Submission to the Australian Government Department of Climate Change and Energy Efficiency

Design of the Carbon Farming Initiative Consultation Paper

Australian Wool Innovation

January 2011

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Contents

1 Executive summary

Introduction

Australian Wool Innovation (AWI) is the research, development and marketing organisation for the $2.3 billion Australian wool industry. AWI receives statutory levies from Australian wool growers and the federal government to invest in research, development and marketing for the industry, and its objectives include enhancing the profitability, international competitiveness and sustainability of the Australian wool industry.

AWI notes there is significant uncertainty and debate in the scientific community regarding anthropogenic global climate warming, including the roles played by carbon dioxide and methane produced in grazing systems. AWI does not accept *prima facie* that the carbon dioxide and methane by-products of ruminants such as sheep are scientifically proven contributors to anthropogenic climate change, or should be considered a form of carbon 'pollution'.

Nonetheless sheep production occupies 18% of Australia's agricultural land area[1], and as owners and custodians of these lands, Australia's sheep producers already play a vital role in storing atmospheric carbon. This is achieved through efficient and productive agricultural and land management practices that lead to capture and storage of atmospheric carbon on-farm in vegetation and soils for food and fibre production.

AWI supports mechanisms to reward farmers for agricultural activities which, result in carbon capture and storage on farm, in soils, vegetation, food and fibre.

Accordingly, AWI acknowledges the intent of the Carbon Farming Initiative (CFI) to provide access to landholders wishing to voluntarily participate in a carbon offsets scheme. However, AWI expresses concern that, due to insufficient accepted methodologies across the broad range of beneficial agricultural and land care practices, there are few, if any real and practical options for farmers to participate in carbon markets other than through agroforestry. This could result in productive farmland being taken over by agroforestry and have a significant negative impact on Australia's sheep and wool industry. As such AWI strongly recommends the need for significant modifications to the CFI to ensure compatibility between efficient, sustainable and productive farming and future carbon markets

Context and design principles

The objective of the CFI to provide a mechanism for contributions by Australian food and fibre producers to greenhouse gas mitigation has to be considered in the context of the broader socio-economic contribution of farmers and value of rural Australia to the national interest through

[1] http://www.anra.gov.au/topics/agriculture/sheep-wool/index.html (accessed 20 January 2011).

productivity and natural resource outcomes as expressed in the National Research Priorities and Rural Research and Development Corporation (RDC) Priorities.

Accordingly, the design of the carbon credit offsets scheme should facilitate emissions abatement and encourage broad participation by farmers, while not jeopardising Australia's long-term food and fibre security or causing deleterious impacts on Australia's economy or socio-economic fabric, especially that of rural and regional Australia. In particular, the CFI should not impose undue cost or regulatory burdens on either participants or the Commonwealth, and must be complementary to long-term productivity and profitability growth for the agriculture sector.

Accordingly, AWI propose a set of guiding principles which should underpin the design of the CFI, and be considered when evaluating the scheme. Simply put, the CFI should:

1. Be complementary to Australia's long-term food and fibre security;

2. Avoid deleterious impacts on Australia's economy or socio-economic fabric, especially that of rural and regional Australia; and

3. Minimise imposition of undue cost or regulatory burdens on participants or the Commonwealth, while facilitating the efficient operation of the carbon markets;

AWI Conclusions

AWI acknowledges the important current and future role Australia's woolgrowers play in the natural atmospheric carbon cycle through landcare and agricultural practices that capture and store carbon in soils, vegetation, food and fibre.

AWI supports mechanisms to reward farmers for beneficial practices and acknowledges the need for integrity of offsets in the context of international obligations and market trading of Kyoto or non-Kyoto credits, but concludes that the CFI, as presented in the consultation paper, offers little in the way of practical, cost-effective options for participation by woolgrowers. A scheme design in which the only practical option for project eligibility on agricultural land is reforestation would not achieve broad participation, would not realise the abatement potential of the land sector, and would be potentially contrary to the long-term interests of the wool industry, National Research Priorities and the Rural RDC Priorities.

AWI's assessment is that it would be very unlikely that woolgrowers would find it economically viable to participate in the CFI due to:

1. The difficulty in meeting proposed eligibility criteria for additionality and permanence;

2. The likelihood that the cost of implementing emissions mitigation or removals projects on-farm, in the absence of productivity gains, would exceed revenue from sale of CFI offset credits;

3. The uncertain but potentially high transaction costs, and complex and demanding leakage and administrative obligations for project proponents; and

4. The lack of landholder knowledge and local enterprise networking, to facilitate aggregation and lower costs to participating individuals.

AWI's conclusions are underpinned by the results of detailed economic modelling, including use of Australian Farm Institute FarmGAS calculator, which shows that carbon credit prices much higher than projected (e.g. by ABARE) would be required to make the mitigation projects viable. In summary:

- AWI modelled representative wool sheep enterprises in the high rainfall and sheep/wheat zones, where each enterprise could undertake one of three well-researched abatement strategies applicable to wool growers - feeding dietary oils; using coated N fertilisers to reduce nitrous oxide from soils; enterprise mix), while achieving zero productivity gains (to be consistent with CFI additionality assumptions), or establishing tree plantations;
- CFI project implementation costs were set a minimal level, and transaction costs excluded;
- Using carbon credit prices of $20 or $40 per tonne of CO_2-e, enterprise gross margins would be substantially reduced under almost all scenarios, and only forestry projects would be the economically sensible mitigation strategies for woolgrowers.
- For 'break-even' to occur, a carbon price in excess of $250 per tonne CO_2-e would be required for most scenarios. If transaction costs were included, the 'break even' carbon price was as high as $12,000 per tonne of CO_2-e.

In summary, despite assuming minimal implementation costs and zero transaction costs, the CFI appears under most circumstances to be uneconomic for woolgrowers to participate - except in the case of establishing agro-forestry projects on former grazing land. Accordingly, AWI believes that the CFI scheme as proposed has the potential to drive land use change from livestock agriculture toward agro-forestry, while committing participants to zero or low productivity gains in other parts of the farm enterprise. The long-term impacts for Australia are likely to be negative except in the sense of achieving nominal national carbon targets – there will be negative impacts on long-term food and fibre production, deleterious to the best interests of Australian farmers and the rural community.

AWI recommendations

AWI proposes a more flexible approach to assessing eligibility of agricultural projects that presents more practical additionality, permanence and leakage criteria that can be met in viable food and fibre enterprises. Encouraging broad participation in abatement activities with associated environmental and productivity co-benefits, would also succeed in achieving greater emissions mitigation in national accounts.

Specifically, AWI recommends:

1. the definition of additionality be revised to facilitate landholder achievement of long-term increase in productivity and carbon abatement/sequestration;

2. the definition of permanence be revised to be more flexible and achievable by landholders than the proposed 100-year 'gold standard';

3. a more flexible definition of leakage and approach to leakage boundaries (spatial, temporal and enterprise) to avoid incompatibility between CFI participation and long-term growth in productivity in agricultural lands in Australia;

4. detailed investigation of the potential impacts of CFI activities on landholders and rural and regional communities be conducted prior to commencement of any such scheme. Any review should include specific assessment of the impacts of projects on prime agricultural land, water availability and biodiversity. In addition, farmers and other stakeholders should have access to information and independent assessment, supported by government resources, if they have concerns about the impacts of forestry offset activities, and;

5. development of methodologies applicable to individual producers, regions or industries, to reward a broad range of beneficial agricultural practices and activities and to enable broad participation, with flexibility to engage with Kyoto-compliant or non-compliant offset markets.

Research opportunities

Reflecting AWI concerns about key elements of the proposed CFI, particularly the risks of either low landholder participation or negative consequences for the long-term viability of Australia's agricultural industries and rural and regional communities, a number of research opportunities are proposed. These include research aimed at:

1. Improvement in our capacity to predict the quantitative and qualitative impacts of climate change policies on the land sector (particularly socio-economic impacts), including:

    a. the implications of mitigation policies to induce land use change from agriculture toward agro-forestry, and the potential impacts on demand for prime agricultural land and Australia's food and fibre security;

    b. the implications of varying critical technical definitions, such as those for additionality, permanence, or leakage, on scheme participation and resultant land use changes;

    c. generation of a regionally representative array of case studies evaluating alternative modes of engagement with schemes such as the CFI, and the likely cultural and socio-economic barriers and impacts, for potential communication to landholders.

2. Systematic aggregation of data defining common land-use practices, on a regional and farming system basis, for the purposes of informing design and evaluation of projects.
3. Development of methodologies applicable to sheep enterprises in production areas across Australia. Such activities, which AWI would consider co-investment in, should be informed by ongoing review of existing international projects and methodologies which could apply to Australian landholders, whether these be Kyoto-compliant or not.

In terms of resource opportunities AWI believes significant additional funds should come from Government sources, to support the development of a broad range of methodologies which encourage the dual outcomes of carbon mitigation and efficient and sustainable production. Traditional Rural RDC funds may not be useable until the potential conflict between the CFI and the Rural RDC Priority to improve productivity and profitability of existing industries is overcome.

2 Rationale for AWI's comments on the proposed design of the Carbon Farming Initiative

This section outlines the case for the Carbon Farming Initiative to encourage woolgrowers and other landholders to participate in practical carbon offset activities with benefits for both sustainable food and fibre production and for meeting climate change mitigation targets. This objective underpins the comments from Australian Wool Innovation on the options presented in the consultation paper for design of the CFI.

Australian Wool Innovation (AWI) acknowledges the potential benefits of encouraging land sector abatement projects and believes that woolgrowers can make a positive contribution to meeting Australia's greenhouse gas emissions reduction targets.

The potential of the CFI to provide a mechanism for contributions by Australian food and fibre producers to reducing net greenhouse gas emissions is best considered in the context of the broader socio-economic contribution of farmers and the real value of rural Australia to the national interests. Farm-related businesses account for 17% of national employment and 12% of GDP (ABARES 2010[2]). However, while regional and rural Australia is home to only about 30% of the population, this sector manages the majority of the natural resources, environmental heritage and food and fibre production for the whole nation. Excluding the six state capital cities, agriculture and its related economic sectors made up 17.2% of regional GDP and 24.2% of regional employment[3]. In summary farmers provide:

- Stewardship of approximately 80% of Australia's land mass, including in excess of 50% where no alternative production value is practical;
- Social and economic underpinning of rural communities, and;
- Significant contribution to global food and fibre security, including through Australia's position as the largest exporter of fine wool, second largest exporter of sheep meat, and second largest exporter of beef.

AWI's submission on the CFI consultation paper responds to the invitation to provide comments on options for scheme design and propose alternatives for development of legislation and regulations. AWI wishes to support the development of a scheme that would provide opportunities for woolgrowers and other farmers to participate, but

[2] Outlook 2010. Mar 2, 2010, Australian Bureau of Agricultural and Resource Economics, Canberra, Australia

[3] (Econotech 2005)

believes changes are required to the design as proposed in the consultation paper to achieve this. Such changes would be complementary to productivity and profitability growth for the agriculture sector while providing for easy adoption to stimulate widespread carbon sequestration outcomes for the land sector.

2.1 AWI and the wool industry

AWI is the research, development and marketing organisation for the Australian wool industry. AWI receives statutory levies from the 29,347 Australian wool growers and the federal government to invest in research, development and marketing for the industry. AWI's objectives are to:

- increase information and knowledge through the targeted investment in on-farm and off-farm research and development;
- enhance the profitability, international competitiveness and sustainability of the Australian wool industry; and
- increase demand and market access for Australian wool through targeted investments in marketing and promotion.

These objectives provide the rationale for AWI to submit an analysis of the CFI and recommendations for refinements and research needs.

Australia occupies a critical position in the global wool economy – while Australian woolgrowers supply around one-quarter of the global supply of wool fibre of all types[4], they produce around 50% of specific wool types utilised in the US$82 billion apparel wool industry, probably receiving around 70% of consumer investment in wool apparel[5].

The Australian wool industry also makes a substantial contribution to the Australian economy, responsible for around 7% of the value of Australian farm exports in 2008/09, or 0.8% of total exports[6].

The wool industry globally can potentially make a substantial contribution to emissions abatement – the majority of wool processing occurs in developing countries where Clean Development Mechanism (CDM) and other mechanisms are relevant. Notwithstanding these abatement opportunities, the well documented benefits of wool in insulation of buildings can also contribute to improved energy efficiency and therefore reduced heating and cooling energy use.

In addition, the wool fibre has unique and potentially valuable properties in an environmental sense – durable and non-flammable, wool fibres are 50% carbon by weight[7]. Expressed in terms of carbon dioxide (CO_2) equivalents, each kilogram of greasy wool equates to around 1.3

[4] ABARE, 2009.

[5] Swan, P.G. (2010), "The future for wool as an apparel fibre", In: The International Sheep and Wool Handbook (Ed. D. Cottle), Nottingham University Press, ISBN 978-1-904761-86-0.

[6] ABARE, 2009

[7] Höcker, H. 'Fibre Morphology' in Wool: Science and Technology, ed. Simpson, W.S and Crawshaw, G.H, Woodhead Publishing Limited, Cambridge, 2002, p.60-79

kgs of CO_2 equivalents, and the 2009 Australian wool clip thus represents around 500 million kgs of CO_2 equivalents captured and stored from the contemporary atmosphere[8].

2.2 The importance of encouraging participation by woolgrowers in the CFI

Potential for abatement in wool growing regions

Wool production continues to be one of Australia's most important agricultural industries, representing a forecast $2.3 billion in export income in 2009-2010.

The distribution of wool production in Australia is extensive (Figure 1). The current sheep flock of 71 million occupies some 18% of Australia's agricultural land mass[9], with approximately 30% of the flock in the high rainfall zone (HRZ), 55% in the sheep/wheat zone (SWZ) and 15% in the pastoral zone. The natural resource base of soil, water and vegetation that provides the fundamental basis on which the wool industry continues to build significant economic and social benefits for the nation, also provides abatement opportunities to assist in meeting Australia's climate change policy goals.

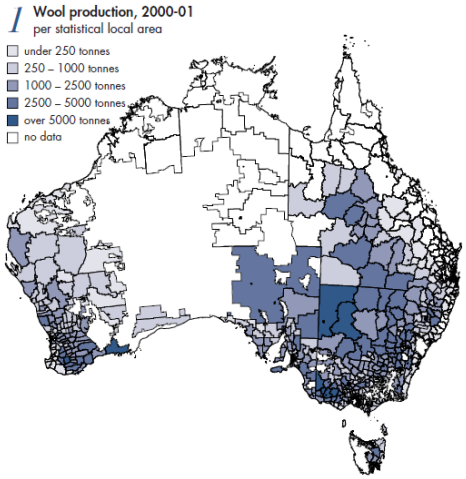

Figure 1. The distribution of wool production in Australia.[10].

Australia's extensive grazing industries are already demonstrating that rural landscapes can be managed to effectively support profitable food and fibre enterprises, while sustainably caring for the natural

[8] Dr Paul Swan, personal communication, 18 November 2010

[9] http://www.anra.gov.au/topics/agriculture/sheep-wool/index.html (accessed 20 January 2011).

[10] Barrett D., Ashton D., Shafton W. (2003) Australian Wool Industry 2003. ABARE Research Report 03.5

environment and supporting rural communities. Sheep and cattle farmers understand that good environmental management, e.g., maintaining groundcover and soil health and effective control of pests and weeds, not only increases productivity but delivers benefits to the natural ecosystems, including maintaining or increasing biogenic carbon stocks. Wool growers overwhelmingly demonstrate a sense of pride in their farms and a desire to see their assets passed on to future generations in better condition and AWI's research and development program as set out in the 2010 – 2013 strategic plan supports goals of increasing productivity and profitability, responsible natural resource management and contributing to reducing greenhouse gas emissions both on- and off-farm.

2.2.1 Limited Options for GHG abatement for woolgrowers

AWI notes there is significant uncertainty and debate in the scientific community regarding anthropogenic global climate warming, including the roles played by carbon dioxide and methane produced in grazing systems. AWI does not accept *prima facie* that the carbon dioxide and methane by-products of ruminants such as sheep are scientifically proven contributors to anthropogenic climate change, or should be considered a form of carbon 'pollution'.

Given the scientific uncertainties, it is critical that any Commonwealth-implemented scheme that seeks to reduce the methane and carbon dioxide emissions from agricultural land is designed in such as way as to minimise the risk of negative impact on Australia's socio-economic fabric, especially the communities of regional and rural Australia.

While the scientific community seeks to address uncertainties, AWI is supporting the Reducing Emissions from Livestock Research Program under the Australian Government Climate Change Research Program; this is exploring a range of options to decrease the emissions intensity of ruminant food and fibre production. However quantified mitigation in farm systems for various measures is currently uncertain.

There is also potential to increase the amount of carbon stored on-farm in biomass and in soils. Eligible reforestation projects provide Kyoto credits while soil carbon sequestration provides non-Kyoto credits that are traded in some voluntary markets. Quantification of the potential credits in 'removals' projects are currently uncertain, particularly on the large areas of pastoral country. Variable and low rainfall and infertile soils limit sequestration potential per unit area, but the extent of grazing properties means the potential total carbon offsets may be substantial. It is in the interest of woolgrowers to understand what carbon offset credits may mean for their business. Because many operate mixed enterprises, benefits for woolgrowers are not exclusive to one commodity but in many cases also have impacts on other livestock and grain production.

In summary, while research is actively continuing into methods for reducing emissions and storing carbon in agricultural lands, there appear to be limited options for woolgrowers to contribute to emission abatement.

2.2.2 Design of the CFI

Domestic and international offset schemes

The CFI was initiated to encourage greenhouse gas abatement and give primary producers (farmers, livestock producers, forest growers and other land managers) access to markets for carbon credits.

The government plans for the CFI to commence on 1 July 2011 with provision for administering the National Carbon Offsets Standard (NCOS) voluntary domestic credits as well as credits that can be counted towards Annex 1[11] country Kyoto Protocol targets (non-Kyoto and Kyoto CFI credits, respectively). Future international agreements may allow some or all NCOS voluntary offset activities to provide internationally recognised credits. For this reason the CFI is designed to provide rigorous accounting of non-Kyoto as well as Kyoto credits and to ensure the integrity of all offsets. CFI credits for activities eligible for Kyoto Protocol national accounts are fungible with ERUs[12] or CERs[13] providing a market through registries held in other Annex 1 countries. In addition, implementation of the CPRS or alternative carbon-pricing policy in Australia, if inclusive of offsets, would be expected to provide a price incentive for eligible CFI credits.

Referenced International Offset Systems

Alberta Greenhouse Gas Reduction Program

Alberta was the first jurisdiction in North America to introduce regulations requiring large facilities to reduce their greenhouse gas emissions, and although the scheme is by design not Kyoto-compliant, Kyoto-compliant projects can and have been registered. Offsets are one of the mechanisms regulated entities can use to reach compliance under the *Specified Gas Emitters Regulation*, and offsets must be Alberta based and meet a number of criteria in order to be used for compliance with the regulator. An offset must originate from a voluntary action (approved project-type) in a non-regulated sector or operation. Additional criteria include:

- Have a government approved quantification protocol for project-type;
- Result from actions taken on or after January 1, 2002;
- Occur on or after January 1, 2002;
- Be real, demonstrable, quantifiable;
- Not be required by law;

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[11] http://unfccc.int/kyoto_protocol/items/2830.php,(accessed 20 January 2011)

[12] ERU (Emission Reduction Unit) is a unit of 1 metric tonne of carbon dioxide-equivalent (CO_2-e) GHG emissions reduction or removals accounted for under Kyoto Protocol rules for Joint Implementation projects.

[13] CER (Certified Emissions Reduction) is a unit of 1 metric tonne of carbon dioxide-equivalent (CO_2-e) GHG emissions reduction or removals accounted for under Kyoto Protocol rules for Clean Development Mechanism projects.

- Have clearly established ownership;
- Be counted once for compliance purposes; and
- Be verified by a qualified third party.

The Alberta Scheme allows for a range of project activities relevant to the agriculture sector including:

- Reducing enteric methane from beef cattle (dietary oils, reduced days on feed, reducing cull age)
- Reducing nitrous oxide emissions from croplands
- Biogas – using agricultural waste
- Pork – innovative feeding and manure management
- Adoption of reduced or no-till

These projects include both Kyoto and non-Kyoto compliant projects, and the majority of registered agriculture projects to date have been in the tillage activity.

Under the Alberta Greenhouse Gas Reduction Program offsets representing 4.5 Mt CO_2-e were traded in 2009 at an average price of US$13.5 per tonne. This was equivalent to only 0.5% of carbon credits by volume and 2.5% by value of the total North American carbon market.

US Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) [14] was the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. Ten north-eastern and Mid-Atlantic states have capped and will reduce CO_2 emissions from the power sector 10% by 2018.

RGGI Participating States currently allow regulated power plants to meet up to 3.3% of their compliance obligations using offsets. Prescriptive regulatory requirements aim to ensure that awarded CO_2 offset allowances represent CO_2-e emissions reductions or carbon sequestration that is real, additional, verifiable, enforceable, and permanent. Projects in the five listed project categories are eligible for the award of CO_2 offset allowances if they meet all requirements in participating state regulations:

- Landfill methane capture and destruction
- Reduction in emissions of sulfur hexafluoride (SF_6) in the electric power sector
- Sequestration of carbon due to afforestation

[14] http://www.rggi.org/home (accessed 20 January 2011)

- Reduction or avoidance of CO_2 emissions from natural gas, oil, or propane end-use combustion due to end-use energy efficiency in the building sector
- Avoided methane emissions from agricultural manure management operations

Eligibility is determined by RGGI based on requirements for (1) Consistency, Monitoring and Verification, and (2) Additionality.

Consistency is required to demonstrate that the project meets relevant state regulatory requirements, and ongoing monitoring and verification reports must demonstrate the achievement of emissions reductions or carbon sequestration prior to any award of offset allowances by an RGGI participating state.

The RGGI includes strict requirements for additionality, defined as achieving greenhouse gas emissions reductions from an offset project that would not otherwise have occurred in the absence of the offsets program, since this is seen as the key to ensuring offsets projects result in real emissions reductions in the context of a cap-and-trade program. Project additionality, emissions baselines and reductions are covered by state regulatory requirements. A 'Model Rule' is developed with the objective of materially-consistent regulations, for comparable offset quality across the RGGI participating states and fungibility of CO_2 offset allowances. State regulations also require that the offset activities are not required by law or regulation and that they not receive incentives from associated programs. In addition, projects must also meet category-specific benchmarks and performance standards designed to ensure that approved offset project represent activities that significantly exceed standard market practice.

Climate Action Reserve

The Climate Action Reserve (CAR)[15] is a national offsets program working to ensure integrity, transparency and financial value in the U.S. voluntary carbon market. Its objective is to ensure the quality of the standards registered under the Reserve so that emissions reductions associated with projects are real, permanent and additional. The associated Climate Action Registry and Californian Climate Action Registry provide a reporting framework to facilitate trading.

Participation: The CAR system recognises selected land sector projects, e.g. methane capture in intensive livestock production systems. By December 2009, CAR had 367 registered projects and had delivered 8,410,173 Climate Reserve Tonnes (CRTs) representing abatement of 8.41 M t CO_2-e. Livestock projects contributed 151,903 t CO_2-e. It is important to recognise that US is not a signatory to the Kyoto Protocol.

Additionality: The CAR has a requirement for additionality that is similar to that proposed for the CFI. It offers Standardised Additionality Tests which are similar to the Additionality proposed CFI Positive List.

[15] http://www.climateactionreserve.org/ (accessed 20 January 2011)

However, CAR is exploring how to introduce an approach to additionality that is more practical for agriculture recognising that while it is desirable to have consistency across projects through a general additionality standardisation test, there will be need to be workable solutions specific to the type of agriculture project and data availability.

Research and Development: The CAR has identified the need to invest in establishing common practice and data for agricultural projects with information needing to be 'systematically collected and documented, as opposed to anecdotal accounts.' Broad participation in the CFI will similarly require investment in research and data and information collation on a regional and farming system basis.

Portuguese Carbon Fund

In June 2009, the Portuguese Government allocated €8.5million to soil carbon sequestration in sown, bio-diverse pastures. The Portuguese Carbon Fund was established to administer these funds. Under the Fund, the Terraprima project was set up, aggregating farmers to carry out on-farm activities which sequester soil carbon. About 400 farmers are participating in the Terraprima project, collectively establishing 42,000ha of improved pastures. Over three years, it is expected this project will deliver 0.9Mt CO_2-e sequestration.

Portugal has opted into grassland management under Article 3.4 of the Kyoto Protocol and activities and emissions and removals of greenhouse gases from agricultural soils contribute to meeting Portugal's Kyoto target. To ensure compliance farmers must fulfil seven obligations until 2012, and in turn receive payments from the government for each hectare of improved pasture as a one-off payment - €200 per ha established in 2009 which dropped to €150 in 2010 equating to approximately €46.80 and €31.90 per tonne CO_2-e for 2009 and 2010, respectively.

The additionality requirement associated with soil carbon sequestration is to some extent managed by enforcing a requirement that the financial support must be deemed important for the establishment of the improved pastures, however there is also a requirement that financial support must not be crucial for longer-term pasture maintenance, (i.e. maintenance of the project must be financially viable in the longer term) as if this was not the case this would be a threat to the permanence of the sequestration.

The difficulty associated with proving permanence of biosequestration activities such as soil carbon sequestration is demonstrated by the Terraprima Project soil carbon measurements. Soil carbon measurements for natural pastures in Portugal in 2004 and 2005 showed sequestration of 7.0tCO_2/ha in 2004 and emissions of 1.8t CO_2/ha in 2005. This difference is because 2005 was the driest year in Portugal in the past 140 years[16].

[16] Aires L.M., Pio C.A., and Pereira J.S. 2008, Carbon dioxide exchange above a Mediterranean C3/C4 grassland during two climatologically contrasting years, *Global Change Biology*, Vol. 14, pp. 539-555.

The Portuguese Terraprima government is attractive to farmers because of the government guaranteed payment and co-benefits for productivity with improved biodiverse pastures. However permanence remains an issue for farmers if there is an international agreement beyond 2012, since it is likely the government would enforce land management activities which limit the risk for the government of subsequent loss of sequestered soil carbon.

Insights from Offsets Aggregators

Regardless of any Australian scheme, landholders and managers already have the opportunity to participate in established offshore schemes. The key constraints to uptake are the lack of Australian methodologies, the low price for offsets for individual landowners and managers, and social and knowledge constraints preventing the aggregation across properties by groups of landowners/managers to spread administrative costs.

2.3 Key findings

The Australian Wool Industry is important to the economy and management of approximately 18% of the continental land mass. The Australian wool industry also occupies a critical position in the global wool apparel industry, dominating fibre supply.

Sheep utilise enteric fermentation to provide food and fibre products from environments and pastures where cropping and other agricultural activities are not viable.

Despite the positive role that sheep grazing systems play to capture and storage of atmospheric carbon in soils, vegetation, food and fibre - there are currently few practical, cost-effective options for wool-growers to participate in carbon markets, and AWI is investing in research in collaboration with other livestock industries and government

AWI supports recognition of the potential positive contribution by woolgrowers to national abatement objectives, but appropriate design features of the CFI will be critical to ensure grower reward and participation.

Full evaluation of international carbon offset schemes should be undertaken to provide insights into policies for carbon markets and how best to provide a framework appropriate to agricultural producers that encourages activities that mitigate emissions but minimise risk and deliver co-benefits and are complementary to a profitable farm enterprise and strong rural communities.

Beyond CFI design, there are implementation constraints such as lack of landowner knowledge and local enterprise networking to facilitate aggregation.

3 AWI's comments on the Design of the Carbon Farming Initiative Consultation Paper

This section provides comments by AWI on the design of the Carbon Farming Initiative as presented in the consultation paper released on 15 November 2010. Comments also reference the *Carbon Credits (Carbon Farming Initiative) Bill 2011 Exposure Draft 22/12/2010* and the Carbon Farming Initiative: Draft Guidelines for Submitting Methodologies released on 4 January 2011. Comments are directed specifically to the eight issues in the consultation paper on which stakeholders were invited to comment where relevant to the particular interests of woolgrowers.

Scheme Design Principles

AWI's comments refer to Section 3 of the CFI consultation paper. Clause 124 of the exposure draft legislation and the draft methodology guidelines:

The two guiding principles for design of the Carbon Farming Initiative are:

1. Ensuring environmental integrity – credits that represent genuine and additional emissions abatement will have a higher market value and help address climate change; and

2. Enabling broad participation – clear and simple rules will keep administrative costs low and ensure that farmers and other land owners and managers can benefit from the scheme.

The objectives of these guiding principles are clear and address key aspects of eligibility for and integrity of offset credits applicable to domestic voluntary and international carbon markets. However, for the particular case of offsets from the land sector additional guiding principles should be acknowledged, including that the CFI should:

1. Be complementary to Australia's long-term food and fibre security;

2. Avoid deleterious impacts on Australia's economy or socio-economic fabric, especially that of rural and regional Australia;

3. Minimise imposition of undue cost or regulatory burdens on participants or the Commonwealth, while facilitating the efficient operation of the carbon markets.

In addition to the high level principles, effective implementation and broad participation will require methodologies that are based on the best science, and are fair, practical and regionally relevant. Ongoing review and engagement with stakeholders, including farmers and other landowners and managers, and industry bodies such as RDCs that have detailed understanding of on-ground practices and the social and business networking barriers to uptake.

Scheme Coverage

AWI's comments refer to Section 4 of the CFI consultation paper and Clauses 5,11,25,44 and 45 of the exposure draft legislation and the draft methodology guidelines:

AWI supports broad coverage across the land sector but notes that the list includes activities for which there are currently not well-established abatement practices or monitoring, reporting and verification methodologies. Many of these activities are currently not widely adopted or implemented on large scales because it would be too costly to do so. Calford et al. (2010)[17] suggest that abatement activities related to savannah burning and improved fertiliser management (but not use of inhibitors) are the most likely activities to be carried out at the scale of extensive livestock production. In general there are a limited number of activities that provide economic and practical options for woolgrowers, particularly in pastoral regions, with the exception of reforestation and possibly avoided deforestation and soil carbon sequestration activities.

Landfill projects: Landfill facility (legacy waste abatement) activities do not fit well with other projects listed in Section 44 of the Exposure draft legislation and their inclusion in the CFI scheme is questionable. Landfill facilities and associated abatement projects are not generally available to farmers, forest growers and non-industrial land managers.

Regional communities, water and biodiversity

AWI's comments refer to Section 6 of the CFI consultation paper and Sections 5, 25(4) and 352 of the exposure draft legislation and the draft methodology guidelines:

As a major production system on 18% of Australia's agricultural land mass, wool growing is well-placed to continue to contribute to meeting the multiple production and environmental goals for our landscapes given appropriate policy settings.

Managing the changing and complex pressures on land, water and biodiversity systems while meeting food and fibre production objectives and ensuring the economic and social well-being of rural and urban Australia is recognised by governments at all levels and must be a consideration if the CFI is to achieve its objectives.

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[17] Calford E.M., Gurney A., Heyhoe E. And Ahammad H. (2010) *The effects of an emissions offsets scheme on Australian agriculture* ABARE Issues Insights 10.2 Canberra

Conversion of agricultural lands: AWI recognises the value of environmental stewardship by woolgrowers of the lands they manage and welcomes the opportunity for woolgrowers to access credits. Offset markets could increase the capacity to undertake environmental plantings in environmentally sensitive areas and lands of marginal productive value for the benefit of current and future Australians.

The consultation paper highlights possible benefits of land sector abatement activities for farm productivity, biodiversity and natural resource management. However as noted by GHD Hassall (2010)[18] there are a limited number of models that predict the likely rate and scale of land use change from agriculture to carbon sink plantations, and the differences and other limitations such as the inability to predict broader environmental and socioeconomic impacts, mean that model results provide only indicative projections. The benefits of increased soil carbon levels on soil health and of strategic environmental plantings for biodiversity and protection of sensitive areas such as riparian zones are supported by robust science.

The consultation paper does not provide an approach to address potential competition for water and good agricultural land. Existing pressure to find appropriate balance between food and fibre production and biosequestration projects is well-documented in independent studies and government modelling and reports underpinning stakeholder concerns. For example:

- The PMSEIC (2010a)[19] report on *Challenges at Energy-Water-Carbon Intersections* lists three risks/uncertainties associated with afforestation for carbon credits and bioenergy: (1) Transport costs; (2) Possible displacement of food production areas; (3) Decreased water flow to catchments. This report highlights the need to integrate landscape functions, including food, fibre and wood production, water production and use, bioenergy production and biosequestration, conservation of environmental assets and economic and social wellbeing to achieve long-term resilient land systems and resolve tensions;
- GHD Hassall (2010)[20] identified the potential for significant impacts of carbon sink plantations in agricultural catchments on water availability and bushfire risk and stressed the need for approval processes to seek to mitigate not only negative environmental impacts but also socioeconomic impacts of land use change at regional and farm scales.

Environmental plantings on marginal lands are generally characterised by slower growing, lower biomass species that consequently also provide lower carbon credit benefits than plantations on more productive lands. Analysis of the impacts of an offset market for reforestation credits on land use must take into account the uncertainty in pressure

[18] GHD Hassall (2010) *The Implications of Greenhouse Mitigation Policies on the Demand for Agricultural Land.* Research Report, Australian Farm Institute, Surry Hills, Australia.

[19] PMSEIC (2010a) *Challenges at Energy-Water-Carbon intersections.* Prime Minister's Science, Engineering and Innovation Council, Canberra, Australia. (page 45)

[20] GHD Hassall (2010) *The Implications of Greenhouse Mitigation Policies on the Demand for Agricultural Land.* Research Report, Australian Farm Institute, Surry Hills, Australia.

on arable land and other productive lands in Australia. Burns et al. (2009)[21] estimate that under a higher carbon price (ABARE CPRS-15 scenario) approximately one-third of afforestation would occur in the HRZ with 44% in the SWZ and the remainder in the pastoral zone. GHD Hassall (2010) reported that the majority of carbon sink plantations to date are in regions of low to medium annual rainfall (<600 mm).

In summary, there is potential for reforestation offset projects to be established on land currently used for wool production but, to be viable, a high carbon price is needed due to the low yields on less productive lands.

Impacts of reforestation on water availability: Conversion from non-tree to forest cover will result in reductions in run-off particularly as the trees approach maturity (i.e. 15 – 20 years after planting)[22, 23]. While the impacts are likely to be greater in high rainfall zones, there could also be flow-on effects if agricultural lands (HRZ and SWZ) are converted to commercial forests resulting in sheep grazing displaced into more marginal zones.

Biodiversity and integrated impact: An integrated approach for approval of offset projects is needed to ensure there is sufficient protection of natural and agricultural resources. At the same time the scheme should avoid being overly restrictive and unreasonably delaying or preventing eligible offset projects.

The CFI design includes a proposal for a three-pronged approach to addressing potential risks to prime agricultural lands, water and biodiversity. It is proposed that there could be a requirement for projects to:

- Obtain regulatory approvals at all levels of government;
- Consider alignment with regional NRM plans; and
- Demonstrate no reliance on destruction or degradation of existing native forests.

The Draft Methodology Guidelines, however, do not provide any guidance for the proponent on this approach and does not include consideration of this approach by the Domestic Offsets Integrity Committee (DOIC) or system administrator. The administrative complexity of this approach would add significantly to the process of registering a project and is further complicated by the fact that the majority of state and local jurisdictions do not themselves have processes to deal with carbon sink projects.

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[21] Burns K., Vedi J., Heyhoe E. And Ahammad H. (2009). *Opportunities for forestry under the Carbon Pollution Reduction Scheme (CPRS): an examination of some key factors.* ABARE Issues Insights 09.01, Canberra.

[22] Parsons M., Frakes I. and Gerrand A. (2007). *Plantations and water use.* Science for Decision Makers, August. (Cited in GHD Hassall (2010))

[23] GHD Hassall (2010) *The Implications of Greenhouse Mitigation Policies on the Demand for Agricultural Land.* Research Report, Australian Farm Institute, Surry Hills, Australia.

A further consideration is that the conservation and resource benefits of environmental plantings mean that sensitive areas are already being reforested. GHD Hassall (2010) estimated that the area of cleared land being revegetated with permanent plantings was about 100,000 ha per year. A strict interpretation of additionality rules may mean that these environmental plantings are defined as 'common practice' and new plantations may not be eligible for offset crediting as activities beyond business-as-usual.

AWI recommends detailed investigation of the potential impacts of CFI activities on landholders, and rural and regional communities, prior to commencement of any such scheme. Any review should include specific assessment of impacts of projects on prime agricultural land, water availability and biodiversity. In addition, farmers and other stakeholders should have access to information and independent assessment, supported by government resources, if they have concerns about the impacts of forestry offset activities.

Potential research and development activities include:

Improvement in our capacity to predict the quantitative and qualitative impacts of climate change policies on the land sector (particularly socio-economic impacts), including:

a. the implications of mitigation policies to induce land use change from agriculture toward agro-forestry, and the potential impacts on demand for prime agricultural land and Australia's food and fibre security;

b. the implications of varying critical technical definitions, such as those for additionality, permanence, or leakage, on scheme participation and resultant land use changes and;

c. generation of a regionally representative array of case studies evaluating alternative modes of engagement with schemes such as the CFI, and the likely socio-economic impacts, for potential communication to landholders.

In terms of resource opportunities AWI believes funds should come from Government sources, not traditional rural Research and Development funds until the conflict between the National Research Priorities, Rural RDC Priorities and potential CFI outcomes is addressed.

Additionality

AWI's comments refer to Section 7.1 of the CFI consultation paper and Sections 39 and 24(4) of the exposure draft legislation and the draft methodology guidelines:

The principle of additionality in a carbon offsets scheme is that credits can be given only for emissions reduction or removals that would not have occurred in the absence of the scheme. Under this principle, an offset should not be credited if the abatement activity was required by regulation or would have been undertaken anyway under a business-as-usual situation, e.g. for economic reasons. The rationale is that credits are awarded for abatement activities undertaken as a result of the creation of the offsets scheme.

While additionality appears straightforward, assessment of economic additionality is not simple and involves assumptions relating to financial, technological and social decision-making. There are a few precedents in other countries where offset schemes have included agriculture, including the Portuguese Carbon Fund for soil carbon sequestration in improved pastures, Alberta Scheme for a range of agricultural activities and the United States Regional Greenhouse Gas Initiative. Each of these schemes has an approach to try to achieve a balance between not crediting business-as-usual actions and providing incentives for new activities that achieve abatement in viable farming businesses.

The consultation paper describes a strict definition of additionality. To facilitate eligible projects the CFI would develop a 'Positive List' of activities identified as able to have their assessment streamlined because they clearly: (1) are not required by any legally binding mandate; and (2) result in no economic advantage to the proponent.

The draft methodology guidelines provide for these activities to be considered additional if they aren't commonly undertaken and either: (1) they are not financially viable without carbon credit incentives; or (2) there are technological or other barriers to adoption. A number of issues arise given these guidelines.

a. Defining what is 'common practice' is complex since it will vary regionally and will change over time. It will also be difficult to estimate what is 'financially viable' for an individual farmer and to generalise across different land management systems. Hence interpretation of the guidelines is subjective introducing uncertainties that will be a critical limitation to participation in the CFI.

b. Agricultural activities which result in carbon sequestration and are consistent with productivity or profitability gains are by definition ineligible, both within the project bounds, or outside if they result in emissions, despite the fact that these activities represent a carbon sequestration win:win for Australia. For example, use of rotational grazing or use of coated slow release nitrogen fertilisers, while currently not common practice, would potentially be considered ineligible if shown to provide productivity benefits, and therefore not included on the 'Positive List'.

c. The majority of agricultural activities that provide abatement also provide productivity gain but have not been widely adopted e.g. the rate and timing of nitrogenous fertiliser applications are important management factors affecting the efficiency of pasture growth response, costs and also potential loss of nitrogen as N_2O. A recent industry survey[24] of farm practices, however, indicate that many producers do not adequately manage rate and timing of application or fertilisers to pastures and over a third did not know their rate of application.

Another case study presented in the Appendix illustrates that to implement a mitigation project based on feeding dietary oils to reduce

[24] Meat and Livestock Australia (MLA) - unpublished

enteric methane emissions from a merino flock would not be economically viable at a carbon offset price of $20 or $40 per credit (i.e. per tonne CO_2-e emissions reduction). There are many assumptions in this modelling due to uncertainties in the science particularly of methane, policy and market settings but achieving a 10% reduction in emissions and earning 40 credits would result in the farm moving from a $50,000 gross margin to having a net loss. An offset price about two orders of magnitude higher would be expected for break even for this hypothetical project.

The CFI needs to overcome the interaction between additionality and leakage which means for those wanting to participate, a choice between agroforestry participation and long term productivity growth is required. This occurs because while the additionality definition affects the land within project boundaries and excludes activities which increase productivity, the leakage criteria prevents productivity increases outside of the project area (i.e the rest of the property, or neighbouring properties), if these result in increased emissions.

Other issues that add to the administrative complexity of additionality eligibility and reporting under the proposed design of the CFI are 'baseline' and 'variability'.

Baseline: Defining and projecting a without-project baseline scenario (Step 3 in the Methodological Guidelines) require regionally-relevant data and information and modelling capacity. In many cases this would require professional capacity. Investment by government in research and data development that provided for a more consistent approach would assist in streamlining project assessment, validation and reporting.

Variability and averaging: The methodology guidelines describe an averaging approach to estimating abatement where biosequestration is subject to variability resulting from climate variability or management cycles but do not include information on how a rolling average on a period of five or more years would be treated under the 3-year crediting period review.

Alternative approach to additionality

AWI considers there are opportunities for the land sector to achieve substantial reductions in net greenhouse gas emissions and sequester significant quantities of carbon in Australia, if eligibility is sufficiently flexible.

AWI recommends that the definition of additionality be revised to facilitate landholder achievement of long-term increase in productivity and carbon abatement/sequestration. One compromise approach under consideration in the USA (the Climate Action Reserve) is to discount carbon projects for the degree of commonality of the practice within a region – while this represents an attempt to address the issue, more fundamental change is required in order to address the present incompatibility between the CFI definition of additionality and long-term farm productivity gains.

The challenges of encouraging aggregated participation of a large percentage of land managers in regional or industry activities could be

addressed through existing capacity in regional groups (NRM groups or CMAs) or on behalf of farmer, Landcare or industry groups (with consideration of the costs of belonging to such groups).

Permanence

AWI's Comment refer to Section 7.2 of the CFI consultation paper and Sections 16, 31-32, 79-83 and 89-93 of the exposure draft legislation and the draft methodology guidelines:

It is impossible in practice to guarantee permanence of land sector bio-sequestration offsets and AWI suggests the CFI recognise a range of activities able to be undertaken by woolgrowers and other farmers that store carbon in soils and vegetation for a period of time. Without a more flexible approach than that presented in the consultation paper there would be little incentive for farmers to enter into offset project agreements.

Reforestation projects allow for carbon stocks to be easily monitored and visibly maintained (or replaced) for a period of 100 years. In particular environmental plantings on marginal lands may not significantly restrict management of productive lands. Other potential sequestration projects would impact on the flexibility needed in agricultural systems, such as converting a defined area of a mixed farming enterprise in the sheep-wheat zone to continuous no-till grain production as a soil carbon sequestration project for the next 100 years.

It is impossible for farmers to make very long-term enterprise commitments to land use change options. Farm businesses need to be able to respond to market demand and also the future climate and natural disturbances. Allowing credit for removals projects other than reforestation if biogenic carbon was stored for a period of greater than twenty years would enable participation by woolgrowers through activities such as rotational grazing that are currently being researched for evidence of an increase in soil carbon. These activities do 'buy time' for the development of mitigation technologies in other sectors, e.g. Stationary Energy, and hence contribute to decreasing global warming.

The carbon maintenance obligations likely to be placed onto title deeds and monitoring of those changes over time will increase the administrative burden of the CFI over several changes of property or credit ownership. Any caveats on land have the potential to be viewed as a discount to the property's value. The use of an offset aggregator creates further legal complexity and cost regarding differences between property rights over soil carbon and the land holding it.

Risk Reversal Buffer: A 5% risk of reversal buffer that is uniform across all sequestration projects appears consistent with other comparable schemes However, the provision for adjustment of the risk of reversal buffer to reflect increased information appears very open-ended and it is not clear from the consultation paper whether adjustments can be retrospective and this should be clarified.

Avoided deforestation crediting period: A period of twenty years for issuing credits for avoided deforestation appears a reasonable compromise to avoid the need for detailed yield information for each region and species applicable to an individual project. Twenty years

represents a reasonable average for the period required for trees to reach their maximum biomass.

Because drivers toward agroforestry are strong in the CFI and there is little science to support other abatement strategies in terms of permanence, agroforestry will be the only option practically possible for most farmers. Potential land use change to carbon forestry would impact on Australia's long term food and fibre security.

AWI recommends the definition of permanence is revised to be more flexible and achievable by landholders than the proposed 100-year 'gold standard'.

Leakage

AWI's comments refer to Section 7.3 of the CFI consultation paper and Sections 100(4)(g) and 102 of the exposure draft legislation, and the draft methodology guidelines:

AWI recognises the need to ensure integrity of offsets credited to project activities but there is insufficient detail in the consultation paper on how to verifiably monitor leakage, for example, no spatial, temporal or enterprise boundaries for leakage are defined. Attributing a change beyond the control of the project proponent is frequently difficult. Together with defining a baseline, identifying and justifying estimates of leakage adds to the data needs, administrative complexity and transaction costs of participation by woolgrowers in the CFI.

AWI urges that the CFI principle of simple and clear rules and low administrative costs be adhered to in the design of the scheme. A strict interpretation of the leakage boundary rule may result in increased indirect emissions in the following scenarios:

> Leakage scenario 1: agro-forestry may increase regional tourism, possibly resulting in increased transport and service provider emissions, which could negate the abatement from the project.
>
> Leakage scenario 2: within a single business conducting a project e.g. an approved soil carbon project will not allow for increased stocking rates on the remainder of the property due to increased emission outside the project boundary.

AWI recommends a more flexible definition of leakage and approach to leakage boundaries (spatial, temporal and enterprise) is needed to avoid incompatibility between CFI participation and long-term growth in productivity in agricultural lands in Australia.

CFI processes

AWI's comments refer to Section 8 of the CFI consultation paper and Sections 5, 10-18, 20-25, 31, 35, 37, 48-56, 41-43, 46-47, 57-65, 66-69, 72, 74, 82-83, 142, 148, and 209-210 of the exposure draft legislation, and the draft methodology guidelines:

Crown leases and native title lands: Sections 41 to 43 of the draft legislation deal with applicable carbon sequestration rights and eligible interests. Since significant areas of pastoral lands are Crown leasehold AWI requests that clear explanations be provided of the eligible interests in carbon stocks in vegetation and soils in each State on Crown leases as well as on native title lands.

Co-benefits: AWI supports the consultation paper proposal that Governments work to develop a method for assessing and rating or accrediting the value of co-benefits associated with abatement projects. This is a positive consideration for woolgrowers and AWI is interested in supporting recognition of the NRM co-benefits of land management by woolgrowers.

Administrative costs: The reporting, crediting, auditing and verification processes underpin integrity of the offset scheme and the abatement credits. This CFI participation cost must be considered in assessing economic additionality of projects. Providing land managers with access to data and streamlined processes will facilitate broad participation.

Under the assumptions of potential costs for legal, auditing, reporting etc. using realistic though uncertain daily fees, the case study presented in the Appendix demonstrates that for a 1000 merino fine wool enterprise, the administrative costs would be higher than the income from offset credits at a price of $20 or $40.

Steps: The scheme processes diagram as given in the consultation paper and copied below (Figure 2) provides only a summary of the potential steps in project approval and registration.

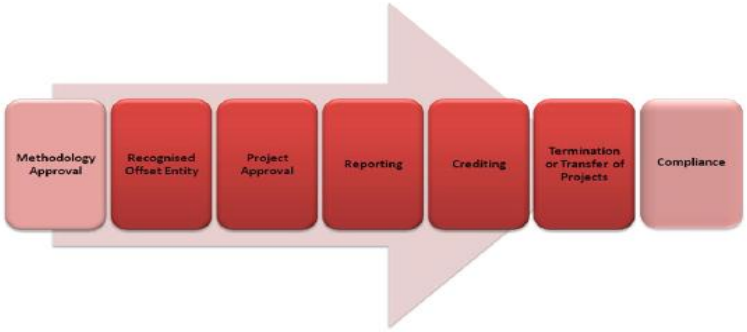


Figure 2: Scheme process summary from CFI.

For example there could be requirements on the proponents for information and justification at several steps of the project approval phase shown in the diagram, as in the following flow chart for possible steps to establish additionality, each of which could be time-consuming.

Methodology Development

AWI's comments refer to Section 9 of the CFI consultation paper and Sections 27, 39, 99-124 of the exposure draft legislation, and the draft methodology guidelines:

Development and approval of acceptable methodologies will be the critical 'hinge' element of the CFI in practice, and a critical interaction point between prospective purchasers of offsets and project proponents in Australia. To this end, consultation between government, project proponents and industry is essential to ensure that methodologies are practical and transparent, and the approach to disclosure of evidence appears appropriate. However, other aspects of the scheme should be reviewed within three years.

AWI believes that research is required in development of methodologies applicable to individual producers, regions or industries, to reward a broad range of beneficial agricultural practices and activities and to enable broad participation, with flexibility to engage with Kyoto-compliant or non-compliant offset markets.

3.1 AWI's assessment of participation by woolgrowers in the CFI

The CFI rules around additionality, permanence, leakage and associated costs are the main barriers to broad participation by the wool industry. Modelling suggests that an unachievable carbon price would be required to encourage participation from wool growers.

AWI notes there is significant uncertainty and debate in the scientific community regarding anthropogenic global climate warming, including the roles played by carbon dioxide and methane produced in grazing systems. AWI does not accept *prima facie* that the carbon dioxide and methane by-products of ruminants such as sheep are scientifically proven contributors to anthropogenic climate change, or should be considered a form of carbon 'pollution'.

Nonetheless, for the purposes of examining the financial implications of attempting to reduce emissions or sequester carbon in agro-forestry projects, AWI has conducted a preliminary analysis of the impacts of participation in the Carbon Farming Initiative on the financial and carbon calculation aspects of representative hypothetical wool growing enterprises. This modelling is detailed in the Appendix, and summarised in the following text.

AWI modelled wool sheep enterprises representative of the high rainfall and sheep/wheat zones, where each enterprise could undertake one of four well-researched abatement strategies applicable to wool growers:

- feeding dietary oils;

- using coated N fertilisers to reduce nitrous oxide from soils), while achieving zero productivity gains (to be consistent with CFI additionality assumptions);
- varying the enterprise mix; or
- establishment of an eligible forestry plot on approximately 11% of the farm land area (25 ha and 100 ha unallocated farm area respectively).

For the purposes of this analysis:

- CFI project implementation costs were set a minimal level, transaction costs were excluded, and sensitivity analysis not attempted;
- it was assumed that projects were eligible under provisions for additionality and that permanence and leakage definitions complied; and
- for the removals projects, it was assumed that the maintenance costs were negligible.

The analysis considered impacts out to 2020 (10 years), and did not attempt to consider longer term impacts, such as the potential impact of the CFI's Carbon Maintenance Obligation on land title transactions or land value.

Using carbon credit prices of $20 or $40 per tonne of CO_2-e, the analysis showed that enterprise gross margins would be substantially reduced under almost all scenarios, and only forestry projects would be the economically sensible mitigation strategies for woolgrowers. For 'break-even' to occur, a carbon price in excess of $250 per tonne CO_2-e would be required for most scenarios. If transaction costs were included the 'break even' carbon price was as high as $12,000 per tonne of CO_2-e – broadly consistent with the findings of Keogh and Davison (2010) that a high carbon price that would be required to make the mitigation projects viable for woolgrowers.

In summary, despite assuming minimal implementation costs and zero transaction costs, the CFI appears under most circumstances to be uneconomic for woolgrowers to participate - except in the case of establishing agro-forestry projects on former grazing land.

While acknowledging that there are many assumptions in this case study analysis of the financial and greenhouse gas implications for participation of an example woolgrower, the results do strongly reinforce the theoretical assessment that it is unlikely that many farmers, at least livestock producers, would benefit from registering projects in for carbon offsets. Even if more detailed modelling and information changed the results by an order of magnitude the costs are greater than the potential credit value.

4 Conclusions

AWI acknowledges the important current and future role Australia's woolgrowers play in the natural atmospheric carbon cycle through landcare and agricultural practices that capture and store carbon in soils, vegetation, food and fibre. AWI supports mechanisms to reward farmers for beneficial practices.

AWI notes there is significant uncertainty and debate in the scientific community regarding anthropogenic global climate warming, including the roles played by carbon dioxide and methane produced in grazing systems. AWI does not accept *prima facie* that the carbon dioxide and methane by-products of ruminants such as sheep are scientifically proven contributors to anthropogenic climate change, or should be considered a form of carbon 'pollution'.

AWI acknowledges the need for integrity of offsets in the context of international obligations and market trading of Kyoto or non Kyoto credits, but concludes that the CFI, as presented in the consultation paper, offers little in the way of practical, cost-effective options for participation by woolgrowers. A scheme design in which the only practical option for project eligibility on agricultural land is reforestation would not achieve broad participation, would not realise the abatement potential of the land sector, and would be potentially contrary to the long-term interests of the wool industry, National Research Priorities and the Rural RDC Priorities.

AWI's assessment is it would be very unlikely that woolgrowers would find it economically viable to participate in the CFI due to:

- The difficulty in meeting proposed eligibility criteria for additionality and permanence;
- The likelihood that the cost of implementing emissions mitigation or removals projects on-farm, in the absence of productivity gains, would exceed revenue from sale of CFI offset credits;
- The uncertain but potentially high transaction costs, and complex and demanding leakage and administrative obligations for project proponents; and
- The lack of landholder knowledge and local enterprise networking, to facilitate aggregation and lower costs to participating individuals.

AWI's conclusions are underpinned by the results of detailed economic modelling, including use of Australian Farm Institute FarmGAS calculator, which shows that carbon credit prices much higher than projected (e.g. by ABARES) would be required to make the mitigation projects viable, except for agro-forestry projects.

Accordingly, AWI believes that the CFI scheme as proposed has the potential to drive land use change from livestock agriculture toward agro-forestry, while committing participants to zero or low productivity gains in other parts of the farm enterprise. The long-term impacts for Australia are likely to be negative except in the sense of achieving national carbon targets – there will be negative impacts on long-term

food and fibre production, deleterious to the best interests of Australian farmers and the rural community.

In order to minimise the potential for negative impacts on the Australia's wool industry, AWI makes the following recommendations to the proposed CFI:

1. the definition of additionality be revised to facilitate landholder achievement of long-term increase in productivity and carbon abatement/sequestration. One compromise approach under consideration in the USA is to discount carbon projects for the degree of commonality of the practice within a region – while this represents an attempt to address the issue, more fundamental change is required in order to address the present incompatibility between the CFI definition of additionality and long-term farm productivity gains;

2. the definition of permanence be revised to be more flexible and achievable by landholders than the proposed 100-year 'gold standard';

3. a more flexible definition of leakage and approach to leakage boundaries (spatial, temporal and enterprise) to avoid incompatibility between CFI participation and long-term growth in productivity in agricultural lands in Australia;

4. detailed investigation of the potential impacts of CFI activities on landholders and rural and regional communities be conducted prior to commencement of any such scheme. Any review should include specific assessment of the impacts of projects on prime agricultural land, water availability and biodiversity. In addition, farmers and other stakeholders should have access to information and independent assessment, supported by government resources, if they have concerns about the impacts of forestry offset activities.; and

5. development of methodologies applicable to individual producers, regions or industries, to reward a broad range of beneficial agricultural practices and activities and to enable broad participation, with flexibility to engage with Kyoto-compliant or non-compliant offset markets.

In general, AWI proposes a more flexible approach to assessing eligibility of agricultural projects that presents more practical additionality, permanence and leakage criteria that can be met in viable food and fibre enterprises. Encouraging broad participation in abatement activities with associated environmental and productivity co-benefits would also succeed in achieving greater emissions mitigation in national accounts.

Appendix – Case studies

Introduction

This Appendix describes the modelling of hypothetical farms with the objective of providing a broad indication of the direction and magnitude of impact of the Carbon Farming Initiative (CFI) on woolgrowers. Model farms were used to assess whether participating in the Scheme could provide opportunities for Australian woolgrowers wishing to access carbon markets and hence whether they would be attracted to participate in the Scheme.

Many assumptions have had to be made due to uncertainty in the future policy details and carbon market and the quantified estimate of impact consequently has a high uncertainty.

AWI notes there is significant uncertainty and debate in the scientific community regarding anthropogenic global climate warming, including the roles played by carbon dioxide and methane produced in grazing systems. AWI does not accept *prima facie* that the carbon dioxide and methane by-products of ruminants such as sheep are scientifically proven contributors to anthropogenic climate change, or should be considered a form of carbon 'pollution'.

However, the approach undertaken and the assumptions used are broadly consistent with modelling conducted for other agricultural commodities, and used for illustrative purposes only.

Overview of analysis

The framework of the analyses, data sources and main assumptions and limitations for the case studies are summarised below.

1. Two Model Farms were set up: (1) A self-replacing Merino Ewe property in northern NSW producing 18 micron wool; and (2) A farm in the northern sheep-wheat zone running Merino Wethers producing 20 micron wool and growing wheat and sorghum.
2. Greenhouse gas emissions and farm financial balance (Gross Margins) were modelled using the Australian Farm Institute FarmGAS calculator: http://www.farminstitute.org.au/ Only emissions directly associated with the farming activity were included in this analysis and the additional capacity in FarmGAS to estimate emissions for whole farm emissions including requirements such as electricity and fuel was not used.
3. Data for financial and flock parameters for sheep and grain enterprises are derived from information available on the NSW Department of Primary Industries , Sheep Enterprise Budget Series – April 2010 (Accessed 05/01/2011): *http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets/livestock*)
4. All financial calculations are in 2010 dollars with no adjustment; no assumption of price change and no assumption of productivity growth. This simplified approach can be challenged but uncertain future trends would not change the broad outcomes and conclusions of the case study.

5. The modelled years are 2011 (before CFI commencement), 2012 (after CFI commencement with initial Carbon offset price of $20), 2020 (year of commitment under the Cancun Agreement with Carbon price of $40 approximately in line with projections under ABARE 5% emissions reduction scenario). The offset price is based on 2005 Treasury modelling 25 indicating $20-25 in 2012 and $40-50 in 2020 with a conservative price assumed because of the delay in carbon pricing in Australia.
6. To investigate mitigation opportunities and potential access to carbon markets for woolgrowers that would follow the introduction of the CFI, a number of mitigation activities were modelled for each of the hypothetical farms. The background and supporting information for the example cases are provided in Addendum B. In summary the activities were:
    a. Merino Ewe enterprise:
        i. Dietary oils to reduce enteric methane production
        ii. Reforestation project
    b. Sheep-Wheat enterprise:
        i. Dietary oils to reduce enteric methane production
        ii. Coated nitrogenous fertiliser to reduce nitrous oxide from cropping system
        iii. Changing the mix of livestock and grain production i.e. pasture vs crop area
        iv. Reforestation project
7. Scenario modelling to estimate the impact of the CFI focuses on costs and income related directly to wool production except in the scenarios that consider reforestation as the project activity. Direct and indirect costs associated with farm inputs such as electricity and diesel use and the impact of a carbon price on these input costs are not considered. Similarly adaption strategies to climate change or climate change policies are ignored.
8. An assumption is made on possible costs that would be associated with participation in the CFI. The design and exposure draft legislation indicate the need for participants to undertake contract establishment, auditing, verification and reporting that would be additional to existing farm record keeping and would most likely require professional advice. Initiation of participation and the associated costs are assumed to occur in 2012 with ongoing costs for reporting and verification. The costs assumed are adapted from assumptions of these costs that have been made in modelling undertaken by the Australian Farm Institute.

[25] Australian Government Treasury 2008, *Carbon Pollution Reduction Scheme- Australia's Low Pollution Future*, White Paper, Australian Government, Canberra.

9. The impacts of mitigation activities on the two Model Farms were modelled using a combination of FarmGAS and spreadsheet calculations developed to reflect CFI design.

An overview of the hypothetical farms and results of the modelling and mitigation scenarios are set out below with the details of the farm financial balance and other assumptions following as Addendum B.

Model Farm 1

Data are taken from NSW DPI Farm Enterprise budget for Merino Ewes (18 micron) – merino rams, i.e. a fine wool producer in medium to high carrying capacity (eg northern NSW Slopes and Tablelands region).

Production: The small-scale 1000 Merino ewe breeding property is a specialist fine wool production system.

Farm Area: 230 ha with 205 ha pasture used for sheep grazing and 25 ha unallocated.

Scenarios: The enterprise data above were translated to inputs for FarmGAS as an initial 2010/11 model, i.e. prior to commencement of the CFI and the following scenarios were then applied:

Table A 1. Modelled scenarios for CFI participation with mitigation and sequestration projects on a wool producing farm.

Model Farm 1		
Scenario	**Description**	**Additional information**
Scenario 1	2011 Base case – Fine wool on 205 ha, 25 ha unallocated (not Kyoto forest)	Agriculture emissions not capped
Scenario 2	2012 – CFI commenced and the farmer registers a mitigation project using dietary oils to reduce enteric methane, based on adding 3.3% oils on a DMI basis to achieve 11.55% reduction.	Carbon credit price is $20.tonne CO2-e). Transaction costs are estimated based on Keogh & Davison (2010) adjusted for sheep.
Scenario 3	2020 – As Scenario 2 but C price higher	Carbon credit price $40.tonne CO2-e).
Scenario 4	2012 – CFI commenced and the farmer registers a sequestration project for reforestation of the 25 ha unallocated farm land in 2011.	Carbon credit price $20.tonne CO2-e). 5% risk of reversal buffer applied.
Scenario 5	2020 – CFI commenced and the farmer has maintained the 25 ha reforestation project from 2011.	Carbon credit price $40 tonne CO2-e. 5% risk of reversal buffer applied.

Table A 2. Modelled scenarios for CFI participation with mitigation and sequestration projects on a sheep-wheat farm.

Model Farm 2		
Scenario	**Description**	**Additional information**
Scenario 1	2011 Base case –Wool production wethers on 500ha, 300 ha wheat and 300 ha sorghum, 400ha farm house and unallocated (not Kyoto forest)	Agriculture emissions not capped
Scenario 2	2012 – CFI commenced and the farmer registers a mitigation project using dietary oils to reduce enteric methane, based on adding 3.3% oils on a DMI basis to achieve 11.55% reduction. (see details Addendum C)	Carbon credit price is $20.tonne CO2-e). Transaction costs are estimated based on Keogh & Davison (2010) adjusted for sheep.
Scenario 3	2020 – As Scenario 2 but C price higher	Carbon credit price $40.tonne CO2-e.
Scenario 4	2012 – CFI commenced and the farmer registers a mitigation project using coated N fertiliser to reduce N2O, to achieve 40% reduction. (see details Addendum C)	Carbon credit price $20.tonne CO2-e.
Scenario 5	2020 – As Scenario 4 but C price higher	Carbon credit price $40 tonne CO2-e.
Scenario 6	2012 – CFI commenced and the farmer registers a sequestration project for reforestation of the 100 ha unallocated farm land in 2011.	Carbon credit price $20.tonne CO2-e. 5% risk of reversal buffer applied.
Scenario 7	2020 – CFI commenced and the farmer has maintained the 100 ha reforestation project from 2011.	Carbon credit price $40 tonne CO2-e. 5% risk of reversal buffer applied.

Results

While acknowledging that there are many assumptions in this case study analysis of the financial and greenhouse gas implications for participation of an example woolgrower, the results do strongly reinforce the theoretical assessment that it is unlikely that many farmers, at least livestock producers, would benefit from registering projects in for carbon offsets. Even if more detailed modelling and information changed the results by an order of magnitude the costs are greater than the potential credit value.

This analysis has assumed that the projects were eligible under provisions for additionality and that permanence and leakage provisions applied.

The results are summarised below for each Model Farm. Key points are the high carbon price that would be required to make the mitigation projects viable. The analyses show the level of abatement as estimated

based on current level of scientific understanding and the costs of implementation of the projects. Even based on minimal implementation costs alone, i.e. cost of dietary oil alone and assuming that the costs of administration to the sheep can be incorporated into existing expenditure on labour for supplementation, a carbon credit price of $358 per tonne CO2-e credited would be required to break even for Model Farm 1. For Model Farm 2, a larger enterprise with gross income of about $600,000, with income from both sheep and grain, a carbon credit price of $255 to $285 would be required for the project to be financially viable on the value of carbon offset value alone. Estimates of transaction costs are uncertain but if they were included a carbon credit price of approximately $750 to $12000 would be needed for Model Farm 1 and around $420 to $725 per tonne CO2-e for Model Farm 2.

For the removals projects, reforestation of 25 ha and 100 ha unallocated farm area was undertaken on Model Farms 1 and 2, respectively. Initial establishment costs are high but it is assumed that the maintenance costs are negligible the period to start making a net profit from carbon credits is around a decade, assuming there is a reliable offset market.

Table A 3. Modelled impact of participation in the CFI for small mitigation and sequestration projects on a wool producing farm.

Model Farm I - impact of CFI participation

	Enterprise Financial performance					GHG Emissions (+ve)or removals (-ve) (t CO2-e)				
Scenario	Gross Margin - without CFI	CFI Project Costs	CFI Transaction Costs	Offset Credit Value	Gross Margin - with CFI	Agric. emissions	Abatement (enteric methane + soils N2O)	Removals (forest)	Break-even C price for project costs only	Break-even C price for project + transaction costs
Scenario 1: 2011 base case	$49,591	$0	$0	$0	$49,591	396.7	0.0	0.0		
Scenario 2: CFI dietary oils project 2012	$49,591	$3,614	$9,000	$202	$36,775	386.6	10.1	0.0	$357.87	$1,249.13
Scenario 3: CFI dietary oils project 2020	$49,591	$3,614	$4,000	$710	$41,267	386.6	10.1	0.0	$357.87	$753.98
Scenario 4: reforestation project 2012	$49,591	$13,125	$8,000	$88	$28,378	396.7	0.0	-4.4		
Scenario 5: reforestation project 2020	$49,591	$0	$4,000	$5,436	$40,155	396.7	0.0	-135.9		

Table A 4. Modelled impact of participation in the CFI for small mitigation and sequestration projects on a wool producing farm.

Model Farm 2 - impact of CFI participation

	Enterprise Financial performance					GHG Emissions (+ve)or removals (-ve) (t CO2-e)				
Scenario	Gross Margin - without CFI	CFI Project Costs	CFI Transaction Costs	Offset Credit Value	Gross Margin - with CFI	Agric. emissions	Abatement (enteric methane + soils N2O)	Removals (forest)	Break-even C price for project costs only	Break-even C price for project + transaction costs
Scenario 1: 2011 base case	$194,281	$0	$0	$0	$194,281	1058.6	0.0	0.0		
Scenario 2: CFI dietary oils project 2012	$194,281	$5,976	$11,000	$469	$176,836	1035.2	23.4	0.0	$254.95	$724.23
Scenario 3: CFI dietary oils project 2020	$194,281	$5,976	$4,500	$938	$182,867	1035.2	23.4	0.0	$254.95	$446.93
Scenario 4: coated fertiliser project 2012	$194,281	$9,600	$11,000	$673	$173,008	1024.9	33.7	0.0	$285.17	$611.93
Scenario 5: coated fertiliser project 2020	$194,281	$9,600	$4,500	$1,347	$178,834	1024.9	33.7	0.0	$285.17	$418.85
Scenario 6: reforestation project 2012	$194,281	$52,500	$10,000	$88	$131,693	396.7	0.0	-18.4		
Scenario 7: reforestation project 2020	$194,281	$0	$4,500	$5,436	$184,345	396.7	0.0	-572.5		

Model Farm 1 – additional information

Flock size	1000 ewes
Ewe body weight:	50 kg
DSE rating:	2.1 dse/ewe

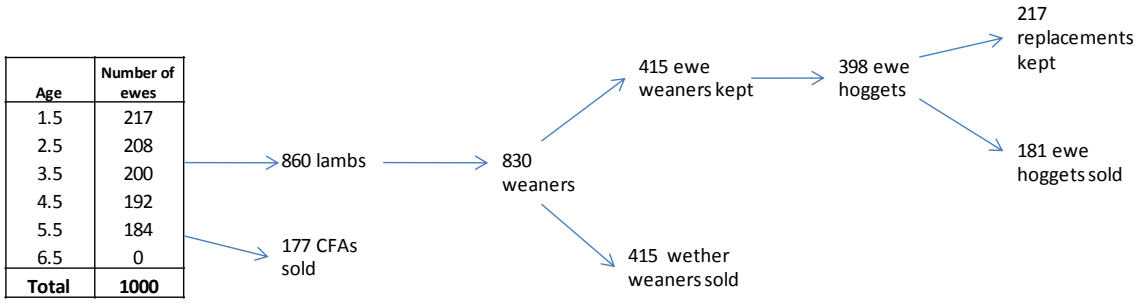
1. Flock Parameters

Flock mortality	4%	Ram %	2%
Productive life	5 years	Marking %	86%
Ewe body weight	50kg	Weaning %	83%
DSE rating /ewe	2.05	Weaning	3 months
Stocking rate/ha	10 dse		

Note: Pasture cost calculated at 90kg of single super applied every year at a cost of $450/ton; $5.4/ha.

2. Flock Structure

Age	Number of ewes
1.5	217
2.5	208
3.5	200
4.5	192
5.5	184
6.5	0
Total	**1000**



Model Farm 2 – additional information

Data are adapted from NSW DPI Farm Enterprise budget for wethers (20 micron) and wheat and sorghum financial budgets.

Wool production, with dryland cropping two crops per year, wheat and sorghum, each medium to high carrying capacity (eg northern NSW Slopes and Tablelands region).

Production: The 1500 ha property has 1200 ha under production on variable areas. The base case average system has 300ha each in wheat and sorghum and runs 4000 merino wethers for wool production.

Farm Area: 1500 ha with 300 ha unallocated for production, mainly with the farm house and shrubs.

Financial Model

Summary of the Farm Financial Budgets

Model Farm 1

INCOME				
Livestock sales:	**Number**	**$ / head**		**Totals**
Breeding Ewes	177	$58.00		$10,266
Maiden Ewes		$58.00		
Other Ewes		$58.00		
Lambs/Hoggets	181	$100.00		$18,100
Rams	4	$91.16		$365
Wethers	415	$42.00		$17,430
				$46,161
Wool sales:	**No shorn**	**Kg/hd**	**Cents/Kg**	**Total $**
Breeding Ewes	**860**	4.9	689	$29,034
Maiden Ewes	**150**	4.9	689	$5,064
Other Ewes	**50**	4.7	689	$1,605
Lambs/Hoggets	**190**	3.3	758	$4,695
Rams	**20**	7.0	689	$965
Wethers	**432**	3.3	689	$9,703
			Total Wool Sales	**$51,067**
			TOTAL INCOME	**$97,228**

VARIABLE COSTS						
Livestock purchases:			**Purchase Price**			
	Number		**$/head**			**Totals**
Breeding Ewes (in lamb)	**0**					
Maiden Ewes	**0**					
Lambs/Hoggets	**0**					
Rams	**4**		**$900**			$3,600
Wethers	**0**					
Marketing / sales costs				***Total Livestock purchases:***		**$3,600**
Cartage TO saleyards			$2.00	$ / head		$1,554
Cartage FROM saleyards			$1.50	$ / head		$6
Commission				Total $		
or Commission as % of total sales			5.0%	%		$2,553
Wool harvesting/selling costs:						
Shearing	**Number**	**$/head**	**No of Shearings**		**Total**	
Ewes/Wethers	1,492	$5.98	1		$8,922.16	
Lambs	190	$4.00	1		$760.00	All shearing
Rams	20	$8.43	1		$168.60	$9,851
Crutching	**Number**	**$/head**	**No of Crutchings**		**Total**	
Ewes/Wethers	1,492	$0.85	1		$1,268.20	
Lambs	190	$0.85	1		$161.50	All crutching
Rams	20	$1.71	1		$34.20	$1,464
Shed costs - shedhands, woolclasser,						$0
Wool tax		2%	of wool income			$1,021
Commission - wool sales		4%	of wool income			$2,043
Wool selling costs (warehouse, testing, etc)		$42.00	/bale x	42	bales	$1,764
Cartage		$17.43	/bale x	42	bales	$732
Wool Packs, branding fluid, etc		$436.00				$436
Sheep health:						
	Number	**Type (drench,**	**$/head**	**No of repeats**		
Drench	1,620		$0.30	3		$1,458
Dipping	1,620		$1.07	1		$1,733
Jetting	1,620		$0.50	1		$810
Vaccine	1,620	6-in-1	$0.24	1		$389
Lamb Marking	838		$3.75	1		$3,143
Scanning	1,000		$0.90	1		$900
Other:						
Supplementary feed		**fed**	**$/tonne**			
Hay			$400			
Grain (type 1)		27	$180			$4,770
Grain (type 2)			$400			
Silage			$400			
Fodder crops ('$ / hectare)						
Pasture maintenance costs			$9,410			$9,410
					TOTAL VARIABLE COSTS	**$47,637**

Model Farm 2

INCOME				
Livestock sales:	**Number**	**$ / head**		**Totals**
Breeding Ewes		**$50.00**		
Maiden Ewes		**$50.00**		
Other Ewes		**$50.00**		
Lambs/Hoggets		**$100.00**		
Rams		**$50.00**		
Wethers	**752**	**$66.92**		**$50,324**
				$50,324
Wool sales:	**No shorn**	**Kg/hd**	**Cents/Kg**	**Total $**
Breeding Ewes	**0**	4.0	700	$0
Maiden Ewes	**0**	5.0	700	$0
Other Ewes	**0**	5.0	700	$0
Lambs/Hoggets	**832**	4.0	559	$18,790
Rams	**0**	4.5	400	$0
Wethers	**4,000**	6.2	481	$119,288
			Total Wool Sales	**$138,078**
			TOTAL INCOME	**$188,401**

VARIABLE COSTS						
Livestock purchases:			**Purchase Price**			
	Number		**$/head**			**Totals**
Breeding Ewes (in lamb)	**0**					
Maiden Ewes	**0**					
Lambs/Hoggets	**0**					
Rams	**0**					
Wethers	**832**		**$45**			$37,440
Marketing / sales costs				***Total Livestock purchases:***		**$37,440**
Cartage TO saleyards			$2.00	$ / head		$1,504
Cartage FROM saleyards			$1.50	$ / head		$1,664
Commission				Total $		
or Commission as % of total sales			5.0%	%		$6,904
Wool harvesting/selling costs:						
Shearing	**Number**	**$/head**	**No of Shearings**		**Total**	
Ewes/Wethers	4,000	$5.98	1		$23,920.00	
Lambs	0	$5.98	1		$0.00	All shearing
Rams	0	$8.00	1		$0.00	$23,920
Crutching	**Number**	**$/head**	**No of Crutchings**		**Total**	
Ewes/Wethers	4,000	$0.85	1		$3,400.00	
Lambs	0	$0.80	1		$0.00	All crutching
Rams	0	$1.50	1		$0.00	$3,400
Shed costs - shedhands, woolclasser,		$1,780.00				$1,780
Wool tax		2%	of wool income			$2,762
Commission - wool sales		4%	of wool income			$5,523
Wool selling costs (warehouse, testing, etc)		$42.99	/bale x	136	bales	$5,847
Cartage		$17.43	/bale x	136	bales	$2,370
Wool Packs, branding fluid, etc		$1,411.68				$1,412
Sheep health:						
	Number	**Type (drench,**	**$/head**	**No of repeats**		
Drench	4,832		$0.58	2		$5,605
Dipping	4,000		$1.07	1		$4,280
Jetting	4,000		$0.58	1		$2,320
Vaccine	4,000	6-in-1	$0.24	1		$960
Lamb Marking	0		$2.00	1		$0
Scanning	0		$0.90	1		$0
Other:						
Supplementary feed		**fed**	**$/tonne**			
Hay		56	$180			$10,080
Grain (type 1)			$400			
Grain (type 2)			$400			
Silage			$400			
Fodder crops ('$ / hectare)						
Pasture maintenance costs			$11,500			$11,500
					TOTAL VARIABLE COSTS	**$129,270**

Mitigation strategies

Dietary Oils

Research has shown supplementing the diet of ruminants with dietary fats or oils reduces the amount of methane produced per unit of dry matter intake (DMI), with most work having been done on intensive production systems in dairy or feedlots.

The mitigation activity assumed in this case study is based on peer-reviewed research on the impact of dietary oils on methane production in the rumen (Grainger et al. 2008[26], Moate et al. 2011[27]). For every 1% increase in fat or oil in the diet (on a dry matter intake base) there is a 3.5% reduction in methane production. Trials have shown that this mitigation is accompanied by an increase in productivity. Under the additionality requirements of the CFI could mean that when better animal performance was a co-benefit of the mitigation strategy it may it may not be eligible. For this exercise it has been assumed that any increase in productivity was small and insufficient for investment in feeding oils in an extensive system with good pasture availability and existing investment in grain supplementation for 8 to 12 weeks.

DMI may be suppressed at fat intakes above 6-7% (Eckard et al. 2010[28]) and the case study assumed that 3.3% oil was added to the diet for 90 days during summer. The cost of the dietary fats and oils was assumed from data provided in Grainger et al. (2008) to be $250 per tonne feed. It is assumed also that administering the supplement could be incorporated into existing costs. There is a degree of uncertainty regarding the per cent mitigation but it is based on the best available peer reviewed science.

Coated nitrogen fertilisers

Nitrification inhibitor-coated fertilisers with compounds such as nitrapyrin and dicyandiamide have been shown to be effective in reducing nitrification and nitrous oxide emissions[29]. On average the amount lost as nitrous oxide is decreased by 40%. The higher cost of coated fertilsers, approximately 10% higher than conventional products, has been a disincentive to uptake[30].

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[26] Grainger C, Clarke T, Beauchemin K.A., McGinn S.M. and Eckard R.J. (2008). Supplementation with whole cottonseed reduces methane emissions and can profitably increase milk production of dairy cows offered a forage and cereal grain diet. *Australian Journal of Experimental Agriculture* **48** (2) 73-76. DOI: 10.1071/EA07224.

27 Moate P.J., Williams S.R.O., Grainger, C., Hannah M.C. and Eckard, R.J. (2011) Comparison of cold pressed canola, brewers grains and hominy meal as dietary supplements suitable for reducing enteric methane emissions from lactating dairy cows. Animal Feed Science & Technology (in press).

[28] Eckard R.J., Grainger C., de Klein C.A.M. (2010) Options for the abatement of methane and nitrous oxide from ruminant production – a review. *Livestock Science* 130:47-56.

[29] Eckard R.J., Grainger C., de Klein C.A.M. (2010) Options for the abatement of methane and nitrous oxide from ruminant production – a review. *Livestock Science* 130:47-56

[30] Richard Eckard, personal communication.

Reforestation Projects

Reforestation projects were restricted to those that were eligible for Kyoto Protocol CFI credits, i.e. clear of forest on 1 January 1990 and able to be planted with 'forest' according to definitions[31]. Model Farm 1 has 25 ha available eligible land for a reforestation project and Model Farm 2 has 100 ha. The plantations established are environmental plantings such as engineered woodlands that will not be harvested and will therefore meet CFI permanency eligibility. It was also assumed that the land to be planted was not allocated to production and therefore had an opportunity cost of zero.

Establishment costs for the forest are taken from a Landcare information sheet for the Northern Inland Forestry Investment Group with funding provided by the Border Rivers Gwydir CMA and Southern New England Landcare [32] .This document gives an average establishment cost of $525/ha. Additional costs were pruning of 30% of trees at $1.50 per tree. Thinning and tree harvesting costs were assumed zero in the timeframe of the present analysis at least. Hence for this modelling, costs were kept to a minimum.

A 5% risk of reversal buffer was assumed to apply to sequestration credits in the reforestation project.

[31] Forest definitions are detailed in various documents on the DCCEE website, www.climatechange.gov.au

[32] Thompson D., Bowe J. And Zirkler K. (2009). *Engineered Woodlands Information Sheet 4, Economic Aspects, Northern Inland Forestry Investment Group.* Accessed 7 January 2011. http://www.snelandcare.org.au/linkedfiles/EWInformationSheet4web.pdf