Australian Agriculture as a Provider of Carbon Offsets

Possibilities and issues in developing an offsets market
A Discussion Paper

Prepared for NSW Department of Industry and Investment
& the Victorian Department of Primary Industries

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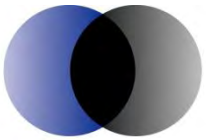

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Executive Summary

Key points

- This report proposes a coordinated package of measures to tap into the potential of agriculture to support climate policy objectives within an overall adaptive policy response. It focuses on ways to reduce large biases against accessing these opportunities early, to support more cost effective response to climate threats. In general, these measures would be complementary to discounting and other measures already emerging for addressing established concerns for permanence of sequestration etc.
- The report identifies limitations, of particular relevance to agriculture, in the focus on emissions reduction targets. It proposes instead that the primary objectives guiding policy development should relate directly to climate outcomes, such as the Copenhagen 'ultimate goal' of preventing dangerous anthropogenic climate change and its risk-based working objective of the proposed 2 degree peak warming target; this might possibly be extended to include peak ocean acidity.
- Agriculture has significant scope to reduce emissions and sequester carbon through offset arrangements. Broadly, agricultural offsets are certified changes in patterns of behaviour deemed to have delivered sequestration or abatement of greenhouse gases relative to baselines.
- Offsets which are Kyoto compliant (covering abatement of methane and nitrous oxide emissions from farms) could be traded into the CPRS (if it proceeds or with an analogous emission trading scheme) while offsets which are non-Kyoto compliant (soil carbon sequestration), or all offsets in the absence of an emissions trading scheme, can be traded in voluntary markets.
- The report flags two complementary instruments that could add greatly to the incentives for early investment in creating agricultural offsets:
  - In addition to certifying offsets based on a 'safe' assessment of minimum impacts, the certifying agency could issue 'options', redeemable as additional offsets in the future, should new science or changed rules indicate that greater abatement/sequestration can be safely inferred.
  - Pooling of diverse offsets into portfolios spanning farms, regions, farm systems and even countries, could be used to greatly increase the level of safe attribution of offsets to individual behaviour changes – simply reflecting sound risk management principles.
- It will be important to tap into the potential of agricultural offsets at an early stage, even in the absence of scientific certainty, since the costs of waiting in terms of the cumulative impacts of climate change, are likely to be high. Early development of agricultural offsets, especially in relation to soil carbon, can demonstrate to other countries the potential for such activity and could assist in rule changes to article 3.4.
- The report argues for a less restrictive approach to the concept of permanence in offset arrangements to reflect the importance and value of temporary and earlier sequestration or emission reduction as part of an overall adaptive approach to climate threats.
- It will be important to address the issue of leakage where the benefits of one farm's emission reductions can be partly 'clawed back' by the normal market responses of other producers, or as a result of gaming behaviour.
  - Well developed models can identify leakage paths, and also enable various categories of offsets to be recognised based on the extent and magnitude of leakage.
- The report highlights the importance of complementarity in climate change policy with other arms of policy, such as drought policy, to avoid perverse incentives, reduce duplications and capitalise on policy synergies.

Purpose & context

This is an issues and discussion paper – exploring issues that arise in seeking to establish *sound institutional arrangements for agricultural offsets*, if these arrangements are to tap the potential of agriculture, while limiting any incentives for counterproductive responses. It is intended to feed into the public policy discussions leading up to the establishment, and progressive evolution, of effective offsets arrangements. In this role, it seeks to challenge some common assumptions – a number of which appear to have encouraged constraints on tapping the potential of agricultural offsets and that would, if allowed to persist, add significantly to the costs of effective climate response.

This Executive Summary has been written almost as a stand-alone document, at least for understanding the main narrative and for gaining a good overview of the main points raised in the paper, including key elements of the reasoning. The body of the report and its attachments involve finer detail, fuller development of the arguments and documentation of experience elsewhere.

We have not sought here to nominate 'winning' farm sector changes, though we have expressed strong views as to how these might be aggregated and packaged to maximise value. We have noted a wide range of credible suggestions for changes to farming practices that might be achieved at modest and competitive cost – and addressed the question of what arrangements could best tap into this potential, given the uncertainties, constraints in existing rules and need for international compliance in the broad approach over time.

We have assumed a continuing strong commitment to reducing greenhouse gas emissions as part of a collaborative international response and focused on how offsets may allow this to be done better. However, the Federal Government has just announced a delay in the reintroduction of its CPRS legislation and a range of recent developments have increased uncertainty regarding the form and timing of climate change policy in Australia and internationally. These uncertainties are now part of the policy context – and may well have strengthened the case for a strong and early focus on tapping the potential for abatement and sequestration offered by agriculture and land use.

Background & Rationale

Potential value of agricultural offsets strengthened by recent policy developments

The encouragement of voluntary measures to help limit Australia's contribution to atmospheric greenhouse gas levels, or to reduce the costs to Australia of meeting any targets, is now a fairly uncontroversial concept. There is formal institutional support from the Federal Government via its National Carbon Offsets Standard. Importantly, two recent shifts in climate policy – the decision to defer indefinitely inclusion of agriculture in the proposed 'cap and trade' Carbon Pollution Reduction Scheme and the parallel strengthened

commitment to pursue agricultural opportunities via offsets – have elevated the importance of offsets within Australian climate policy. The concept of voluntary offsets has been promoted by a number of farm organisations. And agricultural offsets measures, especially build-up of soil carbon, play a central role in the policy approach recently announced by the Federal Opposition.

One of the great attractions of agricultural offsets lies in the substantial evidence that there may be a wide range of opportunities for offsets where the *effective cost of creating these offsets would be low* and, in some cases, negative. This is in sharp contrast to the likely economics of some other Australian core climate policy initiatives, such as the commitment to the development of geosequestration. These favourable economic pointers arise largely from the *complementarity* between a range of 'climate friendly' behaviour changes and *improved farm productivity*. While not all of these measures are low cost, there is *scope for sharing the costs* across the value of improved farm output as well as the value of abatement services created. In this way, offsets production might be viewed as fitting into an *expanded farm product mix* that offers *joint economies* across traditional production and the delivery of environmental services – as can be true now of complementarity between livestock and crop production and, even more tightly, between wool and sheep meat production.

Areas where this complementarity appears particularly high – where there may be *opportunities for low cost abatement and sequestration* as a result – include:

- productivity benefits of *direct application of carbon* (such as biochar) to the soil as a soil improver, with implications for soil structure and water retention and use;
- productivity benefits of genetic and herd management processes that *limit methane emissions from ruminants*, noting that high methane emissions could be viewed as wasted energy;
- productivity benefits from *better targeted application of nitrogenous fertiliser*, with nitrous oxide emissions being indicators of unutilised nitrogen in fertilisers;
- potential for productivity benefits from *increased steady state levels of carbon stored in vegetation*, whether through farm trees or increased density and biomass of other productive species – and extending to vegetation mass in soil as a result of low tillage farming systems etc.; and
- potential for more cost effective and less GHG-intensive production as a result of *modifications to some current policy settings that post perverse incentives for high emission production practices* – including aspects of drought and water policy.

Given current policy positions and trends, and the reality of agriculture's current and potential role in influencing national emissions, we see an extremely *valuable role for agricultural offsets* as part of the Australian, and global, response to climate change threats. It appears feasible to move fairly quickly to *begin tapping* this potential, though the short-term gains in terms of effective mitigation are likely to be modest because of a series of constraints and issues that can probably only be addressed safely and efficiently over time. These issues are real and must be addressed.

Scope for delivering high credibility short-term gains is real but constrained

Serious bias in current methods

However, some of the approaches that have emerged to address these issues, including decisions not to credit carbon abatement from a range of measures (a 'too hard' basket) and to heavily discount the effects of others, seems almost certain to entail a *bias towards unnecessarily high conservatism and unnecessarily high costs* of pursuing emission reduction and other climate change objectives.

Mechanisms to address serious issues, while posting early and growing incentives

We see scope for bringing a range of mechanisms to bear. These measures could *attack the unnecessary biases while protecting the integrity* of the overall response. Prominent here are two classes of instrument for greatly reducing the constraints posed by uncertainty and the desire to limit risks of encouraging counterproductive changes: pooling of risks across diverse behaviour changes, across multiple instruments, farms, regions, production systems and possibly even countries; and assigning to those willing to change behaviour retrospective access to value in the event that later determinations conclude that their actions resulted in more abatement or sequestration than was at first allowed.

Progressive expansion of coverage

Importantly, it seems feasible to look to an *evolution of these arrangements from this initial base*, to permit progressively *more comprehensive tapping of the real potential of agriculture while ensuring the integrity and credibility* of its contribution to global atmospheric carbon levels.

This evolution might sensibly involve:

Coverage

- *increasing coverage* of patterns of behaviour change that are accepted as the basis for offsets, bringing in instruments initially considered too uncertain for accreditation;

Diversification to manage risk

- *increasing 'packaging'* of individual offsets into more robust parcels of behaviour changes and contracts extending across and between farms and regions;
  - this approach extends well beyond *aggregation of similar projects*, to include creation of *extensive diverse portfolios of measures*, and actively *exploiting that diversity* to increase confidence in aggregate impacts;
    - … these strategies will need to be accompanied by sound governance measures, and we have not recommended backing off an approach

that only certifies 'safe lower bound' estimates of value as a way of limiting risks and intensifying incentives;

Sector models to assess leakage

- increasing use of increasingly sophisticated *regional farm modelling tools* to allow estimation of loss of abatement benefits as a result of market responses to individual behaviour change (abatement 'leakage');
  - supporting less harsh discounting of value and posting explicit incentives to limit leakage and to invest in improving the models;

Rising price incentives

- increasing financial incentives to agricultural offset providers while *managing the risks of posting counterproductive behaviour change* incentives;
  - reflecting both the likely rise in the marginal cost of abatement to the economy, and the strengthening science allowing a higher proportion of actual abatement benefits to be recognised safely;

More 'renting' of climate services rather than one-off payments

- a shift away from the trading of 'lumpy' offsets on a *one-off capital payment* basis, towards greater reliance on *'rental' mechanisms* linked to active monitoring and assessment of value;
  - reducing the level of uncertainty attached to valuation, allowing payment as a revenue stream linked to the flow of climate services provided over time, even from 'lumpy' investments in sequestration (there may well be commercial incentives to develop these instruments within the market, as a way of managing risks); and
  - providing an additional facility for 'banking' credits in expectations of rising value over time;

Retrospective benefits from better science/rules

- *increasing capacity to tap into additional value of past investment* in offset creation, as improvement in the science and/or applicable rules establishes past abatement/sequestration that was not fully recognised originally;
  - creation of explicit options instruments with prospects for later conversion to credits could be used to allow *the prospects for these improvements to be tapped early* to encourage abatement and sequestration; and
  - the growth in this pool of options would result in *accumulating pressure to improve the science and to effect changes in rules* that are limiting the realisation of this value for Australia;

Offsets sold into CPRS etc

- expanding scope for *voluntary trading of offsets into compulsory 'cap and trade' markets*, including the Australian CPRS, if it proceeds – but extending to overseas markets if and as they emerge, providing scope for even greater financial incentives for change and allowing these traded offsets to *reduce the costs of complying with the cap* while *other offsets directly reduce atmospheric carbon*; and

Complementary regulation

- *evolution of regulatory measures* in ways that support the efficient functioning of these offsets arrangements, in particular limiting 'leakage' of the abatement benefits through market responses that counteract some of the nominal abatement benefits of specific behaviour changes:

- The early operation of the voluntary offsets market could yield valuable information on which to base judgments regarding the most cost-effective form and intensity of complementary measures – to strike a sensible balance between accuracy of incentives posted and relevant transaction and compliance costs.
- This process, and the wider adaptive evolution of the market arrangements would be strongly supported by on-going monitoring of sectoral emissions and analysis of underlying trends.

Offsets may help plug a gap in abatement policy

Assuming the CPRS proceeds, agricultural offsets could be viewed as a *range of measures intended to help plug the 'gap'* between the emissions covered by the CPRS and aggregate Australian emissions. The recent firm decision to exclude agriculture indefinitely from the CPRS, locks a substantial 'gap' – the share of emissions not covered by the CPRS – into the longer term. At about 25 per cent of current emissions, this gap (of which about two-thirds are directly attributable to agriculture, mainly methane and nitrous oxide) is likely to require *effective complementary (non-cap and trade) measures*, especially if proposed 2050 targets are to be safely and affordably attainable.

Here, offsets could have a role to play alongside *regulatory and educational measures* and *international trading of credits*.

Value as a sink

However, focusing on contributions to emissions and ways of limiting them, tends to undervalue the *potential of agriculture as a carbon sink* – capturing and sequestering the atmospheric emissions of others through biological processes and sequestering for long periods the carbon produced in other industrial processes (including biochar). The potential of agriculture in climate policy is not constrained by its level of emissions. Here agriculture commands both a large sequestration resource and the scope for exploiting complementarities between sequestration and farm production. Also, the potential for technologies and institutional arrangements developed and/or implemented in Australia being extended to other countries appears substantial – with the possibility of this making a substantial difference to atmospheric GHG levels.

We see an important role for agricultural offsets whether the CPRS is implemented or not. The decision here will, however, shape the most appropriate wider policy settings. In principle, the *potential* value of agricultural offsets, as contributors to emissions reduction, is likely to be greatest in the absence of an ETS. This is because the need to source the lower cost emission reduction opportunities will be enhanced without the coverage of the CPRS or other ETS, especially if the alternative is strong regulation or direct investment in emission reductions without some form of market testing. Conversely, without the CPRS, there are likely to be greater difficulties in posting significant incentives to generate agricultural offsets – if no offsets can be traded into an ETS market with a high carbon price.

Effectively, without the CPRS, greater care may be needed in the design – but in return there would be scope for greater 'returns' from the investment. There is likely to be a need for greater emphasis on complementary regulatory measures and probably a need for greater precision in these complementary measures, even if this entails somewhat elevated transaction and compliance costs. These will be needed to limit incentives for perverse behaviour changes. However, we would strongly favour an evolutionary approach to the development of the right mix of measures – tied into on-going monitoring of the sector and of wider national and international developments. The proposed 2015 Productivity Commission inquiry, to assess relative merits of policies and programs, could have a central role to play in the development of this mix.

Should the CPRS proceed, then it can be expected to deliver strong demand signals, as the cap on emissions is reduced. This will be particularly true of any offsets directly tradable within the CPRS, but should apply also to other offsets that may be amenable to later conversion to CPRS-tradable entitlements. This could occur as a result of improvements in science or negotiated changes in current trading rules – such as the Kyoto treatment of land use change.

Cost reduction vs. GHG reduction

Broadly speaking, offsets that are tradable and traded into the CPRS, or other cap and trade arrangements (including international trades), should have the effect of lowering the costs to Australia of working within the cap. For this to be efficient, and internationally credible, it will be crucial that sound approaches are applied to dealing with the risks of leakage and impermanence, amongst other issues. Trading of offsets in this way may also, under current offsets policy, create scope for *additional affordable tightening of the cap* over time.

Other offsets, that are not tradable but that offer demonstrable reductions in atmospheric carbon, can be viewed as contributing directly to global and Australian climate change goals.

Possible efficiency in limiting transaction costs

Voluntary offsets, with scope for accreditation and trading, offer *scope to find cost competitive behaviour changes* and to *limit and sensibly target transaction costs*, by encouraging behaviour change only where the gains, in terms of emission reductions, are 'considered' large enough to justify the costs. This can be much harder to achieve through regulation, which is generally 'blunter' in its reach and capacity to differentiate between efficient and inefficient constraints. In reality, a mix of offsets and regulation is likely to offer the most cost effective means of achieving effective constraint – with a greater, safe role for offsets being likely to support finding lower cost ways of meeting targets.

It is also important to note that a voluntary market, by definition allowing 'opting out' by some enterprises, is prone – without other corrective measures – to substantially *constraining the scope for rewarding the offsets* created by other enterprises, effectively diminishing the real value of offsets. These rights to opt

out flow from both the exclusion of agriculture from the CPRS (which has a built-in 'leakage containment' mechanism) and the right not to participate in the offsets market with the associated accounting for enterprise emissions – and with an associated 'right' to actually increase emissions in response to commodity market signals.

Reduced emissions by some will in turn be partially 'offset' by the encouragement their farm changes offer for increased emissions by others. This is particularly (but not only) true where enterprises seek to create offsets by switching output mixes, such as from sheep and cattle into crops. This problem is real and places extra emphasis on regulatory measures, warts and all, to limit these problems – or will otherwise require a higher cost (payment for offsets) to achieve a similar level of effective abatement.

In the paper we address (and summarise below) the central issues that need to be handled carefully if the objectives in establishing offsets arrangements are to be achieved. Some of those pose substantial challenges. Attempting to slur over them is likely to be counterproductive and in some cases these challenges are unlikely to be amenable to complete resolution – they will remain as constraints on the value that can be obtained via offsets arrangements.

Proposed shift in paradigm – better risk management

Serious bias in current approaches to real concerns

Current methods being used to address these issues in established offsets markets *appear systematically, and substantially, biased towards underutilisation of the potential offered by these offsets*. These biases stem from the use of *highly conservative methods* to prevent *crediting individual project-level behaviour change* for greater abatement, sequestration or climate change value than it actually delivers. While addressing these concerns for downside risks head on, we believe the focus is on the *wrong indicators of downside risks* (project rather than whole of strategy risks of delivering less than has been credited) and that these methods generally involve *no accounting for the value of the crucial upside to these same uncertainties*. Many behaviour changes will deliver much more value than is indicated by estimation of a *safe lower bound on project value*. This asymmetry involves bias away from *lower cost overall climate response strategies* within acceptable *whole of strategy safety limits*.

Policy drivers should be more focused on climate outcomes...

Our concerns begin with the strong focus on emissions targets at points in time as though they were ends in themselves, when they are imperfect means that can and should be subject to adjustment as new information emerges. They embed a bias against early sequestration. More fundamentally, the presumption that the least cost way of meeting these emissions targets is the optimal strategy is misguided, given the uncertainty about these targets over time. A low cost 'solution' that lacks the flexibility to be adjusted to meet newly reassessed demands over time could be very costly relative to an alternative strategy with a nominally higher cost but greater flexibility. We firmly believe that climate outcomes, not instruments to manipulate these outcomes, should form the overarching goals that guide strategy development. This aligns well with the Copenhagen commitment to stabilising GHG levels to prevent "dangerous anthropogenic interference with the climate system" and its current interpretation as a risk-based working goal of limiting temperature rise to 2 degrees.

...and management of risks in the precision of the climate modelling.

Wrong focus, wrong risk management tools

The conservatism is understandable, but we believe the level is greatly in excess of what is needed to protect the integrity of the system and the confidence that can be attached to the impact of the abatement arrangements on climate change objectives. This *project-level emphasis on certainty* does not incorporate efficient modern approaches to risk management, where these risks relate not to uncertainty at the project level but to the *net aggregate impact of all measures*. Here, the value of a project lies in the extra value delivered to the overall strategy, adjusted for the change in risks of the overall strategy: a key point developed below is that strategy risk is very different from the sum of individual risks; project risks are poor, sometimes incredibly poor, pointers to the change in strategy risk delivered by a project.

Earlier is better, subject to risks

It is also important to formally recognise the costs of delaying tapping into high prospect opportunities for behaviour change that appear likely to entail only modest costs relative to alternatives. Many of these delays are largely irreversible in terms of the impact of the economic costs of climate response and the impact on actual climate outcomes. A strategy that avoids the risks of moving too soon needs to account for any associated risks introduced from not moving soon enough. Of course caution is needed – but caution is needed in respect of missing upside as well as adding to downside.

Need to manage upside as well as downside risks

A different paradigm is proposed, with the potential to alter very substantially: the nature of the arrangements; the strength of early incentives for behaviour change; the assignment of risks and of the value of upside opportunities and their associated incentive effects; the incentives, private as well as public, for investment in strategic R&D and model development to support greater precision as to the impact of behaviour changes on net emissions; and the incentives, private as well as public, for achieving improvement in the

international rules, especially as they relate to soil carbon but extending to elements of permanence, additionality and verifiability.

Central to this change in paradigm are the following concepts suggested for serious consideration within an offsets strategy:

Foundation for progressively better offsets arrangements

- Recognition that the *primary value in the initial offsets arrangements will lie in the foundation they provide for evolving policy* and the arrangements to address the main issues and information constraints over time:
  - they will encourage and focus the *development of capability* within the sector, within the research community and within international negotiation processes – capability consistent with *efficient process evolution*, rather than seeking (futilely) to be efficient at an early point in time;
  - they will also deliver some early abatement but their value will probably be much broader and greater than the direct value of the immediate abatement; and
  - the initial arrangements should be viewed as securing access to much broader options for sound and cost-effective climate response over time;

Reducing risks by exploiting diversity

- Moving progressively away from *single instrument*, single farm (or aggregation of similar farms) offset products to admit and encourage more diverse *portfolio products* that *span instruments, soil types, rainfall, production systems etc.*
  - Creating room to exploit *economies of scope* as well as *economies of scale* in managing the risks associated with high levels of uncertainty when dealing with individual instruments and projects – because these portfolios, appropriately designed, will effectively be *self-hedging in dealing with risks of under-delivery of anticipated benefits.*
    - … Effectively exploiting the difference between project and whole of strategy economics and risk – to deliver more cost effective strategy.
  - These methods should allow substantially higher safe levels of *initial accreditation* and will shift the emphasis from *project abatement safely created* to *incremental portfolio abatement safely delivered.* The two concepts are fundamentally different, implied numbers are likely to be radically different and the latter concept is far more directly linked to climate change goals than the former;

Farm and region models to assess diverse portfolios

- Use of increasingly sophisticated and targeted *regional farm sector models, with explicit balancing of supply and demand*, modified to provide the capability to assess likely levels of leakage and to adjust accreditation accordingly – effectively discounting for leakage risk;
  - and using the same *models to create incentives to adapt behaviour* in ways that limit leakage and resultant discounting;

Value in pre-emption

- Recognising the basic principle that *waiting to act until the benefits of the action can be proved definitively can be, and commonly is, highly inefficient* and can entail locking into costs many times greater than the costs avoided;

  - and following through on the consequences, that encouragement of early action can represent sound and cost effective insurance that justifies the risks;

Option value of upside

- Explicitly *recognising upside opportunities* associated with behaviour change – including greater abatement than can yet be safely assumed and future changes in rules – and providing policy support for the value of these *'options' to become part of the incentives* for earlier and stronger offset creation.
  - Allowing *past abatement to be converted to credit* as and when this is supported by the research and the rules.
  - Explicitly recognising the *value to climate goals of earlier change*, as a result of the cumulative warming nature of climate change, and allowing *past abatement options to be 'inflated forward'* for the value of any climate benefits associated with the early action (while also discounting for any break-down of stored carbon) before conversion to formal credits.
  - Building *incentives, private as well as public, to improve the science, change limitations in the rules and update the verification processes* to reflect the new knowledge and to allow options to be exercised.
  - Combining these to *encourage earlier and more extensive creation of credits*; commitment to the *monitoring and research* that will allow accumulated options to be converted to credits, and encouraging the commercial markets that are creating offset portfolios to take into account the value of these options to encourage more efficient targeting of farm sector resources.

Challenges some conventional wisdom

It is important to recognise that a shift in paradigm along these lines may challenge a range of current assumptions – and indeed challenge what is considered best practice in farm response to climate threats and in processes for valuing and rewarding farm responses. The altered approach to risk management embodied in the proposed approach is quite fundamental and could result in fundamental re-ranking of the relative attraction of different forms of farm behaviour change.

Box 1 **Example of increasing incentives from pooling risk across a portfolio**

Consider the case of a farm behaviour change being assessed for a carbon credit. The assessors recognise substantial uncertainty as to the level of carbon that might be captured and conclude that the distribution of plausible outcomes is approximately a Normal distribution, with a mean of 7.9 tonnes and a standard deviation of 3 tonnes. They adopt a project focus, in which a safe lower bound is interpreted as the 1 percentile outcome – a level of accredited abatement that will be delivered 99 per cent of the time. This results in credit being issued for 1 tonne of carbon abatement, even though the expected abatement is 7.9 tonnes. Incentives are very weak.

What now if we could pool 100 such measures, spread across different forms of behaviour change, different farms, regions, rainfall patterns, production systems – even countries. Purely for simplicity, assume all offer the same distribution of possible outcomes.

If assessed case by case, the assessors would conclude that each offers safe abatement of 1 tonne and would issue credits for 100 tonnes of carbon.

However, if instead they looked at the distribution of the portfolio of 100 initiatives, again using the 1 percentile safety rule, they would reach a very different conclusion – because the 'Central Limit Theorem' applies to the distribution. The 1 percentile of the portfolio is 718 tonnes, not 100 tonnes. Each farm contributes 7.18 tonnes, not 1 tonne, to the safe lower bound performance of the portfolio, and could receive credit for over seven times the abatement that would be recognised in a project-by-project assessment process. The whole climate change initiative gains from the greatly enhanced, and now much less biased, incentives to deliver abatement and sequestration.

The remaining upside – the gap between the 718 tonnes credit and the expected contribution of 790 tonnes, and the 540 per cent chance that the actual outcome could be greater again, could then be tapped by issuing options over this upside – to be exercisable if and when the assessment rules are changed to reflect new information.

Any or all of more stringent verification requirements, larger portfolios, greater uncertainty on individual initiatives and scope for including in the portfolio some measures whose outcomes are negatively correlated (self-hedging), would serve to strengthen the point made by this example. There is no requirement for all initiatives to be identically distributed.

Observations on key issues

Objectives

Emission targets or better climate outcomes?

There is a big difference between an objective of contributing equitably to a global strategy to limit warming to two degrees (especially if also linked to limiting acidification of oceans), and one directed at specified emission targets in future years, accounted within agreed principles. The former affords much more scope for recognising the true value of agricultural offset options, especially 'lumpy' sequestration options. In particular, it affords a stronger basis for recognising that early action with good prospects for delivering early abatement has value relative to equivalent abatement at a later date.

Consideration should be given to ensuring that the offsets market does not incorporate unintentional bias against these strengths of agricultural offsets – bias that seems highly likely within current approaches to offsets. In general, any focus on targets for point in time emission rates appears prone to potentially serious bias against the potential offered by agriculture. Similarly, the stronger the emphasis on value because of Kyoto compliance, the greater the bias against potentially lower-cost ways of meeting objectives stated in terms of actual climate outcomes and risk.

It may well be best for offsets policy to be formally focused on climate change objectives – in terms of indicators such as temperature trends and peaks and ocean acidification – even, while recognising the need for international reporting and compliance. The international rules do not prescribe the national objectives, nor do they require policy optimisation solely in terms of the rules.

Treatment of soil carbon under international rules

Serious constraints in current rules

Effectively, changes in soil carbon as a result of changes in land use are excluded from Australia's accounting for GHGs – and cannot be traded into an internationally compliant cap and trade scheme. This stems from the decision to require bundling together all land use impacts, whether a result of deliberate decisions or external factors (such as climate change trends). We consider this to be seriously flawed policy that has severely limited the incentives for soil-based carbon storage being pursued by Australia and a number of other countries that have, in response to this 'all or nothing' requirement, decided in favour of 'nothing' – for sound reasons.

In Australia, non-anthropogenic changes in soil carbon are likely to stem largely from droughts, emergence from droughts and bushfires – with quite limited implications for *trend levels of atmospheric carbon*, but with volatility that is challenging for sound policy in an environment heavily driven by annual reporting against targets. In other countries, non-anthropogenic carbon changes may trend strongly in response to climate trends (e.g. tundra melt) but the drivers are beyond the control of the individual country.

Australia is lobbying for change to the rules and this should continue. Pending change, the prospects for the rules being changed could be harnessed, via options instruments, to increase incentives for otherwise sensible investments in building soil carbon – via options that can be exercised in the event that the rules change to recognise such soil carbon contributions.

We have also noted, here and elsewhere, the scope for an Australian *target on aggregate anthropogenic emissions, inclusive of anthropogenic soil carbon changes*, alongside formal reporting within Kyoto principles against *lower Kyoto-compliant targets*, to enhance incentives for tapping the potential of soil carbon and to increase

pressure on the international arrangements. The combination of these elements could address head-on the understandable concerns of the Australian Government with the costs of failing to comply with international commitments – while providing scope both to tap into measures that are cost effective for Australia and to increase pressure on the international rules where they are proving costly internationally.

Uncertainty

Alternative to waiting till uncertainty resolved is to assign options over future changes

It is hard to be precise about the abatement impact of individual farm level changes – relative, for example, to a generator remaining shut down for an hour. These concerns have led to agricultural offset possibilities being rejected as too uncertain – or harshly discounted. However, this reasoning needs to be applied carefully:

- Uncertainty entails upside opportunities as well as downside risks. Rejecting action because it may under-deliver should only be done after an assessment of the chances that it might instead over-deliver.
- This is fundamentally an efficiency issue – the likely cumulative effect of rejecting a series of initiatives on the grounds that each, individually, involves large downside risk, is the rejection of a portfolio of actions likely to have much less downside risk and to offer access to greater upside opportunity.
  - This flows simply from the way that portfolio risk arises. With diversity across a wide range of risks, achieved across instruments, soil types etc., the volatility of the portfolio will be much less than the sum of volatilities of each element. Sound risk management must exploit this feature of diverse portfolios to prevent valuable contributors to the solution being dissuaded.
  - The potential in this approach may be to allow offset portfolios to be safely valued at many times the safe value attached to its individual components.
- The logic presupposes that offset providers need to be compensated fully at the time they create the offsets – and when the uncertainty is greatest.
  - Systems can be established to assess annual (or some other time period) values on services provided, based on monitoring of actual storage levels – an approach that can greatly reduce the effective uncertainty. Expectations of future success in demonstrating impact can then drive incentives for early change.
  - Use of options instruments, issued at the time the offsets are created, with the options exercisable if and when improved science or measurement recognises greater impact from the offsets than was originally allowed, can also be used to introduce early incentives for behaviour change with good prospects for being able, later, to demonstrate higher value.

– Similarly, rates of discount (for lack of permanence, benefit leakage etc. as below) that have initially been set high to ensure that abatement is not over-estimated and over-compensated, could be subject to future (downwards) revision, with associated rights to exercise options over this potential future value. Again, these will translate into stronger early incentives for creation of offsets, despite their high uncertainty and the level of discounting initially imposed – highlighting the potential for complementarity between the two instruments for managing risks.

Permanence

Permanence can be over-rated within a portfolio response to climate threats

Within the proposed paradigm, technical permanence of carbon capture can be 'over-rated' – which is not to underrate the significance of future loss of stored carbon. Most sequestration possibilities trigger resistance on the grounds that they cannot be guaranteed to keep the GHGs out of the atmosphere indefinitely. This is commonly addressed through some form of discounting of the value of the sequestration. Temporary capture can still have value – in slowing cumulative warming and its damage, in slowing ocean acidification, and in buying time to replace the sequestered carbon in the future. In relation to some possibilities, like biochar application, the gap between a likely average life of the carbon in storage, and a safe lower bound on the storage of carbon at a specific site, could be centuries. The potential for costly bias is substantial if the emphasis is on project-level safe lower bounds, with discounting based on them.

The proposed options instruments and/or the use of 'service rental' approaches, in which payment is made for demonstrated storage over defined time periods, could go a long way towards correcting for these substantial biases. These instruments would be used, in most instances, in addition to differential discounting for different sequestration activities. Furthermore, contractual mechanisms could be used to guarantee replacement of lost carbon – using the most cost effective technologies then available to 'recapture' any losses in excess of any already applied discounting. Precisely analogous issues have had to be addressed in relation to forestry investments – and, in turn, these might be better addressed by tapping into the potential of options instruments.

Leakage

Leakage of nominal benefits is important

Leakage could be viewed as a special case of lack of permanence. A farmer reduces livestock production, limiting farm emissions. This reduces supply, encouraging a price rise that, in turn, encourages increased supply from other farms – so the *net reduction* in emissions is less than the *farm-level gross reduction*. Some of the *benefits are lost as a result of market response*.

If, instead, the farmer were to alter animal breeding or feed mix to lower the emissions intensity of meat production, the level of leakage is likely to be much less. If this were done without cost, there should be no leakage. Broadly speaking, output mix changes will tend to be more vulnerable to leakage than input mix changes.

Modelling tools could be applied to estimation

Various forms of sector modelling can be harnessed to provide a basis for estimating the net effect on production of single farm decisions that alter levels of production. While it will make sense, in time, to consider whether the substitute production will tend to be more or less emissions intensive than the initial production forgone, it would seem feasible to move fairly fast to produce a credible set of product and region-specific leakage factors, that could be further improved over time.

Diverse portfolios may allow the risks to be limited

It may also be possible to limit leakage risks by compiling offset portfolios that are self-hedging – that limit or eliminate the market incentives to expand emissions outside of the portfolio. There would be strong incentives for this to be done if it could be achieved at a modest transaction cost.

Additionality

Farm systems are already changing in ways that are tending to lower emissions intensity – precisely because of the complementarity between lower emissions and higher farm productivity recognised earlier. Some abatement can be achieved at zero or even negative cost – with the trends into lower tillage systems and more targeted application of nitrogen being clear examples.

This said, earlier change is again better than later change and there may well be a case for encouraging more rapid take-up of already cost-competitive innovations where there is natural inertia.

Interactions with other environmental values

Many of the prospective areas of behaviour change in the farm sector, to deliver abatement or sequestration, are likely to involve significant interactions with other areas of environmental policy and associated policy objectives. Given that these other values may be less than perfectly priced, there are risks of intervention failure to be addressed – possibly alongside opportunities for complementary pursuit of GHG and other environmental objectives.

Accumulation of increased soil carbon and movements out of livestock into cropping would have implications for levels and patterns of water interception, for patterns of fertiliser use, etc. Care is needed to ensure that an apparent small saving in the cost of abatement is not being bought at high cost to other elements of the land and water system. Conversely, of course, these very interactions are part of the processes that support the view that some of these

processes may deliver low-cost abatement and sequestration – precisely because they can also enhance enterprise productivity through better structured soil, better management of water, etc.

Perverse interactions with other policies

More generally, a number of existing policy settings – notably drought policy settings – have the effect of encouraging relatively high GHG-intensity patterns of agriculture. Earlier work by ACIL Tasman emphasised the incentives that flow from elements of drought policy – and recommended attacking these policy distortions ahead of creating counteracting incentives in offsets markets. If there are constraints on how rapidly these policy changes can be made, there would still seem to be scope to move on the offsets opportunities in a policy setting committed to progressive correction of the perverse interactions.

Demand for offsets

If the CPRS proceeds, and posts a clear price signal, this will open opportunities for a range of offsets to be offered to this market at a market-determined price.

Demand for offsets can come from several sources:

Commercial value

- as now, there is likely to be some commercial value in being able to demonstrate 'green credentials' through either coverage of own company emissions by offsets or through active, demonstrable, and accredited proof of direct contribution to reduced atmospheric GHGs;

'Altruism'

- individuals and companies may seek access to instruments for directly making a positive contribution for, essentially, altruistic reasons – though extending to concerns for children and grandchildren, and encompassing values linked to social responsibility;

Trades with CPRS

- where trade into the CPRS or other cap and trade arrangements is possible, the direct value of such trades could underpin rising value; in the absence of such demand, regulatory measures might be used to support analogous demands;

Value in 'banking' rights'

- where there are good prospects for such trading opportunities to arise, then these measures could have value in hedging exposure to cap and trade risks – there could also be demand to hold the rights to any future trading opportunities; and

Government

- governments could choose to express demand directly – analogous to the expressed demand to 'buy-back' environmental water flows in the Murray-Darling Basin.

The first two of these are real, but probably quite limited in the incentives they can post – as reflected in values that have emerged from the CCX, for example. Indeed, these incentives could actually diminish with introduction of a CPRS – especially for firms and households whose main emissions are linked to energy and fuel use.

Commercial linkage to the CPRS could clearly drive substantial value that works in the opposite direction. This policy agenda would tend to favour progressive extension of the range of effective offsets for which such trading is possible – or prospective. Complementary regulatory devices could go some way towards simulating these incentives, though probably with less precision.

Direct government demand, whether funded through other mechanisms (CPRS revenues, special levies, etc.) or not, could certainly increase incentives and could, under some circumstances, make economic sense where there are market or intervention failures remaining. In the context of large commitments by governments to supporting analogous measures, such as geosequestration, there is a legitimate question of whether the acquisition and extinction of relatively low-cost and immediately effective offsets may not be competitive with some of this spending. In the absence of the CPRS this strategy, possibly linked to a funding mechanism, could make greater sense.

Market mechanics

Government involved in rules or operation?

Choices will be needed between governments establishing the institutional and regulatory environment within which commercial offsets markets flourish, or intervening more strongly to establish a central market, probably with some resultant monopoly power. There seems little case for preventing other markets and a good case for encouraging commercial exploration of opportunities to better 'plug gaps'.

However, a case for a more central solution may emerge from the value in tapping size and scope economies effectively. This is likely to still be feasible through sound institutional arrangements that encourage and reward the assembly of high value diverse portfolios, including aggregation of portfolios across different commercial markets. A more 'hands-on' role might be supported by a strong desire to move early to make major progress – though again this might also be achieved by governments agreeing to enter these markets as buyers with a clearly understood demand profile, rather than seeking to run the market.

Government role in accreditation

Governments are likely to have a more natural role in formal accreditation processes. High credibility, internationally recognised standards for accreditation could deliver a lot of value to the markets, while advancing government objectives for demonstrating real abatement and for

demonstrating to other countries ways of delivering real abatement in agriculture.

Implications for NCOS

If the proposed paradigm shift were adopted, then this has implications for the National Carbon Offset Standard, for the accreditation processes, and for how these would need to evolve over time.

Useful role for standard contracts

Liquidity in markets is likely to favour the development of something like standard contract specifications – in terms of product, duration, etc. A focus on this is appropriate, but care seems necessary to prevent it from discouraging effective tapping of scope economies. It would be easy for standardisation to favour single instrument measures, and dealing with permanence via a requirement to roll over a similar instrument. It seems likely that any such bias could prove quite costly in the longer term.

Box 2 **Upside options need not create new information needs, nor add much complexity**

It would be quite feasible to routinely issue options over upside revisions of accreditation rules without introducing substantially greater complexity to the market. While the existence of the options is likely to intensify the pressures to improve the science or address defects in the rules, this is an opportunity and an options market can operate without any major changes.

All that is required is a system that allows previously accredited farm behaviour changes, for which safe credits have already been issued, to be resubmitted based on the original documentation plus the information contained in the option document itself. If the then available science, and standard accreditation process, would recognise a higher level of abatement or sequestration than originally credited, then all that is needed is a process to:

- reassess the total credits, using the new accreditation rules, and to issue fresh credits for the difference between the new and the earlier assessments; and
- incorporate the derivation of these additional credits into the options document, providing a basis for further reassessment in the future.

What is involved here is a sensibly evolving accreditation process. This evolution will make sense whether options have been issued or not – the rules are reviewed periodically to factor in new information. The fact that the rules may change over time provides the basis for one or more tranches of option value to be realised, by having past actions reassessed within current rules.

Contract duration not prescribed

For related reasons, we see little value in prescribing the duration of contracts. Better discovery of smarter solutions would seem likely to flow from a more flexible approach that handles uncertainty and impermanence soundly. This would not, of course, mean there could not be a standard contract – this could allow much lower transaction costs across multiple activities. It would seem sensible, however, to allow opting out where greater value could be demonstrated. In time, the emphasis on large and diverse portfolios might actually prove more effective at containing transaction costs via size and scope

economies, and the increased application of regional modelling methods to underscore value demonstration.

For single instrument measures, we would favour the use of realistic (and probably therefore fairly harsh) discounting for risks, coupled with options over future upside potential. These options would themselves be amenable to packaging into more diverse portfolios in the future, as a way of demonstrating greater value than was at first considered justified. Use of this approach would favour early effective communication regarding the nature of the investments that will be made in improving the science, establishing revised thresholds, changing limiting rules, and developing portfolio accreditation methods that will recognise the value of scope economies in managing risks.

A range of mechanisms could be used to encourage and assemble portfolios of measures – ranging from relatively light-handed, market-driven mechanisms through to a centralised process. We consider the role of government likely to be more in early facilitation and capability building than in long term operation of these pooling arrangements.