



Australian Government
Climate Change Authority

REAPING THE REWARDS: IMPROVING FARM PROFITABILITY, REDUCING EMISSIONS AND CONSERVING NATURAL CAPITAL FINAL REPORT

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The Authority consulted with the Australian Government Departments of the Environment and Energy and Agriculture and Water Resources in the preparation of this research report and thanks these agencies for their comments. The views expressed in this report are the Authority's own and should not be taken as the views or positions of those departments.

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CHAIR'S FOREWORD

The Climate Change Authority is pleased to release this research report, which explores ways to simultaneously improve on-farm profitability and reduce greenhouse gas emissions on the land while conserving the natural environment.

The Australian landscape is an intrinsic part of our national identity. As a society we still rely heavily on goods and services produced on the land. Our wildlife and natural environment are not only internationally significant but also provide many Australians with economic, social and cultural amenity. The Australian Bureau of Statistics (2017b) valued Australia's environmental assets at \$6 trillion in June 2016.

The Authority's research indicated that many landholders are taking action to deliver both emissions reductions and broader environmental outcomes and, in doing so, farmers improve their own bottom lines. This report explores the reasons such coordinated action is not even more widespread among landholders.

As is often the case with policy conundrums of this kind, barriers to better coordinating action on the land are multi-faceted. They include a lack of information—both in terms of getting information to landholders on agricultural research and development and the availability of baseline data for developing and evaluating policy; transaction costs for farmers associated with participating in government programs and challenges inherent in coordinating the many different government and non-government players involved in delivering policy.

More funding for coordinated action on the land is an obvious response and one supported by a number of organisations with which the Authority engaged in the course of this research. However, significant new funding for large scale grant programs seems unlikely in the current budget environment and the Authority has therefore recommended a number of other possible solutions to create incentives for genuine multiple benefits. These include a voluntary online tool to collect farm level data to reduce transaction costs for farmers participating in government programs. The Authority is also recommending ways to coordinate existing policies to achieve better outcomes, create new markets, finance multiple benefits, and develop new technologies to access new economic and environmental opportunities on the land.

The Authority hopes that the findings and recommendations in this report will help landholders become even more resilient in the face of environmental and economic challenges and assist the Australian community as a whole in the vitally important task of preserving our unique natural capital for the future.



Wendy Craik AM

Chair, Climate Change Authority

27 April 2018

EXECUTIVE SUMMARY

ABOUT THIS RESEARCH REPORT

The Climate Change Authority (2016) recommended, as part of its *Towards a climate policy toolkit: Special Review on Australia's climate goals and policies*, an examination of ways to reduce greenhouse gas emissions on the land while enhancing the natural environment and improving on-farm profitability. This research report responds to that recommendation.

The types of activities that effective policy coordination could encourage on the land include establishing a windbreak of native trees to store carbon, generating revenue from carbon credits while providing shelter for stock as well as providing a habitat for local wildlife. In another example, returns to beef cattle farmers can be enhanced by improving the productivity of the herd through better herd selection, which increases live weight gain and also reduces emissions. These land-based activities make good sense. The key question emerging from this research is why activities like these, that deliver win-win-win outcomes, are not more widespread? This report analyses the barriers to delivering genuine multiple benefits on the land and recommends some possible solutions.

This report is less about how emissions can be reduced as a stand-alone goal in its own right. Rather, *Reaping the Rewards* is more about achieving improved profitability for landholders, reducing emissions and achieving broader environmental benefits at the same time through a single intervention like, for example, establishing multispecies vegetation on a previously unused part of a farm. In practice, the extent to which emissions can be reduced on the land will depend on a number of factors including government policy, economic benefits to farmers and the technical feasibility of emissions reduction actions.

The Authority recommended policies for reducing emissions in some depth (including for the land sector) in its *Towards a climate policy toolkit: Special Review on Australia's climate goals and policies* (CCA 2016). The Authority also considered the land sector in its review of the Emissions Reduction Fund (ERF) and this report incorporates some of the key findings from the ERF review (CCA 2017b).

WHY PURSUE MULTIPLE BENEFITS?

Agriculture is an important part of Australia's economy as it provides 14 per cent of the nation's export earnings (ABARES 2017a). The sector supports a number of other industries and provides much of Australia's food and agricultural commodities.

As managers of nearly 50 per cent of the Australian landmass, farmers and other landholders also play a central role in the conservation and restoration of Australia's natural capital (ABS 2017a). Despite these efforts, the natural resource management (NRM) challenges faced in some agricultural regions remain substantial (Australian Government 2017c).

The greenhouse gas emissions associated with agriculture are significant, with the sector accounting for approximately 13 per cent of the emissions in Australia's national emissions inventory, mostly methane from livestock (DoEE 2017c, f). In addition, land management on agricultural lands affects vegetation and soils, generating emissions or storing carbon. Landholders also cause emissions from energy use and transport.

All sectors, including agriculture, will need to contribute to the Paris Agreement's global goal to reduce net greenhouse gas emissions to zero in the second half of this century. This is likely to require significant changes to agricultural systems and practices.

The agriculture sector is faced with market-related pressures to boost productivity and profitability (Productivity Commission 2005, 2016, RIRDC 2015, Australian Government 2015). There are

opportunities and challenges associated with increasing global demand for agricultural products and the opening up of new markets (RIRDC 2015).

ENVIRONMENTAL INFORMATION AND REPORTING: THE FOUNDATION FOR COORDINATING POLICY

Access to reliable information about the condition of the natural resources being managed and how their condition changes through time is a necessary precondition for robust policy making, and the integration of climate, NRM and agricultural policies. One of the key challenges for delivering genuine multiple benefits on the land is a lack of data to support the development and evaluation of policy.

While significant progress has been made on Australia's environmental information systems over the past decade (BoM 2013), more work is needed. Comprehensive and more accessible information will help government agencies and others develop and assess programs. The Authority welcomes the work by the Australian Government and the states and territories' through the Meeting of Environment Ministers to develop a robust national approach to environmental information to meet the needs of policy makers.

To reduce duplication and the transaction costs faced by farmers, the Authority recommends the Australian Government lead the development of a voluntary online farm reporting tool that can meet the reporting requirements of the ERF and jurisdictions' NRM programs. This could build on current work being undertaken by CSIRO through its Digiscape platform.

COORDINATING POLICY FOR MULTIPLE OBJECTIVES

All levels of government as well as some non-government organisations design and implement emissions reduction, NRM and agricultural programs or other initiatives.

To facilitate better coordination among all these players, the Authority recommends the Australian Government lead work with states, territories and other stakeholders to develop best practice guidance for land-based programs.

The Authority recognises that considerable work is being done to coordinate efforts to reduce emissions and deliver multiple benefits on the land across and within governments and is of the view that building on these existing efforts could deliver even more in terms of coordinated action.

The establishment of a community of practice of government officials and other actors to develop best practice guidance could embed a coordinated approach to land-based policy. NRM regional bodies and the Rural Research and Development Corporations should also be involved in this work, which should explicitly consider opportunities for reducing emissions on agricultural land subject to NRM planning processes and coordinating agricultural research and development (R&D) for multiple benefits.

In its review of the ERF, the Authority recommended that the Government provide some resources to the Department of the Environment and Energy for the development of new ERF methods. Given the high priority governments accord to improving water quality in the Great Barrier Reef and other sensitive marine catchments, the Authority supports development of a new ERF method to reward fertiliser reductions from sugarcane farming.

Existing ERF methods for vegetation establishment or conservation already help improve water quality in the Reef while storing carbon. Such ERF projects are likely to need co-funding to pay for water quality benefits and to make uptake economic for landholders. The Reef Trust as well as state and territory government programs could help fund these multiple benefits.

CREATING NEW MARKETS FOR MULTIPLE BENEFITS

There are a number of policy options for creating new markets or incentives on the land so that carbon offset projects can deliver multiple benefits.

An agreed standard could in effect certify carbon credits as carrying other benefits such as biodiversity or employment benefits to local Indigenous communities—a little like the Heart Foundation tick did. Businesses could purchase carbon credits accredited with extra benefits to distinguish their products in the marketplace or to meet corporate social responsibility goals.

The Authority recommends that the Australian Government lead development with states and territories and other stakeholders of a multiple benefits accreditation standard for ERF and other carbon offset projects. This standard should begin with the biodiversity benefits associated with vegetation and soil, building on existing work. Project accreditation against the standard could then be undertaken by the private sector.

The Authority considered another model to value multiple benefits that would involve creating separate tradable credits for each non-carbon benefit. The Authority is of the view that accurately quantifying these different benefits would be challenging given the lack of robust data and research available at present but sees merit in re-visiting this approach in the future as experience and expertise develops.

Direct grant programs provide another way for landholders to realise carbon, NRM and other benefits. ERF or other offset project proponents could receive carbon credits for reducing emissions and grants to pay for the NRM benefits. The Authority recognises that some activities with multiple benefits are eligible for grants under some programs such as Regional Land Partnerships and Smart Farms (part of the National Landcare Program) and believes such support is an important vehicle for showcasing opportunities for multiple benefits on the land. However, the Authority also recognises that establishing a new large-scale, grant program is likely to be challenging for governments, in the current constrained fiscal environment.

Some activities on the land that deliver multiple benefits require upfront capital. For example, planting native trees as a windbreak requires upfront spending on plantings but can increase crop production and provide shelter for stock, delivering improved financial returns over many years. A lack of capital for such investment may be one reason why farm level investment in multiple benefits is not more widespread.

The Authority recommends therefore that a targeted Land and Environment Investment Fund be established to provide financing for landholders for projects that deliver genuine, multiple benefits. As with the Clean Energy Finance Corporation (CEFC), such a fund could be given a clear mandate that specifies government priorities. These could include areas such as biodiversity, climate resilience, economic benefits to Indigenous communities, water quality and soil health. Also like the CEFC, the new Fund could be staffed by market experts that are well placed to assess the risk of such investments and offer targeted loan products that meet the needs of landholders while still delivering a commercial rate of return on investment.

There is a range of opportunities and barriers for Indigenous communities to generate ERF carbon credits while also delivering other environmental, social and economic benefits. The Authority made a number of recommendations in its ERF review to enhance engagement with Indigenous stakeholders on ERF projects with a view to driving multiple benefits from these projects (CCA 2017b). The Authority encourages the Australian Government to support Indigenous communities in their efforts to find new markets for multiple benefits of ERF projects.

IMPROVING ON-FARM PRODUCTIVITY

Policies that reduce agricultural emissions and genuinely enhance NRM outcomes can also help farmers improve their profitability. Participating in the ERF is a significant source of revenue for the rural sector as a whole but transaction costs can be a barrier for the broader uptake of individual ERF projects.

Energy related projects could reduce emissions on-farm and improve profitability. The National Energy Productivity Plan (NEPP) provides a framework to accelerate action on Australia's energy productivity. The Authority recommends the development of new NEPP measures aimed at improving on-farm energy efficiency.

R&D is key to improving farmers' productivity while reducing emissions and improving NRM outcomes. For example, the National Livestock Methane Program found that grazing beef cattle on leucaena, a legume fodder crop, could increase gross farm margins by up to 37 per cent and simultaneously reduce methane emissions by 17 per cent (MLA 2015b).

The Rural Research and Development Corporations (RDCs) are the main drivers of agricultural R&D in Australia. The CSIRO and the Australian Research Council grants also make important contributions (ARC 2015, CSIRO n.d.). The Authority recommends that RDCs and other relevant research bodies build on their existing work programs to more explicitly target multiple benefits and offer guidance to landholders on reducing emissions and enhancing NRM while further improving farm productivity.

The Authority notes that agricultural landholders face a dual exposure on climate. International commodity markets are looking more closely at the emissions intensity of imported agricultural goods while the impacts of climate change itself will make agricultural production more challenging. The Authority hopes that the findings in this report will help farmers and other landholders become even more resilient in meeting these future challenges.

LIST OF RECOMMENDATIONS

Develop a voluntary online farm reporting tool and new indicators		Chapter
R.1	The Australian Government work with states and territories, industry and other stakeholders to co-design a voluntary online farm reporting tool to reduce transaction costs by collecting information about on-farm activities and meeting reporting requirements for the Emissions Reduction Fund, and other emissions reduction and natural resource management programs administered by the Commonwealth, states and territories and non-government organisations.	3
Create a community of practice and provide advice		Chapter
R.2	The Australian Government lead work with states and territories and other stakeholders, including natural resource management organisations and Rural Research and Development Corporations, to develop best practice guidance for program design and implementation so that goals of emissions reductions, enhanced natural resource management and on-farm profitability are coordinated effectively.	4
R.3	The Australian Government work with states, territories, industry, non-government organisations and other stakeholders to establish a community of practice that interacts regularly to ensure best practice guidance (R.2) for program design and implementation is kept up-to-date and implemented.	4
R.4	Industry bodies, natural resource management and catchment bodies and local government associations consider providing advice to their stakeholders on opportunities to deliver genuine multiple benefits, informed by best practice guidance (R.2) and the community of practice (R.3).	4
R.5	The Australian Government work with natural resource management regional bodies and the states and territories so that natural resource management planning processes explicitly consider opportunities for storing carbon and reducing emissions on agricultural land while also addressing potential adverse impacts, for example on water availability or biodiversity.	4
Facilitate Emissions Reduction Fund projects with multiple benefits		Chapter
R.6	The Australian Government work with industry, the Queensland Government and other stakeholders to develop a method under the Emissions Reduction Fund to incentivise emissions reductions from growing sugarcane by improving the efficiency of fertiliser application.	4
R.7	In future Emissions Reduction Fund method development, the Australian Government consider giving priority to other methods that could deliver genuine multiple benefits, provided they also have potential for widespread, cost-effective uptake and robust abatement.	4
R.8	The Australian Government use Commonwealth programs such as the Reef Trust to co-fund Emissions Reduction Fund projects and encourage states and territories to use their relevant grant or loan programs to realise genuine multiple benefits from the Emissions Reduction Fund such as reduced agricultural runoff, improved water quality outcomes and enhanced on-farm productivity benefits.	5

Create new markets for multiple benefits		Chapter
R.9	In consultation with other government and non-government stakeholders, the Australian Government develop an accreditation standard to support a private market for carbon credits that have genuine multiple benefits, commencing with biodiversity.	5
R.10	The Australian Government explore the options for a business or a non-government organisation to administer a program based on the multiple benefits accreditation standard recommended in R.9.	5
Support investment in multiple benefits		Chapter
R.11	The Australian Government establish and promote through trusted local sources a Land and Environment Investment Fund targeting projects that generate genuine, multiple climate, natural resource management and economic benefits.	5
Support Indigenous communities to participate in environmental markets		Chapter
R.12	The Authority encourages the Australian Government to support Indigenous communities in their efforts to find new markets for genuine multiple benefits for Emissions Reduction Fund projects.	5
Enhancing on-farm profitability while delivering multiple benefits		Chapter
R.13	The Australian Government work with state and territory governments to develop new National Energy Productivity Plan measures aimed at improving on-farm energy efficiency.	6
R.14	The Rural Research and Development Corporations and other relevant research bodies build on their existing extension programs to continue to offer guidance to landholders on how to reduce emissions and encourage natural resource management while further improving farm productivity. Rural Research and Development Corporations' work programs should consider including objectives for both emissions reductions and natural resource management as well as on-farm profitability.	6

PROPOSED TIMING OF RECOMMENDATIONS

	First 12 months	1 to 3 years
Develop a voluntary online farm reporting tool and new indicators	R.1 Develop online farm reporting tool to reduce transaction costs for Emissions Reduction Fund and other government emissions reductions and natural resource management programs.	R.1 Test and roll out online farm reporting tool.
Create a community of practice and provide advice	<p>R.2 Develop best practice guidance on integrating policy for genuine multiple benefits.</p> <p>R.5 Natural resource management planning processes explicitly consider emissions reductions and carbon storage.</p>	<p>R.3 Implement best practice guidance and community of practice for integrating policy for genuine multiple benefits.</p> <p>R.4 Industry, natural resource management and catchment bodies, and local government associations, consider providing advice on genuine multiple benefits.</p>
Facilitate Emissions Reduction Fund projects with multiple benefits	<p>R.6 Develop an Emissions Reduction Fund method for improving fertiliser efficiency on sugarcane farms.</p> <p>R.8 Facilitate co-funding of Emissions Reduction Fund projects with genuine multiple benefits.</p>	R.7 Consider giving priority to methods under the Emissions Reduction Fund that deliver genuine multiple benefits, provided they also have potential for widespread, cost-effective and robust abatement.
Create new markets	R.9 Develop accreditation standard for carbon credits with genuine multiple benefits commencing with biodiversity.	R.10 Consider administration of a program based on the multiple benefits accreditation standard (R.9) by private or non-government sector.
Support investment in multiple benefits	R.11 Establish Land and Environment Investment Fund and begin outreach work with rural communities.	R.11 Outreach to local trusted advisors on the Land and Environment Fund.
Support Indigenous communities to participate in environmental markets	R.12 Support efforts by Indigenous communities to find new markets for genuine multiple benefits from Emissions Reduction Fund projects.	
Enhance on-farm profitability while delivering multiple benefits	<p>R.13 Develop new National Energy Productivity Plan measures aimed at improving on-farm energy efficiency.</p> <p>R.14 Rural Research and Development Corporations continue to roll out delivery programs that guide landholders on how to achieve genuine multiple benefits and have work plans to underpin this.</p>	

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 climate change policy. The third and final report of the Authority's Special Review into climate policy, *Towards a climate policy toolkit: Special Review on Australia's climate goals and policies*, said there should be an examination of how better integrated policies can drive multiple benefits for the land sector (CCA 2016). This report responds to that recommendation. A particular focus of this report is on how emissions reduction, agriculture and natural resource management (NRM) policies can simultaneously enhance agricultural profitability, while reducing emissions and enhancing NRM.¹

This means this report is less about how emissions can be reduced on the land as a goal in its own right and more about achieving together the three objectives of profitability, reduced emissions and broader environmental and other benefits.

Agriculture contributes significantly to Australia's trade performance, being responsible for about 14 per cent of the nation's exports by value (ABARES 2017a). The agricultural sector directly accounts for 2.2 per cent of gross domestic product and around 2.2 per cent of employment (ABS 2017c, d). Almost 80 per cent of Australian agricultural production outputs (by value) are exported (ABARES 2017a). These statistics understate the importance of agriculture as the sector supports a number of other industries. It also provides much of the food and agricultural commodities needed by Australia's economy and society.

As owners and managers of nearly 50 per cent of the Australian landmass, farmers and other landholders play a central role in the conservation and restoration of Australia's natural capital (ABS 2017a). As most farmers are acutely aware, it is in their financial interests to manage their natural assets sustainably. Despite these efforts, the NRM challenges faced in some agricultural regions are substantial (Australian Government 2017c). 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 and businesses) in the design and implementation of NRM policies that support landholders in their efforts to conserve and restore natural capital while avoiding unintended consequences.

The Authority recognises that considerable work is being done to coordinate efforts to reduce emissions and deliver multiple benefits on the land across and within governments and is of the view that building on these existing efforts could deliver even more in terms of coordinated action.

The greenhouse gas emissions associated with agriculture are significant, with the sector accounting for approximately 13 per cent of the emissions in Australia's national emissions inventory (DoEE 2017c, f). In addition, land management on agricultural lands affects vegetation and soils, generating emissions or storing carbon. Landholders also cause emissions from energy use and transport.

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

¹ This 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). Although the commercial forestry sector has an important role to play in reducing Australia's emissions it has been excluded from the scope of this research to allow greater focus on the opportunities for improved outcomes in the agricultural sector. 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.

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.

To date, efforts to reduce agriculture-related emissions have focused mainly on supply-side measures that seek to reduce emissions, or enhance carbon storage, through changes in technologies and management practices (Smith et al. 2014). The types of technologies and management practices available to reduce agriculture-related emissions are diverse, ranging from sequestering carbon in vegetation and soils and capturing methane from livestock through to the genetic manipulation of crops and livestock (Smith et al. 2008, Eckard et al. 2010).

That said, the diversity of the sector means that a step change in agricultural production that would significantly reduce emissions across the range of different farming enterprises may prove challenging to deliver in the short to medium term. There are around 86,000 individual farming operations in Australia undertaking a range of activities across over 370 million hectares (ABS 2017a).

The Authority is of the view that opportunities remain to reduce emissions from the agriculture and land sector. In its review of the Emissions Reduction Fund (ERF) the Authority recommended that additional funding be provided to the Department of the Environment and Energy to work with research organisations and stakeholders to develop new methods for land-based ERF projects to reduce emissions. The Authority also recommended that Rural Research and Development Corporations include emissions reductions as a priority for their research and development work (CCA 2017b). In practice, the extent of emissions reductions that can be achieved from agriculture will be driven by a combination of factors including government policy, the rate of development and uptake of new technologies and the extent to which these are economic and can benefit farmers.

In addition to dealing with climate change and the broader environment, the agriculture sector is faced with market-related pressures to boost productivity and profitability (Productivity Commission 2005, 2016, RIRDC 2015, Australian Government 2015). There are also opportunities 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).

These opportunities and challenges were outlined in the Authority's issues paper, which called for public submissions to inform this research report (CCA 2017a).

Each of the challenges and opportunities facing the agricultural sector may require targeted public policy responses.² Yet, without coordination, individual policies may fail to cost-effectively capture the potential benefits that could be realised. For example, climate policies that promote carbon storage through reforestation can also improve NRM outcomes, provided there are measures in place to ensure plantings are located appropriately in the landscape, involve the use of suitable species and have necessary water entitlements.

The Authority's aim in undertaking this research is to identify whether and how climate, NRM and agricultural policies can be better integrated so as to deliver these multiple benefits. The first part of this report focuses on current policies and actions. The second part of the report proposes possible policy solutions to the challenges of delivering multiple benefits on the land.

² While adaptation to climate change is an important policy issue in its own right for the agriculture sector it is beyond the scope of this report.

1.2 THE CONSULTATION PROCESS

The Authority invited submissions from interested organisations and individuals in the issues paper for this research project, which was released in March 2017 (CCA 2017a).

The Authority also met a range of stakeholders through roundtable discussions and individual meetings, and received 19 written submissions. Feedback from stakeholders was used to inform this report and its recommendations. The Authority thanks all individuals and organisations that contributed.

This report also draws on consultation and submissions from the Authority's ERF review and submissions made to the Australian Government's 2017 review of climate policies.

Public submissions on this research project are available on the Authority's website and details of the Authority's consultation for this review are at Appendix A.

CHAPTER 2 THE AGRICULTURE SECTOR

2.1 EMISSIONS FROM AGRICULTURE IN AUSTRALIA

Agricultural activities result in emissions and carbon storage that are mostly recorded in two parts of Australia's emissions inventory: agriculture; and land use, land-use change and forestry (LULUCF). At a high level, agriculture emissions consist of the methane and nitrous oxide emissions related to land use, including methane emissions from livestock 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 2017e). Agricultural production also causes some emissions recorded in energy categories (e.g. agriculture-related transport and electricity use) and waste (e.g. animal waste from abattoirs). The Authority has not quantified the contribution of agriculture to LULUCF, energy or waste emissions due to difficulties in attributing inventory emissions data to agricultural activities.³

Agriculture emissions (as defined by the United Nations Framework Convention on Climate Change/Intergovernmental Panel on Climate Change (IPCC) agriculture emissions category) make up around 13 per cent of Australia's total net emissions (Table 1). Agriculture emissions have decreased by 13 per cent from 80 million tonnes of carbon dioxide equivalent (Mt CO₂-e) in 1990 to 70 Mt CO₂-e in 2015 (Figure 1). Agriculture emissions can vary materially year by year depending on agricultural stocking rates and production area, which are driven by market and climate factors such as changes in agricultural prices and water availability (DoEE 2017c).

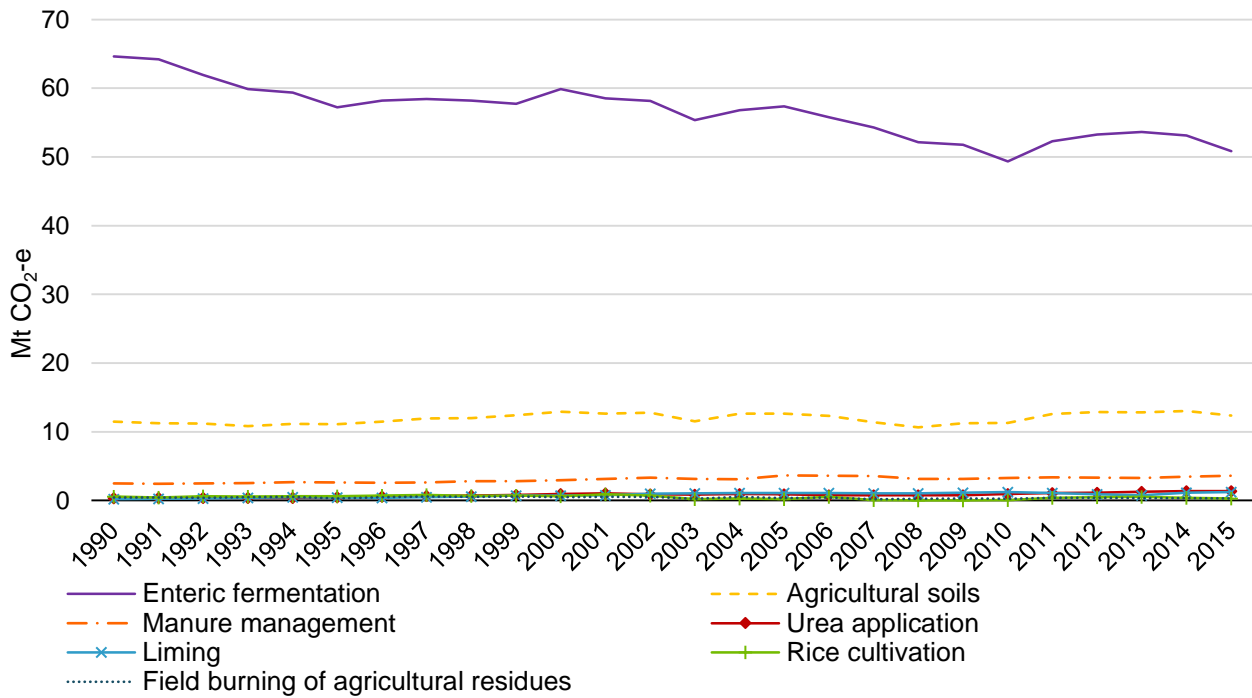
TABLE 1 Agriculture emissions in Australia, 2015, description of reporting categories

Category	Mt CO ₂ -e	Description
Enteric fermentation	50.8	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	12.4	The emission of nitrous oxide from agricultural soils, mostly through nitrification and denitrification.
Manure management	3.6	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	1.4	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	1.2	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	0.3	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.
Total	70.0	

Source: DoEE 2017c,f

³ Australia's National Greenhouse Accounts and associated publications fulfil Australia's international and domestic greenhouse gas reporting requirements. To ensure consistency and comparability between the inventories of different countries, emissions must be estimated using the methods described by the IPCC, or country-specific methods consistent with the IPCC guidelines where these improve the accuracy of emissions estimates (DoEE 2017e). The IPCC has an ongoing work program to produce this methodological advice, which draws on nominated experts from around the world and extensive review (IPCC 2017).

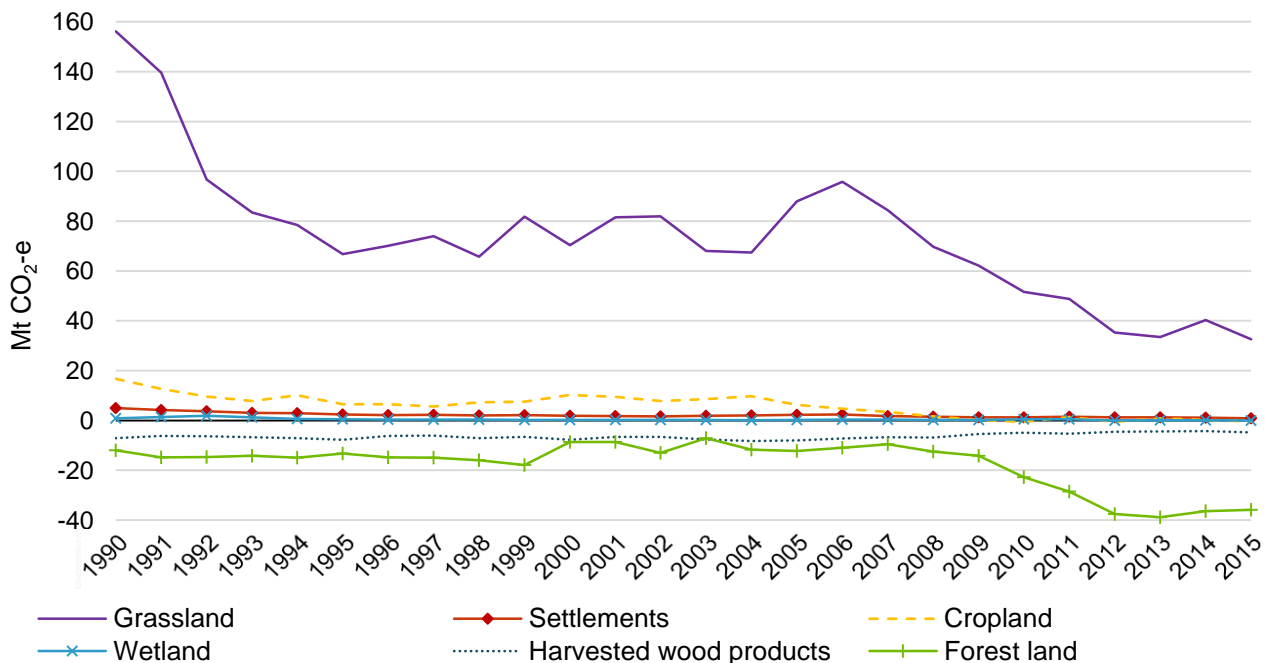
FIGURE 1 Agriculture emissions, 1990-2015



Source: DoEE 2017c

Agricultural lands (i.e. land that supports cropping or broad acre stock pasture) also produce significant emissions and store carbon that is reported in the LULUCF inventory category. LULUCF emissions have declined significantly since 1990, primarily as a consequence of reduced agriculture-related land clearing (also known as deforestation) (Figure 2, DoEE 2017c). Rates of land clearing fell by 91 per cent between 1990 and 2015, contributing to a 76 per cent reduction in emissions (DoEE 2017b,c). The reduction in emissions from land clearing made a significant contribution to Australia meeting its international emissions reduction targets in the first commitment period of the Kyoto Protocol.

FIGURE 2 Land use, land-use change and forestry emissions, 1990-2015



Source: DoEE 2017c

In the 2015 inventory, the LULUCF sector as a whole reported a small net sink, meaning that more carbon was stored by the sector in plants and soils than emitted through activities such as land clearing.

However, opportunities remain for reducing emissions and increasing storage in LULUCF including on farms. Not all emissions and sequestration from LULUCF occurred on-farm however. The category also includes emissions and sequestration from commercial forestry, for example.

The agricultural sector as a whole is expected to play an important role in meeting Australia's existing and future emissions reduction targets because of the amount 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, including reforestation, soil management, and improved livestock herd and manure management (The Treasury 2011, The Treasury and DIICCSRTE 2013, ClimateWorks et al. 2014, Henderson et al. 2017). Emissions from savanna burning⁴ for example were approximately 7.4 Mt CO₂-e in 2015 (DoEE 2017b). While the costs of individual projects vary, appropriately designed and located agriculture abatement projects can provide a low cost way of reducing emissions and increasing carbon storage. The results of the six Emissions Reduction Fund (ERF) auctions support this, with land-based projects providing over 80 per cent of the contracted abatement (Box 1, CER 2017c). As is discussed in Chapters 4, 5 and 6, a challenge for government and industry is designing policies that realise these opportunities and identify new ways of reducing agriculture-related emissions while simultaneously providing economic benefits to landholders and improving environmental outcomes.

2.2 POLICIES TO REDUCE EMISSIONS AND ENHANCE CARBON STORAGE

At the federal level, the primary incentive for emissions reductions and the enhancement of carbon storage in vegetation and soils on agricultural lands is the ERF, which has three distinct 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, 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)*).

The purchasing element of the ERF involves the acquisition of ACCUs by the Clean Energy Regulator (CER) on behalf of the Australian Government. The acquisition of these carbon credits primarily occurs through auctions, although the CER also has the capacity to purchase ACCUs outside the auction process.

The final element of the ERF is the safeguard mechanism, which applies to facilities that emit more than 100,000 t CO₂-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 years. The safeguard mechanism commenced operation in July 2016. The 100,000 t CO₂-e threshold for the safeguard is unlikely to apply to many 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).

⁴ 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. Generally, between 26 and 55 million hectares of savanna grasslands, woodlands and forests are affected by wildfires and prescribed burning each year (DoEE 2017a). These fires result in methane and nitrous oxide emissions, and also alter the amount of carbon stored in vegetation, debris and soils.

In its recent ERF review the Authority found that land-based offsets are likely to be needed as part of Australia's emissions reduction toolkit and ERF purchasing has established a solid architecture for the administration of land-based offsets into the future (CCA 2017b, 2016).

As of 2 March 2018, there were 703 validly registered ERF projects, nearly 70 per cent of which were under land-based methods (364 vegetation, 77 savanna burning, 33 soils and 17 other agriculture emissions avoidance) (CER 2018b). Details of the agriculture-related methods are provided in Box 1.

BOX 1 AGRICULTURE-RELATED METHODS UNDER THE EMISSIONS REDUCTION FUND

As at 2 March 2018 there were 35 methods under the Emissions Reduction Fund (ERF), 20 of which relate to agriculture and land (Table 2). To date, there have been six auctions, with over 190 million Australian Carbon Credit Units (ACCUs) (equivalent to over 190 million tonnes of carbon dioxide equivalent) to be delivered from 438 projects under more than 400 contracts with an average price of \$11.90 per tonne of abatement (CER 2017c). Over 80 per cent of emissions reductions contracted to date through the ERF have come from agriculture and land sector projects. Vegetation projects alone account for 124 million ACCUs or 65 per cent of contracted abatement. A further 17.8 million ACCUs are contracted from agriculture projects and 13.8 million from savanna burning projects (CER 2017c).

TABLE 2 Agriculture-related methods under the Emissions Reduction Fund

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 two 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.
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.
Soil management	Three methods for building soil carbon by changing management practices in grazing and cropping systems.
Vegetation management	There are nine methods that promote the enhancement of carbon storage in vegetation, including through the protection of existing native forests and re-establishment of native forests.

Source: CER n.d.

In addition to the ERF, there are a number of other federal, state or territory and local government agricultural and natural resource management (NRM) policies that affect agriculture-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). 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. The Wilderness Society's submission on this research project supported further regulation of land clearing to reduce emissions and deliver NRM benefits. For a more detailed discussion of the land clearing laws in New South Wales and Queensland please see the issues paper (CCA 2017a).

2.3 NATURAL RESOURCE MANAGEMENT POLICIES

All levels of government in Australia, federal, state or territory and local, are involved to some degree in NRM. This has resulted in a wide range of policies and strategies being used to achieve NRM objectives. For example, Australia's Biodiversity Conservation Strategy 2010-2030 is a guide for all levels of governments in Australia to conserve national biodiversity. It aims to coordinate efforts at a national level across all sectors to sustainably manage biological resources (DoEE n.d.a). All levels of government also run information-based extension programs that aim to influence land management decisions by increasing capacity and knowledge amongst landholders and NRM groups.

Grant schemes are frequently used to achieve enhanced NRM outcomes. Since the 1980s, the Australian Government has run a series of large-scale NRM grant schemes, the latest iteration of which is the National Landcare Program. These programs have provided financial support to farmers, Landcare groups and others for conservation activities like tree planting, or pest and weed control. Similar grant-based programs are run at the state and local government levels, and by regional NRM bodies (Curtis et al. 2014, Hajkowicz 2009, SRRATRC 2010).

Conservation tenders are one of the more innovative voluntary NRM policies used in recent years, where landholders are invited to compete for government NRM contracts to provide ecological services or benefits. The use of auctions and long-term monitoring of program outcomes is intended to improve the efficiency of allocating public resources. The Australian Government's Environmental Stewardship Program committed \$152 million over the period 2007-2012 and is one of the largest conservation stewardship programs run to date in Australia (Ansell et al. 2016, Blackmore and Doole 2013, Zammit 2013). The Australian Government also provides tax concessions for approved conservation covenants. Conservation covenants and agreements provide permanent protection of an area of high conservation value at the request of the landholder (DoEE n.d.c, OEP 2015).

Over the past 30 years, economic instruments have also been increasingly used to address NRM issues (BDA Group and CSIRO 2007, DoE 2015b, Fallding 2014). Water trading is a well-known example whereby diversion of water from ground and surface water systems is limited to protect environmental values (ABARES 2017b). Water trading allows water to be allocated to where it is valued most, improving the efficiency with which water is used by producers.

Regulations are also used for various NRM-related purposes. Apart from those regulations related to native vegetation and land clearing, fire management, soil conservation and pest and weed control are amongst the most common. Invasive pests and weeds adversely affect agricultural productivity and cause extensive harm to the environment. To address these risks, the states and territories have laws that require landholders to control specified pests and weeds (Productivity Commission 2016). These regulations can work in tandem with grant and other voluntary programs to help landholders control pest and weeds. The same action can prevent invasive species from destroying or crowding out native vegetation, thereby enhancing or conserving carbon stored in vegetation or soils.

Non-government organisations such as the Australian Wildlife Conservancy (which owns and manages 3.8 million hectares of land in Australia) also work in partnership with land owners and governments to undertake on-ground NRM-related projects such as conservation programs including feral animal control, weed control, fire management and translocations of threatened wildlife (Australian Wildlife Conservancy n.d.).

2.4 POLICIES TO ENHANCE AGRICULTURAL PRODUCTIVITY

Improvements in farm productivity have enabled Australia's agricultural sector to continue to increase production and remain internationally competitive (Gray et al. 2014). As with climate and NRM, many different policies are used to promote agricultural productivity:

- Funding for research and development (R&D), which is coupled with industry contributions, to develop practices to improve the profitability, sustainability and competitiveness of rural industries;
- Assistance to help farmers prepare for and manage drought conditions including low interest loans;
- The Rural Financial Counselling Service to provide farmers with financial advice and the Farm Finance Initiative to provide eligible farmers with access to short term loans;
- Increased engagement by the Australian Competition and Consumer Commission to strengthen competition in agricultural supply chains (Australian Government 2015);
- Wider public investments in infrastructure (such as in transport, water and telecommunications) and research and development, and implementing free trade agreements also support agricultural productivity growth; and
- State and territory government provision of agriculture-related research and extension services, often in partnership with industry or other research bodies (Australian Government 2015). In 2014-15 Australian states and territories spent about \$350 million on agriculture related R&D (ABS 2016).

Over \$1 billion of public money was invested in agricultural R&D in 2008-09, and extension services in Australia (Productivity Commission 2011). 'Without those investments, Australia's rural sector would almost certainly be much less productive and competitive' (Productivity Commission 2011, p XXII). Shanks & Zheng (2006) estimate that investments in rural R&D have led to a rate of return of around 24 per cent. The Rural Research and Development Corporations (RDCs) are one of the main vehicles for the delivery of this research. These organisations are funded by a combination of industry levies, matching tax payer contributions and voluntary industry contributions. The work of the RDCs is complemented by other government research, development and demonstration initiatives, including the Cooperative Research Centres Program and the CSIRO (Productivity Commission 2011).

2.5 PRIVATE SECTOR INITIATIVES

Private sector initiatives that deliver multiple benefits on the land can be complementary to government policies and present further opportunities and challenges for coordination. For example, global market demand for 'sustainable' products is growing. This can open new markets or attract higher prices for farmers producing sustainable products (Nielson 2015, NMI 2017). As a result, there is a range of industry-led initiatives that contribute to delivering multiple benefits on the land. Table 3 outlines a few of these examples, which demonstrate the breadth of activity throughout the supply chain.

TABLE 3 Examples of private sector initiatives that deliver multiple benefits**Farm sector—farmers and industry groups**

- Meat and Livestock Australia is aiming for a carbon neutral red meat industry by 2030 and has identified a number of changes in practices and technologies to achieve this goal (MLA 2017).
- The Australian dairy industry's sustainability framework 2020 targets include reducing emissions intensity by 30 per cent and water intensity of manufacturers by 20 per cent from 2010–11 levels (Dairy Australia 2017).
- A range of Australian producers are certified as carbon neutral, including Ross Hill Wine Group under the Australian Government's Carbon Neutral Program (DoEE n.d.b) and Tahbilk winery through an internationally accredited greenhouse gas certification programme under ISO 14065 (Tahbilk 2018).

Supply chain—retailers and restaurants

- McDonalds has committed to eliminating deforestation from their supply chain. The company is working with suppliers, including in Australia, to develop strategies for sustainable sourcing of priority products, including beef and poultry (McDonalds n.d.).

Consumers—information, certification and markets

- Sustainable Table provides information to help consumers identify sustainable products (Sustainable Table n.d.).
- Online stores like The World of Good and physical markets like Sydney Sustainable Markets bring together suppliers of sustainable products (TWG 2018, SSM n.d.).

2.6 INTERACTIONS BETWEEN POLICIES

The key challenge for this research is to find ways to better coordinate action to reduce emissions on the land while also enhancing the natural environment and improving on-farm profitability. Within Australia, there have been some initiatives designed to integrate climate, NRM and agriculture policies. Incorporating emissions reduction objectives into Queensland's vegetation management laws is an early example (*Vegetation Management and Other Legislation Amendment Act 2004* (Qld)).

The Australian Government provided \$43.9 million over 2011–12 to 2015–16 for the Regional NRM Planning for Climate Change Fund under the Clean Energy Future plan. 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 (DoSEWPC 2012).

Under the Victorian Government's Catchment Carbon Offsets Trial the Victorian Government is working with catchment management authorities to enhance understanding of carbon offset opportunities that align with NRM plans and improve catchment management outcomes (Victorian CMAs submission on the 2017 review of climate policies). For example, environmental plantings in waterway buffer zones add to biodiversity, sequester carbon in plants and can reduce the cost of water treatment by reducing runoff into waterways. The trial is intended to contribute to the Victorian Government's target of achieving net zero emissions in the water sector by 2050, while simultaneously improving catchment, biodiversity and water quality outcomes (VDELWP 2016).

Integration or coordination between policies to deliver genuine multiple benefits should consider implications for the additionality of activities—whether or not they would go ahead without the support of one or more of the coordinating programs. The ERF has explicit, legislated requirements for ERF projects to generate emissions reductions that would not occur in the absence of the ERF. However, the ERF design explicitly allows for some co-funding of ERF projects to pay for non-emissions reduction benefits (such as improving water quality). Additionality is mainly an issue for offsets programs or other measures to reduce emissions. It is also important when considering whether tax payers are receiving value for public money expended through grants programs or other subsidies like tax concessions. It may be less of a concern for other initiatives to encourage broader environmental outcomes and the

Authority considers that questions of additionality are best dealt with by decision makers (i.e. federal and state governments, NGOs and other organisations offering programs and initiatives) in the context of individual programs' objectives.

Box 2 outlines some of the multiple benefits that can accrue from well integrated policies.

BOX 2 POSITIVE INTERACTIONS BETWEEN POLICIES

Positive impacts of emission reduction policies on natural resource management outcomes

- Planting indigenous vegetation for carbon storage improves biodiversity and soil health
- Managing grazing practices to increase soil carbon improves soil health
- Early dry season burning of savannas to reduce emissions improves biodiversity, social and cultural outcomes
- Reducing fertiliser application to reduce nitrous oxide emissions reduces water pollution
- Managing livestock manure to reduce emissions improves soil health, and reduces water, air and odour pollution
- Revenue from carbon projects increases landholders capacity to undertake natural resource management activities

Positive impacts of emission reduction policies on agriculture outcomes

- Changes in land-use and management practices to reduce emissions and increase storage increase farm revenue and profitability, and diversify farm income through sale of Australian Carbon Credit Units
- Modifying livestock manure management to reduce emissions increases farm revenue, reduces energy costs, and enables the sale of electricity and renewable energy certificates
- Changes in livestock management practices to reduce methane emissions increases farm productivity and profitability
- Modifying fertiliser use to reduce nitrous oxide emissions reduces farm input costs

Positive impacts of natural resource management policies on emissions

- Ecological restoration programs increases carbon storage in biomass and soils
- Planting of windbreaks increases carbon storage in biomass and soils
- Conservation reserves protect carbon stocks
- Pest and weeds management protects carbon stocks and helps to restore degraded ecosystems thereby increasing carbon storage
- Measures to reduce fertiliser and nutrient runoff reduce nitrous oxide emissions and increase soil carbon

Positive impacts of agriculture policies on emissions

- Agricultural programs promote more efficient livestock herd management, resulting in increased production efficiencies and reduced methane and nitrous oxide emissions
- Agricultural programs promote composting and use of livestock manure, resulting in increases in productivity and reduced emissions
- Management to increase soil fertility increases soil carbon
- Research and development discovers new technologies to increase farm productivity and reduce emissions

Internationally, there are a number of examples where governments have sought to encourage improved integration and coordination between climate, agriculture and NRM policies (Box 3). However, efforts to coordinate policy to achieve multiple benefits are still in their infancy, particularly outside of developed countries.

BOX 3 CASE STUDIES OF POLICIES FOR MULTIPLE BENEFITS IN OTHER COUNTRIES

Climate Smart Agriculture

Climate Smart Agriculture (CSA) involves modifying agricultural systems to achieve greater productivity and resource efficiency, but also to promote improved agricultural resilience to climate variability. CSA projects are being tested in regions such as South-East Asia, West Africa and India by international research collaborations like the Consultative Group for International Agricultural Research (CGIAR) who are administered by the World Bank, in partnership with governments and the private sector (CGIAR 2013b). CSA projects in countries such as Malawi and Zambia are integrating trees into crop and livestock systems under the Evergreen Agriculture project supported by the Government of the United Kingdom. This project is helping to reduce emissions and sequester carbon (by up to 3.5 t CO₂-e per hectare per year), conserve water (improving water use efficiency by up to 380 per cent) and improve soil fertility. These benefits are leading to increased productivity with maize yields increasing by around 30 per cent (CGIAR 2013a).

European Union Common Agricultural Policy reform

The European Union Common Agricultural Policy (CAP), which has been running for over 50 years across European nation states, includes improved climate change outcomes in its objectives (European Commission 2012). The CAP objectives for 2014-2020 are: viable food production, sustainable management of natural resources and climate action and balanced territorial development. Landholders receive CAP funds to pursue improvements in animal productivity, manure management and soil management, forestry measures and make investments that are beneficial for the environment or climate (European Commission 2013).

Brazil: the Low Carbon Agricultural Plan

Brazil, like Australia, is a country where a large proportion of its emissions come from agriculture and agriculture-related land use. In 2010, the Brazilian Government launched the Low Carbon Agriculture Plan (ABC Plan) to reduce agricultural land-based emissions. The centrepiece of the plan is a low interest rural credit scheme designed to fund low-carbon agricultural practices or technologies likely to contribute to mitigation or adaptation. Examples of projects that have received funding include forest restoration, rehabilitation of degraded pastures, biological nitrogen fixation and manure management. Many of the targeted activities are likely to simultaneously improve NRM outcomes although this is not an explicit goal of the program (Newton et al. 2016).

The main target of the ABC Plan is to reduce greenhouse gas emissions by 133 to 166 Mt CO₂-e by 2020. In 2014–2015, more than USD4 billion was given to over 25,000 projects under the ABC Plan (CSA n.d.). A 2016 study considered that barriers contributing to the lack of uptake included the need for better outreach and engagement to overcome information barriers, as well as farmer resistance to the adoption of new practices (Newton et al. 2016).

CHAPTER 3 ENVIRONMENTAL INFORMATION AND REPORTING: THE FOUNDATION FOR COORDINATING POLICY

Access to reliable information about the condition of the natural resources being managed and how their condition changes through time is a necessary precondition for robust policy making, and the integration of climate, natural resource management (NRM) and agricultural policies. 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 initiatives to recognise multiple benefits.

3.1 A COMMON APPROACH TO ENVIRONMENTAL INFORMATION

While significant progress has been made on Australia's environmental information systems⁵ over the past decade (BoM 2013), more needs to be done to expand their scope, enhance their robustness and improve accessibility. As is discussed in Chapters 4, 5 and 6, there are opportunities for the development of new policies and markets to capture multiple climate, NRM and agriculture benefits. Environmental information is a necessary precondition to the creation and efficient operation of these policies.⁶ More comprehensive and accessible information systems will also increase the capacity of government agencies and others to assess the effectiveness of existing and future policies. This will provide an empirical basis for improvements. A further benefit of environmental information systems is their capacity to increase engagement in climate, NRM and agricultural issues and public confidence in policy making.

The scope for advances in environmental information systems was acknowledged by federal, state and territory environment ministers in November 2016, when they agreed to work together to develop a common national approach to environmental accounts. As the statement from the meeting suggests:

This important work will ensure accurate and reliable information is available to governments, communities and business to better understand the condition of the environment and make better decisions. It will improve the ability to track outcomes in specific locations and across state and territory boundaries, and demonstrate the value of the environment to our standard of living. (MEM 2016, p. 1)

The Authority encourages the Australian Government and the states and territories to work together to deliver a robust national approach to environmental accounting, and develop comprehensive and accessible environmental accounts that meet the needs of policy makers.

3.2 IMPROVING REPORTING OF ON-FARM DATA

Land managers and farmers that participate in government programs are usually subject to reporting obligations and these can be time consuming and expensive, particularly when coupled with auditing obligations. These transaction costs can act as significant deterrents to participation in NRM and emissions reduction programs (Blackmore and Doole 2013). The Australian Forest Products Association, Australian Institute of Petroleum and others cite transaction costs as a barrier to participation in the Emissions Reduction Fund (ERF) (AFPA submission on the ERF review, AIP submission on the 2017 review of climate policies). The resulting loss of participation can undermine the effectiveness of the programs and contribute to scepticism amongst landholders about their merits. There are opportunities to decrease transaction costs particularly when there is duplication in reporting requirements between programs. For example, farmers participating in the ERF and some NRM programs will generally be

⁵ Environmental information systems provide information about environmental stocks and flows. Australian examples include the ABS' Measures of Australia's progress (ABS 2013) and the environmental–economic accounts (2017a). The Australian Government state of the environment reports (2017c) also use environmental indicators. For further information see the Authority's issues paper for this research project (CCA 2017a).

⁶ See the State of the Environment Report (Australian Government 2017c) for further details on how environmental information can be used.

required to report separately under each program, even though there may be overlaps in the information reported. Given the nature of NRM and emissions reduction or carbon storage programs, and the number of government agencies and non-government actors involved in their delivery, the risk of duplication could be significant.

Data can help land managers to benefit from improved practices that also deliver genuine environmental benefits. Information about sustainability performance can help farmers access emerging markets (Section 2.5) and inform decision making (Box 5). Consolidating data from a number of landholders could facilitate benchmarking across farming practices. Enabling land managers to compare their own performance with best practice in their industry may also highlight new opportunities. Experience with Dairy Australia's emissions calculator suggests that where a farmer has higher emissions than the industry average for an aspect of their operations, efficiency gains and cost savings may result from a change in practice (Box 4, Dairy Australia n.d.a).

BOX 4 AUSTRALIAN DAIRY CARBON CALCULATOR

Dairy Australia's Australian Dairy Carbon Calculator (formerly DGAS) allows dairy farmers to identify any on-farm sources of emissions that are higher than the industry average and identify where efficiency improvements might both improve productivity and reduce emissions (Dairy Australia n.d.a).

For example, a dairy farmer with a herd of 310 cows entered data into the calculator and found the farm has higher than average emissions from nitrogen fertiliser, indicating he could improve fertiliser efficiency.

The farmer realised that by replacing 70 per cent of applied nitrogen fertiliser with urea coated with an inhibitor he could improve pasture production with a net increase in farm profit of over \$2,000 per year. Although there will be an upfront increase in fertiliser costs of around \$1,900 the farmer expects this to be more than offset by over \$3,900 in additional milk income per year as a result of the increased pasture production. The change could also reduce emissions by around 29 t CO₂-e year (Dairy Australia pers comm 2018).

Dairy Australia has a number of fact sheets and videos of farmers benefitting from using the calculator. Farmers have made changes leading to improvements in farm productivity and emissions in areas including feed quality, manure management, fertiliser use, irrigation efficiency, energy and fuel use and herd reproduction efficiency (Dairy Australia n.d.a).

As a first step in reducing the reporting-related transaction costs faced by farmers and other landholders and improving the usefulness of reported data, the Authority recommends the Australian Government lead the development of a voluntary online farm reporting tool that can meet the requirements of the ERF and other carbon and NRM programs. Ideally, the tool would enable landholders to meet their reporting obligations and evaluate the environmental impacts of their management actions.

The Authority suggests that a trial involving key stakeholders, including the National Farmers' Federation (NFF), be part of the tool development process to ensure its useability. The trial could build on work underway including CSIRO's Digiscape (CSIRO n.d.a),⁷ and a proposal developed by the NFF for online reporting for land-based ERF projects (NFF pers comm 2017). By providing farmers and NRM groups with the capacity to evaluate the environmental impacts of their activities, the tool could help promote

⁷ The Digiscape Future Science Platform is a big data initiative that aims to make agriculture more profitable, lower impact and lower risk through integrating these outcomes and a common IT infrastructure for agricultural information.

voluntary improvements in management practices as well as reducing program reporting costs and duplication.

Once cleaned for confidentiality, data from the tool could be made available to federal and state and territory policy makers developing the environmental indicators and other information referred to in the previous section.

An effective online farm reporting tool could help farmers and other land managers demonstrate their environmental management to financial institutions and participate in markets for sustainable commodities on a voluntary basis, with resulting environmental benefits to the wider community (Box 5, Section 2.5).

Recommendation

R.1 The Australian Government work with states and territories, industry and other stakeholders to co-design a voluntary online farm reporting tool to reduce transaction costs by collecting information about on-farm activities and meeting reporting requirements for the Emissions Reduction Fund, and other emissions reduction and natural resource management programs administered by the Commonwealth, states and territories and non-government organisations.

BOX 5 FINANCIAL MARKETS AND THE UNITED NATIONS NATURAL CAPITAL DECLARATION

There is a growing trend in financial markets and businesses to incorporate natural capital into some business decisions. For example, the Natural Capital Protocol is a standardised framework to identify, measure, and value impacts and dependencies on natural capital supported by 250 odd organisations across multiple sectors around the world (Natural Capital Coalition 2017). Within Australia, the Australian Government is supporting a project through the Rural R&D for Profit program to apply natural capital accounting in the forestry, cotton and fisheries industries to help identify natural capital risks in farm business systems, access finance and access premium markets (DoAWR 2017a).

Another global initiative is the United Nations Natural Capital Declaration, a voluntary financial sector initiative aimed at integrating natural capital considerations into financial products and financial and corporate reporting frameworks (Mulder et al. 2013, UNEP and Global Canopy Programme 2012). It was launched at the United Nations Rio+20 Earth Summit in 2012. As of 8 March 2018, there were 42 signatories including the National Australia Bank and VicSuper (UNEP and Global Canopy Programme 2017).

Building on the Declaration, and partnering with the Clean Energy Finance Corporation, the National Australia Bank now provides product discounts to some customers who invest in renewable energy and energy efficiency (NAB 2017). Similar to the approach to renewable energy and energy efficiency, the National Australia Bank has signalled its intention to offer discounts on loans and other financial products to farmers who are able to demonstrate they have good environmental practices and are conserving the natural capital associated with their operations (Yeates 2015). These products are not yet available and the National Australia Bank has not announced when they will be released. Such investments can also contribute to farm level productivity and resilience to changing market conditions.

CHAPTER 4 COORDINATING POLICY FOR MULTIPLE BENEFITS

4.1 ESTABLISHMENT OF BEST PRACTICE GUIDANCE AND COMMUNITY OF PRACTICE

As discussed in Chapter 2, responsibility for the design and implementation of climate, natural resource management and agricultural policies is distributed across three government levels—federal, state or territory and local—and multiple different agencies within each government. Non-government actors also deliver programs and initiatives. The multiple layers of government and number of agencies and other players produces inherent coordination issues.

The Authority is aware of consultation initiatives for individual programs that work very well. For example, the Department of the Environment and Energy holds regular natural resource management (NRM) Emissions Reduction Fund (ERF) workshops, Technical Working Groups and public consultation involving a range of stakeholders.

The challenge is to coordinate more broadly across different programs, departments, levels of government and beyond government into the non-government and private sectors to deliver multiple objectives.

To facilitate better coordination, the Authority recommends the Australian Government lead work with states and territories and other stakeholders on increasing awareness of the interactions between emissions reductions, NRM and agricultural policies and develop best practice guidance for program design and implementation. Developing best practice guidance would aim to ensure common objectives—emissions reductions, enhanced NRM outcomes and on-farm profitability—are considered when designing new programs in any of these three areas. Best practice guidance would ensure that such programs are designed so that linkages and support could be drawn from each other where feasible. Guidance could draw on international and Australian based examples of integrated policy that has been done well, such as some of the projects undertaken by the Consultative Group for International Agricultural Research (Box 3). It could take the form of a 'how to guide' for government agencies and non-government organisations and cover how to frame program objectives, delivery strategies and key performance indicators.

Further to this, the establishment of a community of practice of government officials and non-government actors to develop and then implement best practice guidance could embed a comprehensive and coordinated approach to policy coordination on climate, NRM and agriculture. The community of practice could foster closer ties between agencies and stakeholders and facilitate collaborative learning. Ideally this would involve stakeholders from all levels of government and agency types, and representatives from industry and non-government organisations. The community of practice would exchange information about the interaction between climate, NRM and agricultural policies and meet regularly to ensure the proposed best practice guidance for program design is kept up-to-date.

In the ERF review the Authority recommended some industry bodies and local government associations consider providing advice on the ERF (CCA 2017b) to their members. NRM and catchment bodies (that are not already doing so) could also consider taking on this advisory role. This could extend to advice on opportunities to deliver multiple benefits and be informed by best practice guidance and the community of practice.

Recommendations

- R.2** The Australian Government lead work with states and territories and other stakeholders, including natural resource management organisations and Rural Research and Development Corporations, to develop best practice guidance for program design and implementation so that goals of emissions reductions, enhanced natural resource management and on-farm profitability are coordinated effectively.
- R.3** The Australian Government work with states, territories, industry, non-government organisations and other stakeholders to establish a community of practice that interacts regularly to ensure best practice guidance (R.2) for program design and implementation is kept up-to-date and implemented.
- R.4** Industry bodies, natural resource management and catchment bodies and local government associations consider providing advice to their stakeholders on opportunities to deliver genuine multiple benefits, informed by best practice guidance (R.2) and the community of practice (R.3).

4.2 STRATEGIC NATURAL RESOURCE MANAGEMENT PLANNING

Strategic NRM planning is a form of land use planning involving the formulation and evaluation of policies for achieving NRM objectives. It occurs at the federal, state or territory, and local government levels through various statutory and non-statutory processes. Federally, the Australian Government undertakes strategic NRM planning under the *Environment Protection and Biodiversity Conservation Act 1999* bioregional planning and strategic assessment provisions. State and territory governments undertake strategic NRM planning through planning and environmental legislation, which guide development and decision making in approval processes. Regional NRM groups 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 can play an important role in facilitating emissions reductions in the agricultural sector (Dale et al. 2013). For example, regional or local NRM plans could be used to provide guidance on carbon storage projects so as to minimise the risks of inappropriate carbon plantings that adversely affect water availability, biodiversity or agricultural communities. They could also be used as a vehicle for encouraging the establishment of biodiverse carbon plantings that are appropriate for the local area, or plantings in areas subject to dryland salinity. Strategic NRM plans could also be used to set regional and local guidance on prescribed burning for emissions reduction purposes.

The Regional NRM Planning for Climate Change Fund (Section 2.6) was designed to facilitate the integration of mitigation and adaptation priorities into NRM plans. Stakeholder feedback received during the course of this research suggests the strategic planning work supported by the Fund was effective in building the capacity of NRM groups to respond to the challenges associated with climate change mitigation and adaptation (Victorian Catchment Management Authorities submission on this research project). NRM bodies across Australia have developed strategic NRM plans that consider climate change and the carbon economy (NRM Regions Australia submission on this research project).

The Authority recommended as part of its ERF review that scheme participants advise relevant NRM bodies of proposed projects so that those bodies are informed about projects in their areas and to encourage dialogue between scheme participants and NRM bodies (CCA 2017b).

Given the difficulty in funding new grant programs, the Authority recommends the Australian Government further engage with the NRM regional bodies and the states and territories, for example through the best practice guidance (R.2) and community of practice (R.3) recommended above, to ensure NRM plans explicitly consider opportunities for storing carbon and reducing emissions on agricultural land while delivering environmental benefits and avoiding perverse impacts.

Recommendation

R.5 The Australian Government work with natural resource management regional bodies and the states and territories so that natural resource management planning processes explicitly consider opportunities for storing carbon and reducing emissions on agricultural land while also addressing potential adverse impacts, for example on water availability or biodiversity.

4.3 PEST AND WEED MANAGEMENT REGULATIONS

Pests and weeds have significant adverse impacts on agriculture and the environment. Australian governments have a range of laws, policies and agencies designed to assist in the control and, where possible, elimination of these species where they are declared under state or federal legislation (Productivity Commission 2016). Some states are using their biosecurity legislation to impose a general obligation on landholders to reasonably manage biosecurity risks from these pest animals and weeds.⁸ Governments also have legislative obligations to manage pests and weeds, and local governments can be well placed to manage local pests and weeds.⁹

Generally, existing pest and weed policies are focused on delivering agriculture and NRM benefits. Yet they can play an important role in reducing emissions and enhancing carbon storage. Feral animals can adversely affect the amount of carbon stored in vegetation and soils by feeding on trees and shrubs, and suppressing the regrowth of native vegetation (Peltzer et al. 2010). Overgrazing of grasslands by feral animals can also reduce ground cover, leading to soil carbon losses (and erosion) (Peltzer et al. 2010). Weeds can have similar impacts, as well as adversely affecting fire behaviour in affected areas (Box 6) (Peltzer et al. 2010, Rossiter et al. 2003, Setterfield et al. 2010). These interactions reinforce the importance of effective coordination and best practice guidance in the design and implementation of government policies and programs.

The role pest and weed control can play in climate policy is recognised, to some extent, in the ERF. There are several methods that incentivise pest and weed control on the basis of their ability to enhance carbon storage. For example, the Human-induced Regeneration and Native Forest from Managed Regrowth methods include the humane control of feral animals and the management of weeds as eligible carbon offset activities where the animals and weeds have obstructed or suppressed the regrowth of native forest.

⁸ See, for example, *Biosecurity Act 2014* (Qld), s 23; *Biosecurity Act 2015* (NSW), s 22; and *Weeds Management Act* (NT), s 9.

⁹ Reflecting this, under some state biosecurity laws, local governments are given responsibilities for the management of particular biosecurity issues within their municipalities. See, for example, *Biosecurity Act 2014* (Qld), s 48; and *Biosecurity Act 2015* (NSW), s 371.

BOX 6 GAMBA GRASS

An illustration of the cross-overs between weeds and climate policy relates to gamba grass (*Andropogon gayanus*), a tall perennial African tussock grass, introduced to Northern Australia as a pasture grass in the 1930s (March 2011). Gamba grass is very productive, well suited to the tropics, adapted to a wide array of soil types and resistant to drought conditions. Although these characteristics made it a potentially valuable pasture grass, they also made it an aggressive and invasive weed (Petty 2013). The grass has now spread across parts of Queensland, Western Australia and the Northern Territory (Australian Weeds Committee 2012).

Gamba grass is highly combustible. It replaces native grass fuel loads, resulting in increased wildfire intensity, and frequency and increased emissions (Setterfield et al. 2013). This in turn decreases shrub and tree cover, affecting biodiversity and decreasing carbon storage in the landscape. It increases risks to people and property, increases fire management costs and reduces the availability of traditional foods and other resources for Indigenous communities.

By changing the fire ecology, gamba grass also undermines the effectiveness of early dry season burning and the viability of the associated savanna burning projects under the Emissions Reduction Fund (ERF) (Adams & Setterfield 2013). The Australian Government is proposing to explicitly exclude areas infested with gamba grass from the scope of the proposed new ERF savanna burning methods, which may provide a further incentive for landholders to control its spread (DoEE 2018). The threats posed by gamba grass have also resulted in its inclusion on the list of Weeds of National Significance in 2012 (Australian Weeds Committee 2012). It is now also a declared noxious weed under Queensland, Western Australia and Northern Territory legislation (*Biosecurity and Agricultural Management (Prohibited Organisms) Declaration 2013* (WA), DAFF 2016, DoENR 2017). There have been calls for increased recognition in government policies of the complementary natural resource management, climate and agriculture-related benefits of controlling the continued spread of the grass (Petty 2013).

4.4 EMISSIONS REDUCTION FUND METHODS, FERTILISER EFFICIENCY AND MULTIPLE BENEFITS

At the federal level, the ERF provides the main source of funding for emissions reductions on the land. The Government's 2017 review of climate policies confirmed the ERF as the centrepiece of its emissions reduction policy (DoEE 2017a). About \$265 million in funding remains for future ERF auctions (CER 2017c).

The ERF is focused on purchasing emissions reductions rather than explicitly funding co-benefits.

However, if ERF projects were able to secure additional revenue by delivering benefits beyond emissions reductions, uptake of certain ERF projects could be higher. Investment in new method development under the ERF could therefore be worthwhile where other programs or initiatives facilitate uptake by paying for the delivery of benefits beyond emissions reductions. For example, the lack of projects using the ERF Fertiliser Use Efficiency in Irrigated Cotton method (Box 7) that credits reductions in emissions from cotton fertiliser use suggests these projects are not economic on the basis of their emissions reduction benefits alone at current Australian Carbon Credit Unit prices. Analysis undertaken for CottonInfo (Welsh et al. 2015), the cotton industry's joint extension program, found that the small

scale of emissions reductions available at a farm scale meant projects under this method would be uncompetitive at auction. However, projects that reduce fertiliser use can produce complementary NRM benefits, including reduced nutrient runoff and related water pollution.

The ERF additionality rules were designed to allow for this type of co-funding to deliver benefits beyond emissions reductions. The successful development of an approach to use ERF projects to reduce fertiliser use and deliver multiple benefits could serve as a pilot for other arrangements. To contribute to achieving value for money it is important that such an approach is designed to encourage uptake of additional projects that would not be economic under either policy alone.

BOX 7 FERTILISER EFFICIENCY, EMISSIONS REDUCTIONS AND REDUCED IMPACT FROM RUNOFF

Under the Emissions Reduction Fund, cotton growers can earn carbon credits by reducing emissions from synthetic nitrogen fertiliser per tonne of cotton produced. Emissions reductions can be achieved by increasing the efficiency of fertiliser use by changing the rate, source, timing or placement of nitrogen fertilisers while still maintaining or increasing cotton yields.

A similar approach to the cotton method could be applied to the sugar industry with both emissions reductions and water quality benefits. This could improve water quality outcomes in the Great Barrier Reef catchments by reducing nitrogen leaching and runoff from agricultural land as well as reducing emissions (Angus & Grace 2016; Brodie et al. 2015). Such an approach has broader support. For example, in a report for the Queensland Government, Energetics (2017, p4) suggested a new method for fertiliser use efficiency in sugarcane.

Given the high priority governments are according to improving water quality and reducing agricultural runoff into the Great Barrier Reef (GBR) and other sensitive marine catchments, the Authority is of the view that an ERF method to reward genuine fertiliser reductions from sugarcane farming should be explored as a priority. Such a method would need to take account of Queensland regulations that require cane farmers to restrict their nitrogen and phosphorus use.

Projects under an ERF sugarcane fertiliser method are likely to need co-funding from other sources to pay for water quality benefits and to make uptake more economic for landholders. The Reef Trust is one possible source of funding for multiple benefits. The Reef Trust commits \$260 million in Australian Government funding to innovative, targeted investment focused on improving water quality, restoring coastal ecosystem health and enhancing species protection in the GBR region.

The Queensland Government has implemented a number of programs to support the GBR and these should also be explored as sources of co-funding, provided they align with ERF additionality and other requirements. For example, Queensland's Reef Credits pilot could provide another source of funding for water quality benefits (Box 8).

Aggregated projects using existing ERF methods are already helping improve water quality in the GBR while increasing carbon in vegetation (Section 6.2.1). Establishing woody vegetation along river, creek and gully banks acts like a sieve to reduce sediment and pesticides flowing into the GBR while also helping to prevent soil erosion (Section 6.1.4). These ERF projects enable farmers to reap the efficiency

benefits and cost savings from reducing fertiliser application, and establishing vegetation reduces erosion.

The livestock industries, such as piggeries, where biogas from manure can be used to generate renewable energy, offer another source of multiple benefits. In circumstances where the commercial viability of electricity generation from biogas is commercially or technically innovative, funding from the Australian Renewable Energy Agency could support demonstration projects with the aim of increasing uptake of the technology.

The Authority recommended, in its ERF review report, a process to enable stakeholders to propose new ERF methods, the Government to publish method development priorities and increased funding for method development on the land (CCA 2017b). Building on these recommendations, the Authority further recommends these processes give priority to methods that could also deliver genuine multiple benefits, like fertiliser reduction, provided the methods have a high likelihood of delivering low cost, significant abatement for the ERF and broad uptake within a given sector or industry. The Authority remains of the view that while priority should be given to develop methods with multiple benefits no change should be made to the ERF purchasing principles given the ERF's focus on delivering low cost abatement (CCA 2017b).

Recommendations

- R.6** The Australian Government work with industry, the Queensland Government and other stakeholders to develop a method under the Emissions Reduction Fund to incentivise emissions reductions from growing sugarcane by improving the efficiency of fertiliser application.
- R.7** In future Emissions Reduction Fund method development, the Australian Government consider giving priority to other methods that could deliver genuine multiple benefits, provided they also have potential for widespread, cost-effective uptake and robust abatement.
- R.8** The Australian Government use Commonwealth programs such as the Reef Trust to co-fund Emissions Reduction Fund projects and encourage states and territories to use their relevant grant or loan programs to realise genuine multiple benefits from the Emissions Reduction Fund such as reduced agricultural runoff, improved water quality outcomes and enhanced on-farm productivity benefits.

CHAPTER 5 CREATING NEW MARKETS AND OPPORTUNITIES FOR MULTIPLE BENEFITS

This chapter outlines possible policy options for creating new markets or incentives for multiple benefits on the land. These include multiple benefits accreditation for carbon offsets, grant programs and investing in multiple benefit projects through a new Land and Environment Investment Fund. This chapter also considers how to enhance participation by Indigenous communities in projects with multiple benefits.

5.1 MULTIPLE BENEFITS ACCREDITATION

Carbon offset providers may be able to capture the value of non-carbon benefits of their projects through multiple benefits accreditation. Under such an approach, the carbon offsets are certified as being sourced from an activity that provides other benefits (environmental, economic, social or cultural), a little like the Heart Foundation Tick certified certain healthier foods.

A number of international voluntary schemes have been developed to accredit the non-carbon benefits of carbon offset projects, including The Gold Standard, Climate, Community and Biodiversity Standard, SocialCarbon and Plan Vivo. These schemes establish a standard, or criteria for accreditation, then administer the standard for participating firms and individuals to ensure that its requirements are met including for reporting, verification and, for some, the use of registries to avoid double counting. At present, however, none of the international voluntary accreditation schemes operate in conjunction with Emissions Reduction Fund (ERF) projects.

There is also a number of emerging products available in Australia that offer credits for multiple benefits. For example, South Pole's EcoAustralia credit includes an internationally verified carbon credit stapled with an Australian Biodiversity Unit with these credits retired on the Victorian Government's Native Vegetation Credit Register. As discussed in Box 8, there is also work underway to develop Reef Credits for projects with multiple benefits.

Existing standards and emerging multiple benefit credits are likely to need some development to align with the rules of the ERF (and possibly local conditions).

The Authority sees benefit in the development of a multiple benefits accreditation scheme that could sit alongside the ERF and other emissions reduction offset projects and provide recognition for projects and credits with multiple benefits to distinguish themselves in the market. This could attract a higher price for these units and lead to the implementation of projects with multiple benefits that would otherwise not have been viable. The Authority is of the view that a single harmonised standard could best provide clear guidance and confidence to the market.

The Authority considered whether development of such an accreditation scheme could be undertaken by the private sector or other players. The Authority is aware that some organisations and state governments are moving in this direction but it is unclear when such accreditation standards would be available or whether they would be suitable for widespread uptake rather than favouring a particular set of circumstances.

If the Australian Government led work to develop a standard, it may be more likely to align well with the ERF rules and establish a level playing field for all interested participants rather than meeting the needs of particular commercial interests. Existing accreditation standards could offer insights for developing a multiple benefits standard that could apply to ERF projects. Once established, a program based on the standard could be administered by the private sector or a non-government organisation to minimise costs to government.

Such an accreditation program could help facilitate the further development of a private market for accredited Australian Carbon Credit Units (ACCUs) with demand driven by purchasers wanting to demonstrate their contribution to broader environmental or social outcomes. This could include entities with liabilities under the safeguard mechanism or potentially the National Energy Guarantee, the “make-good” provisions under the ERF or the voluntary market.

The voluntary market is the most likely source of demand for accredited ACCUs and is fairly modest when compared with the emissions reduction task to meet Australia’s Paris Agreement goals. The voluntary demand for ACCUs is small—around 116,000 ACCUs were voluntarily cancelled in 2017 (CER 2017a). This probably reflects the relatively high price of Australian units compared with international units. ACCUs were traded on the global voluntary market for an average of around \$13.35 compared with \$3.85 for all voluntary offsets in 2016 (Ecosystem Marketplace 2017, RBA 2018).

Around 1.8 million carbon units were voluntarily cancelled on behalf of Australian businesses, individuals and programs in 2016 (DoEE pers comm 2018, Markit 2018, APX 2018). These include cancellations to achieve carbon neutral certification under the Australian Government’s Carbon Neutral Program and under other certification schemes or self-reported targets.

The development of an accreditation model would also need to be done carefully given the risk of duplication with industry-based best management practice schemes. The National Farmers’ Federation (NFF), in its submission on this research project, raised concerns about the potential for an accreditation standard to duplicate existing business initiatives. The NFF supports further competitive grant funding as an alternative to incentivise multiple benefits with public good outcomes.

The Authority understands from consultation that voluntary private sector and individual demand for carbon offset units with multiple benefits accreditation is likely to be fairly low, given the generally low uptake of similar voluntary measures in the past. However, the development of an accreditation standard by the Government would provide a vehicle to raise public and corporate awareness of broader environmental or social issues. It could also help land-based sectors currently not covered by best practice approaches to demonstrate their bona fides to international markets that are increasingly looking for sustainably sourced products.

The Authority recommends therefore that the Australian Government lead development with states and territories and other stakeholders of a multiple benefits accreditation standard for ERF and other carbon offset projects. This standard should be confined in scope, in the first instance, to the biodiversity benefits associated with vegetation and soil projects. An initial focus on biodiversity for the accreditation standard would also limit overlap with industry best management practice initiatives as these are unlikely to include initiatives that promote biodiversity. It would also provide learning by doing that could inform future development of a standard for other multiple benefits where work is less well advanced.

The standard could establish what species of vegetation would be eligible and how the biodiversity benefit should be calculated, drawing on existing work done by NGOs and governments. For example, the value of connected ecosystems to provide wildlife corridors or habitats is well documented (Australian Government 2017c). The Victorian Government has also developed standards for native vegetation credits (including biodiversity values), which are typically used for development offset requirements (DELWP n.d.). Reviewing and updating of the accreditation standard may be best done by government on an ongoing basis to maintain integrity and a level playing field amongst private sector players.

Recommendations

- R.9** In consultation with other government and non-government stakeholders, the Australian Government develop an accreditation standard to support a private market for carbon credits that have genuine multiple benefits, commencing with biodiversity.
- R.10** The Australian Government explore the options for a business or a non-government organisation to administer a program based on the multiple benefits accreditation standard recommended in R.9.

5.2 SEPARATE CREDITING

The Authority considered another model to recognise multiple benefits—namely the creation of a separate, tradable instrument that would sit alongside carbon credits (for example a separate biodiversity credit could be generated from carbon projects as a tradable instrument in its own right) (CCA 2017a). Both the carbon and non-carbon credits could then be sold in separate markets either to the government or to the private sector.

Some submissions supported separate tradable instruments in preference to the accreditation model because the different benefits receive separate, transparent monetary values. For example, Green Collar Group's submission on this research project indicated a strong preference for separate crediting of non-carbon benefits so that each commodity stream is 'valued by the market independently' (p10).

The Authority is concerned however that separate crediting would require more governance and administration to create and track multiple tradable instruments than the simpler accreditation model. Separate crediting would therefore carry higher transaction costs.

To date, there is little evidence of demand for separate crediting from the voluntary market to justify these costs. Although there are existing compliance markets for biodiversity and heritage offset credits under federal, state and territory planning and environmental approval processes (see for example the *Planning and Environment Act 1987 (Vic)*), the scope for separate voluntary crediting arrangements to piggyback off development conditions offsets is limited because development related offsets are usually narrow in scope and have additionality rules.

Although there are examples of initiatives to develop separate crediting systems these are still in the early stages of development so it is difficult to assess their effectiveness.

The Authority notes however, that the development of the governance needed for a multiple benefit accreditation model could be a step towards the separate crediting model, and could be built upon if a multiple benefit market with separate tradable instruments looks prospective in the future. Data collected through the Authority's recommended online reporting tool (R.1) could contribute to the development of metrics to support separate crediting. The Authority sees merit in reconsidering separate tradeable instruments as experience and expertise develops, and if there is evidence of sufficient demand for such credits to justify the administrative costs.

BOX 8 THE REEF CREDITS PILOT

Terrain NRM group will pilot a mechanism to measure and credit reductions in sediment, nutrients and pesticides flowing into the Great Barrier Reef. Terrain has allocated funding as part of a major integrated project for the Wet Tropics region of Queensland to establish a standard under which methods for crediting could be developed. This follows extensive consultation in developing the major integrated project plan, which included commissioning a feasibility study of a reef credits program by Green Collar. Major integrated projects are a regionally-based approach to improving outcomes for the Great Barrier Reef, funded by the Queensland Government.

The pilot is still in its early stages, with Terrain and Green Collar working with farmers to develop methodologies for crediting. Purchases of reef credits will be open to any groups, including Government that may benefit from the outcomes. However it is unclear at this stage where demand might come from.

Source: Terrain Natural Resource Management (2017)

5.3 DIRECT GRANTS

Direct grant programs provide another way of enabling landholders to realise the carbon, natural resource management (NRM) and social benefits associated with project activities. Grant funds could be awarded through competitive tenders or auctions. Competitive processes make grant programs more cost effective but may not always fulfil social or equity objectives unless these are built explicitly into the program's objectives and delivery strategies. A number of stakeholders support grant funding to pay for multiple benefits including The Wilderness Society and NRM Regions Australia (submissions on this research project).

In principle, grant programs to support multiple benefits could be similar to existing NRM grant programs, only rather than paying exclusively for NRM benefits, the programs could also provide payments for the carbon.

A new grant program could be designed as a complement to the ERF or other carbon offset programs. ERF project proponents would receive ACCUs to reflect the carbon benefits and grants to cover costs associated with providing NRM and other benefits. An alternative model could involve the establishment of a new stand-alone program instead of the ERF to provide combined grant payments for emissions reductions, carbon storage or environmental offset projects that generate social, cultural or economic impacts.

Establishing a new grant program (either as a stand-alone program or as a direct complement to the ERF) is likely to be challenging for governments in the current constrained budgetary environment. If such a program went ahead, savings would probably need to be found from other areas of government spending, and the implications of shifting resources from the other areas would need to be carefully considered.

Under an alternative approach, current or planned grant programs that support NRM benefits could be re-purposed to support carbon as well as NRM outcomes, where it is feasible and cost-effective to do so. In some cases there may be a strong rationale for activities that target a specific NRM outcome without considering other benefits. For example, in a case where the protection of a threatened species requires a specific project activity with only small or non-existent carbon benefits pursuing other benefits beyond

protecting threatened species is unlikely to be worthwhile. On the other hand, where synergies are possible, reorientating NRM grant funding towards activities that offer multiple benefits has the potential to increase the cost-effectiveness of the government responses to climate and NRM challenges.

The National Landcare Program is the Australian Government's primary NRM grant program. Some programs under the National Landcare Program such as the Regional Land Partnerships and the Smart Farms Program can provide funding to projects with multiple benefits (Box 9). The Authority is of the view that grant programs such as these are an important vehicle for demonstrating the feasibility of activities with multiple benefits on the land and may result in broader uptake.

BOX 9 SMART FARMS PROGRAM

The Smart Farms Program under the National Landcare Program provides an example of how grants can integrate multiple objectives. The Smart Farms Program aims to increase land managers' awareness, knowledge, capability and adoption of tools and management practices that will deliver more productive and profitable agriculture, protect or improve biodiversity and natural resources and help Australia meet obligations under relevant international treaties, including the Paris Agreement (Australian Government 2017b).

The Smart Farms Program includes two grants schemes to support on-ground projects—the Smart Farms Small Grants for projects up to \$100,000 and the Smart Farming Partnerships for larger projects. To be eligible for a grant, projects must contribute to one or more of:

- soil health;
- conserving or restoring biodiversity;
- climate change adaptation;
- greenhouse gas emissions management and resource efficiency; or
- sustainable agriculture and natural resource management that supports these other outcomes.

Eligible activities under the program could include projects with multiple benefits such as those that reduce nutrient losses into waterways while improving productivity. Activities to enhance reporting around multiple benefit programs and that could drive increased uptake may also be eligible.

The Government announced the Smart Farms Program in September 2017 and has committed \$134 million in funding over six years. The first rounds of grant applications closed in December 2017, with further rounds expected.

Source: DoAWR 2017b

5.4 LAND AND ENVIRONMENT INVESTMENT FUND

As discussed in Chapter 6 there is a range of activities that can help diversify farmer's revenue while also reducing emissions and delivering other benefits for the environment. There is however a range of barriers to the uptake of these activities.

Some activities that deliver multiple benefits and financial returns in the long run may require upfront capital investment or decrease income in the short term. For example, planting native trees as a windbreak requires upfront spending on plantings. However, windbreaks can also deliver improved financial returns over many years by increasing crop production, providing shelter for stock (Cleugh et.al. 2002) or by generating carbon credits¹⁰. Shelter belts can also significantly reduce calving and lambing mortality in beef, sheep and dairy herds, thereby increasing productivity (Agriculture Victoria 2002).

A number of stakeholders have identified upfront costs as a barrier to implementing these and other projects with multiple benefits (KLC submission on this research project).

Some lending institutions are considering the viability of loan products to landholders that reflect the value of natural capital and resilience to climate variability. Such loans could also incentivise activities on-farm to deliver multiple benefits (Box 5). The Authority understands however that there is some way to go before banks can make a clear business case for making such investment decisions.

In some ways, a lack of capital for on-farm investment in multiple benefits is similar to the circumstances that led to the establishment of the Clean Energy Finance Corporation (CEFC) to fund low emissions energy. The policy case for establishing the CEFC rested in part on the view that the lack of capital for clean energy projects was hampering investment in projects that would deliver a public good. The Government stepped in to offer targeted investment loans through the CEFC and reduced the commercial risk, which facilitated more investment in cleaner energy (Explanatory Memorandum, Clean Energy Finance Corporation Bill 2012 (Cth)).

Similarly, uptake of investment to deliver multiple benefits on the land (for example to establish windbreaks) appears to be hampered by difficulties on the part of financial institutions to assess the risk of these investments. The absence of farm level data and benchmarks makes it difficult to evaluate the impact of a given investment on productivity and the associated risk.

As discussed in previous chapters, the lack of robust data at the farm level is a challenging problem for a range of measures that could be used to create incentives for multiple benefits on the land. The Authority has recommended improved reporting of on-farm data, which could contribute to developing this knowledge over time (R.1). However, as with separate crediting of multiple benefits (Section 5.2), the Authority is of the view it may be some years before these benefits can be measured with the robustness required to underpin widespread investment decisions in the private sector.

The CEFC however was confronted with a similar problem when it began assessing investments in clean energy. The CEFC sought to solve this problem by employing experts in clean energy and finance to assess its loan applications. This approach allows it to assess risk effectively and in consequence, it is able to offer targeted loans to its clients and still deliver a commercial rate of return on its loan portfolio to Government (CEFC 2017a).

The Authority is of the view that a similar model—a CEFC for the land—could help drive uptake of multiple benefit projects that have public benefits and could also provide the private sector with increased confidence to invest in such activities in the longer-term.

Investment in on-farm projects that receive targeted loan funding could act as demonstration projects to the wider farming community and provide data to government to help build metrics and benchmarks to allow for the private sector to more readily offer such loans to landholders in the future.

An outreach program to inform trusted local advisors in regional communities could help spread the knowledge and uptake of these types of projects.

¹⁰ To be eligible to generate ACCUs under the ERF, windbreaks would need to meet the criteria specified in an ERF method such as minimum area requirements.

The CEFC has already been giving loans to farmers to improve their energy efficiency and use of low emission electricity by investing over \$200 million through almost 800 small-scale investments in agribusinesses. In addition, the CEFC announced in February 2018 a \$100 million investment in a new agriculture platform managed by Macquarie Infrastructure and Real Assets. The CEFC investment in Macquarie aims to improve sustainable agriculture management practices and deliver increased productivity with improved energy efficiency. As part of the investment, the CSIRO will contribute expert analysis to enable knowledge of clean energy technology and practice to be shared across the farming sector and promote widespread uptake.

The Authority recommends therefore that a targeted Land and Environment Investment Fund that provides financing for multiple benefit projects on the land be established. Like the CEFC, such a fund could be given a clear mandate that specifies government priorities for multiple benefits on the land. These could include areas such as biodiversity, climate resilience, economic benefits to Indigenous communities, water quality and soil health.

Loan products from the new Land and Environment Investment Fund could work in tandem to support investments in projects eligible for other government funding programs such as the ERF and grants through the National Landcare Program, provided they deliver broader environmental or community benefits.

Agricultural industry sustainability frameworks could help inform loan criteria for the Fund and funding could be provided to meet or exceed these standards (Section 2.5). The design and operation of the Fund could draw on experience with other targeted loan programs including the CEFC and the Regional Investment Corporation, which will administer government loans from 1 July 2018 to support eligible Australian farm businesses (DoAWR 2017c).

Consultation with stakeholders for the purposes of this research project suggest that there is demand for this targeted loan support as long as transaction costs are low (NAB pers comm 2018). A delivery partnership with financial institutions that provide loans to landholders may be desirable to make it easier for farmers to participate (NAB pers comm 2018). Partnership arrangements could build on the finance sector's understanding of broader agri-business risks and assist the private sector to leverage its existing expertise to incorporate new knowledge of multiple benefits into their decision making.

Depending on the model, the Land and Environment Investment Fund would be expected to generate a commercial return. Although appropriations would be needed to fund the loans initially, they would be listed as assets that generate a return (interest). As the loans are repaid they become a source of revenue.

Recommendation

R.11 The Australian Government establish and promote through trusted local sources a Land and Environment Investment Fund targeting projects that generate genuine, multiple climate, natural resource management and economic benefits.

5.5 SOCIAL IMPACT BONDS

The Authority considered the potential for social impact bonds to support land managers delivering multiple benefits on the land.

Also known as payment-for-success bonds or pay-for-benefits bonds, social impact bonds are financing mechanisms in which governments enter into future contracts with service providers and investors to pay for social or environmental outcomes (Galitopoulou & Noya 2016, Ramsden et al. 2016). A simple form

of a social impact bond would involve an outcomes-based future contract between the government and a private investor (and possibly also a service provider). The investor would then engage the service provider to undertake project activities to deliver the requisite carbon, NRM and social outcomes. After the activities had been undertaken, the outcomes would be measured, reported and verified, typically by a third party auditor. If the outcomes specified in the contract were delivered, the government would make the agreed payments to the investor.

Australian governments have done considerable work on social impact bonds over the past five years although most of the existing initiatives aim to deliver social welfare rather than environmental outcomes (Australian Treasury 2017). The main benefits of social impact bonds stem from the employment of outcome or results based, rather than activity-based, contracting, and the use of private investors to provide the upfront capital necessary to fund the provision of the relevant services (Galitopoulou & Noya 2016, Ramsden 2016). Social impact bonds for environmental outcomes are not yet being used in Australia.

Like grants, social impact bonds also require government funding to provide investors with a return and this is likely to be challenging given current budget constraints (Section 5.3). Further, social impact bonds to incentivise multiple benefits on the land would require development of similar metrics for monitoring, reporting and evaluation that would be needed for separate crediting of multiple benefits (Section 5.2). These are not yet available. The Authority is of the view that the use of social impact bonds to incentivise multiple benefits is premature at present but could be explored in the future as better environmental information and metrics become available.

5.6 INDIGENOUS PARTICIPATION IN EXISTING AND EMERGING ENVIRONMENTAL MARKETS

Active Indigenous involvement in carbon and NRM activities provides a range of important benefits (Price et al. 2012, Russell-Smith et al. 2013). Amongst other things, it can improve biodiversity and natural heritage outcomes, help maintain Indigenous cultural practices, provide employment in remote areas and increase social cohesion (Section 6.1.3). Should new multiple benefits markets emerge, limited resources may also act as barriers to Indigenous communities accessing these markets. Stakeholder feedback received during the Authority's consultations highlighted that Indigenous participation in the ERF has been facilitated through Working on Country and Indigenous Protected Areas funding and any reduction in funding for these projects would likely limit uptake (CCA 2017b). Stakeholders pointed to the former Indigenous Carbon Farming Fund and related programs as a key success factor in the industry to date (ALFA submission on the ERF review, Aboriginal Carbon Fund submission on the 2017 review of climate policies).

The submission from the Kimberley Land Council on this research project states that for savanna burning carbon projects in the North Kimberley:

A number of barriers and challenges face the sector and limit its potential expansion. These challenges relate to the establishment costs of Indigenous carbon projects, properly valuing their social, cultural and biodiversity outcomes, and building the demand at a price that ensures the projects are sustainable. (p. 2)

Other recommendations in this report could go some way to addressing these challenges. The Authority's recommendation for a Land and Environment Investment Fund (R.11) could support Indigenous carbon farming by helping to finance the establishment costs of ERF projects. An accreditation scheme for multiple benefits (R.9 and R.10) could better value social, cultural and biodiversity outcomes and could result in greater returns for ACCUs with multiple benefits accreditation. The Authority considered Indigenous participation in the ERF as part of the ERF review (CCA 2017b). The Authority made recommendations to improve engagement with Indigenous communities when projects are registered to help ensure that Indigenous communities can reap benefits from ERF projects.

In its submission on this research project the Queensland Government Department of Environment and Heritage Protection notes that \$3 million of its \$8.4 million CarbonPlus Fund 'has been allocated for capacity building services that will enable greater participation by Aboriginal landholders in carbon markets' (p 7). This investment aims to support a multiple benefit certification scheme, an investment fund and marketing for carbon credits that deliver multiple benefits as well as a training course in carbon farming (Aboriginal Carbon Fund, submission on the 2017 review of climate policies). The Authority recommends the Australian Government support such initiatives by Indigenous communities to develop markets for multiple benefits by engaging with these groups in the development of a multiple benefit accreditation scheme (R.9 and R.10). The Authority also encourages the Australian Government to consider what further resources would be needed to ensure Indigenous communities are able to engage effectively in any new multiple benefit markets.

Recommendation

R.12 The Authority encourages the Australian Government to support Indigenous communities in their efforts to find new markets for genuine multiple benefits for Emissions Reduction Fund projects.

CHAPTER 6 IMPROVING ON-FARM PROFITABILITY

The effective implementation and integration of policies that reduce agricultural emissions and enhance natural resource management (NRM) outcomes can lead to improvements in on-farm productivity and profitability.

This chapter seeks to explore how these win-win-win opportunities for farmers, the broader environment and emissions reductions can be realised.

BOX 10 EMISSIONS REDUCTION FUND REVENUE

Participating in the Emissions Reduction Fund (ERF) is a significant source of revenue for rural landholders. The Australian Farm Institute (AFI) (2016) has said that 'the annual value of greenhouse emission reduction income earned by farmers exceeds that generated by many other 'traditional' farm commodities such as corn, triticale, soybeans, sunflowers and field peas'. The AFI has also highlighted that a further benefit of ERF revenue is that 'contracted ERF project income is not subject to the same vagaries of weather and international commodity prices as revenue from these other more traditional farm commodities is'.

In the first six auctions, over 155 million Australian Carbon Credit Units (ACCUs) were contracted for land-based projects (using agriculture, vegetation and savanna burning methods). Using the average price for each auction, revenue accruing to these landholders amounts to over \$1.8 billion, or an average of around \$130 million annually from 2015-2028 (the actual prices received, and therefore estimated revenue, is expected to differ from the average) (based on CER 2018a,b).

Understanding the implications for farm profitability, however, requires an understanding of the costs that are incurred to realise the revenue. For some landholders, particularly small ones, the costs of participating in the ERF are likely to be greater than the benefits from the sale of ACCUs (Janissen 2016). However, aggregation services give small landholders the chance to participate by joining with other landholders, spreading the transaction costs. Furthermore, as described in this chapter, ERF projects can generate benefits beyond ACCU revenue that may make projects worthwhile.

6.1 CASE STUDIES ON IMPROVING ON-FARM PROFITABILITY WHILE REDUCING EMISSIONS AND IMPROVING NATURAL RESOURCE MANAGEMENT OUTCOMES

The Emissions Reduction Fund (ERF) has delivered a number of projects that have provided farmers with new revenue streams or otherwise enhanced on-farm productivity as evidenced in the following case studies.

6.1.1 Beef cattle herd management

The ERF's beef cattle herd management method allows pasture-fed beef cattle producers to earn carbon credits by reducing the amount of methane and nitrous oxide emissions from their herds. To do this, the method provides an incentive for cattle producers to improve their productivity by increasing water availability, improving pastures, providing feed supplements, and removing unproductive cows. These

activities increase live weight gain in the herd, resulting in cattle reaching slaughter weights at a younger age, which reduces emissions per kilogram of meat produced.

The ERF herd management method helps improve efficiency and thereby saves farmers money as well as delivering a revenue source from Australian Carbon Credit Units (ACCUs). Analysis by Meat and Livestock Australia found that these improved management methods could generate productivity gains of between \$40,000 and \$80,000 for a herd of 10,000 animals on pastoral land (DoE 2016). In addition to the productivity gains, farmers gain the revenue from the sale of ACCUs. Industry data suggest emissions reductions of approximately 0.2 tonnes of carbon-dioxide equivalent per head per year is achievable in northern beef herds (MLA 2015a).¹¹ With an ACCU price of \$11.90, ACCU revenue from a herd of 10,000 animals would be in the order of \$24,000 per year (10,000 animals is around an average herd size for the Northern Territory and herd sizes elsewhere in Australia are on average smaller (ABARES 2017c)).

Owing to the differences in the types of project activities that can be undertaken, and their effectiveness in reducing the emissions intensity of production, returns from projects are likely to vary considerably. Scale is an important factor for this method with large herd sizes necessary to make projects viable at current ACCU prices. While the methods apply across Australia, uptake may be concentrated in the north. Herd sizes are larger in the north (ABARES 2017c), providing the scale to make ERF projects more viable and cattle are managed less intensively (Ashton et al. 2016), meaning the scope for improvements in emissions intensity is likely to be greater than in the south.

As at 2 March 2018, two projects based on this methodology are registered with the Clean Energy Regulator (CER) and nearly 24,000 ACCUs have been issued to one project (CER 2018b). One of these projects (located in New South Wales and Queensland) has been successful at an ERF auction—contracting 184,000 ACCUs in the April 2016 auction (CER 2018a).

6.1.2 Piggery manure management

The ERF's two piggeries methods provide another illustration of the potential for emissions reduction projects to reduce emissions while improving farm profitability and providing other environmental benefits. The production of pig meat produces emissions, the majority from the anaerobic decomposition of manure in uncovered effluent ponds.

To reduce these emissions, the ERF's piggeries methods require pig farmers to install effluent management systems that capture the methane from the decomposition of the manure and then combust it. This can be done using covered effluent ponds or engineered biodigesters. Where the methane is used to create renewable energy by being combusted in an electricity generator, proponents may be eligible to generate renewable energy certificates under the Renewable Energy Target (RET). Renewable energy certificates are an example of separate crediting which recognises the creation of renewable electricity generation whereas the ACCUs represent the benefit from reducing emissions.

Studies commissioned by Australian Pork Limited suggest capturing and combusting the methane component of biogas can reduce effluent related emissions from piggeries by between 62 per cent (when the methane is flared) and 80 per cent (when the methane is used for heat and power) (Australian Pork Ltd 2011, Wiedemann et al. 2016).

As of 2 March 2018, there were 14 registered piggeries projects (CER 2018b). Ten of these had ERF contracts, with a total of 892,666 ACCUs contracted at an estimated value of \$11.4 million over ten years, using average prices for each auction (CER 2018a,b). Six of the registered projects were also accredited power stations under the Large-scale RET scheme (CER 2018c).

¹¹ Based on phosphorous supplementation for the northern rangelands beef farming system.

Research by the Pork Cooperative Research Centre (2016) demonstrates that lowering emissions consistent with the ERF methodologies can provide significant financial benefits to pig farmers through onsite use of biogas replacing purchased energy, the sale of electricity, generation of renewable energy certificates, and generation of ACCUs.

Use of covered effluent lagoons and biodigesters reduce odour and methane, which also assists with meeting state and local environmental and planning requirements. One example of a piggery that has implemented the ERF method is Blantyre Farms. It was the first farm in Australia to participate in the Carbon Farming Initiative, registering in 2011. Blantyre Farms found that installation of a biogas system generated 52,000 ACCUs (worth a total of \$618,800 at the average ERF price) and a net reduction in electricity and gas expenses of \$20,000 a month (Locke 2017).

Pay back periods may be less than five years in many cases, and can be as short as one to two years (Pork CRC 2016). One of the registered ERF projects paid back an almost \$1 million capital investment in 2.5 years (Pork CRC 2016b). The cost effectiveness of implementing the technology is site specific and depends on, among other things, the size of the herd. Generation of electricity is a key element in offsetting the costs associated with covered effluent ponds. There is also the potential to co-locate horticultural greenhouses to use excess heat generated, and also excess carbon dioxide to enhance horticultural growth. One project located in Stanhope, Victoria, seeks to demonstrate the benefits of co-locating horticulture with a piggery, generating electricity and also producing high quality fertiliser (Minister for Energy, Environment & Climate Change 2016).

6.1.3 Savanna burning

The savanna burning methods require proponents to change the timing and nature of fire practices in northern Australia so as to reduce emissions from fires. In Northern Australian savannas, higher intensity fires that release large quantities of methane and nitrous oxide gases predominate late in the dry season when vegetation is very dry. In the absence of good fire management, fires tend to occur in the late dry season.¹² Lower intensity fires early in the dry season when vegetation still contains some moisture emit less methane and nitrous oxide than fires that occur later in the dry season. Actively burning in the early dry season to reduce the occurrence and extent of late dry season wild fires leads to a net reduction in fuel consumed and area burnt, and a corresponding reduction in methane and nitrous oxide emissions released by fire (*Carbon Credits (Carbon Farming Initiative—Emissions Abatement through Savanna Fire Management) Methodology Determination 2015* (Cth)). Savanna fire projects can also increase carbon storage relative to areas without active fire management due to the cooler fires leaving more woody debris on the ground. By reducing the frequency of intense fires, the average carbon stock in the debris increases over time (Price et al. 2012, Russell-Smith et al. 2013). A method to credit savanna fire sequestration is currently being developed (DoEE n.d.d).

As of 2 March 2018, there were 77 active savanna burning projects registered under two ERF savanna burning methods (CER 2018b). The savanna burning projects stretch across approximately 34 million hectares of Western Australia, Northern Territory and Queensland, or over 4 per cent of Australia's land mass.

In addition to reducing emissions and increasing carbon storage, early dry season fire management activities in general provide multiple environmental, social and economic benefits for landholders and Indigenous communities (Price et al. 2012, Russell-Smith et al. 2013). Improved fire management can enhance natural resource management (NRM) outcomes—increasing species diversity and protecting the habitats of threatened species and ecological communities. However, there are circumstances where early dry season burning can contribute to tea tree invasion and resulting loss of habitat for some bird species, for example in Cape York (Crowley 2013). Furthermore, the timing of early dry season burning

¹² The dry season is usually defined as the period May-October, with the wet from November-April. Under the method, the early dry season is defined as the period January-July, meaning it covers part of the wet, when wildfires are uncommon.

can clash with tourism activities (Ray 2018), so the competing needs of different stakeholders and the timing of fire regimes needs to be managed carefully.

The conduct of burning activities can also provide cultural benefits for Indigenous communities—supporting traditional practices and protecting country. They can also provide employment for Indigenous and non-Indigenous communities in regional and remote areas, where participation rates tend to be lower, and unemployment rates higher, than in metropolitan areas (Department of Employment 2017). In their submission on the ERF review, Arnhem Land Fire Abatement said that carbon projects ‘support Aboriginal people in returning to, working and remaining on their country’ (p.3).

For agricultural producers, improved fire management activities help improve pastures and protect stock, and reduce the need for the management of intense wildfires in the late dry season. The revenue from the sale of ACCUs also helps support the profitability of farm businesses by diversifying their income sources and helping them to address debt concerns (Locke 2017).

All ERF projects must register with the Clean Energy Regulator prior to commencement. Of the 77 savanna burning projects with active registration as at 2 March 2018, 23 were registered by Indigenous corporations and councils, with the remaining 52 being undertaken by government agencies, non-government organisations and private landholders (CER 2018b).

Following registration, projects can then either sell the credits (ACCUs) they generate privately, or under contract to the Australian Government. From the six ERF auctions held to date, 13.8 million ACCUs were contracted from 55 savanna burning projects, worth approximately \$159 million at the average auction prices (CER 2018a,b). This implies the average revenue from contracted savanna burning projects would be around \$2.9 million. In addition, 26 projects that are registered under the ERF but do not have contracts with the Government have earned a total of nearly 1 million ACCUs (CER 2018b). These ACCUs can be sold into the private market or alternatively the project proponent could bid into a future ERF auction.

Balancing the costs and returns from project activities is a challenge for some of the existing savanna burning projects, and prospective proponents. These costs and returns are affected by the type and amount of vegetation present, the remoteness of the site and the types of fire management practices used (for example use of a helicopter compared to the use of on-ground vehicles). With ERF auction prices averaging \$11.90 per ACCU, some Indigenous communities report that many existing projects do not recover their costs, or make profits. In some cases, the productivity improvements to agricultural enterprises, when combined with ERF revenues, may make these activities worthwhile. In others, proponents receive supplementary funding from government, philanthropic or other private sources, which enables the activities to continue.

6.1.4 Revegetation

The greatest volume of abatement under the ERF comes from vegetation methods that give credit for allowing vegetation to grow back by removing stock, fencing off, or preventing land clearing. Together these project types account for nearly 64 per cent of total contracted abatement and the ACCUs are worth an estimated \$1.4 billion (using average prices paid at each auction) (CER 2018a,b).

These projects provide landholders with a new revenue stream that may be particularly attractive for marginal farming land where the per hectare returns from farming are low. In addition to the revenue from the sale of ACCUs, regeneration of native forests can also benefit farmers through improved quality of land and water supply.

Broader environmental benefits can arise by restoring riparian vegetation along creeks and gullies, especially in catchments feeding into the Great Barrier Reef where sediment and nutrients from runoff have caused reef decline (Brodie et al. 2015). For example, under the Catchment Conservation Alliance with the Queensland Government, Green Collar has been contracted to deliver more than 20.5 million

ACCUs over the next 10 years from two ERF projects. These projects will protect and restore approximately 500,000 hectares of native forest and woodlands within the Great Barrier Reef catchment, Moreton Bay Catchment and other key catchments in Queensland by halting clearing or assisting ecosystem restoration (CER 2016).

6.2 BARRIERS TO UPTAKE OF THE EMISSIONS REDUCTION FUND

Farm profitability can be increased through productivity improvements and earning ACCUs by reducing emissions. Enhancing NRM outcomes also helps farm productivity, such as by making agricultural soils more productive and drought resistant.

Despite evidence of multiple benefits, uptake of these practices that reduce emissions and deliver NRM benefits, such as improving soil management and changing stock feeding practices, has been limited. Five ERF methods in the agriculture sector have no uptake (CER 2018b). To increase uptake, policy makers need to understand and address barriers to uptake including:

- Landholders may lack information about, or understanding of, the potential opportunities and operation of the ERF and auction process (Kragt et al. 2017). Potential participants may therefore be either unaware of the benefits that may be realised or are uncertain about the processes required for participation. Furthermore, the uptake of new technologies and practices by landholders is greatly affected by past practice, familiarity and trust.
- Landholder involvement in climate and NRM markets is partly a function of the returns they are likely to receive from participation, which are, in turn, affected by the costs they will incur to participate. Transaction costs such as project establishment, measurement and reporting may be prohibitive for small landholders. Projects across multiple properties can deliver economies of scale and lower transaction costs for individual landholders (Section 6.2.1). There is anecdotal evidence, however, that some farmers have concerns about unscrupulous operators and dislike sharing project returns with aggregators.
- There may be a lack of (perceived) affordable project opportunities. As outlined in Section 2.1 there are significant opportunities for abatement remaining in the land sector (The Treasury 2011, The Treasury and DIICSRTE 2013, Herrero et al. 2016, Henderson et al. 2017). Some suggestions for additional opportunities are presented in Sections 6.3.1 and 6.3.2.

The National Farmers' Federation (NFF) submission on this research project outlines a number of practical barriers to greater participation by farmers in the ERF, and lists these as: difficulty understanding the legal and financial risks to participating in the carbon market; concerns about the real farm gate return and risks from project participation; and the need for the ERF to be more easily applicable to mixed enterprise farms. Farmers for Climate Action emphasised the need for long-term certainty in policy settings to encourage farmers to participate (submission on the ERF review).

The Australian Government and industry are working to reduce information barriers and increase farmers' understanding of the ERF. The CER has produced guidance material, including a questionnaire that helps individuals determine whether they are eligible to participate in the ERF (CER 2017b). The Department of the Environment and Energy also provides guidance for ERF participants, including on aggregation agreements (DoEE 2017d). In addition, the carbon industry, led by the Carbon Project Developers Council is developing a carbon industry code of conduct to define industry best practice for aggregators and other professionals involved in managing ERF projects (Raphael Wood, pers comm 2017).

6.2.1 Aggregation of agricultural Emissions Reduction Fund projects to help with on-farm productivity

One of the identified barriers to the uptake of ERF projects is high transaction costs. The NFF said in their submission on the 2017 review of climate policies that the small scale of potential projects on most individual farms cannot sustain the overhead costs associated with participating in the ERF.

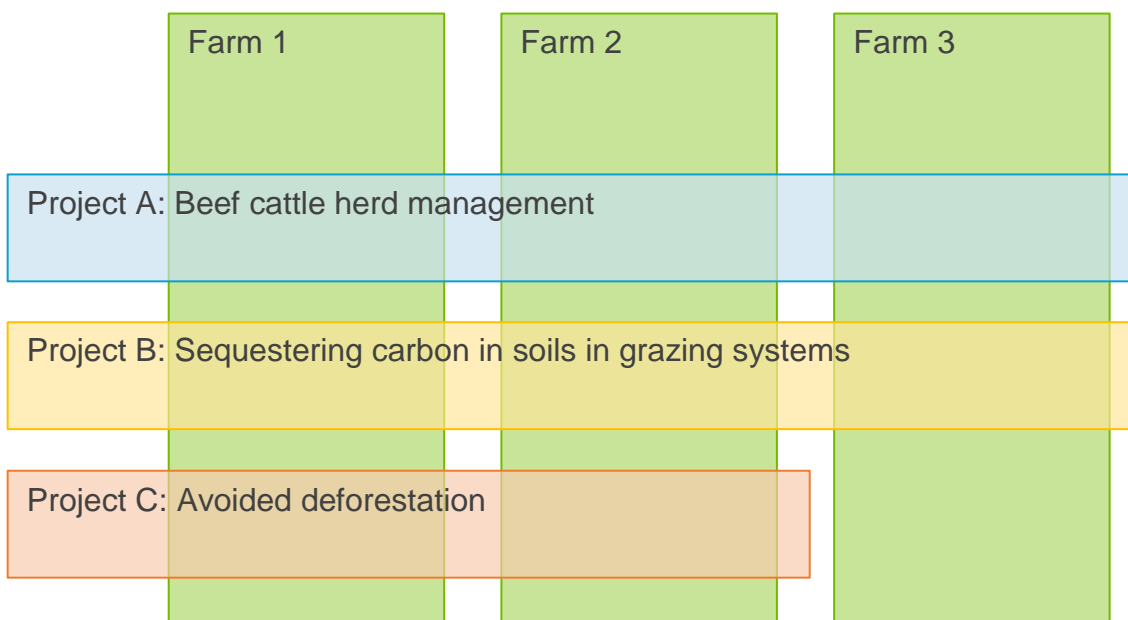
For the ERF, aggregation refers to bringing together or pooling emissions reductions from multiple physical sites or different offset projects. It is a service offered by some Carbon Service Providers.

Both projects and contracts can be aggregated under the ERF. Under project aggregation, activities that use the same method across multiple sites are pooled into a single project. Contract aggregation on the other hand combines projects using different methods into a single bid at an auction. Most of the aggregation that occurs under the ERF is project based with less than five per cent of all contracts aggregated (CER 2018a).

The ERF was intended to encourage aggregation to reduce transaction costs, overcome information barriers and ultimately increase participation (Australian Government 2014). In its submission on the 2017 review of climate policies, Green Collar Group, a carbon service provider, said that ‘[a]llowing aggregation has created scale and efficiencies in the federal carbon space’ (p. 3).

Taking the current aggregation approaches a step further, aggregators could establish multiple projects across multiple farms and bid into the ERF under one contract (Figure 3). This may increase opportunities and decrease costs for farmers, who can undertake more activities on their farm and deal with only one aggregator. However, this broader aggregation may be difficult to implement in practice, as farmers and aggregators would have to manage measurement and reporting requirements across multiple methods.

FIGURE 3 Aggregation of multiple Emissions Reduction Fund project types across multiple farms



Note: Figure 3 shows three individually owned farms participating in three different aggregated ERF projects that have been pooled into one ERF contract. Each of the three farms have decided to participate in beef cattle herd management and sequestering carbon soils in grazing systems projects. Farms 1 and 2 have also decided to participate in an avoided deforestation (preventing land clearing) project. An aggregator contracts with each farm and manages the three different projects in accordance with the methodology requirements for each project - the landholders each only enter into one contract with the aggregator. The aggregator registers three projects with the CER and manages the reporting and

auditing requirements for each project with the farms. The aggregator also chooses to participate in an ERF auction, and sell the abatement arising from all three projects to the government under one contract. The three farmers share the net revenue (minus the aggregator's fee).

The Authority notes that the voluntary online tool (R.1) could help simplify reporting and lower transaction costs for a bundled approach to aggregating projects, like that depicted in Figure 3.

The NFF has suggested the complexity of aggregation agreements and lack of standards for aggregators are a barrier to ERF participation (submissions on this research project and the 2017 review of climate policies). The Authority examined aggregation in its ERF review (CCA 2017b). The Authority found aggregation was common among projects successful in ERF auctions and made recommendations aimed at reducing the risks for landholders involved in aggregated projects including through increased information and transparency.

6.3 FURTHER OPPORTUNITIES FOR ENHANCING FARM PRODUCTIVITY

6.3.1 On-farm energy efficiency

There may also be opportunities to improve the efficiency of energy use on-farm. In 2015-16, energy consumed by the agriculture sector represented almost two per cent of Australia's total energy consumption. Over the last decade, this has grown at an average of about two per cent per year (DoIIS 2017). The amount of energy used varies for each farm, with more intensive agriculture, such as irrigated agriculture including dairy and cotton, generally using larger amounts of energy.

There is scope to increase the efficiency of energy use on farms and reduce spending on electricity and fuel, for example through the improved design and operation of irrigation pumping, and using more energy efficient equipment in agricultural production (Box 11).

The Australian Government is helping to facilitate investment by farmers in energy efficient equipment or renewable power generation through the Clean Energy Finance Corporation (CEFC). The CEFC is making finance available at discounted rates through commercial banks including Westpac, National Australia Bank and the Commonwealth Bank (CEFC 2017b). A similar model could be adopted for the new Land and Environment Investment Fund the Authority recommends in Section 5.4.

BOX 11 SMARTER ENERGY USE ON AUSTRALIAN DAIRY FARMS

Based on the Australian Bureau of Agricultural and Resource Economics (2017c) farm survey, in 2015-16 Australian dairy farms spent an average of just over \$20,000 per year on electricity. This represented about three per cent of their total costs. 'Smarter energy use on Australian Dairy farms' was a Dairy Australia program funded by the Department of Industry and Science to improve the energy efficiency of dairy farms. Between 2012 and 2015, almost 1,400 dairy farmers completed an energy assessment through the program. Independent analysis of the data gathered through the assessment concluded that some energy savings were identified for all properties, with savings greater than \$2,000 per year identified for about 45 per cent of properties. For example, a dairy in Bamawm Victoria reduced its electricity used by nine per cent through pump upgrades. Six farms in New South Wales saved between \$1,080 and \$3,108 per year by installing a variable speed drive to their vacuum pumps.

Source: Dairy Australia n.d.b

The Authority believes the agricultural sector could contribute towards the Australian Government's National Energy Productivity Plan, which provides a framework to accelerate action to deliver a 40 per cent improvement in Australia's energy productivity by 2030, while reducing energy costs for Australian farmers.

Recommendation

R.13 The Australian Government work with state and territory governments to develop new National Energy Productivity Plan measures aimed at improving on-farm energy efficiency.

6.3.2 Coordinating agricultural research and development

While the focus of most government funded agricultural research and development (R&D) and extension work is on improving the productivity of the agricultural industry, there is some recognition among research organisations of the importance of developing emissions reduction or carbon storage options, enhancing resilience to climate variability and enhancing natural capital. Reflecting this, many of the Rural Research and Development Corporations (RDCs) have now integrated climate-related R&D and extension into their work programs, including Meat & Livestock Australia, Dairy Australia and Australian Pork Limited. The CSIRO and the Australian Research Council grants also make important contributions to research into reducing emissions on the land (ARC 2015, CSIRO n.d.). The question arises as to how best to build on this work and broaden research into opportunities across the sector.

There are 15 different rural RDCs across the agriculture, fisheries and forestry industries. The objective of the RDCs is to deliver 'tangible and practical improvements for their industries in terms of productivity and profitability, sustainability, and the community' (Council of Rural Research and Development Corporations n.d.). The Australian Government's priorities for rural research and development, informed by the 2015 Agricultural Competitiveness White Paper, are promoting advanced technologies, managing natural resources and soils to improve production, managing biosecurity threats and adoption of R&D (Australian Government 2015). Some collaborative projects under the Rural R&D for Profit program are also undertaking research relevant to emissions reductions through consideration of nitrogen use efficiency (DoAWR 2016b).

The main collaborative program for agriculture-relevant climate change research is the Climate Change Research Strategy for Primary Industries (CCRSPI). CCRSPI identifies research priorities for future investment and collaboration by bringing together the RDCs, the CSIRO, and the Australian and state and territory governments. CCRSPI partners individually fund and manage the research according to the needs of their industry and region. CCRSPI is mainly focused on information sharing and collaboration. However it does not include targeted priorities for research funding, nor does it set delivery strategies or key performance indicators (CCRSPI n.d.).

Agricultural R&D work undertaken on reducing greenhouse gas emissions over the past decade has shown how some agricultural emissions reduction technologies and practices support productivity and profitability objectives (Beukes et al. 2010, DoAWR 2016a, MLA 2015b). For example, research undertaken as part of the National Livestock Methane Program found that grazing beef cattle on leucaena, a legume fodder crop that grows in tropical and sub-tropical environments, could increase gross farm margins by up to 37 per cent and simultaneously reduce methane emissions by 17 per cent (MLA 2015b). Other research from the program found similar effects (although to a lesser extent) from grazing sheep on native shrubs with methane reducing properties in autumn in south-western Western Australia (DoAWR 2016a, MLA 2015b). Another finding from research was the potential emissions reductions associated with stock feed supplements made from marine red macro-algae (*Asparagopsis taxiformis*). In experimental conditions, supplements derived from the algae have been shown to reduce

methane emissions by up to 80 per cent (DoAWR 2016a, MLA 2015b). At present, the supplements are not commercially available. Should they become so, there is the potential they could drive both emissions and productivity improvements by reducing feed energy losses in livestock through methane production, which would increase live weight gains and therefore profitability.

The 2015 Agricultural Competitiveness White Paper identified adoption of R&D in general as a priority area for further work and coordination (Australian Government 2015). The Australian Government funded AgriFutures (formerly the Rural Industries RDC) to develop an online extension hub and to analyse existing extension and capacity building models (eXtensionAUS n.d.).

The Authority considered stakeholder calls for more R&D funding for land-based offsets in the ERF review (CCA 2017b). The Authority recommended that the Australian Government allocate additional funds for land sector method development and require RDCs to include emissions reductions as a priority for their work.

The Authority further encourages RDCs to continue to explore innovative ways to convey the outcomes of their research to farmers, building on their existing extension programs. For example, Dairy Australia in its extension model has integrated its messaging on improving farm efficiency and lowering emissions intensity, linking 'smart business—lower emissions'. Dairy Australia has successfully rolled out these messages through short online videos that highlight the benefits to the farmer (Dairy Australia n.d.a).

Recommendation

R.14 The Rural Research and Development Corporations and other relevant research bodies build on their existing extension programs to continue to offer guidance to landholders on how to reduce emissions and encourage natural resource management while further improving farm productivity. Rural Research and Development Corporations' work programs should consider including objectives for both emissions reductions and natural resource management as well as on-farm profitability.

CHAPTER 7 CONCLUSION

The Authority embarked on this research project to find out why more landholders are not taking action to achieve multiple benefits on their land when adopting practices like improving soil quality could save landholders money, particularly over the longer term.

The answer bears some similarities to the reasons why opportunities for improving energy efficiency often go unaddressed (CCA 2016). Landholders may lack information to value the benefit of taking action. Alternatively the hassle factor or lack of direct incentives means doing something about multiple benefits does not seem worthwhile.

One of the key barriers to achieving multiple benefits is a lack of robust data from which benchmarks and metrics could be developed to assess the state of natural capital at the farm level and then estimate how it can be improved (or otherwise) by a particular management action.

This lack of farm level environmental information and its connection to farm financial performance also makes it difficult to develop and evaluate policy.

It can be time-consuming and sometimes costly for landholders to participate in government programs aimed at improving environmental outcomes. The Authority is of the view that a voluntary online tool could make it easier for farmers to participate in government programs while also providing policy makers with better data to develop benchmarks and metrics in the future.

Government programs tend to be focused on only one objective rather than the achievement of multiple benefits.

The Authority is aware that in some parts of government, consultation including across policy agendas (like carbon and natural resource management) is being done extremely well. There are also some programs and initiatives that are explicitly open to funding multiple benefits. The Australian Government's Smart Farms Program is still being rolled out but appears to be very much a step in the right direction. That said, widespread coordination across programs and beyond government to achieve multiple objectives remains challenging. The Authority has recommended a community of practice to develop best practice guidance for all the players involved in program delivery but also, most importantly, so government and non-government representatives regularly engage with each other on these important issues.

With some exceptions, markets for multiple benefits (beyond carbon) are either embryonic or non-existent. The Authority thinks that the best option for encouraging the development of markets for multiple benefits (in the short term) is to piggy back off the Emissions Reduction Fund's (ERF) success on the land. This could be done with an accreditation standard that 'accredits' ERF projects that also improve environmental outcomes on-farm (like biodiversity) or provide economic benefits to Indigenous communities. Other carbon offset schemes could adopt the same approach of accrediting emissions units that also carry genuine multiple benefits.

The development of new ERF methods (like fertiliser reduction) with a particular focus on broad acre agriculture would, in the Authority's view, assist this effort.

The Clean Energy Finance Corporation's work with banks to provide targeted finance to landholders wanting to invest in lower emissions or more energy efficient technology is one of the key success stories the Authority identified in the course of this research. The Authority would like to see this model applied more broadly (beyond low emissions and energy technologies) and recommends the establishment of a new Land and Environment Investment Fund to fund investment in projects that deliver genuine multiple benefits.

The Authority hopes that the findings and recommendations in this report will help landholders become even more resilient in the face of environmental and economic challenges and assist the Australian community as a whole in the vitally important task of preserving our unique natural capital for the future.

APPENDIX A PUBLIC CONSULTATION

On 9 March 2017, the Authority released an issues paper to facilitate consultation on this topic of research. In response to the issues paper, the Authority received 19 stakeholder submissions, all of which are available on the Authority's website at www.climatechangeauthority.gov.au.

Table A1 lists the individuals and organisations that provided submissions.

The Authority also held a number of consultation meetings with stakeholders, including with businesses, non-government organisations, research and development corporations and federal, state and territory government agencies.

This report also draws on consultation and submissions from the Authority's Emissions Reduction Fund review and submissions made to the Australian Government's 2017 review of climate policies.

The Authority thanks all those that provided submissions or engaged with the Authority for this work.

TABLE A1 Submissions received

Submitter	Submission number
Robert Saunders	1
Gordon Williamson	2
Kimberley Land Council	3
Victorian Catchment Management Authorities	4
Climate Friendly	5
The Wilderness Society	6
Wentworth Group	7
Doctors for the Environment Australia	8
Sustainable Business Australia	9
National Farmers' Federation	10
Green Collar Group	11
Australian-German Climate & Energy College	12
RepuTex	13
Corporate Carbon	14
NRM Regions Australia	15
Trust for Nature (Victoria)	16
South Australian Government—Department of Environment, Water and Natural Resources	17
Greening the Desert	18
Queensland Government—Department of Environment and Heritage Protection	19

ACRONYMS

ACCU	Australian Carbon Credit Unit
AFI	Australian Farm Institute
CAP	Common Agricultural Policy
CCRSPI	Climate Change Research Strategy for Primary Industries
CEFC	Clean Energy Finance Corporation
CER	Clean Energy Regulator
CGIAR	Consultative Group for International Agricultural Research
CO₂	Carbon dioxide
CO₂-e	Carbon dioxide equivalent
CSA	Climate smart agriculture
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ERF	Emissions Reduction Fund
GBR	Great Barrier Reef
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land Use, Land-use Change and Forestry
NEPP	National Energy Productivity Plan
NRM	Natural resource management
R&D	Research and development
RDC	Rural Research and Development Corporation
RET	Renewable Energy Target

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