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Australian Farm Institute

The Implications of the Australian Government's Carbon Farming Initiative for Beef Producers

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Farm Policy Research Institute

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March 2011

A report prepared for Meat & Livestock Australia by
The Australian Farm Institute

Australian Farm Institute Limited
Suite 73, 61 Marlborough Street
Surry Hills NSW 2010
AUSTRALIA
ABN 29 107 483 661
T: 61 2 9690 1388
F: 61 2 9699 7270
E: info@farminstitute.org.au
W: www.farminstitute.org.au

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Foreword

The Carbon Farming Initiative (CFI) has been proposed by the Australian Government as a legislated mechanism that will enable farmers to generate revenue from the sale of greenhouse gas sequestration and mitigation activities.

The legislation will create a regulated marketplace for farm sequestration and mitigation activities, and farmers who voluntarily participate will earn offset credits which will be able to be sold to businesses that wish to use those to reduce their total business emissions, or to claim carbon-neutrality for their products. The market for such units will initially be a voluntary market, in that businesses or individuals buying the units will be doing so because they are volunteering to take such action, not because it is a mandatory requirement. It is, however, anticipated that a mandatory market for carbon offsets will emerge if the Australian Government proceeds to implement national greenhouse emission policies, as it has proposed it will in 2011.

The introduction of a carbon offset market for farms will have significant long-term implications, and will entail both opportunities and risks for farm business managers. In many respects, carbon offset production will for some farmers become one extra enterprise option available for farm business managers, bringing with it additional revenue and additional costs, new decisions about how to physically integrate the enterprise into a farm business, and the need for farmers to manage this enterprise in a way that adds to total farm profitability.

There are a large number of uncertainties associated with both the details of how this new market will be implemented, and how it will function. There are also very obvious interactions between this new market, and a potential progression to a mandatory carbon market in Australia. While acknowledging these uncertainties, the research detailed in this report is an initial attempt to gain some understanding of the issues the farm sector and individual farmers will need to consider as this new farm enterprise emerges. Further analysis will undoubtedly be required as arrangements associated with the CFI become confirmed in legislation.

Mick Keogh
Australian Farm Institute.
January, 2011.

Executive Summary

The Australian Government has proposed the introduction of the Carbon Farming Initiative (CFI), a policy proposal that will recognise and create a market for greenhouse emission offsets arising from actions carried out on farms.

The research reported here involved the use of farm financial models to analyse the potential financial implications of the CFI for Australian beef producers, under a range of realistic future scenarios.

The modelling also involved assumptions about the introduction of future policies in Australia that would impose a mandatory cost on activities that result in greenhouse emissions. In the absence of a mandatory emission cost, the market for CFI emission offsets will be limited to Australian and international voluntary carbon markets that generally result in a relatively low price being paid for emission offsets. A future mandatory carbon market would result in much higher future offset prices, but would also result in higher operating costs for beef enterprises.

The key findings arising from this research were as follows;

- The introduction of a mandatory carbon price in the economy (irrespective of the mechanism employed to achieve that) will have a negative impact on beef farm profitability, even in the event (as appears likely) that no cost will be applied to direct farm emissions. This is because beef enterprises have no means of increasing beef prices in response to an increase in farm costs and higher beef processor costs, which will occur as a result of increased energy costs arising from a carbon price.

- The implementation of the proposed CFI may provide some opportunity for farm businesses to reduce the negative impact of an economy-wide carbon price through the adoption of technologies that achieve a reduction in farm emissions, in particular those emissions arising from livestock which form the bulk of beef farm emissions. These emission offsets will be able to be sold to generate additional revenue.

- Financial modelling revealed that in order for a beef farm with between \$100-\$200,000 annual turnover to match ‘business as usual’ farm cash income while participating in the CFI offset market, the carbon price needed is approximately \$270/tonne CO_2-e. For a larger-scale beef farm with annual turnover in excess of \$400,000, the carbon price required is \$230/tonne CO_2-e.

- Alternatively, for participation in the CFI to be financially viable for beef farmers, the technology will need to be relatively inexpensive. For example, in the case of a technology capable of bringing about at least a 20% reduction in cattle emissions, the threshold cost above which this technology would no longer be viable for adoption appears to be in the region of \$10 - \$15 per head per annum, based on projections of anticipated future carbon prices.

- Alternatively, for a technology to be financially viable at the costs assumed in this analysis (\$65 per head per year) and at projected mandatory carbon market prices it

would also need to boost productivity by between 15 and 20%, in addition to achieving a reduction in emissions of 20%.

- Finally, it is difficult to envisage a scenario under which participation in the CFI would be financially viable for beef producers, if the CFI offsets created were only able to be sold into the voluntary carbon market at prices equivalent to historical carbon prices.

The results highlight the significance of the ‘additionality’ test that will be adopted to determine eligibility under the CFI. If the additionality test is defined in a way that means actions that generate both productivity and emission benefits will be ineligible for recognition under the CFI, then it is unlikely that beef producers will be able to participate in the CFI. If, however, the additionality test does not preclude actions that also bring about productivity benefits, then it is much more likely that beef producers will be able to participate in the scheme, assuming appropriate emission mitigation technology can be developed in the short to medium term.

The results also highlight that it will be essential to accelerate research and development investment into technologies that have the potential to bring about both emission mitigation and productivity benefits for beef producers. This will be important both to assist the national effort to meet future emission reduction targets, and also to assist the beef industry to remain internationally competitive despite higher operating costs that will inevitably be associated with domestic carbon policies.

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1.0 Introduction and background.

The Australian Government made an election commitment in August, 2010, to implement a Carbon Farming Initiative (CFI), which would provide farmers and other landholders with the opportunity to participate in carbon markets and to generate revenue from the sale of offset units earned by undertaking recognised greenhouse gas sequestration or mitigation activities on farms. The objective of the research reported here is to investigate the proposed CFI from a farm financial perspective, in order to gain a better understanding of the potential it may provide for Australian farm businesses.

To progress the CFI proposal, the Australian Government Department of Climate Change and Energy Efficiency (DCCEE) has released a consultation paper (DCCEE, 2010), outlining the proposed arrangements for the CFI, and seeking comment from interested parties. The proposal is that the CFI will be implemented via legislation to be tabled in the Australian Parliament in February 2011, and the Government has stated that the objective is to have the scheme operating from 1 July, 2011.

The CFI proposal entails a number of elements, all of which will be implemented via legislation. The aim will be to create a scheme which recognises and rewards farmers and other landholders for taking actions that are considered to reduce the net amount of greenhouse gases produced in Australia. This can be achieved either by actions that sequester greenhouse gases (ie remove greenhouse gases from the atmosphere through processes such as photosynthesis that convert CO_2 to non-gaseous carbon compounds such as wood) or mitigation (ie actions which reduce the normal amount of emissions associated with a particular activity – such as a process that reduces CO_2 emissions from a coal-burning power station.)

The CFI consultation paper identifies a range of activities in livestock, crop and forestry production where the opportunity exists for farmers to take action that will either sequester greenhouse from the atmosphere (forestry development) or will mitigate the amount of greenhouse gases that would normally be produced (livestock and crop production and land management).

In order for these activities by farmers to be recognised under the scheme, farmers will need to adopt and apply accredited methodologies, will need to design offset projects that comply with those methodologies, and will be subject to audit and other forms of verification to ensure that the requirements of the methodologies are being implemented. A technical group, termed the Domestic Offsets Integrity Committee (DOIC) has already been established, and this group will have the role of assessing proposed methodologies to ensure that they meet the requirements of the National Carbon Offset Standard.

Farmers participating in the CFI will be subject to a regular audit, and will have to complete periodical returns that will be submitted to the scheme administrator. If these returns confirm that the landholder has met the scheme requirements, the landholder will receive CFI offset credits, equivalent in number (less a risk management buffer) to the calculated tonnes of carbon dioxide equivalent (CO_2-e) emission reduction achieved as a result of adopting the approved methodology.

Ownership of these credits will be recognised in an official register (much like the system used for land titles), and these credits will be tradable and confer rights on the owner similar to rights associated with the ownership of other property such as land or shares.

The demand side of the market for these CFI credits will initially consist of companies or individuals that wish to voluntarily take action to reduce the net greenhouse emissions attributable to, or associated with their activities. Examples of such companies or individuals include major banks which wish to make a claim that their operations are carbon neutral, companies which wish to claim that the products they sell are carbon neutral, or individuals who voluntarily decide to pay money to offset the greenhouse emissions associated with their electricity use or air travel. These companies or individuals will need first to calculate the emissions associated with their actions or products using standard calculation methodologies, and then purchase CFI offset credits equivalent in number to their calculated net emissions.

It is important to recognise that the ‘market’ as it currently exists is what is termed a voluntary carbon market. In such a market the purchasers of offset credits are not required to do so by law, but choose to do so for a variety of reasons. This ‘market’ already exists in Australia and internationally, but up until the implementation of the CFI it has been unregulated, and consumers and other participants have had no real way of ensuring that claims made about carbon-neutrality or emission offsets are credible. The implementation of the CFI will effectively regulate this market, in that a company or individual making a claim about carbon neutrality in the future will have to be able to validate this by demonstrating they have purchased CFI offset credits. If they are unable to do this, they will be liable to prosecution under Australian laws relating to false advertising.

In the longer term, it is proposed that the market for CFI offset credits will be expanded to include companies that have a mandatory requirement to reduce the net emissions associated with their activities. This will be the case if the Australian Government introduces an emissions trading scheme (such as the Carbon Pollution Reduction Scheme proposed in 2008) or some form of carbon tax.

If a mandatory greenhouse emission reduction scheme is introduced, the Government has foreshadowed that not all types of CFI offset credits will be eligible to be traded in that market.

This is because the Australian Government has committed to meet a national emission target, with national emissions calculated according to methodologies endorsed by the Intergovernmental Panel on Climate Change, a body established under the United Nations Framework Convention on Climate Change. Under current calculation methodologies, Australia has opted not to include soil carbon emissions or sequestration on agricultural land in the national greenhouse inventory, because current calculation methodologies do not allow the impacts of natural factors such as drought or bushfire to be separated from the impacts of human actions. As a consequence, unless international emission accounting rules change, CFI offset credits associated with soil carbon sequestration will only be able to be sold into voluntary carbon markets. CFI offset credits associated with a range of livestock and forestry management activities will be able to be sold into mandatory carbon markets (based on current emission accounting methodologies) if a mandatory carbon market or carbon tax is implemented in Australia.

Whether or not certain CFI offset credits can be marketed into voluntary or mandatory carbon markets is a significant issue for farmers, because of the large difference in prices for offset credits in these two markets. Offset credits able to be sold into mandatory carbon markets (such as the EU ETS or the New Zealand ETS) typically trade at values close to $A 20 per credit, whereas offset credits sole into voluntary carbon markets typically trade at values of around $3 - $5 per credit.

The CFI consultation paper identifies a range of activities that it is anticipated will be the subject of accredited methodologies that will be able to be implemented by farmers to earn CFI offset credits. These methodologies will be in a form similar to the documentation associated with Quality Assurance systems, or international quality standards such as those published by the International Standards Organisation. They will document the processes that farmers need to undertake (such as record keeping and reporting) to become participants in the CFI, and identify audit and other requirements associated with accreditation under the scheme.

The CFI is designed to tie in with the National Carbon Offset Standard (NCOS), which provides guidance on what constitutes a voluntary offset, and the requirements of schemes set up to recognise such offsets.

The NCOS specifies that for actions to be recognised as an offset, the scheme under which they are produced needs to meet the following criteria;

- **Additional.** A project must result in carbon sequestration or abatement that would not have occurred in the absence of the scheme,
- **Permanence.** The scheme must be able to demonstrate that the abatement or sequestration will be maintained for 100 years,
- **Leakage.** The scheme must not result in additional emissions being produced elsewhere as a result,
- **Measurable and verifiable.** Systems must be in place to accurately measure or estimate the abatement or sequestration, and must be verified by an independent third party.
- **Conservative.** The scheme must result in conservative estimates of sequestration or abatement.
- **Internationally consistent.** Estimation systems must be consistent with international estimation standards and reporting practices adopted under the United Nations Framework Convention on Climate Change.
- **Peer-reviewed science.** Supporting evidence must be peer-reviewed science that has been subject to peer review and subsequently published in a reputable Journal.

The extent to which any proposed methodology meets these criteria will be decided by the DOIC, which will be guided by policy and documentation already made available by the Government. Two matters that will be of particular significance for proposed CFI methodologies are the additionality and permanence criteria.

1.1 Additionality

Following is an extract from the CFI consultation paper which details the Governments approach to assessing whether or not a proposed methodology meets the additionality requirement.

> *Assessing whether abatement is additional to business as usual – whether the project would have occurred in the absence of the scheme – can be time consuming, costly and subjective.*
>
> *To reduce participation costs whilst maintaining environmental integrity, the scheme could provide for streamlined assessment of additionality in the manner outlined below. Further, the Government has provided funding to develop methodologies as part of the Carbon Farming Initiative. This will include development of approaches to baseline setting that will make it easier for project proponents to demonstrate that their projects are additional.*
>
> *Activities which achieve abatement and clearly do not result in material increases in agricultural productivity or business profitability would be identified in the regulations through a "positive" list that would be deemed additional without further assessment.*
>
> *Activities that could be included on such a list include not-for harvest, carbon sink forests, on-farm tree planting or capture and flaring of methane from livestock manure or landfill facilities.*
>
> *Landscape conservation or restoration that has been funded under previous or existing government programs and secured, for example with a covenant or contract, could not be considered additional even if environmental covenants or contracts protecting these areas are removed or cancelled. Similarly, activities that require ongoing funding, such as feral camel management and savanna fire management, would likely be considered once government funding ceases.*
>
> *If an activity is on a positive list or depends on revenue from the sale of credits, participation in future government conservation and natural resource management programs including grants, covenanting and stewardship programs would not, of itself, result in ineligibility for participation in the Carbon Farming Initiative.*
>
> *The majority of agricultural activities increase productivity. Approaches to assessing additionality, which are consistent with integrity principles outlined in section 7, will be explored as part of the program of work to develop offset methodologies for use under the Carbon Farming Initiative.*
>
> *Activities that are mandated under Commonwealth, state, territory or local government regulations could not be approved as these form part of business-as-usual.*

The above discussion indicates that the Government proposes taking a quite hard line in relation to the additionality test, suggesting that if an activity also produces an overall productivity benefit for the farm, then it would not be considered to meet additionality requirements. This is obviously an issue for further discussion, but which if applied literally would preclude virtually all offset activities with the exception of permanent plantations of trees.

1.2 Permanence

The permanence requirements detailed in association with the CFI apply to sequestration, rather than mitigation activities. This means they would apply to carbon sink forests and soil carbon sequestration, but not to mitigation activities such as an action which reduced livestock methane production for a certain period.

The broad principles outlined in the CFI consultation paper are that the permanence requirements mean that a carbon store has to be capable of being retained for 100 years to be considered permanent, and therefore to be eligible as an action generating CFI offset credits. In the event that sequestration actions are reversed by human actions (trees removed or soil cultivated and therefore significant soil carbon released) there would be a requirement to relinquish CFI offset credits equivalent to the amount of carbon lost. In the event that carbon stocks were removed through natural events (drought or bushfire) there would be a requirement to replenish carbon stocks, but no requirement to relinquish CFI offset credits. However, no additional CFI credits would be earned by the project until carbon stocks again exceeded their pre-event levels.

A risk of reversal buffer is also proposed for sequestration activities, meaning that farmers would only receive 95% of the number of credits they would otherwise be entitled to, based on estimated sequestration amounts. This buffer acts as a form of insurance for the government, ensuring that even in the event of drought or bushfires Australia will still be able to meet international emission commitments.

These proposals are still to be confirmed, but do provide some basis for assumptions made in the next sections of this report.

2.0 Methodology

To gain a better understanding of the implications of the CFI for farm businesses, financial modelling was carried out under a range of different assumptions and scenarios. The methodology utilised for this modelling has been described in a previous publication (Keogh and Thompson, 2008). It essentially involves the creation of farm financial models based on available farm survey data, and the use of those models to test different scenarios. This project involved the development of financial models for a typical small and large-scale Australian beef farm, and the use of those models to analyse the implications of the adoption of a specific technology (in this case a slow-release capsule that reduces livestock emissions) that could be used to generate offset credits under the proposed CFI.

The assumptions underlying the following analysis need to be carefully considered, and the outcomes need to be qualified by stressing that they represent the potential impact of this particular policy measure and associated assumptions when considered in isolation; rather than as part of a dynamic and interrelated economic system. The modelling reported here is relatively static, in that no change in farmer decision-making, enterprise mix or farm activity is accounted for. The modelling approach used also does not attempt to incorporate some of the inevitable flow-on impacts of a carbon price in either the wider economy, or within the agriculture sector. As such the results provide an indication of the potential scale of opportunity or challenge that each policy option presents to agriculture, rather than a projection of likely future farm returns.

It is assumed the Australian Government implements a carbon policy (either a trading scheme or tax) in the year 2012. The policy is assumed to impose a price on greenhouse gas emissions which will be similar to that projected by the Australian Government Treasury in its modelling completed in 2008 (Australian Government, 2008), given that it is assumed that Australia's stated 2020 emission targets (between a 5% and a 15% emission reduction by 2020) will remain unchanged, as per the Australian commitment under the Copenhagen Accord.

During the initial stages of the policy, it is proposed that those direct emitters of greenhouse gases in the stationary energy, fugitive emissions and waste sector, which produce net emissions in excess of 25,000 tonnes CO_2-e per annum, will be required to pay for their emissions at the rate specified by the policy. These businesses will first be required to use standard calculation methodologies to estimate their annual greenhouse emissions (as is currently the case under the National Greenhouse and Energy Reporting Scheme) , and then will be required to pay to the government an amount equivalent to the tax rate multiplied by the net tonnes of greenhouse emissions generated by their business each year. These businesses will have the option of either paying the tax, or reducing net emissions through the purchase of eligible offsets, such as those generated by farmers participating in the CFI, or a combination of both of these.

As a consequence, it is assumed that offset prices per tonne CO_2-e will be essentially similar to the carbon tax or price. A progressively increasing tax will be imposed by the government each year, which will result in an increase in the carbon price, creating greater incentives for businesses to reduce their net emissions.

In the first analysis, a base-case (business as usual) scenario was developed for each of the model farms, which assumed that no carbon price or tax is introduced. It was then assumed that a policy to implement a carbon price is introduced, and further analysis was conducted to estimate the potential impact of that policy on future projected farm profitability, over a multi-year period. The difference between the two projections provides a projection of the likely impact of a carbon policy on future farm profitability, all other factors remaining unchanged.

In a second set of analyses, the potential for the farms to participate in the Carbon Farming Initiative was investigated. It is assumed that agriculture is not a covered sector under the carbon policy, allowing businesses in the sector to become providers of carbon offsets. Offsets are therefore able to be sold into the carbon market, and are not required to offset direct on-farm emissions. The following scenarios are considered in this modelling:

- **CFI Mandatory** - Agriculture is an uncovered sector and does not have to pay a cost for direct on-farm emissions, however the farm business elects to participate in the CFI to generate offsets which can be sold into the mandatory carbon market
- **CFI Voluntary** - Agriculture is an uncovered sector in the policy, and the farm business elects to participate in the CFI to generate offsets which can only be sold into the voluntary carbon market.

Other analysis was also carried out which examined the impact of changes in the costs associated with the adopted mitigation technology, and the financial implications of the adoption of a mitigation technology that also generates productivity gains for the farm enterprise.

Timeframe

The modelling commences in 2011, and projects forward to 2040, and assumes an emission cost is imposed from 2012 onwards.

National emission reduction targets

It was assumed that, based on Australia's stated international commitments, the Australian Government will adopt greenhouse emission targets to achieve a reduction in emissions of between 5% and 15% by 2020, compared to national emission levels in 2000. The significance of these targets is that they, in turn, will determine likely future carbon prices in the event that a mandatory national carbon policy is introduced.

Carbon price assumptions

A key variable in modelling the impact of these policy measures is the potential price or cost that will apply to greenhouse emissions. The carbon price assumptions used in this modelling are those projected by the Australian Treasury (Australian Government, 2008). The Treasury modelling projected the future level and trajectory of carbon prices that would be necessary to achieve a reduction in emissions of either 5% or 15% by the year 2020, and based on that also projected future electricity prices. As it is assumed the carbon policy is introduced in 2012, for the year 2011 the carbon price is set to zero.

The Treasury analysis was carried out in 2005 dollars, however the ABARE data used to create the model beef farms (detailed below) used in this analysis was in 2008-09 dollars. The Treasury carbon price projection has been adjusted to 2008-09 dollars, using average inflation rates estimated by the Reserve Bank of Australia. The projected carbon prices are shown in Figure 1, below.

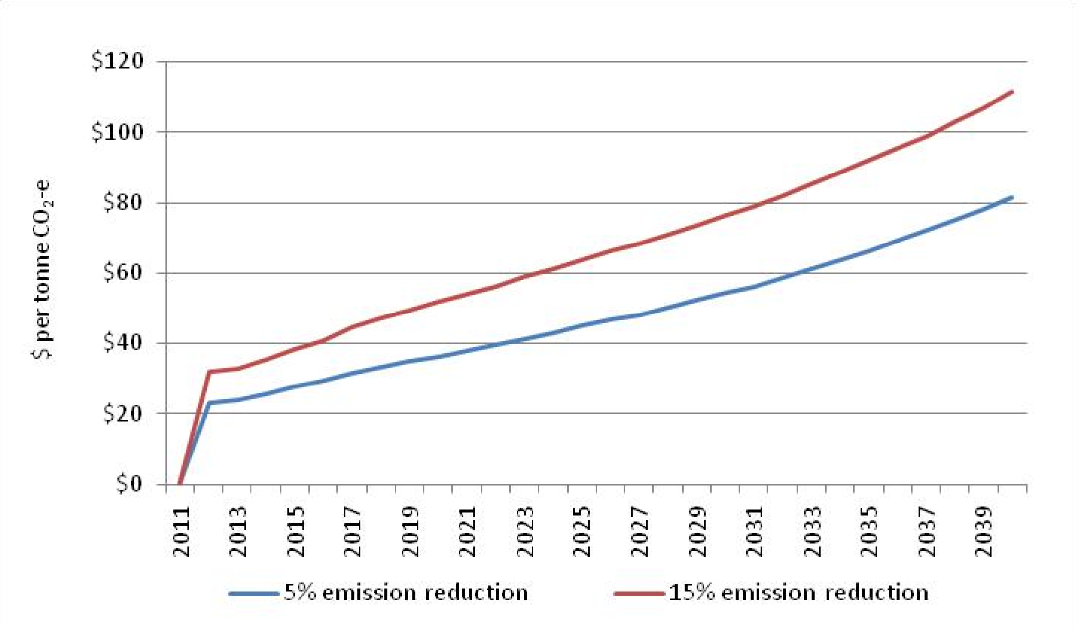


Figure 1. Projected future carbon price under two emission reduction scenarios

Electricity and fuel price increase assumptions

The results of the Treasury modelling were used to project future fuel and electricity prices. Fuel prices were assumed to start at $1.30 per litre in 2011, and projected increases in the price of fuel follow Treasury projections of percentage changes over time.

For electricity prices, the Treasury modelling projected changes in wholesale electricity prices. Wholesale electricity prices are approximately half the price of electricity for retail consumers such as farm businesses, with the other 50 per cent of retail prices being the costs associated with electricity distribution. For the purposes of this modelling, projected future retail electricity prices have been calculated by doubling projected wholesale electricity prices under each of the relevant carbon reduction scenarios.

Electricity prices were projected by Treasury in 2007 dollars, however the ABARE data used to develop the financial models of beef farms is in 2008-09 dollars. The Treasury electricity prices were adjusted to 2008-09 dollars, using appropriate CPI data published by the Reserve Bank. Changes in projected fuel and retail electricity prices under the two emission reduction scenarios are shown in Figures 2 and 3 respectively.

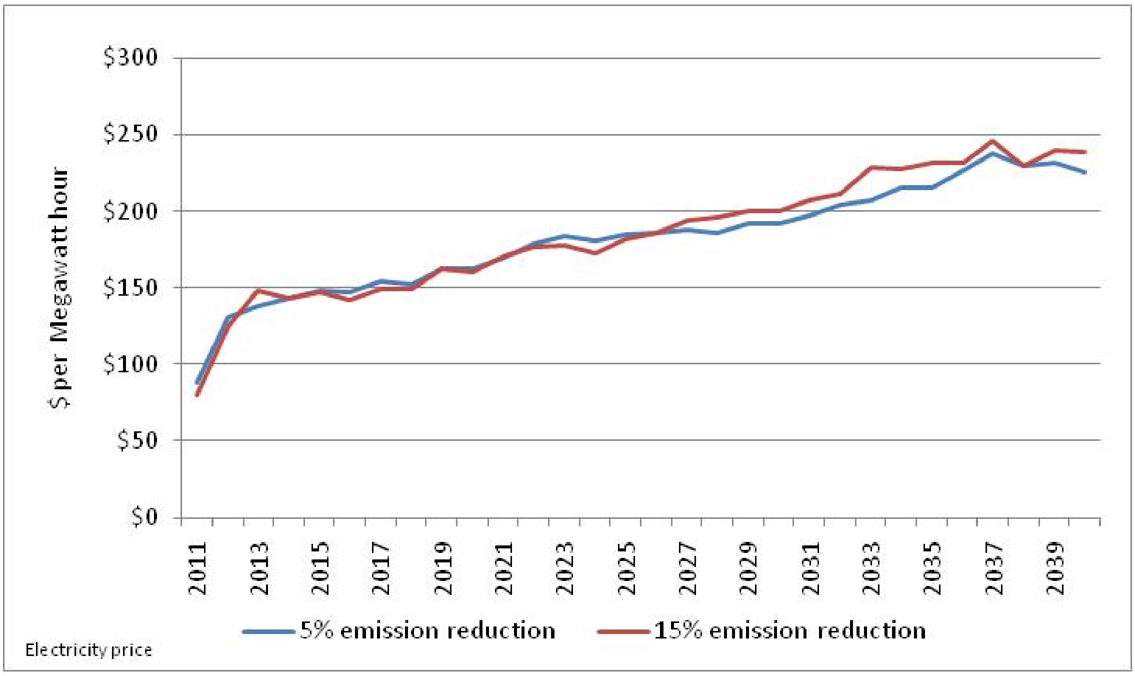


Figure 2. Projected retail electricity prices under two emission reduction scenarios.

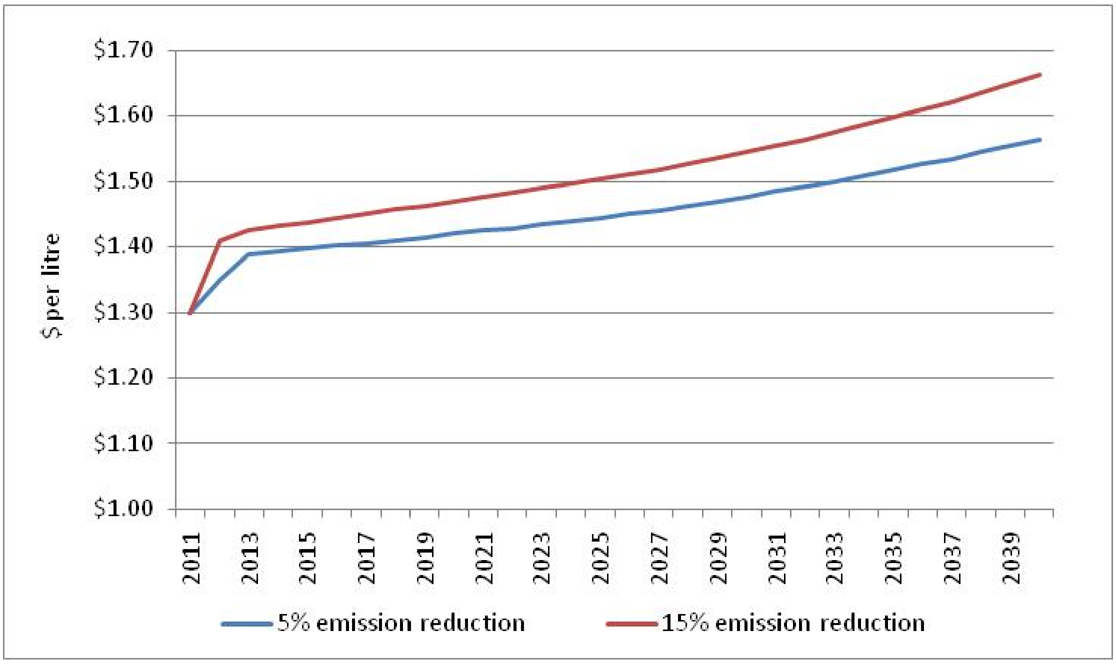


Figure 3. Projected fuel prices under two emission reduction scenarios.

Model farms.

The modelling reported here assesses the impact of the implementation of a carbon policy in the general economy for two model beef farms. The financial models of these farms were developed using average annual data arising from farm surveys carried out by ABARES. The two enterprises selected were a beef farm with gross income between $100,000 and $200,000, and a beef farm with gross income in excess of $400,000 per annum. These represent two ends of the spectrum of beef farms in Australia.

Data available from the ABARES Agsurf database (ABARES 2010) was used as the basis of the financial models developed for each farm. The Agsurf data for these farms is taken as an Australia-wide average, so is not specific to a rainfall or production zone. It is assumed in the modelling that the beef enterprises will face higher costs (as a consequence of the carbon policy), but will not receive higher prices due to the need to remain competitive in global markets.

To estimate the potential impact of the carbon price on the cost of farm inputs, itemised annual revenue and expenditure data was obtained for the two different sized farms. The Agsurf database provides itemised average farm revenues and expenditures (all expressed in 2008-09 dollars) based on details of actual farm revenues and expenditures obtained through annual surveys of a sample of Australian farms. To negate abnormal seasonal variation, data were obtained from the Agsurf database for the years from 2005 to 2009 inclusive, and the results averaged to provide a single-year model for each of the farms included in the study. The data for each farm are outlined in Table 1 below.

Table 1: Characteristics of model beef farms derived from ABARE Agsurf database.

	Farm business turnover ($)	
Physical characteristics	**$100 - $200,000**	**$ 400,000 +**
Total land area (Ha)	3,796	60,680
Area cropped (Ha)	29	177
Beef herd	456	3,522
Total receipts ($)	$ 145,115	$ 1,302,010
Total costs ($)	$ 117,243	$ 1,111,638

Impact on input costs

Farm input items which are likely to have their costs impacted by an increase in energy prices were identified. For each of these farm inputs, an estimate was made of the potential flow-on cost impacts of increases in fuel or electricity costs, based on an approximation of the significance of fuel or electricity in the provision of those goods or services. The responsiveness of the cost of each of the inputs to a change in fuel or electricity costs was based on an estimate of the proportion of the total cost of the input that is fuel or electricity costs.

Table 2 below provides a summary of the farm input items, the cost of which is likely to be impacted by increases in fuel and energy costs, and an estimate of the percentage flow-on effect of increases in fuel and energy costs that will be reflected in the future cost of these inputs for farmers.

For example, if fuel prices are estimated to rise by 10 per cent as a result of the policy, then contract cropping prices are estimated to rise by 5 per cent (i.e. 50 per cent of 10 per cent).

Table 2. Estimated flow-on impacts of increases in fuel and electricity prices.

Farm Input	Linked to: (fuel or electricity)	Percentage flow-on cost impact
Contracts- cropping	Fuel	50%
Contracts- livestock	Fuel	20%
Crop and pasture chemicals	Fuel	50%
Electricity	Electricity	100%
Fertiliser	Fuel	50%
Fodder	Fuel	30%
Fuel oil and grease	Fuel	100%
Water charges	Electricity	10%
Repairs and maintenance	Fuel	20%
Shearing/crutching	Fuel	20%
Stores and rations	Fuel	10%
Vet fees	Fuel	20%
Handling/marketing	Fuel	30%
Shire and PPB rates	Fuel	10%
Total freight	Fuel	80%

For future years, it was assumed that the costs for farmers of all other (non-energy related) farm inputs will remain constant, with no inflation factor being applied. This approach was adopted not because it is assumed that farm input costs will remain constant in the future, but because the critical issue for farm businesses is changes in the relative cost of farm inputs compared to the prices received for farm outputs. The focus of this research is to assess the impacts of the policy measure on farm businesses, all other things being equal. By holding non-energy related farm input costs and future farm revenues constant (aside from assumed productivity growth), the results provide a picture (in current dollar terms) of the relative impact of the carbon policy on farm businesses as emission costs change.

Under the policy, it is assumed that agricultural processors (such as beef processors) with emissions of more than 25,000 tonnes of CO_2-e will have a cost imposed on their factory emissions and will also face increased costs for their inputs. These costs will be associated with wastewater management, transport and electricity usage. Being largely trade-exposed, it is assumed that these increased costs will be passed on to agricultural producers in the form of higher processing costs or lower livestock prices. The increased beef processor cost estimated by ABARE (Tulloh *et al.* 2009) for 2015 was $7.60 per head, an amount which varied depending on the prevailing carbon price assumed to apply. This cost was added to total farm costs, and assumed to increase in proportion to increases in the level of the carbon tax or price. It was assumed that 100 per cent of the extra beef processing cost is passed through to farmers.

Productivity growth

An important variable under consideration in this research is the rate of productivity growth assumed for the beef industry over future years. This is important because applying a cost to carbon will result in increases in farm costs, but not change farm revenue. The agriculture sector in Australia has dealt with such challenges over many years through productivity growth, which in essence involves increasing units of output per unit of input. Historical rates of productivity growth for sub-sectors of agriculture, as estimated by ABARE, (Nossal and Gooday, 2009) are shown in Table 3.

Table 3. Average annual input, output and total factor productivity (TFP) growth in broadacre industries 1977-78 to 2006-07.

	TFP growth (%)	Output growth (%)	Input growth (%)
Total broadacre	1.5	0.8	-0.6
Cropping	2.1	3.1	1.0
Mixed crop-livestock	1.5	0.1	-1.5
Beef	1.5	1.7	0.1
Sheep	0.3	-1.4	-1.8

Source: Nossal et al., 2009

The analysis reported here assumes that, in the future, beef farm productivity growth rates will be maintained at 1.5% per annum, and will not change as a result of the introduction of a tax or price on carbon. It was also assumed that the adoption of the mitigation action – in this scenario the use of a rumen bolus to reduce enteric methane emissions from cattle– brings about no added productivity benefits for the beef production enterprise. Further analysis carried out under one scenario varied this assumption in order to assess the size of the productivity gain that the emission mitigation technology (the rumen bolus) would need to provide in order to make its adoption at least revenue neutral, from the perspective of the beef enterprise.

Farm greenhouse emissions

In order to obtain a more complete picture of the potential impact of mitigation options for participation in the offset market, the greenhouse gas emissions arising from the beef farms included in this analysis were calculated using the FarmGAS Calculator (Australian Farm Institute, 2009).

The FarmGAS Calculator estimates 'farm-created' greenhouse gas emissions using the methodologies defined by the Australian Government, which are utilised to estimate Australia's National Greenhouse Gas Inventory (NGGI). The NGGI is prepared in accordance with the Intergovernmental Panel on Climate Change Guidelines. The methodology applied to agriculture contains both Australian-specific and IPCC default methodologies and emissions factors. The FarmGAS Calculator has enterprise-specific calculators for beef production, sheep production, intensive livestock production (feedlot and piggery) dryland and irrigated cropping, horticulture and environmental plantings on farm.

To generate an estimate of emissions for each enterprise, some general assumptions about farm operations were made, and available physical information about each farm was obtained from the ABARE Agsurf database. Greenhouse emission calculation methodologies only vary to a small degree between States for the same enterprise, and for simplicity the two model farms were assumed to be located in NSW. It was assumed all cattle were bought or sold in Autumn, using the ABARE Agsurf data as a basis. The direct farm emission estimates were 583 tonnes CO_2-e for the smaller beef farm, and 4,745 tonnes CO_2-e for the larger beef farm.

Emission mitigation

To estimate potential revenue arising from participation in the CFI, a scenario was developed involving a methodology that may be available to reduce enteric methane emissions from beef cattle. There are currently no commercially available products registered for use in Australia that make claims about reduced enteric methane emissions, although some currently available products used in beef production internationally have been shown in trials to result in up to a 20% reduction in methane emissions from cattle when used under specific conditions.

For the purposes of this modelling, it was assumed that a hypothetical technology is available which involves giving cattle an annual slow-release rumen bolus which releases a specific, methane reducing chemical into the rumen for twelve months. It was assumed cattle treated with the bolus produce 20% less methane emissions than untreated cattle, running under the same conditions. The bolus is assumed to be applied to all cattle on the farm. It is also assumed that each bolus has a radio frequency transmitter embedded in it, which facilitates rapid external detection of the presence of the bolus in an animal, utilising similar technology to that currently used to read electronic cattle tags.

The estimated emission reduction only applies to methane from enteric fermentation, so the resulting reduction in emissions will be less than 20% of the total farm emissions.

Currently-available rumen boluses to prevent bloat advertise an effective action lasting for 100 days. In this analysis it is assumed that a bolus is developed which is effective for 365 days. It is assumed that the cost of such a product might be double that of the commercially-available 100 day bolus ($32.50), resulting in a bolus cost of $65 per head per annum. The movement of stock turned off the farm and bought in, is assumed to remain consistent throughout the period of the modelling analysis. As such, the total number of boluses applied to cattle is the same each year. In addition to the bolus cost, the required applicator has a cost of $165 (for the entire herd), but there are no other costs assumed to be associated with the system as application and monitoring of the bolus could be carried out at the same time as other activities, for example drenching.

Costs and receipts associated with offsets.

In opting to participate in carbon markets, there are two sets of costs that will face farmers. The first is a ‘one-off’ project design cost, which involves the collection and compilation of all the relevant data that is required to comply with the selected offset methodology. The second set of costs is the ongoing operational costs associated with record keeping, reporting, and the recurrent costs associated with the specific technology that is being used.

Under existing international methodologies for offset projects such as forestry (under the international Voluntary Carbon Standard (VCS)) professional project developers report that for some projects, the initial project design and data compilation costs can range from $100,000 to

$150,000 per project (Dickey,2011). These costs are quite high because of the detailed documentation that is required in order for these projects to comply with the international standards, and the broad range of factors that must be addressed in the project proposal. These include climate, topography, soil types, tree species involved, harvest and management plans, estimates of tree growth rates, and details of the way in which a range of different risk factors will be addressed.

At this stage it is not clear to what extent these same requirements will be applied to proposed offset projects under approved CFI methodologies, although given the desire that offset credits generated will be suitable to trade in international markets, it is likely that similar requirements (and therefore costs) may apply. The extent to which these costs may be moderated through project aggregation is unclear at this stage. Given the uncertainty surrounding project design costs under the CFI, no attempt has been made to include these in the following financial analysis. It is important to note, however, that there will be one-off design costs associated with CFI offset projects and that these costs could be quite significant.

There are also likely to be ongoing operational costs associated with opting to participate in the CFI, such as accreditation, the cost of record keeping and compiling annual statements, and the costs associated with required system verification. An attempt has been made to develop a realistic estimate these costs, which are detailed in Table 4 below. Because the emission tax is not applied until the year 2012, it is assumed the farmer is not able to sell offsets until 2012. All initial costs associated with participating in the carbon offset market are therefore assumed to apply in 2012.

Table 4. Assumed operating costs associated with a CFI offset project.

Item	Cost
Initial accreditation	$3,000 one-off cost
Legal advice (contract)	$2,000 one-off cost
Initial verification	$1,500/day one-off cost
Annual statement preparation	$1,000/day each year
Annual verification	$1,500/day each year
Audit	$1,500/day every third year

Subsequent to the project design being approved, the initiation of the system on-farm is assumed to include the need for an accredited person to train the farmer and help with the establishment of record-keeping procedures. It is also assumed the accredited person would need to be present and to supervise the initial application of the bolus to the herd, and to validate cattle numbers. The initial training is estimated to take 2 person days of time, at a cost of $1,500 per day. The supervision and verification of initial bolus application is also assumed to require the presence of an accredited person at a cost of $1,500 per day, with 500 head of cattle able to be verified per day. For example, a beef cattle herd of 1,000 would require an accredited person to be present for two days for bolus insertion and verification, with an associated cost of $3,000.

Following the first year of participation in the CFI, it is assumed verification will be necessary to ensure the new cattle introduced to the herd and all existing cattle have been treated with the boluses each year. Rather than checking the whole herd, it is assumed this verification will be achieved via a check of documents (such as invoices for the required boluses) and a random check of 10% of the herd. This is estimated to cost $1,500 per day, with up to 500 head of cattle able to be checked each day.

Each year the farmer will be required to complete an annual statement outlining activities carried out and compliance with the methodologies approved for methane mitigation, including any changes to the project. This activity is estimated to take two days per year, with an assumed cost of the farmers' time of $1,000 per day.

Once every 3 years, it is assumed an audit will be required to be carried out by an approved, independent third party. This audit will occur in the first year of participation in the CFI, and every third year following. The audit is assumed to take 2 days, at a cost of $1,500 per day.

A risk buffer has been proposed for sequestration activities associated with the CFI. In this modelling it was assumed a risk buffer would not apply to mitigation activities.

3.0 Results.

The results arising from the modelling carried out using the two farm financial models are displayed in the following figures and tables, and discussed below.

3.1. Impact of a carbon price on farm cash income.

The first set of analyses involved projections of the impact of a carbon policy on beef farm profitability, in the absence of CFI offset revenue. The measure of profitability used is farm cash income, which is defined as farm cash revenue minus farm cash costs. This measure ignores farm costs associated with capital items and operator wages.

Figures 4 and 5 are graphs of percentage change in farm cash income for the two farms over the period from 2012 to 2040. In each case, the change in farm cash income is a comparison with the baseline business-as-usual (BAU) scenario where no carbon tax is imposed. The BAU case is a projection of future farm cash income in the absence of a carbon price. Also shown is projected farm cash income under several carbon price scenarios.

These scenarios are a carbon price applied generally in the economy (but not for farm emissions) at levels Treasury has projected would be necessary to achieve a 5% national emission reduction by 2020 (Carbon tax -5%), and a carbon price at the level Treasury has projected would be necessary to achieve a 15% reduction in national emissions by 2020 (Carbon tax -15%). As such, the figures show the change in farm cash income purely as a result of the introduction of a carbon tax and associated increases in input costs. For all scenarios, it is assumed that historical rates of productivity growth (1.5% per annum) remain unchanged over the timeframe of the projections and all other factors remain constant.

The results show that for the smaller beef farm (Figure 4), the -5% carbon price would result in a 8% (-$8,290) reduction in farm cash income by 2040, and for the -15% carbon price a 10% reduction (-$11,081) in farm cash income is projected, relative to the business-as-usual scenario.

These figures show the impact of introducing a carbon price, on farm cash income. As the price of carbon increases, input costs respond, and the cost of farm inputs also increases. In addition, the costs processors impose on farmers are expected to increase. As these costs increase, the farm cash income comes under pressure, because the productivity rate of 1.5% per annum isn't keeping pace with the increase in farm inputs. That is, the costs of farm inputs are increasing at a faster rate than productivity.

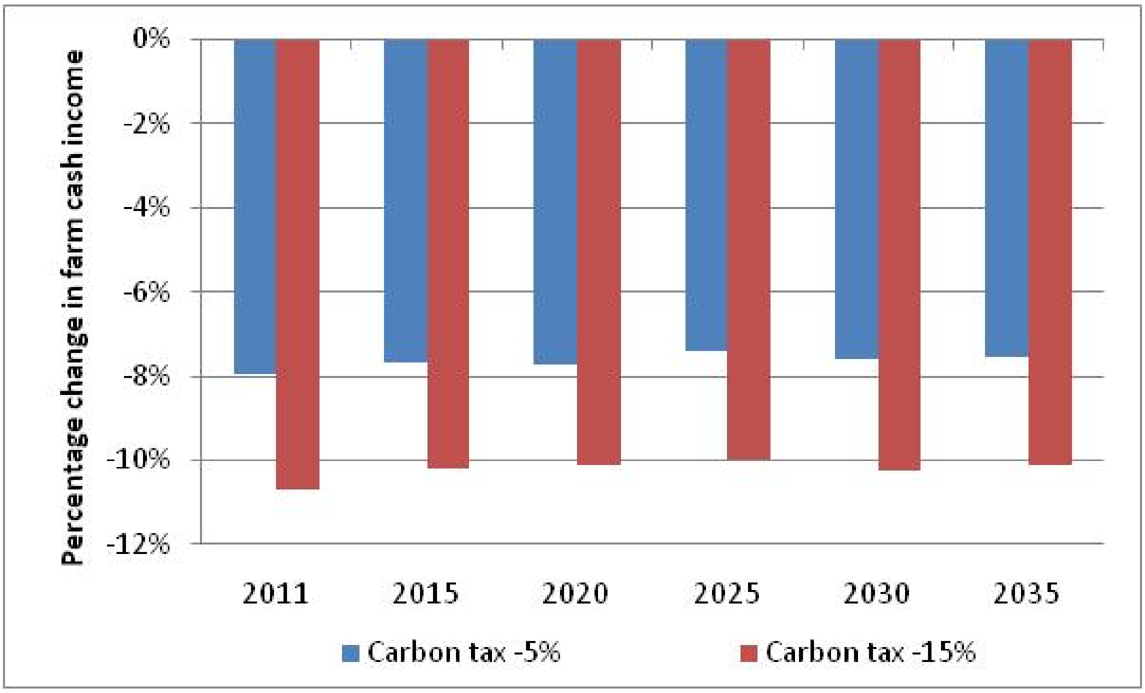


Figure 4. Percentage change in farm cash income from the business as usual case (no carbon tax) for a $100-$200,000 turnover beef farm under two carbon price scenarios.

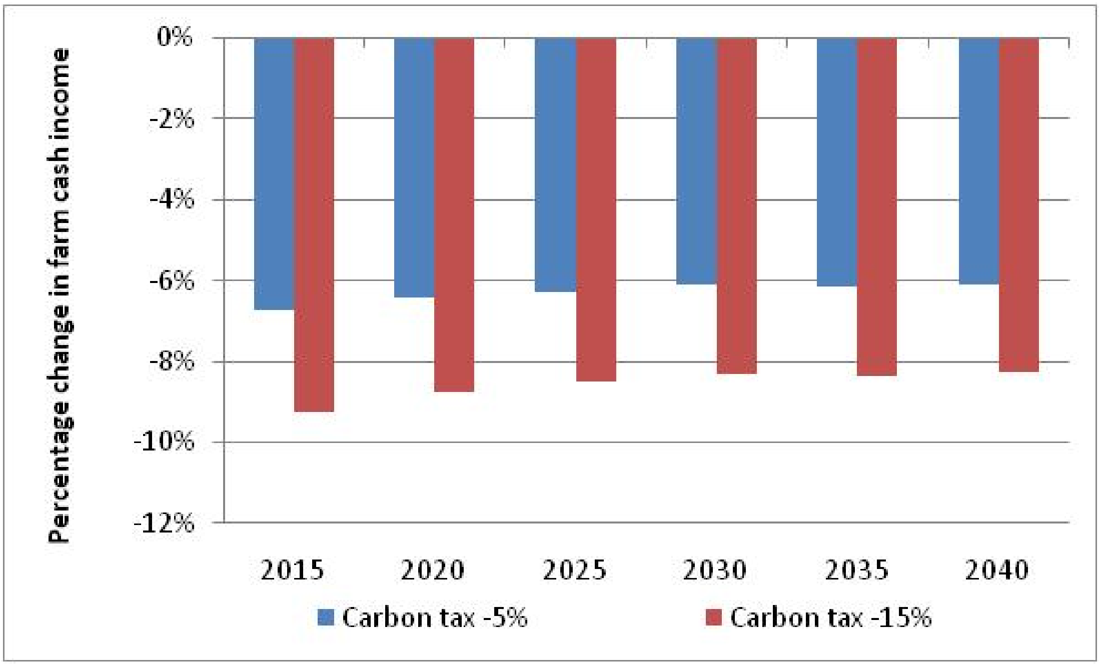


Figure 5. Percentage change in farm cash income from the business as usual case (no carbon tax) for a $400,000+ turnover beef farm under two carbon price scenarios.

As the price of carbon increases, the costs of farm inputs also increase. This has an impact on the farm cash income of the farm, as evident from Figures 4 and 5. The impact of the carbon price scenarios on projected farm cash income for the larger beef farm (Figure 5) is relatively smaller (a 6% reduction (-$56,450) by 2040 under the -5% carbon price scenario and a 8% reduction (-$76,281)by 2040 under the -15% carbon price scenario) than for the small beef farm. This is likely explained by the fact that the larger farm generates higher margins per head of cattle than the smaller farm, and is therefore in a better position to absorb extra costs, especially when expressed in percentage terms.

An alternative way of considering the potential impact of the carbon price on beef farm profitability is to analyse the rate of productivity growth that would need to be achieved in order to overcome the negative impacts of the additional farm input costs; that is to maintain farm cash margins at an equivalent level to the business-as-usual scenario, despite the carbon price.

Through a 'trial-and-error' approach of adjusting assumed rates of productivity growth for each of the carbon price scenarios, it was found that for the $100-$200,000 turnover beef farm model under the 5% emission reduction price, the required average rate of annual productivity growth was 1.65%, a 10% increase on historical productivity growth rates. Under the 15% emission reduction price, the average productivity rate required was 1.7% per annum, which is a 13% increase over historical rates.

For the beef cattle farm with $400,000+ annual turnover, under the 5% emission reduction price scenario, average annual productivity growth of 1.6% per annum is required to maintain current profitability levels, which is a 7% increase on the base productivity level. Under the 15% emission reduction price scenario, the productivity rate is required to climb to 1.65% per annum, which is a 10% increase on the base productivity level.

It should be noted that the modelling reported here does not incorporate more dynamic changes such as enterprise substitution, which would be an option for beef producers faced with increased input costs that significantly eroded farm profitability. It is also assumed that there are no other changes for the enterprise, such as changes to the timing of cattle sales or purchases.

3.2. Impact of CFI participation on farm cash income

The second set of scenarios examined assumed that a carbon price has been implemented, that direct farm emissions remain uncovered, and that the farm business manager opts to participate in the CFI in order to generate offsets which can subsequently be sold to businesses that wish to use offsets to reduce their overall carbon liability.

Logic suggests that a business facing a carbon price would only opt to purchase CFI offsets if they were available at a lower unit price per tonne of CO_2-e than the prevailing carbon price, although for simplicity it has been assumed in these scenarios that the price of CFI offsets per tonne CO_2-e is equal to the carbon price applying more generally in the economy.

The following scenarios model the situation that would apply in the event that a mandatory carbon market has been established through the imposition of a carbon price (at the carbon prices projected by Treasury) and CFI offsets can be sold into that market, and the case where CFI offsets may only be marketed into a voluntary carbon market (such as currently exists) under which demand for offsets is created by companies or individuals not faced with a direct carbon cost, but that wish to offset emissions arising from their activities, or make carbon-neutrality claims. In the latter case, it is assumed that carbon prices equivalent to $5 per tonne CO_2-e prevail.

Figure 6 shows percentage change in farm cash income for the smaller-scale beef farm when participating in the CFI scheme (under the assumptions outlined earlier) with CFI offsets able to be marketed into the mandatory carbon market, and in the case that CFI offsets can only be sold into the voluntary carbon market, at a price equivalent to $5 per tonne CO_2-e. The farm cash income is shown as percentage change from the scenario where a carbon price is imposed, but agriculture is uncovered.

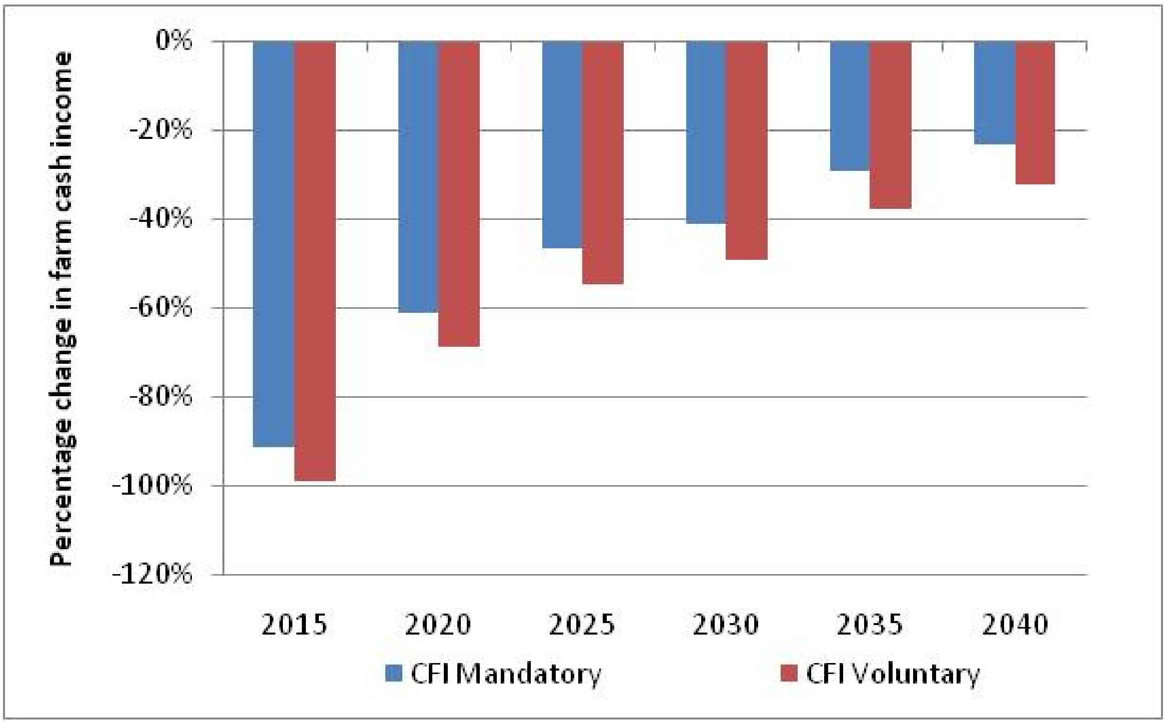


Figure 6. Change in farm cash income associated with CFI participation, $100-$200,000 turnover beef farm, under the 5% emission reduction carbon price scenario (CFI mandatory) and a voluntary carbon price scenario (CFI voluntary).

The graph highlights that, under the CFI assumptions detailed earlier, it is very unprofitable for the farm business manager to participate in the CFI. In later years it becomes slightly less unprofitable to participate in the CFI under mandatory carbon market prices, as the offsets generated become more valuable as the carbon price increases.

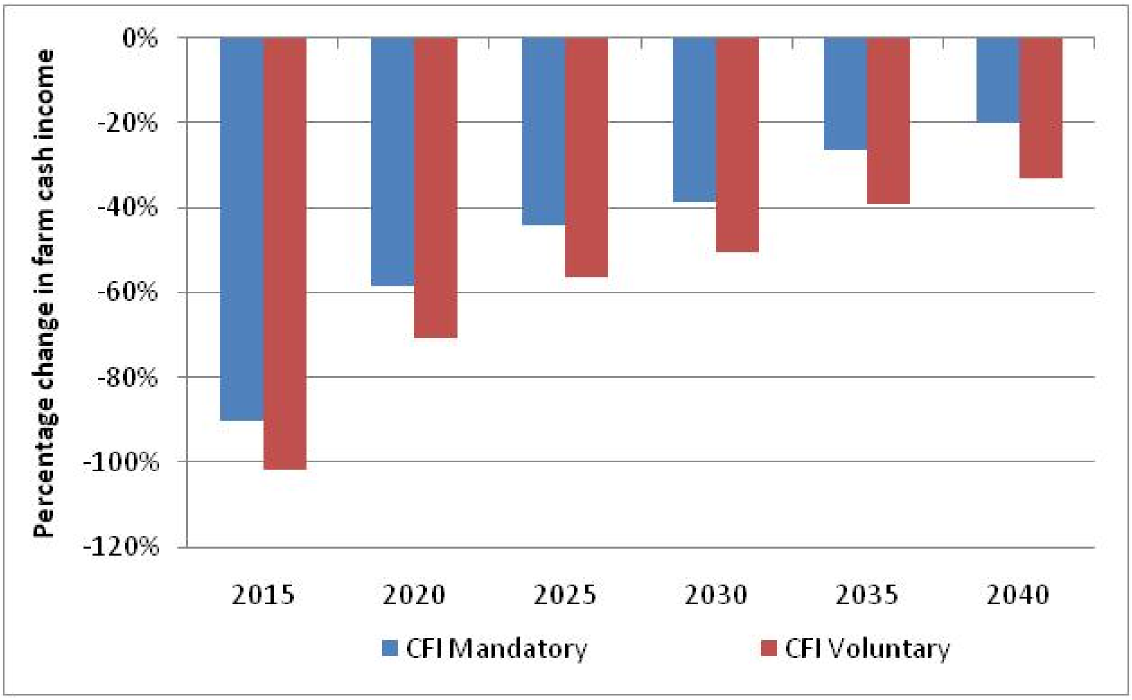


Figure 7. Percentage change in farm cash income associated with CFI participation, for a $100-$200,000 turnover beef farm under the -15% emission reduction carbon price scenario (CFI mandatory) and a voluntary carbon price scenario (CFI voluntary).

The results again show that, even at the higher carbon price, participation in the CFI offsets scheme would not be feasible at the costs and under the arrangements outlined earlier in this report. It is evident that, as mandatory carbon prices increase in the latter years of these projections, participation in the CFI where offsets can be sold into the mandatory carbon market becomes progressively less unprofitable compared to non-participation, but there is still a negative impact on farm profitability associated with CFI participation.

Figures 8 and 9 following show the same set of scenarios for the $400,000+ beef farm. While the trend in impacts on farm cash income of CFI participation is similar for the beef farm with greater annual turnover, the results again highlight that participation in the CFI under either a mandatory or a voluntary carbon price scenario would be highly unprofitable.

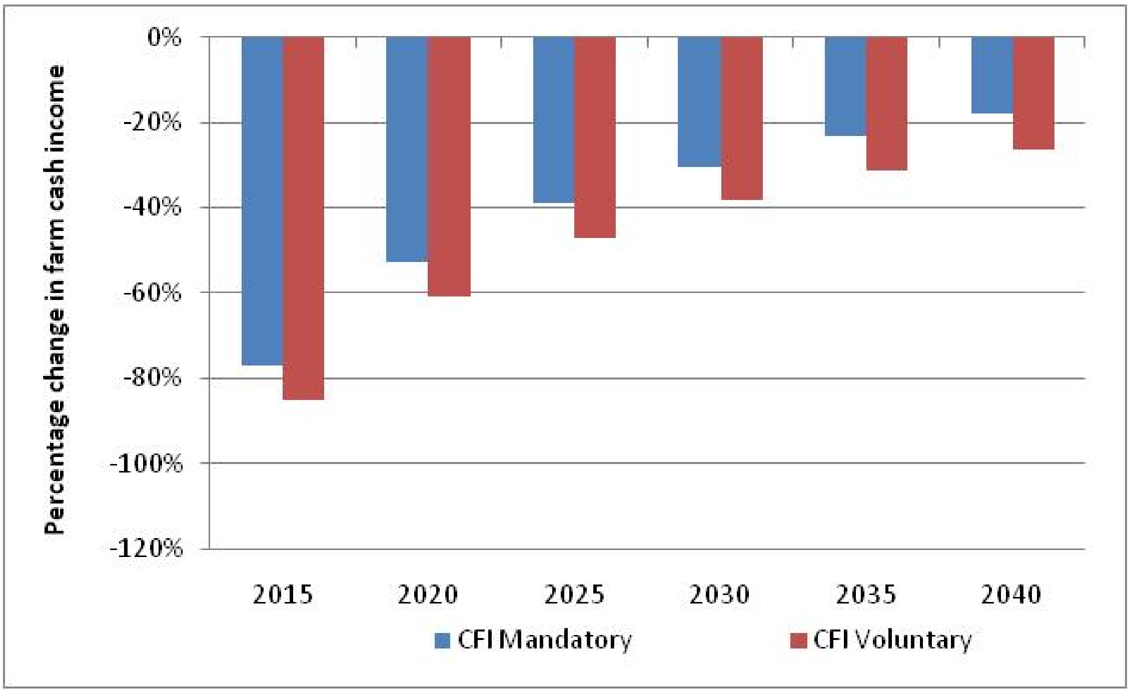


Figure 8. Projected change in farm cash income associated with CFI participation for a $400,000+ turnover beef farm under the -5% emission reduction carbon price scenario (CFI mandatory) and a voluntary carbon price scenario (CFI voluntary).

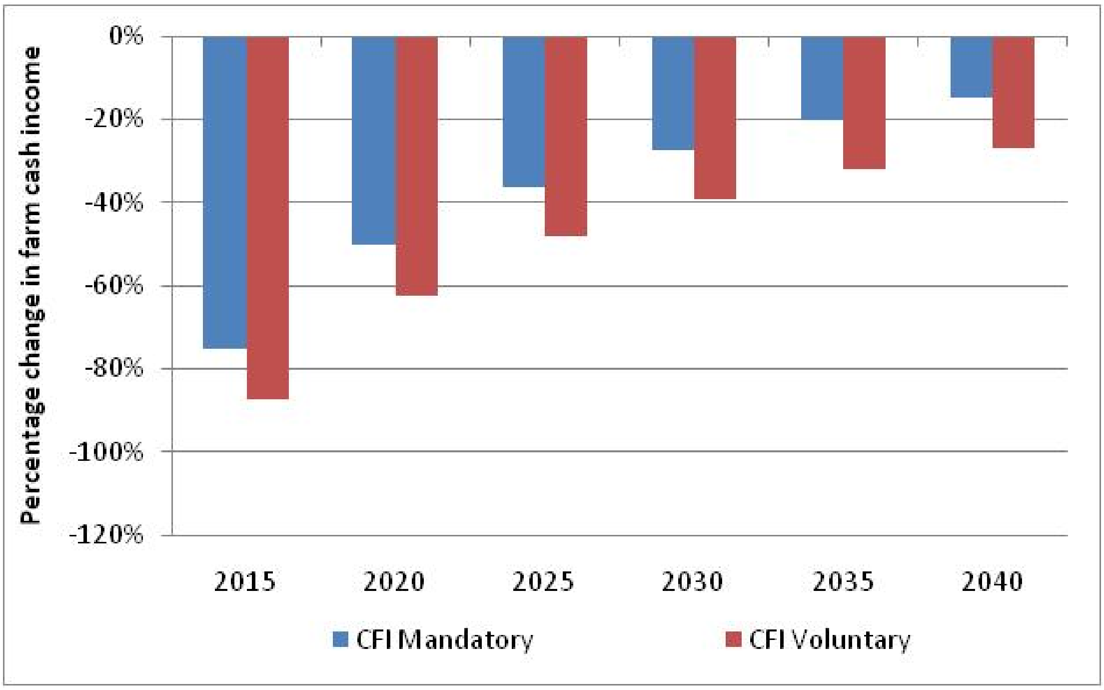


Figure 9. Projected change in farm cash income associated with CFI participation for a $400,000+ turnover beef farm under the -15% emission reduction carbon price scenario (CFI mandatory) and a voluntary carbon price scenario (CFI voluntary).

It is clear from the results that even when offsets are sold into the mandatory market and the carbon price is equal to that assumed in Treasury projections, farm cash income is negatively impacted. Essentially the costs associated with participating in this market far outweigh the revenue from the sale of offsets. However, it should be noted that the CFI participation costs that have been assumed in the above modelling, while based on realistic assumptions, are essentially hypothetical and at best provide some broad indications of potential outcomes. It should also be recalled that any 'one-off' project design costs associated with CFI participation have not been included as a cost in this analysis. The inclusion of this cost (even if discounted over the life of the project) would further reduce the viability of CFI participation.

To consider the offset price necessary for farm cash incomes of a beef farm participating in the CFI to equal those associated with the business as usual scenario, different carbon prices were modelled for both farms. The historical productivity rate for beef farms was also assumed to apply.

In order for the $100-$200,000 annual turnover beef farm to match 'business as usual' farm cash income while participating in the CFI offset market, the carbon price needed is approximately $270/tonne CO_2-e. For the beef farm with annual turnover of $400,000, the carbon price required is $230/tonne CO_2-e.

The cost of the rumen bolus is the recurrent cost item that has the greatest impact on farm cash income, for a beef farm participating in the CFI. Analysis was carried out to investigate the bolus price required for farm cash income of a beef farm participating in the CFI to equal those under the 'business as usual scenario'. It was assumed the 5% emission reduction price applies, and the beef farm maintains a productivity rate of 1.5% per annum.

At a price of $15 per bolus, the farm cash income for beef farms participating in the CFI offset market gradually increases to match those under the scenario where a carbon tax is imposed but agriculture is uncovered. However, the $100-$200,000 annual turnover beef farm requires 26 years of projected carbon price increases before annual farm cash income under the CFI scenario equals the farm cash income under the carbon tax scenario. For the larger beef farm, with an annual turnover of $400,000, a period of 17 years of carbon price increases is required before farm cash income under the CFI is equal those under the carbon tax scenario.

This analysis highlights that technology costs will need to be much lower, CFI participation costs much lower, and CFI offset prices much higher than the assumptions used in this modelling in order for CFI participation to become viable for either of the model beef farms that are the subject of this research.

The results of this analysis are outlined below in Figures 12 and 13 below. It shows that for a technology that achieves a 20% reduction in emissions in a beef herd, the break-even cost (given anticipated carbon prices) for beef farmers is likely to be in the range of $10-$12 per head per annum. This analysis is carried out with 'average' beef farm profitability. However, this assumes that the offsets creates can be sold into the mandatory carbon market. The carbon price in the mandatory market is higher than that of the voluntary, so if the offsets were only able to be sold into the voluntary market, it could be assumed that the break-even cost of the technology would need to be lower.

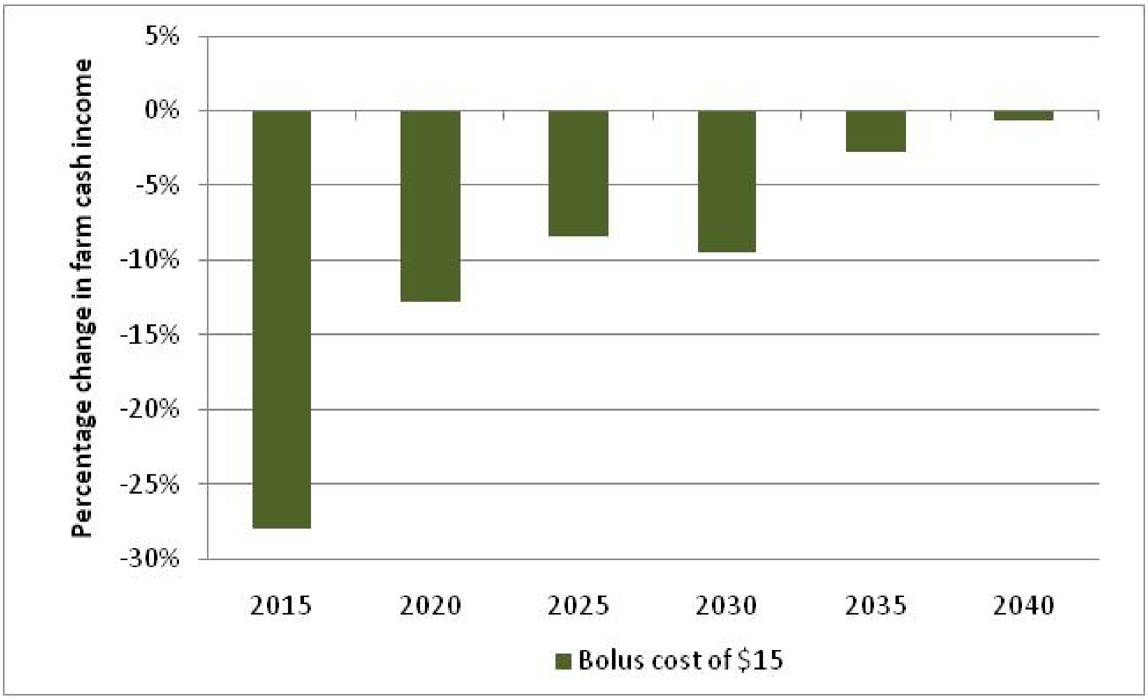


Figure 10. Projected change in farm cash income associated with CFI participation, for a beef farm with average annual turnover of $100-$200,000under a 5% emission reduction carbon price scenario with a bolus price of $15 per head per annum.

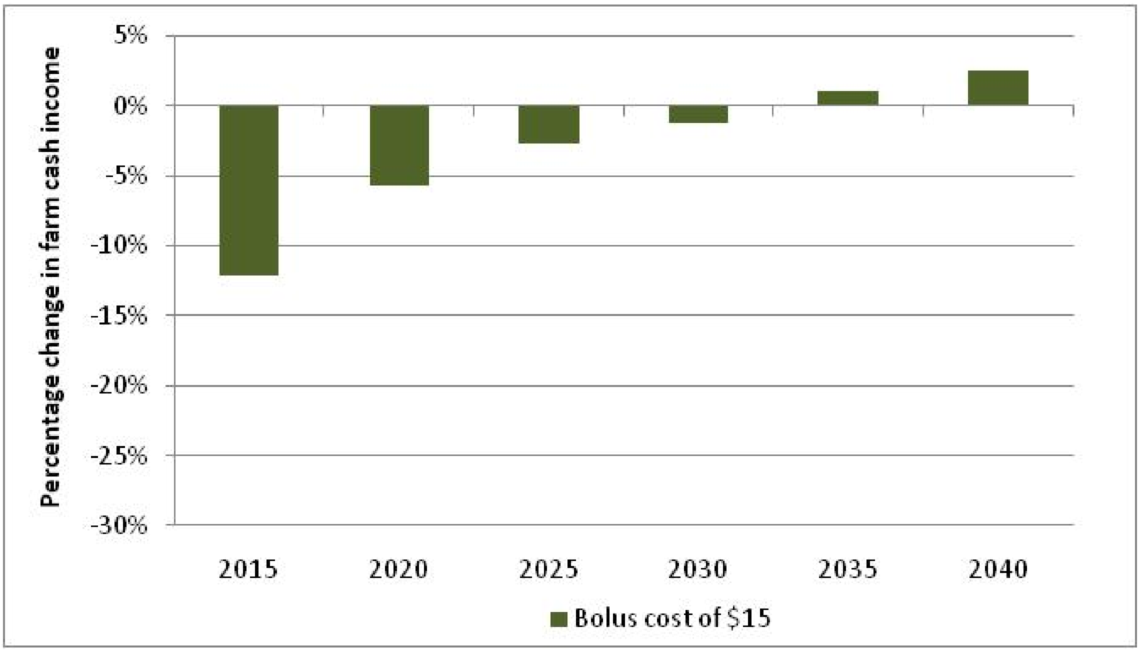


Figure 11. Projected change in farm cash income associated with CFI participation, for a beef farm with average annual turnover of $400,000+ under a 5% emission reduction carbon price scenario with a bolus price of $15 per head per annum.

3.3. Impact of CFI participation with technologies producing added productivity gains.

The scenarios examined in section 3.2 above assumed that the use of the rumen bolus in the cattle herd did not result in any added productivity gains in the herd. This reflects the situation envisaged if a strict interpretation of the additionality test is adopted, which would mean that only technologies that did not bring about productivity gains could be considered to pass the additionality test detailed in the CFI consultation paper.

An alternative approach to the analysis is to estimate the amount of productivity gain that a technology would need to achieve, assuming the costs detailed earlier, in order for it to be profitable for beef producers to adopt.

Using a 'trial and error' approach, it was found that in the case of the smaller-scale beef herd ($100,000 - $200,000 turnover), the bolus would need to bring about a 20% increase in productivity under the -5% emission price scenario, and a 25% increase in productivity under the voluntary carbon price scenario in order for participation in the CFI to at least achieve a break-even outcome in the short to medium term (ignoring any one-off offset project design costs).

In the case of the larger-scale beef farm, the required additional productivity arising from use of the bolus was slightly less (in the region of 18-23%) in order for participation in the CFI to at least achieve a break-even result compared to the business as usual case under a mandatory carbon price. As noted above, for farm cash incomes to reach a break-even outcome under the voluntary carbon price scenario, a 25% increase in productivity is required.

Figures 12 and 13 below show the percentage change in farm cash income under a 5% emission reduction, with a 20% productivity gain resulting from the bolus application, for both mandatory and voluntary carbon price scenarios. In each of these figures, farm cash income when participating in the CFI is compared with farm cash income under a scenario where a carbon tax is imposed but agriculture remains uncovered. Therefore, these figures show the change in farm cash income purely as a result of participating in the CFI.

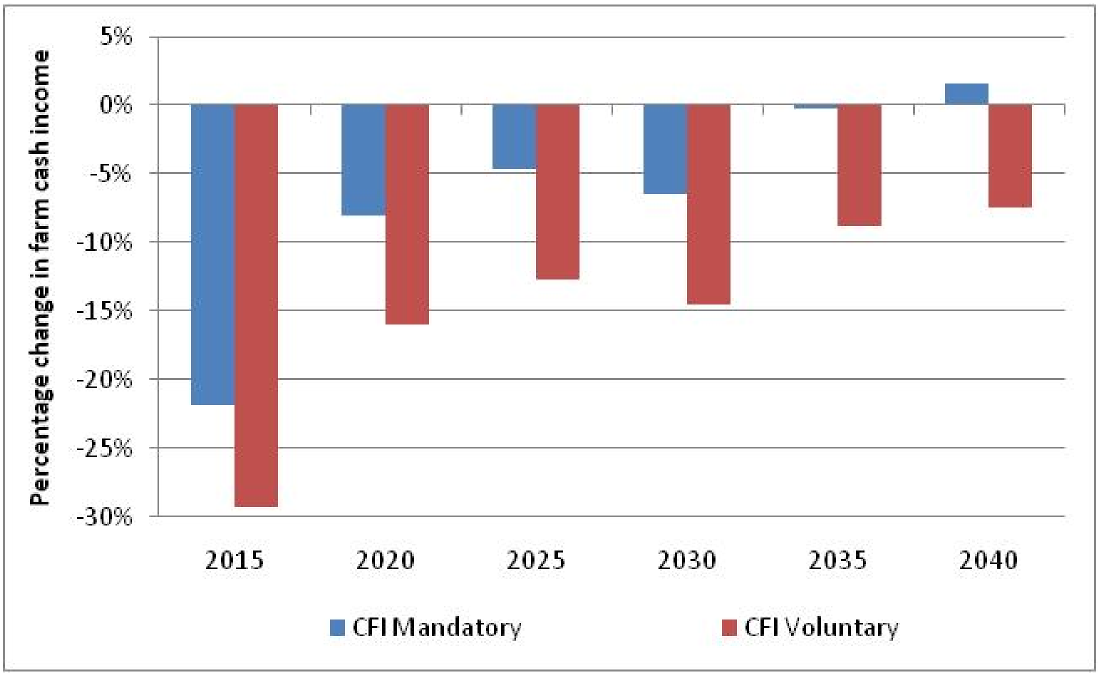


Figure 12. Projected change in farm cash income associated with CFI participation for a $100 - $200,000 turnover beef farm, under a 5% emission reduction carbon price scenario (CFI mandatory) and voluntary carbon price (CFI voluntary) with bolus producing a 20% productivity gain, in addition to 20% emission mitigation.

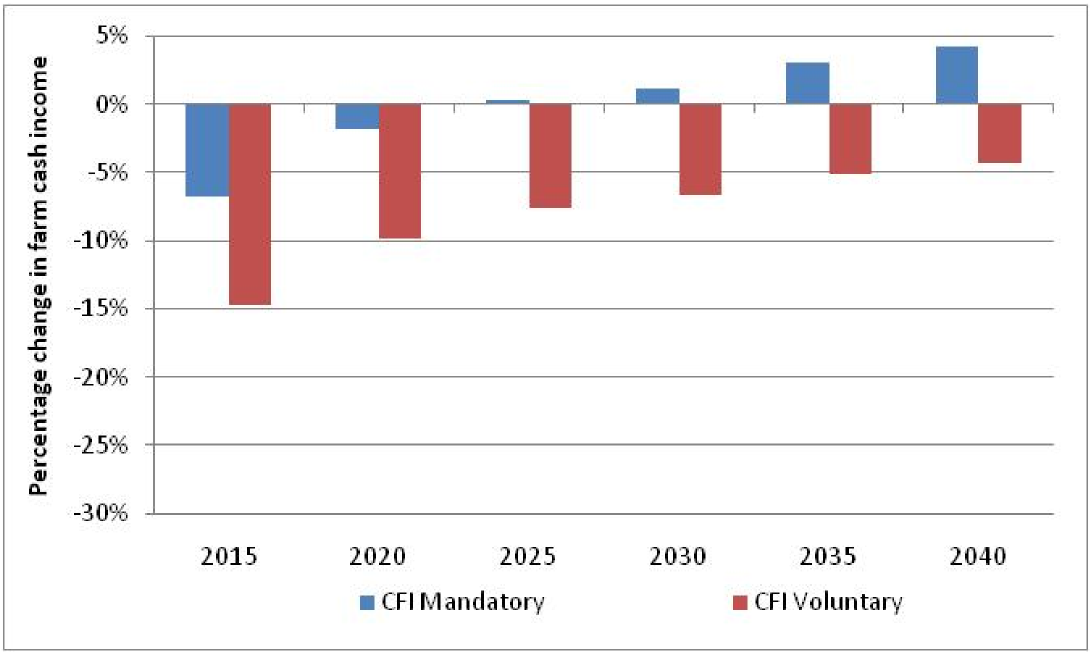


Figure 13. Projected change in farm cash income associated with CFI participation for a $400,000 + turnover beef farm, under a 5% emission reduction carbon price scenario (CFI mandatory) and voluntary carbon price (CFI voluntary) with bolus producing a 20% productivity gain, in addition to 20% emission mitigation.

4.0 Discussion

It must be recognised that the preceding analysis involves what are essentially hypothetical scenarios, even though these scenarios can be considered to entail realistic assumptions, based on costs and benefits associated with currently available technologies. As a result, the outcomes should be considered to provide some guidance, but in no way should they be considered definitive. As can be seen from the alternative scenarios examined, changes in some key assumptions (such as the cost of the technology or the productivity gains associated with a technology) can bring about large changes in farm financial outcomes.

That qualification notwithstanding, there are a number of broad conclusions that arise from this analysis. These are as follows;

- The introduction of a mandatory carbon price in the economy (irrespective of the mechanism employed to achieve that) will have a negative impact on beef farm profitability, even in the event (as appears likely) that no cost will be applied to direct farm emissions. This arises because beef enterprises have no means of increasing beef prices in response to an increase in farm costs and higher beef processor costs, which will occur as a result of increased energy costs arising from a carbon price.

- The implementation of the proposed CFI may provide some opportunity for farm businesses to reduce the negative impact of an economy-wide carbon price through the adoption of technologies that achieve a reduction in farm emissions, in particular those emissions arising from livestock which form the bulk of beef farm emissions.

- For participation in the CFI to be financially viable for beef farmers, the technology will need to be relatively inexpensive. For example, in the case of a technology capable of bringing about at least a 20% reduction in cattle emissions, the threshold cost above which this technology would no longer be viable for adoption appears to be in the region of $10 - $15 per head per annum, based on projected future carbon prices.

- Alternatively, for a technology to be financially viable at the costs assumed in this analysis it would also need to boost productivity by between 15 and 20%, in addition to achieving a reduction in emissions of 20%, when the cost of the mitigation technology is $65 per head.

- Finally, it is difficult to envisage a scenario under which participation in the CFI would be financially viable for beef producers, if the CFI offsets created were able to be sold into the mandatory market, or the voluntary carbon market at prices equivalent to historical carbon prices.

This analysis indicates that it is unlikely that farm business managers will adopt emission mitigation technologies (as distinct from sequestration options) in order to participate in the CFI if the offsets generated are only able to be marketed at carbon prices prevailing in voluntary carbon markets. Given current technologies and the need for the development of methodologies, this means that farmers are much more likely to participate in the CFI by generating sequestration-related offsets, in particular carbon-sink forestry. However, given the permanency requirements associated with such offsets, this will potentially disadvantage early-movers given the lower initial carbon prices that are anticipated in the event that a mandatory carbon price is implemented.

4.1 The additionality test.

A key issue for resolution in relation to the potential for farmers to engage with the CFI will be the test that is applied to determine whether or not an activity is ‘additional’ and therefore can be considered eligible to be recognised under the CFI. The key test proposed in relation to this issue is whether or not the emission abatement (either sequestration or mitigation) would have occurred in the absence of the CFI. The logic behind this concept is that the community clearly would not wish to be paying for an activity that would have occurred anyway, and that therefore does not provide real abatement in excess of what could have been anticipated in the absence of a carbon price.

There is a need for careful consideration of this question, from a number of different perspectives. While it may appear to be logical to only reward activities that would not have occurred in the absence of the CFI, it is also important to consider the timing of the adoption of that activity, the eventual level of adoption of the technology, and the impact that the CFI may have in encouraging an activity to occur at an earlier time or on a more widespread basis than would otherwise have been the case.

A simple example might be the adoption by beef farmers of a rumen bolus, such as has been used as an example in this research project. If the use of the bolus had absolutely no productivity benefits for beef farmers, and simply acted in a manner that reduced methane gas production from a cow’s rumen, then it is obvious that the use of the bolus should be recognised as meeting the additionality test, and therefore if adopted by farmers should generate CFI offset credits that could be sold.

If, however, use of the bolus generates both methane mitigation and a small productivity benefit that made its use marginally financially positive for a small number of the most efficient beef producers or for some beef producers in a particular region, then it could be anticipated that its use would be slowly adopted by only a small proportion of beef producers, even in the absence of any incentive provided by the CFI. This could mean that use of the bolus did not pass a strict interpretation of the additionality test, and that it therefore should not be recognised under the CFI. However, this decision would almost certainly mean that adoption of the bolus in the beef industry would be much slower than would be the case if it was recognised, which in turn would mean that national greenhouse emissions would remain higher for a longer period, necessitating a higher carbon price, and imposing additional costs on the entire community. Recognising the bolus under the CFI would speed the adoption of the technology by more beef producers, and bring benefits to the wider community more rapidly than would otherwise be the case.

What the above example highlights (and what is evident from the differences in the modelling results reported here between the large and the small beef farm) is that farm businesses are not homogeneous, and it is not possible to make an absolute determination for the entire industry about whether a particular practice would or would not have been adopted in the absence of the CFI. It is also highly likely that the productivity gains from specific practices will vary across regions and production systems, with products that bring productivity gains for cattle on high quality improved pasture not necessarily bringing the same productivity benefit for cattle on native pastures in northern Australia, and vice versa.

The Alberta Offset System.

Under the Alberta Offset system, activities which generate offsets must be voluntary actions by firms which don't have legal requirements to reduce emissions. In order for a project to qualify as an eligible offset project, it must:

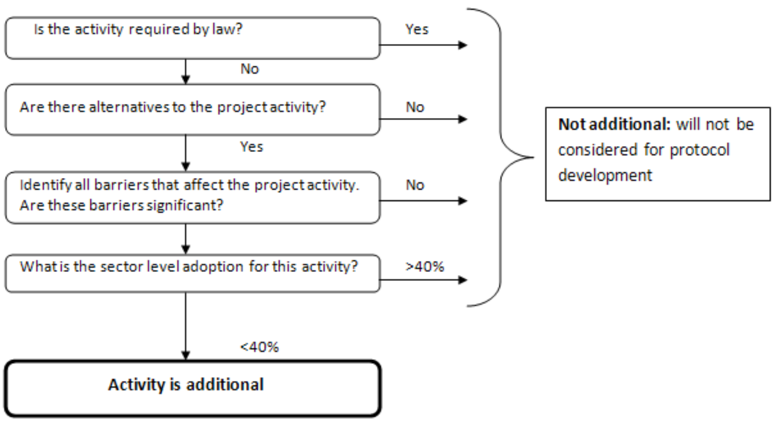
- Result from actions taken on or after 1 January 2002
- Occur on or after 1 January 2002
- Be real, demonstrable, quantifiable
- Not be required by law
- Have clearly established ownership
- Be counted once for compliance purposes
- Be verified by a qualified third party
- Have occurred in Alberta.

Projects that are approved under the Alberta Offset System have a credit duration of 8 years, which can be extended another 5 years if the offset activity is still deemed to be carrying out activities that are above 'business-as-usual' practices of the day. Projects must provide 'real' emission reduction or removal, and in order to prove this must use scientifically acceptable methods of estimating mitigation and sequestration.

To prove that an activity is above 'business-as-usual', or additional, there are a number of requirements that must be met. The activity cannot be required by law, and alternative technologies must be available. Significant barriers to the adoption of an activity need to be demonstrated, and these can include:

- Technological barriers
- Financial barriers, which occur if there is a negative or long run return on investment that will affect a business' willingness to invest in a project
- Social barriers, when public perception or understanding limits the adoption of a new activity.

Finally, the uptake of an activity across the sector must be determined. If adoption levels are low, the activity may be deemed additional. Alberta has set an adoption level of 40% of a sector as being business-as-usual. The steps involved in determining additionality are outlined in the figure below.



Requirements to prove that an activity is above 'business-as-usual'.

The Alberta Offset System includes the following project activities that are of importance to the agriculture sector:

- Beef cattle feeding - including between 4 and 6% of edible oils in feed to reduce enteric methane emissions by 20%
- Days on feed - reducing the number of days required for finishing groups of cattle
- Beef lifecycle - reducing the cull age of cattle
- Biogas - anaerobic decomposition of agricultural materials including manure, silage and dead animal stocks
- Nitrous oxide emissions - changed management of applied Nitrogen sources to reduce nitrous oxide emissions for annual and perennial cropping systems. Lands grazed by animals are excluded from this protocol.
- Pork - innovative feeding of swine and storing and spreading of manure
- Tillage - adoption of reduced-till or no-till practices

For each of the activities listed above, guidance methodologies have been developed for project proponents to use in the estimation of baseline emissions, mitigation and sequestration.

Speeding up the adoption of a practice that result in both greenhouse and productivity benefits (using a mechanism such as the incentive provided by the CFI) will bring about greater greenhouse emission mitigation at an earlier time, which provides a benefit to the entire community.

In considering this issue from a broader perspective not just limited to greenhouse emission abatement, it is evident that Government's have in the past, and continue to recognise the benefit of providing incentives to encourage actions earlier than may have otherwise been the case, even when those actions bring benefits to the individual as well as the wider community. The co-funding approach adopted in relation to Landcare programs is a case in point. There is well documented evidence available that most landcare projects deliver a mix of community and landholder benefits. These benefits include soil and wind erosion control, water quality improvements, salinity management, biodiversity enhancement, improved livestock grazing management, increases in farm capital values and improvements to the scenic amenity of landscapes. In the normal course of events, some landholders undertake actions such as revegetation even in the absence of incentives, because they recognise the long-term benefits for the farm. However, the availability of added incentives (in the form of landcare grants) encourages many more farmers to adopt these practices at an earlier time than they would otherwise have. As a result, the community gains a range of benefits at an earlier time they would otherwise have, and some of these – such as improved water quality – can result in considerable savings for the community through avoided additional costs.

There is an argument to the effect that the availability of landcare incentives disadvantages those farmers who take action in advance of the incentives being available. However, the counter-argument is that they took the initial decision because it was financially viable from their perspective, and they also benefit from having other landholders adopt such actions at an earlier time than they otherwise would have, because of the public benefits that arise. It is also the case that some landholder proceed with revegetation or other landcare projects but opt not to access landcare incentives, even when they are available, because of the additional 'transaction' costs (paperwork, restrictions on species and planting location etc.) associated with a landcare application. These landholders obviously do not consider they are disadvantaged in not accessing the landcare funding incentives.

The approach adopted under Landcare (whereby incentives are provided for actions that bring about both landholder and community benefits at an earlier time than might otherwise have been the case) is also evident in the Australian Government's "Caring for our Country" program.

The stated objectives of the Caring for our Country program are as follows;

By 2013, Caring for our Country will:

- *Assist at least 30 per cent of farmers to increase their uptake of sustainable farm and land management practices that deliver improved ecosystem services.*
- *Increase the number of farmers who adopt stewardship, covenanting, property management plans or other arrangements to improve the environment both on-farm and off-farm.*
- *Improve the knowledge, skills and engagement of at least 30 per cent of land managers and farmers in managing our natural resources and the environment.*

It is apparent from these that the Government recognises the advantages arising from quicker adoption and implementation, and therefore does not restrict the incentives to only those actions that do not deliver productivity benefits on-farm.

The approach adopted in controlling feral pests on private and public land is another relevant example. There are a wide range of benefits for both private landholders and the wider community that arise from effective control of feral animals on both public and private land.

Feral pest control program a great success

A successful partnership is achieving great outcomes for the control of feral animals in the Upper Hunter.

Over the past three months the Mid Coast Livestock Health and Pest Authority (LHPA) has undertaken an extensive aerial control and ground baiting program on 212,000 hectares around the edges of Upper Hunter National Parks and reserves.

The program is a partnership between the Hunter-Central Rivers Catchment Management Authority (CMA), the National Parks and Wildlife Service (NPWS) and the LHPA and is being funded by the Australian and New South Wales Governments.

Many native fauna species in the Hunter region are threatened by feral pests either directly through predation and competition for food or shelter, or indirectly through changes they cause to their habitat. The control of feral predators such as foxes and wild dogs is a high priority for the recovery of the Broad-toothed Rat and Brush-tailed Rock-wallaby, which occur in and around the Barrington Tops National Park and State Conservation Area. Controlling feral pigs also benefits threatened species by reducing damage to habitats caused by wallowing, rooting and the spread of weeds and pathogens such as the Root-rot Fungus (*Phytophthora cinnamoni)* which is known to occur in the area.

The CMA is committed, through the Hunter-Central Rivers Catchment Action Plan, to working with partners to treat animal pests in order to help conserve biodiversity in our region. The CMA has teamed up with NPWS and Mid Coast LHPA to support additional efforts to the routine baiting for feral pests carried out in the Upper Hunter each year.

Mid Coast Livestock Health and Pest Authority Ranger, Craig Crooks, says the problem was bigger than previously thought. “When we undertook a survey from the air to get an idea of the size of the feral animal populations, we were amazed by the number of feral pests, especially pigs, running wild in these areas,” said Mr Crooks.

The partnership has been a huge success with an impressive 2,350 feral pigs, goats, foxes, wild dogs, feral cats and hares treated.

“These pests have a massive impact on the environment; they’re a major threat to biodiversity and cause a lot of damage to soils and waterways.”

As a result of the program, rural producers can expect reduced livestock losses and damage to fences and other rural infrastructure caused by feral animals.

“We aimed to complete the control program before spring to avoid the breeding season for non-target native species. Controlling feral pests at this time will also help improve lambing and calving rates throughout the region and reduce stock losses and damage from wild dog attacks.”

Over one hundred landholders took part in a series of workshops, provided through the program, to learn more about what they can do to control feral animals on their properties.

July 2009.

Accessed at http://www.lhpa.org.au/news/feral-pest-control-program-a-great-success

Despite the obvious productivity benefits for landholders if they implement effective feral animal control programs on their own land, the Australian and State governments adopt a partnership approach on this issue, recognising the community benefits that arise from a coordinated approach that also provides direct benefits to landholders through productivity gains, and by reducing their feral pest control costs. The provision of government incentives ensures that the public benefits are realised over a shorter timeframe, and the involvement of the landholders is likely to ensure that cost-sharing occurs, and the result is a lower cost for both landholders and the public in achieving simultaneous public and landholder benefits.

In considering the application of the additionality test, it is also important that it is clear exactly what the ‘action’ is that is being recognised and incentivised by the scheme, bearing in mind that the atmosphere is indifferent how reduced atmospheric greenhouse gas concentrations are achieved. A relevant example to help explain this concept is adoption of minimum tillage and stubble retention in crop management.

It is evident from numerous studies, and from the widespread adoption of minimum tillage and stubble retention practices across Australia that farmers have recognised they are able to achieve substantial productivity benefits from the adoption of the practice, through reduced input costs and improved soil fertility. It would therefore seem logical that the adoption of minimum tillage and stubble retention should not be recognised under the CFI as a practice that would generate CFI offset credits.

However, if a landholder was prepared to enter into an agreement under which they were bound to permanently adopt only minimum tillage in their crop production enterprise, it could be argued that the agreement represents an additional activity that should be recognised under the CFI and would therefore generate offset credits. A further question might be how many offset credits such an agreement should earn, and this would probably need to be based on the difference in sequestration between this, and a normal situation whereby minimum tillage might be used nine times out of ten, but conventional tillage used 10% of the time. It is important to recognise, however, that the relevant activity in this case is not using minimum tillage (a widespread activity) but the act of agreeing to not use any other tillage practices (an additional activity).

A further issue that arises in the case of minimum tillage adoption is that in some high rainfall regions, minimum tillage is not widely adopted because trials have shown that there are limited benefits and sometimes added costs arising from its adoption. In these regions, the adoption of minimum tillage would bring community benefits in the form of reduced soil carbon emissions, but will not be adopted unless there is a strong incentive to do so. The recognition of such practices as being ‘additional’ in certain regions would bring wider community benefits through reduced emissions and a subsequently lower required carbon cost in order to achieve a desired greenhouse emission target.

These examples, and the modelling results discussed earlier highlight that adopting a prescriptive, “no-productivity gain” definition in deciding whether or not an activity passes the additionality test proposed for the CFI will limit the public benefits that the CFI proposal has the potential to generate. An approach that includes broader consideration of the net public benefit associated with recognising activities under the CFI is more likely to achieve greater public benefits over a shorter timeframe.

4.2 Conclusions.

The preceding analysis has identified that, based on realistic assumptions about potential emission mitigation technologies and likely compliance requirements, the proposed CFI is unlikely to be attractive for Australian beef producers. The potential revenue that is likely to be able to be generated from the sale of emission offsets appears likely to be considerably less than the cost associated with actions to produce those offsets, and there will also be CFI project design and compliance costs over and above those costs.

The analysis has also highlighted that under a scenario whereby the technology adopted to reduce emissions also produces a significant productivity gain, it is much more likely that participation in the CFI will prove attractive for beef producers in the short to medium term.

This result highlights the significance of the 'additionality' test that will be adopted to determine eligibility under the CFI. If the additionality test is defined in a way that means actions that generate both productivity and emission benefits will be ineligible for recognition under the CFI, then it is unlikely that beef producers will be able to participate in the CFI. If, however, the additionality test does not preclude actions that also bring about productivity benefits, then it is much more likely that beef producers will be able to participate in the scheme, assuming appropriate technology can be developed in the short to medium term.

This conclusion also highlights that it will be essential to accelerate research and development investment into technologies that have the potential to bring about both emission mitigation and productivity benefits for beef producers. This will be important both to assist the national effort to meet future emission reduction targets, and also to assist the beef industry to remain internationally competitive despite higher operating costs that will inevitably be associated with domestic carbon policies.

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