

Rangeland Beef Production and Carbon Farming

Beef cattle enterprises of greater than 120,000 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 beef enterprises looking at GHG emissions reductions and sequestration activities.



Scenario

Bioregion: Stoney Plains and Finke
 Approx. property sizes: >120,000ha
 Ave Rainfall: 180 mm
 Stock: Cattle
 Ave stock rates: 150ha/animal
 Stocking Rate as DSEs: 18ha/DSE
 Stock numbers: 700 to 1700

Emissions Reductions

Greenhouse Gas emissions reductions were modelled using REDDS based on a herd emissions reduction method that resulted in quicker growth and turn off of stock. Results from REDDS were converted to tonnes of CO₂e and \$ per animal to enable comparison with income from meat production for that property.

Summary: Emission Reduction

Modelling of beef production properties greater than 120,000 Ha showed that emissions could be reduced by 308 to 1122 t CO₂e/year. This is below the entry level of 2,000 t CO₂e /year required by the ERF auction rules. This means that entry into that market is not possible without aggregation of several properties or herds.

At a carbon price of \$10/tonne these beef properties could expect potential income from herd emission activities between \$3,080 and \$11,200/year. With a carbon price of \$40/tonne the income would be between \$12,320 and \$44,880/yr. depending on the season and number of animals in the herd. 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 \$162,000 and \$317,000/yr. after costs (Gross Margin) at 2015 prices with an average of \$230,000.

Emissions reduction per animal

Season type	Possible t CO ₂ e reduction/animal from base line
Good	.44 tonnes
Fair	.49 tonnes
Bad	.66 tonnes

The range of possible CO₂e emissions reductions in a beef large herd depending on the season.

Emissions reduction \$ per animal

Season type	Carbon Income \$ per animal @ \$10/tonne	Carbon Income \$/ animal @ \$40/t
Good	\$2.73	\$15.93
Fair	\$3.23	\$17.93
Bad	\$4.93	\$24.73

Gross margins (income, less direct costs) for carbon from an average of 1200 animals

Emissions Reduction potential

- Methods for emissions reduction via a herd management project are available and being successfully run in higher rainfall regions.
- Emission reduction methods are likely to also increase productivity and have environmental co-benefits.
- Carbon companies are interested in aggregating emissions reduction activities in the rangelands across multiple properties.

Limiting factors to undertaking emission reduction activities

- An aggregation of several properties would be required to achieve a minimum bid size under the auction rules for the ERF.
- The costs of involvement in the ERF, extra paper work and fees to aggregators could make an emissions reduction project un-attractive to an already profitable business.
- Lack of accurate herd records and weights of animals in this region will be a hindrance to operating emissions reduction projects.

Carbon Sequestration

A standard 17,000ha block was modelled for each of these properties, comparing incomes from beef versus carbon. Average carbon sequestration rates in this country were deemed to be 0.125 and 0.275 tonne/ha/year, depending on the season and stocking rates.

The cost of setting up and running the sequestration project was estimated at an average of \$8.00/tonne CO₂e. This included the initial set up cost of \$344,000, (mainly for fencing) that was spread over 25 years as well as management and reporting costs at the year of issuance of ACCUs,

Summary: Sequestration

The numbers in the tables are indicative and will vary depending on factors such as the local micro climate, the baseline the project starts from, set up and management costs (fencing and feral animal management) and the sequence of seasons. Income from carbon sequestration varied greatly between the properties that were analysed, ranging from as little as \$240 a year after costs, to as much as \$14,286 (at \$10/t CO₂e).

Fencing remains the greatest setup cost for sequestration projects in this landscape. The large areas required to gain a small return on carbon sequestration meant that the design of each carbon project had to include 52kms of fencing to restrict grazing from cattle, sheep and camels.

Carbon Sequestration Income

As the carbon price increases the gross margin increases. Another way to increase this margin is to reduce costs. If the 17,000ha block were to be used for beef production the return on it would be \$27,200/year.

Ave. Carbon Sequestered on 17,000 Ha per year	Possible Gross Margin @ \$10/tonne/yr	Possible Gross Margin @ \$40/tonne
2900 tonnes	\$5,800	\$92,800

Average Carbon sequestered and gross margins.

Average Income/ \$/ha for beef	Carbon Income/ha @ \$10/t	Carbon Income/ha @ \$40/t
\$1.60	\$0.34 / ha	\$5.46 / ha

Beef cattle v's carbon sequestration

Sequestration positives

- Rapid responses of native vegetation to good rainfall years is possible.
- An advantage could be gained by starting a project with a low carbon baseline by choosing land that has a history of over grazing or has suffered a recent wild fire.
- Large areas of country are available that are remote from water points and are not normally grazed.

Limiting factors to sequestration

- The cost of erection and management of long fence lines to keep out opportunistic grazers (camels, sheep and kangaroos) is expensive.
- Seasonal variations can result in little vegetation growth in some years.
- When wild fires occur in this region they can be large scale and very difficult to control.
- Sequestration methods have not been trialled 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, 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.

Emissions baselines need to be established through accurate recording of stock weights and stock movements and the involvement of expert assistance to complete detailed modelling on soil and vegetation in the proposed sequestration site (including measurements against an approved method of sequestration) will be needed to verify the economics of the project.

Comprehensive records of livestock and land management activities will be needed to develop carbon projects in the future and landholders can commence keeping these records now.

Landholders need to consider the herd improvements that they can apply (such as more intensive grazing management, reduced periods of "joining", regular pregnancy testing and weaning) that will increase the efficiency of their stock production systems.

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