Carbon credits in the vineyard – fact or fiction?

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Introduction

Over the past 18 months we have seen a dramatic increase in the media coverage on climate change and related issues. Although the Australian Federal Government is sufficiently convinced by the scientific evidence presented by the Intergovernmental Panel on Climate Change (IPCC) to act on climate change, the media continues to sow seeds of doubt by airing the views of both proponents and sceptics with equal weighting. Thus we find that, although the majority of the Australian population supports action on climate change (Australian Research Group 2008), there are still many who remain sceptics.

While the physical impacts of climate change are predicted to affect Australian agriculture in the years to come, more imminent are the policy and peripheral impacts associated with climate change. It is therefore more helpful to think through not just the 'Physical' impacts of climate change, but also the 'Policy' and 'Peripheral' impacts that are already having an effect, regardless of scepticism about 'physical' climate change itself.

Following the ratification of the Kyoto Protocol (UNFCCC 1998) by the Rudd government in December 2007, there have been a number of 'policy' impacts of climate change from the Federal Government. These policies include setting a national renewable energy target of 20% by 2020, a review of exceptional circumstance funding in the light of climate change, and not the least of which is the Carbon Pollution Reduction Scheme (CPRS), which targets a 60% reduction in emissions by 2050 (DCC 2008a).

As a party to the UNFCCC Australia has produced national inventories since 1992 and is committed to publishing updated national inventories each year. This inventory also determines Australia's emissions reductions obligations under the Kyoto Protocol, and together with the CPRS target is driving the policy agenda for emissions reductions.

Agricultural emissions

According to the Australian National Greenhouse Gas Inventory (DCC 2008b), Agriculture produced an estimated 90.1 Mt CO2-e emissions or 16.4% of net national emissions in 2006 (Figure 1). However, this does not include the fuel and energy used by the agricultural sector, as these are accounted for under the transport and stationary energy sectors in Figure 1.

Agriculture is the dominant source of methane (58.0%, 69.8 Mt) and nitrous oxide (80.7%, 20.3 Mt) emissions, with enteric methane being 10.8% of national emissions and nitrous oxide 2.8% of national emissions. Clearly the beef, sheep and dairy sectors are highest in total emissions, mainly due to enteric methane emissions plus nitrous oxide emissions from dung and urine deposition. Cropping systems are mainly accountable for nitrous oxide emissions from fertiliser use, but also a small amount of methane and nitrous oxide emissions where crop residues are burned.

The Carbon Pollution Reduction Scheme

The Federal Government released its Green Paper on the Carbon Pollution Reduction Scheme (CPRS) in July 2008 (DCC 2008a), with the white paper due by the end of 2008. The aim of the CPRS will be to reduce greenhouse gas emissions by 60% by 2050. As of 2010 the CPRS green paper suggests covering the stationary energy, transport, fugitive emissions, industrial processes, waste and forestry sectors. The Government proposes to cover these sources and sectors via a combination of direct obligations on facilities with large emissions, and obligations on upstream fuel suppliers for the emissions resulting from the combustion of fuel.

Because the CPRS will concentrate on the biggest polluters first, it will place obligations on around 1,000 Australian companies in total – those that produce more than 25,000 tonnes of carbon pollution each year. This represents less than one per cent of Australian businesses.

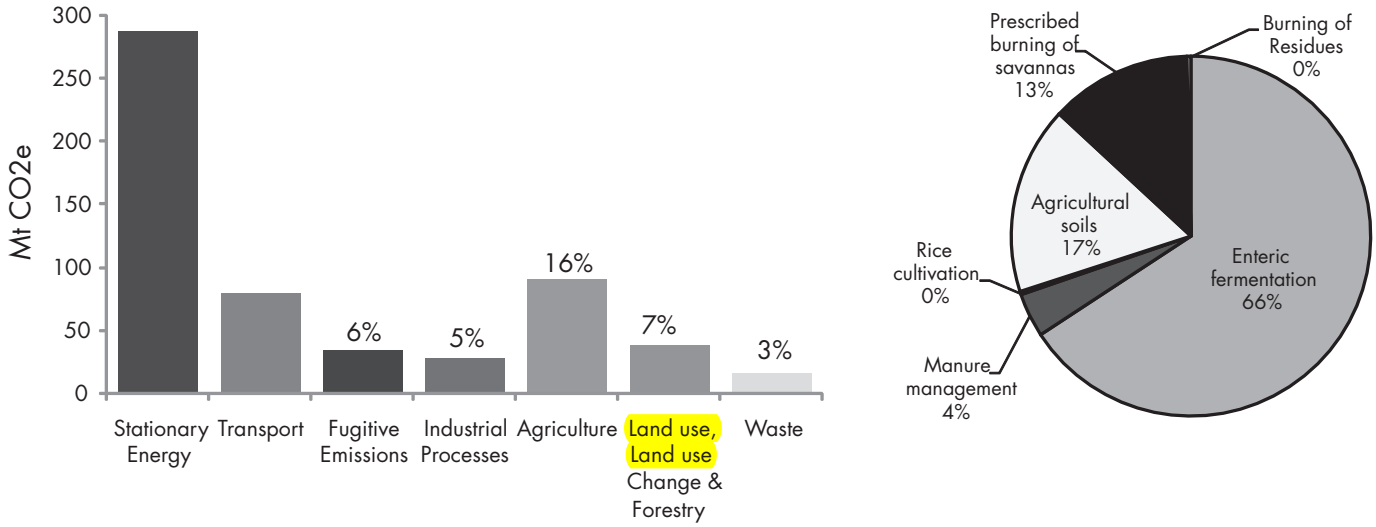

Figure 1. Australian national sectoral greenhouse gas emissions (left) and the apportionment of emissions within the agricultural sector (right) (DCC 2008b).

Agriculture

While the green paper proposes the CPRS to start in 2010, it suggests delaying the inclusion of the agricultural sector until 2015, with a final decision by 2013. However, as agriculture contributes around 16% of national greenhouse gas emissions, the Federal Government has made it clear that this sector will either be covered by the scheme, or other policy options will be considered to achieve similar targeted reductions in emissions.

Emissions from fuel and electricity consumption on-farm are most likely to be accounted for upstream at the generator or refinery, with increased costs being passed on to the farmer. ABARE (ABARE 2007) modelled the impacts of an ETS on agriculture and found real increases above inflation of 5% for petrol, 10% to 15% for diesel and less than 3% on fertiliser over 20 years. ABARE also estimated that the impact of a $40/t CO2e carbon trading price would increase agricultural production costs by approximately 3% for livestock and 4.5% for cropping, assuming no transitional assistance and no adaptation; this does not include direct liability for methane and nitrous oxide emissions. However, this modelling was prior to the release of the green paper. Treasury will release its modelling in October 2008, which should provide a clearer idea of likely impacts.

Carbon Neutral versus CPRS

The concept of 'Carbon Neutral' wine is becoming more popular, particularly as consumers become more concerned over their environmental footprint, and choose to express this concern in their buying habits. This could be considered a 'peripheral' impact of climate change.

The Wine Institute of California, New Zealand Winegrowers, Integrated Production of Wine South Africa and the Winemakers Federation of Australia contracted Provisor Pty Ltd to develop the *International Wine Carbon Calculator* (Forsyth and Oemcke 2008). This calculator provides information for full carbon accounting of wine production, including the on-farm and post-farm emissions, thus allowing producers to understand the action required to achieve complete carbon neutrality in wine production.

However, under the Federal government's method of accounting (and thus the likely liability under the CPRS), on-farm viticulture would only be liable for nitrous oxide emissions from soil and fertiliser use, with indirect liability due to chemical, fuel and electricity use being captured upstream at the supplier. In addition, the preferred position of the green paper is that the point of obligation for this liability be either upstream (e.g. fertiliser company) or downstream (e.g. processor). It is important to note that this liability under the CPRS is significantly different to requirements for achieving carbon neutrality.

Where are the carbon credits?

Like any other farmers there will be a requirement on all agricultural industries to purchase and remit emissions permits to the government annually to match their emissions. Obviously, any strategies that can be implemented to reduce these emissions or gain credits against an emission liability will reduce the number of permits that will be required.

Under the CPRS it is clear that only Kyoto-compliant forestry plantings will count as credits; these rules exclude forests established prior to 1990 and treat the carbon stored in felled trees as if it had all been released into the atmosphere at felling. The Federal government believes these accounting rules are not an appropriate reflection of reality and that carbon stored in wood products should be recognised and has committed to renegotiate these rules in any subsequent international agreements (DCC 2008a).

However, until this negotiation is successful, the only 'carbon credits in the vineyard' are likely to be farm forestry. However, if the government is successful in negotiating for carbon stored in harvested wood products to be recognised, viticulture may then consider alternative approaches to long-term storage of posts and poles from the vineyard.

Tree plantings

The most obvious way in which farmers can generate emissions credits (permits) under the CPRS is through planting trees; this will be via a voluntary opt-in basis as of 2010 and the area of land will need to be registered in the scheme to gain credits.

Significantly the green paper suggests that environmental and landcare plantings will count, as long as they are Kyoto compliant. Professional advice must be sought first to ensure that the area and species proposed will comply with the definitions of a Kyoto forest (e.g. a minimum area of land of 0.05 to 1.0 ha with tree crown cover [or equivalent stocking level] of more than 10 to 30%, with trees with the potential to reach a minimum height of 2 to 5 metres at maturity in situ, as defined in the Marrakech Accords [UNFCCC 2001]).

Soil carbon

There are significant technical and logistical barriers to accurately accounting for soil carbon stocks. Article 3.4 of the Kyoto Protocol (UNFCCC 1998) focused on changes in the rate of net soil sequestration. Australia rejected adoption of this Article in 2001 for calculation of its national inventory, due to a concern that it would incur a net liability.

Some key points need to be made here (Baldock et al. 2007):

- The amount of carbon found in a soil can be viewed as a balance between inputs (plant residues and fire) and losses due to decomposition and mineralisation; basically a big, but slowly changing input: output equation. If you grow more pasture or crops during a good season then soil carbon stores will increase, but if the same farm experiences a drought, then more carbon may be lost than added to the soil, and you go backwards.
- The factors limiting the amount of crop or pasture residues entering the soil as new carbon are limited by solar radiation, temperature range, availability of water and nutrients; most of these are out of the control of the farmer apart from fertiliser and irrigation. In most of Australia, water availability sets an upper limit on plant production and therefore soil carbon storage.
- It is important to first know the composition of the carbon in your soils, before any judgment can be made about management impacts, as some fractions do not change much over time (e.g. charcoal) and others can change greatly (e.g. humic fraction).
- Soil carbon sequestration is difficult to monitor and quantify, particularly over short time frames (decades).
- Soil carbon will NOT be recognised in the CPRS and is unlikely to be included in the foreseeable future. However, soil carbon can be traded on the informal or voluntary markets. The main issue is that the carbon price on formal markets (e.g. EU) is close to AU$40/t, with soil carbon trades around US$2 to US$5/t on the Chicago Exchange (voluntary market), indicating the relative confidence investors have in these markets.
- However, this is also where farmers may get into trouble, as once traded you no longer own the right to disturb that carbon i.e. essentially even ploughing the field will create a liability that you may have to pay to the owner of the soil carbon.

- Likewise, from the point above, if you have traded the carbon in your soil, and there is a protracted drought, essentially the soil carbon store starts depleting and a liability may be created.
- Perhaps the biggest issue with building soil carbon lies in the amount of N, P and S required to build soil carbon. As there is a stable ratio of C/N = 10, C/P = 50, and C/S = 65 in the humic fraction in the soil, to build 1 t of humus (60% carbon, 600 kg C or 2.2 t CO2e) will require 60 kg N (at a cost of $130/t, excluding P & S). Thus we would need a $60/t CO2 carbon price just to pay for N.

Nitrous oxide abatement

The main on-farm liability under the CPRS for viticulture will be from nitrous oxide emissions, resulting from nitrogen fertiliser use. At this stage the National Greenhouse Gas Inventory (DCC 2008b) applies a simple emission factor, assuming that 0.3% and 2.1% all nitrogen fertiliser applied to dryland cropping and horticultural is deemed to be lost as nitrous oxide. The risk for viticulture is that these are default figures derived from other horticultural industries and may reflect a far higher estimate of nitrous oxide than is actually emitted.

By managing the rate, source, placement and timing of nitrogen fertiliser application nitrous oxide emissions can be minimised, while ensuring maximum efficiency of the nitrogen (De Klein and Eckard 2008). Nitrification inhibitor coatings have been commercially available for a number of years and can significantly reduce the nitrous oxide lost from fertiliser. With the introduction of the CPRS, these products may now see more widespread adoption as the additional cost is weighed against the liability of purchasing emission permits.

An indirect impact if the CPRS will be on nitrogen fertiliser costs. The manufacture of nitrogen fertilisers requires significant energy, inextricably linking its production cost to fuel prices. The foreseeable impact of the CPRS on the cost of manufacture, plus the liability created when spread on farms, could be a considerable economic challenge for agriculture in the years to come.

Conclusion

From the above discussion it is clear that the only 'Carbon Credits in the Vineyard' are limited to Kyoto-compliant tree plantings. Soil carbon storage will not generate carbon credits under the CPRS.

However, there is hope that carbon stored in harvested wood products may be recognised in future international negotiations, providing viticulture with additional options for management of posts and poles in the vineyard.

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