Australian Government
Climate Change Authority

ACTION ON THE LAND: REDUCING EMISSIONS, CONSERVING NATURAL CAPITAL AND IMPROVING FARM PROFITABILITY

AN ISSUES PAPER

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ISSUES PAPER

The Climate Change Authority has released this issues paper to assist individuals and organisations to prepare submissions to inform the Authority's research into natural resource management, agriculture and land based emissions reduction. It outlines:

- the scope of the work
- matters on which the Authority is seeking comment and information
- how to make a submission.

This issues paper identifies matters that the Authority considers most pertinent to this work, but comments on any other issues that participants consider relevant are also welcome.

Key dates

Issues paper released
9 March 2017

Submissions close
20 April 2017

Final Report
Mid 2017

How to make a submission

All submissions except those made in confidence will be published on the Authority's website.

Submissions can be lodged

via email to: submissions@climatechangeauthority.gov.au
via post to: Submissions, Climate Change Authority, GPO Box 787, Canberra ACT 2600

Contacts

For further information about this work or making a submission, contact the Climate Change Authority on 1800 475 869 or via email at enquiries@climatechangeauthority.gov.au.

Web site

www.climatechangeauthority.gov.au

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CHAIR'S FOREWORD

The Climate Change Authority is pleased to release this issues paper, as a basis for consultation to inform its research into natural resource management, agriculture and land based emissions reductions.

In the third and final report of its Special Review into Australia's climate goals and policies, which was completed in 2016, the Climate Change Authority recommended some avenues for further research. One of these is an examination of the multiple benefits for farm profitability and the broader environment that could result from well-designed emissions reduction policies on the land.

Of course, the core business for farmers is to produce the food and other agricultural commodities that Australians and the rest of the world demand. While the days of the Australian economy riding primarily on the sheep's back are to some extent behind us, agriculture still produces 17 per cent of our export earnings, and remains the mainstay of many of our regional and rural communities.

Agriculture is a key sector for action on climate change. Land based activities account for around 20 per cent of Australia's greenhouse gas emissions, and the sector will need to continue to play its part in meeting our Paris Agreement emissions reduction commitments.

Farmers and other landholders, including Indigenous communities, play a vital role as custodians of Australia's natural resources with agricultural land accounting for around 50 per cent of Australia's landmass.

While the debate on natural resource management for values like biodiversity, threatened species and water quality is often cast in terms of trade-offs with economic development, the Authority is keen to explore whether carefully crafted policies can deliver on a triple bottom line of environmental, economic and social benefits.

I have had many conversations with landholders over the years about ways to reduce greenhouse gas emissions or to deliver other environmental outcomes like improving water quality, conserving vegetation or enhancing the ability of agricultural soils to retain moisture and resist drought. Experience shows that establishing a wind break of trees, for example, can store carbon, provide shelter for stock and safeguard against soil erosion. Reducing levels of fertiliser application can reduce emissions, agricultural run-off and improve on-farm profitability.

A key question for the Authority's research is to understand the barriers to realising multiple benefits like these on the land and to see whether it is possible to deliver more 'win-win' outcomes for farmers and other landholders – improving their profitability while reducing greenhouse gas emissions and enhancing our natural resources.

I encourage individuals and organisations with an interest in these matters to make a submission to the Authority by 20 April 2017. These submissions will help inform development of a research paper that the Authority plans to release in mid-2017.

Wendy Craik AM

CHAPTER 1. INTRODUCTION

1.1. THE CLIMATE CHANGE AUTHORITY AND THE CONTEXT FOR THIS WORK

The Climate Change Authority is an independent statutory agency, established to provide expert advice on Australian climate change policy. The third and final report of the Climate Change Authority's special review into climate policy, *Towards a climate policy toolkit: Special Review on Australia's climate goals and policies*, recommended there be an examination of the multiple benefits that could result from land based emissions reduction policies (CCA 2016). This issues paper is the first phase of work by the Authority to meet that recommendation. The Authority's aim in undertaking this research project is to assess how climate change mitigation, agriculture and natural resource management (NRM) policies interact and to determine whether there are opportunities for improving the linkages between them.[1] The Authority is particularly interested in understanding how agricultural productivity and profitability can be enhanced while reducing emissions and how emissions reduction, agriculture and NRM policies can drive such an outcome.

Agriculture contributes significantly to Australia's trade performance, being responsible for 17 per cent of the nation's exports by value (ABARES 2016, ABS 2016a). It also accounts for 1.9 per cent of Gross Domestic Product (GDP) and around 2.5 per cent of employment (ABS 2016b, 2016c). These statistics understate the importance of agriculture as the sector is integrated with a number of other industries, including food product manufacturing, which accounts for 1.7 per cent of national employment (ABS 2016c). Agricultural landholders are also responsible for the management of around 385 million hectares (ha), or 50 per cent of Australia's landmass (ABS 2016d), making them important for the achievement of public policy objectives related to climate change and NRM.

The greenhouse gas emissions associated with agriculture are significant, with the sector accounting for approximately 20 per cent of Australia's emissions, or 107 million tonnes (Mt) of carbon dioxide equivalent per year (CO_2-e per year) (DoEE 2016a). Under the Paris Agreement, the long-term global objective is to reduce net greenhouse gas emissions to zero in the second half of this century (UNFCCC 2015, art. 4). Although the Agreement does not impose obligations on specific sectors, ultimately all sectors, including agriculture, will need to reduce their emissions substantially in pursuit of the global goal. This is likely to require significant changes to agricultural systems and practices.

While finding ways to reduce its emissions and increase carbon storage, the agriculture sector is faced by a number of other existing and likely future challenges. These include market-related pressures to boost productivity, the need to promote resilience to climate variability and change, and the need to conserve the natural capital that underpins the sector and provides broader social

[1] The project does not cover commercial forestry (plantations, and public or private native forestry), other than farm forestry (small-scale forestry integrated with other cropping and/or grazing operations). The commercial forestry sector has an important role to play in reducing Australia's emissions. It has been excluded from the scope of this review to allow greater focus on the opportunities for improved outcomes in the agricultural sector. Forestry will be within scope for the Authority's second Carbon Farming Initiative review, which is due to be completed by 31 December 2017. This current project is focused on terrestrial emissions reductions and natural resource management. While also significant, coastal and marine environments including fisheries pose unique challenges that are beyond the scope of this work.

benefits (Productivity Commission 2005, RIRDC 2015, Australian Government 2015). There are also opportunities for the agricultural sector associated with increasing global demand for agricultural products and the opening up of new markets (RIRDC 2015). Australian Government policies seek to capture these opportunities, including by increasing access to foreign markets through free trade agreements, a number of which have been signed in recent times with countries in the Asia-Pacific region (Australian Government 2015).

Each of the challenges and opportunities facing the agricultural sector may require targeted public policy responses. Yet, without coordination, there is the potential for individual responses to these issues to work against efforts to address the others. For example, policies that promote emissions reductions through single species carbon plantings can miss opportunities to achieve NRM objectives, such as enhancing ecosystem integrity. Properly integrated policy responses can also ensure policy instruments designed to address a particular issue simultaneously capture other benefits. For example, climate policies that promote carbon storage through reforestation can simultaneously improve NRM outcomes, provided there are measures in place to ensure plantings are located appropriately, involve the use of suitable species and have necessary water entitlements.

A key aim for the Authority in undertaking this work is to determine whether there are opportunities for better integration between climate, agriculture and NRM policies at all levels of government. The focus of this work is on how policies to reduce greenhouse gas emissions in the agricultural sector interact with agriculture and NRM policies.

The Authority invites submissions on all issues relevant to the scope of this work. Those interested in making a submission should not feel constrained by the issues or questions raised noting that the Authority will be consulting on a broader range of issues as part of its review of the Carbon Farming Initiative legislation and the Emissions Reduction Fund later in 2017.

CHAPTER 2. THE AGRICULTURE SECTOR AND ITS CHALLENGES

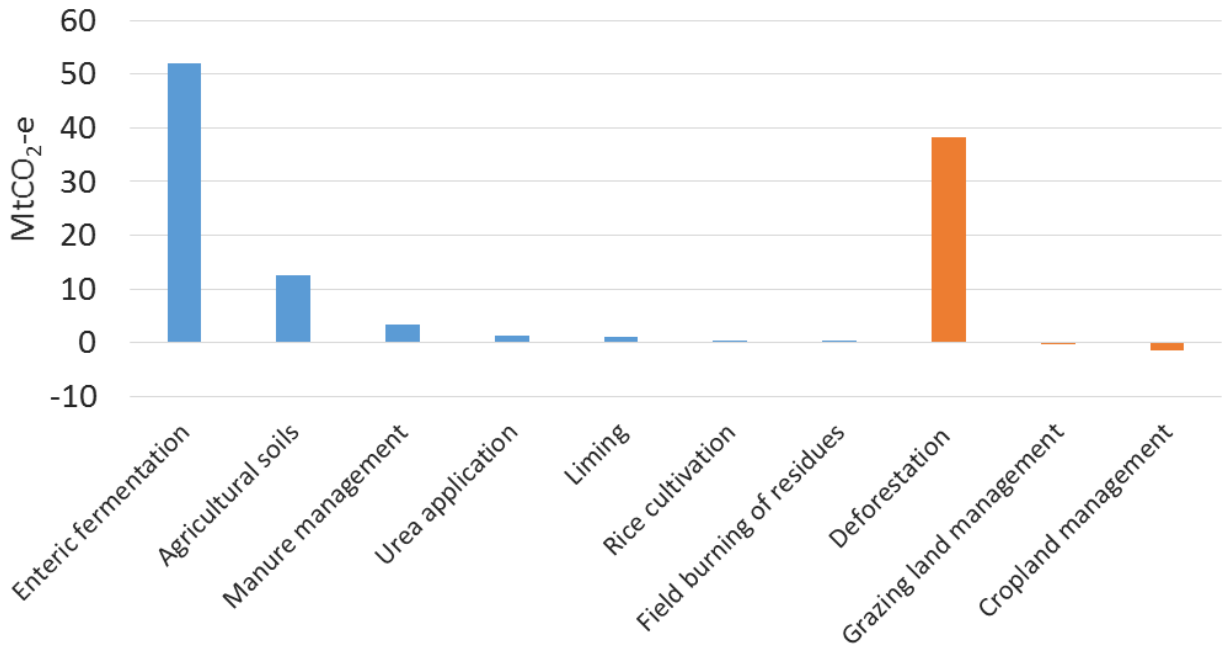
As flagged in the introduction, the agriculture industry is faced with four main challenges: reducing agricultural-related emissions, improving productivity, adapting to climate change and conserving natural capital (Productivity Commission 2005, RIRDC 2015, Australian Government 2015). Developing effective policy is best informed by a good understanding of these challenges and their interactions. The following sub-sections provide a brief overview of these challenges.

2.1. REDUCING EMISSIONS

Agricultural activities result in emissions and carbon storage that are recorded in two parts of Australia's emissions inventory: agriculture; and land use, land-use change and forestry (LULUCF). At a high level, 'agricultural' emissions consist of the methane and nitrous oxide emissions related to land use, including methane emissions from enteric fermentation and nitrous oxide emissions from agricultural soils. 'LULUCF' mostly records the fluxes of carbon dioxide from live vegetation, debris and soil caused by land management practices and land-use change (DoEE 2016b).

Combined, net emissions (emissions minus carbon storage) from agriculture and the agricultural-related component of LULUCF account for approximately 20 per cent of Australia's emissions (107 Mt CO_2-e on average per annum from 2010-2014) (DoEE 2016a, 2016b). This is more than the emissions from transport, more than double the emissions associated with the combustion of fossil fuels by the manufacturing and construction sectors, and approximately 60 per cent of the emissions associated with electricity generation (DoEE 2016a, 2016b). The breakdown of agricultural-related emissions is shown in Figure 1, and described in Table 1.

FIGURE 1. AVERAGE ANNUAL NET AGRICULTURAL-RELATED EMISSIONS IN AUSTRALIA, 2010-2014



Note: Figure 1 excludes afforestation and reforestation. As such environmental plantings on agricultural land are excluded.
Source: DoEE 2016a.

TABLE 1. AGRICULTURAL-RELATED EMISSIONS IN AUSTRALIA, DESCRIPTION OF REPORTING CATEGORIES

EMISSION CATEGORY	AVERAGE EMISSIONS (MT CO_2-E PER YEAR)	DESCRIPTION
AGRICULTURE		
Enteric fermentation	52	The emission of methane as a result of the fermentation of carbohydrates by microbes, called methanogens, under anaerobic conditions in the rumen of livestock.
Agricultural soils	12	The emission of nitrous oxide from agricultural soils, mostly through nitrification and denitrification.
Manure management	3	Emissions of methane and nitrous oxide associated with livestock manure. Most of the emissions are associated with intensive livestock systems (dairy, feedlot cattle and pigs), where manure is deposited in large piles or lagoons and decomposes under anaerobic conditions, producing methane.
Urea application	1	The emission of carbon dioxide as a result of the application of urea to agricultural soils. Urea is a widely used synthetic nitrogen fertilizer.
Liming	1	The emission of carbon dioxide as a result of the application of lime to agricultural soils. Lime is applied to agricultural soils to ameliorate soil acidity, improve soil structure, and improve plant growth.
Rice cultivation	0.4	The emission of methane as a result of the decomposition of plant residues under the anaerobic conditions produced when rice crops are irrigated.
Field burning of residues	0.3	The emissions of methane and nitrous oxide that arise from stubble burning.
LAND USE, LAND-USE CHANGE AND FORESTRY		
Deforestation	38	The emission of mostly carbon dioxide from vegetation, debris and soils as a consequence of land clearing, and the subsequent storage of carbon dioxide on land cleared since 1990.
Grazing land management	-0.3	Emissions and carbon storage associated with the management of grazing lands. This includes changes in soil carbon from land management changes, emissions and storage of carbon dioxide associated with shrubs on grazing lands, and methane and nitrous oxide emissions from savanna burning. Methane and nitrous oxide emissions from savanna burning (approximately 8.8 Mt CO_2-e per annum) are now reported in the land sector. These emissions were reported in the agriculture sector in Australia's national greenhouse gas accounts up to the 2013 reporting year.
Cropland management	-2	The emission of mostly carbon dioxide, and storage of carbon dioxide, associated with the management of croplands, including orchards, vineyards and land managed on crop-pasture rotations.

Source: DoEE 2016a, DoE 2015.

Agricultural emissions, defined in the narrow carbon accounting sense that excludes LULUCF, have decreased by 10 per cent since 1990, although they can vary materially year-by-year depending on agricultural stocking rates and production area, which are driven by factors such as changes in water availability and agricultural prices (DoEE 2016a). Agricultural-related LULUCF emissions have declined significantly since 1990, primarily as a consequence of reduced agricultural-related land clearing (known as 'deforestation') (DoEE 2016a). The national deforestation rate fell by 70 per cent between 1990 and 2014, resulting in an almost 60 per cent reduction in deforestation emissions (DoEE 2016a; DoEE 2016c). The reduction in deforestation emissions made a significant contribution to Australia meeting its international mitigation obligations in the first commitment period of the Kyoto Protocol. The agricultural sector as a whole (agriculture and LULUCF) is expected to play an important role in meeting Australia's existing and

future mitigation obligations because of the magnitude of its emissions and the opportunities for cost-effective emissions reductions and carbon storage (The Treasury 2011, The Treasury and DIICCSRTE 2013, ClimateWorks et al. 2014).

The available research suggests there are many cost-effective abatement options in the agriculture sector incorporating LULUCF activities such as reforestation, avoided deforestation, and soil management (Cole et al. 1997, Smith et al. 2008, The Treasury 2011, The Treasury and DIICCSRTE 2013, ClimateWorks et al. 2014, Herrero et al. 2016, Henderson et al. 2017). While the costs of individual projects vary, appropriately designed and located land sector projects can provide a low cost way of reducing emissions and increasing carbon storage. The results of the four Emissions Reduction Fund (ERF) auctions support this, with land sector projects providing over 80 per cent of the contracted abatement (CER 2016a, 2016b).[2] The majority of this contracted abatement comes from a small number of project types: avoided deforestation, human-induced regeneration, savanna burning, soil carbon sequestration in grazing systems and manure management in piggeries (CER 2016a, 2016b). The dominance of these project types in the auctions reflects, at least in part, their comparatively low emissions reduction costs. Beyond these project types, there are other land sector activities that, at least in theory, offer cost-effective options for reducing emissions and increasing carbon storage. A challenge for government is designing policies that realise these opportunities and that identify new ways of reducing agricultural-related emissions.

CONSULTATION QUESTIONS

Q.1. Are there particular land sector abatement activities, or data on land sector abatement costs, that the Authority should consider when conducting the research?

2.2. IMPROVING PRODUCTIVITY

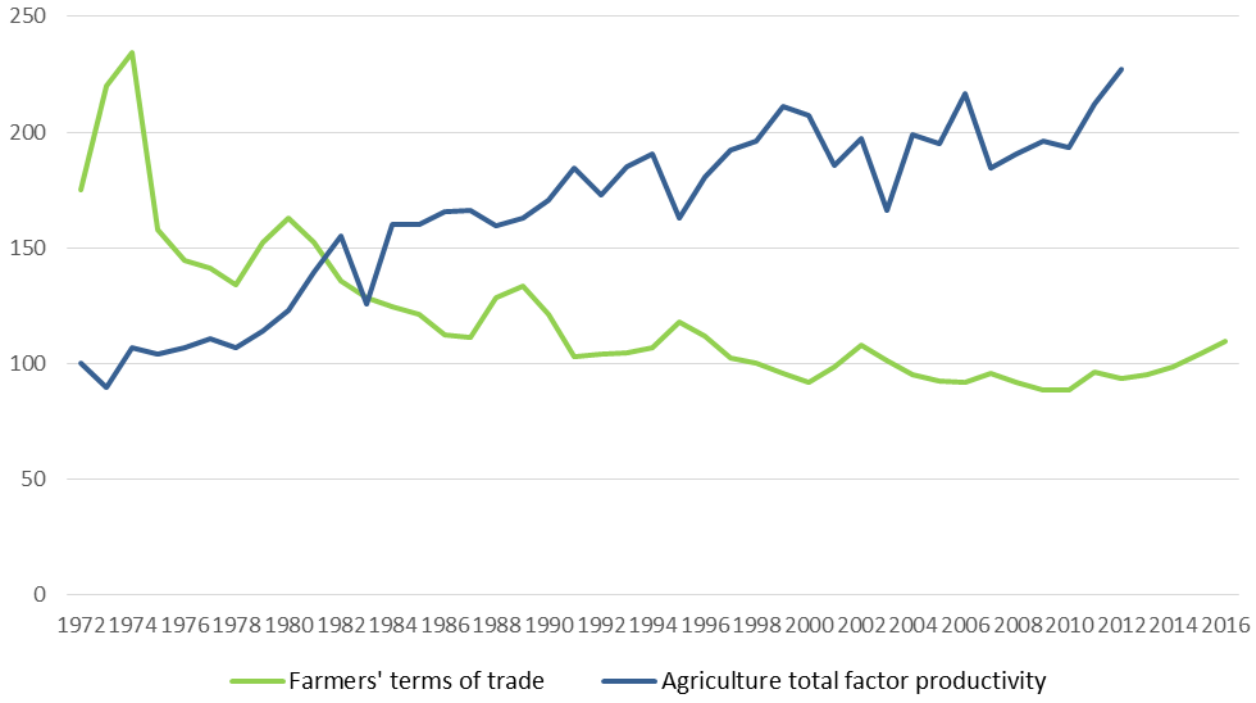
Australian farmers supply competitive, trade-exposed markets (Productivity Commission 2005). Almost 80 per cent of Australian agricultural production outputs (by value) are exported (ABARES 2016). Producers supplying domestic markets also face strong competition from imports (Productivity Commission 2005). The competitive nature of agricultural markets is reflected in trends in real prices. Since the late 1980s, the real prices of most major agricultural commodities have declined. There are exceptions—for example, lamb and mutton—but the overall trend has been downward (ABARES 2016). Real farm input prices have also declined over this period but the falls in prices received have been greater, resulting in a downward trend in farmers' terms of trade (ratio of prices received and paid by farmers) (Figure 2).

In recent years, farmers' terms of trade have rebounded, mainly as a consequence of a sharp increase in beef cattle prices since 2014 (ABARES 2016). While sustained higher prices are possible, historically, the competitive nature of agricultural markets has constrained growth in real prices and there is a risk this will continue to be the case in the future. The agricultural industry's

[2] Further details of the ERF are provided in Part 3.1.2.

traditional response to the pressures associated with declining or stagnant terms of trade has been to increase productivity, which has enabled it to maintain or improve profitability (Productivity Commission 2005, Sheng et al. 2016).

FIGURE 2. INDEX OF FARMERS' TERMS OF TRADE AND TOTAL FACTOR PRODUCTIVITY IN AUSTRALIA, 1972-2016



Note: Total factor productivity is based on all inputs to production.
Source: ABARES 2016, Sheng et al. 2016.

The Australian Government's Agricultural Competitiveness White Paper of 2015 sets out a multi-pronged strategy for building a more profitable, resilient and sustainable agriculture sector (Australian Government 2015). The strategy is built around five policy priorities: improving regulatory and tax systems, and promoting healthier competition in agricultural markets; improving water, transport and communications infrastructure; strengthening drought and risk management policies; promoting a smarter approach to farming based on strong research and development and effective natural resource policy; and improving access to premium markets. While seeking to capture opportunities associated with expanded market access and growth, the strategy emphasises the need for continued productivity improvements to maintain competitiveness and profitability (Australian Government 2015).

The agriculture industry faces other challenges, including reducing greenhouse gas emissions and increasing carbon storage in soils or vegetation. There is research that suggests mitigation and agricultural policies can work synergistically, with improvements in agricultural productivity helping to enhance the effectiveness of emissions reduction policies (Baker et al. 2012). The Authority is interested in receiving submissions on how agricultural productivity can be enhanced while also delivering emission reductions, NRM or other benefits.

2.3. CLIMATE CHANGE

Agriculture is susceptible to variations in climatic conditions because of the importance of rainfall and temperatures to crop and livestock production (Howden et al. 2008, Henry et al. 2012, Anwar et al. 2007, 2013). Droughts reduce water availability and soil moisture and thereby reduce plant growth. In doing so, they adversely affect crop yields and liveweight gain of livestock. Similarly, temperature changes can affect both crop and livestock production, with temperature extremes having the most acute impacts. For example, heat waves can increase livestock mortality and reduce crop yields, as can severe cold weather.

Australian agricultural producers are accustomed to climate variability, especially frequent droughts. In the Murray-Darling Basin—Australia's most iconic agricultural region—droughts have been recorded on 17 occasions, and over 40 per cent of the years, since European settlement (Helman 2009). Similar variability in rainfall is a feature of Australia's other major agricultural regions (Manins et al. 2001, BoM & CSIRO 2015, 2016). The impacts of droughts on agricultural output are not uniform, with crop production tending to be more acutely affected than livestock production (Rayner et al. 2010). This is because crop producers have fewer opportunities to respond to decreases in water availability than livestock producers, who can, for example, use supplementary feed to make up for reduced pasture availability and condition and agist or sell off stock.

Climate change could have significant impacts on agricultural production and productivity by increasing the frequency and intensity of extreme events, including drought, changing average temperatures, rainfall and atmospheric conditions, and altering the distribution of pests, weeds and diseases (Luo et al. 2003, Ludwig & Asseng 2006, Howden et al. 2008, Ludwig et al. 2009, McKeon et al. 2009, Cullen & Eckard 2011, Bell et al. 2012, Henry et al. 2012, Anwar et al. 2007, 2013). The nature and magnitude of these impacts will depend on the success of the global community in reducing emissions, the sensitivity of the climate system to elevated greenhouse gas concentrations, and the responses taken to manage risks and promote agricultural productivity. The impacts are also likely to be regionally variable (Ludwig & Asseng 2006).

There has already been significant drying across southern Australia over the past two decades, especially in the April–October growing season (BoM & CSIRO 2015, 2016, Hochman et al. 2017). This has been particularly acute in southwest Western Australia, where May–July rainfall has fallen by 19 per cent since 1970 relative to the long-term average (BoM & CSIRO 2016). There has also been a 15 per cent decline in late autumn and early winter rainfall since the mid-1990s in southeastern Australia (BoM & CSIRO 2016). Recent research suggests the changing climate has contributed to a stagnation of national wheat yields since the early 1990s and resulted in a 27 per cent decline in water-limited yield potential, most of which is attributable to reduced rainfall and higher temperatures (Hochman et al. 2017). Future climate change could exacerbate these trends, placing additional pressure on agricultural producers.

2.4. CONSERVING NATURAL CAPITAL

The natural systems that underpin agricultural production, and societal development more broadly, are often referred to as natural capital (Costanza & Daly 1992). More recently, the phrase 'ecosystem services' has emerged as a shorthand way of referring to the direct and indirect

contributions ecosystems make to human wellbeing (Daily 1997, Costanza et al. 1997, Farber et al. 2002, MEA 2005, Fisher et al. 2009).

Agriculture provides ecosystem services, relies on ecosystem services and receives and generates ecosystem services (Zhang et al. 2007, Swinton et al. 2007, Dale & Polasky 2007). The ecosystem services provided by agriculture include food, fibre and fuel, and cultural, aesthetic and spiritual outputs. The production of these ecosystem services is dependent on a range of supporting and regulating services relating to climate, soils, nutrients and hydrology. Farmers also have to contend with a range of natural challenges that impede production and increase costs, such as pests, weeds and diseases. Some farming practices may also degrade natural capital or have other adverse impacts such as biodiversity loss, nutrient pollution, soil salinity or acidity, and greenhouse gas emissions.

As owners and managers of more than 50 per cent of the Australian landmass, farmers play a central role in the conservation and restoration of Australia's natural capital (ABS 2016d). As most farmers are acutely aware, it is in their financial interests to manage their natural assets sustainably. Many landholders also voluntarily invest a considerable amount in providing ecosystem services for the broader community (ABS 2016). Despite these efforts, the NRM challenges faced in some agricultural regions are substantial (SoEC 2011). Past land management practices have left a legacy of extensive land degradation in certain areas that some landholders may struggle to resolve (SoEC 2011). Landholders are also generally unable to capture the full benefits associated with investments in the provision of ecosystem services such as biodiversity outcomes. Equally, they generally do not incur the full costs associated with the degradation of natural capital. Owing to these factors, there is an important role for government and other actors (like non-government organisations or businesses) in the design and implementation of NRM polices that support landholders in their efforts to conserve and restore natural capital while avoiding unintended consequences.

CONSULTATION QUESTIONS

Q.2. Do the four identified pressures adequately capture the major issues facing the agricultural sector that are relevant to the intersection of NRM, agriculture and climate policy?

Q.3. How can the government, non-government and private sectors address these challenges?

Q.4. How could these challenges affect efforts to deliver emissions reductions, NRM and agricultural policy objectives in a coordinated way?

CHAPTER 3. REDUCING EMISSIONS FROM AGRICULTURE AND THE LAND SECTOR

3.1. OPTIONS TO REDUCE EMISSIONS

There are four activities that are responsible for most agricultural-related emissions: livestock management; vegetation and soil management; savanna burning;[3] and the application of synthetic nitrogen fertilisers and other soil additives (DoEE 2016a, 2016b). There are a number of ways of reducing emissions from these sources and enhancing carbon storage on agricultural lands. Livestock-related emissions can be reduced through improved animal management and breeding, improving feed quality, the feeding of supplements like condensed tannins, and the provision of vaccinations, or introduction of competitive or predatory microbes, to reduce methane production in the rumen (Smith et al. 2008, Eckard et al. 2010, Beukes et al. 2010, Buddle et al. 2011). Manure emissions can be reduced by encouraging the capture and destruction of methane from manure piles and effluent ponds (Clemens et al. 2006). Vegetation and soil-related carbon dioxide emissions can be reduced, and carbon storage enhanced, by encouraging revegetation and the retention of existing vegetation, and the uptake of cropland and grazing land management practices that build soil carbon levels and can increase productivity (Paustian et al. 2000, Lal 2004, Post et al. 2004, Smith et al. 2008). Soil-related nitrous oxide and carbon dioxide emissions can be mitigated by encouraging more efficient use of nitrogen fertilisers and lime, improving irrigation practices and soil drainage, and by planting crops that inhibit nitrification (de Klein & Eckard 2008, Eckard et al. 2010).

3.1.1. POLICIES TO INCENTIVISE EMISSIONS REDUCTIONS AND ENHANCE CARBON STORAGE

The challenge for policymakers is to design policies that encourage the uptake of these and other similar emissions reduction options in an environmentally effective, cost effective and equitable manner. There are four broad categories of policies that could be used for this purpose: information-based; voluntary; market based; and regulatory (Hamilton & Macintosh 2008). Regulation imposes legally enforceable restrictions to realise emissions reduction objectives. Market based policies require those responsible for emissions to internalise all or part of the associated social costs and rely on market forces to promote economically efficient responses. Voluntary approaches give those undertaking emitting activities the option of participating in a program to reduce emissions and use positive incentives (for example, grants or subsidies) to change behaviour. Information-based policies aim to reduce emissions and enhance carbon storage by improving people's awareness and understanding of the issues, and building their capacity to respond.

3.1.2. THE EMISSIONS REDUCTION FUND

Under current policy settings, a mix of instruments is used to reduce and control agricultural-related emissions. At the federal level, the primary incentive for emissions reductions

[3] Savannas are 'tropical and sub-tropical formations with continuous grass cover occasionally interrupted by trees and shrubs'. In Australia, they are defined as including monsoonal open forest and woodland through to semi-arid grasslands. Approximately 40-50 million hectares of savanna grasslands, woodlands and forests are affected by wildfires and prescribed burning each year (DoEE 2016a). These fires result in methane and nitrous oxide emissions, and also alter the amount of carbon stored in vegetation, debris and soils.

and the enhancement of carbon storage in vegetation and soils on agricultural lands is the Emissions Reduction Fund (ERF). The ERF has three components: crediting; purchasing; and safeguarding emissions reductions. The crediting component provides Australian carbon credit units (ACCUs) for projects that reduce emissions or enhance carbon storage. Eligibility is contingent on there being a method (Box 1), which provides the technical basis and rules for calculating the emissions reductions and carbon storage generated by the projects (*Carbon Credits (Carbon Farming Initiative) Regulations 2011* (Cth)).

BOX 1: CURRENT ERF METHODS IN THE AGRICULTURE AND LAND SECTOR

There are currently 33 methods under the ERF, 18 of which relate to agriculture and land (Table 2). To date, there have been four auctions, which have contracted 178 Mt CO_2-e of emissions reductions (CER 2016c). The majority of contracted emissions reductions over the next ten years is expected to come from the agriculture and land sector with 113.4 Mt contracted from vegetation, 17.3 Mt from agriculture and 13.8 Mt from savanna burning (CER 2016c).

Some of the options to reduce emissions in the agricultural sector involve changes in management practices that can lead to improvements in agricultural productivity and profitability (Monteny et al. 2006, Grainger et al. 2008, Beauchemin et al. 2008, Eckard et al. 2010). For example, improvements in herd management or fertiliser use can reduce emissions while also increasing output or reducing inputs. Depending on the ERF project type, income received from the sale of ACCUs may also be more secure than some other agricultural production activities as they have received government contracts for a set price over periods of between seven and ten years. This means revenue from contracted ERF projects will not be as heavily influenced by fluctuations in international commodity prices.

TABLE 2. AGRICULTURAL-RELATED METHODS UNDER THE ERF

METHOD FAMILY	DESCRIPTION
Enteric fermentation	Beef cattle herd management to improve productivity and reduce methane emissions. Replacement of urea lick blocks with nitrate lick blocks for pasture-fed beef cattle to reduce methane emissions. Provision of dietary additives (for example, canola meal) to milking cows to reduce methane emissions.
Manure management	There are three methods that incentivise the capture and combustion of methane from piggery and dairy effluent lagoons. Diversion of manure waste to engineered biodigesters and subsequent capture and combustion of biodigester methane.
Vegetation and soil management	There are nine methods that promote the enhancement of carbon storage in vegetation and soils, including through the protection of existing native forests, re-establishment of native forests, and building soil carbon stocks by changing management practices in grazing and cropping systems.
Savanna burning	Early dry season burning and other fire management activities in savannas that reduce methane and nitrous oxide emissions.
Synthetic fertiliser application	Improved efficiency of synthetic fertiliser use in irrigated cotton systems.

Source: CER n.d.

The purchasing element of the ERF involves the acquisition of ACCUs by the Clean Energy Regulator on behalf of the Australian Government. The acquisition of these carbon credits primarily occurs through auctions, although the Clean Energy Regulator has the capacity to purchase ACCUs outside of the auction process. To date, there have been four auctions, which have contracted 178 million ACCUs (equivalent to 178 Mt CO_2-e) from 397 projects under 356 contracts with an average price of A$11.83 per tonne of abatement (CER 2016c).

The final part of the ERF is the safeguard mechanism, which applies to facilities that emit more than 100,000 tonnes of CO_2-e per year. The safeguard mechanism imposes regulatory limits on the emissions from these facilities. If a facility exceeds its safeguard limit in a particular year, it is required to purchase offsets (ACCUs) or compensate for the exceedance by reducing its emissions in the following year(s). The safeguard mechanism commenced operation in July 2016. The 100,000 tonne threshold for the safeguard is unlikely to apply to most agricultural businesses. The safeguard mechanism is not projected to deliver significant emissions reductions or demand for ACCUs in the short term but it has the potential to play an expanded role in the future if it is enhanced (CCA 2016).

3.1.3. OTHER GOVERNMENT POLICIES

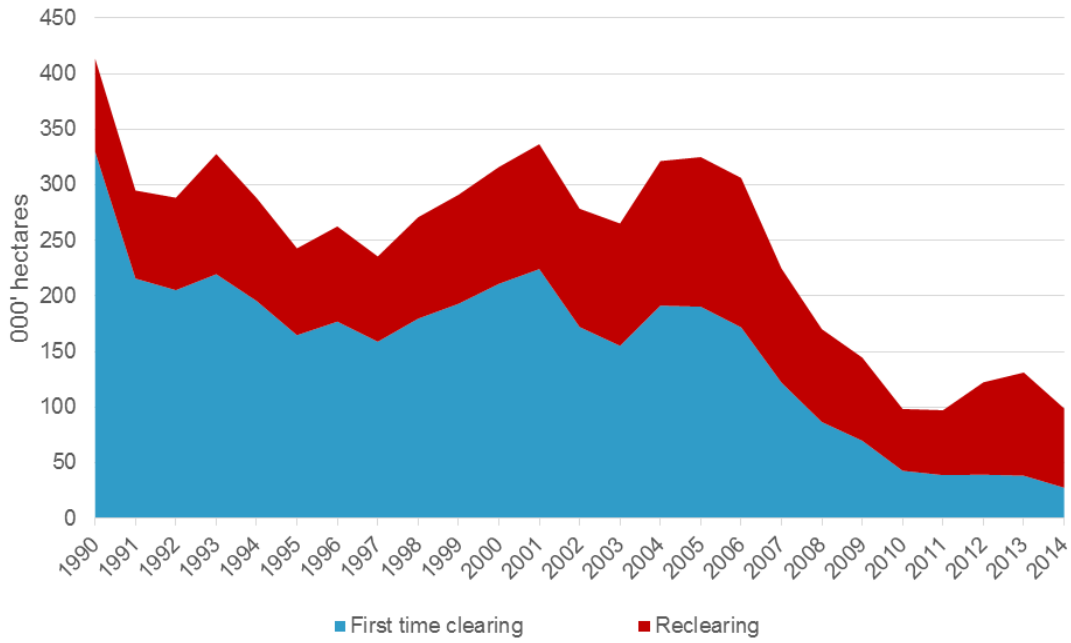
In addition to the ERF, there are a number of other federal, state or territory and local government agricultural and NRM policies that affect agricultural-related emissions. Most of these are not directly aimed at reducing emissions. An example is the native vegetation and biodiversity laws in the states and territories, which are complemented by vegetation clearing restrictions that apply under the federal *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). These laws are mainly orientated towards the prevention of land degradation and protection of biodiversity but they have the secondary effect of protecting carbon stocks in soil, trees and other vegetation.

Questions have been raised about the effectiveness of these laws in reducing land clearing, with most of the attention focusing on Queensland and New South Wales. These two states have been responsible for more than 80 per cent of land clearing in Australia since 1990 (DoEE 2016c). The evidence suggests the Queensland native vegetation regime that commenced in 2004 was highly effective. After broad scale clearing was phased out over the period 2004 to December 2006, the rate of forest conversion (first time clearing of forest) dropped sharply, from an average of almost 185,000 ha per year over the previous decade to an average of 37,000 ha per year over the period 2010–2014 (Figure 3). The rate of forest re-clearing (clearing of forest regrown since 1972) also fell, from an average of 110,000 ha per year to 72,000 ha per year over the same time periods. In 2013, Queensland's land clearing laws were liberalised to enable more clearing to occur under self-assessable codes and allow broad scale clearing in certain circumstances (QDSITI 2016).

In New South Wales, the equivalent state land clearing legislation, the *Native Vegetation Act 2003* (NSW), was less effective (Independent Biodiversity Legislation Review Panel 2014). As Figure 4 shows (note difference in scale compared with Figure 3), immediately before and after the commencement of the legislation in 2005, the rates of forest conversion and re-clearing increased, before falling back to around 78,000 ha per year, similar to the rates seen over the period 1995-2003 (65,000 ha per year). Only in the most recent years, 2013 and 2014, did deforestation

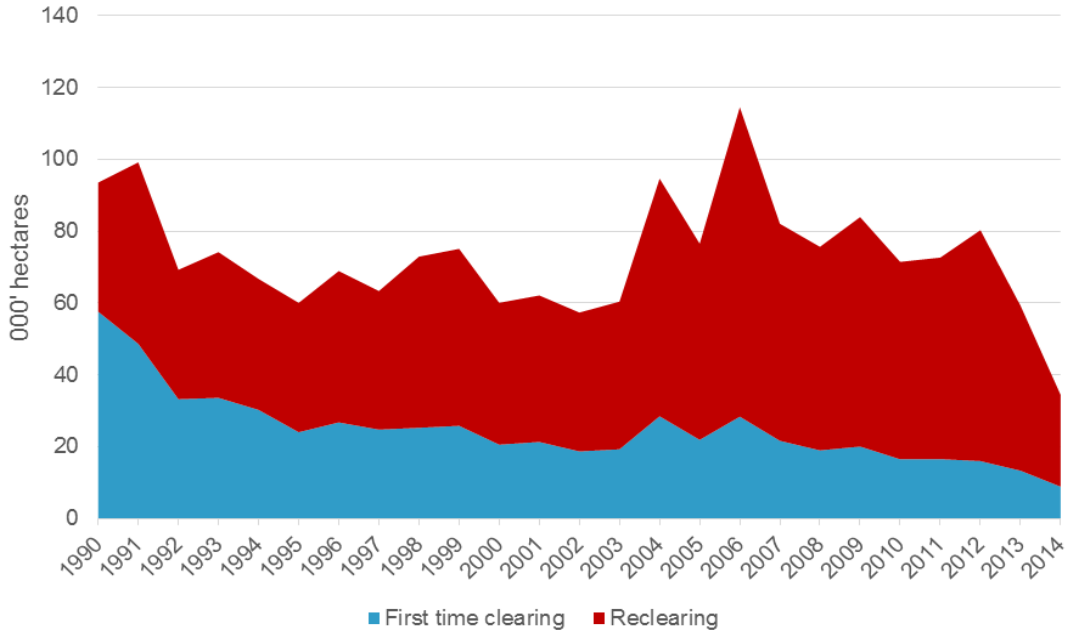
rates decline appreciably. It is unclear what has driven this. Potential causes of the decline include the ERF, agricultural input and output prices and climatic factors. In late 2016, the New South Wales land clearing regime was overhauled to allow more code-based clearing and amend clearing-related offset requirements (*Biodiversity Conservation Act 2016* (NSW); *Local Land Services Amendment Act 2016* (NSW)).

FIGURE 3. DEFORESTATION IN QUEENSLAND, FIRST TIME CLEARING VS. RECLEARING, 1990-2014



Source: DoEE 2016c.

FIGURE 4. DEFORESTATION IN NEW SOUTH WALES, FIRST TIME CLEARING VS RECLEARING, 1990-2014



Source: DoEE 2016c.

While state and territory native vegetation laws often dominate the discourse about NRM-climate policy interactions, there are many other agricultural and NRM policies that affect agricultural-related emissions and carbon storage. These include grant-based NRM schemes like the National Landcare Programme, which support public and private bodies to undertake conservation activities like tree planting and pest and weed control. These conservation activities often simultaneously increase carbon storage or decrease emissions. All Australian jurisdictions also have terrestrial and marine protected areas that provide ecological services, including climate benefits (for example, the reserves store carbon in biomass and soils). The terrestrial component of the National Reserve System—a network of protected areas across all jurisdictions that seeks to ensure Australia has a comprehensive, adequate and representative system of reserves—now has 10,339 terrestrial reserves covering 137.5 million hectares (DoE 2014). Indigenous Protected Areas make up 40 per cent of the terrestrial reserve area, national parks 25 per cent, with the remainder a combination of other protected areas types (for example, nature reserves and refuges, conservation parks, and regional parks and reserves) (DoE 2014). Forty-five per cent of terrestrial reserves in Australia are governed by non-government entities (communities or private entities), with a further seven per cent under joint governance arrangements (DoE 2014). The extent of non-government involvement in the National Reserve System illustrates the importance of non-government actors in the provision of ecological services.

CONSULTATION QUESTIONS

Q.5. What has been the economic impact of emissions reduction policies like the ERF on the agricultural sector?

Q.6. Are any additional incentives needed to encourage further emissions reductions in the agricultural sector?

Q.7. What emissions reduction opportunities should the Authority consider that could enhance the interactions between climate mitigation, agriculture and NRM policies?

CHAPTER 4. CLIMATE, AGRICULTURE, NRM AND OTHER INTERACTIONS

Climate, agriculture and NRM policies are interrelated, with each having the capacity to have foreseen and unexpected impacts on the others. For example, climate policies that aim to reduce agricultural-related emissions can simultaneously promote or obstruct agricultural productivity or NRM objectives. The potential for costs and benefits to spillover into other domains means policy coordination could generate better outcomes.

A key aim for the Authority in undertaking this research project is to determine whether there are opportunities for better integration between climate, agriculture and NRM policies at all levels of government. The focus of this work is on how policies to reduce greenhouse gas emissions or store carbon in the agricultural sector interact with agriculture and NRM policies.

CONSULTATION QUESTIONS

Q.8. What climate, agriculture and NRM policy interactions should be covered in the Authority's research?

Q.9. How, and to what extent, do existing climate change mitigation policies affect the operation and outcomes from agricultural policies?

Q.10. How, and to what extent, do existing climate change mitigation policies affect the operation and outcomes from NRM policies?

Q.11. How, and to what extent, do existing agricultural and land based emissions reduction policies affect social, economic and cultural outcomes, including for farmers and Indigenous people?

To assist in the consideration of these questions, set out below are examples of the types of policy interactions the Authority is particularly interested in exploring.

4.1. STRATEGIC NRM PLANNING

Strategic NRM planning can occur at the federal, state or territory, regional and local government levels through various statutory and non-statutory processes. Industry bodies also play an important role. Federally, the Australian Government can undertake strategic NRM planning through the EPBC Act's bioregional planning and strategic assessment provisions. State and territory governments have the capacity to undertake strategic planning through planning and environmental legislation, which can guide development and decision-making in approval processes. Regional NRM groups can make statutory or non-statutory strategic plans and, at the local level, one of the primary functions of councils is to make planning schemes, a form of strategic land-use planning.

Although the nature and import of these strategic NRM plans varies, they could potentially play an important role in facilitating emissions reductions in the agricultural sector by helping to reduce non-carbon costs and maximise non-carbon benefits of agricultural-related carbon projects. For example, NRM plans could be used to set regionally and locally sensitive restrictions on carbon

storage projects so as to minimise the risks of inappropriate carbon plantings that adversely affect water availability, biodiversity or economic and social activity in agricultural communities. Likewise, they could be used as a vehicle for providing positive incentives for the establishment of regionally appropriate biodiverse carbon plantings, or plantings that serve other functions (for example, deep rooted vegetation in areas subject to dryland salinity). Strategic NRM plans could also be used to set regionally and locally sensitive restrictions on the conduct of prescribed burning for emissions reduction purposes.

In addition to helping improve mitigation policies, strategic NRM plans could facilitate cost-effective adaptation to climate change. This could be by helping to increase awareness and knowledge of climate change impacts and vulnerabilities, directing NRM investments to adaptation priorities, improving water management, and matching development activities to areas suitable under possible future climate conditions. As part of the Australian Government's Clean Energy Future plan, A$43.9 million was provided over the period 2011–12 to 2015–16 for the Regional NRM Planning for Climate Change Fund. The Fund supported the revision of NRM plans to incorporate mitigation and adaptation priorities, and the production of regional level climate change information to support NRM planning. The Authority is interested in receiving information on whether the capacity of federal, state, regional or local NRM agencies to incorporate mitigation and adaptation information into NRM plans needs to be enhanced, and if so how that should been done.

CONSULTATION QUESTIONS:

Q.12. What role, if any, should strategic NRM planning play in helping to minimise non-carbon costs and enhance non-carbon benefits of agricultural carbon projects?

Q.13. If strategic NRM planning should be used for these purposes, whose responsibility should it be to prepare and implement the plans, and through what processes?

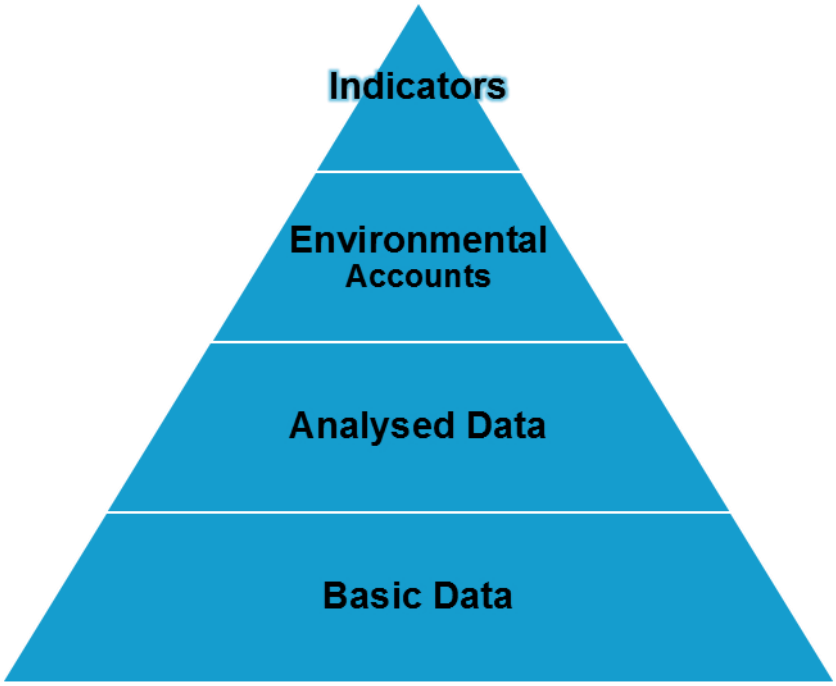
4.2. ACCOUNTING AND INFORMATION SYSTEMS

A necessary precondition for robust policy-making is access to reliable information on the condition of the matters being managed and how the condition changes through time. Good information does not guarantee better decision-making but, in its absence, robust decisions are less likely. Information on changes in condition are also important for developing frameworks for the recognition of multiple benefits (Section 4.5).

Since the early 1990s, a considerable amount of work has been done, at both the international and domestic levels, to develop comprehensive greenhouse gas and environmental information systems. The impetus provided by the United Nations Framework Convention on Climate Change (UNFCCC) has led to the development of mature greenhouse gas accounting systems in most developed nations, including Australia. Many emerging and developing nations now also have, or are in the process of developing, comprehensive greenhouse gas accounting systems. The Paris Agreement has established processes that should ensure ongoing expansion of the geographic coverage of greenhouse gas accounting systems and the continued improvement of their accuracy (UNFCCC 2015, art. 13).

Generally, existing environmental information systems are less developed than those concerning greenhouse gas emissions. Yet the comprehensiveness and quality of these systems differs depending on their scope and geographic coverage. Environmental information systems now exist for a wide range of issues, including ground and surface water flows and quality, heritage sites and their condition, vegetation cover and condition and biodiversity (DEH 2006, BoM 2016). The systems also span the full range of the 'information pyramid': basic data, analysed data, environmental accounts and indicators (Figure 5).

FIGURE 5. ENVIRONMENTAL INFORMATION PYRAMID



Source: Hammond et al. 1995, van Dijk et al. 2014.

There are many federal, state and local government agencies and programs that collect, process and analyse environmental data (the lower levels of the information pyramid). Organisations like the Bureau of Meteorology, Geoscience Australia, Australian Bureau of Statistics, Murray Darling Basin Authority and Department of the Environment and Energy have particular environmental data collection tasks they perform on an ongoing basis, which has facilitated the development of robust and consistent time series data. In other instances, government agencies collect data on a more short-term or ad hoc basis for immediate use in programs. Provided this data is collected using suitable methods, they can be aggregated with other data and used for alternative purposes such as the development of regional, state and national accounts and indicators.

The business and non-government sectors also collect and process significant amounts of environmental data. This is often done for the purposes of complying with regulatory requirements or participating in government programs. For example, under state and federal planning and environmental approval processes, development proposals are often obliged to undergo an environmental impact assessment, requiring the collection and analysis of environmental data. The conditions attached to development approvals also frequently require monitoring and reporting on

environmental conditions and the impacts of projects. Similarly, proponents of agricultural and land sector carbon projects under the ERF are required to collect and report environmental data related to carbon stocks and emissions in order to calculate abatement and claim credits.

Historically, there have been issues associated with the scope, quality and integration of environmental information systems that lie at the lower levels of the information pyramid (DEH 2006, SoEC 2011, van Dijk et al. 2014, BWG 2016). For example, data gathered and processed for one purpose is often unusable for other purposes due to methodological issues, or is not shared with other potential users. Another recurrent problem has been difficulties in collating and aggregating information from various government, business and non-government sources; for example, data gathered for the purposes of environmental impact assessments. The causes of these issues have included lack of cooperation between agencies, narrow data collection parameters, inconsistencies in methods, limitations on access and intellectual property restrictions (DEH 2006, van Dijk et al. 2014).

The Authority is interested in exploring whether there is scope to streamline, harmonise and better integrate existing environmental data collection systems that apply to the agricultural sector. This could include the development of consistent national protocols for the collection, analysis and publication of environmental data required for government programs. The Authority is also interested in understanding whether such data streamlining initiatives could reduce transaction costs associated with data collection, including at the farm level.

CONSULTATION QUESTIONS:

Q.14. Is there scope to streamline, harmonise and better integrate existing environmental data collection and analysis systems that apply to the agricultural sector? If so, how might this be done?

Environmental accounts and indicators sit at the higher levels of the information pyramid (Macintosh & Wilkinson 2006, van Dijk et al. 2014, BoM 2013a, 2013b). Environmental accounts provide information on environmental stocks and flows in a unified system of accounts in monetary or physical units (Macintosh & Wilkinson 2006, Vardon et al. 2016, BoM 2013a, 2013b). These approaches mirror the System of National Accounts for economic stocks and flows in that there is a balance between the relevant environmental stocks at the beginning of the accounting period, the flows during the period and the stocks at the end of the period. This contrasts with the formal greenhouse gas accounting systems (developed by the Intergovernmental Panel on Climate Change and endorsed by the UNFCCC) that only provide data on flows (emissions and removals)[4]. The Australian Bureau of Statistics (ABS) publishes the *Australian environmental–economic accounts* which is the ABS' first comprehensive environmental-economic account, combining data on environmental and economic stocks and flows previously published in other ABS series (ABS 2014a). It uses both physical and monetary measures and, reflecting its relative

[4] For LULUCF, carbon stock data is used to estimate emissions flows.

infancy, currently contains experimental estimates of various stocks and flows, including of carbon stocks (geocarbon (fossil based)) and biocarbon (vegetation and soils)) and ecosystem services (both for supply and use).

Environmental indicators involve the presentation of aggregated data on one or more aspects of the environment in an accessible form (Hammond et al. 1995, OECD 2000, Macintosh & Wilkinson 2006). They typically involve the use of quantitative metrics designed to simplify information on complex natural and social phenomena. Examples including the ABS' *Measures of Australia's progress* (ABS 2014b) and United Nations' *Sustainable development indicators* (UN 2007). The *Australian state of the environment reports* also use environmental indicators (SoEC 2011).

The Authority is interested in stakeholder perspectives on whether improvements could be made to existing environmental accounts and indicator systems to facilitate better integration of agriculture, NRM and climate policies.

CONSULTATION QUESTIONS:

Q.15. What improvements (if any) could be made to existing environmental accounts and indicator systems to facilitate better integration of climate, agriculture and NRM policies?

4.3. PLANNING AND ENVIRONMENTAL APPROVALS

All jurisdictions in Australia have planning and environmental approval processes that serve a range of purposes, from the promotion of urban amenity and public health through to biodiversity conservation, heritage protection and the management of native vegetation. Existing agricultural land-uses are usually beyond the reach of planning and environment regulations. They are considered to be 'existing uses' for which no further government approvals are required. However, new agricultural developments often require environmental and planning approvals. In most cases, the approval processes are structured, either formally or informally, around a mitigation hierarchy that requires proponents to avoid, mitigate or offset the adverse environmental impacts of their development. Environmental impacts are defined broadly for these purposes. Yet the mitigation hierarchy is typically not applied, or not applied fully, to greenhouse gas emissions, including those from agricultural developments.

One obvious manifestation of this relates to federal, state and territory environmental offset schemes that seek, for example, to address losses in biodiversity as a result of development. Offsets refer to actions taken to improve the condition of the environment in order to compensate for the adverse impacts of a development. Strictly, the term offset refers to situations where there is *equivalence* between the environmental loss and environmental gain; what is sometimes referred to as a like-for-like requirement. Most Australian environmental offset arrangements allow proponents to use other mechanisms to satisfy offset requirements, including direct offsets that are not like-for-like (for example, the protection of habitats or ecosystems other than the one affected

by the proposed development), and the provision of money for conservation-related education or research.

In recent years, some jurisdictions have experimented with offset schemes that require or allow proponents to make offset payments into a trust, which is then used to fund strategic conservation measures. The South Australian Native Vegetation Fund – Significant Environmental Benefit Grants scheme is an example. Queensland's financial settlement offsets and offset account under the *Environmental Offsets Act 2014* (Qld) uses a similar model, as does the Commonwealth Reef Trust Offset scheme.

Reflecting the broader focus of most planning and environmental regulatory systems, existing approval-linked environmental offset schemes rarely give explicit consideration to the climate change benefits of compensatory mitigation actions. They are usually exclusively focused on biodiversity and sometimes heritage impacts. The exclusion of emissions from offset design could result in important linkages being missed and offset services being valued inappropriately.

CONSULTATION QUESTIONS:

Q.16. Should approval-linked offset schemes give explicit consideration to the emissions reductions or carbon storage implications of compensatory mitigation actions and, if so, how?

4.4. MANAGING THE NON-CLIMATE RISKS OF CARBON OFFSET PROJECTS

Under the ERF, a number of measures have been put in place to manage the non-climate related risks associated with carbon offset projects. The most well-known of these is the negative list; a list of project types specified in the ERF regulations that are excluded from the scheme on the basis of their likely adverse environmental and social impacts (*Carbon Credits (Carbon Farming Initiative) Regulations 2011* (Cth) reg. 3.36 and 3.37). Amongst other things, the excluded project types currently include projects involving the planting of known weed species and tree planting projects that do not have relevant water access entitlements. In addition to the negative list, in some cases, restrictions have been included in ERF methods to manage non-climate risks.

CONSULTATION QUESTIONS:

Q.17. Are there appropriate restrictions under the ERF to manage the non-climate related risks associated with carbon offset projects? If not, how could they be improved?

4.5. MULTIPLE BENEFITS CERTIFICATION AND FACILITATION

Although the ERF contains measures to manage the potential adverse impacts of carbon offset projects, there are no equivalent provisions to enable project proponents to realise the monetary value of any associated non-climate benefits. The exclusion of non-climate benefits from the scope of the ERF was a deliberate policy choice, driven by a desire to incentivise the uptake, and subsequent purchase by government, of the lowest cost (from a financial perspective) emissions reduction opportunities. While logical, it may mean project proponents are not receiving the full social value of their projects and projects that have lower net social costs (because, for example, they provide biodiversity benefits or employment in rural and remote areas) than the buy price under the ERF are not being implemented. Box 2 provides an example of the multiple benefits that can arise from emissions reduction projects using a case study on Indigenous carbon projects.

CONSULTATION QUESTIONS:

Q.18. Should government policies formally recognise the non-climate benefits associated with ERF projects undertaken by Indigenous communities and, if so, how should this be done?

Q.19. Would the development of such approaches be better left to the private sector perhaps working in partnership with non-government organisations or Indigenous communities?

There are three distinct models for enabling carbon offset providers to capture the non-carbon value of projects: separate crediting; multiple benefits accreditation; and direct grant programs which are set out below.

4.5.1. SEPARATE CREDITING

Under the separate crediting approach, carbon offset providers would receive carbon credits for the emissions reductions, and separate credits (for example, biodiversity credits) for the other benefits that flow from the project activity. Both the carbon and non-carbon credits could then be sold in separate markets either to the government or to the private sector. This approach is theoretically attractive as the types of benefits are distinct, and the creation of separate tradable property rights would enable these benefits to be properly valued. While conceptually attractive, there are institutional and technical barriers to this approach. For example, under the ERF regulatory additionality requirement, actions required under a law of the Commonwealth, a State or a Territory are not eligible ERF activities (*Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth), s. 27(4A)(b)). This rule means reforestation and revegetation projects undertaken to satisfy biodiversity offset requirements imposed under federal, state or territory law are not eligible projects under the ERF.

The rationale for these types of exclusions is based on additionality concerns. Offset schemes of all types carry risk that the emissions reductions or conservation of an ecosystem would have happened without the scheme. This additionality risk can be compounded if the intent is to generate separate credits to reflect different environmental services.

BOX 2: INDIGENOUS CARBON PROJECTS

The ERF has provided cultural, environmental and economic opportunities for a number of Indigenous communities, particularly by providing a source of revenue to support improved fire management practices on Indigenous lands in northern Australia. As at the end of January 2017, there were 23 savanna burning projects registered under the ERF by Indigenous corporations and councils (CER 2016b). These projects stretch across a vast area of Western Australia, Northern Territory and Queensland and, to date, more than 1.9 million ACCUs have been issued to them, worth approximately A$22.5 million at current ERF auction prices (CER 2016b).

These savanna projects involve increasing or improving early dry season burning so as to reduce more intense, and higher emitting, late dry season fires. The reduction in intense late dry season fires reduces methane and nitrous oxide emissions, and increases carbon storage (Smith et al. 2008, Price et al. 2012, Russell-Smith et al. 2013). Savanna burning projects also provide important cultural, NRM and economic benefits, including facilitating traditional burning practices, improving biodiversity outcomes and helping to provide employment (Price et al. 2012, Russell-Smith et al. 2013). While it is widely recognised that Indigenous savanna burning projects generate multiple benefits, the ERF only recognises the avoided emissions (work is currently being undertaken to incorporate carbon storage into the relevant methods). This means the communities are not receiving the full social value of their projects. Indigenous proponents frequently report their projects are not financially viable on the basis of ERF revenues alone and that they are dependent on additional funding provided through other sources, particularly the Australian Government's Working on Country program.

There are a number of options available to the government to address this issue, including separate crediting of non-climate benefits, multiple benefits accreditation and the provision of additional direct grants (see below). Alternatively, solutions could be left to the Indigenous communities and non-government actors; for example, one or more private multiple benefits accreditation schemes could be established, with funding provided by non-government sources (e.g. corporations and private philanthropists). The Authority is interested to hear from stakeholders on whether the non-climate benefits associated with ERF projects undertaken by Indigenous communities should be more formally recognised in government policy processes and, if so, how this might be done.

For example, where there is a mandatory regulatory requirement that dictates biodiversity impacts be offset, and a necessary by-product of the biodiversity offset is the storage of carbon, the storage is not additional. The sequestration would be undertaken in the absence of the incentive provided by the carbon offset scheme (for example, the ERF).

Another barrier to separate crediting approaches is the potential absence of a market for the credits. There are existing compliance markets for biodiversity and heritage offset credits under federal, state and territory planning and environmental approval processes. The source of demand for other types of non-carbon credits is less clear, although it could come from the voluntary market. If reliance was placed on the voluntary market, there is uncertainty about whether there would be sufficient demand to drive change.

4.5.2. MULTIPLE BENEFITS ACCREDITATION

An alternative to separate crediting is a multiple benefits accreditation approach. Under this approach, the non-carbon benefits associated with carbon offset projects are not captured as a separate tradable instrument. Rather the carbon benefits generated by the project are certified as being sourced from an activity that provides multiple benefits (environmental, economic, social and/or cultural).

A number of voluntary standards have already been developed to accredit the non-carbon benefits of carbon offset projects, including The Gold Standard, Climate, Community and Biodiversity Standard, Social Carbon, and Plan Vivo. When the legislation that underpins the ERF—the *Carbon Credits (Carbon Farming Initiative) Act*—was first passed, it was envisaged it would include a similar voluntary non-carbon benefit accreditation and recording scheme (Explanatory Memorandum, Carbon Credits (Carbon Farming Initiative) Bill 2011 (Cth), s. 127). The remnants of this proposal remain in the legislation; section 168(1)(o) of the Act provides a mechanism for proponents to voluntarily include particular information about the environmental and community benefits of projects in the ERF Register. To date, no rules or regulatory requirements have been created in relation to this process due to resource and technical constraints.

4.5.3. DIRECT GRANTS

The final option for enabling carbon offset providers to capture the non-carbon value of projects is direct grant programs, under which the government (federal, state, territory or local) pays the providers directly for the non-carbon benefits. This model can equally work in reverse, with governments paying the providers of non-carbon offsets for un-credited carbon benefits. This type of approach could be incorporated into NRM-related schemes like the National Landcare Programme. An alternative model could involve the establishment of a stand-alone program to provide payments for emissions reduction, carbon storage or environmental offset projects that generate uncompensated social, cultural or economic impacts.

Any attempt to adopt a direct grant program approach would have to ensure the payments are drawn from an appropriate source, and have regard to the implications of shifting resources from other program areas. Grant programs also risk spending tax payers' revenue on environmental services that would be delivered anyway as a result of say an ERF project or regulatory offsets requirements.

A challenge for any scheme designed to enable carbon offset providers to capture the non-carbon value of projects—whether it involves separate crediting, multiple benefits accreditation or direct grant funding—is the technical and ethical difficulty of developing criteria for assigning values. There are precedents for calculating and assigning biodiversity, heritage, economic and social values to projects that could be used for these purposes. However, there are particular issues with schemes that seek to assign values to cultural benefits because of different understandings of what constitutes cultural significance, and challenges in ensuring appropriate balancing of environmental, social, economic and cultural benefits.

CONSULTATION QUESTIONS:

Q.20. What approach, if any, should be adopted to assist carbon offset proponents to realise a monetary value for non-carbon benefits associated with their projects?

Q.21. If a separate crediting approach is adopted, what integrity restrictions, if any, should be imposed on project eligibility to address additionality concerns?

Q.22. If a multiple benefits accreditation approach is adopted, what should be included within the scope of the accreditation process and what models of accreditation should be used?

Q.23. Should the accreditation of non-carbon benefits be led by government or left to the non-government sector?

Q.24. What should the role of government be in establishing markets for multiple benefits and how can an appropriate framework be developed?

Q.25. Should the government provide funding for multiple benefits? If yes, how should such funding deal with additionality issues?

4.6. NRM FUNDING

There are various grant-based schemes at the federal, state or territory, and local government levels that are designed to enhance NRM outcomes including biodiversity conservation. At the federal level, these include the National Landcare Programme, Green Army, and 20 Million Trees programs (the Government announced the termination of the Green Army program in late 2016). There are similar state and territory programs, including the Western Australian *State NRM Program*, the Tasmanian *Landcare Assistance Package*, and the New South Wales *Saving our Species* program. Under these schemes, grants are provided to government and non-government entities to undertake NRM activities, including revegetation, reforestation and ecological restoration and weed and pest control.

Many of the activities funded through these types of programs generate both NRM and climate benefits. The climate benefits typically take the form of carbon storage in vegetation or soils but they can also include the avoidance of emissions (for example, through improved fire regimes).

CONSULTATION QUESTIONS:

Q.26. To what extent are existing NRM grant programs designed to capture complementary carbon benefits?

Q.27. Are there opportunities to improve the linkages between climate change mitigation policies and NRM grant programs?

4.7. FIRE MANAGEMENT

There are laws, policies and fire agencies in all states and territories that control the preparation for, and response to, wildfires and the lighting and management of prescribed burns. These laws, policies and agencies can help minimise the fire-related risks associated with carbon plantings and savanna burning. They can also help facilitate the effective use of fire to manage wildfire risks and improve NRM and climate outcomes. Equally, when the laws and policies are poorly designed or implemented, they can unduly obstruct carbon plantings and the effective use of fire to reduce emissions.

CONSULTATION QUESTIONS:

Q.28. Are any changes needed in state or territory fire management laws to help minimise fire-related risks associated with emissions reduction projects, or to promote the more effective use of fire to manage wildfire risks and improve NRM and climate outcomes?

4.8. SOIL CONSERVATION

Similar to fire management, all states and territories have laws, policies and agencies designed to promote soil conservation and prevent land degradation. These laws and policies date back to the late-1800s, when inappropriate farming practices led to widespread land degradation. Successful policy interventions have greatly improved soil management but state and territory soil management agencies, and the laws and policies they administer, continue to play an important role in preventing and responding to land degradation problems.

These laws, policies and agencies have the potential to facilitate the uptake of improved soil management practices that increase productivity and soil carbon levels. This could be through the provision of information and other support for soil carbon storage projects. The ERF currently has two soil methods that cover practices to enhance soil carbon, and so far 20 projects have been registered. Alternatively, there may be potential for other policy instruments, including grants or regulations, to promote practices that help store carbon.

CONSULTATION QUESTION:

Q.29. What role, if any, could soil conservation laws, policies and agencies play in promoting land management practices that increase the storage of carbon in soils?

Q.30. What barriers exist to uptake of soil conservation projects through the ERF?

4.9. PEST AND WEED CONTROL

Invasive pests and weeds adversely affect agricultural productivity, cause extensive harm to the environment, and can adversely affect carbon storage in vegetation and soils. Feral animals can adversely affect the amount of carbon stored in vegetation and soils by killing mature trees and shrubs, and suppressing and killing the regrowth of native vegetation. Overgrazing of grasslands by feral animals can also reduce ground cover, leading to soil carbon losses (and erosion). Weeds can have similar impacts, suppressing the regrowth of vegetation, killing mature vegetation and adversely affecting fire behaviour in affected areas.

Australian governments have a range of laws, policies and agencies designed to assist in the control and, where possible, elimination of pests and weeds. Many states and territories have laws that impose obligations on landholders to control certain pests and weeds. There are also a range of non-regulatory measures that are used by all levels of government to assist in the control and eradication of pests and weeds, including NRM grants and government funded research programs like the Invasive Animals Cooperative Research Centre and now defunct Cooperative Research Centre for Australian Weed Management. Non-government organisations such as the Australian Wildlife Conservancy (which owns and manages 3.15 million hectares of land in Australia) work in partnership with land owners and governments to undertake on-ground conservation programs including feral animal control, weed control, fire management and translocations of threatened wildlife.

There are some existing formal linkages between pest and weed control and climate policy. For example, under the ERF, the Human-induced Regeneration and Native Forest from Managed Regrowth methods include the humane control of feral animals as an eligible carbon offset activity where the animals have obstructed the regrowth of native forest.

CONSULTATION QUESTION:

Q.31. Are there opportunities for improved linkages between climate change mitigation and pest and weed management policies to maximise climate and NRM outcomes?

4.10. AGRICULTURAL RESEARCH AND DEVELOPMENT, AND EXTENSION

Over A$1 billion of public money is invested annually in agricultural research and development (R&D) and extension (Sheng et al. 2011, Productivity Commission 2011, Mullen & Keogh 2013).

This is provided through multiple federal, state and territory programs and agencies, including the Rural Research and Development Corporations (RDCs). The RDCs are funded by a combination of industry levies, matching tax payer contributions and voluntary industry contributions (Productivity Commission 2011). Currently, most of the R&D and extension work funded by government is directed at improving the productivity of the industry. In the past, there has been considerable investment in R&D to reduce emissions. One example of where this has occurred is the Filling the Research Gap program, which has now ceased (it was a component of the former Carbon Farming Futures program). The program supported research into emissions reduction technologies and practices that reduce emissions or enhance carbon storage in the agricultural sector. The Authority is keen to understand current or planned research that covers similar activities and would welcome submissions on this point.

CONSULTATION QUESTIONS:

Q.32. To what extent do publicly-funded agricultural R&D and extension programs focus on the reduction of emissions and the opportunities to simultaneously mitigate emissions and improve productivity?

Q.33. Are there opportunities to re-orientate publicly-funded agricultural R&D and extension programs towards reducing emissions from NRM and agriculture?

CHAPTER 5. NEXT STEPS

The Authority will consult widely on this paper and encourages submissions by interested organisations and individuals on the issues raised here. Submissions are due on 20 April 2017.

Interested organisations and individuals should not feel constrained by the issues or questions raised here, noting that the Authority will be consulting on a broader range of issues as part of its review of the Carbon Farming Initiative legislation and the Emissions Reduction Fund later in 2017.

The Authority plans to release its final report on climate, agriculture and NRM in mid-2017.

APPENDIX A. CONSULTATION QUESTIONS

CONSULTATION QUESTIONS	
Q.1.	Are there particular land sector abatement activities, or data on land sector abatement costs, that the Authority should consider when conducting the research?
Q.2.	Do the four identified pressures adequately capture the major issues facing the agricultural sector that are relevant to the intersection of NRM, agriculture and climate policy?
Q.3.	How can the government, non-government and private sectors address these challenges?
Q.4.	How could these challenges affect efforts to deliver emissions reductions, NRM and agricultural policy objectives in a coordinated way?
Q.5.	What has been the economic impact of emissions reduction policies like the ERF on the agricultural sector?
Q.6.	Are any additional incentives needed to encourage further emissions reductions in the agricultural sector?
Q.7.	What emissions reduction opportunities should the Authority consider that could enhance the interactions between climate mitigation, agriculture and NRM policies?
Q.8.	What climate, agriculture and NRM policy interactions should be covered in the Authority's research?
Q.9.	How, and to what extent, do existing climate change mitigation policies affect the operation and outcomes from agricultural policies?
Q.10.	How, and to what extent, do existing climate change mitigation policies affect the operation and outcomes from NRM policies?
Q.11.	How, and to what extent, do existing agricultural and land based emissions reduction policies affect social, economic and cultural outcomes, including for farmers and Indigenous people?
Q.12.	What role, if any, should strategic NRM planning play in helping to minimise non-carbon costs and enhance non-carbon benefits of agricultural carbon projects?
Q.13.	If strategic NRM planning should be used for these purposes, whose responsibility should it be to prepare and implement the plans, and through what processes?
Q.14.	Is there scope to streamline, harmonise and better integrate existing environmental data collection and analysis systems that apply to the agricultural sector? If so, how might this be done?
Q.15.	What improvements (if any) could be made to existing environmental accounts and indicator systems to facilitate better integration of climate, agriculture and NRM policies?
Q.16.	Should approval-linked offset schemes give explicit consideration to the emissions reductions or carbon storage implications of compensatory mitigation actions and, if so, how?
Q.17.	Are there appropriate restrictions under the ERF to manage the non-climate related risks associated with carbon offset projects? If not, how could they be improved?
Q.18.	Should government policies formally recognise the non-climate benefits associated with ERF projects undertaken by Indigenous communities and, if so, how should this be done?
Q.19.	Would the development of such approaches be better left to the private sector perhaps working in partnership with non-government organisations or Indigenous communities?
Q.20.	What approach, if any, should be adopted to assist carbon offset proponents to realise a monetary value for non-carbon benefits associated with their projects?
Q.21.	If a separate crediting approach is adopted, what integrity restrictions, if any, should be imposed on project eligibility to address additionality concerns?

Q.22.	If a multiple benefits accreditation approach is adopted, what should be included within the scope of the accreditation process and what models of accreditation should be used?
Q.23.	Should the accreditation of non-carbon benefits be led by government or left to the non-government sector?
Q.24.	What should the role of government be in establishing markets for multiple benefits and how can an appropriate framework be developed?
Q.25.	Should the government provide funding for multiple benefits? If yes, how should such funding deal with additionality issues?
Q.26.	To what extent are existing NRM grant programs designed to capture complementary carbon benefits?
Q.27.	Are there opportunities to improve the linkages between climate change mitigation policies and NRM grant programs?
Q.28.	Are any changes needed in state or territory fire management laws to help minimise fire-related risks associated with emissions reduction projects, or to promote the more effective use of fire to manage wildfire risks and improve NRM and climate outcomes?
Q.29.	What role, if any, could soil conservation laws, policies and agencies play in promoting land management practices that increase the storage of carbon in soils?
Q.30.	What barriers exist to uptake of soil conservation projects through the ERF?
Q.31.	Are there opportunities for improved linkages between climate change mitigation and pest and weed management policies to maximise climate and NRM outcomes?
Q.32.	To what extent do publicly-funded agricultural R&D and extension programs focus on the reduction of emissions and the opportunities to simultaneously mitigate emissions and improve productivity?
Q.33.	Are there opportunities to re-orientate publicly-funded agricultural R&D and extension programs towards reducing emissions from NRM and agriculture?

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