, evaluation and verification.

3.2.2 Policy framing

The achievements of NRM policy, and more recent developments in carbon farming, have elements of effective policy framing. Many authors have described the success of the Landcare movement in creating environmental and social goals that resonate with a range of values and facilitated un-precedented collaboration (Lockwood, 2000; Tennent and Lockie, 2013; Curtis *et al.*, 2008; Sobels *et al.*, 2001). This led to a shift in the perception of land degradation and the importance of more sustainable agricultural practices (Curtis, 1999). The recent carbon farming discourse has introduced a new dimension, appealing to profitability discourses and creating a sense of opportunity (Paul *et al.*, 2013).

However, some question whether the policy framing has evolved sufficiently for the contemporary context. Eckersley (2013) concludes that the scale of the response is increasingly disproportionate to the scale of the problem, with the realities and urgency of climate change not being adequately communicated. Consistent objectives, that facilitate GHG abatement, are not integrated across policy areas. Van Oosterzee (2012) contends that integration of complementary NRM and carbon farming objectives has been largely overlooked. Increasing adaptation responses are also typically not linked to mitigation objectives (Berry *et al.*, 2015; Watkiss *et al.*, 2015). More broadly, policy inconsistency means farmers receive conflicting messages about increasing sustainability of production, while also being directed to engage in competitive markets which drive land degradation for short-term returns (Bjørkhaug and Richards, 2008). These limitations have led to a lack of a coherent and relevant story about sustainable landscape management and associated mitigation benefits.

Several authors have suggested that future approaches to policy framing should involve a new, compelling vision, with broader relevance than the traditional conservation-oriented ethic (Eckersley, 2013; Ogilvy *et al.*, 2015; Hamblin, 2009). This would involve adequately acknowledging climate change as a 'game changer' (Eckersley 2013: 25), while articulating the local environmental, economic and social co-benefits of climate change mitigation activities. A holistic problem and response definition could recognise the suite of challenges facing rural Australia, developing a discourse that speaks to the multi-

functionality of landscapes (Steffen *et al.*, 2009; Wilson, 2007; Bjørkhaug and Richards, 2008; Holmes, 2006). Fleming and Vanclay (2011) argue that by emphasising co-benefits of mitigation activities and 'no-regrets' options, dominant discourses, related to maximising profit and questioning climate change, can be influenced.

Such policy framing would facilitate greater policy integration, 'mainstreaming' mitigation objectives across wider agricultural policy, including climate change adaptation, drought and economic policy to avoid inconsistencies in objectives (Locatelli *et al.*, 2015; Cockfield and Dovers, 2013). Ogilvy *et al.* (2015) propose aligning objectives from these different policy areas and discourses, advocating the development of Australia's sustainable agriculture credentials to gain competitive advantage in global markets that increasingly preference sustainable production. Effective framing can shift perceptions of normality and possibility, allowing new, more constructive narratives to emerge (Irwin, 2001).

3.2.3 Policy Instruments

Facilitation

Landcare has long been the centrepiece of facilitative approaches, maintaining a network of voluntary community groups, supported by grant-based funding, since the 1980s (Tennent and Lockie, 2013). Many authors have documented the success, and more recent demise, of the Landcare movement (Curtis, 1999; Curtis *et al.*, 2008; Lockwood, 2000; Tennent and Lockie, 2013). Its decline is largely attributed to reduced and inconsistent funding associated with a shift from collaborative, capacity-building approaches to targeted market-based instruments (MBIs) (Tennent and Lockie, 2013; Robins and Kanowski, 2011; Curtis and Lefroy, 2010). Critics questioned the ability of education and cost-sharing approaches to deliver larger-scale outcomes because of the costs borne by farmers (Pannell *et al.*, 2006). However, Lockie and Tennant (2013) suggest that the shift away from the Landcare approach has gone too far, undermining altruistic motivations and alienating a dedicated community of participants.

The range of possibilities for facilitative approaches, such as changing other policy (policy integration) or ongoing investment in research, development and extension (RD & E), have not been fully implemented. Ogilvy *et al.* (2015) suggest a policy shift to focus on facilitating market-led incentives by catering to, and encouraging growth in, demand for production that maintains or improves the natural resource base. This would involve increased RD & E into innovative sustainable agricultural practices and leveraging the leaders in agriculture that are showing that better land management, with associated mitigation benefits, can also be more profitable. Ogilvy *et al.* (2015) suggest that government could act as a broker by negotiating access to markets that value environmental credentials, and providing metrics and certification standards. Facilitative policy approaches have important advantages, largely related to social and political feasibility and broad applicability. They are therefore important in complementing regulatory and incentive instruments (Gunningham and Young, 1997).

Regulation

Land clearing legislation, the main regulation relevant to GHG mitigation, has been celebrated by advocates and resulted in significant decline in deforestation (Maron *et al.*, 18th March 2015). However, this approach has been criticised for generating resentment from many in the farming community. It has been described as inequitable, inflexible and as reducing farmer trust and engagement with government policy efforts (Robinson and Dent, 2005; Bartel, 2014). Greiner and Miller (2008) and Schirmer and Dovers (2012) have further confirmed farmers' distain of regulatory tools. Van Oosterzee *et al.* (2014) argue that regulation puts the costs on the farmer for delivering services that benefit broader society. A shift in policy focus from 'what cannot be done' to what 'should be done' is suggested (Van Oosterzee *et al.*, 2013: 308). Such a shift could include clarifying an increased environmental duty of care (Bates, 2001; Young and Shi, 2003; Greiner and Miller, 2008). However, given regulation does not create the finances farmers require to manage landscapes, incentive and cost sharing measures should support any regulatory efforts (Van Oosterzee *et al.*, 2014).

Incentives

The increasing prominence of market-based incentives has seen the concept of payment for ecosystem services (PES) emerge, whereby the state pays individual landholders for biodiversity conservation, and more recently carbon abatement contributions, through mechanisms such as the *Carbon Farming Initiative* (CFI) (Gómez-Baggethun *et al.*, 2010). Establishing the CFI was widely acknowledged as an achievement, as the most comprehensive land sector offset scheme globally (Macintosh and Waugh, 2012). Many see viable environmental markets as a promising way to deliver broad-scale climate change mitigation in the land use sector, while achieving multiple co-benefits (Eckersley, 2013; Greiner and Gregg, 2011; Greiner and Stanley, 2013; Van Oosterzee *et al.*, 2014; Fargher, 2013). Studies of farmers have also shown preference for policy instruments that incorporate a financial incentive (Schirmer *et al.*, 2012; Greiner and Miller, 2008). Creating incentives allows farmers to take commercial advantage of the many services their management can provide

(Commonwealth of Australia, 2009), consistent with the concept of multi-functionality (Steffen *et al.*, 2009).

While carbon markets are acknowledged to hold significant potential for the land sector, critics argue that the CFI, now the *Emissions Reduction Fund* (ERF), will not deliver the landscape scale change required (Longmire *et al.*, 2014; Van Oosterzee, 2012; Eckersley, 2013). The ERF's narrow scope, complexity, high transaction costs and low carbon price are all cited as limiting factors to wider participation. The administrative, assessment and monitoring requirements of participating in generating carbon credits is time-consuming and expensive, meaning it is difficult for individual farmers to be involved (Van Oosterzee, 2012; Fargher, 2013). This reflects the inherent difficulties with measuring emissions reduction and sequestration in the land sector (Saddler and King, 2008), which also means actual emissions reductions are often uncertain, raising questions about dependability (Dovers and Hussey, 2013).

While environmental markets are widely alluring, some caution viewing them as a panacea (Redford and Adams, 2009), and note the risk of disincentivising altruistic behaviours (Greiner and Gregg, 2011). This reinforces the need for a diversified mix of policy instruments (Dovers and Hussey, 2013; Gunningham and Young, 1997).

3.2.4 Policy delivery

A key focus and achievement of the past decades in NRM policy development has been the establishment of organisational resources to deliver outcomes at the local level, mainly through the establishment of a network of Landcare groups and regional NRM bodies. Regional planning and delivery has focused on fostering collaboration, community ownership and allowing flexibility for locally relevant goals, consistent with the principle of subsidiarity (Vella and Sipe, 2014; Marshall, 2009; Steffen *et al.*, 2009; Robins and Kanowski, 2011). Funding of NRM programs, beginning with the *National Landcare Programme* (NLP) in 1990, has amounted to considerable government expenditure (Hajkowicz, 2009), with periods of accessible funding and staff support

successfully engaging farmers and delivering important environmental and social outcomes (Sobels *et al.*, 2001).

Despite these efforts, delivery of NRM programs has often been short-term, inconsistent and without the necessary resources (Mitchell *et al.*, 2007; Vanclay and Lawrence, 1995). This has resulted from changes in funding arrangements from successive governments, confused roles and responsibilities between governance levels and inadequate follow-up required to make projects successful (Vella and Sipe, 2014; Mitchell *et al.*, 2007; Hajkowicz, 2009; Bammer *et al.*, 2005). This was evident with the introduction of *Caring for our Country* (CfoC) and the unexpected retreat from the regional model of NRM governance (Ryan *et al.*, 2010). The 40% drop in funding for regional bodies under CfoC resulted in reduced capacity, compromising their ability to deliver regional NRM plans (Robins and Kanowski, 2011). When trust and legitimacy of policy activity is hard-won (Vanclay, 2004), short-term and inconsistent funding is damaging (Pannell *et al.*, 2006).

Eckersley (2013:5) argues for a ‘much bigger and bolder endeavour’ in the future, building on networks and experience of existing Landcare groups and regional NRM bodies. Some argue that carbon markets could be used to reinvigorate the role of regional NRM organisations (Dale *et al.*, 2013; Van Oosterzee *et al.*, 2014; Vella and Sipe, 2014). This proposal would make it simpler for farmers to participate in generating carbon credits, as they could opt-in to a regionally coordinated effort using standardised templates, with regional NRM bodies acting as aggregators (Van Oosterzee *et al.*, 2014). This would also allow other regional NRM goals, articulated in regional plans, to be synchronised with carbon farming efforts, therefore working towards integrated resource management (Bellamy and Johnson, 2000; Marshall, 2009).

This chapter has introduced relevant literature covering barriers to change for farmers, the strengths and weaknesses of policy efforts to-date and possible future policy directions to for climate change mitigation in the agricultural sector. *Chapter 4: Policy Review* further details policy activity, providing context for the literature reviewed here.

Chapter 4: Policy Review

This policy review synthesises key policy efforts relevant to the six areas of GHG abatement outlined in the BZE LUP (see Table 1). As explained earlier, many of the measures in the BZE LUP have long been objectives of NRM policy. Subsequently, GHG mitigation objectives and associated policy are considered here as an overlay on a relatively mature policy domain, with all relevant policy activities included, regardless of whether they are primarily directed at the reduction of GHG emissions. First, the historical policy context is outlined. Second, the current policy context is summarised according to policy objective. Third, indirectly relevant policy is briefly covered, with a view to understanding opportunities to increase policy integration. This chapter is more descriptive than analytical, providing the context for critical engagement in *Chapter 5: Results and Discussion*.

4.1 Historical policy context

Agri-environmental policy, or natural resource management as it is typically called in Australia, has developed rapidly since the 1980s (Hajkowicz, 2009). This has been driven by increasing concern about the impact of agriculture on environmental systems and significant public investment, largely from the Commonwealth Government (Crowley, 2001). Table 6 summarises key Commonwealth NRM programs since 1990, as well as the *Land Sector Package*, the *Carbon Farming Initiative* (CFI) and the *Carbon Farming Futures Programme* (CFF), which accompanied the introduction of a price on carbon in 2011. Apart from facilitating small-scale involvement in voluntary carbon markets (Taplin, 2004), the CFI and CFF represented the first policy effort to achieve emissions reduction in the agriculture sector. In NSW, land sector offsets were also implemented under the Greenhouse Gas Reduction Scheme (GGAS), the first mandatory emissions trading scheme in the world, operating from 2003 – 2012 (APART, 2013).

Table 6: Commonwealth NRM programs

Program	Key objectives	Key outcomes
National Landcare Programme (NLP) - Introduced 1990/91 \$360 million	Increase awareness of land degradation, support sustainable agricultural practices and encourage community collaboration.	Land restoration and sustainable agriculture projects undertaken by individuals and community groups supported by grant-based funding (Sobels <i>et al.</i>, 2001).
Natural Heritage Trust (NHT) 1 & 2 - Introduced 1996/97 & 2000/2001 \$1.3 billion (NHT 1) \$1.2 billion (NHT 2)	Building capacity through formal NRM institutions and planning processes to work towards integrated catchment management (Marshall, 2009).	Establishment of 56 regional NRM bodies through bilateral agreements with States/ Territories (Robins and Dovers, 2007). Each region developed a regional NRM plan through community consultation. NRM regional bodies become key delivery agents for project funding (Lane <i>et al.</i>, 2009).
Caring for Our Country (CfoC) - Introduced 2007/2008 \$2.25 billion	Strategic targeted investments, with a greater focus on monitoring and evaluation (Robins and Kanowski, 2011).	Established wider use of market-based instruments (MBIs) to pay farmers for ecosystem services, with reduced focus on Landcare and regional NRM bodies
Land Sector Package (LSP), Carbon Farming Initiative (CFI) and Carbon Farming Futures Programme - Introduced 2011 as part of the <i>Clean Energy Future package</i> (CEF) which introduced a price on carbon. - CFF: \$140 million - LSP: \$1.7 billion for the <i>Biodiversity Fund, Indigenous Carbon Farming Fund, Regional Planning for NRM Climate Change Fund</i> and the <i>Land Sector & Biodiversity Board</i>.	The CFI was an offset mechanism for the Carbon Pricing Scheme under the CEF package, allowing the land sector to generate tradable carbon credits. The LSP complimented the CFI by funding CFI investment in projects with benefits for biodiversity and Indigenous communities. The LSP also allocated funds to update regional NRM plans for climate change and operated in addition to <i>Caring for our Country</i> NRM programs.	The CFI allowed land managers to generate carbon credits through adopting approved methodologies, which included avoided emissions and carbon sequestration (Macintosh and Waugh, 2012). Credits could be sold in compliance or voluntary markets, with additional LSP funds available to support projects with high co-benefits. The CFF funded RD & E to support participation in the CFI, as well as a tax offset for minimum tillage machinery. With the change of government in 2013, the <i>Clean Energy Act</i> was repealed and most aspects of the <i>Land Sector Package</i> were dismantled.

Note: Program details sourced from Hajkowicz (2009) and Department of Environment (2013) unless otherwise stated.

4.2 Current policy context

Current policy directly relevant to the GHG abatement measures can be divided into two categories according to policy objectives (Bates, 2001). Firstly, policy that has climate change mitigation in the agricultural sector as a primary objective. This applies to the *Emissions Reduction Fund* (ERF) and remnants of the *Carbon Farming Futures Programme* (CFF). Secondly, policy with climate change mitigation in the agricultural sector as one of many objectives, which can be broadly labelled as NRM policy, which relates to all measures aiming to reduce the impact of agriculture on environmental values, such as biodiversity, soil health and water quality.

The central feature of the current Commonwealth Government's 'Direct Action' climate change policy is the \$2.55 billion *Emissions Reduction Fund* (ERF), a modified version of the CFI. The ERF is used to purchase carbon credits generated under approved emission reduction methodologies in order to achieve Australia's commitment to a 5% emissions reduction on 2000 levels by 2020 (St John and Swoboda, 2014; Department of Environment, 2015). Unlike the CFI, which was attached to a price on carbon, demand for ERF credits is not being generated beyond government. Other defining features of the ERF include the reverse-auction mechanism to purchase lowest cost GHG abatement, coverage of all sectors of the economy and greater flexibility for aggregating carbon abatement projects (Commonwealth of Australia, 2014).

The *Carbon Farming Futures Programme* (CFF) was introduced to support the CFI and represented a significant investment in research, development and extension (RD & E). It consisted of three parts: 1) *Filling the Research Gap*, which funded R & D to support development of abatement methodologies, 2) *Action on the Ground*, which funded on-farm trials, and 3) *Extension and Outreach*, which funded communicating carbon farming opportunities to farmers. While no new CFF projects have been funded since the change of government in 2013, existing projects were funded to 2017, and so continue to contribute to operation of the ERF. Under the Land Sector Package, \$44 million was allocated to updating

regional NRM plans to include climate change mitigation and adaptation and these plans will be finished in early 2016 (Bohnet *et al.*, 2013; Department of Environment, 2013). The Commonwealth also continues to regulate the voluntary carbon market through setting offset accreditation standards through the *National Carbon Offset Standard* (NCOS) (Commonwealth of Australia, 2015d).

Under the current Liberal-National Party government, elected in 2013, the central Commonwealth NRM program has been renamed the *National Landcare Programme* (NLP), with a reduced budget of \$1 billion (Commonwealth of Australia, 2015e). In addition to the NLP, the \$700 million *Green Army Programme* also delivers NRM outcomes by employing Australians aged 17-24 to work on practical environmental projects (Commonwealth of Australia, 2015e). The contemporary Landcare movement is supported by state governments, the Commonwealth and through the corporate partnerships and donations (Landcare Australia, 2015). The NLP is the Commonwealth Government's contribution to Landcare activities and is separated into regional and national streams.

The NLP regional stream involves delivering funding to Australia's 56 regional NRM organisations, for administration, extension and devolved allocation of small grants. The national stream supports specific initiatives funded by the Federal Government. These include the *20 Million Trees Programme*, as well as programs inherited from *Caring for our Country*, which have no new funding allocated, but still require administration. This includes MBIs targeting biodiversity conservation, such as the *Environmental Stewardship Programme*, which pays individual farmers to protect endangered ecological communities (Lindenmayer *et al.*, 2012). The *20 Million Trees Programme* makes grants available to Landcare groups, individuals, as well as service providers for larger-scale plantings.

The NLP and NRM regional bodies are supported, to varying extents, by state governments through legal structures and additional funding (Hajkowicz, 2009). State governments also deliver separate environmental programs. For

example, VIC, NSW and QLD have biodiversity conservation MBIs (*BushTender*, *BioBanking* and *NatureAssist* respectively), where farmers are paid to protect valuable habitat (Zammit *et al.*, 2010). States also administer independent land management regulations, which are named differently between states but are based on the same underlying principles. These include environmental duty of care regulation, which refers to baseline standards of land management that landholders must maintain (Young and Shi, 2003). Agricultural activities that have the potential for high levels of pollution are subject to additional regulation, covering activities such as intensive livestock operations, including piggeries, beef and dairy cattle operations. Conditions of development approval often include measures related to effluent management and pollution risks (Rogers, 2008).

In relation to GHG abatement measures, the most important regulatory function undertaken by state governments is through native vegetation regulation and associated threatened species regulation. These regulations relate directly to state and local planning systems that determine land use decisions, with approval required for most land clearing activities. The establishment of native vegetation laws began in the 1990s and has been contested since then. In QLD, NSW and VIC, native vegetation legislation has recently been reformed to be less rigid, especially in QLD (Victorian Government, 2013; Byron *et al.*, 2014). In addition to state native vegetation and threatened species regulation, the Commonwealth's *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* enables the Federal Government to regulate activities relevant to matters of national environmental significance (MNES). The Commonwealth also coordinates state-based native vegetation management through plans, such as *the 2012 Native Vegetation Framework* and *Australia's Biodiversity Conservation Strategy 2010–2030*.

Table 7 summarises the key aspects of current policy addressing the six areas for GHG abatement outlined in the BZE LUP. It shows the coverage of the ERF, and where NRM policy is working to the same effect. It also highlights measures that are not objectives of NRM policy, namely manure management and enteric fermentation, and therefore where the ERF, and the inherited *Carbon Farming*

Futures Programme (CFF), are the only relevant policy activity. Policy activity is organised into three general categories, policy that *facilitates*, *induces* or *compels* (Bromley 1997), as established in Table 5.

Table 7: Current policy for abatement measures from the BZE Land Use Plan (1-3)

Areas for GHG abatement	GHG abatement measures	Key aspects of relevant current policy activity
1. Carbon sequestration in biomass	1.1 Increasing carbon stored in soils and plants through revegetation in agricultural landscapes.	Facilitate: <i>National Landcare Programme, The Green Army Programme and 20 Million Tree Programme</i> <i>CFF: Filling the Research Gap, Action on the ground, Extension and Outreach</i> - Providing accreditation standards for the voluntary offset market through NCOS. Induce: - ERF methodologies: Environmental planting of native trees; Human-induced regeneration; Permanent Mallee planting; Reforestation and afforestation. Compel: - State-based native vegetation/ threatened species regulation & Cth EPBC Act (1999) limiting land clearing.
2. Abatement of emissions from agricultural land clearing and soil carbon loss	2.1 Cease land clearing and re-clearing for agriculture.	Facilitate: <i>National Landcare Programme</i> Induce: - ERF methodologies: avoided deforestation; avoided clearing of native regrowth. - State and Commonwealth biodiversity conservation MBIs, which pay farmers to preserve habitat. Compel: - State-based native vegetation/ threatened species regulation & Cth EPBC Act (1999) limiting land clearing.
3. Abatement of emissions from enteric fermentation	3.1 Reduce enteric fermentation (technology and management).	Facilitate: <i>CFF: Filling the Research Gap, Action on the ground, Extension and Outreach.</i> Induce: - ERF methodologies: Dietary supplements for milking cows and beef cattle.
	3.2 Reduce enteric fermentation (reduce herd numbers).	Facilitate: <i>CFF: Filling the Research Gap, Action on the ground, Extension and Outreach.</i> Induce: - ERF methodology: Beef cattle herd management.

Table 8: Current policy for abatement measures from the BZE Land Use Plan (4-6)

Areas for GHG abatement	GHG abatement measures	Key aspects of relevant current policy activity
4. Abatement of emissions from agricultural crops and soils	4.1 Reduce synthetic fertilizer application, enabled by alternative cropping and grazing regimes (e.g.: conservation tillage) that maintain nutrient levels.	Facilitate: • <i>National Landcare Programme</i> • CFF: <i>Filling the Research Gap, Action on the ground, Extension and Outreach.</i> Induce: • ERF methodology: Reducing fertiliser use in irrigated cotton. Compel: • State-based environmental duty of care and pollution regulation.
5. Abatement of emissions from biomass burning	5.1 Reduce savannah burning.	Facilitate: • <i>National Landcare Programme</i> • CFF: <i>Filling the Research Gap, Action on the ground, Extension and Outreach.</i> Induce: • ERF methodology: Early dry season savannah burning.
	5.2 Reduce burning of crop residues.	Facilitate: • <i>National Landcare Programme</i>
6. Abatement of manure management emissions and bioenergy opportunities	6.1 Adopt on –farm energy generation using bioenergy.	Facilitate: • CFF: <i>Filling the Research Gap, Action on the ground, Extension and Outreach.</i> Induce: • ERF methodology: Destruction of methane in dairies/piggeries and biodigesters in piggeries.
	6.2 Reduce manure stockpiling.	No relevant policy

To provide a more comprehensive view, two further policy areas are canvassed briefly here: rural economic development and drought policy. These areas are raised because of the potential synergies and conflicts with emissions reduction outcomes in the agricultural sector, which are explored in *Chapter 5: Results and Discussion*.

Since World War Two, federal and state government policy for rural and regional Australia has been characterised by a shift away from protectionism and government support to market liberalisation and self-sufficiency (Hogan and Young, 2013). This has involved a focus on economic growth in the regions to support individual and community-level self-sufficiency (Hogan and Young, 2013). This approach has been reflected in the recent *Agricultural Competitiveness White Paper* (ACWP), which aims to increase investment, job creation and economic growth in the agricultural sector, with a strong focus on improving profits 'to the farm gate' (Commonwealth of Australia, 2015a).

The ACWP has five priority areas: 1) Fairer competition for farmers, 2) Infrastructure investment (with an emphasis on water), 3) Drought and risk management 4) Farming smarter through R & D investment and 5) Accessing premium markets (Commonwealth of Australia, 2015a). At the state level, rural economic growth is being pursued through *Regional Growth Plans* (NSW & VIC) and the *QLD State Planning Policy* (NSW Department of Planning and Environment, 2015; QLD Department of Infrastructure Local Government and Planning, 2015; VIC Department of Transport Planning and Local Infrastructure, 2015). These plans articulate priorities to guide local level planning, focusing on increasing population and economic activity in regional areas.

Consistent with the self-sufficiency trend, drought policy has also seen a marked shift away from relying on government (Botterill and Cockfield, 2013). This is seen in the *Intergovernmental Agreement on National Drought Programme Reform* (2013) building on the *National Drought Policy* (1992) focusing on encouraging farmers to better prepare for droughts and manage business risk. Despite this, government support for farmers experiencing drought remains significant. Federal level drought support now includes the

Farm Household Allowance, Farm Finance Concessional Loans, Farm Management Deposits, and flexibility in taxation arrangements for all farmers experiencing financial hardship. State level policy such as the *NSW Drought Strategy* and *QLD Drought Relief Assistance Scheme (DRAS)*, also involve land tax relief, transport subsidies and RD & E (QLD Department of Agriculture and Fisheries, 2015; NSW Government, 2015).

This review has summarized the policy landscape, describing the range of relevant policy areas and highlighting their key features. The strengths and weaknesses of these policy efforts are explored in the second section of *Chapter 5: Results and Discussion*.

Chapter 5: Results and Discussion

This chapter presents the findings from the fifteen semi-structured interviews and discusses them in relation to *Chapter 3: Literature Review* and *Chapter 4: Policy Review*. First, seven key barriers to farmers adopting GHG abatement measures are identified. The subsequent discussion considers current policy and future directions in relation to these barriers, informed by the key aspects and principles of effective policy design established in *Chapter 3: Literature Review*.

5.1 Barriers to change: Insights from farmer interviews

The barriers to adopting GHG abatement measures experienced by the farmer sample can be organised into two primary categories: *Characteristics of the change* and *Circumstances of the farmer* (Pannell et al., 2006; Greiner and Gregg, 2011). Given the policy focus of this thesis, a third category is identified here, *Characteristics of relevant policy efforts*, which acknowledges that policy itself can present barriers. Barriers were either explicitly identified by the farmers or implicitly referred to and identified through analysis. The relative importance of the different barriers is not delineated in this thesis, though it is well established that financial cost barriers have the biggest impact (Pannell *et al.*, 2006). These barriers are also generic, in that they do not refer to specific GHG abatement measures, which have varied cost-benefit characteristics. The seven key barriers identified are presented and defined in Table 9 and discussed further below.

Table 9: Barriers to adopting GHG abatement measures for farmers

Key barrier	Features of barrier
Characteristics of the change	
1. <i>Financial costs of the change</i>	Determines relative advantage and consists of material, labour, maintenance and foregone productivity costs. Net costs determined by benefits of the change.
2. <i>Complexity or novelty of the change</i>	Determines trialability and refers to technological characteristics of the change and how different they are to existing management practices.
Circumstances of the farmer	
3. <i>Lack of capacity to change due to other pressures</i>	Refers to external factors influencing farmers' financial and emotional capacity to change. Two key factors discussed here: declining terms of trade and climate change impacts.
4. <i>Inadequate level of information</i>	Refers to current understanding of, and access to information about, the change and its associated costs and benefits. Relates to 1. <i>Complexity or novelty of the change</i> and 7. <i>Complexity of government policy</i> .
5. <i>Sociocultural context not conducive to change</i>	Refers to established sociocultural norms, such as conservatism, stoicism and denial of climate change science, which limit acceptability of change.
Characteristics of relevant policy efforts	
6. <i>Inconsistent government policy (policy objectives and delivery)</i>	Refers to contradictory policy objectives and instability in delivery which undermines perceived legitimacy of, and willingness to engage with, policy efforts to motivation change in practices.
7. <i>Complexity of government policy</i>	Refers to complexity of policy frameworks and difficulty experienced in interacting with them.

5.1.1 Characteristics of the change

Barrier 1: Financial costs of the change

Financial costs of a change determines the relative advantage and therefore the likelihood of adoption (Pannell *et al.*, 2006). Costs associated with GHG abatement measures include reduced profitability cost (opportunity cost), the cost for materials, labour costs and maintenance costs. For example, revegetation would displace grazing, require input costs for fencing and labour

and may require a level of ongoing management. However, net costs are also determined by benefits of the change and while longer-term financial benefits of some practices were acknowledged, short-term costs were seen as prohibitive. Cost barriers are well established as the most influential in farmer decision-making (Pannell *et al.*, 2006), however, this factor cannot be viewed in isolation (Greiner and Gregg, 2011; Reeson, 2008).

Box 1 - Quotes from farmers supporting Barrier 1: Financial costs of the change

"If the government came out and said you had to spray your field with something to reduce emissions- it's just another job- it's another cost – who's going to pay for that cost?" (Farmer 4)

"The labour cost is the big one. We use a lot of volunteer work on our farm and we couldn't manage it without that. We couldn't afford to pay for the planting, fencing and weeding that the volunteers do." (Farmer 2)

"One thing I have learnt is that while I love my environment, you can't just lock it up, you need some sort of ongoing management." (Farmer 6)

Barrier 2: Complexity or novelty of the change

As identified by Ohlmer *et al.*, (1998), the complexity or novelty of the change presented can impede implementation due to a lack of understanding and higher risks. GHG abatement measures were discussed by farmers in two categories: 1) measures familiar to farmers being suggested on a larger-scale, involving revegetation and soil management and 2) completely new measures, largely relating to enteric fermentation and manure management. Complexity and novelty were not barriers for the former, but were for the later. As Farmer 5 expressed: *"That's the one (enteric fermentation) that we hear and go 'oh hell'- we don't understand it"*. This reflects the close alignment of many GHG abatement measures with existing NRM objectives, as outlined in the *Chapter 4: Policy Review*.

5.1.2 Circumstances of the farmer

Barrier 3: Lack of capacity to change due to other pressures

All the farmers identified other pressures that were limiting their capacity to consider and implement GHG abatement measures. Declining terms of trade, with increasing costs and decreasing returns, was widely identified as the cause of financial and emotional stress. These stresses have limited the financial and emotional capacity to invest in changing practices. Unfavourable market conditions and the inability to pass on extra costs was regularly given as a reason not to change. This related to domestic markets and the influence of the supermarket duopoly and global markets, where Australian producers are competing with highly subsidized agricultural sectors in other countries. This supports previous research demonstrating the social costs of the increasingly trade-exposed Australian agricultural sector (Smith and Pritchard, 2012).

Difficult climatic conditions were also perceived to affect capacity to change, which the farmers attributed partly to the impacts of climate change. Farmers cited the increasing frequency of droughts and floods, more severe fires and insect infestations as placing strain on their farming operations by making it harder to return a profit and therefore reducing flexibility to implement GHG abatement measures. Farmer 5 in particular expressed feelings of being forced to make undesirable management decisions in order to stay afloat when his area is facing sustained decreases in winter rainfall. This sentiment is reminiscent of the 'vicious cycle' described by Ogilvy *et al.*, (2015).

Box 2 - Quotes from farmers supporting Barrier 2: Lack of capacity to change due to other pressures

"Farming is a lifestyle thing...But every year there is a little bit less lifestyle. When I grew up around here we never worked on a Sunday. We rarely worked after dark. Now we'll walk past some of our machines and they are covered in lights. Now my farm is open 16hrs a day, seven days a week, every day of the year...I'd like to have more time to do that sort of stuff and follow up this grant and that grant, but it just doesn't happen." (Farmer 5)

"I haven't done much planting recently. Partly because it was easier to make a living back then than it is now. Now you're just flat out all the time just surviving...Especially when you're dealing with the big operators like Woolworths and Coles."(Farmer 4)

"Every morning when I go and put my boots on, I am at the Olympic Games and everyone we're racing against is on steroids. Everything I tell you will be tainted by that fact. We are on the world stage." (Farmer 5)

"The one in January was the mother of all fires...People don't want to admit it but reading between the lines people knew that the scrub was the driest it has ever been before. These are the events that hit you in the face. There are things you can't ignore. You'd have to be very ignorant to not think we are looking down the barrel." (Farmer 5)

Barrier 4: Inadequate level of information

Information barriers relate to the level of understanding of GHG abatement measures and access to information that enables confidence to implement them (D'Emden *et al.*, 2006; Vanclay, 1992). As mentioned in *Barrier 2: Complexity or novelty of the change*, level of understanding varies about GHG abatement measures. However, even for familiar measures, understanding the climate change implications increases complexity and adds information demands; especially for those generating carbon credits, which relates to *Barrier 7: Complexity of government policy*. Farmers acknowledged that the internet gave unprecedented ability to access and share knowledge. However, they felt that personal exchanges and information 'on the ground' was needed to influence behaviour, as is well established (Australian Public Service Commission, 2007). They also referred to a more general lack of understanding of climate change, and agriculture's contribution to emissions, as a barrier to engaging with the issue. This was reinforced by the DPI policy official, who observed limited

understanding of soil carbon among farmers. Some felt the information they had received from government was inaccurate, which contributed to climate change denial and perceptions of government information as not credible (Vanclay 2004). Farmer 6 described his experience: *"We've had some real crap. One fellow came down, quite a high-up fellow, and said that the Murray River would never flood again. Then the next year it did. People straight away hone in on that."*

Box 3 - Quotes from farmers and policy official supporting Barrier 4: Inadequate level of information

Farmers:

"You need to get in touch with the expertise and that drives enthusiasm. If knowledge and confidence reached a certain level, I'd just go and borrow the money and do it myself (install a biogas plant). I don't have the time or energy to track it all down and do all the homework... It's like the move into growing Avocados. We did a little bit of research but I gained the confidence to go and do it from the knowledge of other local people growing them. If you've got someone constantly putting the information in front of you, then that's what it is about." (Farmer 6)

"People know that it (climate change) is occurring but feel like it is out of their control. Nobody really knows how to act on it." (Farmer 2)

Policy Official:

"We learnt that most farmers didn't actually have an idea of what their soil carbon levels were." (NSW DPI Policy Official 7)

Barrier 5: Sociocultural context not conducive to change

While the farmers interviewed were all leaders in embracing change, the conservative culture of the wider farming community was identified as a barrier to adopting further GHG abatement measures. The farmers defined this culture as stoic, self-justifying and resistant to change, consistent with established research (Cockfield, 2013). These attitudes were particularly evident in relation to climate change, with farmers describing high levels of climate change denial in their communities, reinforcing previous findings on understanding of climate change among farmers (Fleming and Vanclay, 2011; Buys *et al.*, 2012; Evans *et al.*, 2011). This divided understanding of the problem undermines the impetus

for a meaningful response. Farmers felt this sentiment was fuelled by political indecisiveness on the issue and despite their own 'belief' in climate change, sought a clearer message from government.

Box 4 - Quotes from farmers supporting Barrier 5: Sociocultural context not conducive to change

"I've got to be very careful here about what I say, because there is no point being a farmer if you take a negative attitude - then why don't you get out?" (Farmer 4)

"People worry about what their neighbors will think. The pressure that is put on people who do things differently is very real." (Farmer 1)

"At the moment things are changing for the worse, quickly...From every farmer you would get a different reason why." (Farmer 5)

"Personally, I'd like to see a bit more of an admission from the government on what their stance actually is. Whether this is a problem that is a man-made thing. That's pretty annoying...Too much fence-sitting going on." (Farmer 4)

5.1.3 Characteristics of relevant policy efforts

Barrier 6: Inconsistent government policy (policy objectives and delivery)

Government policy was seen to be inconsistent in two ways: 1) contradictory policy objectives and 2) lack of stability in policy delivery. Farmers perceived contradictions in policy goals both within agriculture, where the short-term productivity objective remains pervasive (Bjørkhaug and Richards, 2008), as well the wider government agenda, where the underlying causes of climate change, such as fossil fuel use, were not being addressed. These inconsistencies in policy goals undermined the perceived legitimacy of policy efforts aimed at reducing emissions in the agricultural sector and farmers' motivation to change. Short-term contracts for staff on the ground, short-term project grants and constant changes in policy direction have also affected willingness to engage in government efforts to promote improved land management practices and GHG abatement. This experience supports existing research that shows

inconsistency in policy delivery erodes community trust (Vanclay and Lawrence, 1995; Mitchell *et al.*, 2007).

Box 5 - Quotes from farmers supporting Barrier 6: Inconsistent government policy

"They [Department of Agriculture] are still advocating more and more fertilizer, more and more pesticides – they've just gone down that direction....I've been along to field days just to see what they say and I can't believe what I hear." (Farmer 1)

"...when you've got governments that are digging up fossil fuels as fast as they possibly can, why should I be told to plant a chunk of my farm down to trees? ...it's just a bit silly to do small things on an individual farm like this when you've got so many bad things going on that are reversing any progress you might make." (Farmer 3)

"They [government] keep moving the goal posts – or pulling the goal posts down...Change of governments and no direction...they are so variable and changeable that you can't trust them." (Farmer 1)

"The government only talks, in farming sense, short-term- you don't even get a medium term, which with farmers is 5-10 years. We hear all of this stuff, but the timeline is wrong for us. They've got to bring in more medium to long-term things." (Farmer 5)

Barrier 7: Complexity of government policy

The complexity of the policy landscape, with multiple governance layers and numerous programs, some with highly technical features, can make participating with confidence difficult. This is exacerbated by the policy instability explained above. None of the farmers could articulate a clear understanding of current policies to achieve GHG abatement measures in the agricultural sector. As Farmer 4 expressed, *"We try to keep abreast of it, but if it's not that relevant you switch off a bit. I find the CFI a bit hard to understand, it's not that simple."* As established in the literature (Bammer *et al.*, 2005; Mitchell *et al.*, 2007), policy complexity was widely acknowledged by policy officials as a barrier to engagement.

5.2 Current policy and future directions

Given the general nature of the barriers identified above and their consistency with existing literature, their relevance to the broader farming community is assumed. These barriers provide the basis for the following discussion, which considers how policy efforts to-date, introduced in *Chapter 3: Policy Review*, have addressed these barriers and how they could be overcome in the future through effective policy design. This discussion is structured around the policy analysis framework adapted from Dovers and Hussey (2013) covering policy framing, policy instruments and policy delivery. It draws on data from the interviews with farmers and policy officials and builds on *Chapter 4: Literature Review*.

5.2.1 Policy framing

Findings from the interviews exposed weaknesses in policy framing related both to problem and response definitions and inconsistent policy objectives (Dovers and Hussey 2013). The farmers interviewed felt that current policy was not looking at “*whole landscape function*” (Farmer 1) or the “*bigger picture*” (Farmer 5). They believed that the scale of the response was inadequate and that different components of the problem were not linked in a holistic approach. Farmers expressed intuitively what Dovers and Hussey (2013) highlight as the importance of problem scaling through connecting meta-problems, sustainability, to macro-problems, climate change in the agricultural sector, to micro problems, management of different on-farm emissions sources. Farmer 3 explained this disconnect: “*If they try at the moment to tell us we have to lock up carbon, people are just going to laugh and say, ‘well, why approve all these new coal mines?’ It has to be a genuine over all policy, not just a little gimmick on the side.*” Farmers wanted to see climate change mitigation activity in the land sector as part of a holistic landscape management and an economy-wide mitigation effort.

Disconnection between related policy problems was demonstrated well with climate change mitigation and adaptation, which are typically addressed discreetly, adaptation at the state level and mitigation at the Commonwealth level (Wilkins, 2008). This characterisation of the problem does not encourage a connection between cause and effect or the long and short-term action that is required. It also does not allow synergies and trade-offs between adaptation and mitigation to be understood and negotiated (Berry *et al.*, 2015). As Policy Official 7 from NSW DPI commented: *“Doesn’t matter what you call it but one action can have multiple outcomes....so collectively there has probably been a bit of a disservice to label something as adaptation and something else as only mitigation.”* This separation may also help facilitate the emphasis on adaptation to ‘climate variability’, an ambiguous and politically-charged term that confuses climate change science and legitimises denial. Comments from Policy Official 9 from the NFF demonstrated this mentality:

“The NFFs approach to climate change has been to stay away from the debate about what is causing climate change and focus on climate variability and helping farmers adapt. Adaptation to climate variability rather than fundamental shifts in business models to mitigate significant amounts of carbon.”

Adaptation was often discussed as being the solution to the problem, indicating a reactive approach that focuses on undeniable observable impacts now, but doesn’t acknowledge future transformative change. Not adequately defining how sub-problems relate to each other and larger-scale problems leads to policy inconsistency in objectives and delivery.

Tension between different objectives was evident when talking to policy officials about the Emissions Reduction Fund (ERF). All of the policy officials mentioned productivity co-benefits of mitigation measures as being crucial to their current uptake under the ERF. The income from ERF carbon credits was repeatedly referred to as the *“icing on the cake”*, with the productivity gains of adopting the mitigation measures the primary motivation. Policy officials saw

the ERF as a tool to highlight the productivity benefits of mitigation activities to industry, therefore having influence beyond those participating in the ERF and potentially acting as a catalyst for wider-scale adoption of mitigation measures in the sector. This strength in framing comes from emphasising the relative advantage of mitigation measures by demonstrating where cost barriers are low, therefore appealing to influential productivity discourses (Fleming and Vanclay, 2011).

While the emphasis on productivity has made adopting climate change mitigation measures more accessible and attractive for some, it also raises potential contradictions. If the policy intent is focused on productivity, this opens the possibility for the primary mitigation objective to be compromised by focusing on emissions intensity rather than net reduction. For example, if research and development (R & D) funding is being driven by short-term profitability rather than to achieve deep emissions reductions. These inconsistencies in policy objectives can make policy seem insincere, creating barriers to farmer engagement. This focus may also act to reinforce exclusively profit-driven productivity discourses, rather than still appealing to existing motivations but shifting emphasis to resilience and long-term productivity (Fleming and Vanclay, 2011). This difference is important, although subtle, highlighting the need for improved policy integration, discussed later in further detail.

Box 6 - Quotes from policy officials addressing the productivity objective

“Some people might do ERF type projects, but not formally, because of complicated paperwork and auditing, but they might change because they see the productivity benefits. In a way the ERF could be a catalyst for change across the industry... in a way that focus on productivity is self-perpetuating.” (Cth. DoE Policy Official 2)

“I don’t think you can under-estimate the self-start potential here.” (Cth. DoA Policy Official 2)

“You couldn’t say climate change is a high priority for the department. Supporting farmers to be more productive is a high priority and if improving soil carbon improves productivity then carbon sequestration is a bonus, it’s not the key objective; it’s about productivity.” (Cth. DoA Policy Official 3)

“To sum up our policy: we want investment in mitigation options that both improves productivity as well as reduce emissions, making them palatable to farmers...We are very willing to reduce emissions intensity of our activities; the emissions per unit of production.” (NFF Policy Official 9)

“...My personal view is that, led by industry and government, we are investing more in the applied end of research, which means the technologies that are not business as usual but are not really long term.” (NSW DPI Policy Official 7)

To address challenges of policy framing, participants referred to a range of priorities. Farmers expressed the importance of acknowledging that meta and macro-problems need to be addressed consistently across policy platforms (Dovers and Hussey 2013). This could support a better understanding of climate change, how it translates to management decisions and the implications of those changes for other policy objectives, for example, adaptation (Watkiss *et al.*, 2015).

While the context for change needs to be better established, emissions from agriculture will always be difficult to comprehend, with fluxes of GHGs occurring constantly, diffused over vast landscapes and accumulating over long timeframes (Lorenzoni *et al.*, 2007). In light of this, the importance of focusing on local co-benefits of climate change mitigation was widely cited by farmers and policy officials. As is well established (Australian Public Service Commission, 2007), social, environmental and economic benefits, on a

recognisable scale, were acknowledged by participants as being most motivating. This would involve not isolating mitigation as a priority, but shaping it to a broader resilience imperative linked to adaptation and long-term productivity. Encouraging a sense of opportunity and a focus on resilience could help overcome sociocultural barriers.

Box 7- Quotes from farmer and policy official explaining framing co-benefits

Farmer:

“Almost everyone would change for reasons other than climate change mitigation. It’s hard for everyone to understand and get a grasp on climate change. Changing for financial or environmental reasons, people will do it because it’s easier to grasp that, even though the outcomes are going to be the same.” (Farmer 1)

Policy Official:

“Mitigation measures can contribute to longer-term profitability and sustainability of the agricultural sector - that should be emphasised more... rather than it just being ‘here’s a contribution that agriculture is making to Australia’s GHG reduction targets.’ (NSW DPI Policy Official 7)

A focus on co-benefits and resilience could resonate with a diverse range of public values (Vigar and Healey, 2002). The challenge is to appeal to the dominant short-term profitability discourse, while simultaneously shifting the discourse to a sustainability and resilience focus (Fleming and Vanclay, 2011; Daviter, 2007; Bacchi, 2009). While greater emphasis on productivity benefits could broaden appeal, Rutherford and Campbell (2014) urge caution and encourage recognition of trade-offs involved in giving ‘principled priority’ (Lafferty and Hovden 2003:9) to environmental and sustainability outcomes.

One possible path forward discussed with policy officials involved the ‘clean and green’ image used by Australian producers to promote Australian produce to export markets (ABARES, 4th March 2014). While the credibility of these claims has been questioned (Chang and Kristiansen, 2006), this discourse is already owned by industry. With two-thirds of Australia’s produce exported

(Department of Agriculture and Water Resources, 2015), Policy Official 9 from the NFF confirmed this could be a useful point of leverage:

“Ultimately this is a business ploy, so if that’s the way in which policy needs to be framed, ‘these policies will help us maintain this clean green image in order to get a premium price and these are the policies you have to comply with’, then that might be a very good way to frame it.”

Adding greater credibility to ‘clean and green’ claims could provide an advantage in competitive global markets and attract premium prices from an increasing number of consumers, especially in Asia, willing to pay more for sustainably produced products (Nielsen, 17th July 2014; Tseng *et al.*, 2013; Ogilvy *et al.*, 2015). Reducing GHG emissions could be actively included in increased ‘green’ credentials. This approach could address circumstantial barriers for farmers adopting GHG abatement measures. By attracting a premium price, capacity to change could be increased, allowing long-term benefits to outweigh short-term costs. Improved land management practices also increase resilience to climate change impacts and the sociocultural context could shift as the identity of Australian agriculture evolved. Ogilvy *et al.* (2015) refer to these reinforcing elements as the ‘virtuous cycle’ that the Australian agricultural sector should aspire to.

Effective framing will be increasingly important as climate change impacts intensify. A focus on framing change as a normal learning process would help to overcome sociocultural barriers to change in rural communities. As Farmer 5 noted, *“There is a perception that admitting there is something wrong is admitting that you’re doing something wrong at the moment. Rather than saying, ‘the world is a constantly changing thing.’”* While linking weather events to broader trends has been problematic in the past (Hulme, 2009), better communication around extreme events could be useful in harnessing them as catalyst for longer-term change in practice. Farmer 1 stressed the potential here, *“While the drought is on, it’s hard to change but when the drought breaks, that is when a lot of change happens. People realise they have to do things differently for when the next drought happens”*. Broader policy framing will guide

policy instrument design and delivery. However, instrument and delivery aspects also have distinct framing dimensions, which are included in the following discussion.

5.2.2 Policy instruments

Facilitation

Two aspects of facilitative approaches are discussed here: community engagement and education and investment in RD & E. All the farmers had been involved with Landcare to varying degrees and spoke of the importance of grassroots engagement, ownership and education. Farmers thought Landcare worked because of the social, community-oriented focus and availability of funding and other resources. This reinforced existing research recognising the success of Landcare in overcoming socio-cultural, information and cost barriers (Curtis *et al.*, 2008; Lockwood, 2000; Sobels *et al.*, 2001). Consistent with the literature, reductions in funding, inconsistent policy delivery, volunteer burn out, a narrow conservation focus and increasing bureaucracy were identified as reasons for Landcare's decline (Tennent and Lockie, 2013). Regional NRM bodies were also mentioned as important for local education and engagement. The reduced prominence of these institutions is discussed more in the policy delivery section.

The importance of continued and increased education and community engagement, supported by funding for group projects, was stressed by farmers. As Farmer 1 explained: *"The pressure that is put on people who do things differently is very real. Easiest way to overcome this is to get farmers into groups. Work together; share ideas; support each other."* The need for education from experts and information exchange between farmers was emphasised, particularly in relation to science about climate change and mitigation options, given the complexities and misunderstanding of the science. Farmer 3 believed that if farmers were better educated about climate change impacts, they could be advocates for change, given their vulnerability: *"If farmers understood the risk, then you might get a groundswell of demand from farmers to take action"*. This may be starting to occur, with the NSW Farmers Association recently

publicly calling on governments to ‘transition from fossil fuels’ (Hannam, 16th July 2015).

Re-invigorating the Landcare approach was suggested by some farmers as an option for upscaling education and community engagement. In addition to the traditional focus on conservation and environmental quality, a revived Landcare movement could also include production values and a strong mitigation objective. This would be consistent with the broader holistic policy framing described earlier. Farmer 6 described an innovative new ‘Landcare Producer Group’ as the *“best model”*, explaining: *“It’s a group whose heart is in Landcare and conservation but whose soul is in production. We try to marry the two together.”* Re-invigorating Landcare in this way could enable the sociocultural context to become more conducive to implementation of GHG abatement measures. As Farmer 3 stressed: *“You need people to believe that it is important, rather than just throwing handouts at them.”*

Box 8 - Quotes from farmers explaining experiences of Landcare

“...the education that came from that (Landcare) was absolutely profound. It turned the whole farming thing on its ear, people became concerned about drainage and birds...” (Farmer 6)

“Landcare worked because it got farmers back communicating again....Our meetings weren’t boring, they were just parties.” (Farmer 1)

“Providing education and funding for on ground works has changed the mindset of farmers.”, “Ten years ago it reached a point where it did stagnate, but that’s no reason to get rid of it, that’s a reason to reinvent it, to get some other direction.” (Farmer 1)

“There wasn’t enough strings to its bow. It seemed to be very much just down the line of just planting trees and that’s how everybody took it... needed greater focus on production... Landcare needs to be snapped off and stuck in the ground to start growing again.” (Farmer 5)

Investing in R & D was another key facilitative approach raised in interviews. There was a perception among farmers that more R & D was needed and that the farming community should be included in the process. As Farmer 2 noted:

“There needs to be a lot more research done. The government needs to get scientists out in the field, working with groups and collecting data. Through this process you will achieve education.” This was reinforced by the NSW DPI policy official, who had seen the educational benefits of farmers being involved in a recent soil carbon pilot scheme: *“We got some engagement from our pilot almost from a learning perspective – it was seen as an opportunity to learn about what their soil carbon levels are actually like.”*

While significant investment in research, development and extension was made under the *Carbon Farming Futures Programme* (CFF), there has been no further funding allocated. This means publicly funded innovation, rather than profit-driven private investment, will not be advanced and mitigation-specific extension will remain limited. These policy decisions have implications for overcoming cost, complexity and information barriers to farmers adopting GHG abatement measures. Policy Official 7 from NSW DPI explained:

“This government isn’t putting any more money into it because they think that it is already done and that now we just need to see if it will be taken up. I don’t think that’s true. We need a lot more R & D and follow through on elements of that...Some of the more experimental technologies for agriculture could do with more investment. Some of them could be higher risk but potentially much higher returns as well.”

Continued investment in RD & E is crucial in developing and disseminating expertise, especially given the complexity and novelty of many GHG abatement measures.

Regulation

Compelling change through regulation is notoriously difficult in the land sector with high compliance and transaction costs (Smith *et al.*, 2007) and strong cultural resistance to government interference (Bartel, 2014). Land clearing laws, the most prominent and controversial of the relevant regulation, had not directly impacted any of the farmers interviewed because their properties were cleared before these regulations were introduced. Despite this, regulatory

approaches were still unpopular with the farmers interviewed, though potential effectiveness was acknowledged. Farmers preferred less adversarial approaches, as Farmer 3 explained: *“It’s much better to work together with communities, work together rather than relying on regulation. You get a much better result if everyone is pulling in the same direction.”* This is consistent with suggestions by Van Oosterzee *et al.* (2013:308) to place greater emphasis on ‘what should be done’, rather than ‘what cannot be done’.

Regulatory approaches to emissions reduction in the agricultural sector were seen by some policy officials as necessary in the long term. Excluding agriculture from regulatory negative incentives, such as an ETS or levy system may be increasingly difficult to justify, though it would be highly contested. The complications, both political and practical, of including agriculture in an ETS are well known and other sectors will need to move first (Saddler and King, 2008). In the short-term, using the agricultural sector as a source of offsets to accompany an ETS, as the original CFI was intended, was acknowledged by participants as a strategic approach. Any instruments that generated funds, such as a GHG levy on agriculture (Saddler and King, 2008), could be used to reinvest in land management projects.

In any case, any regulatory instrument including agriculture would have to be related to international moves to do the same, so Australia was not further disadvantaged in a competitive global market place. This depends on progress through international policy frameworks, which is not advanced for the agricultural sector (Murphy *et al.*, 2010). If other barriers were overcome, for example, through influencing the sociocultural context, regulation may become more acceptable in the future.

Box 9 - Quotes from policy officials and Farmer 5 regarding regulatory approaches.

Policy officials:

"Agriculture shouldn't be a special case...In the mean time trying to find some innovative ways to overcome transaction costs and treating them as a source of credits is probably a reasonable thing to do, but if you've got good systems in place, it's hard to maintain why agriculture should be different to other sectors." (NSW DPI Policy Official 7)

"Agriculture is very willing to play a part in the reduction task, it does need to be understood that we are very trade-exposed and that we are a very important industry – we produce food – it should always be viewed in that context." (NFF Policy Official 9)

Farmer:

"The Australian government has been saying to them (other countries) this entire time (since the 70s), 'this isn't fair, you should do what we're doing', but they haven't altered their stance at all. No country has listened to the Australian government giving the Australian farmers as an example of not subsidizing...If we go and tell them that we've reduced our emissions by reducing our herd, will they listen? Over the last 30 years, they haven't listened." (Farmer 5)

Incentives

The Carbon Farming Initiative (CFI), now Emissions Reduction Fund (ERF), has introduced a MBI to drive adoption of GHG abatement measures through purchasing carbon credits generated by landowners. The MBI approach is effective in overcoming cost barriers through establishing a mechanism for payment for ecosystem services for farmers (Lockie, 2013). As mentioned above, this approach is also engaging industry with the productivity benefits of mitigation measures, with potential broader influence.

However, in its current form, the ERF is complex, narrow, and inaccessible and viewed with scepticism due to the risks involved (Van Oosterzee, 2012). Despite being motivated and engaged with previous government activities (mainly through Landcare), none of the farmers interviewed had been involved in the CFI/ERF or had a good understanding of the current ERF. This is not surprising given the total number of agriculture projects under the CFI at the end of 2014

was 55 (Climate Change Authority, 2014) and the number of projects funded at the first ERF auction earlier this year was 107 (Sturmer and Main, April 23rd 2015).

The ERF was seen by farmers as complicated, not relevant and not legitimate because of its tokenistic nature as Australia's primary climate change policy. As Farmer 3 explained: *"Carbon farming is a con... it's all a bit higgledy piggledy...no one around here takes it too seriously."* There were also concerns about the permanence of carbon in the landscape and potential liability for those involved. Farmer 2 had attended a meeting on the CFI and described farmers' impressions: *"The mood of the meeting was that farmers were too vulnerable. Which was a pity because there was a few hundred people there who were interested in it. Farming is so risky already. No one wants to take on more risk."* This further demonstrates the effect of barriers to engagement associated with policy complexity.

The Farmers' perceptions were reinforced through interviews with policy officials who acknowledged that generating carbon credits was confusing and involved high transaction costs, with application writing, implementation as well as monitoring and reporting. The risks for farmers entering contracts, given the inherent uncertainty about actual GHG abatement, were also of concern. Furthermore, because the ERF is expanded to include all sectors of the economy, future opportunities may be limited for the land sector as other sectors will be able to offer lower cost abatement. Low carbon prices, such as the \$14 per ton realised at the first ERF auction, mean many land sector projects are not viable (Evans *et al.*, 2015; Van Oosterzee, 2012), despite delivering co-benefits other than abatement. These factors, as well as the finite nature of available investment through the ERF, mean market-based opportunities remain niche, mainly accessible to larger operators and are not overcoming barriers to adopting GHG abatement measures for most farmers.

Box 10 - Quotes from policy officials regarding the Emissions Reduction Fund

“A lot of farmers are in the business of farming, not negotiating contracts – so it will tend to lend itself to the business savvy or the larger producers who can pay to have someone do it on their behalf.” (NFF Policy Official 9)

“The big operators can afford to make a change and some of the methodologies are hugely complicated – so you need to have a team working on how to implement them.” (Cth. DoE Policy Official 2)

“We’re particularly concerned about the contracts that our farmers negotiate into, especially with aggregators, e.g.: if they under deliver carbon, if they over deliver, timing issues. There is significant business risk.” (NFF Policy Official 9)

“The problem for us is that in the first auction there were quite a lot of land sector projects, but that’s probably because that’s where most of the methodologies exist. As methodologies come online for other sectors – power stations, large manufacturing – they will be able to achieve emission reductions at a much lower price than the land sector.” (NRM Regions Australia Policy Official 8)

All farmers recognized that financial incentives had the most immediate and wide-scale impact. While none of the farmers had participated in carbon markets, carbon credits were seen as a promising method for generating payment for ecosystem services in the future. However, the experience with the carbon price and CFI had left some cynical. Farmer 1 lamented: *“It was almost in place....It was world leading. Probably needed tweaking around the edges. But we lost that opportunity. Whether we can get it back again, I don’t know. Will any government be game to do it ever again?”* Farmer 6 also expressed disappointment: *“When carbon farming first came out we got excited because that is where we thought it was going to go and it’s just stalled and gone nowhere.”* Ideally, a future carbon market would be simpler to participate in and have a much broader scope than the ERF, with demand being generated beyond government (Fargher, 2013). A preference for more traditional tax incentive mechanisms for fencing, planting and minimum tillage machinery was also expressed.

There was a perception that financial incentives were appropriate because farmers should be paid for the public good outcomes they deliver, as Farmer 1 stressed: *“If the general public want to address climate change and get good quality food. The people should shake the can. If change is wanted outside of good agricultural practice then we shouldn’t have to pay for it.”* This was reinforced by Farmers 4 and 5: *“We don’t pay enough for our food for the farmers to look after the land. It’s a community responsibility”; “That’s where we were at with the carbon sequestration. We’d like someone to recognize that we’re doing this.”* This has policy framing implications, in that community-wide responsibility for land management needs communicating and reinforcing.

Farmers and policy officials identified the potential for a certification or labelling system that recognized producers land management practices. While organic certification is well-established, it can be ridged. A broader labelling scheme could appeal to a wider range of farmers and would represent an approach that both facilitative and incentives-based. It also could include regulatory components, with minimum standards required universally. If this was associated with a premium price, resistance may be reduced. Increased certification and labelling would support a more rigorous ‘clean and green’ message for Australian agricultural exports, as discussed earlier. Domestically, this could maintain social license and encourage willingness to pay for more sustainable production (Ogilvy *et al.*, 2015).

Land stewardship criteria, including GHG mitigation, could be aligned with existing quality assurance procedures. Previous similar efforts, such as the *National Framework for Environmental Management Systems in Agriculture* (Natural Resource Management Ministerial Council, 2002) and existing accreditation facilitated by the *National Carbon Offset Standard*, provide a foundation for such an approach (Hamblin, 2009). Policy official 3 from the Commonwealth DoA recognized the potential: *“Being able to have our product on the shelf in China and be able to show that we are green, this is the farmer, this is how he protects his creek and this is what he’s doing to address climate change, maybe this will help”*. They added: *“Any exporter of fresh food will have to meet*

four or five quality assurance tests, both Australian and international standards, so why couldn't you do something like that for sustainability?"

There are many opportunities to create financial incentives for farmers to adopt GHG abatement measures, both through creating new markets for environmental services or improving the performance of existing markets.

Instrument choice

Instrument choice for achieving NRM outcomes has long been debated, typically comparing the benefits of education, community-orientated approaches against market-based individual payment instruments (Lockie, 2013). Interviews confirmed these tensions, with farmers expressing the value of both approaches, but themselves demonstrating the broader effect of community – orientated approaches, which they had all been involved in, but none having received funds through MBIs. Policy officials also acknowledged the trade-offs of allocating scarce funds to different approaches.

Achieving carbon abatement in the land sector through purchasing carbon credits under the CFI / ERF mechanisms has added a new dimension to the policy instrument mix. Given the emphasis on private productivity benefits of mitigation measures under the ERF, this raises questions about policy instrument choice according to principles of public private benefit distribution (Pannell, 2008). Given the science on some GHG abatement measures is still developing, the cost benefit ratios are not well known and therefore the impediment to adoption may not be properly identified, leading to misallocation of public funds. As policy official 7 noted:

"There are a subset [of measures] that will never get over the line without incentives. There are probably some of them that we just don't put enough into extension... They're [government] trying to address a short-term profitability objective and investing in practices that make sense to adopt anyhow."

Accurately identifying which barriers to change, outlined earlier, are most relevant should inform instrument choice. Evaluating cost barriers should involve using principles of public and private benefit, especially with measures where private productivity benefits are high and inadequate level of information may be the barrier. As Farmer 5 noted: *“You show farmers how they can make money and make their lives easier and they will do it. You don’t need to rub their nose in it or wave a stick over them. It’s just going to happen”*. If incentives are needed to transition or shift mindsets, as policy official 6 suggested with the ERF, then these incentives should be short-term (Bates, 2001). For activities where public benefit is high and private net benefit is low or marginal, payment for ecosystem services, for example carbon credits, becomes appropriate to overcome cost barriers (Pannell, 2008).

However, considering cost and information barriers alone is not sufficient. Complexity barriers associated with characteristics of the GHG abatement measures require greater RD & E. Circumstantial barriers linked to capacity to change due to other pressures and the sociocultural context indicate the need for policy integration and facilitative approaches that shift cultural norms, such as re-invigorating the Landcare movement. These approaches also recognise that farmers value social and environmental outcomes and encourage altruistic behaviour (Greiner and Gregg, 2011). Policy to address barriers should also include facilitating costs of GHG abatement and environmental protection to be internalised through certification, labelling and developing market demand for these products (Ogilvy *et al.*, 2015). Increased regulation could be introduced as economy wide GHG abatement activity intensifies and public sentiment shifts.

Given the heterogeneity of farms, farmers (Kuehne *et al.*, 2007) and the varied costs and benefits of different GHG abatement measures, a mix of policy instruments is required for a comprehensive approach to achieving climate change mitigation in the agricultural sector (Gunningham and Young, 1997; Dovers and Hussey, 2013). Multiple ‘levers’ ideally capture the best elements of each policy approach, simultaneously *facilitating*, *inducing* and *compelling* for maximum effect. A strong policy mix recognises that one size does not fit all,

and that different sections of the farming community need to be accommodated (Hamblin, 2009). Accurately identifying barriers to change and tailoring policy mixes accordingly will encourage efficiency and effectiveness (Dovers and Hussey 2013).

5.2.3 Policy delivery

Policy framing and policy instruments rely on consistent governance structures with adequate resources to underpin implementation. Policy delivery is also crucial to ensure that policy itself doesn't create barriers to engagement and change. Key limitations in policy delivery to-date relate to limited human and financial resources, confusing governance structures and inconsistency in delivery (Mitchell *et al.*, 2007; Bammer *et al.*, 2005). Large investments were made under the NLP (\$360 million), NHT 1 & 2 (\$2.5 billion) and CfoC (\$2.25 billion) (Hajkowicz, 2009), however this has not always translated into the resources needed on the ground (Mitchell *et al.*, 2007).

The complex and volatile governance landscape, with multiple delivery agents, planning processes and high levels of administration, but sometimes questionable on-the-ground effects, was also commented on by farmers. They stressed the importance of staff on the ground and the value of grants they received for fencing and planting on their properties. Reduced, and less distributed, human and financial resources in recent years have made projects more difficult. Farmer 1 commented: *"In the early days of Landcare we used to know who the coordinators were and we used to work closely with them. A lot of the on ground stuff that used to be done isn't done anymore."*

The most persistent weakness raised was the instability in delivery arrangements and short timeframes for staff contracts and project funding. Under the current government this trend has continued, changing from the CFI to the ERF and introducing the new *20 Million Trees Programme* and *Green Army Programme*. The *Green Army Programme* has been met with particular frustration by Landcare supporters who see it as taking funding from traditional Landcare projects, without encouraging community engagement,

which delivers sustained social and environmental outcomes (Rutherford and Campbell, 2014). For the farmers interviewed, instability in delivery were barriers to engagement and led to a sense of disillusionment with government-led initiatives.

Inconsistency in delivery is also demonstrated by the decline in prominence of NRM regional bodies and plans. Participants commented on the regional model of NRM governance losing momentum under *Caring for our Country* (Dale *et al.*, 2013; Robins and Kanowski, 2011). Under the current government there has been a correction in focus, with \$450 million of the \$1 billion *National Landcare Programme* being allocated to the regions (Commonwealth of Australia, 2015e). However, the frequent changes in resourcing and level of autonomy has constrained the potential of the regions. This is reinforced under the ERF, where aggregators are the main players and NRM bodies are not involved.

Box 11 - Quotes from farmers and Policy Official 3 regarding policy delivery

Farmers:

"They (regional NRM body) were very approachable. Now, no one would know who they are supposed to talk to. I don't know and I'm involved in it. How would Jo blow farmer down the road know who to talk to?" (Farmer 1)

"It's about accountability – but it gets ridiculous – all of the paper work for how you've spent the money and the whole system jams up and nothing gets done and then people get frustrated". (Farmer 6)

"Going back a decade we used to have CMA plans. They were drawn up, with large corridors of trees planned across whole basins. But I don't see too many of them being implemented, so I think it needs to be revisited." (Farmer 2)

Policy official:

"They (NRM regions) never got the opportunity to realise their potential. Each time there was a change in government it took the wind out of them for at least a year – the delays in funding, the reduction in funding, funding being diverted to different things. We were getting some really good governance in place – they were poised for success – then under Caring for our Country they really got the wind knocked out of them." (Cth. DoA Policy Official 3)

"There's a lot of cynical people out there now. With the regional NRM approach we were trying to get ownership back into the community. But if you were told that you had ownership and then had it taken away, you'd have to think you'd lose faith in that system." (Cth. DoA Policy Official 3)

Farmers interviewed stressed that engagement with policy efforts depends on their credibility and ownership at the local level. They felt strongly that policy delivery had to be informed by a decentralised, bottom-up philosophy, focused on providing necessary resources on the ground, consistently over the long-term (Sobels *et al.*, 2001). The human, financial, information resources needed could come from a governance-wide focus on mitigation, rather than just the Commonwealth. Greater involvement from non-government actors, such as industry bodies and private agronomists, would also enable wider impact. Many delivery channels gives authority to the message, with each agent engaging their areas of responsibility to achieve a consistent policy objective (Australian Public Service Commission, 2007). The Wilkins Review (Wilkins 2008) determined that mitigation should primarily be a Commonwealth responsibility, except when situations may vary considerable locally, which it

does in the agricultural sector (Van Oosterzee *et al.*, 2014). Therefore, an inter-jurisdictional mitigation effort, as part of integrated catchment management, would be justified and consistent with the subsidiarity principle (Marshall, 2007).

Box 12 - Quotes from farmers supporting long-term, decentralised delivery

"You never fix a problem from the top down. Governments never work that out. Anything that is closer to the people is far better. More so with country people."
(Farmer 1)

"Needs to start from the ground up... It doesn't need to start from Canberra out. That would look like a shop front in Nhill. That would look like a tertiary educated person and a small army of locals doing the fencing for the trees, doing the counting of the trees, not someone driving from Horsham or Ballarat. There is nothing that we love more in little towns than seeing people living in our houses again and shopping in our shops again. We've got no time for someone who drives in. They are buggered by the time they get here. They can't be stuffed. All they are thinking about is getting back to wherever it is."
(Farmer 5)

"Longer-term commitment and longer-term planning and longer-term budgeting is needed." (Farmer 2)

Policy delivery could also involve a greater role for regional NRM bodies, which are not a formal tier of government, but which nevertheless an established delivery agent. This would use the experience and expertise with local land management already developed in these organisations. As suggested by Van Oosterzee *et al.* (2014), regional NRM bodies could continue supporting facilitative approaches, while also providing opportunities to participate in generating carbon credits through performing an aggregation role. This possibility was recognised by policy officials and while they identified barriers, they all supported the idea. Benefits would include locally tailored policy delivery, consistent with existing NRM priorities and plans, which is less complex for participants, helping to overcome problems with scalability and accessibility (Van Oosterzee *et al.*, 2014; Platonova-Oquab *et al.*, 2012). NRM regional bodies are also more trusted than brokers, who currently fulfil the aggregation function. Effective intermediaries are essential for participation in

environmental markets (Fargher, 2013). This could also simplify engagement with farmers, therefore working to overcome complexity and inconsistency barriers.

Effectively coordinating local co-benefits through greater involvement by NRM bodies could ultimately mean that GHG abatement measures are more appealing to adopt. Farmers stressed that poorly planned and implemented projects are remembered, so better local coordination could maintain community engagement. Barriers to regionally co-ordinated aggregation include regional bodies not having the relevant expertise to aggregate carbon credits and complexities due to legal frameworks of some NRM regions (Robins and Dovers, 2007). The role of NRM bodies speaks directly to policy integration, which is addressed in the next section.

Box 13 - Quotes from policy officials regarding regional NRM bodies as aggregators of carbon credits

“Most aggregators are working for a profit and should be understood as such. Hence we would be very supportive of groups like NRMs entering that space. They come with a lot of trust in our opinion, lots of farmers will have already participated in their projects. If they’re able to provide a vehicle that more farmers feel comfortable engaging with, what a great idea.” (NFF Policy Official 9)

“An NRM body would be a perfect fit for that (aggregator role)... they’re trusted, they’re active, they have a lot of regions where lots of people from the region are on the board...what’s missing is the expertise the knowledge about how the CFI/ERF-like projects work. They could hire that in or develop it internally. I think it’s a very good option.” (Cth. DoE Policy Official 2)

“If you had the ERF that also took into account co-benefits, then those regional NRM groups would be very important, because they are the ones best placed to inform about what mitigation options offer the highest value in terms of biodiversity, water quality etc. So if you had a nice linkage there with environmental outcomes then I think not having them there is a major problem. With the current ERF it’s all focused on just emissions so I think aggregators can largely be filled by brokers.” (NSW DPI Policy Official 7)

Accurately accounting for national emissions reductions is important in meeting international obligations under the UNFCCC. Uncertainty in

measurement and attribution of emissions makes accounting for GHG abatement in the land sector is difficult. Saddler and King (2008) have argued that agriculture cannot be held to the same emissions accounting standards. This is a reason not to pursue emissions reduction in the agriculture as a first priority, but it is *not* a reason to avoid meaningful reduction activities entirely. It just warrants a simpler monitoring and evaluation (M & E) regime (Van Oosterzee *et al.*, 2014) with a higher degree of accepted error (World Bank, 2010).

While the policy suggestions made here are directed at climate change mitigation, measuring emissions reduction at a fine scale will not always be feasible. With generating carbon credits, there can be a greater onus on the owner for measurement and verification. However, with distributed Landcare-style engagement, which has a mitigation focus, high standards in M & E cannot be expected. In any case, M & E would have to be such that it did not create more barriers to farmer participation. Having regional NRM bodies coordinate accounting, at a high level, could help overcome challenges with M & E and provide information to help justify investment. Importance of emissions accounting is also reduced if 'no-regrets' options are pursued and land sector abatement is in addition to more significant emissions reduction elsewhere in the economy.

5.2.4 Policy integration

Policy integration involves considering all areas of policy that have a potential positive or negative affect on a policy goal and identifying opportunities to harness synergies and reconcile conflicting objectives (Collier, 1994; Lafferty and Hovden, 2003; Ross and Dovers, 2008). Policy integration is inherent in many aspects of policy framing, instruments and delivery and speaks to all seven of the barriers identified for farmers adopting GHG abatement measures. However, given the importance of this principle, it is discussed discretely here. Two levels are considered: 1) Integration between the ERF, a climate change mitigation policy, and existing NRM policy and 2) Integration of climate change

Box 14 - Quotes from policy officials regarding integrating NRM and climate change mitigation

“It might be better if the regional NRM bodies could see the projects being proposed and then be able to say yes or no...If we have all these plans that have been prepared and expertise built up in regions, you’re not using it to make sure you have the best outcome from that (ERF) investment.” (NRM regions Australia Policy Official 8)

“So like any big new policy (referring the ERF), your first phase is just getting it done within your own parameters, especially when green army and Landcare were also getting it done within their own parameters (as new policy programs) – integrating from the beginning when you have all these moving parts is quite challenging.” (Cth. DoE Policy Official 1)

mitigation objectives into broader agricultural and rural sectorial policies, focusing on drought policy and rural economic development.

Given similar on ground activities, alignment of climate change mitigation measures with NRM is logical. This was recognised under the *Clean Energy Futures package* which allocated \$44 million to the *NRM Planning for Climate Change Fund*. This investment has enabled regional NRM plans to be updated to guide mitigation and adaptation efforts, ensuring consistency with existing regional NRM priorities (Bohnet *et al.*, 2013). The scope and influence of updated plans, which will be finished in 2016, is yet to be seen. There is also a legal requirement for ERF projects to explain how they are consistent with regional NRM plans. However, as Policy Official 8 from NRM regions Australia explained: *“it’s a pretty low key sort of power – there is no follow through.”* If NRM bodies choose to be proactive in promoting ERF methodologies to farmers in their area or commenting on methodologies, they can, but otherwise there is no connection between the ERF and existing land management policies. This disconnect reinforces policy inconsistency and complexity barriers to farmers engagement.

Better integration with existing NRM policy could involve having NRM bodies as aggregators, as described earlier, or greater involvement of NRM bodies in mitigation investment decisions. This would allow NRM and mitigation trade-offs to be negotiated and complementary benefits maximised. This is

particularly important given potential negative effects of mitigation measures on other NRM objectives, especially water and biodiversity, are well established (Pittock, 2011). Policy officials acknowledged the difficulties of policy integration when programs are still maturing, highlighting the need for long-term policy settings (Dovers and Hussey 2013).

The more challenging aspect of environmental policy integration is mainstreaming sustainability objectives across sectorial policies (Pittock *et al.*, 2015; Locatelli *et al.*, 2015; Berry *et al.*, 2015). Minimising contradictory objectives across sectors will often involve confronting underlying causes of policy problems and ideological conflicts can be problematic (Dovers and Hussey, 2013; Gunningham and Young, 1997; Lafferty and Hovden, 2003; Pittock *et al.*, 2013). These factors mean mainstreaming is both the most difficult and potentially effective.

Integrating abatement of agricultural GHG emissions across drought policy and rural economic development is briefly considered here. These two areas were introduced in the policy review and are particularly relevant to *Barrier 3: Lack of capacity to change due to other pressures*, which included declining terms of trade and increasing climate change impacts.

Drought is a defining feature of the Australian climate and is predicted to place increasing strain on production systems (Botterill and Cockfield, 2013). Policy officials and farmers acknowledged that despite recent reforms, current drought measures, such as welfare payments, subsidies and tax concessions, could result in perverse mitigation and NRM outcomes, such as sustained overstocking. Similarly, in the recent Agriculture Competitiveness White Paper (ACWP), suggestions to increase water infrastructure and transportation demonstrates an antidotal emphasis of addressing the symptom and not the cause (Commonwealth of Australia, 2015a; Dovers and Hussey, 2013). As climate change impacts intensify, these perverse outcomes could also, by maintaining production on increasingly marginal agricultural land, facilitating further degradation and GHG emissions. Linking mitigation and adaptation activities will become increasingly important (Locatelli *et al.*, 2015), as

solutions for immediate pressures are sought, potentially at the expense of longer-term mitigation outcomes.

However, a shift from reactive to genuinely proactive drought policy that supports agricultural systems to be more resilient, could deliver adaptation and mitigation outcomes. For example, improving soil health reduces fertiliser requirements and increases water holding capacity (Kimble *et al.*, 2007). Farmer 1 explained this logic: “...propping up a bad agricultural practice with drought assistance is not the way to go... Better off spending that money on introducing regenerative agriculture, then you’ll buffer against droughts.”

A more proactive approach would involve greater investment before drought takes hold, which would be entirely consistent with the preparedness emphasis in current drought policy (Hogan and Young, 2013). This would also align well with recent activity in adaptation RD & E through the *NRM Planning for Climate Change Fund*, which has developed the *AdaptNRM* tools, which assist regional NRM bodies and their stakeholders to prepare for climate impacts (CSIRO, 2014). Farmers did stress the limits of preparedness and that some support will always be necessary during severe droughts. Increasing conditionality attached to this government support could involve requiring GHG abatement measures to be implemented in order to receive government assistance.

All of the farmers had personal experience of rural decline and decreasing terms of trade was a major factor in perceived capacity to adopt GHG abatement measures. Policy to encourage economic development has to-date focused on increasing regional economic growth with market-driven solutions that increase competitiveness of the agricultural sector. However, efforts so far have not stemmed the national trend of rural decline or the pressure farmers experience due to declining terms of trade (Hogan and Young, 2013). The recent ACWP has focused on these trends, with returning profit ‘to the farm gate’ as a key priority. This includes, for example, boosting the *Australian Competition and Consumer Commission’s* (ACCC) engagement with the agriculture sector to increase fair trading and investment in training farmers on cooperatives and

other business structures to decrease costs and increase competitiveness. The effect of these measures in reducing pressure on farmers is yet to be seen.

Despite the sentiment in the ACWP, current rural economic development policies largely represent a continuation of neoliberal regime that has driven rural decline and increasing pressure on farmers since the 1970s (Alston and Kent, 2004; Hogan and Young, 2013; Lockie *et al.*, 2006). Farmers recognised the contradictory messages they are subject to, with the market often forcing them to prioritise short-term profitability while NRM policy advocates reducing the impacts of production to achieve long-term sustainability (Bjørkhaug and Richards, 2008). Farmer 4 described this tension: *“The prices get squeezed and you have to cut corners all the time. And maybe the first thing you cut is your environmental type work.”* These experiences are consistent with the ‘vicious cycle’ described by Ogilvy *et al.*, (2015), where factors out of farmers control require them to make short-term management decisions.

Pursuing growth in the agricultural sector that is not dramatically decoupled from increasing emissions will mean any reductions in emissions intensity will be undermined by net emissions increases. However, effective policy integration could align rural economic development with GHG abatement outcomes, while largely remaining within neoliberal economic constructs, but shifting the intent behind them (Lockie and Higgins, 2007). For example, as already discussed, diversified income streams for farmers could be developed through large-scale carbon markets (Eckersley, 2013) or by creating sustainability credentials and labelling to access premium markets, allowing farmers to be paid for better land management practices. This could have community-wide economic and social benefits. These priorities should be reflected in state and Commonwealth policies for regional economic growth, such as the ACWP and state-based regional growth plans.

Farmers’ recognised the potential of alternative rural economic development, where mitigation was a key objective. Farmer 1 believed: *“If we had a functioning viable carbon market, it could invigorate a lot of rural areas. It could*

put confidence and direction back into rural areas.” Farmer 6 articulated different paths forward: *“It’s just a slow spiral down. So we’ve got to try and get some productivity back into this land that has been cleared or we need some other form of funding to revegetate it.”* Rural economic development policy that aimed to reduce financial pressures on farmers would also increase their capacity to implement further mitigation measures according to individual motivations.

Genuine policy integration will be needed to achieve broad-scale implementation of GHG abatement measures by farmers. Drought policy and rural economic development demonstrate the potential for policy co-ordination, as well as potential divergence, to the detriment of mitigation outcomes.

To synthesise the conclusions of this thesis, Tables 10, 11, 12 and 13 present the findings for the three research questions and how they relate to each other to form a cohesive and comprehensive assessment. Tables 10 and 11 link the strengths and weaknesses of policy to-date to the seven key barriers originally identified through farmer interviews. Tables 12 and 13 then summarise the recommendations for future policy directions and identify which of the seven key barriers these recommendations help address.

Table 10: Summarised findings for Research Questions 1 and 2 (Barriers 1-4)

Research Question 1: What are the barriers to wider adoption of GHG abatement measures for the six farmer case studies in the BZE LUP?	Research Question 2: How have policy efforts to-date addressed the barriers highlighted by farmer case studies?	
	<i>Strengths</i>	<i>Weaknesses</i>
Barrier 1: Financial costs of the change	• Cost-sharing approaches through Landcare and NRM policy. • RD & E under CFF revealing productivity benefits of abatement. • Income stream through payment for ecosystem services under CFI/ ERF. • Focus on framing productivity co-benefits of mitigation under the ERF.	• NRM and Landcare funding reduced. • CFF Investment in RD & E not continuing. • ERF opportunities limited and narrow. • Carbon price too low; other sectors will be favoured in future ERF auctions.
Barrier 2: Complexity or novelty of the change	• RD & E under the CFF working to simplify GHG abatement methodologies. • Policy efforts to-date mean, especially the CFI, have established a level of familiarity with GHG sources and abatement measures. • By exposing productivity benefits of mitigation to industry, the ERF may be supporting broader uptake.	• CFF Investment in RD & E not continuing. • Climate change mitigation policy for the agricultural sector remains niche, given the limited and narrow nature of the ERF.
Barrier 3: Lack of capacity to change due to other pressures	• Shift to preparedness emphasis in drought policy. • Investment in climate change adaptation RD & E. E.g.: AdaptNRM tools. • Focus on increasing 'profit to the farm gate' in the ACWP.	• Drought policy remains largely reactive. • Policy efforts have not addressed declining terms of trade.
Barrier 4: Inadequate level of information	• Education benefits of Landcare bottom-up community engagement. • RD & E projects under CFF supporting dissemination of information on abatement measures and carbon farming opportunities.	• NRM and Landcare funding reduced. • CFF Investment in RD & E not continuing and existing projects are highly targeted. • Farmers interviewed didn't feel there was accessible information on GHG abatement measures.

Table 11: Summarised findings for Research Questions 1 and 2 (Barriers 4-7)

Research Question 1: What are the barriers to wider adoption of GHG abatement measures for the six farmer case studies in the BZE LUP?	Research Question 2: How have policy efforts to-date addressed the barriers highlighted by farmer case studies?	
	<i>Strengths</i>	<i>Weaknesses</i>
Barrier 5: Sociocultural context not conducive to change	• Cultural shift through Landcare bottom-up education and community engagement. • Emerging carbon markets creating sense of opportunity. • By exposing productivity benefits of mitigation to industry (enabled by RD & E under the CFF), the ERF may be changing boarder perception of GHG abatement measures.	• NRM and Landcare funding restructured and reduced. • Landcare becoming 'too green' and not including production concerns. • Land clearing regulation has been divisive. • Opportunities for participating in carbon farming are limited, so broader sociocultural shift is unlikely. • CFF Investment in RD & E not continuing. • Focus on adaptation to 'climate variability' observable now, rather than future transformative change.
Barrier 6: Inconsistent government policy (policy goals and delivery)	• Under the current government there has been increased autonomy returned to regional NRM bodies to allocate funding at the local level. • Updating regional NRM plans to guide mitigation & adaptation activities (through the <i>NRM Planning for Climate Change Fund</i>.)	• Disconnects between: mitigation policy (ERF) and existing NRM policy; mitigation and adaptation policy; mitigation and drought policy; mitigation and rural economic development policy. • ERF tokenistic and not linked to economy-wide mitigation effort. • Confused policy intent: potential for productivity emphasis to undermine mitigation benefits. • Inadequate financial, human and organisation resources. • Instability in policy delivery with short-term programs and funding.
Barrier 7: Complexity of government policy	• Changes under the ERF have allowed aggregation of projects, allowing farmers to participate through intermediaries.	• ERF methodologies remain very complex and difficult to negotiate and working with intermediaries involves its own risks. • Complexity of governance structures involved make participating with confidence difficult, especially given inconsistent policy delivery.

Table 12: Summarised findings for Research Question 3 (Policy framing and policy instruments)

Research Question 3: How can these barriers be overcome through effective policy design?	Barriers addressed
Policy framing – recommendations	
<i>Holistic problem/ response definition:</i> • Link meta, macro and micro problem/ response dimensions to support better understanding of connections between sustainability (problem), climate change (problem) and on-farm management decisions (response). • Link mitigation to a broader landscape resilience imperative related to adaptation and long-term productivity. <i>Clear, consistent policy goals:</i> • Acknowledge climate change as a ‘game changer’ & combat community confusion rather than ignore or fuel misunderstanding. • Increase policy integration to harness synergies and reconcile conflicting objectives between different policy areas. • Support community wide recognition that farmers need to be rewarded for public benefit contributions. <i>Appeal to influential discourses:</i> • Appeal to productivity discourse while shifting focus to resilience, long-term sustainability and associated mitigation outcomes. Appeal to public values related to observable local environmental, social and economic co-benefits. • Frame change as normal and unavoidable given future climate predictions. Recognise extreme weather events as catalysts for change. Appeal to rural stoicism by focusing on resilience and encouraging a sense of opportunity.	<i>Barrier 5:</i> Sociocultural context not conducive to change, <i>Barrier 6:</i> Inconsistent government policy (policy goals and delivery)
Policy instruments – recommendations	
<i>Facilitate:</i> • Increase education & community engagement: Re-invigorate Landcare with holistic focus, including production & mitigation objectives. Promote information exchange from experts/ between farmers to increase literacy on GHG abatement measures. • Maintain public investment in RD & E looking beyond short- term profitability objectives. Include farmers in RD & E process. <i>Induce:</i> • Promote broader opportunities for PES through carbon markets, with demand being generated beyond government through linking to economy-wide ETS. Support eco-labelling opportunities by providing certification and market access – link to ‘clean and green’ image. Continue & reinstate more traditional cost-sharing approaches. E.g.: tax incentive mechanisms. <i>Compel:</i> • Avoid provoking community resistance. Increase regulation as public sentiment shifts & other barriers are reduced. Include in ETS if M & E issues can be resolved or establish alternative mechanism. E.g.: levy approach. <i>Policy instrument choice:</i> • Design a mix of policy instruments based on accurate identification of barriers & that recognises heterogeneity of farmers.	<i>Barrier 1:</i> Financial costs of the change, <i>Barrier 2:</i> Complexity or novelty of the change, <i>Barrier 4:</i> Inadequate level of information, <i>Barrier 5:</i> Sociocultural context not conducive to change

Table 13: Summarised findings for Research Question 3 (Policy delivery and policy integration)

Research Question 3: How can these barriers be overcome through effective policy design?	Barriers addressed
Policy delivery recommendations	
<i>Increase financial, human and organisational resources:</i> • Re-invigorate Landcare bottom-up approach by providing accessible grant funding and supporting staff. • Re-invigorate role of regional NRM bodies by engaging them to co-ordinate increased investment, allowing consistency of projects with regional NRM priorities. E.g.: Regional NRM bodies providing intermediary carbon credit aggregation role. • Engage all levels of government, each using the 'levers' available to them. <i>Reduce complexity of delivery arrangements:</i> • Simplify engagement through directing delivery through NRM regional bodies. E.g.: regional carbon credit aggregation. • Employ appropriate standards for M & E of GHG reductions, acknowledging that agriculture is different to other sectors and fine scale accounting will not always be feasible. M & E of GHG reductions, at a high level, could be undertaken by NRM regional bodies. Expectations for M & E of GHG reductions should differ according to policy instrument. <i>Consistency in delivery arrangements:</i> • Long-term programs, investment commitments & staffing arrangements. Consistency to regain trust and farmer engagement.	<i>Barrier 1:</i> Financial costs of the change, <i>Barrier 4:</i> Inadequate level of information, <i>Barrier 6:</i> Inconsistent government policy (policy goals and delivery), <i>Barrier 7:</i> Complexity of government policy
Policy integration recommendations	
<i>Increase integration between mitigation policy and broader NRM policy</i> • Require more involvement from NRM regional bodies in mitigation investment decisions to maximise local co-benefits. E.g.: NRM bodies as aggregators or having deciding influence over ERF project determinations. <i>Increase integration between mitigation policy and broader sectorial policy: harness synergies, avoid perverse outcomes.</i> • <u>Drought policy synergy:</u> Proactive early investment to improve sustainability of farming practices, increasing landscape & social resilience to drought, as well as delivering mitigation outcomes. When support is required, mitigation outcomes included in increased conditionality requirements. • <u>Drought policy perverse outcome:</u> Reactive government payments & subsidies encourage sustained land degradation with negative NRM & mitigation outcomes. E.g.: sustained overstocking. As droughts intensify with climate change, short-term solutions for immediate pressures compromise long-term solutions (with mitigation benefits), & land degradation continues. • <u>Rural economic development synergy:</u> Increased income stream for farmers through PES opportunities (e.g.: carbon credits) & eco-labelling to access premium markets, with community-wide economic development benefits. • <u>Rural development perverse outcome:</u> Continued pressure on farmers & rural communities from declining terms of trade keep farmers in short-term 'vicious cycle' with limited financial or emotional capacity to adopt GHG abatement measures.	<i>Barrier 3:</i> Lack of capacity to change due to other pressures, <i>Barrier 6:</i> Inconsistent government policy (policy goals and delivery), <i>Barrier 7:</i> Complexity of government policy

Chapter 6: Conclusion

Climate change mitigation in the agricultural sector will be a key component of any pathway to deep emissions reduction in the Australian economy (Garnaut, 2008; Climate Works Australia, 2010). The BZE LUP demonstrates how dramatic emission reductions in the agricultural sector could occur through six areas for GHG abatement. This thesis has investigated how public policy could begin to operationalise this vision. It has addressed three key aims: 1) to identify barriers to adopting further GHG abatement measures for the six case study farmers from the BZE LUP 2) to assess the strengths and weaknesses of policy efforts to overcome these barriers to-date and 3) to provide recommendations for key aspects of policy design to help overcome these barriers in the future.

The literature review, *Chapter 3*, considered scholarly work on barriers to farmer behaviour change, principles of effective policy design and existing views on current and future policy for climate change mitigation in the agricultural sector. It also established the analytical frameworks that guided data collection and interpretation; a farmer behaviour change framework adapted from Greiner and Gregg (2011) and a policy analysis framework adapted from Dovers and Hussey (2013). The policy review, *Chapter 4*, then summarized all relevant policy to-date for the six areas of abatement measures from the LUP. Primary data collection involved semi-structured interviews with the six farmer case studies from the BZE LUP and nine policy officials from government and non-government organisations.

6.1 Key findings

In addressing the first research aim, the following seven key barriers to farmers adopting GHG abatement measures were identified: 1. Financial costs of the change; 2. Complexity or novelty of the change; 3. Lack of capacity to change due to other pressures; 4. Inadequate level of information; 5. Sociocultural

context not conducive to change; 6. Inconsistent government policy (policy goals and delivery); and 7. Complexity of government policy. These barriers provided the basis for addressing the second and third research aims regarding current and future policy.

Strengths of policy to-date include the success of Landcare and NRM policy in addressing financial cost and information barriers and shifting the sociocultural context to be more conducive to change. More recently the establishment of mechanisms enabling farmers to generate carbon credits through the CFI and ERF, have further addressed financial cost barriers for some and successfully appealed to influential productivity discourses. RD & E under the CFF has supported these efforts and contributed to increasing awareness of carbon farming opportunities.

However, current policy has demonstrated significant weaknesses. Funding for Landcare and NRM policy has been reduced, investment in RD & E under the CFF has been discontinued and opportunities to participate in the ERF remain limited. For most farmers, cost, complexity and information barriers to implementing GHG abatement measures are not being addressed. NRM policy has also been plagued by short-term and uncertain delivery arrangements that undermine farmer engagement. The change from the CFI to ERF has continued that trend. This instability further complicates interaction with an already complex policy landscape. Current efforts demonstrate limited policy integration by not adequately addressing broader factors reducing farmers' capacity to adopt GHG abatement measures, such as declining terms of trade and climate change impacts. Weak policy problem and response definitions and inconsistent policy objectives mean that policy intent is confused, a cohesive message has not been achieved and sociocultural barriers to change remain.

Current policy settings will not achieve the scale and pace of change required; in fact, they reinforce many of the barriers articulated by farmers to adopting GHG abatement measures. Evidently, more ambitious and decisive policy is required. This thesis provides recommendations for key aspects of future policy design, covering policy framing, policy instruments and policy delivery, as well as policy integration.

6.1.1 Policy recommendations

- Future approaches to policy framing should include improved problem definition, which recognizes climate change as the macro problem but focuses on local co-benefits of mitigation measures. More consistent policy objectives would see mitigation in the agricultural sector as part of integrated landscape management and linked to an economy-wide emissions reduction effort.
- Future policy instrument mixes need to be strong and diverse with multiple ‘levers’ capturing the best elements of each policy approach. Instruments to *facilitate* change could include continued RD & E and re-invigorating the Landcare bottom-up approach, with a broader production focus. Instruments to *induce* change could include broader opportunities for payment for ecosystem services, as well as certification and labelling to attract premium prices, with an emphasis on Australian agriculture’s ‘clean and green’ image. Instruments that *compel* change will only be possible when other sectors’ emissions are regulated and public sentiment shifts as other barriers to adopting GHG abatement measures are reduced.
- Future policy delivery should be characterised by increased financial, human and organisational resources and consistent, long-term delivery arrangements. This could involve re-invigorating the Landcare bottom-up approach and enabling a greater role for NRM regional bodies in coordinating increased investment. For example, through performing an intermediary carbon credit aggregation role and undertaken monitoring and evaluation of regional GHG reduction. These measures would support local engagement and credibility. While maintaining a local delivery focus, all levels of government could adopt a mitigation objective, using the ‘levers’ available to them.
- Future policy should be informed by principles of policy integration, where synergies are harnessed and perverse outcomes avoided. This

thesis has identified the need for increased integration between mitigation policy (the ERF) and existing NRM policy to ensure holistic landscape management. Improved integration would see a central role for regional NRM bodies in co-ordinating GHG abatement projects. Broader opportunities were also identified to achieve mitigation, drought policy and rural economic development outcomes through increasing landscape resilience. However, current policy trajectories risk significant perverse outcomes, where short-term drought or rural economic development outcomes are prioritised at the expense of long-term mitigation outcomes. No policy works in isolation and a broader perspective is essential for holistic policy approaches (Pittock *et al.*, 2015).

6.2 Contribution and further research

This research has made three important and innovative contributions. First it has reaffirmed literature considering barriers to behaviour change for farmers, farmers' experiences of NRM policy efforts to-date and ideas for future directions in sustainable agriculture and land management policy and climate change mitigation. Second, it has complemented existing research by providing a climate change mitigation perspective on these broader land use policy themes. Third, it has provided recommendations for key aspects of policy design to upscale mitigation outcomes in the agricultural sector, drawn from unique insights from both recipients and administrators of public policy.

Further research in this area could examine the sustainability implications of the 2015 Agricultural Competitiveness White Paper in greater detail; improve understanding of the costs and benefits of individual GHG abatement measures and accurately identify barriers to implementation, especially for newer technologies; and examine regional NRM plans updated for climate change mitigation and adaptation as they are completed in early 2016.

The agricultural sector will face increasing pressure to adapt as climate change impacts intensify; it must also play a key role in the pathway to a decarbonised

world. These dual challenges will define the coming decades for the sector. Climate change mitigation activities present significant opportunities to meaningfully contribute to the global mitigation effort, while becoming more environmentally, socially and economically resilient at the local level. Bold policy efforts will be required to deliver these important outcomes.

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Appendix 1: Interview schedules

Farmer interview schedule

Introduction

The BZE Land Use report, in which your farm was a case study, outlined a pathway to dramatically reduce net GHG emissions from the agricultural sector. The report presented a range of measures to reduce GHG emissions and increase bio-sequestration. These measures were:

- 1) Abatement of emissions from agricultural clearing and soil carbon
 - Cease land clearing for agriculture and re-clearing
 - Adopt practices that mitigate soil erosion: maintaining groundcover, retaining stubbles, avoiding fallowing, conservation tillage etc.
- 2) Abatement of emissions from enteric fermentation
 - Reduce enteric fermentation (technology and management- e.g dietary additives)
 - Reduce enteric fermentation (reduce herd numbers)
- 3) Abatement of emissions from agricultural crops and soils
 - Reduce emissions from synthetic fertilizer application
- 4) Abatement of emissions from biomass burning
 - Reduce savannah burning
 - Reduce burning of crop residues
- 5) Abatement of manure management emissions and bioenergy emissions
 - Adopt on –farm energy generation using bioenergy
 - Reduce manure stockpiling
- 6) Abatement through carbon sequestration in biomass
 - Increasing carbon stored in soils and plants through revegetation in agricultural landscapes

Throughout the interview, when I say ‘GHG abatement measures’, I’m referring to these activities.

For your property, GHG emissions were measured to be xx t CO₂-e/ yr, with the main sources being from.... You’ve undertaken some important work.... My research is trying to investigate what governments could do to facilitate scaling up adoption of abatement and sequestration measures. For your property that might look like.... Keep this in mind for the following questions.

I’ll first ask you some introductory questions, then ask about your interaction with existing relevant government policy, then ask about the barriers that exist for adopting further GHG abatement measures and what you think governments could do to support increased implementation of GHG abatement measures.

Introductory questions

- 1) How long have you been on your property?
- 2) How long has your family been in the area?
- 3) Have you already implemented GHG abatement measures on your land and what have they been? (Remembering that the activities may have been undertaken for other environmental benefits and achieved GHG abatement incidentally) Why have you implemented them?

Part 1: Current policy

Sequestration and abatement of GHG emissions in the agricultural sector is the explicit objective for only one policy in all Australian jurisdictions: the Commonwealth Carbon Farming Initiative, which has become the Emission Reduction Fund. Despite this, there is a significant body of policy either directly or indirectly relevant to the sequestration and abatement activities outlined above. Most existing policy relates to managing native vegetation and land degradation.

By 'policy' I mean anything that government does to bring about change in behaviour towards a particular end. E.g: Regulation: land clearing laws. Education: Landcare. Incentives: CFI.

Current policy relevant to the GHG abatement measures in the BZE Land Use report includes (Paraphrase):

Federal:

- The Carbon Farming Initiative/ Emissions Reduction Fund: Landholders can generate carbon credits that the government buys through competitive reverse-auctions.
- The National Landcare programme: Project specific grant funding + funding to regional NRM bodies to support local Landcare groups.

State:

- Environmental duty of care, land clearing, threatened species and biodiversity offset regulation: Set baseline for expectations of land stewardship.
- Education, extension and support services undertaken by regional NRM bodies:
- Support/ grants for local Landcare groups.

State and Federal governments also provide assistance for drought-affected farmers and farmers experiencing financial stress. While my research focuses on policy measures addressing climate change mitigation, all areas of public policy activity supporting the agricultural sector could potentially be relevant when considering future policy solutions.

Questions:

- 4) How would you describe your understanding of the Federal/State policy frameworks supporting GHG abatement measures, or working against

the implementation of abatement measures?

- 5) Have you received support (finance, education or services that have helped facilitated a change in practice) from state or federal governments to implement GHG abatement measures on your land? If so, when, from whom and in what form?
 - a. Have you received support for GHG abatement measures where climate change mitigation was the primary objective?
 - b. What level of government were you interacting with?
 - c. What agencies or groups were you interacting with?
- 6) What have been the strengths and weaknesses of the policy support you have received?
 - a. Has it been: Accessible? Consistent? Well-resourced? Strait forward? Not too much paperwork involved?
 - b. Have there been any unintended negative consequences (perverse outcomes)?
 - c. Have there been any unintended positive consequences (co-benefits)?
- 7) If you haven't received any support, do have impressions of what support (finance, education or services that have helped facilitated a change in practice) is available to farmers to undertake GHG abatement measures?
- 8) Considering beyond your personal experience, do you have impressions of if/how farmers in your area or the wider farming community have received support to implement GHG abatement measures?
- 9) Have you received any support from the government not directly related to GHG abatement measures or NRM issues, such as through drought assistance or financial assistance? If so, in what form and how was it used? Is there any other interactions you've had with government policy?
- 10) Is there anything else you'd like to say in relation to existing policy efforts to support adoption of GHG abatement measures?

Part 2: Barriers

The next section will ask about the factors that you think are preventing you from taking further steps to implement GHG abatement strategies on your property.

Questions:

Circumstances of the farmer

- 11) What circumstantial factors, that are out of your control, do you think are preventing you from implementing GHG abatement measures on your property? (The characteristics of the context you're operating in that are out of your control)
- a. Inadequate policy support (as we discussed earlier)
 - b. Lack of industry support – no best practice standards.
 - c. Climatic conditions- drought
 - d. Market conditions- price pressures etc.
 - e. Uncertainty about land tenure or the future of the property
 - f. Unsupportive cultural and social context among local community of farmers and Australian community more broadly
 - i. What is the level of awareness/ concern/ initiative among their community about climate change mitigation measures?

Characteristics of the farmer

- 12) How would you describe your personal goals in farming? What do you want to achieve through your farming practice?
- a. Financial/ economic success
 - b. Conservation / sustainability
 - c. Lifestyle
 - d. Social recognition
- 13) In the current context, do you think your personal goals prevent you from taking further steps to implement GHG abatement strategies? Do you *want* to implement GHG abatement measures? Why / why not?

Characteristics of the change in practice

- 14) Considering the abatement activities relevant to your property, what characteristics of these activities would make them unattractive to implement?
- a. Physical requirements effecting feasibility?
 - i. Land and water availability
 - b. Technical/ capacity requirements effecting feasibility?
 - i. Finance
 - ii. Labour costs/ availability
 - iii. Equipment
 - c. Apart from physical constraints and capacity/ finance, are there any other aspects of the change that make changing practice unattractive for you?
 - i. Opportunity costs & profitability
- 15) Which of the measures relevant to your property would you implement first/ as a priority? Why?
- a. Measures with co-benefits

b. Easiest measure

16) Considering beyond your personal experience, do you have impressions of the barriers that exist for farmers in your area or the wider farming community to implementing GHG abatement measures?

17) Is there anything else you'd like to say about the barriers to adopting GHG abatement measures?

Part 3: Future policy solutions

This final section of questions will address future policy solutions, investigating how you think governments could improve on existing policy (covered in the first section of questions) and help overcome the barriers you've discussed (covered in the second section of questions). These questions will cover problem framing (what objectives policy should have and how messaging could encourage support), policy instruments (what mechanisms government should use to achieve objectives) and policy implementation (arrangements for delivery).

Questions:

Problem framing

18) What do you think the goals of GHG abatement policy should be?

19) Are there any principles that you think should inform policy development?

20) How do you think policy efforts in this area should be presented/communicated/packaged?

- a. Do you think policy in this area needs a 'new narrative'? If so, what should it involve? (e.g: multi-functionality, resilience)

21) GHG abatement measures are relevant to multiple policy objectives, not just emissions reductions. Given GHGs are invisible and climate change is a slow global phenomenon, the immediate effects of abatement measures relate to other environmental, social or economic effects. Many commentators believe that policy efforts in this area need to be better integrated, with multiple, complementary policy objectives. What do you think are the challenges/ policy problems facing rural and regional Australia that should also be considered when thinking about implementing policy to reduce emissions from the agricultural sector?

- a. Rural decline
- b. Climate change adaptation
- c. Biodiversity
- d. Farm productivity
- e. Farm finances
- f. Strong communities

g. Recognition of farmers

- 22) What do you think about the political feasibility of introducing policy targeting climate change mitigation in the agricultural sector? How do you think this would be received in your area? Do you have any ideas about how policy efforts could be made more palatable?
- a. What is the level of concern about climate change in your area?
 - b. How ready do you think people are to adopt change in practice as part of climate change mitigation efforts?

Policy instruments

- 23) What do you think federal and state governments could do to support you to implement GHG abatement measures on your property?
- 24) Would financial incentives from government encourage you to implement GHG abatement measures?
- i. Tax incentives
 - ii. Direct payments for ecosystem services (carbon and biodiversity credits)
 - iii. Cost sharing for projects
- b. What would be the approximate cost for you to implement GHG abatement measures on your property such as revegetation? Please state in terms of \$/ha for revegetation or \$/km for fencing.
- c. What portion of those costs should be borne by government compared to the farmer?
- d. Would increased non-financial recognition from peers and the greater public encourage you to implement GHG abatement measures?
- 25) Would education and extension measures encourage you to implement GHG abatement measures?
- i. Accessible information on land management for GHG abatement- support agencies/ staff, training available.
 - ii. Assistance developing property management plans
 - iii. Guidelines for best practice
 - iv. Community support and involvement facilitated by government initiatives.
- 26) Do you think government regulation should play a role in further encouraging adoption of GHG abatement measures? Why/ why not?
- i. E.g.: Strengthening native vegetation clearing laws or legislating requirements for using manure management technologies for new facilities.
- 27) Of the policy instruments discussed above, what do you think is the most important?

- 28) Do you think payments to farmers for drought assistance or other financial stress should be linked to climate change mitigation outcomes?
E.g.: Moving off marginal farming land.

Policy implementation

- 29) Do you have any thoughts on how policy support should be delivered to farmers?
- a. What would you think about administering increased support through existing regional NRM bodies?
 - b. What level of government presence would you like to see on the ground?
 - c. Would you like to be part of regionally supported projects, which involve efforts across many properties, with centralised carbon accounting and administration or undertake projects independently?
- 30) Considering beyond your own property and experience, what policy framing, instruments and implementation measures do you think would be needed to get your neighbours and others in your area to implement GHG abatement measures?
- 31) Do you have anything else to add about what policy support you think should be implemented and how?
- 32) Is there anything else you'd like to add or emphasise before we finish the interview?

Thank you very much for sharing your insights.

Policy official interview schedule

(Adapted slightly for each participant depending on organisation and relevant area of expertise)

Introduction

- I am an Honours student at the Fenner School of Environment and Society at the ANU. My supervisors are Stephen Bygrave and Karen Hussey.
- My Honours topic is: *"Climate change mitigation in the agricultural sector: How can land holder experience inform policy direction."*
- I'm doing this project because I'm really interested in learning about the role of government and how people interact with public policy. I'm also interested in the agricultural sector and climate change mitigation and adaptation.
- This research is following on from the Beyond Zero Emissions (BZE) Land Use Plan published last year.
- My research so far has involved:
 - Summarising current state and federal policy for the GHG abatement measures outlined in the BZE plan.
 - Interviewing the six farmers whose properties were used as case studies in the BZE Land Use Plan about their perspectives on current and past policy, the barriers to adopting GHG abatement measures and ideas for future policy direction.
- The aim of this interview is to:
 - Gain a better understanding of relevant policy frameworks and what they're trying to achieve (i.e. their policy intent). I've tried to understand what exists, but I've never worked in this space.
 - To canvas the perspectives from my research and the farmers I interviewed to see if/how you think these experiences and ideas could inform future policy in this area.

Consent

- Run through participant information sheet.
 - If you don't want to answer a question – you absolutely don't have to – I'll be grateful for any insights you can share.
 - In some of the questions I say 'Do you think' and in these cases you don't have to provide your personal opinion, but some key points for consideration would be good.
 - I expect that I will use the information to support my understanding of what is possible and the real world challenges and limitations of different options
 - The focus will remain on the farmers I interviewed and their experience because that's where my research questions are targeted.
- Discuss and sign consent form.

- Confirm they don't have any other questions about how the information they provide will be used.
- Establish how much time we have.

Current policy

1) For each of the GHG abatement measures could you:

- Briefly summarise current (and any particularly relevant past) commonwealth policy activity that you know of.
- Mention any particular challenges and opportunities the different measures present.
- Mention any relevant experience you've had.

Note: I am considering all policy activity, whether climate change mitigation is the main objective or not.

GHG abatement measures

- Abatement of emissions from agricultural land clearing and soil carbon
- Abatement of emissions from enteric fermentation
- Abatement of emissions from agricultural crops and soils
- Abatement of emissions from biomass burning
- Abatement of manure management emissions and bioenergy opportunities
- Abatement through carbon sequestration in biomass

2) Considering these available mitigation measures we've just discussed, do you see any significant policy gaps in the current approach?

3) Given most of these GHG abatement measures relate directly to Natural Resource Management (NRM) and biodiversity conservation objectives, are policy efforts linked, and if so, how?

- How does climate change mitigation policy (CFI/ ERF) relate to regional NRM bodies, landcare groups or other local networks?
- How does climate change mitigation policy (CFI / ERF) relate to existing priorities in regional NRM plans?

4) Given the differences between the Carbon Farming Initiative (CFI) and the Emissions Reduction Fund (ERF), have the aims of the Carbon Farming Futures projects (designed to support participation in the CFI) changed? If so, how?

5) What carbon farming opportunities remain for farmers who cannot participate in the ERF?

6) As the ERF includes projects in all sectors, do you think carbon farming projects could be excluded?

7) To what extent is the climate change mitigation objective integrated across activity within the Department of Agriculture?

- a) To what extent is climate change mitigation a priority in the activities of Department of Agriculture?
- b) In what ways has that objective been integrated into existing policy frameworks?
- c) Do you think there are any inconsistencies or contradictory objectives being pursued?

8) Are there any links between current drought assistance measures and climate change adaptation and mitigation measures?

Future policy directions

- Questions are based on the assumption that meaningful climate change mitigation action will become a priority.
- Questions relate to *policy framing*, *policy instruments* and *policy implementation*.

9) *Policy framing*: How do you think climate change mitigation policy for the agricultural sector should be framed and communicated in the future?

- a) From your interactions with stakeholders on this issue, what is the level of engagement with and enthusiasm for carbon farming opportunities?
 - a. What should the policy goals be?
- b) How do you think other challenges facing rural Australia can be considered in climate change mitigation policy? E.g.: Increasing economic and social activity in areas experiencing rural decline through investment in climate change mitigation projects.
- a) Farmers that I spoke to expressed a desire to participate in a community wide effort where “people believed change is important.” What is the role of policy in cultivating this?
- b) Given many climate change mitigation activities will benefit farmers in the long term, are the co-benefits of climate change mitigation adequately communicated?
- c) How should climate change mitigation and adaptation be connected? E.g.: Areas worst affected by climate change impacts could be targeted for mitigation investment?

- 8) *Policy instruments*: What mix of policy instruments is needed to achieve wide-scale climate change mitigation activity in the agricultural sector?
- a) Do you think that the agricultural sector should have to pay for the emissions they are responsible for or only be paid for emissions reductions?
 - a. What are some different opinions on this?
 - b) Could an accreditation scheme, where farmers could certify their produce as 'climate friendly,' be feasible or effective?
 - c) Could drought assistance measures be tailored to have a climate change mitigation benefit? If so, how?
 - a) What do you think the role of regulation should be in climate change mitigation policy for the agriculture sector?
- 9) *Policy implementation*: How can climate change mitigation policy be implemented efficiently, effectively and at the scale required?
- c) How could the role of regional NRM bodies be utilized more effectively?
 - a. Some authors suggest that a regionally coordinated approach could make participating in carbon markets simpler for farmers, while also reinvigorating regional planning efforts – do you agree?
 - d) What role should landcare and other grassroots networks play?
 - e) What role should industry and other extension bodies play?
 - f) How could the trend towards bigger farms, less farmers and more corporate operations effect future implementation of climate change mitigation efforts?
 - g) Many farmers mentioned that they had made changes in management practices after drought or some other catalyst event. Do you think there is potential to harness times when farmers are most receptive to change?
 - a. "Nothing makes us more receptive than seeing our crops die."
 - h) How do you see the Australian government responding to more severe climate change impacts for the agricultural sector, especially as the productive capacity of some areas becomes increasingly marginal?

10) Is there anything else you'd like to add?

I'm really grateful for the opportunity to meet with you. Thank you for your time.

Appendix 2: Data analysis

Themes coded from farmer interview transcripts

RQ 1: Barriers to implementing further GHG abatement measures

Characteristics of the change

Financial cost

- Reduced productivity cost (opportunity cost).
- Cost for materials or inputs.
- Labor cost for things like fencing and planting trees.
- Maintenance cost (e.g.: ongoing care of plantings)

Complexity or novelty

- Having to learn about new practices, trial them etc.
- Confusion about emissions abatement technology and outcomes
- Nature of the climate change problem and their role in addressing it

Characteristics of the farm

Rainfall

Soil type

Organic certification

Characteristics of the farmer

Personal goals and motivations

Previous involvement and evidence of leadership

Circumstances of the farmer

Increasing pressures

- Declining terms of trade + increasing labor cost = no ability to pass cost on
- Nature of Australian food markets (supermarkets dominating etc.). Price takers.
- Competing in global markets.
- Changing climate- adaptation challenges
- Time poor

Social and cultural context not conducive to change

- Conservatism and stoicism
- Attitudes to climate change
- Political indecisiveness on climate change – lack of political leadership
- Lack of a collective sense of urgency and community wide effort

Lack of information

- Low quality information

External factors

Characteristics of Industry and Government policy

- Inconsistent
- Complex

RQ 2: Current (and past) policy

Understanding of current policy – CFI/ ERF

Lack of engagement with current agricultural climate change policy

- None of the farmers had been involved in the CFI/ERF or had a good understanding of the current ERF.
- Complexity of policy.
- Narrow scope.
- Not every accessible.
- Not relevant.
- Not much legitimacy or authority.

Strengths of policy activities they had interacted with in the past

Bottom up, Landcare style engagement

- Importance of grassroots engagement and ownership.
- Change in attitude.
- Social, community-oriented focus
- Availability of funding and other resources.

Weaknesses of policy activities they had interacted with in the past

Policy framing

Conflicting policy objectives

- Within Agricultural policy and extension
- Between sectors
- Lack of a holistic, landscape- scale approach

Policy instruments

Demise of Landcare and regional approach

- Reduction in resources: funding, staff etc.
- Stagnating enthusiasm for landcare
- Focus became too 'green'.
- Inconsistencies with policy delivery
- Shift from decentralized bottom up approach to centralized top down.
- Became very bureaucratic.

Permanence and risk of carbon farming

Policy delivery

Policy inconsistency, lack of stability and short time scales

- Constant changes in policy direction, programs and funding
- Climate change mitigation policy.
- Short-term contracts for staff on the ground, short-term project grants, short-term commitments.

Drought policy

- helpful and necessary
- Not been used efficiently in the past.

RQ 3: Future policy solutions

Policy framing

Problem definition

- Big picture
- Communicating importance

- Focus on change and how it is normal to respond to changing circumstances

Policy goals

- Coupling NRM/ CC mitigation with production objectives
- Cultivating an Australian-wide sense of responsibility
- Integrate other challenges facing rural Australia
- Link CC adaptation and mitigation
- Stress co-benefits

Policy instruments

Facilitate

- R & D + new technologies
- Education
- Knowledge sharing

Induce

- Financial incentives
- Ecolabelling

Compel

- Who should pay?
- Role of Regulation

Policy delivery

More Resources

Organisational structures

- Less complicated
- Respond and capitalize on times of stress for change catalysts
- Bottom up approach
- Regional approach
- Industry bodies
- Role of landcare groups

Long-term consistent delivery

Themes coded from policy official interview transcripts

Current policy – practical details

Current policy – Strengths

- Focus on productivity co-benefits of mitigation
- Improved drought (adaptation) policy
- Climate change update for NRM plans
- Support for Landcare and NRM regional bodies – focus on the land sector

Current policy - Weaknesses

- Emphasis on productivity
- ERF not a long term solution
- Policy integration: Disconnect between Climate Change mitigation and NRM policy
- Policy integration: policy incoherence
- Isolating benefits
- Complexity of the ERF
- Relationship between land sector and other sectors
- Confusion between jurisdictions
- Focus on adaptation
- Language of climate variability

Future policy direction – Policy framing

- Emphasise and develop co-benefits
- Use 'clean, green and high quality' image
- Greater policy integration
- Be cautious but honest with communicating climate change impacts

Future policy direction – Policy instruments

- Incentives
 - Ecolabelling
 - Negative incentives
- Facilitative
 - Communication and Education
 - R & D
- Regulation
 - Including Ag emissions in ETS

Future policy direction – Policy delivery

- Co-ordination and cooperation between jurisdictions and organisations
- Involve non-government actors
- Consistency in policy delivery
- Regional approach

Appendix 3: Participant information sheet and consent form



Participant Information Sheet

Researcher:

I, Ishbel Cullen, am an undergraduate Honours student at the Fenner School of Environment and Society at the Australian National University, Canberra. I am undertaking an honours year to complete my Bachelor of Science (Resource and Environmental Management).

Project title:

Climate change mitigation in the Australian agricultural sector: how can landholder experience inform policy direction?

General outline of the project:

Description and methodology: The Honours program involves nine months working on an independent research project. My research project will consider adoption of greenhouse gas abatement measures in the Australian agricultural sector, with a focus on how landholder experience can inform policy direction. This research will review relevant state and federal policy, investigate what further policy support farmers need to adopt carbon abatement measures and draw conclusions about how policy frameworks could facilitate increased adoption of carbon abatement measures.

Participants: Primary data will be collected through semi-structured interviews with farmers, farmer representative groups and policy-makers from relevant Government Departments. There will be approximately eighteen interviews in total.

Use of data and feedback: Interview data will be analysed and presented in an honours thesis, which will be available for you to read. A summary of the research findings will also be provided.

This research is being done in collaboration with Beyond Zero Emissions (BZE), a research and education organisation dedicated to designing and implementing a zero carbon emissions economy for Australia. My honours project builds on BZE's *Zero Carbon Australia Land Use Plan* published last year, which demonstrates how zero carbon agriculture could technically be achieved. The report can be downloaded from <http://bze.org.au/landuse>.

Participant involvement:

Voluntary participation and withdrawal: Participation in this research is voluntary and you can withdraw or decline to take part at any point until the work is prepared for publication. You can also choose not to answer an interview question. If you do wish to withdraw, your data will be destroyed and not used.

What does participation in the research request of you? In participating in this research, you will be asked to complete a semi-structured interview. The interview questions will focus on your experience of current policy frameworks and your views about what further support farmers require to increase adoption of greenhouse gas abatement measures on their properties. Interviews will be recorded and transcribed. A transcript will be provided to you for verification before the data is used.

Location and duration: The interview will take place in person where feasible, at a location convenient for you. Interviews will be approximately 60 minutes in length, with the total time requested of you in this research being about two hours.

Risks: If you wish to remain confidential, there may remain a risk of third-party identification, where you can be identified through other information you provide. This will be considered when deciding what information is presented in publication and further efforts to de-identify you will be made if necessary.

Benefits: It is unlikely that this research will personally benefit you. However, this research will contribute to a broader conversation about the role of government policy in reducing greenhouse gas emissions in order to mitigate climate change. Considering this research is being done in collaboration with BZE, it will also contribute to their work.

Confidentiality:

If chosen, confidentiality can be maintained, as far as the law allows. Information can be kept confidential throughout data collection by storing interview transcripts and personal details separately. You can choose how you are identified in the final thesis, either full name, pseudonym or no attribution.

Data storage:

Material collected will not be accessible to anyone other than myself. Transcribed interviews will be stored on a password-protected computer. Interview data will be kept for five years after the publication of my thesis and any other publications using this data (e.g.: journal article). Five years after publication, the data will be destroyed.

Queries and Concerns:

If you have any queries or concerns about this research, please contact me or my supervisors:

Ishbel Cullen (Primary Investigator)

T: 0406 940 914

E: u5006844@anu.edu.au

Dr Karen Hussey (Supervisor)

T: + 612 6125 1036

E: karen.hussey@anu.edu.au

Dr Stephen Bygrave (Supervisor)

T: 040 890 7686

E: stephen.bygrave@bze.org.au

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee. If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager

The ANU Human Research Ethics Committee

The Australian National University

Telephone: +61 2 6125 3427

Email: Human.Ethics.Officer@anu.edu.au



WRITTEN CONSENT for Participants

Climate change mitigation in the Australia agricultural sector: how can landholder experience inform policy direction?

I have read and understood the Information Sheet you have given me about the research project, and I have had any questions and concerns about the project (listed here

_____)

addressed to my satisfaction. I agree to participate in the project.

YES ☐ NO ☐

I agree to this interview being audio-recorded YES ☐ NO ☐

I agree to be identified in the following way within research outputs:

Full name YES ☐ NO ☐

Pseudonym YES ☐ NO ☐

No attribution YES ☐ NO ☐

Signature:.....

The Australian National University | Canberra ACT 0200 Australia | CRICOS Provider No.