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Producing Climate Clever Beef in northern Australia

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Abstract
Northern Australian beef businesses are currently facing a challenging time with significant pressure on profitability across all regions. Simultaneously, the community and Government are concerned about the environmental impact of the beef industry (e.g. greenhouse gas emissions).

The Climate Clever Beef initiative aims to increase the adoption of practices that optimise productivity, profitability, resource condition and greenhouse gas emissions outcomes. A framework was developed which was a powerful tool to identify and analyse management options for individual beef businesses.

The process enabled the identification of "win-win" management options where both profitability and greenhouse gas emissions were improved and highlighted the magnitude of any trade-offs for other management options.

This paper presents a summary of three case studies from three diverse regions in northern Australia, including two examples on the impact of management options on livestock greenhouse gas emissions and one example of carbon sequestration through regrowth management. Key findings include:

- Total emissions are likely to increase with property development and herd build-up.
- Carbon sequestration with regrowth retention may provide opportunities.
- Some management options can improve both herd efficiency and greenhouse gas emissions intensity.

Introduction
The Australian beef industry is the world's seventh largest beef producer with a national herd of 26.6 million cattle, producing 2.1 million tonnes of carcase weight (2010-11) with a gross value of $8.1 billion (MLA 2011). The industry is the major land use for 47% of Australia's land area. The northern beef industry (Queensland, Northern Territory and northern half of Western Australia) produce half the national beef output. The substantial size of Australia's beef industry inevitably results in environmental concerns with the industry potentially having significant impacts on land condition and water quality (e.g. sediment entering the Great Barrier Reef lagoon) and contributing to Australia's reported greenhouse gas emissions.

Community and Government concerns around the impacts of climate change driven by greenhouse gas emissions has led to policy development to restrict greenhouse gas emissions and increase carbon sequestration (removal and storage of carbon dioxide from the atmosphere) on grazing land. To date, agriculture in Australia has been exempt from direct greenhouse gas emissions reduction strategies (e.g. the carbon tax).

Mitigating greenhouse gas emissions has impacts at all levels of the beef production chain. However, options for northern beef businesses to reduce emissions or increase sequestration are poorly understood, with many beef producers (and advisors) uncertain how to respond.

The Climate Clever Beef project (funded by industry, Australian and State governments) used a 'participatory' model of development and extension to collaborate with individual beef businesses and groups. A framework was developed to identify key industry and regional drivers, benchmark the performance of individual businesses and identify and evaluate alternative management options (Figure 1). The holistic approach systematically assessed five factors at each stage of the framework: profitability, herd productivity, land condition, greenhouse gas emissions and climate change risk. This was achieved by integrating several existing tools, including Profit Probe^{TM}, Breedcow Dynama and FarmGAS.

This paper presents a summary of three case studies from three diverse regions in northern Australia (Queensland Gulf, VRD (Victoria River District) in Northern Territory and Fitzroy Basin in Queensland). Two case studies are examples of the impact of management options on livestock emissions and the third is an example of carbon sequestration through regrowth management.

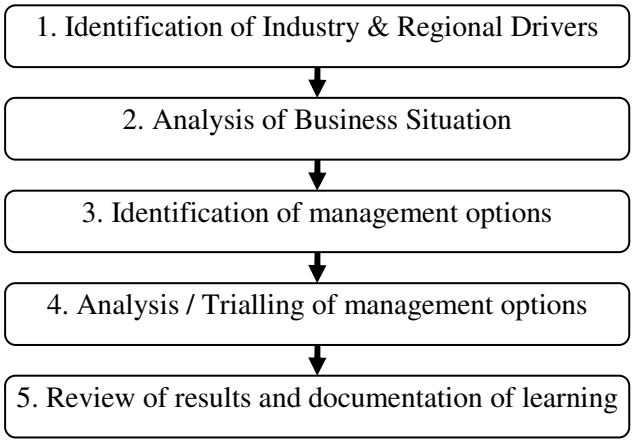

Figure 1: Framework to identify and assess management options.

Industry and regional drivers

Despite the size and importance of the northern Australian beef industry, at the individual business level the industry is currently facing a challenging time with significant pressure on profitability induced by high debt levels, increasing costs, flat product prices and poor productivity gains across all regions (McCosker *et al.* 2010). The precarious position of many beef businesses means that alternative management practices need to be carefully selected and assessed to ensure they have appropriate productivity and environmental outcomes.

Key negative drivers in specific regions include:

- Poor land condition due to continuous grazing and heavy stocking rates in the Queensland Gulf reducing diet quality and impacting herd productivity.
- High land prices in the Fitzroy region with limited opportunities to expand and high climate variability.
- Limited market options, particularly for cull cows and heavy cattle, and high transport costs in the VRD.

Key strengths in the different regions include:

- Methane emissions in the VRD and Queensland Gulf are low per hectare due to the relatively low stocking rates (i.e. 5-25 ha/hd). However, the slow growth rates and low weaning percentages result in poor emissions (Eady 2011).
- Development opportunities still exist in the VRD to sustainably increase herd size and productivity by spreading livestock into less utilised areas.

- Fertile soils and higher stocking rates in the Fitzroy region enable increased turn-off and better emissions intensity.

Case study 1: Gulf region in Queensland (suite of improvements)
The property was purchased 16 years ago, at which point both land and cattle condition was poor. Considerable time and effort has been spent improving land condition and livestock productivity by reducing stocking rates, wet season spelling, pasture improvement and implementing supplementary feeding programs. As a result, productivity has improved through increased weaning rates (46% to 70%), reduced death rates and improved growth rates (50-60 to 130-150kg/hd/yr) resulting in an 80% increase in liveweight sold off the property. Gross margin improved by 93%.

Total livestock methane emissions reduced by 15% and greenhouse gas emissions intensity ($kgCO_2$-e per kg liveweight sold) halved through the implementation of the suite of management changes.

Case study 2: VRD region in NT (infrastructure development to increase carrying capacity)
The key profitability and productivity issues identified for the VRD property included: under-development (limited utilisation of ungrazed pastures away from water points) and sub-optimal herd performance. Opportunities to improve sales returns and reduce operating costs were also identified. Four realistic management options were identified: increasing carrying capacity through infrastructure development and pasture improvement, selling 50% of the sale cattle into the Queensland market, implementing an early weaning program and improving the genetics of the herd.

Current carrying capacity is about 50% of the estimated potential for the property (S. Petty *pers. comm.).* With a stabilised herd under the current level of development, the annual EBIT (earning before interest and tax) was estimated to be ~$116,000. Undertaking property development to improve carrying capacity to 75% of the estimated potential substantially increased EBIT, however a combination of strategies is likely to deliver the best outcome.

Increasing carrying capacity will increase herd emissions by approximately 50%, however if herd productivity improvements (e.g. early weaning, improved genetics) are also undertaken there may be some improvement in greenhouse gas emissions intensity as occurred in Case study 1.

Case study 3: Fitzroy region in Queensland (regrowth management)
The Fitzroy property is dominated by relatively fertile brigalow country with buffel grass, however approximately 36% of the property is covered by woody regrowth of varying densities with some nearing 10 years of age. Business analysis indicated that the key area to target for improvement was asset turnover.

High levels of regrowth reduce pasture production and beef productivity reducing turnover. Alternative regrowth management strategies were assessed for profitability and productivity and the potential return from carbon sequestered in regrowth as part of a "carbon project" was considered. Three strategies were:
- Regrowth retention (no clearing)
- Clear regrowth using Tebuthiuron herbicide (business as usual)
- Clear regrowth and plant a forage legume (leucaena)

The analysis assumed 1000ha of ten year old regrowth and the impacts were assessed over 30 years. Changes in carrying capacity, regrowth rates and costs were provided by the experienced property owner. Net present value was calculated for each management option and considered:

1. Livestock income only
2. Livestock income and potential carbon income from regrowth retention.

Table 1 Net present value of regrowth management options

	Livestock income only	Livestock and regrowth sequestration income
Regrowth retention	$ 275,000	$ 652,000
Clear regrowth	$ 338,000	
Leucaena	$ 384,000	

Obviously, regrowth retention resulted in lower livestock income due to reduced livestock carrying capacity over time with the leuceana option the most profitable. However, if a net carbon price (carbon price minus expenses and risk management costs) of $10 per tCO_2-e was received for carbon sequestration in regrowth, the regrowth retention option would be substantially ahead over a 30 year period, although permanence and impact on future options will need to be considered.

Conclusions

The Climate Clever Beef framework was a powerful tool to identify the key issues and assess options to improve individual business resilience. Reduction in total greenhouse gas emissions will be dependent on whether or not a property has completed its development and herd build-up phase as emissions will increase with higher livestock numbers. Under a carbon market, carbon sequestration through regrowth retention may provide opportunities for some beef businesses. However, improving herd efficiency and greenhouse gas emissions intensity should be a goal for all beef businesses.

Further information on the Climate Clever Beef project can be found at http://futurebeef.com.au/resources/projects/climate-clever-beef/

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