18TH ANNUAL PACIFIC-RIM REAL ESTATE SOCIETY CONFERENCE

ADELAIDE, AUSTRALIA, 15-18 JANUARY 2012

# WILL A CARBON PRICE CHANGE PRIVATE FARM FORESTRY IN AUSTRALIA?

Ian Clarkson FAPI, Lecturer in Property, CQUniversity Australia

Faculty of Arts, Business, Informatics & Education, Building 34, CQUniversity, CQ Mail Centre, Rockhampton Q 4702
Email: i.clarkson@cqu.edu.au

## ABSTRACT

*Rural industries are not yet included in the proposed Australian federal government Carbon Tax. During the interim before the Emissions Trading Scheme is introduced, farms have an opportunity to either earn money through selling Carbon Credits or at least reduce the impact an ETS will have on their on-going farm costs when it is introduced.*

*This exploratory paper looks at the proposed Carbon Tax and how a farm may generate income from this proposal. Information has been sourced from Government bodies; industry interest groups; and interviews with peak body representatives. The paper seeks to provide farmers with a framework to explore the viability of Carbon Sinks on their enterprise by exploring a case study of a grazing property in South-east Queensland.*

Keywords: Rural, Valuation, Climate Change, Carbon Credit

# INTRODUCTION

As economic concerns alter the global financial position and items such as Emission Trading Schemes are debated at higher levels of government, the impact upon the continued economic viability of farming and regional areas is tested time and again. Producers in countries such as Australia and New Zealand which have minimal subsidies for rural areas are under pressure to produce more from a finite productive land area with suitable climate for farming.

As an urban environment encroaches and a profit driven resource sector, from which governments derive vast royalties for budgets, press to develop more prime farming land, the sector's production land shrinks. Advancements in technology and crop varieties will always assist to increase production, but oversupply of a crop; departures of established markets e.g. live cattle trade; and a strong dollar can reduce farm income quickly. More legislation is being passed, including the Queensland government's Vegetation Management (Regrowth Clearing Moratorium) Act 2009 and the Great Barrier Reef Protection Amendment Act 2009 which both significantly altered farming practice in Queensland in 2009. There is then the additional Federal government Acts such as the 18 recently passed "Clean Energy Future" bills and other initiatives such as the Murray Darling Basin Scheme.

Farming entities in Australia are endeavouring to reduce their costs to maintain viable operations. The paper seeks to provide farmers with a framework to explore the viability of Carbon Sinks on their enterprise to assist their farm income, or to at least offset increased charges, through a critical review of literature and policy applied to a case study of a grazing property in South-east Queensland.

# THE POLITICAL LANDSCAPE IN AUSTRALIA

## Kyoto Provisions

The Kyoto Protocol comes from the United Nations (UN) Framework Convention on Climate Change and was adopted on 11 December 1997 and was to come into force on 16 February 2005. The protocol calls for 37 "Annexe 1" developed and industrialized countries to reduce their overall levels of the four main Greenhouse gases (GHG) by 5.2% below the 1990 level. (Pachauri, 2007) The gases listed are Carbon Dioxide, Methane, Nitrous Oxide and Sulphur Hexafluoride in addition to Hydrofluorocarbons and perfluorocarbons. International airline and shipping traffic is not included and these gases are in addition to Chlorofluorocarbons (CFC) which was subject to the 1987 Montreal Protocol which focussed on ozone depletion.

The UN Intergovernmental Panel on Climate Change (IPCC) in 2007 released its fourth assessment report which drew the following conclusions:

- Warming of the climate system is unequivocal

- Humans are very likely to be causing most of the warming that has been experienced since 1950
- It is very likely that changes in the global climate system will continue well into the future, and that they will be larger than those seen in the recent past.(Pachauri, 2007)

The change in the Australian Federal government during 2007 has seen the ratification of Kyoto Protocol in late 2007. The quick development of an Emissions Trading Scheme, later titled Carbon Pollution reduction Scheme, after the Garnaut Review with a new Federal government department created was next with legislation proposed before a rethink and slowing of the process in 2010. This was then dropped as policy due to polls indicating the process being unpopular with voters. It has since been resurrected in a different form by the current 2010 elected Labour government in a deal with minor parties and independents to secure continued power.

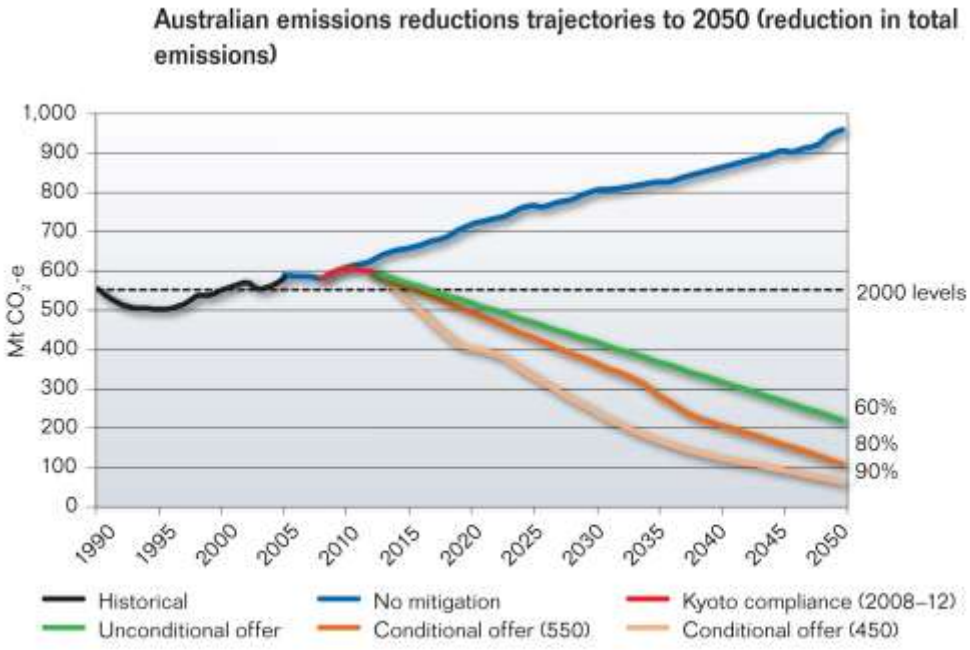
The protocol allows for emission trading, clean development technology and joint implementation as ways of Annexe 1 countries meeting their obligations.

*The United Nations Framework Convention on Climate Change* listed the "stabilization and reconstruction of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" as the main objective of the protocol. The main concept which relates to rural holdings is point 2:

- Implementation. In order to meet the objectives of the Protocol, Annex I countries are required to prepare policies and measures for the reduction of greenhouse gases in their respective countries. In addition, they are required to increase the absorption of these gases and utilize all mechanisms available, such as joint implementation, the clean development mechanism and emissions trading, in order to be rewarded with credits that would allow more greenhouse gas emissions at home. (UNFCoCC, 2010)

In Australia ratifying this agreement it committed to upholding the general principles and endeavouring to achieve the desired reductions in GHG emissions. To meet the desired reductions, once the Emissions Trading Scheme (ETS) is in place, Australia has to meet a target of 108% of 1990 greenhouse gas emissions. This means a reduction to about 16,500,000 tonnes of net annual carbon dioxide production from a 2009 figure of 564,542,000 $CO_2$-e which is a slight reduction on the 2008 figures.(Australian Government, 2011) There are several flexible market mechanisms to aid this which include an ETS.

**Figure 1 Australia emission reduction trajectories (Garnaut, 2011)**



John Sheehan (2009) noted that the proposed CPRS did not clearly differentiate between property rights and carbon rights and how these may be exchanged.

*…in determining whether a person has the exclusive legal right to obtain the benefit (whether present or future) of sequestration of carbon dioxide by trees to which a reforestation project relates, it is immaterial whether that right extends to sequestration of carbon dioxide by the soil in which the trees are growing.(Australian Government, 2008)*

This breathtaking definition of carbon sequestration right conveniently ignores the historic legal nexus between the ownership of the elemental land property right and all things in or on that land, such as the living fibre of vegetation (trees). The definition does not explain how the right to carbon in the living fibre will be crystallised out of the land property right. A number of States have adopted profit a prendre as a basis for the right to carbon, however this action offends the common law notion of land property, and is fundamentally flawed.(Sheehan, 2009) This raises the point as to how carbon rights may be transferred or paid for in context of separating the carbon right from the land right.

Whilst Energy, through power generation and transport of goods, is the biggest producer of greenhouse gases in Australia, the second highest producer of GHG in Australia is rural industries. In terms of rural enterprises, Garnaut cites that Agricultural emissions are more than 6 times the OECD average, being the third highest behind New Zealand and Ireland, blamed mainly on cattle and sheep numbers. It is estimated that agriculture directly contributes about 15% of Australia's GHG emissions (Meer, 2009), or just under 3 tonnes $CO_2$ per person per year, through two main sources. These are Methane from livestock and Nitrous Oxide from nitrogenous fertilizer use in soils. But conversely, Australia has the most wooded area of any OECD country and is second in the world in wooded area cover with about 28.8 hectares per person (Garnaut, 2011). Agricultural GHG emissions have reduced by 0.6% in the 2011 financial year from the previous year's output.

**Figure 2 Australia agriculture emissions (Meer, 2009)**

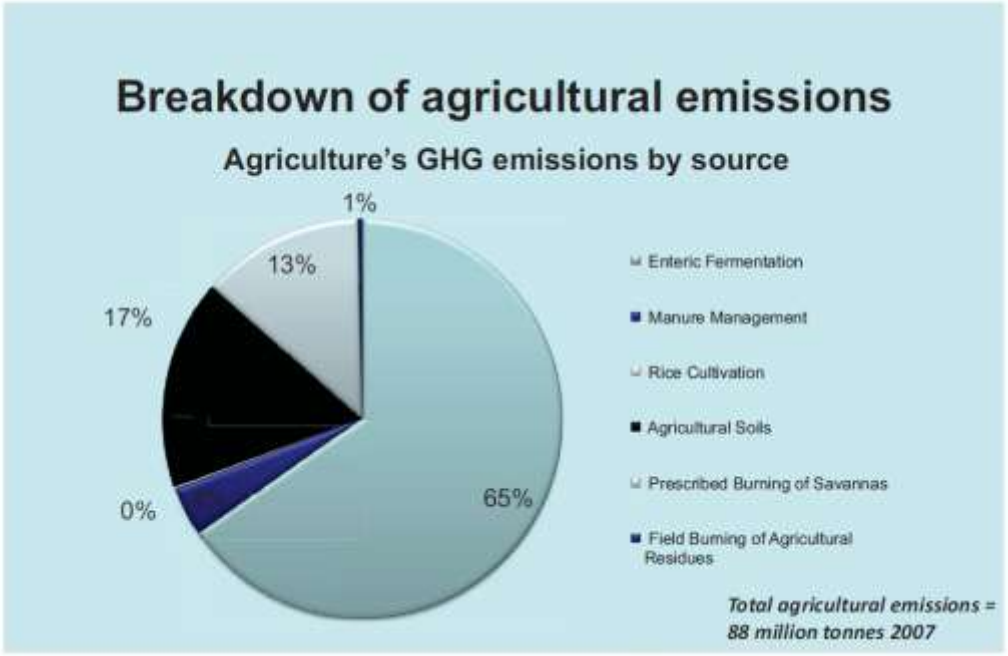
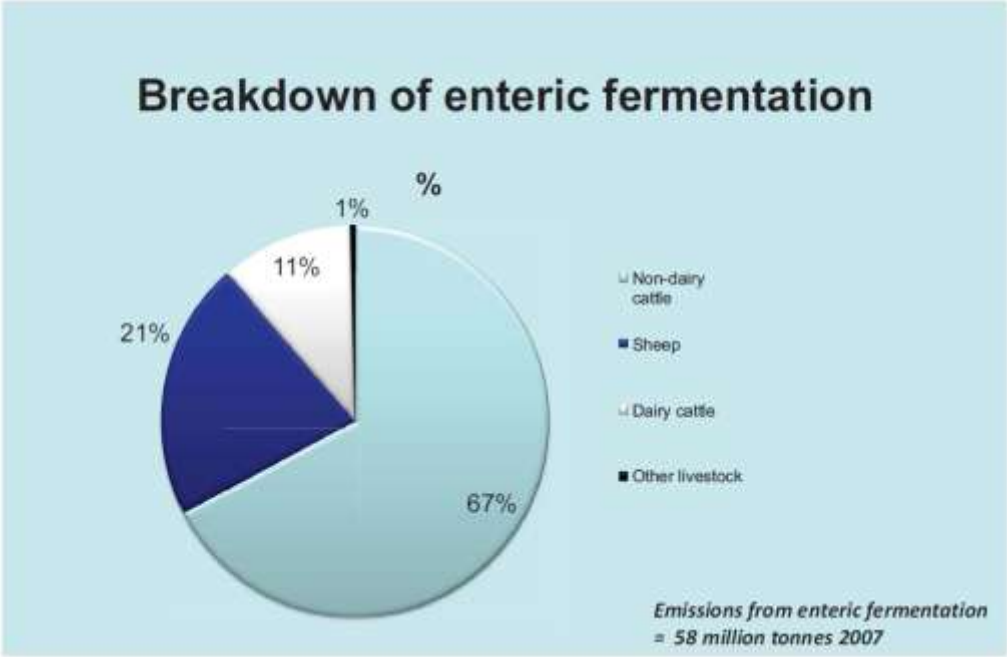


**Figure 3 Australia stock emissions (Meer, 2009)**




A point of interest from Garnaut is that he recommends the reduction of the Australian cattle herd by 7,000,000 head from approximately 25,000,000 down to 18,000,000 with a significant 40% reduction in the sheep population to about 45,000,000 head. These figures were based upon the red meat consumption of Australia and the replacement of these high methane producers with "greener" chicken and kangaroo consumption with a requirement to lift the Australian kangaroo population from 34,000,000 to 240,000,000 by 2020 to offset the reductions in red meat production. This failed to address the other significant factor in sheep production that the majority of the flock is used for wool production, not meat consumption. This natural product in wool would need to be replaced by alternative fibres if this flock reduction occurred and there was still a demand for these products. The near 80,000,000 sheep in Australia currently produce 330,000,000 kilograms of wool of which approximately 67% is Ultrafine to Fine Medium wool. About 67% of the Australian clip is sold to China for textile and industrial use with a further 8% to Italy for fine textile use. There was no accounting for this in the Garnaut Report which looked solely at food production and not other variables in this section. An argument has been advanced that the use of wool will diminish as more synthetic fibres are produced and used. These synthesized polymers are generally produced from petroleum based chemicals and account for about half of the world's fibre use and textile production is the fifth largest contributor to $CO_2$ emissions in the United States. (EIA, 1998) The Stockholm Environment Institute shows that due to the high energy requirement of extracting oil from underground, there is approximately 9.52 kilograms of $CO_2$ emissions per tonne of spun fibre in creating polyester in the U.S.A. compared to 5.89 kilograms of $CO_2$ to produce 1 tonne of cotton in the U.S.A (SEI, 2005)

## What did the Carbon Pollution Reduction Scheme propose for Rural Industry?

The main area of difference between the Garnaut Review and the proposed Rudd 2008 Carbon Pollution Reduction Scheme is in relation to compensation and free permits. The Garnaut Review argued for no free permits for generators, and for limited compensation, but based on cash not free permits, for the trade-exposed emissions-intensive sector. Successive policies from the Government have included more compensation for both categories of emitters, entirely through the allocation of free permits. The National Carbon Accounting System together with the National Greenhouse Gas Inventory, both monitored by the Department of Climate Change and Energy Efficiency, will determine the amount that each industry must account for in Australia's carbon economy.

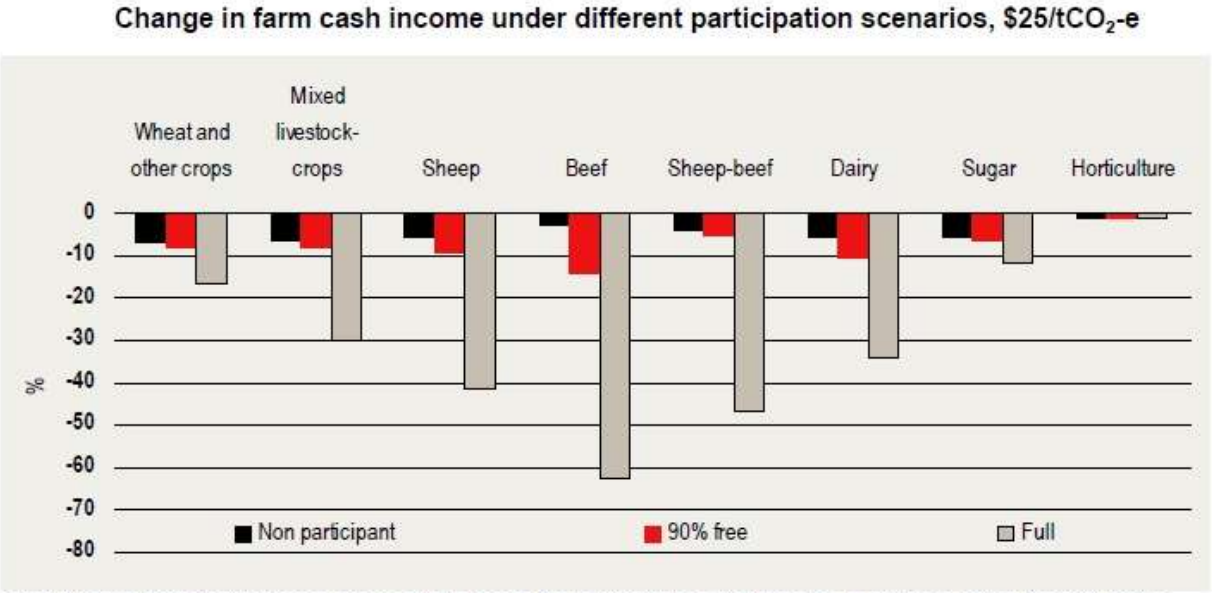
It is significant that agriculture is not proposed to be included in the original Rudd CPRS before 2015 after a decision in 2013. This timeline was based upon the CPRS commencing in 2010. There has been no position announced at the time of the preparation of this paper by the Gillard 2011 government.

Peter O'Brien, Managing Director of Rural Industries Research Development Corporation said, "Agriculture will be affected by the CPRS both directly and indirectly. Emissions costs in the form of abatement and/or to purchase permits will potentially account for a significant share of production costs for livestock sectors, and it is difficult for Australian farmers to pass the costs to their customers because most of their products are exported. Even if agriculture is not included in a CPRS, it will still be impacted by higher input prices and lower demand."

The May 2009 report prepared by RIRDC points out that:

It should be noted that agriculture would still face adverse impacts of a CPRS even if it is not included in the scheme. This is because the industry will face higher costs of inputs such as petrol, electricity, chemicals and other goods and services.

**Figure 4 Farm income changes from ETS at $25 per tonne CO2 (Jiang, 2009)**




*Note*: Change from the three-year average data except for horticulture sector that the changes are extrapolated from the sectoral impacts using HI_LINK model.

Under current accounting conventions, many agricultural activities are quite emissions intensive. The average beef farm, for example, produces 0.028 tonnes of $CO_2$ -e per dollar of cash income. With a permit price of $23 per tonne, this means that for the average beef farm, 50 cents in every dollar of cash income may be taken up by permit costs.

Even without the direct costs of permits, farms use a variety of inputs (fuel, electricity and so on) that are also emissions intensive. With a $25 per tonne permit price, chemical and fertilizer costs are expected to increase by around 3 per cent, and freight costs could increase by around 2 per cent.

## 2011 Gillard Labor, Greens and the independents

The September 2010 election has delivered an interesting paradigm where the Labor, Green, Independent coalition together with a Labor/Green Senate will most likely pass a CPRS or ETS in some form this term of parliament with a fixed Carbon price of $23/tonne. This will more than likely occur after 1 July 2011 when the Greens' receive the balance of power in the Senate.

Whilst various consultative measures are being proposed by Labor, some would say delaying tactics, there is an inevitable process in which a Carbon Tax of some style will occur. The Greens strongly favour the Garnaut report whilst Labor wish to give free credits to many of the major polluters. This will undoubtedly cause negotiation and as such we will base our scenario on the prepared document at the time of writing in August 2011.

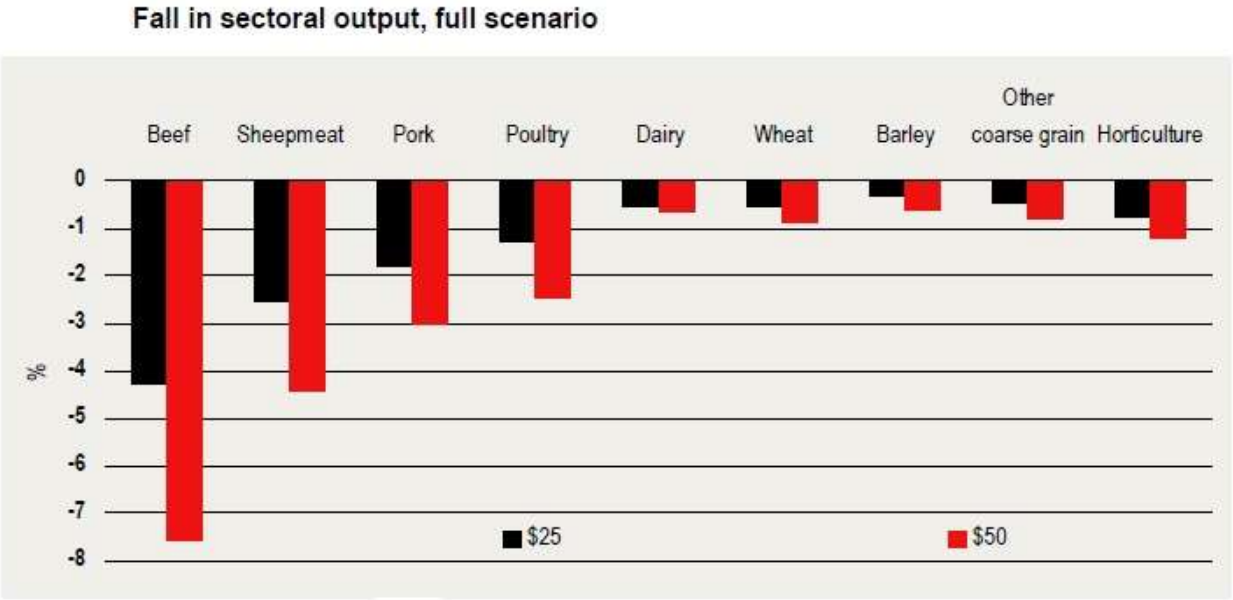
# CARBON CREDITS IN RURAL INDUSTRY

## What can Rural Australia do to reduce the impact or take advantage?

We have already seen the option presented by Garnaut of changing the Australian meat herds away from Methane producing animals to non-ruminant indigenous sources such as kangaroo. The other options presented are to reduce the size of farm operations whilst maintaining the farm size i.e. lower stocking rates or less intensive production and cropping to lower methane and nitrogenous emissions. The third alternative is to create a form of "Carbon Sink" by either re-forestation or another source of bio-fixing of carbon such as in-soil sequestration.

A sectoral analysis using agricultural commodity models suggests that sectoral output would fall by from half a percentage point to over 4 per cent when the permit price is \$25/t$CO_2$-e, and by from 0.7 to 7.6 per cent when the price is \$50/t$CO_2$-e (Figure 5).

**Figure 5 Fall in sectoral output (Jiang, 2009)**




This estimate of downturn would mean that a carbon price of \$25 per tonne $CO_2$ has the potential to close up to 14% of beef producers being the smaller farms in the sector. (Jiang, 2009).

## Re-foresting carbon sequestration

The most progressed thinking to try and off-set some of the carbon issues is the re-forestation of degraded land; land close to waterways; or strategic land which will form shade or windbreaks for more efficient overall farm production. This is on the basis that as trees grow they capture carbon from the atmosphere by converting Carbon Dioxide gas into carbon in the tree fibre through photosynthesis.

The big question is "How many trees to plant to offset the farm production?" To this there is no simple answer as varieties of trees will grow differently and therefore capture varying amounts of carbon whilst climactic and soil differences will also cause large variations. A further factor is the harvesting of trees, or their loss in a natural disaster such as bushfire would be treated as an emission under the Kyoto Protocol and as a result the owner of the forest would have to surrender the Credits unless the trees are replanted immediately after an event.

Carbon Neutral reports on their website:

We currently plant an average of 6-7 trees per tonne. In the 350-450 mm rainfall area of WA, we estimate the number of trees required per tonne of $CO_2$ varies from 4 – 10 depending on location, species of tree, soil type and type of planting. If we could plant karri trees in 1,000mm rainfall areas, it could be more than a tonne of $CO_2$ per tree! (Wilson, 2010)

The Australian Greenhouse Office (AGO) has developed a website where information can be input to calculate how much Carbon is sequestered by a hectare of forest. The approximate average allowed within an Australian context is

about 600 to 650 tonnes of carbon per hectare during a 25 to 30 year growing cycle for most Australian hardwood species which equates to an allowance of 20 $tCO_2$ per hectare per annum. This is a rough analysis and our later scenario is based upon this amount as a conservative calculation even though the AGO calculated a higher 30 tonne p.a. figure for the particular scenario developed in association with Private Forestry Southern Queensland.

The CPRS has a requirement for tree plantations to be maintained for 100 years which is a cycle of 3 to 4 harvests depending upon growth of trees. In arid areas with poorer soils it may only achieve one harvest.

### In-soil carbon sequestration

In Soil carbon sequestration is potentially a very large pool with a global estimate of 2.3 trillion tonnes of available matter, three times that of carbon in the atmosphere.(Jiang, 2009) Soil carbon is the store of carbon, again through photosynthesis into plant material, which is converted into roots, stems and leaves. It is then the transfer of carbon to the soil through roots, decay of litter and charcoal from burning that sequesters carbon.

**Figure 6 Soil carbon capture (Jiang, 2009)**

**Increase in soil carbon by agricultural practice**

| Practice | Tonnes carbon/ha/year | $tCO_2$-e/ha/year | Note |
|---|---|---|---|
| Crop | –0.136 | –0.50 | Most sites lost carbon |
| Annual pasture | 0.18 | 0.66 | Most sites gained carbon |
| Perennial pasture | 0.82 | 3.01 | All sites gained carbon |

*Note*: Increase in soil carbon over 25 years between 1968 and 1993 from 45 sites in South Australia and western Victoria
*Source*: J. Skjemstad, CRC for Greenhouse Accounting, cited in Wiley and Wilson (2008)

It is evident from studies that a change to zero tillage cropping will increase soil carbon. Perennial pasture over annual pasture also has a significant benefit as is shown in Figure 6.

As reported by Jiang, Hanslow and Pearce:

A big hurdle to adopt these practices is how to measure and verify the carbon sequestered/abated in a quick, reliable and cost-effective way, because the amount of carbon sequestered depends on many factors such as soil type, species and weather conditions. Direct measuring of every farm's sequestration is most accurate, but not financially feasible. An indirect, practice based model combined with soil sampling, carbon modelling and random verification seems a viable option.(Jiang, 2009)

At this point, there is a lack in defined calculations of accurate measures but this will become a growing area, particularly in cell grazing techniques and various cropping options.

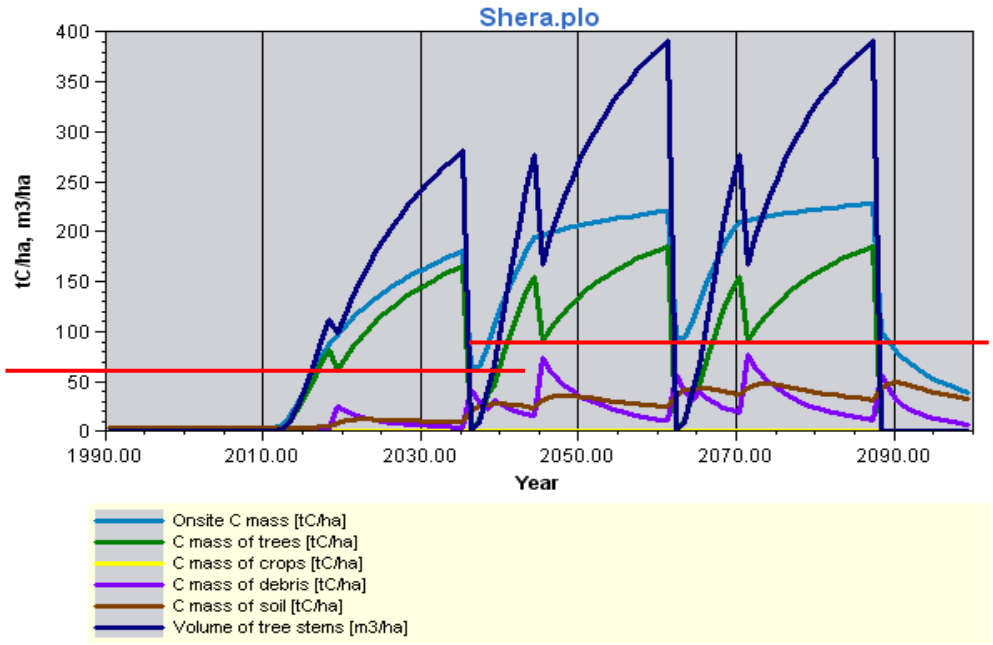
## RE-FORESTATION EXAMINED: ASSESSING THE RETURNS

### Return on private on-farm forest integrated into farm

Our focus now turns to what may be the potential returns to a farm for the selling of Carbon Credits. As Re-forestation is the most advanced in accuracy, and it was chosen to develop a scenario based upon this activity in South-east Queensland sub-tropical wet sclerophyll zone.

Firstly, the amount of carbon which will potentially sequestered is assessed via the AGO website. Our data was input by Private Forestry Southern Queensland. This was based upon a mixed Eucalyptus cloeziana (Gympie Messmate), Eucalyptus punctata (Grey Gum), Corymbia maculata (Spotted Gum) native hardwood forest in a private plantation.

**Figure 7 Carbon accumulated in trees, debris and soil as simulation for selected site (DoCC, 2010)**




The Australian Greenhouse Office (Department of Climate Change) has developed a modelling tool to calculate the carbon sequestered by a range of species across Australia. As a rough calculation it is estimated that the plantation will produce around 200 tonnes of wood/ha or equivalent 780 tonnes/ha of absorbed $CO^2$ over a 25 year rotation. However in any area that is to be harvested the equation for valuation is a lot more complicated and needs to be fed into a model to calculate the result, as it now discounts all wood harvested but allows for accumulated carbon in soil and debris, but will also calculate replanting.

The case study is on a private farm forestry plot located near Glastonbury outside of Gympie in south-east Queensland. The data was entered into the tool box, along with rainfall, soil information and management regime by Sean Ryan of Private Forestry Southern Queensland. The Toolbox runs the program and predicts the total carbon sequestered within the trees, soil and debris. The red line on the graph is the recommended level of carbon available for sale at stage one and then stage two. As the plantation grows actual growth data increments are entered into the tool box as part of the verification and auditing process. (It is expected that the current 100% discount for harvested material will change in the foreseeable future and will allow for carbon stored as either a sawn product or power pole etc).(Ryan, 2010)

Whilst the initial data shows a seqestration rate of 30 tonnes/ha p.a., we have adopted the more conservative national average of 20 tonnes/ha in our income calculations shown as Table 1. This is due to the growth rate predicitons shown from the first two years of growth being slightly behind those estimated by the program. Based upon average growth rates, and a carbon price of $23 per tonne as per the announced Gillard government pricing, the farm income shows a Return on Investment of 4.56% for the forest which increases to 5.64% when Carbon is input with rural industries not captured. This return includes a land figure at current price for accuracy in return analysis.

## Table 1 Estimated income at different growth patterns (Ryan, S. & author 2011)

**Estimated Income for Mixed Hardwood Forest (Eucalyptus cloeziana, Eucalyptus punctata, Corymbia maculata) in South-East QLD on a Per Hectare Basis - $23/tonne Carbon Credit**

| ***Action*** | ***Start Year*** | ***Span*** | ***Average Growth Total/ha*** | | ***Below Ave Growth Total/ha*** |
|---|---|---|---|---|---|
| **Land** | 1 | 1 | **-$14,000.00** | | |
| **Pre-plant** | 1 | 1 | | | |
| Professional services | 1 | 1 | **-$1,200.00** | | |
| Slash site | 1 | 1 | **-$140.00** | | |
| Mark out rows | 1 | 1 | **-$270.00** | | |
| 1st Vegetation spray | 1 | 1 | **-$270.00** | | |
| Disc or rip | 1 | 1 | **-$800.00** | | |
| 2nd Vegetation spray | 1 | 1 | **-$270.00** | | |
| Supply of seedlings | 1 | 1 | **-$2,440.00** | | |
| Planting of seedlings | 1 | 1 | **-$2,750.00** | | |
| Mulching | 1 | 1 | **-$100.00** | | |
| Fertiliser application | 1 | 1 | **-$480.00** | | |
| **Maintenance** | | | | | |
| Professional services | 2 | 5 | **-$2,000.00** | | |
| Slashing (3pa for 2 years) | 1 | 2 | **-$840.00** | | |
| Vegetation Spray (4pa for 2 years) | 1 | 2 | **-$2,160.00** | | |
| Form prune (2 @ 1m height @ 12 month) | 1 | 2 | **-$640.00** | | |
| Lift & form prune (1 @ 1.5m @ 24 month) | 3 | 1 | **-$320.00** | | |
| Year 3 thinning to 500 stems/ha | 3 | 1 | **-$800.00** | | |
| Year 3 - 4 prune (500 stems @ 3m) | 4 | 1 | **-$800.00** | | |
| Year 5 - 7 thinning to 350 stems/ha | 5 | 1 | **-$800.00** | | |
| Year 5 - 6 prune (350 stems @ 6.5m) | 6 | 1 | **-$880.00** | | |
| Slashing (pre-site capture @ year 6) | 6 | 1 | **-$560.00** | | |
| Year 7 prune 200 best stems to 12m with 150 to 8m | 7 | 1 | **-$1,000.00** | | |
| | | | | Slashing (pre-site capture @ year 8) | **-$560.00** |
| **TOTAL EXPENSES** | | | **-$33,520.00** | | **-$34,080.00** |

| | | | | | |
|---|---|---|---|---|---|
| **Income** | | | | | |
| *Year 7 thinning* of 150/ha round posts @ $6/post | 7 | 1 | **$900.00** | *Year 7 thinning* of 100/ha round posts @ $6/post | **$600.00** |
| *Year 12 commercial thin 150 stems* @ 50% 11m poles @ 350mm dbh @ $70/pole | 12 | 1 | **$5,250.00** | *Year 12 commercial thin 150 stems* @ 25% 11m poles @ 350mm dbh @ $70/pole | **$2,590.00** |
| & 50% strainers 2 per stem @ $20 ea | 12 | 1 | **$3,000.00** | & 75% strainers 2 per stem @ $20 ea | **$4,520.00** |
| with 150 stays @ $15 ea | 12 | 1 | **$2,250.00** | with 100 stays @ $15 ea | **$1,500.00** |
| *Year 25 harvest (200 stems ave 500mm dbh & 32m height)* | | | | | |
| 50% poles @ $389 ea | 25 | 1 | **$38,900.00** | 25% poles @ $389 ea | **$19,450.00** |
| 20% veneer logs of 460mm dbh by 6m @$250/$m^3$ = $247 ea | 25 | 1 | **$9,880.00** | 20% veneer logs of 460mm dbh by 6m @$250/$m^3$ = $247 ea | **$9,880.00** |
| 30% sawlog of 420mm dbh to 300mm @ 15m (2$m^3$ @ $110/$m^3$ or $220 ea) | 25 | 1 | **$13,200.00** | 55% sawlog of 420mm dbh to 300mm @ 15m (2$m^3$ @ $110/$m^3$ or $220 ea) | **$24,200.00** |
| Left over round posts (180 from tops @ $20 ea) | 25 | 1 | **$3,600.00** | Left over round posts (100 from tops @ $20 ea) | **$2,000.00** |
| Left over fencing (400 from tops @ $20 ea) | 25 | 1 | **$8,000.00** | Left over fencing (200 from tops @ $20 ea) | **$4,000.00** |
| *Carbon sequestered* | | | | | |
| 200 tonnes wood/ha or 780 tonnes/ha $CO_2$ over 25 years this is conservatively permitted to be sold as 20 tonne $CO_2$ per annum increasing to 25 tonne p.a. later in stand @ $23/tonne | 2 | 24 | **$11,040.00** | 160 tonnes wood/ha or 620 tonnes/ha $CO_2$ over 25 years this is conservatively permitted to be sold as 15 tonne $CO_2$ per annum increasing to 25 tonne p.a. later in stand @ $23/tonne | **$8,280.00** |
| Currently all harvested timber is written down to no retained carbon. This may change so that carbon in power poles is acknowledged. Retained carbon in soil and mulch is acknowledged in model & this slowly builds. | | | | | |
| ***Gross Income Ex Carbon*** | | | **$84,980.00** | | **$68,740.00** |
| ***Gross Income Inc Carbon*** | | | **$96,020.00** | | **$77,020.00** |
| | | | | | |
| ***Net Income Ex Carbon*** | | | **$51,460.00** | | **$34,660.00** |
| ***Net Income Inc Carbon*** | | | **$62,500.00** | | **$42,940.00** |
| ***Return on Investment Ex Carbon*** | | | **4.56%** | | **3.46%** |
| ***Return on Investment including Carbon*** | | | **5.64%** | | **4.31%** |

The calculations have been based upon estimated and observed growth rates in a trial plot at Goomboorian outside of Gympie. The data has been prepred in conjunction with Sean Ryan of South East Queensland Private Forestry.

It will be of interest that if rural enterprises are "captured" in an ETS or CPRS this will of course mean that the return will not create an increase in profits to the farm, but may be used to offset that farm's emmissions thus reducing their potential fall in income as shown in Figure 6. Until we know how rural industries are to be held accountable for carbon emmissions, we cannot predict the return scenerios.

Table 1 offers a variation in the analysis accounting for slower growth rates. A slower growth rate changes the original return to the farm from 4.56% down to 3.46% with a Carbon inclusive return of 4.31%.

### Comparison to rural industry returns

Australian rural industries are generally very capital intensive and do not offer high rates of Return on Investment. The 2007 to 2009 ABARE data (ABARE, 2011) has been summarised from their Australian farm surveys 2010 industry series in Table 2 below:

**Table 2 Comparison of rural industry farm returns (ABARE 2009 & author 2011)**

| INDUSTRY | RETURN ON INVESTMENT inc Capital Growth Allowances | RETURN ON INVESTMENT ex Capital Growth Allowances |
|---|---|---|
| Beef cattle | -1.3% to 2.5% | -1.5% to 1.7% |
| Dairy production | -3.2% to 6.2% | -3.9% to 4.1% |
| Grain Production | 2.1% to 3.5% | 1.0% to 1.9% |
| Lamb/Sheep production | 3.7% to 4.2% | 0.2% to 2.1% |
| Private Farm Forestry calculation ex Carbon income | 3.46% to 4.56% | 1.5% to 2.1% |
| Private Farm Forestry calculation including Carbon income | 4.31% to 5.64% | 2.2% to 3.5% |

A major component of the IRR for a farming operation is the capital growth in the value of the property. This has seen a decline in northern Australia markets for cattle and sheep holdings which caused a decline in some returns. This is a marked difference to 2004 when a booming rural market was creating much higher returns to 8.1% in the short term.

As a generalisation, the returns for Private farm forestry are much lower than the originally projected 8% to 9%, but they are potentially commensurate with other standard returns for rural production in Australia. The added income from Carbon credits is a benefit to producers, provided they are not losing major production in the conversion of areas to farm forestry.

## CONCLUSION

It is inevitable that we will see a Carbon Tax in some form or other in Australia. This may not occur in 2013 as first proposed, but with the current Labor/Green/Independent coalition and a Labor/Green Senate, the legislation passed Federal parliament in late 2011 for a Carbon Price of $23 per tonne. The full ETS or other trading scheme is yet to be enacted.

The accuracy of Carbon Sequestration projections is yet to be completed, but Re-forestation will progress as a primary option for offsetting carbon emissions. It is the extent to which rural industries and the high emitting industries are captured within any CPRS which will inevitably create the price for carbon and the amount that people are willing to pay to avoid the cost. The National Carbon Accounting System together with the National Greenhouse Gas Inventory,

both monitored by the Department of Climate Change and Energy Efficiency, will determine the amount that each industry must account for in Australia's carbon economy.

Plantations established since 1990 and re-forestation will certainly be part of a long term strategy for rural producers to either lift potential farm income, or offset the cost of carbon emissions from their properties depending upon what is captured in the legislation and how quickly. The scenario shows maintenance of returns for most farming types if they utilise private farm forestry in selected areas of a property. The added bonus of reducing carbon costs or earning extra income from selling carbon credits may determine the long term outlook for small producers where 14% are projected to close due to increased carbon tax costs.

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