**Australian Government**

**Australian Bureau of Agricultural and Resource Economics and Sciences**

Stephen Palethorpe
Secretary
Senate Environment and Communications Legislation Committee
PO Box 6100
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Dear Mr Palethorpe

Please find attached the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) submission to the Senate Environment and Communications Legislation Committee on the Carbon Farming Initiative (CFI).

At the Outlook Conference in March this year, ABARES presented the paper *The economics of Australia agriculture's participation in carbon offset markets,* a copy of the paper is enclosed. In the paper, ABARES has provided an assessment of the likely demand for Australia's carbon offset credits in the short to medium term.

Yours sincerely

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Deputy Executive Director

8 April 2011

Encl:

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Australian Government
Australian Bureau of Agricultural and Resource Economics and Sciences

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# The economics of Australian agriculture's participation in carbon offset markets

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## Abstract

- The proposed Carbon Farming Initiative (CFI) will set out what farmers, foresters and landholders need to do in order to generate offset credits for sale in carbon markets. However, the CFI will not guarantee markets for such offsets.
- In the absence of an internationally agreed mechanism beyond the Kyoto Protocol, the demand for Kyoto-compliant offset credits in global markets is likely to be limited.
- The voluntary market for carbon offset credits is likely to remain a small fraction of the size of regulated markets.
- A domestic carbon pricing policy with offset credit provisions may play a key role in boosting the domestic carbon market.

**Key words: Agricultural offsets, Carbon Farming Initiative, Carbon markets, Market outlook**

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## Introduction

The Australian Government has proposed to legislate the Carbon Farming Initiative (CFI) in 2011, aiming to establish a crediting mechanism for carbon offset credits generated within Australia by farmers, foresters and other landholders. Carbon offset are emissions reductions and sequestration undertaken in eligible activities that meet certain accreditation criteria. The CFI will set out what farmers, foresters and other landholders need to do in order to generate carbon credits. The government will establish an independent regulator to verify carbon credit claims. Once the credits are verified, they can be traded in Australia's domestic and international carbon markets, generating revenue for farmers and landholders while reducing carbon pollution in Australia's land-based sectors.

Participation in the CFI process is voluntary. Whether or not farmers and landholders will participate in the CFI process to generate carbon offset credits will be determined by the perceived nature and size of such markets and whether such participation is practically feasible and economically beneficial. The supply of offset credits will be influenced by offset crediting methodologies, abatement or sequestration technologies and associated changes in management practices' as well as recognition of co-benefits. These factors will determine offset credit generation and transaction costs. Agriculture's participation in carbon markets will also be influenced by the expected demand for such offset credits. Future demand for carbon offset credits is intimately linked to the ongoing processes aimed at establishing long-term, credible carbon pricing schemes and carbon accounting rules, both nationally and internationally.

The objective of this paper is to explore some of the economic issues around Australian agriculture's participation in carbon offset markets. The paper also discusses the possible role for market innovations such as 'carbon pooling' by aggregators, and policy innovations that may increase the confidence of participants in these carbon offset markets.

## Australia's agriculture sector

In 2009–10, the gross value of farm production was estimated at about $41 billion, contributing around 2.2 per cent to Australia's gross domestic product (ABARES 2010). The agriculture sector of Australia is made up of more than 135 000 businesses, managing about 60 per cent of Australia's land. Most individual agri-businesses emit small amounts of greenhouse gases (GHG) each year; less than 1 000 tonnes of carbon dioxide equivalent ($CO_2$-e) a year (Ford et al. 2009). However, the agriculture sector as a whole is a key source of GHG emissions in Australia. In 2008, the Australian agriculture sector produced around 87.4 million tonnes of $CO_2$-e or about 15.9 per cent of national GHG emissions (table 1). Together with the Kyoto Protocol compliant land use emissions—from land use, land use change and forestry (LULUCF) activities—total emissions from the land-based sectors accounted for about 20.2 per cent of Australia's emissions in 2008 (DCCEE 2010b). Preliminary estimates for 2009 indicate that agricultural emissions have decreased by 2.7 per cent (2.3 million tonnes of $CO_2$-e) from the 2008 levels (DCCEE 2010b).

Of the direct production related emissions of 87.4 million tonnes of $CO_2$-e from the agriculture sector in 2008, livestock emissions accounted for about 67 per cent and crops and soils accounted for about 17 per cent (table 1). Savanna burning and field burning of agricultural residues accounted for a further 16 per cent of total emissions from

agriculture. In Australia, the vast majority of enteric fermentation emissions are from cattle and sheep. The production of cattle, pigs and poultry account for the majority of manure management emissions.

**Table 1: Key sources and sinks of GHGs in Australia's land-based sectors, 2008**

| Source | Emissions | | |
|---|---|---|---|
| | (million tonnes $CO_2$-e) | (% of agriculture) | (% of national inventory excluding LULUCF [a]) |
| **Livestock** | **58.9** | **67.4** | **10.7** |
| Enteric fermentation | 55.6 | | |
| Manure management | 3.3 | | |
| **Crops and soils** | **14.6** | **16.7** | **2.7** |
| Agricultural soils | 14.6 | | |
| Rice cultivation | 0.04 | | |
| **Fires** | **13.9** | **15.9** | **2.5** |
| Prescribed burning of savannas | 13.6 | | |
| Field burning of agricultural residues | 0.3 | | |
| **Total agriculture** | **87.4** | **100** | **15.9** |
| **Land use change** [a] | | | |
| Afforestation and reforestation | –23.0 | | |
| Deforestations | 49.7 | | |
| Total | 26.7 | | |
| **Total land-based** | **114** | | |

[a] Land use, land use change and forestry (LULUCF) activities, based on National Greenhouse Gas Inventory accounting for the Kyoto Protocol.

*Source*: (DCCEE 2010b).

The agriculture sector can play an important role in contributing to Australian efforts to mitigate GHG emissions. There are options to mitigate agricultural GHG emissions. These include, but are not limited to, reducing emissions by increasing feed efficiency through improved genetics, use of higher quality feeds, reduced or no tillage, and improved fertiliser application. Recent research (Beauchemin et al. 2008; Martin et al. 2009) and preliminary results from the Australian Government's Climate Change Research Program suggest that the use of feed additives for intensive livestock production systems in reducing livestock emissions are promising.

Other strategies that increase carbon sequestration may involve conversion of agricultural lands to environmental plantings, and improving pasture and natural grassland management through optimising grazing intensity and timing. Recent technological advances could result in biofuels and biogas becoming alternative sources for energy in the rural sector and provide opportunities to minimise on-farm GHG emissions from fuel use. Within the agriculture sector, individual industries with different emissions profiles will have different abatement options.

## The Carbon Farming Initiative

The proposed Carbon Farming Initiative (CFI) will be a 'legislative scheme' for carbon offset crediting within Australia. The scheme is to be guided by two design principles:

- to ensure environmental integrity
- to enable broad participation.

The draft CFI legislation sets out 'common requirements' for abatement projects, including eligibility criteria (such as additionality, permanence, and avoidance of leakages); crediting periods; and monitoring, reporting, and verification requirements.

Eligible offsets under the CFI that count toward meeting Australia's obligation under the Kyoto Protocol and can be traded into international compliance markets include those generated by:

- reforestation and regrowth
- avoided deforestation
- reduced methane emissions from livestock
- manure management
- reduced fertiliser emissions
- reduced emissions from rice cultivation
- prescribed burning of savannas
- field burning of agricultural residues
- reduced emissions from landfills deposited before July 2011.

Agricultural and forestry offsets under the CFI that do not count toward Australia's obligations under the Kyoto Protocol but can be traded in voluntary markets include those generated by:

- enhanced forest management (forests established before 1990).
- revegetation and vegetation management (establishment and management of woody biomass that does not meet forest criteria).
- cropland and grazing land management (reduction of GHG emissions from soil, cropping and vegetation).

Abatement and sequestration credited under the CFI must meet internationally recognised standards. As outlined in DCCEE (2010a), they must be:

*Additional*—a project must result in abatement that would not have occurred in the absence of the scheme. There would be no reduction in emissions as a result of the CFI if the abatement activity would have occurred in the normal course of business. One would argue that the so-called 'business-as-usual' case (that is, the true baseline) is fundamentally unobservable.

The draft CFI legislation proposes two approaches to determining additionality—a 'positive list' and a 'project-based' approach. The positive list is alleged to achieve streamlined assessment of additionality and reduce participation costs. Activities that may be considered for the positive list include not-for-harvest carbon-sink forests, on-farm tree planting, prescribed savanna burning and flaring of methane from livestock manure or landfills.

The project-based additionality approach requires that the proposed project is:

- not mandated under existing regulations (regulatory additionality test)
- not a 'common practice'
- not financially viable without the expected CFI credit revenue or
- expected to overcome non-financial barriers preventing the uptake of the project (for example, institutional barriers including access to finance or technology, and skills and knowledge gaps) with potential CFI credit revenue.

*Permanent*—permanence is an important characteristic of any offset project that involves the removal of carbon from the atmosphere and its long-term storage in plants, soil or other carbon sinks. There would be no real abatement if carbon were to be stored and subsequently released to the atmosphere. For practical purposes, biological carbon stores would be generally considered permanent if they were maintained (on a net basis) for at least 100 years.

*Avoidance of leakage*—the project must not cause material increases in emissions elsewhere, which nullify or replace the abatement that would otherwise result from the project.

*Measurable and verifiable*—emissions abatement must be able to be accurately measured or estimated to ensure each offset credit represents one tonne of $CO_2$-e of emissions reduction or removal. Measurement and monitoring systems must be consistent over time and enable abatement estimates to be audited. Projects should be verified by an independent, qualified third party.

*Conservative*—conservative assumptions, numerical values and procedures should be used to ensure that abatement and other claims are not over-estimated. Every CFI credit must be equivalent to at least one tonne of $CO_2$-e abatement.

*Internationally consistent*—estimation methods must be consistent with (not necessarily the same as) the National Greenhouse Accounts, where relevant, and internationally agreed methodologies and reporting practices have been adopted by the United Nations Framework Convention on Climate Change.

*Supported by peer-reviewed science*—scientific evidence must be peer-reviewed or, if not based on peer-reviewed science, there must be independent and expert opinion validating the application of the approach or model in the relevant circumstances.

The CFI will provide an important regulatory framework for ensuring the environmental integrity and any applicable scheme integrity of Australian CFI offset credits. In any case, the CFI will not guarantee any market for these credits.

## Other international carbon offset standards

There is no shortage of voluntary carbon offset standards and certification programs around the globe, with around 17 third party standards in existence (Hamilton et al. 2010). Generally, the standards are focused on carbon credit development for purchase by

voluntary buyers to offset their own emissions. However, legislative development for regulated 'cap-and-trade' markets has enabled some voluntary standards to develop pre-compliance standards, including the Climate Action Reserve and the Regional Greenhouse Gas Initiative. While some offset standards such as the Climate Action Reserve will only verify offset projects designed to meet their proprietary methodologies, others such as the Voluntary Carbon Standard and Gold Standard will accept offset projects verified to a select set of other standards' methodologies, in addition to their own standards.

According to Hamilton et al. (2010), the most popular standard in 2009 was the Voluntary Carbon Standard, considered to be among the best certification for eligibility in future regulatory emissions trading schemes, which certified nearly half of the 'over the counter' transacted credits. The next popular were the Gold Standard, the Climate Action Reserve, the American Carbon Registry Standard and the Clean Development Mechanism. To date, standards have been an important determinant for transaction prices and, for earning a premium on the carbon market.

In 2006-07, the International Organization for Standardization released a set of standards, 14064 and 14065, that govern the quantification, reporting and verification of GHG emissions. These standards were created to be 'regime neutral' so that they could be used as a basis for any program. These standards are part of many voluntary offset scheme standards.

## Supply of Australia's carbon offset credits

At any expected market price for carbon offset credits, the number of offset credits farmers can supply depends on their offset generation abilities and associated costs at the margin. These factors will depend on the sequestration and abatement activities that are recognised for offset credit generation ('eligible activities') as well as the 'common requirements' for offset credit accreditation, including meeting additionality and permanence criteria; as well as monitoring, reporting, and verification requirements. As discussed earlier, the proposed CFI legislation will provide the regulatory framework for dealing with these requirements. Issues with the key elements of the framework are discussed below.

### Baseline and additionality

The creation of offset credits will be linked to existing or new technologies and to changes in management practices, and will typically involve setting an agreed baseline to ensure that offset projects provide additional abatement. A prerequisite for setting baselines is to gather a sound understanding of current (and potential) industry practices. Farm practices differ across regions and activities. For example, livestock emissions differ across animal breed, regions and feed availability; intensive versus extensive grazing systems; and management practices used such as cell or rotational grazing. Therefore, a range of baselines will need to be established that take these differences into consideration to ensure equal opportunities for participants across industries to generate offset credits.

Baselines are used to estimate the quantity of abatement or sequestration achieved by an 'eligible' offset project, and hence the number of offset credits a project receives. However, baselines may need to be adjusted over time to take any improvements in management practices or technology into account. This baseline resetting may only apply to emissions abatement projects and not carbon sinks. Carbon sinks are generally bound by the principles of permanence which means that the baseline is set at the carbon stock in existence at the start of the project, and offset credits are issued in accordance with

increases in this carbon stock or reduction of losses that negate the need for resetting the baseline.

A number of international offset markets and standards are considering utilising standardised approaches to additionality in order to induce greater uptake of agricultural offset projects. The proposed CFI 'positive list' is one such standardised approach. Other standardised approaches include common practice tests and standardised baselines. Standardised approaches tend to alleviate uncertainties regarding project eligibility and lower transactions costs. However, establishing standardised additionality tests requires robust information on production systems and management practices at both spatial and temporal scales. Such information should be underpinned by extensive data gathering and regular updates, as well as credible investigation and research.

The Australian Government is currently seeking stakeholder feedback on ways to streamline assessment of additionality for offset projects under the CFI.

## Co-benefits and additionality

Some offset projects may deliver considerable co-benefits—positive effects that accrue to a project over and above the reduction or sequestration of GHG emissions. For example, co-benefits of offset projects could arise from additional employment in the rural sector or additional environmental benefits such as biodiversity, water conservation, salinity reductions, reduced erosion and sediment run-off. In the case of soil carbon accumulation, Sanderman et al. (2010) suggest higher crop yields, nutrient and water efficiency are possible co-benefits.

Co-benefits in terms of yields and productivity growth are of particular interest. The adoption of emissions abatement, sequestration technology or change practice that may lead to yield or productivity growth, may still be limited by a number of factors. These include significant uptake costs relative to small perceived productivity gains, adverse implications for risk management in farming systems and potential loss of competitiveness relative to other practices or investment options, as well as non-market barriers such as knowledge gaps concerning available technology and production practices. In such circumstances, the additionality test needs to be considered carefully from a broader perspective to facilitate uptake.

Some international offset standards recognise different levels of co-benefits, and offset credits generated under these standards often attract a premium rate because they have commercial value in terms of positive marketing opportunities for organisations. The CDM aims to develop broader sustainable developments but does not include specific requirements for the generation of co-benefits, while the Gold Standard has stringent co-benefit requirements for its offset credits.

## Generation costs and farming diversity

Project developers and landholders will incur costs to adopt technology or change management practices to generate offset credits. If an offset project involves land use change—from cropping to pasture systems or pasture systems to biodiversity plantings—farmers' potential receipts from cropping (or grazing) per hectare represent the opportunity costs for land use change and form part of the offset credit generation costs.

Generation costs will vary widely across activities and individual farms, depending on local conditions (including climate, soil and water) and abatement and adoption options. This highlights the limited value of point estimates of costs for particular offset activities in the

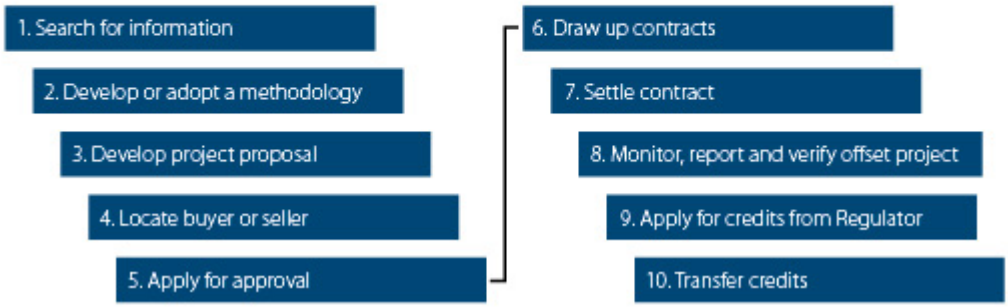
agriculture sector. For example, the point estimate of costs or returns from reducing fertiliser use, do not account for possible risk aversion by farmers in relation to departing from preferred fertiliser application rates, or the additional benefits of applying extra fertiliser to take advantage of optimal seasonal conditions. In such conditions, the opportunity cost of reducing fertiliser use can be particularly high (Weersink 2005). Overall, there is likely to be significant potential to reduce nitrous oxide emissions from fertiliser use but the cost and benefits of cutting fertiliser application rates will have to be estimated at the farm level, taking into consideration the diverse and highly variable nature of agricultural systems.

An international default emission factor, set by the Intergovernmental Panel on Climate Change, of 1.25 per cent of all nitrogen fertiliser applied, is used in Australia to calculate nitrous oxide emissions from irrigated crops. Matching the rate of fertiliser used to the potential crop or pasture demand can play an important role in minimising potential nitrous oxide emissions losses to the environment. Some studies estimated that costs up to $50 per tonne of carbon would result from a restriction on fertiliser use, while several other studies have found that reducing nitrogen fertiliser through improved management practices such as soil testing can reduce both emissions and farm costs (Weersink 2005). Also, the common use of conventional and reduced tillage suggests that profitability comparisons are likely to be inconclusive—suggesting a range of marginal costs of adoption. This is supported by evidence that reduced tillage adoption rates in a region increase with the coarseness of soil granules (more sand and less clay content) and decrease with the amount of precipitation (Weersink 2005).

## Administrative and transaction costs and project size

A potential sequence of steps that an offset proponent may have to go through in opting to participate in carbon markets is outlined in figure 1.

1 Sequence of participating in carbon offset markets




There are costs associated with each step. Some could be ‘one off’ and others ‘ongoing’. Determination of transaction costs for Australian offset projects in the absence of an existing or similar market will be subjective, as issues around who pays for methodology development, stringency of monitoring, reporting verification and credit issuance and registry requirements are uncertain. To what extent these costs can be rationalised through ‘aggregators’ is also unclear at this stage. Although the Australian Government is developing some offset methodologies with stakeholders, costs associated with most of the steps in figure 1 will be borne by project developers.

Hamilton et al. (2010) suggest that while offset credits verified to a third-party standard tend to sell for a premium on the voluntary market, the costs for validation, verification and credit issuance can range from several thousand to hundreds of thousands of dollars a

project, depending on the standard used and the size of the project. These costs are likely to be high for agriculture relative to other sectors because there are formidable uncertainties and measurement challenges, particularly for agricultural offset projects.

The costs associated with registering an offset project with an Australian regulator are unclear at this stage. For example, under the Greenhouse Friendly program (which ended in July 2010), each project was charged $300 for account setup; $200 annual account fee; $500 listing fee; $150 registration fee (new credits from existing project); $300 for transfer/retirement; and $300 for certificate document issuance (Hamilton et al. 2009). Similar costs are charged by international registries such as the American Carbon Registry Standard, Gold Standard and Climate Action Reserve (Hamilton et al. 2009).

These costs have considerable consequences for the Australian agricultural offset market. The majority of Australian farms emit less than 1 000 tonnes of $CO_2$-e a year (Ford et al. 2009). Therefore, most agricultural abatement offset projects in Australia would be small scale. The associated transaction and administration costs could be a possible deterrent to participate in the CFI.

It is also unlikely that Australian farmers will be able to generate significant economies of scale by engaging in soil carbon sequestration activities. A review of the literature relating to soil carbon storage in Australia by Sanderman et al. (2010) suggest that improved crop management practices such as crop rotation, conservation tillage and stubble retention have an average abatement potential across Australian broadacre cropping systems of around 0.7 tonnes of $CO_2$-e a hectare per year. Similarly, improved pasture management practices, such as increasing the proportion of perennial species in pastures, could also improve soil carbon levels by around 0.7 tonnes of $CO_2$-e a hectare per year. Given that the average broadacre farm size in Australia is in the order of 6 500 hectares (AGSURF 2010), almost all soil carbon sequestration projects in Australia would be considered small scale by the Clean Development Mechanism standards. As discussed later, project 'aggregators' can play an important role in easing the scale problem associated with low emissions per farm and the high transaction costs of participating in carbon markets.

## Short to medium term supply prospects

Existing agricultural offset methodologies in other offset schemes and abatement research to date suggests that the most promising areas of offset credit generation, in the short to medium term, are livestock manure management (methane flaring), prescribed savanna burning and reforestation activities. Emissions from manure management accounted for 3.3 million tonnes of $CO_2$-e emissions in 2008 (table 1) arising from methane generated from livestock waste ponds. The capital costs associated with covering waste ponds and flaring of methane can range from $50 000 to over $500 000 depending on size and material used. The uptake rate of these abatement options will depend considerably on carbon prices and the payback period of the upfront capital costs.

In recent years, extensive research has been undertaken and published by the CSIRO with regard to emissions reduction associated with savanna burning, which accounted for 13.6 million tonnes of $CO_2$-e emissions in 2008 (Heckbert et al. 2009). Although an offset methodology will need to be developed and approved, it provides a potential for offset credit generation. Likely constraints in the short term are the lack of trained and skilled staff undertaking fire management in remote areas of Northern Australia.

The Australian Government's Climate Change Research Program is currently investigating options to reduce methane emissions from livestock, reduce nitrous oxide emissions associated with fertiliser use, and reduce emissions or increase carbon sequestration in agricultural soils (soil carbon), as well as on-farm demonstration of mitigation techniques. The outcome of this program will support Australian offset methodology development for these activities.

Participation in the Carbon Farming Initiative (CFI) eligible offset activities is voluntary. This suggests the initiative will be effective only if landholders can see a clear economic benefit from participating in a carbon offset market. For example, if a change in management practice to sequester carbon or reduce emissions costs $50 a tonne $CO_2$-e and the market pays more than $50 a tonne $CO_2$-e, landholders will have an economic incentive to undertake the necessary practice change. It is also important to note that regular changes to the CFI eligibility rules and requirements, while necessary for reflecting farming realities and maintaining scheme integrity, may act as a deterrent for landholders to participate in sequestration and abatement activities, and thus not contribute meaningfully to GHG abatement. Nonetheless, given varying opportunities for GHG abatement or removal across land-based activities, a carbon offset crediting scheme is likely to induce at least some structural change within the land-based sector (Calford et al. 2010).

## Uncertainty, offsets market and institutional innovations

Estimating emissions from biological processes such as agriculture is inherently complex and is likely to retain a significant degree of uncertainty. The emissions reductions in response to management practices (such as crop tillage practices) and climatic conditions (such as drought) are highly variable through space and time and are also influenced by soil type and region.

Carbon sequestration activities are subject to greater uncertainty than emissions reductions activities from agriculture because of natural disturbances such as drought and fire which may undo efforts in storing carbon in the natural environment that are typically subjected to the permanency requirement. In addition, the subtle differences in climate and management practices that influence the actual amount of agricultural emissions abatement are often difficult to cost-effectively quantify with a high degree of accuracy and, therefore, are often estimated based on existing research and modelling. Uncertainty around agricultural offsets also arises from statistical variability, lack of reliable science on emission-reducing agricultural activities and uncertain future quantity of GHG offset credits produced (Sanderman et al. 2010).

As discussed below, various approaches have been proposed over recent years to deal with these uncertainties in order to encourage offset credit generation from the agriculture sector.

### Risk of reversal buffer

Uncertainty in the estimation of agricultural sequestration offset projects typically spans the additionality criteria, permanence and actual future abatement outcomes. Therefore, agricultural offset credits are likely to be issued conservatively by scheme administrators. To manage annual variability, offset credits for biosequestration activities may be issued for average carbon stored instead of what is actually stored in a given year thus reducing the risk that project proponents would need to return credits to scheme administrators.

Most international offset standards apply a discount factor or assurance factor to agricultural offset sequestration projects to overcome these uncertainties. However, the discount factor applied varies with a particular standard (for example, Clean Development Mechanism, the Regional Greenhouse Gas Initiative and Gold Standard) and there is no common consensus on what this discount factor should be as the degree of uncertainty differs significantly across projects, abatement activities and climatic regions.

Under the proposed CFI, consideration is being given to applying a risk buffer of 5 per cent of the carbon sequestered to all biosequestration projects in order to insure the scheme against losses of carbon, while carbon stores are being re-established following bush fires, drought, disease and pest attack. Also, the liability for maintenance of the carbon stock at an individual entity level is difficult to guarantee given the complexity of natural systems and the timescales involved. The CFI also proposes obligations to relinquish credits if carbon stores are destroyed and action is not taken to re-establish them.

## Carbon pooling and other options

Uncertainty may reduce the size of the potential market for agricultural offset credits. The administrator certifying offset credits is likely to take a conservative approach and award credits only for a safe lower bound of abatement to ensure the integrity of an offset credit. However, there may be a reasonable probability that a higher level of abatement will be attained.

ACIL Tasman (2010) discusses a number of measures to increase the size of the offset market in the face of uncertainty around agricultural sequestration activities. They propose issuing an option based on the amount of abatement that exceeds the lower bound specified by the certifying authority. This option could be traded separately from the underlying offset. Creating options in this way could increase demand for offsets and associated options.

Other types of options are also proposed. Rules in the offset market may change over time. Some offset credits that are not currently fungible under the Kyoto Protocol may be declared so at a future date. Options could be defined that would be exercised in the event an offset credit was declared to be Kyoto compliant.

ACIL Tasman (2010) proposes a further measure to increase the size of the market for offsets through ‘carbon pooling’ that involves creating portfolios of diverse offsets. Provided that returns from the offset credits are not perfectly correlated, the variance of the portfolio will be less than the weighted sum of variance of its components. There may be a high risk in holding each of the elements of the portfolio individually. However, the overall risk for the portfolio will be less than the weighted sum of the individual risks. The risk reduction achieved through creating portfolios may increase the demand for offsets.

Portfolios could be constructed for both the Kyoto-compliant and Kyoto non-compliant markets. While the gains from pooling will be greater the more diverse the offset credit generation, it is imagined that there would not be pooling of compliant and non-compliant offset credits.

The proposed CFI allows for project aggregators to play an important role in reducing transaction costs associated with participating in carbon markets. An offset aggregator is

a registered entity that serves as an administrative and trading representative on behalf of multiple project owners. This aids smaller projects that may not generate enough offset credits to rationalise administrative costs. However, the permanence requirement for some offset projects (100-year requirement for sequestration activities) may discourage aggregators and participants from entering into such long-term contracts in the absence of carbon pricing policy certainty and sequestration outcomes.

### Optimal contract and financial instrument designs

One of the greatest challenges for agricultural offset activities is encouraging the early uptake of offset opportunities in the absence of well-established carbon markets and carbon prices. Changes in management practices to reduce emissions or increase carbon sequestration involve upfront costs in the form of labour, capital and additional reporting obligations. Even if the government develops offset methodologies for the agriculture sector, there are barriers to prevent uptake of offset opportunities. Market and policy innovations will likely play an important role in facilitating early uptake of these opportunities.

In a typical offset project, technology adoption costs will be incurred before offset credits can be delivered. Thus, a seller of offset credits would prefer an upfront payment before credits are delivered. On the other hand, buyers will wish to pay only when credits are available. Total payments could be split between an upfront amount and an amount payable on delivery. Palmer et al. (2009) examine such a system to deal with the problem of permanence in carbon sinks. The actual split between upfront and conditional payments would depend on the relative bargaining strength of buyers and sellers. If credits from other sources are available at a single price on delivery, the relative bargaining strength of sellers would be weakened and a single payment system may result. For example, in the compliant market there is a single price for Certified Emissions Reduction units under the Clean Development Mechanism.

Under a two-part payment system, the return from holding an offset contract becomes uncertain. It depends on whether or not carbon credits are delivered. There would be an incentive to pool contracts to reduce this uncertainty. Returns from contracts where credits are delivered would offset the loss from contracts where they were not delivered. The loss would depend on the terms of the contract for the procedures to be followed in the event of non-delivery, assuming contracts are enforceable.

Similar to the two-part payment system, commodity brokers could play an important role in facilitating the uptake of offset opportunities. A commodity broker is an individual or firm that buys and sells commodity contracts on behalf of clients and charges them a commission. This process is well established in grain and livestock futures contracts trading and many farmers are familiar with the system. In a well-established carbon market with credible carbon price signals, agricultural offsets could be recognised as a tradeable financial instrument, thus encouraging broader uptake by businesses and enabling them to become an integrated part of producers' income streams.

## Demand for Australian offsets: a closer look

### Domestic demand

The domestic demand for voluntary carbon offset credits has been small in Australia. The primary motivation for carbon credit retirement has been to meet corporate social responsibility commitments to satisfy environmentally conscious employees, investors, clients and/or consumers (Peters-Stanley 2008; Taiyab 2006). Key buyers of voluntary

offset credits in Australia are major airlines and financial institutions such as the Commonwealth Bank, Westpac, AMP, National Australia Bank and ANZ. Most of the purchased offsets are from forest carbon sinks.

Whether or not the CFI-certified offset credits can be used under a mandatory domestic carbon pricing scheme is still for the Australian Government to decide. The introduction of 'explicit' (as opposed to 'implicit') carbon pricing and offsets provisions will provide long-term policy certainty for carbon offset credit providers under the CFI.

Also, the evolution of explicit carbon pricing policies in Australia (and overseas) will have implications for future demand in a voluntary carbon offset market within Australia. The extent of demand for offset credits in a voluntary market will depend on the public's perception of the effectiveness of 'mandatory' schemes. Individuals may be less willing to pay a premium for green products and practices associated with voluntary schemes if the mandatory schemes are seen as environmentally effective. That is, mandatory schemes operating alongside the voluntary schemes may lead to a reduction or, at most, limited growth in the demand for offset credits purchased by non-mandated firms and/or individuals.

Offset credit prices are expected to remain higher in compliance markets than in voluntary markets. Future international rules and the final CFI rules will determine if agricultural offset credits can be traded into voluntary or mandatory carbon markets and are, therefore, an important issue for Australian agriculture. In particular, some sequestration and abatement activities currently covered under the voluntary offsets market in Australia, such as carbon sequestration in agricultural soils, can only occur over a limited time period—defined as carbon saturation level. If farmers expect an emissions-abating project to be recognised in a future compliant offsets market, they may delay the project in the hope of obtaining a higher price in the future.

## International demand

The nature and size of the 'regulated' CFI offset market for Australian agriculture will depend not only on the domestic carbon pricing policy but also on the international carbon policy environment. In determining the potential international market for Australian offset credits, it is instructive to review the current international state of development of carbon markets. It should be noted that unless the CFI offset credits are also accredited under international voluntary and regulated carbon markets, there will be limited international demand for Australian CFI offset credits.

The Kyoto Protocol is the primary policy platform for addressing climate change mitigation at the international level. The Protocol contains targets that member countries (called Parties) have committed to reach between 2008 and 2012. Under the Protocol, Parties commit to meet their targets (called Assigned Amounts) primarily through national measures. However, the Kyoto Protocol allows three market-based mechanisms, known as 'the carbon market':

- Emissions Trading Scheme
- Clean Development Mechanism
- Joint Implementation.

Under the emissions trading mechanism, the Kyoto Protocol allows Parties with surplus Assigned Amount Units—an allowance to emit GHGs comprising one tonne of $CO_2$-e—to sell these to other Parties to meet their targets.

There are also a range of voluntary and regulated carbon markets operating around the globe alongside the Kyoto Protocol. These include the European Union Emissions Trading Scheme, the New Zealand Emissions Trading Scheme, the Regional Greenhouse Gas Initiative in the north-east and mid-Atlantic states of the United States, the Alberta Offset Scheme, and the NSW and ACT Greenhouse Gas Reduction Scheme. Some of these schemes allow for trading in carbon offset credits. The schemes are described below, with the offset features summarised in table 2.

**Table 2: Offset features of selected carbon schemes**

| Scheme | Start date | Allows for offsets | Type/scope of offsets |
|---|---|---|---|
| Kyoto Protocol | 2008 | yes | CDM / JI |
| EU ETS | 2005 | limited | CDM / JI |
| NZ ETS | 2008 | limited | some CDM / JI |
| RGGI | 2009 | yes | RGGI scheme only |
| Alberta | 2007 | yes | Alberta scheme only |
| MGRA | to be announced | limited | initially US and Canada |
| WCI | 2012 | limited | to be determined |
| AB 32 | 2012 | yes | REDD |

Notes: EU ETS - European Union Emissions Trading Scheme; NZ ETS - the New Zealand Emissions Trading Scheme; RGGI - the Regional Greenhouse Gas Initiative in the north-east and mid-Atlantic states of the United States; Alberta - the Alberta Offset Scheme; MGRA - Midwestern Greenhouse Gas Reduction Accord; WCI - the Western Climate Initiative; and AB 32 - the California Assembly Bill 32: Global Warming Solutions Act; CDM - Clean Development Mechanism; JI - Joint Implementation; and REDD – the United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.

The Clean Development Mechanism is the main international scheme to facilitate abatement in the developing world. The scheme allows entities from Annex B countries (developed economies and economies in transition with specific emissions reduction targets under the Kyoto Protocol) to develop emission reducing projects in non-Annex B countries (developing economies without any emissions reduction targets under the Protocol). The projects generate tradeable credits corresponding to the volume of emission reductions or removals achieved. Such projects can earn saleable Certified Emission Reduction credits, each equivalent to one tonne of $CO_2$-e, which can be counted toward meeting the Kyoto targets of Annex B countries. The mechanism aims to stimulate sustainable development and emission reductions in developing countries, while giving industrialised countries some increased flexibility in meeting their emissions reduction targets. The Clean Development Mechanism is also designed to facilitate the transfer of low-emissions and no-emissions technology from Annex B Parties to non-Annex B countries.

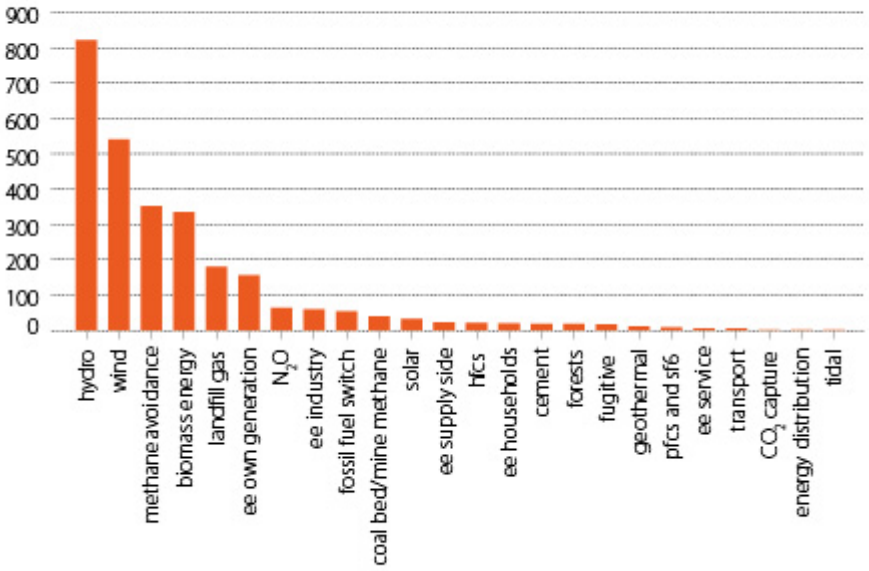
As of 4 February 2011, the Clean Development Mechanism has registered 2 798 projects (UNFCCC 2011a). It is anticipated that these projects will produce Certified Emissions Reduction units of more than 2.7 billion tonnes of $CO_2$-e in the first commitment period of the Kyoto Protocol from 2008 to 2012. The majority of the Clean Development Mechanism projects relate to energy industries, accounting for about 62 per cent of total projects, followed by waste handling projects with about 18 per cent. There are 134 agriculture projects registered, representing about 5 per cent of total Clean Development Mechanism

projects and 19 forestry projects, representing less than 1 per cent of total Clean Development Mechanism projects (UNFCCC 2011a).

Currently, most of the Clean Development Mechanism projects related to agriculture consist of methane recovery from agricultural activities and improved animal waste management systems. Reforestation of degraded land is undertaken in the majority of forest projects. Although methodologies exist for urea offset (reduction in fertiliser emissions) by inoculants application in soybean–corn rotations and emissions reductions through multi-site animal manure collection and treatment in a central plant, no projects have been put forward for approval. In addition, there are currently no Clean Development Mechanism projects or methodologies in relation to soil carbon sequestration.

Currently, China and India are hosting the largest number of Clean Development Mechanism projects and have generated the largest number of Certified Emissions Reduction units to date. The average over-the-counter price for Certified Emissions Reduction units during January 2011 was around €11.10 (Point Carbon 2011c).

2 Registered CDM projects by activity (as of February 2011)



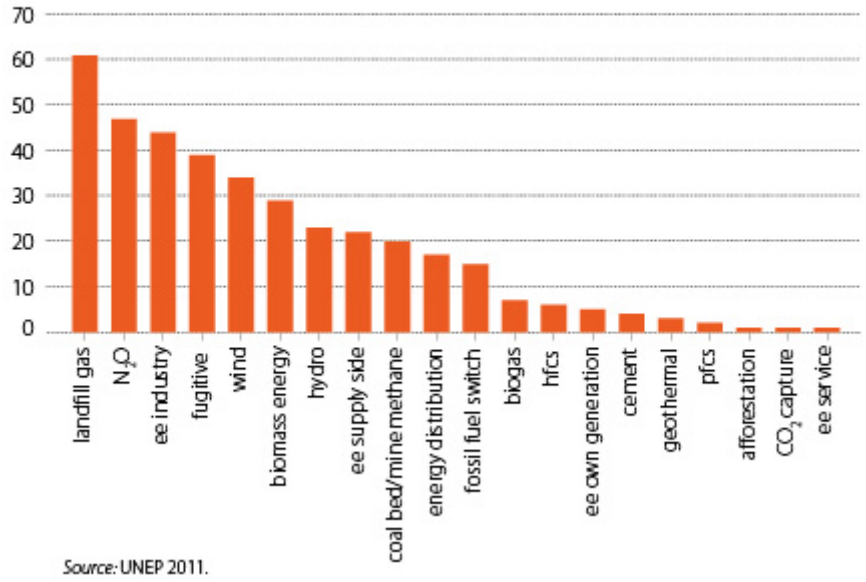

Note: Agricultural projects are part of the methane avoidance activity.
*Sources:* UNFCCC 2011a

The Joint Implementation mechanism allows an Annex B Party to earn emission reduction units from an emission-reduction or emission-removal project in another Annex B Party, equivalent to one tonne of $CO_2$-e which can be counted toward meeting its Kyoto target.

The Joint Implementation mechanism offers Parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer. As of January 2011, the Joint Implementation mechanism has 381 projects in the pipeline, with 211 projects reaching registration status. The majority of the Joint Implementation projects relate to methane reduction from landfill or coal mines and renewable energy projects (figure 3). There is only one project for afforestation and no Joint Implementation projects are proposed for the agriculture sector (UNEP 2011).

The Joint Implementation projects are predominately being undertaken in transition economies such as the Russian Federation, Ukraine, Bulgaria and the Czech Republic.

3 Number of JI projects by activity




*Source:* UNEP 2011.

The European Union Emissions Trading Scheme sets a cap on the emissions produced by power stations, combustion plants, oil refineries and iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board (European Commission Climate Action 2011). Firms liable under the European Union scheme are able to purchase permits from compliance offsets markets. The Clean Development Mechanism and the Joint Implementation offsets mechanisms are part of the compliance scheme.

Phase I of the European Union scheme ran from 2005 to 2007. Currently, Phase II (2008 to 2012) of the scheme is in operation, accounting for almost half of the European Union's $CO_2$ emissions and 40 per cent of its total GHG emissions. Airlines will join the scheme in 2012. The European Union scheme coverage will be further expanded to the petrochemicals, ammonia and aluminium industries and to additional gases in 2013, when Phase III of the scheme starts (European Commission Climate Action 2011).

European Union scheme trading volumes remained fairly stable throughout 2010 and European Union Allowances traded at a price of around €13–16 for most of 2010 (figure 4).

**4 European Union Allowances daily trading prices for phase 2**
2008 to current


*Source:* Point Carbon 2011.

New Zealand introduced an emissions trading scheme in 2008 covering the forestry sector. In 2010, emissions from stationary energy, industrial processes and upstream transportation fuel were included in the scheme. Agriculture is proposed to be covered by the scheme from 2015. The scheme runs as a trial until 2012, during which time the price of permits is capped at NZ$25 and firms are required to surrender one permit per two tonnes of $CO_2$-e emissions if they exceed their free allowance.

The Regional Greenhouse Gas Initiative is the first mandatory, market-based GHG emissions reduction scheme in the United States. Ten north-eastern and Mid-Atlantic states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New Hampshire, New York, Rhode Island and Vermont) have committed to reduce emissions through a 'cap-and-trade' system from the power sector by 10 per cent below the 2009 levels by 2018.

Currently, permit prices under the Regional Greenhouse Gas Initiative are just below US$2 ($2) a tonne of $CO_2$-e because there is substantial oversupply of credits as the cap was incorrectly estimated (Point Carbon 2010a). Forward pricing is estimated to be around US$6 ($6) a tonne of $CO_2$-e by 2024. Under the Regional Greenhouse Gas Initiative, offsets are allowed for up to 3.3 per cent of a facility's total emissions and can rise up to 10 per cent if the 'safety valve' which is set at US$10 ($10) a tonne of $CO_2$-e is triggered (RGGI 2011). Currently, the initiative's five eligible offset categories include projects that:

- capture or destroy methane from landfills
- reduce emissions of sulfur hexafluoride from electricity transmission and distribution equipment
- sequester carbon dioxide through afforestation
- reduce emissions of carbon dioxide through non-electric end-use energy efficiency in buildings
- avoided methane emissions through agricultural manure management operations.

All offset projects must be located within one of the states participating in the Regional Greenhouse Gas Initiative.

There are three proposed regional cap-and-trade schemes in North America: Midwestern Greenhouse Gas Reduction Accord—involving the US states of Illinois, Iowa, Kansas,

Michigan, Minnesota and Wisconsin and the Canadian Province of Manitoba; the Western Climate Initiative—comprising the seven US states of Arizona, California, Montana, New Mexico, Oregon, Utah and Washington, and the four Canadian provinces of British Columbia, Manitoba, Ontario and Quebec; and the California Assembly Bill 32: Global Warming Solutions Act. The Western Climate Initiative and the California Assembly Bill 32 are expected to commence in 2012. The commencement date for the Midwestern Greenhouse Gas Reduction Accord is yet to be determined, as are the detailed scheme designs and regulations for all other schemes.

Alberta is the first jurisdiction in Canada to establish a compliance-based GHG emissions trading system covering all six Kyoto gases. Regulated facilities must reduce their emissions intensity by 12 per cent annually until the end of 2014, from the facility's average emissions intensity over 2003–2005. There are three methods of reduction listed under the legislation:

- upgrade the facility with the installation of new technology
- pay C$15 a tonne $CO_2$-e into a technology fund to invest in R&D and building technology for the future
- purchase carbon offset credits sourced within Alberta.

Agriculture and forestry are the only two industries that can create carbon offset by sequestering carbon. The regulation creates a market for carbon trading between emitters and farmers who sequester carbon. Therefore, the agricultural industry has an opportunity in the emerging compliant offsets market. Alberta's GHG regulation has effectively established a price cap of C$15 t/$CO_2$-e because of the option to pay into a technology fund at C$15 t/$CO_2$-e or to purchase carbon offset credits. Importantly, the Alberta scheme only allows for offsets produced within the scheme jurisdictions.

The NSW and ACT Greenhouse Gas Reduction Scheme commenced on 1 January 2003. It is one of the first mandatory GHG emissions trading schemes in the world. The NSW and ACT scheme aims to reduce GHG emissions associated with the production and use of electricity in NSW and ACT. It achieves this by using project-based activities to offset the production of GHG emissions (GGAS 2010b). Under the NSW and ACT scheme, the following activities can generate tradeable certificates: power generation activities; energy efficiency projects; large electricity users; and carbon sequestration from environmental plantings. To create abatement certificates from forestry activities, a party must be accredited under the NSW and ACT scheme as a Sequestration Pool Manager. The Sequestration Pool Manager does not necessarily have to own the parcels of land that make up its portfolio of forests (the sequestration pool).

To date, there have been only a few entities participating as carbon offset providers under the NSW and ACT scheme. Certificates created by January 2011 include, Blue-Leafed Mallee Limited, with 2 633 certificates; $CO_2$ Australia Limited, with 14 977 certificates; Mallee Carbon Limited, with 31 255 certificates; and Forests NSW, with more than 3 million certificates, all from environmental plantings (GGAS 2010).

In recent years, the NSW Government has been preparing to transition the NSW and ACT scheme to a national scheme. Delayed national action means that there are no clear signals to investors in the energy market regarding how state governments' (including NSW) emissions reduction targets are to be achieved. In this context of ongoing uncertainty around the timing, form and scope of national carbon pricing arrangements, the NSW Government has commenced a review of GGAS (NSW Government 2010).

## Recent trends in international markets

In 2009, voluntary markets (excluding the now defunct Chicago Climate Exchange) were estimated to account for about 1 per cent of total volume of emissions rights traded, representing about 0.3 per cent of total value of trade (Hamilton et al 2010), mostly from carbon forest sinks or renewables.

In 2009, transactions in voluntary carbon markets (including the Chicago Climate Exchange) amounted to 93.7 million tonnes of $CO_2$-e valued at US$387 million, and 51 million tonnes $CO_2$-e estimated at US$338 million without the Chicago Climate Exchange (Hamilton et al. 2010). This can be compared with the 126.6 million tonnes $CO_2$-e transacted in 2008 and valued at US$728 million. In 2009, transactions declined by 26 per cent in volumes and by 47 per cent in value from the corresponding 2008 levels. However, the 2009 market volumes were 39 per cent above the 2007 levels. Sources of voluntary offsets on both the Chicago Climate Exchange and over-the-counter market are very diverse, with methane destruction projects and forestry projects doubling their share in 2009 from the previous year despite low prices received for these offsets.

In 2009, average prices for renewable energy offsets were estimated at US$33.80 a tonne $CO_2$-e for solar, US$12.30 a tonne $CO_2$-e for biomass and US$9.60 a tonne $CO_2$-e for methane. At the low end of the range were geological sequestration and industrial gas credits at US$2.40 a tonne $CO_2$-e and agricultural soil sequestration at US$1.10 a tonne $CO_2$-e. The average price of a voluntary carbon credit transacted on the over-the-counter market was estimated at US$6.50 a tonne $CO_2$-e (Hamilton et al. 2010).

Regulated markets—comprising the European Union Emissions Trading Scheme, the Clean Development Mechanism, the Joint Implementation mechanism, the Kyoto Assigned Amount Units, the NSW and ACT Greenhouse Gas Abatement Scheme, the Regional Greenhouse Gas Initiative and Alberta—traded 8.6 billion tonnes of $CO_2$-e valued at US$143.9 billion in 2009 compared with 4.7 billion tonnes of $CO_2$-e valued at US$134.4 billion in 2008 (Hamilton et al. 2010). However, global trading activity on the carbon markets, voluntary and compliant, for the third quarter in 2010 was down by 14 per cent in volume compared with the same quarter in 2009. According to Bloomberg (2010), one of the most significant drivers of the fall in trading activity was the decline in the Regional Greenhouse Gas Initiative volumes, which was attributed to a systematic surplus of credits in the scheme and the lack of progress on a US federal ‘cap-and-trade’ scheme. The uncertainty about the future Kyoto Protocol carbon market post-2012 and the use of certified emissions reductions (CERs, the CDM-based offset credits) across certain markets will continue to adversely affect trading volumes.

In contrast, the European Union Emissions Trading Scheme recorded an 8 per cent increase in trading activity for the third quarter in 2010 relative to the third quarter of 2009. It seems that the EU scheme will remain by far the biggest operational ‘cap-and-trade’ scheme among the OECD countries prior to 2013 and, therefore, growth in the global carbon market will largely be determined by the growth in this market (Bloomberg 2010). Bloomberg estimated that if no new markets are established before 2013, the carbon market will turn over up to US$0.8 trillion in 2020 and, if the US, Australia and Japan were to introduce ‘cap-and-trade’ schemes, this figure could reach US$1.4 trillion by 2020.

According to Point Carbon (2011a), while the economic downturn has helped some countries to meet Kyoto Protocol targets, falling emissions is also boosting many countries’ surplus of Assigned Amount Units of the Kyoto Protocol. The latest data from the United Nations Framework Convention on Climate Change reveal that some countries that were previous buyers of carbon credits will be on track to meet Kyoto Protocol targets

or even become carbon credit sellers as their emissions fall below their caps (UNFCCC 2011b).

It is estimated that the current Kyoto Protocol commitment period will expire with a surplus of 7–10 billion Assigned Amount Units representing around 10 to 15 per cent of total Assigned Amount Units issued (Point Carbon 2011b). Table 3 presents a summary of the emission liability or surplus status of the EU member states for 2009.

**Table 3: Kyoto emissions balance for EU countries, 2009[a]**

| Country[b] | Kyoto level (million tonnes of $CO_2$-e) | 2009 actual (million tonnes of $CO_2$-e) | 2008 actual (million tonnes of $CO_2$-e) | Change in 2009 relative to 2008 (%) | Balance at 2009 (million tonnes of $CO_2$-e) |
|---|---|---|---|---|---|
| Poland | 529.6 | 377.0 | 397.1 | –5.1 | 152.7 |
| Romania | 256.0 | 129.7 | 152.2 | –14.8 | 126.3 |
| UK | 682.4 | 574.6 | 628.3 | –8.6 | 107.8 |
| Bulgaria | 122.0 | 59.4 | 69.3 | –14.3 | 62.6 |
| Germany | 973.6 | 919.7 | 981.1 | –6.3 | 53.9 |
| France | 563.9 | 512.3 | 534.5 | –4.2 | 51.7 |
| Czech Rep | 178.7 | 132.9 | 141.1 | –5.9 | 45.9 |
| Hungary | 108.5 | 66.8 | 73.3 | –8.9 | 41.7 |
| Lithuania | 45.5 | 21.6 | 24.0 | –10.1 | 23.9 |
| Slovakia | 66.3 | 43.4 | 48.2 | –9.9 | 22.4 |
| Estonia | 39.2 | 16.8 | 20.0 | –16.2 | 22.4 |
| Sweden | 75.0 | 59.8 | 63.4 | –5.7 | 15.3 |
| Latvia | 23.8 | 10.6 | 11.8 | –9.7 | 13.2 |
| Belgium | 134.8 | 124.4 | 135.1 | –7.9 | 10.4 |
| Finland | 71.0 | 66.4 | 70.5 | –5.8 | 4.6 |
| Ireland | 62.8 | 62.3 | 67.8 | –8.0 | 0.5 |
| Slovenia | 18.7 | 19.3 | 21.3 | –9.3 | –0.6 |
| Netherlands | 200.3 | 201.0 | 207.0 | –3.0 | –0.8 |
| Denmark | 55.4 | 62.1 | 63.5 | –2.2 | –6.7 |
| Italy | 483.3 | 490.2 | 541.5 | –9.5 | –6.9 |
| Austria | 68.8 | 80.0 | 86.9 | –7.9 | –11.2 |
| Spain | 333.2 | 367.5 | 403.9 | –9.01 | –34.3 |

**a**. A positive number implies surplus, and a negative number implies liability.

**b.** Data for Cyprus, Greece, Luxembourg, Malta and Portugal are not available. Preliminary data are used for Denmark, Italy, Netherlands, and the UK.

*Source*: Point Carbon (2011a).

The recession may have caused the number of surplus units to balloon in the United Kingdom, Germany, and France. In 2009, the United Kingdom emissions fell to

108 million below its Kyoto Protocol target, while Germany outperformed its target by 54 million tonnes, France by 51.6 million, and Sweden by 15 million (table 3). It is estimated that the eastern European bloc—with member states from the former Soviet Union—will have a surplus of around 500 million Assigned Amount Units over the five-year Kyoto Protocol period. It has so far sold fewer than 15 million units (Point Carbon 2011a).

One country outside the European Union that is likely to purchase Assigned Amount Units, to meet its target is Japan. Japan is currently the world's largest buyer of Assigned Amount Units with an estimated shortfall of 70 million tonnes $CO_2$-e for the Kyoto Protocol period. In recent times, France has offered to sell permits to Japan. The latest estimation of New Zealand's net position under the Kyoto Protocol shows a surplus of 11.2 million tonnes $CO_2$-e as of January 2011 (NZ Ministry for the Environment 2011).

According to DCCEE preliminary estimates, Australia had a 15 million tonnes $CO_2$-e surplus of Kyoto Protocol units in 2007–08 and 20 million tonnes $CO_2$-e in 2008–09, together representing about 7 per cent of Australia's annual Kyoto Protocol target (DCCEE 2010b). Under the proposed CFI, Kyoto-compliant CFI offset credits are exchangeable for Assigned Amount Units or Emissions Reduction Units and can be exported to other Kyoto Protocol registries.

The treatment of the Kyoto units (Assigned Amount Units, Certified Emissions Reduction Units and Emissions Reduction Units) beyond the current Kyoto Protocol period remains critical but largely uncertain. The United Kingdom is expected to cancel its Assigned Amount Units surplus after the current Kyoto Protocol period, and Germany and Sweden have yet to make a decision. Banking of Assigned Amount Units beyond the first Kyoto Protocol commitment period is currently being considered as part of the United Nations Framework Convention on Climate Change negotiations. Some of the options proposed are:

- to allow transfer of Assigned Amount Units to the post-2012 period without restrictions
- to limit the number of Assigned Amount Units that can be banked to a percentage of the surplus allowances
- to only allow countries to use surplus Assigned Amount Units for their own purposes
- to ban any banking of allowances.

## Outlook for Australian CFI offset credits

In the short to medium term, based on existing policy settings, there seems to be:

- limited demand for Australia's Kyoto Protocol-compliant offsets in the Annex B countries
- limited opportunities for Australia's offsets in various regulated and voluntary 'cap-and-trade' markets, including the NSW and ACT Greenhouse Gas Reduction Scheme, Alberta Offsets Market, the Regional Greenhouse Gas Initiative, and the Western Climate Initiative
- limited growth prospects for offsets demand by institutions and business entities seeking to become carbon neutral.

The introduction of a domestic offsets market linked to a carbon pricing scheme is likely to be important in encouraging demand for Australian agricultural offsets, at least in the medium to long run.

## Conclusions

In the absence of an internationally agreed pathway beyond the Kyoto Protocol, the demand for Kyoto-compliant offsets in the global market is likely to be limited. Regionally focused regulatory markets such as the Regional Greenhouse Gas Initiative and Alberta have been established in recent years and a few more schemes are proposed to commence over the next couple of years. However, the demand for Australian offsets in these schemes remains uncertain and would, in any event, be dependent on CFI credits being accredited under those schemes. Also, the voluntary market is likely to remain a small fraction of the size of the regulated markets.

The proposed CFI scheme will set out what farmers, foresters and landholders need to do in order to generate offset credits for sale in carbon markets. A domestic carbon pricing policy with offsets provisions can be expected to play a key role in boosting the domestic carbon offset market. A range of institutional innovations are proposed to facilitate greater uptake of agricultural offset opportunities. These are to deal with uncertainties and costs associated with participating in carbon markets and to increase the supply of agricultural offsets.

Since participation in the CFI eligible offset activities is voluntary, the initiative will only be effective if landholders can see a clear economic benefit from participating in a carbon offset market.

For effective participation of farmers and landowners in the offset market, the additionality test under the CFI needs to be considered carefully from a broader perspective in terms of co-benefits, setting baselines and determining what constitutes emissions reductions that would not have occurred in the absence of the scheme. The Australian Government is currently seeking stakeholder feedback on ways of streamlining assessment of additionality for offset projects under the CFI.

The CFI eligibility rules and requirements need to be flexible to reflect farming realities and to ensure scheme integrity. However, regular changes to these rules (needed to reflect practice change) and the way in which they are applied may act as a deterrent for landholder participation in sequestration and abatement activities. If this were the case, the CFI may not contribute meaningfully to GHG abatement.

Nevertheless, given the varying opportunities for GHG abatement or removal across land-based activities, a carbon offset crediting scheme can be expected to induce some degree of structural change within the land-based activities sector of the economy.

## References


ABARES 2010, Australian commodity statistics, Canberra.

ACIL Tasman, 2010, Australian Agriculture as a Provider of Carbon Offsets, March 2010. Available from URL: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/326155/Agricultural-offsets-discussion-paper-summary.pdf.

AGSURF, 2010, ABARE-BRS: AGSURF: Explore Australian agricultural data, viewed 22 July 2010. Available from: http://www.abare.gov.au/interactive/agsurf/.

Beauchemin, KA, Kreuzer, M, O'Mara, F and McAllister, TA, 2008, Nutritional management for enteric methane abatement: a review, *Australian Journal of Experimental Agriculture*, vol.48, pp.21-27.

Bloomberg, 2010, Carbon Markets - Research Note - 8 October. Available from: http://www.bloomberg.com/.

Calford, EM, Gurney, A, Heyhoe, E and Ahammad, H, 2010, The effect of an emissions offset scheme on Australian agriculture, issues insights, Vol. 10, ABARE, March. Available from URL: http://www.abare.gov.au/publications_html/ins/insights_10/a2.pdf.

DCCEE 2010a, Design of the Carbon Farming Initiative: Discussion Paper, Department of Climate Change and Energy Efficiency. Available from URL: http://www.climatechange.gov.au/en/government/submissions/~/media/submissions/cfi/cfi-consultation-paper-pdf.ashx.

_____ 2010b, 'National Greenhouse Gas Inventory' accounting for the Kyoto target, Canberra. Available from URL: http://www.climatechange.gov.au/en/publications/greenhouse-acctg/national-greenhouse-gas-inventory-2008.aspx.

European Commission Climate Action, 2011, Emission Trading System, viewed 2 February 2011, http://ec.europa.eu/clima/policies/ets/index_en.htm.

Ford, M, Gurney, A, Tulloh, C, McInnis, T, Mi, R and Ahammad, H, 2009, Agriculture and the Carbon Pollution Reduction Scheme (CPRS): economic issues and implications, issues insights, Vol. 09, ABARE, March. Available from URL: http://www.abare.gov.au/publications_html/ins/insights_09/a2.pdf.

GGAS, 2010, GGAS & ESS Registry, Accreditation and Participants, http://www.ggas-registry.nsw.gov.au/searching/accreditationandparticipantsearch.aspx?scheme=GGAS).

Hamilton, K, Sjardin, M, Peters-Stanley, M and Marcello, T, 2010, Building Bridges: State of the Voluntary Carbon Markets 2010. Available from URL: http://www.ecosystemmarketplace.com/pages/dynamic/resources.library.page.php?page_id=7585&section=our_publications&eod=1.

Hamilton, K, Sjardin, M and Shapiro, A, 2009, Fortifying the Foundation: State of Voluntary Carbon Markets 2009. Available from URL: http://www.ecosystemmarketplace.com/documents/cms_documents/StateOfTheVoluntaryCarbonMarkets_2009.pdf.

Heckbert, S, Russell-Smith, J, Davies, J, James, G, Cook, G, Liedloff, A, Reeson, A and Bastin, G, 2009, Northern Savanna Fire Abatement and Greenhouse Gas Offsets on Indigenous Lands, CSIRO.

Martin, C, Morgavi, DP and Doreau, M, 2009, Methane mitigation in ruminants: from microbe to the farm scale, *Published online by Cambridge University Press 03 Aug 2009 doi:10.1017/S1751731109990620*.

NSW Government, 2010, NSW Greenhouse Gas Reduction Scheme (GGAS) review, http://www.greenhousegas.nsw.gov.au/Documents/GGAS_Review_041110.pdf).

NZ Ministry for the Environment 2011, New Zealand's net position under the Kyoto Protocol*,* Last updated: 27 January 2011. Available from URL: http://www.mfe.govt.nz/issues/climate/greenhouse-gas-emissions/net-position/index.html.

Palmer, C, Ohndorf, M and MacKenzie, IA, 2009, Life's a breach! Ensuring 'permanence' in forest carbon sinks under incomplete contract enforcement, Center of Economic Research at ETH Zurich.

Peters-Stanley, M, 2008, Where to Go From Here? The Role of the Voluntary Carbon Market in the Australian Carbon Pollution Reduction Scheme, Carnegie Mellon University, Adelaide, http://www.climatechange.sa.gov.au/uploads/pdf/Publications/Carbon_Markets_PetersStanley.pdf.

Point Carbon, 2011a, AAU surplus grows as recession slashes emissions, viewed 21 January 2011, http://www.pointcarbon.com/1.11498217.

_____ 2010a, Carbon Market North America, viewed 2 February 2011.

_____ 2010b, Seven countries short by 332 Mt for 2008-12 period, up on Q2, viewed 21 January 2011, http://www.pointcarbon.com/aboutus/pressroom/pressreleases/1.1478058.

_____ 2011b, Eastern EU states eye joint proposal on AAU banking, *CDM/JI/AAU News,* viewed 2 February 2011, http://www.pointcarbon.com/1.1497802.

_____ 2011c, Point Carbon's OTC price assessments viewed 2 February 2011, http://www.pointcarbon.com/.

RGGI, 2011, Regional Greenhouse Gas Initiative model rule, Available from URL: http://www.rggi.org/docs/Model%20Rule%20Revised%2012.31.08.pdf.

Taiyab, N, 2006, Exploring the market for voluntary carbon offsets, viewed 4 February 2011, http://pubs.iied.org/pdfs/15502IIED.pdf.

UNEP, 2011, JI projects. Available from URL: http://cdmpipeline.org/ji-projects.htm.

UNFCCC, 2011a, CDM Statistics: registered projects by host party, viewed 7 February 2011, http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html

_____ 2011b, Initial Reports under the Kyoto Protocol, viewed 17 January 2011, http://unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/items/3765.php

Weersink, A, Pannell, D., Fulton, M and Meyer-Aurich, A., 2005, Agriculture's Likely Role in Meeting Canada's Kyoto Commitments, *Canadian Journal of Agricultural Economics*, vol.53, pp.425-441.