The Australia Institute
Research that matters.

Harming farming

The cost to agriculture from the government's emissions reduction plan

A sector by sector proportional emissions reduction approach will mean agriculture will have to reduce emissions by 26 per cent by 2030. Agriculture lacks significant emissions reduction projects, so this emissions cut will come at a large cost.

Discussion paper

Matt Grudnoff

July 2018

ABOUT THE AUSTRALIA INSTITUTE

The Australia Institute is an independent public policy think tank based in Canberra. It is funded by donations from philanthropic trusts and individuals and commissioned research. We barrack for ideas, not political parties or candidates. Since its launch in 1994, the Institute has carried out highly influential research on a broad range of economic, social and environmental issues.

OUR PHILOSOPHY

As we begin the 21st century, new dilemmas confront our society and our planet. Unprecedented levels of consumption co-exist with extreme poverty. Through new technology we are more connected than we have ever been, yet civic engagement is declining. Environmental neglect continues despite heightened ecological awareness. A better balance is urgently needed.

The Australia Institute's directors, staff and supporters represent a broad range of views and priorities. What unites us is a belief that through a combination of research and creativity we can promote new solutions and ways of thinking.

OUR PURPOSE – 'RESEARCH THAT MATTERS'

The Institute publishes research that contributes to a more just, sustainable and peaceful society. Our goal is to gather, interpret and communicate evidence in order to both diagnose the problems we face and propose new solutions to tackle them.

The Institute is wholly independent and not affiliated with any other organisation. Donations to its Research Fund are tax deductible for the donor. Anyone wishing to donate can do so via the website at https://www.tai.org.au or by calling the Institute on 02 6130 0530. Our secure and user-friendly website allows donors to make either one-off or regular monthly donations and we encourage everyone who can to donate in this way as it assists our research in the most significant manner.

Level 1, Endeavour House, 1 Franklin St
Canberra, ACT 2601
Tel: (02) 61300530
Email: mail@tai.org.au
Website: www.tai.org.au
ISSN: 1836-9014

Acknowledgment

The Australia Institute gratefully acknowledges assistance from energy advisory firm RepuTex for providing the underlying data on the marginal cost of emissions reduction activities across the Australian economy. While data was supplied by RepuTex, all analysis of those projects for this paper was done by the author. No analysis or conclusions from this paper should be considered to be that of RepuTex.

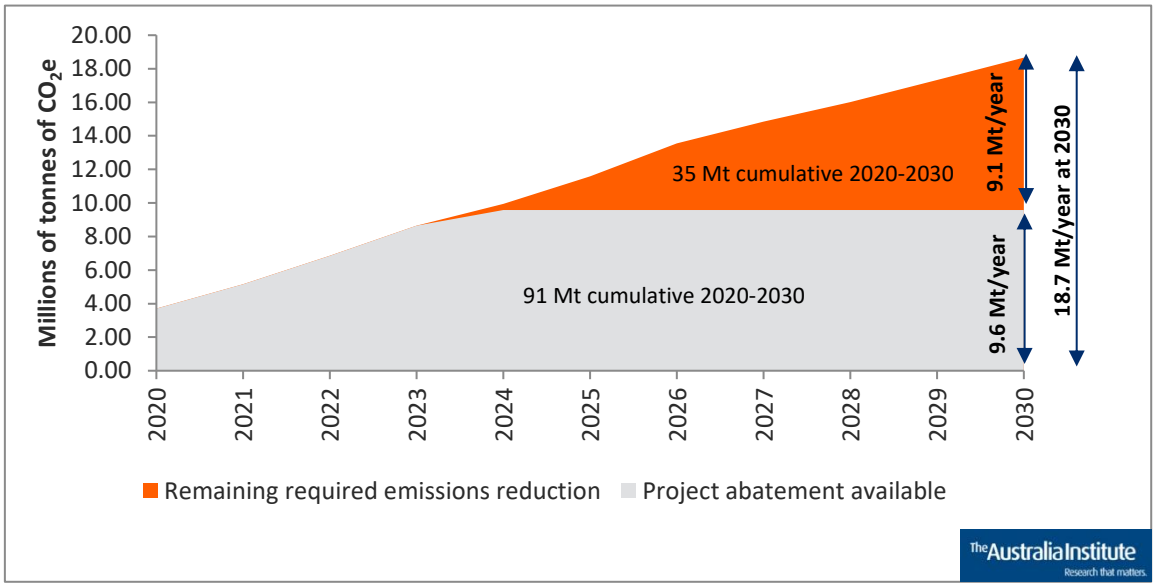
Summary

Australia's commitment under the Paris climate agreement is to reduce carbon emissions by 26 to 28 per cent below 2005 levels by 2030. With the announcement of the National Energy Guarantee the government has required the electricity sector to reduce its emissions by 26 per cent. This implies other sectors such as agriculture will also need to reduce emissions by at least 26 per cent by 2030. This approach will impose significant costs on agriculture and other sectors that do not have the existing, commercially available technologies for emissions reduction that the electricity sector has.

We have calculated that the government's plan will require agriculture to reduce emissions per year by 18.7 million tonnes (Mt) of CO_2e by 2030. Between 2020 and 2030, this represents 126 Mt of CO_2e not emitted compared to business as usual, since the reduction in yearly emissions is expected to occur incrementally.

Emissions reduction projects identified by energy analytics firm RepuTex could reduce agriculture's emissions by a maximum of 9.6 Mt of CO_2e per year and from 2024 onwards the agriculture sector would be unable to abate emissions in line with a 26 per cent reduction trajectory. By 2030 there would be 9.1 Mt per year gap in emissions reductions which will have to come from reducing agricultural production, including significant reductions in livestock numbers. In 2030, this would include 2.9 million fewer beef cattle, 8 million fewer sheep, 290,000 fewer dairy cows and 270,000 fewer pigs.

Figure - Total agricultural sector abatement and project abatement



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017* and RepuTex (2018) *Marginal Abatement Cost Curve - 2030*

This represents an emissions reduction through lower production of 11 per cent by 2030, roughly equivalent to the 15 per cent reduction in emissions through lower production caused by the major Millennium Drought in South East Australia (from 1996 to 2010).

This unnecessarily high cost is a product of the government's decision that every sector should reduce emissions by 26 per cent. If those sectors that are able to most cheaply reduce emissions are allowed to do so, then sectors like electricity generation would reduce emissions by far more than 26 per cent and sectors like agriculture would reduce emissions by less than 26 per cent.

This is particularly important as the government attempts to lock in a 26 per cent reduction target for electricity generation. If the government succeeds in doing this, it will increase the cost to sectors like agriculture.

Introduction

Australia's commitment under the Paris climate agreement is to reduce carbon emissions by 26 to 28 per cent below 2005 levels by 2030.[1] The federal government plans to lock in a 26 per cent reduction in the electricity sector with its proposed National Energy Guarantee. This implies that it intends to reach the Paris target using a proportional sector by sector approach where each sector would need to reduce emissions by at least 26 per cent. The sectors are:[2]

- Electricity
- Stationary energy excluding electricity (also known as direct combustion)
- Transport
- Fugitive emissions
- Industrial processes and product use
- Agriculture
- Waste

This approach is likely to increase the cost of reducing emissions when compared to a sector neutral approach which would see emissions reduced in the sector that can do it most cheaply. This is because some sectors, such as electricity, have an abundance of relatively cheap, commercially proven technologies and techniques for reducing emissions. Other sectors, like agriculture, have fewer and more expensive emissions reduction options.

This paper looks at the potential for the agriculture sector to achieve a 26 per cent reduction by 2030 and the possible costs of doing so. Abatement cost estimates of emissions reduction projects in the agricultural sector have been provided by analysts, RepuTex. These projects reduce the emissions intensity of farming. That is, they reduce the emissions from agriculture without reducing agricultural output. Land use, land use change and forestry (LULUCF) projects have been excluded because a large portion of them would reduce agricultural output. Many of the projects involve reforesting farmland.

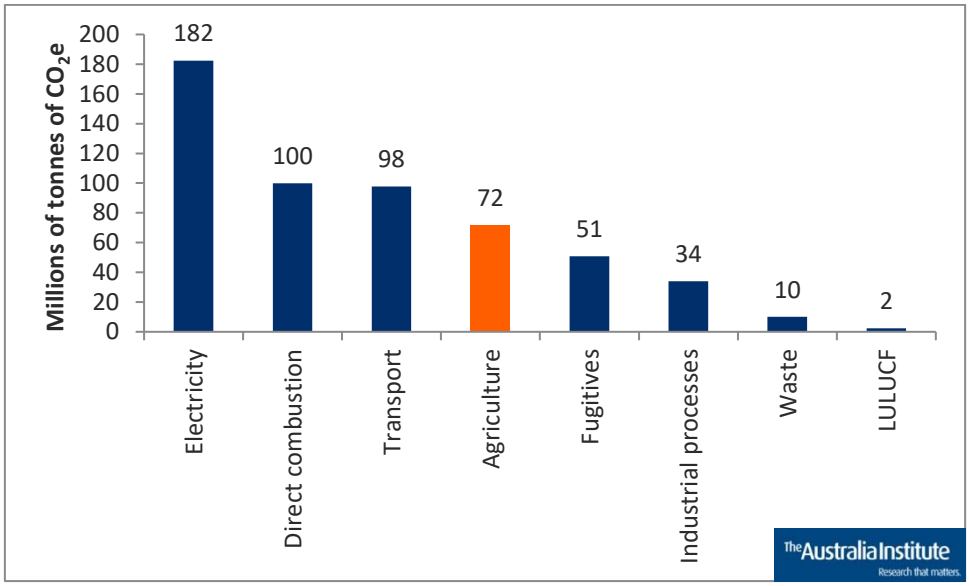
[1] Department of Foreign Affairs and Trade (2015) *Australia's intended Nationally Determined Contribution to a new climate change agreement*

[2] Land use, land use change and forestry (LULUCF) has been excluded from this analysis. LULUCF can be a carbon sink or a source of carbon. Currently it is a very small source of carbon (2 Mt CO_2e) and its exclusion does not make a meaningful difference out to 2030.

Emissions reduction projects

Australia's emissions come from many sources. As shown in Figure 1 below, there are seven key sectors of the Australian economy in relation to greenhouse emissions:

Figure 1 - Emissions by sector in 2018, projection



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

Figure 1 shows that the electricity sector is responsible for a third of Australia's carbon emissions (33 per cent). By contrast, agriculture contributes just 13 per cent of Australia's emissions, expected to rise to 14 per cent by 2020.[3] Of the seven emissions producing sectors, it is the fourth highest.

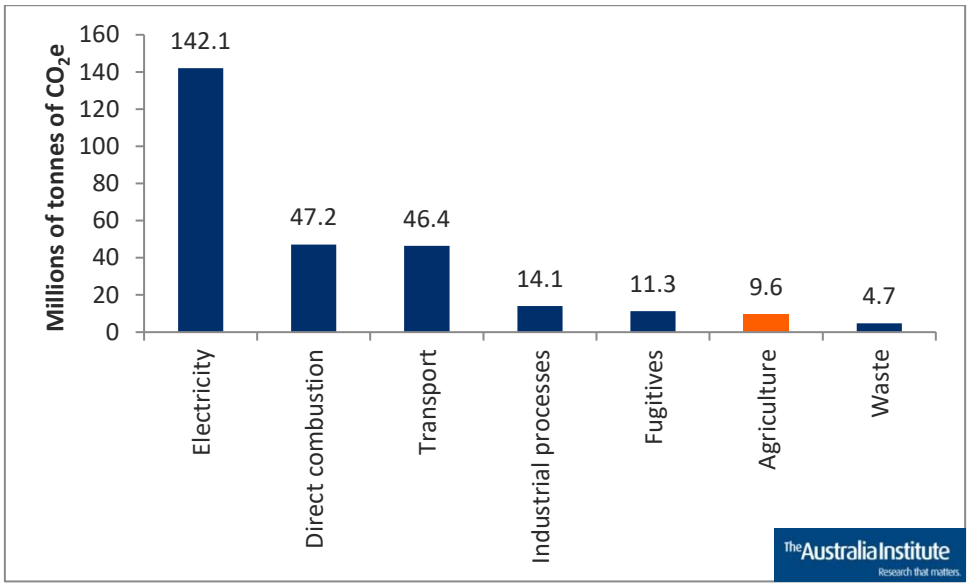
Energy analysts RepuTex have compiled a list of emissions reduction projects across all sectors of the economy, including estimates of the amount of emissions that each project can reduce and the cost of doing so.[4] The amount of emissions reduction available to each sector is shown in Figure 2, below. Just as it contributes the greatest share of emissions, the electricity sector also has the largest amount of potential

[3] All figures of Australia's emissions come from Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

[4] RepuTex (2018) *Marginal Abatement Cost Curve - 2030*, provided to The Australia Institute. Some details are available here: https://www.reputex.com/research-insights/report-meeting-a-2c-target-a-marginal-abatement-cost-mac-curve-for-australia/

emissions reduction projects. The agricultural sector has relatively few projects for its size.

Figure 2 - Total amount of emissions reduction available from projects by sector



Source: RepuTex (2018) *Marginal Abatement Cost Curve - 2030*

Given the large amount of low-cost abatement options available to the electricity sector, most economists and emissions analysts suggest that it should shoulder more of Australia's abatement task.[5] This would reduce the burden on, and costs to, industries such as agriculture.

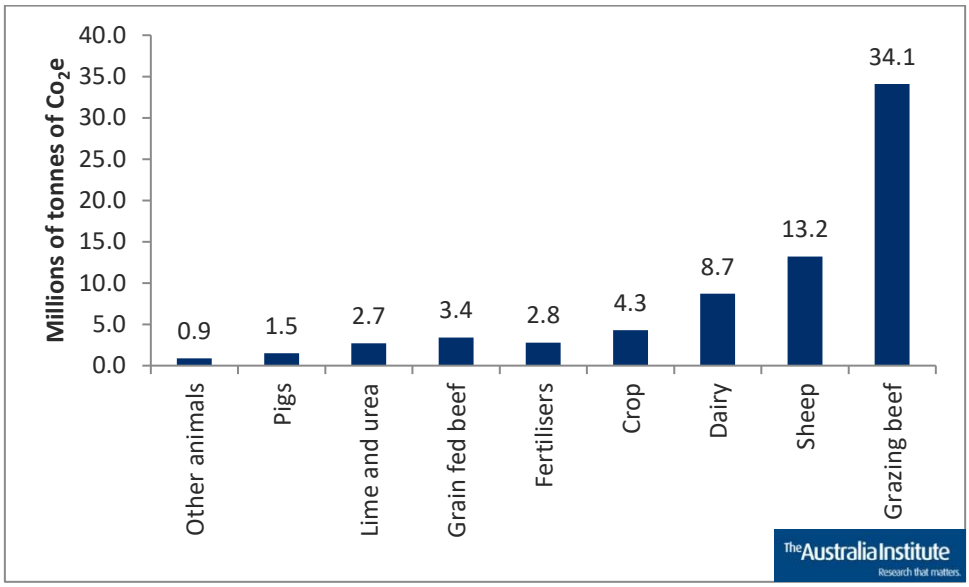
However, government policy appears not to be concerned with minimising cost or the potential of each sector to reduce emissions. This paper will take a close look at implications of this for the agricultural sector. It will look at how much emissions reduction the agriculture sector can achieve with the projects known to RepuTex and what the cost of that reduction would be.

[5] See for example Campbell (2017) *Meeting our Paris commitment,* http://www.tai.org.au/sites/defualt/files/P439%20Meeting%20our%20Paris%20Commitment%20-%20TAI%20Climate%20and%20Energy%20Program%20-%20September%202017.pdf

Agricultural emissions

In agriculture, the top three emissions producing subsectors all involve livestock rearing. The largest is beef grazing, which makes up almost half of agricultural emissions (48 per cent). When grain-fed beef is included (5 per cent), beef makes up 52 per cent of agricultural emissions. This is followed by sheep (18 per cent) and dairy (12 per cent). Together the top three emitters make up over three quarters of carbon emissions in the agricultural sector (83 per cent), as shown in Figure 3 below:

Figure 3 - Agricultural emissions by subsector in 2018



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

Clearly, if the agriculture sector is to reduce its emissions by 26 per cent then these three subsectors are going to have to play a significant role.

The main source of CO_2e from livestock is enteric methane emissions produced by the animal as it breaks down feed. This is done by microorganisms fermenting and breaking down ingested feed and producing methane, most of which is belched.[6] Emissions from pigs do not occur in this way, hence the lower emissions shown in Figure 3. Emissions from pigs mainly relate to the breakdown of manure in effluent ponds.[7]

[6] Lines-Kelly (2014) *Enteric methane research: A summary of current knowledge and research*, NSW Department of Primary Industries

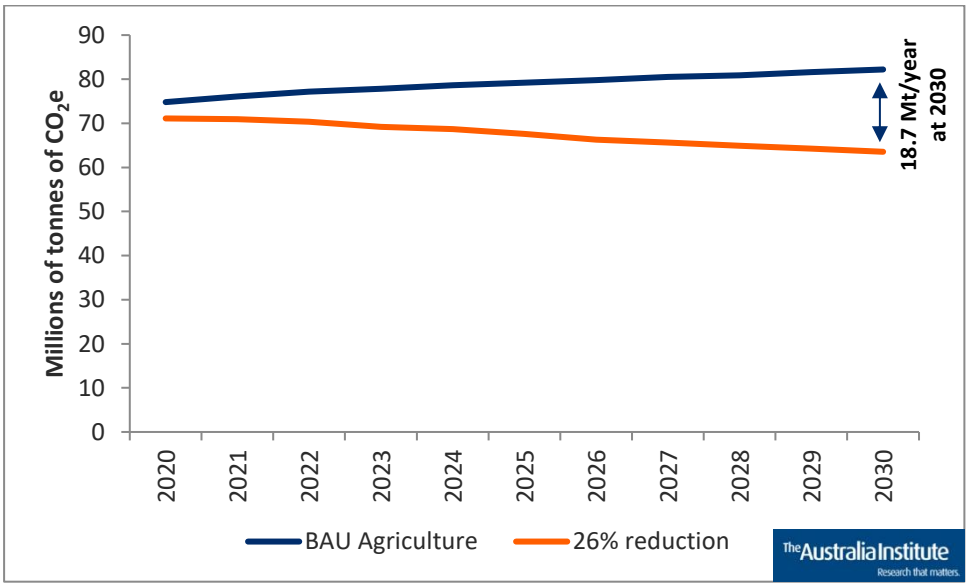
[7] Massey et al. (2013) *Pork Production and Greenhouse Gas Emissions*

Even with the current policies to reduce emissions, including the Carbon Farming Initiative and the Emissions Reduction Fund, agricultural emissions are expected to rise out to 2030 by 10 Mt CO_2e per annum. Half of that increase will be in beef (including grain fed beef). Emissions from sheep will increase by about 2 Mt of CO_2e while Dairy is projected to increase by about 1 Mt CO_2e.[8]

These increases in agricultural emissions include the impact of the Carbon Farming Initiative and the Emissions Reduction Fund. Agricultural emissions would rise even faster without these projects. The RepuTex emissions reduction projects are in addition to the emissions reduction work already underway. Work on reducing agriculture emissions is already underway but in order to reach a 26 per cent reduction target by 2030 a lot more would need to be done.

Agricultural emissions are currently 72 Mt CO_2e per year, but they are expected to rise to 82.2 Mt CO_2e by 2030 in the business as usual scenario (BAU). To reach the Paris target by 2030 agricultural emissions would instead need to fall to 63.5 Mt CO_2e. The difference between the increase in emissions if there is no change in policy and the reduction required to meet the Paris target is the size of the abatement task. This means the total abatement task for agriculture is for emissions to be 18.7 Mt CO_2e per year lower in 2030 than they are currently. The total abatement task from 2020 to 2030 added together is 126 Mt CO_2e. This is shown in Figure 4 as the area between the two lines.

Figure 4 - Agricultural sector emissions business as usual and 26% reduction task

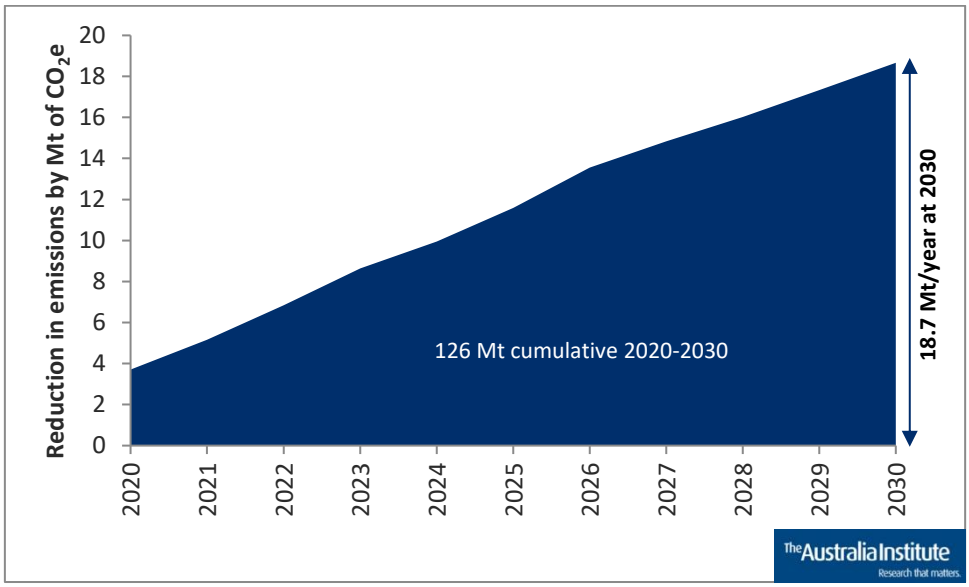


[8] Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

As shown in Figure 5, the emissions abatement task in agriculture will rise steadily in line with a 26 per cent reduction in sectoral emissions.

Figure 5 - Agricultural sector abatement task 2020 to 2030

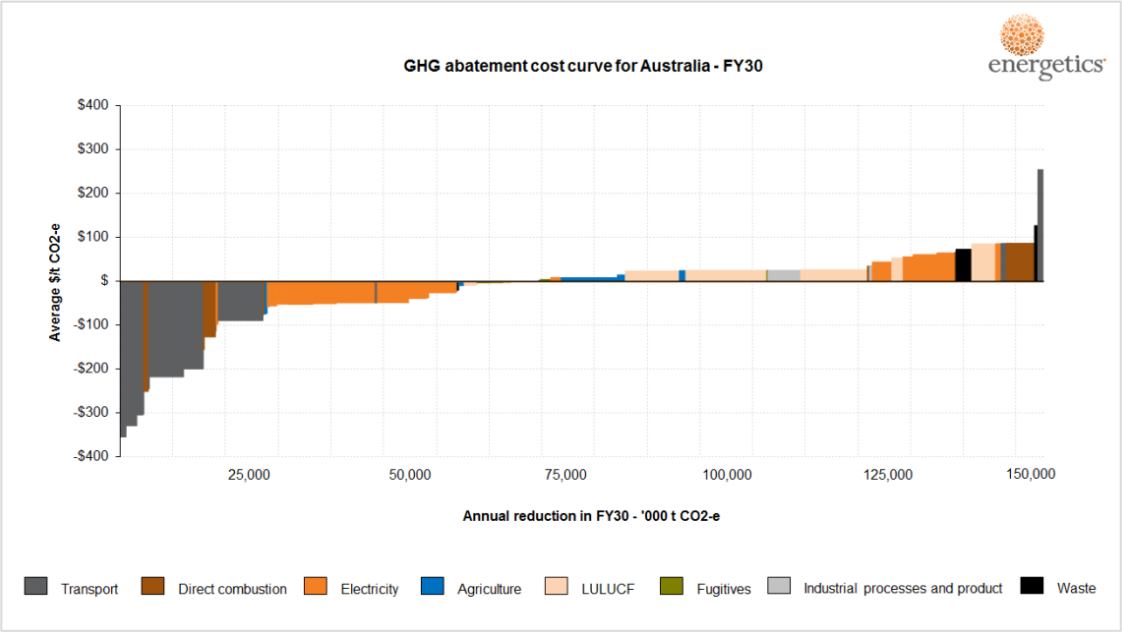


Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017* and Australia Institute calculations

Reducing emissions in the agriculture sector is costly when compared to other sectors in the Australian economy. There are proportionately more abatement projects at lower costs in other sectors. This can be seen in the Government's commissioned Abatement Cost Curve 2030 by Energetics, reproduced in Figure 6 which shows numerous available abatement opportunities in transport, electricity and direct combustion sectors.[9] Many of the available activities incur a negative cost (i.e. will ultimately save the activity undertaker money). The government's decision that each sector should contribute to emissions reduction in the same proportion will lead to an unnecessary increase in cost.

[9] Energetics (2016) *Australia's 2030 climate change emissions reduction target – abatement potential,* http://www.environment.gov.au/climate-change/publications/modelling-and-analysis-australias-abatement-opportunities

Figure 6 - Energetics cost curve



Source: Energetics (2016) *Australia's 2030 climate change emissions reduction target – abatement potential*, http://www.environment.gov.au/climate-change/publications/modelling-and-analysis-australias-abatement-opportunities

That is not to say that the agriculture sector should be excluded from reducing emissions. There are some projects within the agriculture sector that have the potential to reduce emissions at a relatively cheap, or even negative, cost. These projects should be encouraged. Further research and development into other ways to reduce emissions in the agricultural sector should also be encouraged.

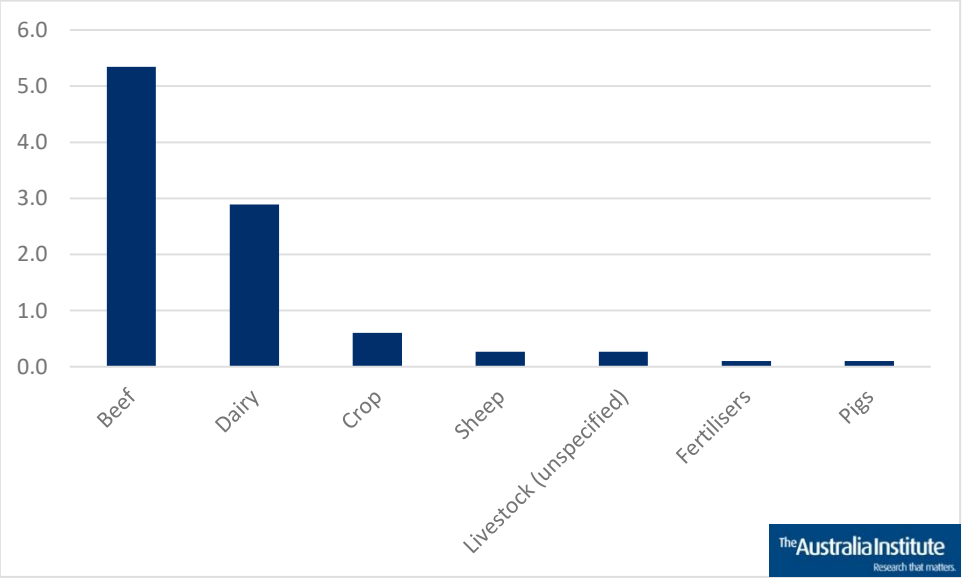
The selection of emissions reduction projects should be based on a comparison with all possible projects in Australia. Sector-specific targets should be based on good policy; assigning the same target for each sector will only increase the cost of reducing emissions.

Agricultural emissions reduction projects

RepuTex has a large database of emissions reduction projects from all sectors. Each project provides for an ongoing reduction in emissions. The database identifies 11 emissions reduction projects, covering most of the agriculture subsectors. They are all considered technologically feasible, meaning they could be implemented at any time. If they were all implemented, they have the potential to reduce agriculture emissions by 9.6 million tonnes of CO_2e each year.[10]

Figure 7 shows the abatement available from agriculture projects in RepuTex's database, sorted by The Australia Institute into subsectors. Our calculations combine the grazing beef and grain fed beef subsectors as it is not always clear which subsector a beef project would belong to.

Figure 7 - Mt per year abatement available from agriculture projects



Beef is the largest source of emissions and has projects that could reduce emissions by the largest amount. These projects include:

- Optimising grazing patterns so that more carbon is sequestered into the soil of grasslands. This includes converting land from crops to pasture, rejuvenating

[10] RepuTex (2018) *Marginal Abatement Cost Curve - 2030*

pasture through seeding, changing stocking rates, changing the duration or intensity of grazing including resting pasture.[11]

- Active feeding programs that allow cows to gain weight more quickly with higher quality feed, which can reduce emissions per day and also reduce the time it takes to bring an animal to slaughter weight, thus reducing lifetime emissions.[12]

The dairy subsector has projects that could reduce emissions by the second largest amount, although it is the third largest source of emissions. The projects include:

- Capturing the methane from dairy waste in covered ponds. The methane is then burnt off and could be further used to generate electricity.[13]
- Reducing methane emissions by feeding dairy cows high fat feed supplements. This allows better digestion of lower quality feeds.[14]

There are also significant projects to reduce emissions from sheep including:

- A similar project to that of cattle that involves optimising grazing patterns so that more carbon is sequestered into the soil of grasslands. This includes converting land from crops to pasture, rejuvenating pasture through seeding, changing stocking rates, changing the duration or intensity of grazing including resting pasture.[15]
- Sheep can also use active feeding programs to allow the lambs and sheep to gain weight more quickly with higher quality feed, which can reduce emissions per day and also reduce the time it takes to bring an animal to slaughter weight, thus reducing lifetime emissions.[16]

---

[11] Australian Government (2018) *Carbon Credits (Carbon Farming Initiative) (Sequestering Carbon in Soils in Grazing Systems) Methodology Determination, 2014,* https://www.legislation.gov.au/Details/F2014L00987

[12] Lines-Kelly (2014) *Enteric methane research: A summary of current knowledge and research*, NSW Department of Primary Industries

[13] Australian Government (2015) *Carbon Credits (Carbon Farming Initiative) (Destruction of Methane Generated from Dairy Manure in Covered Anaerobic Ponds) Methodology Determination 2012,* https://www.legislation.gov.au/Details/F2015C00573

[14] Department of the Environment and Energy (2014) *Feeding dairy additives to milking cows,* http://www.environment.gov.au/climate-change/government/emissions-reduction-fund/cfi/publications/factsheet-dairy-additives-milking-cows

[15] Australian Government (2018) *Carbon Credits (Carbon Farming Initiative) (Sequestering Carbon in Soils in Grazing Systems) Methodology Determination, 2014,* https://www.legislation.gov.au/Details/F2014L00987

[16] Lines-Kelly R (2014) *Enteric methane research: A summary of current knowledge and research*, NSW Department of Primary Industries

Crop emissions can also be reduced with a number of projects including:

- Soil conservation to improve nitrogen mineralisation and soil structure. This increases the amount of carbon captured in the soil. It is achieved through changing from annual cropping to pasture, retaining field stubble and increasing biomass yields through sustainable intensification (nutrient management, soil acidity management, new irrigation and pasture renovation).[17]

There are also projects to reduce piggery emissions including:

- Covering the lagoons that store effluent, collecting the biogas and combusting the gas. The biogas could also be used to generate electricity.[18]

Emissions reduction projects also target fertiliser use including:

- Efficiency improvements in the use of nitrogen fertilisers used by irrigated cotton farmers. Nitrogen fertiliser wastage is as high as 92 per cent, mainly through denitrification, leaching, runoff and volatilization.[19]

[17] Federal Register of Legislation (2015) *Carbon Credits (Carbon Farming Initiative—Estimating Sequestration of Carbon in Soil Using Default Values) Methodology Determination 2015,* https://www.legislation.gov.au/Details/F2016C00263

[18] Australian Government (2015*) Carbon Credits (Carbon Farming Initiative) (Destruction of Methane Generated from Manure in Piggeries—1.1) Methodology Determination 2013,* https://www.legislation.gov.au/Details/F2013L00856

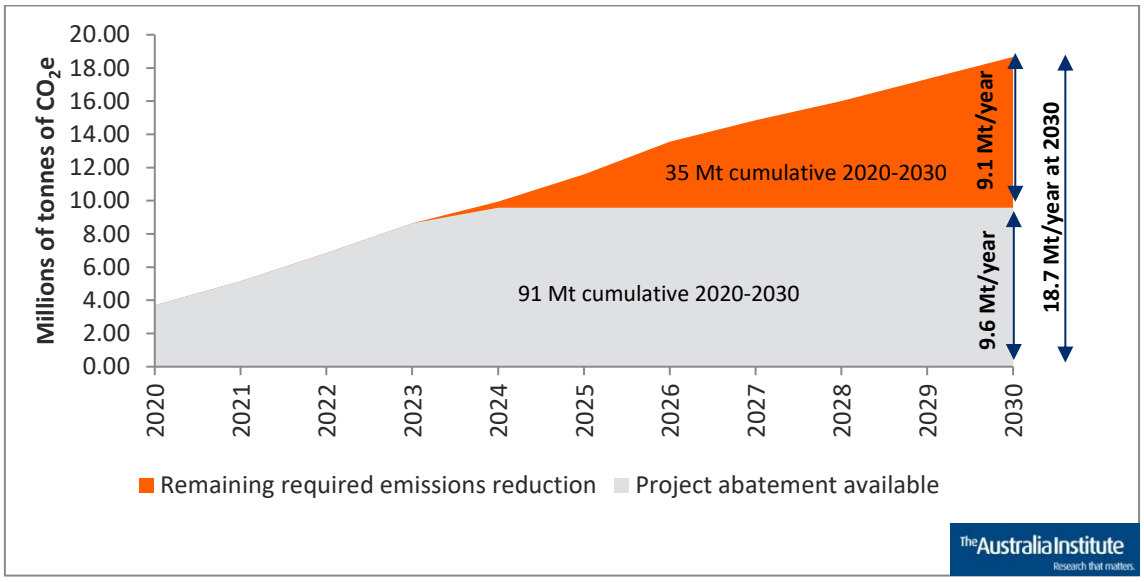
[19] Australian Government (2015) *Carbon Credits (Carbon Farming Initiative—Reducing Greenhouse Gas Emissions from Fertiliser in Irrigated Cotton) Methodology Determination 2015,* https://www.legislation.gov.au/Details/F2015L00584

Emissions targets vs reduction potential

Assuming that all, but only, the existing agricultural emissions reduction projects can be implemented in full, the agriculture sector would still be unable to meet its emissions reduction target. This is because the maximum reduction available from the projects identified by RepuTex is 9.6 Mt CO_2e per year but the required abatement per year becomes larger than this from 2024.

Figure 8 shows the agriculture sector's abatement task, as calculated in Figures 4 and 5, as well as the emissions reduction available with projects identified in the RepuTex data. It assumes that agriculture follows the Australia-wide trajectory to the 26% reduction by 2030 outlined in *Australia's emissions projections 2017.* It does this by incrementally adopting the projects identified by RepuTex until all agriculture projects have been implemented. Figure 8 shows that after 2024 the required annual abatement becomes larger than the annual abatement available from abatement projects.

Figure 8 - Total agricultural sector abatement and project abatement



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017* and RepuTex (2018) *Marginal Abatement Cost Curve - 2030*

Assuming this steady pace of project implementation, the cumulative shortfall in emissions reduction from 2024 to 2030 is almost 36 Mt of CO_2e – the area between

the curves in Figure 8. If all projects were implemented earlier, the shortfall would be smaller; if projects were not all implemented by 2024, the shortfall would be larger. The year this shortfall is largest is 9.1 Mt of CO_2e in 2030. This is the emissions reduction required in 2030 to meet the 26 per cent reduction target after all agricultural emissions reduction projects have been implemented.

Emissions reduction projects in the agricultural sector can reduce emissions without large cost to the sector. They are designed to change the way production happens so that less emissions are produced from the same amount of production. This is important because reduction projects should ideally allow the same amount of production with lower emissions.

Abatement costs and projects from an economic perspective

If all agriculture emissions reduction projects identified are implemented, RepuTex estimate they would reduce emissions by a maximum of 9.6 million tonnes of CO_2e per year at an estimated cost from 2020 to 2030 of $1.8 billion. However, while these estimates may be accurate from an engineering perspective, from an economic perspective there appear to be unstated assumptions that need to be explored.

Many of the projects are estimated to have a "negative cost", meaning that if farmers implement them they should actually save more money in energy efficiency than the project costs to implement. However, if a project truly is negative cost, economists would expect farmers to implement these projects without any form of policy intervention. The fact that these projects have not been implemented means either that there are hidden costs, risks, or that there is some aspect of market failure.

Examples of market failures that could affect emissions reduction projects are large upfront costs, a lack of information or expertise among farmers or the financial benefits are so uncertain that it is not worth the risk.

This paper assumes that the impediments to these projects occurring will be overcome without further cost. In practice, the government may have to pay incentives to farmers to convince them to adopt these projects or the government might have to fund some of these projects directly (the government might get some or all of its money back). None of this funding is included in the cost figures below, which should be seen as optimistic.

Furthermore, not all projects identified by RepuTex are at a commercial stage. If the agriculture sector is to reach at 26 per cent reduction by 2030 then many of these projects will need to come on line quickly. As explained below, all the projects will need to be up and running by 2024. This may not be possible with some of these projects.

To get the full emissions reduction of 9.6 Mt of CO_2e all projects would need to be fully implemented with the full emissions reduction achieved. This seems optimistic as some projects would cover a large number of producers, many of whom are small scale farmers. Compliance will need to be closely monitored to ensure full emissions

reduction is realised. Recent reporting of compliance and enforcement in the Emissions Reduction Fund suggests compliance can be problematic.[20]

On the other hand, it is likely that new emissions reduction methods and technologies will be devised over the coming years. While these calculations do not factor in any technology change, it should be noted that any new projects will be experimental and in an earlier stage of development. They might take time before they can be commercially rolled out and the activity methodologies achieve accreditation (by the Clean Energy Regulator in order to generate carbon credits). This means that it is unlikely in the short term that total amount of emissions reduction possible from agricultural projects will be significantly greater than what is included in the RepuTex data. This is particularly the case because, as we will show below, all the projects will need to be implemented by 2024.

[20] See for example Hasham (2018) *'Serious questions' over whether Australia's emissions cuts are real*, https://www.smh.com.au/politics/federal/serious-questions-over-whether-australia-s-emissions-cuts-are-real-20180710-p4zqln.html

Direct emissions reduction

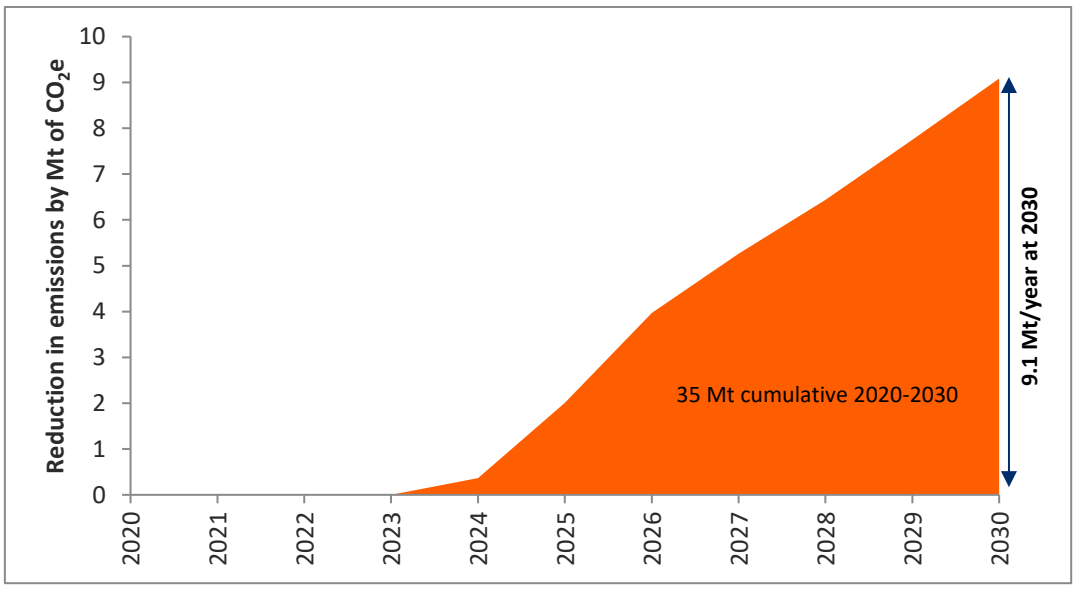
Emissions can also be reduced more directly by reducing production. In the agriculture sector emissions from production are mainly methane from animals. If the agricultural sector does not have enough emissions reduction projects then to meet its targets it will have to reduce its emissions by directly reducing production.

An important distinction is total emissions versus emissions intensity. The emissions reduction projects aim to improve emissions intensity. That is they aim to reduce the amount of emissions for each unit of output such as per kilogram carcass weight or fleece weight. This is a way of reducing emissions without reducing output.

While reducing emissions by reducing the emissions intensity of agriculture is the preferred way of reducing emissions, it is not the only way. Total emissions can be decreased by simply reducing overall production. This is a less desirable way of reducing emissions because the agricultural sector has a reduced income and consumers will have less agricultural produce to consume.

The agriculture sector would run out of emissions reduction projects by 2024, unless new abatement methods can be developed. This is the first year that the sector would have to start reducing production to reduce emissions. Figure 9 shows the emissions shortfall that would have to be made up by reductions in production.

Figure 9 - Shortfall in emissions reduction after all projects fully implemented



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017* and RepuTex (2018) *Marginal Abatement Cost Curve – 2030*

The cost of direct reductions

By 2030 the agriculture sector would have a shortfall of over 9 Mt of CO_2e or about 11 per cent of total agricultural emissions. To reduce emissions in the agricultural sector by this amount would require a significant reduction in agricultural output. If the sector was to reduce emissions in proportion to output then beef production would require the largest reduction in output, 4.7 Mt of CO_2e in 2030. This is the equivalent of 2.9 million fewer cattle from the current Australian herd of 23.6 million meat cattle – or, to put it another way, all the beef cattle in Victoria and South Australia put together.[21]

Sheep farming would require the second largest reduction in emissions, 1.7 Mt of CO_2e in 2030. This is equivalent to eight million fewer sheep, from the current Australian flock of 72.1 million. This reduction in sheep is almost double the number of sheep in Tasmania and Queensland put together (4.2 million). Dairy would need to reduce emissions by 1.1 Mt Co_2e, the equivalent to 290,000 cows, or all the dairy cows in NSW. Pig farming would need to reduce emissions by 0.2 Mt CO_2e (270,000 pigs).

The reduction in livestock is summarised in Table 1.

Table 1 - Summary of emissions and livestock reduction by subsector

Livestock	Mt of CO_2e reduced	Reduction in livestock
Beef (including grain fed beef)	4.7	2,900,000
Sheep	1.7	8,000,000
Dairy	1.1	290,000
Pig	0.2	270,000

The Australia Institute
Research that matters.

Source: Australian Bureau of Statistics (2018) *7121.0 - Agricultural Commodities, Australia, 2016-17* and Department of the Environment and Energy (2017) *Australia's emissions projections 2017* and RepuTex (2018) *Marginal Abatement Cost Curve - 2030*

[21] Reductions in livestock have been calculated using Australian Bureau of Statistics (2018) *7121.0 - Agricultural Commodities, Australia, 2016-17* and reducing the numbers by the equivalent shortfall in emissions, which is 11.1 per cent. This should be considered the equivalent impact that would occur today. By 2030 livestock number would have increased and so the decrease in numbers would be larger.

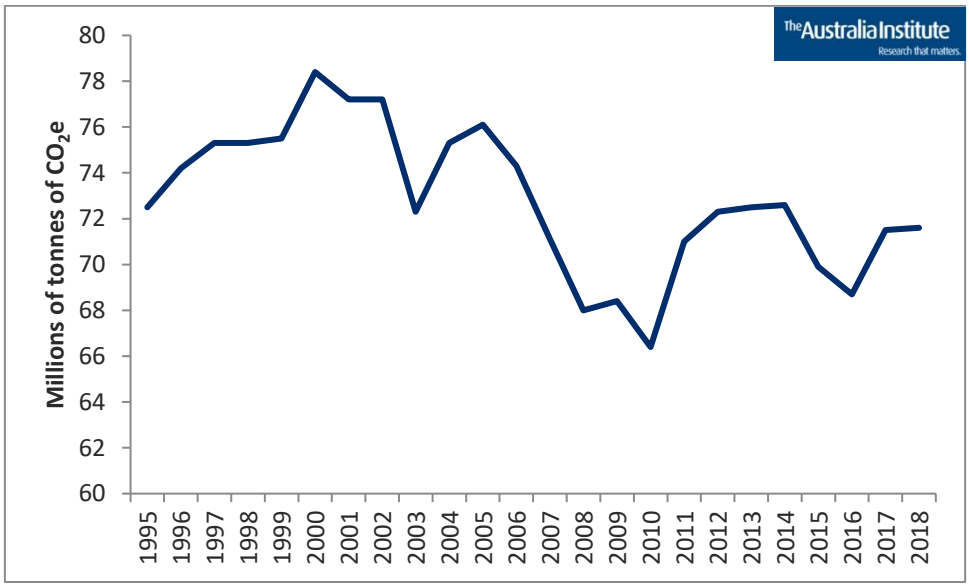
Livestock makes up about 85 per cent of emissions from agriculture. The remaining 15 per cent or 1.4 Mt of CO_2e in 2030 would need to come from the other agriculture subsectors including crops, fertiliser and lime and urea. While reductions in these sectors are far smaller than those of the livestock sectors they will still cause significant reductions in output.

Comparison to Millennium Drought fall in production

A good example of the agricultural sector reducing emissions because of a decrease in output occurred during the 2000s Millennium Drought. During the Millennium Drought total agriculture emissions fell because the drought conditions forced farmers to reduce the number of animals. Fewer animals meant fewer emissions.

The Millennium Drought was underway by the year 2000 and lasted, on and off until 2010. Agricultural emissions peaked in 2000 at 78 Mt of Co_2e and fell 15 per cent to a low of 66 Mt of CO_2e in 2010. The drop in agricultural emissions because of the Millennium Drought can be seen in Figure 10.

Figure 10 - Agricultural emissions during the Millennium Drought (2000 to 2010)



Source: Department of the Environment and Energy (2017) *Australia's emissions projections 2017*

Note: The axis has been shortened to better show the impact of the Millennium Drought

Looked at another way, the agricultural sector would need to reduce its emissions in excess of emissions reduction projects in 2030 by 11 per cent. This is roughly equivalent to the impact of the Millennium Drought, which reduced emissions by 15 per cent.

Conclusion

A sector by sector approach to emissions reduction will harm sectors that have few cheap sources of abatement. Reducing emissions by 26 per cent in the agricultural sector would come at significant cost. This does not need to be the case.

Sectors like electricity generation have commercially available, relatively cheap abatement projects. Additional abatement in these sectors above the 26 per cent target means that sectors like agriculture would have to do less. The more that electricity generation reduces emissions the less the agricultural sector needs to do.

Those who are concerned about the cost to the agricultural sector need to be concerned with the government's plans to reduce emissions on a sector by sector basis. They should also be concerned by the government's National Energy Guarantee if it locks in a 26 per cent reduction in the electricity sector. If the electricity sector does not reduce emissions beyond 26 per cent then other sectors, including agriculture, will have to do more.

The cheapest method to reach the Paris target is to judge a sector on how cheaply it can reduce its emissions, not on arbitrary sector by sector targets. Building walls between sectors will only increase the cost of reaching the Paris target.

References

Australian Bureau of Statistics (2018) *7121.0 - Agricultural Commodities, Australia, 2016-17*, available at <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/7121.0Main%20Features612016-17?opendocument&tabname=Summary&prodno=7121.0&issue=2016-17&num=&view=>

Australian Government (2015*) Carbon Credits (Carbon Farming Initiative) (Destruction of Methane Generated from Manure in Piggeries—1.1) Methodology Determination 2013*, available at <https://www.legislation.gov.au/Details/F2015C00574>

Australian Government (2015) *Carbon Credits (Carbon Farming Initiative) (Destruction of Methane Generated from Dairy Manure in Covered Anaerobic Ponds) Methodology Determination 2012*, available at <https://www.legislation.gov.au/Details/F2015C00573>

Australian Government (2015) *Carbon Credits (Carbon Farming Initiative—Reducing Greenhouse Gas Emissions from Fertiliser in Irrigated Cotton) Methodology Determination 2015*, available at <https://www.legislation.gov.au/Details/F2015L00584>

Australian Government (2018) *Carbon Credits (Carbon Farming Initiative) (Sequestering Carbon in Soils in Grazing Systems) Methodology Determination, 2014*, available at <https://www.legislation.gov.au/Details/F2018C00120>

Department of the Environment and Energy (2014) *Feeding dairy additives to milking cows*, available at <http://www.environment.gov.au/climate-change/government/emissions-reduction-fund/cfi/publications/factsheet-dairy-additives-milking-cows>

Department of the Environment and Energy (2017) *Australia's emissions projections 2017*, available at <http://www.environment.gov.au/climate-change/publications/emissions-projections-2017>

Department of Foreign Affairs and Trade (2015) *Australia's intended Nationally Determined Contribution to a new climate change agreement*, available at <http://dfat.gov.au/internationalrelations/themes/climate-

change/submissions/Pages/australias-intended-nationally-determinedcontribution-to-a-new-climate-change-agreement-august-2015.aspx>

Federal Register of Legislation (2015) *Carbon Credits (Carbon Farming Initiative—Estimating Sequestration of Carbon in Soil Using Default Values) Methodology Determination 2015*, available at <https://www.legislation.gov.au/Details/F2015L01163>

Lines-Kelly R (2014) *Enteric methane research: A summary of current knowledge and research*, NSW Department of Primary Industries, available at <https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/532694/ag-resources-climate-enteric-methane.pdf>

Massey R & Ulmer A (2013) *Pork Production and Greenhouse Gas Emissions*, Extension, February, available at <http://articles.extension.org/pages/27465/pork-production-and-greenhouse-gas-emissions>

RepuTex (2018) *Marginal Abatement Cost Curve – 2030*, unpublished