



# The emerging carbon economy for northern Australia: challenges and opportunities

Summary

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# What is the “carbon economy”?

The Carbon Economy is the set of services, industries and commodities that will arise as a result of trading of offsets for emissions (either traded through markets enabled by Australian legislation, or through other markets) or through the development of biofuels or bioenergy industries.

By Northern Australia we mean lands north of the Tropic of Capricorn, covering close to 300Mha (Fig. 1).



Fig 1. Geographical area defined as Northern Australia for this report.



# What is its potential contribution?

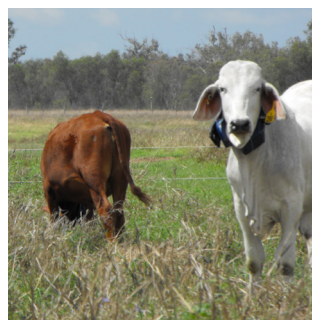
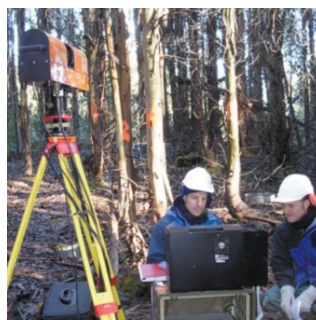
The market is an emerging one with the potential of around one billion dollars (and realistically over 100 million dollars readily attainable) if all the potential opportunities are captured and a burgeoning biofuels industry is realised. The benefits that arise from the operation of the carbon economy will not be confined to climate change action but could also generate environmental and livelihood benefits.

Three strong prospects exist:

1. Reduced emissions from fire and livestock that could generate tens of millions of dollars per year if only partially realised
2. Increased biosequestration in soils and vegetations that has been shown if fully realised through improved fire management to be worth in excess of \$2M per year on the Tiwi Islands alone
3. Growing feedstocks for biofuels is an emerging opportunity

**Challenges** to realising a 'carbon economy' in the North include:

- ♦ Very large area and remote geographical location.
- ♦ Variable climate and comparatively low rainfall.
- ♦ Heterogeneous landscapes.
- ♦ Competition for capital and capability.
- ♦ Complexity of carbon property rights associated with land tenure
- ♦ The northern landscapes contribute to multiple values that have to be reconciled. These include the contribution northern Australia makes to: Indigenous livelihoods, agricultural production, biodiversity conservation.



# What is the opportunity?

## Greenhouse Gas Abatement

The scale of opportunity for emission abatement from the North is potentially significant.

Realising this potential will require work in substantiating these estimates, improving the understanding of the processes and developing supportive policy. Notwithstanding this level of uncertainty some clear indications of prospects, and challenges to their realisation can be identified. Some of these opportunities are being realised in Carbon Farming Initiative (CFI) methodologies, others are in development (Table 1),

## Reducing emissions from fire and livestock

Half of Australia's beef herd is in Northern Australia. It contributes close to 13% (10.5Mt per yr) of Australia's agricultural emissions. At a carbon price of A\$23 per tonne CO<sub>2</sub>-e, these emissions represent a potential abatement market of over A\$240M per year.

Much of the savannah ecosystem in the North burns frequently, contributing another 1-2% (8.6Mt per year) to the national emissions account. At a carbon price of A\$23 per tonne CO<sub>2</sub>e, these emissions represent a potential abatement market of A\$200M per year.

In contrast to sequestration options (storage in vegetation and soil), emissions reductions do not require land managers to commit to permanence and thus give greater flexibility in land management.

## Increased storage of carbon

Although vegetation biomass density in the north is generally low, the vast areas mean that around 30% Australia's stored carbon lies in the soils, vegetation and vegetation residues (35.9, 7.7 and 0.8 Gt of C respectively), more than 300 times Australia's annual emissions. Increased biosequestration in soils and vegetations that has been shown if fully realised through improved fire management to be worth in excess of \$2M per year on the Tiwi Islands alone.

## Biofuels

The North is central to emerging interest in the production of sustainable feedstocks for aviation fuels. Desktop studies show biomass production potential and the potential to establish oil crops sufficient to make a significant (approx. 5%) contribution to jet fuel use in Australia. Nonetheless, the economic analysis and processing requirements are in early stages of investigation and community and industry engagement are needed.

## Limited but locally important other options

Other opportunities for generating abatement, although modest overall, hold potential importance for particular industries.



**Table 1. Prospectivity and possible timeframe until development of approved Carbon Farming Initiative (CFI) methodologies (adapted from Roe 2012)**

	SCALE	EASE TO IMPLEMENT	APPROVED	1 YEAR	2-5 YRS	>5 YRS
<b>SAVANNA FIRE MANAGEMENT</b>						
>1000mm	High	High	✓			
>600mm	High	High			✓	
<b>FORESTRY</b>						
Environmental plantings	Low	Moderate	✓			
Managed regrowth	Moderate locally high	Moderate		✓		
Afforestation	Low	Moderate	✓			
Enrichment	Low	Moderate		✓		
Avoided deforestation	Moderate	High			✓	
<b>LIVESTOCK METHANE</b>						
Livestock management	High	Moderate			✓	
Genetic selection	High	Moderate				✓
Rumen manipulation	High	Low				✓
<b>RANGELANDS</b>						
Biomass only	High	Low			✓	
Biomass and soil	High	Low			✓	
<b>FERAL ANIMALS</b>						
Camel and buffalo	Low	Moderate			✓	
<b>CULTIVATED LANDS</b>						
Soil Carbon	Low	Moderate			✓	
Fertiliser emissions	Low	Moderate			✓	



## Indigenous livelihoods

Indigenous people own or have recognised native title interests in much of the north Australian landscape. The potential benefits of Northern Indigenous communities participating in carbon offset schemes could be significant: improving the social and economic well-being of local communities, and contributing to the sustainability of Indigenous livelihoods. Carbon economic development activities that support Indigenous peoples' cultural, social and environmental priorities can also provide benefits for the broader Australian community through mutual cultural exchange,

capacity building, the protection of biodiversity and the achievement of sustainable land management.

As a market-based incentive, Indigenous carbon co-benefits can include cultural, health, and social benefits generated from targeted land and natural resource management activities. There is a need to identify how Indigenous people will be able to realise these opportunities in a manner that is fair, effective, and accountable. Prospects of successful uptake are enhanced by the demonstrated potential to match carbon farming objectives and methods

to indigenous cultural imperatives, especially discharging obligations to land by deploying familiar tools.

At the same time, there is a range of impediments to Indigenous people participating and benefiting from participating in Northern Australia's carbon economy. Most obstacles to participation in carbon markets relate to land tenure arrangements, biophysical considerations, carbon project certification and verification requirements and the capacity of Indigenous organisations to pursue carbon market and management opportunities.

## Environment

A move towards a carbon emphasis in the northern Australian economy provides both opportunities and challenges for environmental management. In addition, many of the changes to land management that pursue increased carbon returns or mitigate emissions have a range of potential positive and negative environmental outcomes. Planning for the new low carbon economy needs to integrate these environmental factors as management changes and adapts. There is likely to be a growth in market based instruments or other policy response to these changes – again adaptation and adoption become a focus. And beyond these relatively direct influences, climate change itself and the extent to which it is controlled will have a substantial effect on the environment of northern Australia.

Many of the carbon management options in northern Australia either directly manipulate the biota or influence its dynamics. Some effects seem to have clear impacts on biodiversity and ecosystem functions; others are likely to be complex and interacting. Some important but

more indirect benefits are likely – because the change to realising carbon benefits needs to be accompanied by a higher level of adaptive management. Given that it has been observed that 30% of northern grazed rangelands had deteriorated in condition since European settlement and 9% were severely degraded then a higher level of management may have clear ecosystem benefits.

The realisation of these benefits in the highly variable northern environment requires a systematic approach to land management and its support by policy and market settings:

1. Landholders will have to commit to manage stock and fire and carbon mitigation measures, against a background of high climate variability, to prevent irreversible degradation episodes;
2. Government policies must facilitate and value landholder actions in moving to more sustainable management systems;

3. An alert system based on climatic understanding, ecosystem response and resource monitoring which provides warning before damage occurs is crucial; and

4. Financial and policy systems that allow landholders to maintain management during drought and support management actions aiding resource recovery after drought.

Industries based around natural ecosystems (especially tourism) or the services which come from them (fisheries, timber, water, bush foods) are currently an important part of the northern Australian economy. Most of the management changes inherent in the carbon management options for northern Australia are likely to enhance these industries, or in the case of water supply have an overall neutral effect.

# How might the journey to a carbon economy in northern Australia unfold?

Northern Australia is economically, ecologically, socially and culturally different from southern Australia. The carbon markets are in an early stage of development, and much remains to be learnt of how northern systems can contribute to the carbon economy. An “adaptive management approach” will be critical with lessons to be learnt along the way.

Challenges to achieve the Northern contribution to the carbon economy include:

- ♦ The carbon abatement issues are complex covering many dimensions of economic activity, sustainability and livelihood opportunity.
- ♦ The science is also incomplete – new technologies and methodologies are needed and these need to come to grips with complex interactions of biological and physical drivers within variable climates and diverse landscapes of northern Australia.
- ♦ Climate change will add to complexity and uncertainty in the long-term trajectories for northern Australia’s landscapes, industries and communities.

If short term action to achieve the opportunities were deemed by governments to be warranted, some priority elements of a response might include:

- ♦ The relevant jurisdictions could examine the extent to which there are policy impediments to the evolution of a carbon economy in northern Australia. This might for instance consider issues of property rights to carbon across the diversity of land tenure arrangements in place.

- ♦ There are already some limited opportunities to pursue carbon offsets in northern Australia via the savannah burning methodology of the CFI. The practical barriers to widespread implementation of this method remain significant and groups such as NAILSMA could partner with relevant science agencies to develop tools and approaches to improve the ease with which such methods could be scaled out within Indigenous land management areas.
- ♦ The “toolkit” of methodologies available for northern Australia is currently very limited. The savannah burning methodologies needs to be elaborated to cover a wider geographical area (that is areas with annual rainfall less than 1000mm). Methods that can support methane abatement in the livestock sector are needed and these need to reflect the practical realities of management in the extensive beef industry of the north.
- ♦ While the quantities of carbon stored in northern Australian soils and vegetation are massive, the practical prospects of sequestering additional carbon in these sinks remains uncertain. In fact, under climate change or other forms of land use change we could see carbon being lost from these sources with negative consequences on the ecosystems and global atmosphere. The longer term significance of these carbon stocks are such that continued scientific enquiry is essential.



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