Rangeland Beef Production and Carbon Farming

Beef cattle enterprises of less than 20,000 ha

Background

As Australia seeks ways to reduce Greenhouse Gas (GHG) emissions there are potential opportunities for pastoralists to participate in the Australian and global carbon market.

As part of a broader on-property diversification theme, the SA Arid Lands Carbon Farming Project was funded by the Australian Government to explore the potential for carbon farming in the arid rangelands of South Australia.

The *Rangelands Enterprise Diversification Decision Support* tool (REDDS) was developed to enable comparative analysis of pastoral enterprises. In 2016 twelve pastoral properties used the tool to explore the viability of carbon farming. Feasibility studies were undertaken on properties representing beef, meat sheep or wool sheep herds in each of the main land systems.

This case study outlines the results of the feasibility studies on small beef enterprises looking at GHG emissions reductions and sequestration activities.

Scenario

Bioregion:	Flinders Lofty Block
Approx. property size:	<15,000ha
Ave Rainfall:	200 mm
Stock:	Cattle
Ave stock rates:	2 to 6 ha/animal
Stocking Rate as DSEs:	2.2ha/DSE
Stock numbers:	500 to 650

Emissions Reductions

Greenhouse Gas emissions reductions were modelled using REDDS based on a herd emission reduction method that resulted in quicker growth and turn off of stock. Results from REDDS were converted to tonnes of CO_2^e and $ per animal to enable comparison with income from meat production for the property.

Summary: Emission Reduction

At a carbon price of $10/tonne, this model showed that a small beef enterprise in the Flinders Ranges land system could expect potential income from herd emission activities between $3,000 and $5,850/year. With a carbon price of $40/tonne the income would be between $12,000 and $23,400/year, depending on the season. Project costs of $2,000/year need to be subtracted to calculate the gross margin.

The same modelling showed that beef production would bring between $9,000 and $206,000/year after costs (Gross Margin) at 2015 prices with an average of $91,000/year over 10 years.

This property could reduce emission by less than 500t CO_2^e /year depending on the season. This is well below the 2000 tonne threshold required to enter the Emission Reduction Fund (ERF) auction process.

Emissions reduction per animal

Season type	Possible t CO_2^e reduction per animal from base line
Good	0.65 tonnes
Fair	0.6 tonnes
Bad	0.9 tonnes

The range of possible CO_2^e emissions reductions in a small beef herd against the baseline.

Emissions reduction $ per animal

Season type	Carbon Income per animal @ $10/t CO_2^e	Carbon Income per animal @ $40/t CO_2^e
Good	$2.50	$22.00
Fair	$2.00	$20.00
Bad	$5.00	$32.00

Gross margins (income, less direct costs) from carbon from an average of 500 animals

Emissions Reduction potential

- Methods for cattle herd management for emissions reduction are available and being used successfully in higher rainfall areas
- Emission reduction methods are likely to increase this properties' productivity and have environmental co-benefits
- Carbon companies are gearing up to aggregate cattle herd emissions reduction activities in the rangelands across multiple properties

Limiting factors to undertaking emission reduction activities

- An aggregation of many properties would be needed to achieve a minimum bid size under the auction rules for the ERF
- Environmental and herd management actions already undertaken by this landholder could result in a higher baseline than modelled, so reductions might not be as large as calculated

Carbon Sequestration

In this scenario the sequestration modelling was applied to only 4,000ha due to the property size (<15,000ha). This was realistic given that the owners are keen to rehabilitate and increase vegetation cover on this historically denuded land system. The modelling was based on natural regrowth of native vegetation with 50% destocking and a small area of environmental works on 500ha. Average carbon sequestration rates in this country were deemed to be 0.12 tonnes to .36 tonne/ha/year, depending on the season and stocking level.

The cost of setting up and running the Sequestration project was estimated at $12/t CO_2^e. Management and reporting costs were scaled down to a realistic amount for this size enterprise. Initial set up costs of $85,000, (mainly for fencing) were spread over 25 years.

Summary: Sequestration

The numbers in the tables are indicative and will vary depending on factors such as the local micro climate, the base line the project starts from, set up and management costs (fencing and feral animal control) and the sequence of good and bad seasons we modelled.

The modelling highlighted that due to the size of the property the financial returns from carbon sequestration varied considerably due to seasonal conditions. Additionally, if landholders had a run of bad years, or an event such as a fire, the best time to start a sequestration project was soon after these types of event, as they would be starting from a lower base line.

The case study property has a relatively high return per hectare for its small beef herd which, when including loss of productivity from destocking, means carbon prices have to be higher to compete with beef production.

The landholder is undertaking environmental works to improve soil hydration and vegetation cover which may mean that their carbon base line is already elevated making income from sequestration even more difficult. The small amount of carbon that could be sequestered, approximately 600 tonnes per year, and the resulting loss in beef production means that entering the ERF and getting a competitive return from carbon sequestration is very unlikely.

An added impediment is that, fencing able to withstand sheep and goat pressure, would be required to protect the sequestration project area. As a result, the project set up costs are likely to be much higher than we have deemed in this model.

Carbon Sequestration Income

As the carbon price increases the gross margin increases. Another way to increase this margin is to reduce costs. If the 4000ha block were to be used for beef production the return would be $21,000 to $48,000/yr. versus -$1,000 to $18,200/yr. for carbon. A carbon price of $40/tonne is still unable to match the average returns modelled for beef production for this enterprise.

Ave. Carbon Sequestrated on 4,000ha	Possible Gross Margin @$10/t CO_2^e	Possible Gross Margin @ $40/t CO_2^e
640 tonnes	-$1000	$18,200

Carbon sequestered and gross margins.

Average Income/ beef/ha	Carbon Income/ha @ $10/t CO_2^e	Carbon Income/ha @ $40/t CO_2^e
$8.40/ha	-$0.25 /ha	$4.55 /ha

Beef cattle v's carbon sequestration

Sequestration positives

- Rapid responses by native vegetation to good rainfall years is possible
- This land has suffered historical over grazing so currently has a low carbon baseline

Limiting factors to sequestration

- Opportunistic feral grazers (rabbits, goats and kangaroos) are a serious problem in this area and will be expensive to manage in the sequestration area.
- Seasonal variations can result in little vegetation growth in some years
- Currently no sequestration methods have been approved for these land systems or rainfall regions
- It is not clear if a lessee is able to own the sequestered carbon on a pastoral leasehold property

Where to From Here?

Before considering diversification including carbon farming, small beef producers in the SA Arid Lands region need to have a good understanding of their *current* cost of production. This will enable them to objectively analyse the financial return of any potential carbon activities.

The high productivity of the case study property combined with high cattle prices means that carbon farming is not a competitive option in the foreseeable future.

Information prepared on behalf of the SA Arid Lands NRM Board with funding from the Australian Government

Government of South Australia
South Australian Arid Lands Natural Resources Management Board