Northern Territory Government

Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry

Introduction

The Kyoto Protocol has set the rules for carbon trading. Article 3.3 in the Protocol allows countries to monitor changes in carbon stocks for forestry activities (ie forestation or deforestation) undertaken since 1990 and include them in national greenhouse inventories. Net increases of carbon stocks in forests are accounted for in national inventories and can be traded on the global carbon market under Kyoto rules.

In Article 3.4, other potential greenhouse gas sources and sinks relating to agricultural soils, land-use-change and forestry, will also be considered when they can be more accurately measured, and these are likely to be included in the new protocol due to be implemented in 2012.

Reforestation, defined as converting land used for something else into forestry, has been included in Australia's Emissions Trading Scheme, called the Carbon Pollution Reduction Scheme (CPRS), which is now due to begin in 2011. The Scheme is based on a cap-and-trade system in which total emissions will be limited or capped, with tradeable permits[1] issued up to the cap. Agriculture will be exempt from the Scheme until at least 2015.

What Is A Carbon Offset

Carbon offsets (credits) are measured reductions in greenhouse gases that can be traded to cancel out an equivalent amount of emissions produced elsewhere. The activity from which offsets are derived must have 'additionality', meaning that it adds to permanent greenhouse gas abatement that would not have occurred under 'business as usual'.

Forestry will be covered by CPRS on a voluntary basis because the capture and storage of atmospheric carbon by growing trees (bio-sequestration) is relatively straightforward to measure and creates opportunities for trading carbon offsets that are equal in value to permits. Under the CPRS, eligible forest owners will be able to obtain credits for the carbon they capture which they can sell to carbon polluters. For example, a landowner may be entitled to 2 or 3 carbon credits annually for a 10 m x 500 m wind-break of trees and he could sell the credits to a polluter for $40 each depending on the market price at the time.

Other offset schemes currently being used by the voluntary carbon market include abatement of savanna burning and soil carbon sinks which are being considered for coverage by the CPRS from 2013, and renewable energy, energy efficiency, and methane energy (from landfill).

[1] 1 permit = 1 tonne CO_2-equivalent (t CO_2-e)

Forest Sinks

The capacity of trees to sequester atmospheric carbon in their biomass makes them a carbon sink. Under the CPRS, landholders can plant trees to create a forest sink and trade in carbon offsets. However certain rules apply and the first is the definition of an eligible forest sink, as follows:

1. The land used for planting a forest must have been cleared of trees before 1990.
2. Vegetative regrowth not classified as existing forest (see definition below) can be cleared before planting.
3. The planted forest must be at least 0.2 ha in area and 10 m in width, and the trees must be at least 2 m high with 20% canopy cover before it can be used for carbon trading.
4. Trees to be permanent (<70 years) or harvested and replanted.

Calculations: There are a number of ways to estimate carbon uptake by forest sinks. The Intergovernmental Panel on Climate Change (IPCC) Tier 1 methodology is the simplest way of estimating carbon stocks of forests using generic values (see Box 1 below). Tier 2 and 3 methods are more complicated and take into account net emissions from forest soils and wood decay.

The Australian National Carbon Accounting Toolbox (free from www.climatechange.gov.au) uses years of data and modelling to simulate carbon cycles in small scale agriculture and forest plots in any region of Australia, however allometric data for NT trees is still limited. For example, using the Toolbox data builder to model plantings of mix local species at Daly River gave increments of about 1 tonne C/ha/year compared with 6 tonnes C/ha/year using

Box 1: EXAMPLE OF ESTIMATING CARBON STOCKS OF A FOREST SINK USING TIER I METHODOLOGY (IPCC 2006)

Annual change in carbon stocks (ΔC_G) of a forest sink is:

$$\Delta C_{Gij} = \Sigma\ (A \times G_{Total} \times CF)$$

Where;

ij = Climatic domain/region (eg tropical dry forest of Top End of NT)

A = Area (ha) of forest sink.

G_{Total} = Average wood growth (tonnes (t) dry matter (DM)/ha/year) (eg for a young forest plantation category = 12.48 (from 8 t DM above ground growth x 1.56 for root system growth)).

CF = Carbon (C) fraction of wood (eg 0.47 for above category/domain/region).

Using IPCC default data;

ΔC_{Gij} = 1(ha) x 12.48 (t DM/ha/year) x 0.47 (C)
= 5.9 t C/ha/year
(or 21.7 t CO_2- equivalent/ha/year)

IPCC's default values. The Toolbox also allows for manual input of data for selected tree species but suitable data-sets are difficult to find. CSIRO scientists estimate that carbon sequestration rates in the Top End will range from 1.5 - 5.5 tonnes C/ha/year for local trees and planted Eucalyptus species respectively.

However, there are few opportunities for using forest sinks in the NT because:

- Most of the land cleared prior to 1990 was for agricultural development purposes and this remains the dominant land-use.
- Existing forestry activities are mostly on land cleared post-1990.
- Pastoral leases preclude non-pastoral activities.

Notwithstanding the above constraints, a landowner who for example wanted to develop a biodiversity corridor of trees across his property on land that was cleared before 1990 (verified by Landsat) could be eligible to trade in offsets. A good place to ask about receiving offset payments is Landcare CarbonSMART® (www.carbonsmart.com.au).

Abatement of Savanna Fires

Savanna burning produces 35% of all NT greenhouse gas emissions (GHG) albeit only non-CO_2 emissions (CH_4 and N_2O) are counted because the carbon released by fire is assumed to be taken up again in vegetative regrowth.

NT land managers burn off sections of savanna country during the dry season to reduce fuel loads and frequency of wild fires that are capable of destroying property, infrastructure and biodiversity. Early dry season fires are much lower in intensity and release less GHGs into the atmosphere, thereby offering a carbon offset opportunity for the emissions saved by the early fire management. For example, the West Arnhem Land Fire Abatement Project is a voluntary offset scheme that saves over 100,000 tonnes CO_2-e/year which is purchased as a carbon offset by Darwin's LNG industry.

The Australian Government's CPRS is unlikely to accept carbon credits from savanna burning; however the NT Government, in partnership with the private sector, will help to develop a range of voluntary carbon offset opportunities in the Territory, including abatement of savanna fires.

Soil Sinks

Soils are an important carbon sink limited by:

(a) Soil type – better storage capacity in soils with increasing clay content.
(b) Climate – more storage in growing season.
(c) Soil management – net losses when soil is disturbed by clearing, cultivation, continuous grazing or fire.

Soil carbon is derived from plant photosynthesis of atmospheric CO_2 and water (using solar energy) to form carbohydrates required by growing plants. The carbon enters the soil from decaying plant matter and fungi associated with plant roots. Groundcover is therefore the key to maximising soil carbon storage capacity. In degraded soils, changes to management practices can replenish soil organic carbon (SOC) and improve nutrient levels and water holding capacity, resulting in better soil fertility and plant productivity.

SOC (t/ha) is measured from replicated core samples of soil taken at different depths (eg 0-10 cm (top soil), 10-30 cm (sub-soil)). Bulk density (dry matter weight of fresh soil samples of known volume (g/cm3)) and chemical analysis of organic carbon content (%C) is used to calculate SOC (t/ha) of each soil profile, as in the example below:

1.2 g/cm3 (bulk density) x 10 cm (depth) x 0.5 %C = 6 t C/ha

Tropical savannas capture 1-2 tonnes C/ha/year with controlled burning, but this rate of uptake is presumably limited by nutrient and water availability in the soil (Savanna Links 2006). Rotational grazing can also lead to significant increases in SOC (eg by 2% (24 tonnes C/ha) over 5 years) (Baldock 2009). Mixed farming practices such as minimum tillage, stubble retention, and crop rotations with perennial grasses and legumes are all ways of restoring SOC. Understanding the importance of managing carbon in pastoral production systems has been documented at www.carbongrazing.com.au

In 2009, the Australian Government invested considerable funding to research soil carbon storage as a potential for offsets under the CPRS. The voluntary market currently trades in Australian Farm Soil Credits (www.carbonfarmersofaustralia.com.au) in the Australian Soil Carbon Accreditation Scheme (ASCAS) (www.amazingcarbon.com) while other carbon offset providers (eg www.carbonlink.com.au, www.primecarbon.com.au) are developing verifiable offset programs to replenish soil carbon using improved pastoral management practices.

Future of Voluntary Offset Markets

There are about 70 registered offset providers in Australia (see www.carbonoffsetguide.com.au) trading in a range of domestic and overseas carbon markets that are not part of the CPRS. If the Agriculture sector is mandated to trade under the CPRS in 2015 at the processor level, then there is no incentive for producers to change their management practices unless they are able to trade within the Scheme. However, if agriculture remains uncovered in the future then the voluntary market can continue to provide a mechanism for incentive-based emissions management at the farm level.

References

1. Baldock J (2009) Agribusiness Crop Updates.
2. IPCC (2006) Good Practice Guidance for Land Use, Land-Use Change and Forestry.
3. Savanna Links (2006) Savannas and the Carbon Storage Story.

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