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Climate Clever Beef in the Maranoa-Balonne

In Australia agriculture contributes 15% of total greenhouse gas (GHG) emissions annually. Of this, 67% is estimated to come directly from ruminant livestock. The Climate Clever Beef (CCB) project in the Maranoa-Balonne looked at on-farm practices to decrease methane emissions from livestock and improve soil carbon sequestration, while also maintaining or improving productivity and profitability. On-farm trials and computer based modelling were used to investigate the effectiveness of a number of current management strategies, how changes to these strategies affect business and livestock performance and, therefore, implications for soil carbon and emissions from livestock.

Data collected from businesses within the group as well as outside sources show that beef businesses in general in southern Queensland are suffering from a lack of scale and labour efficiency. Managing this while also managing for land condition and extreme weather events need to be in balance. Many producers in this region do not have the option to increase cattle numbers as they are already running at optimum carrying capacity. Stocking more heavily would impact land condition, which in turn would then decrease productivity and profitability. Therefore, producers in the region must find ways to boost productivity (while maintaining similar numbers of cattle) and also improving overall labour efficiency.

Managing emissions from livestock

Implementing best management practice options usually has a positive impact on GHG emissions. In a developed herd these practices may lead to reduced overall emissions. In comparison, in herds and properties that are not yet fully developed improving infrastructure and resultant increases in carrying capacities and stocking rates, can often lead to increased total emissions. In both situations though gains can be made in emissions intensity or the total emissions per unit of product produced. In beef systems this is measured in kilograms (kg) or tonnes (t) of beef produced. Achieving optimum emissions intensity requires that for every tonne of CO_2e produced by an animal the tonnes of beef produced are maximised.

Herd performance measures and management decisions that will affect total GHG emissions and emissions intensity include:

- Weaning rate and reproductive efficiency
- Herd structure and age of turnoff
- Growth rates
- Culling strategies

Optimising the herd structure, reproductive efficiency and improving growth rates are some of the ways that producers in this region can ensure the beef business is running at maximum potential.

Modelling options

In order to assess the implications of some of these strategies on livestock emissions, GHG emissions outputs were analysed and options modelling undertaken on two properties. The first is a breeding property selling weaners at approximately nine months of age, with cattle running on good buffel pastures. The second is a backgrounding and finishing operation, selling bullocks to the meatworks at 500–600 kg liveweight, with cattle being finished on leucaena and improved pastures.

Image 1. Weaners in June 2014 on property 1.

Case study 1

The analysis of the first business focussed on modelling changes in the gross margin and GHG emissions as a result of changing the herd structure and selling older animals instead of weaners. Models undertaken were:

- Current management/turnoff: selling all males and non-replacement females as weaners
- Selling females as weaners and males as bullocks
- Selling females as weaners and males as yearlings
- Selling females as yearlings and males as bullocks
- Selling females and males as yearlings

As shown in Table 1 the current management scenario has the lowest overall emissions. This is due mostly to the fact that very young animals are being turned off and are not on the property for very long, meaning they have less time to contribute to GHG emissions. However, the increased emissions values in the other scenarios are very minimal and are not significantly different from the current scenario. It is also important that GHG outcomes do not hinder the productivity or profitability of the business. When looking at Table 1 it is clear that changing the current strategy to selling older male animals will provide an improvement for the gross margin of the business, as shown in Scenarios 2 and 3. This will help to ensure a more viable business into the future, allows for increased marketing opportunities and also provides a greater opportunity for selling down strategies in dry times. Scenario 3 also has very little change in GHG emissions from current management and also gives the lowest emissions per kilogram of beef sold, giving more efficient beef production overall.

Table 1. Outputs for each scenario.

	1. Current Management /Turnoff	2. Weaner Heifers, Bullocks	3. Weaner Heifers, Yearling Steers	4. Yearling Heifers, Bullocks	5. Yearling Heifers, Yearling Steers
Farm characteristics					
Total herd size (AE)	1,600	1,600	1,600	1,600	1,600
Farm area (ha)	14,000	14,000	14,000	14,000	14,000
Total turnoff (t liveweight sold)	**281**	**327**	**332**	**318**	**321**
Turnoff/breeding cows > 3 years (t liveweight sold)	0.41	0.55	0.49	0.58	0.52
Farm gross margin					
Gross margin before interest (% increase on current)	-	11%	14%	2%	3%
Gross margin after interest (% increase on current)	**-**	**8%**	**13%**	**-4%**	**-2%**
Greenhouse gas (GHG) emissions					
Total GHG emissions (t CO_2e/year)	2,981	3,080	3,012	3,107	3,047
GHG emissions/AE (t CO_2e/AE)	1.86	1.93	1.88	1.94	1.90
GHG emissions/turnoff (t CO_2e/t liveweight sold)	10.60	9.41	9.06	9.78	9.49
GHG emissions/ha (t CO_2e/ha)	0.213	0.220	0.215	0.222	0.217

Image 2. Selling older cattle may improve business returns and improve emissions intensity.

Case study 2

The second property analysis focussed on the impact of improving the feedbase to improve animal performance and increase turnoff rates of cattle. This particular property has had breeders in the past, but in recent years has moved to a full trading operation. In order to improve animal performance the owners have planted leucaena across one third of the property to date and are currently preparing country to plant more. In a trial done near Bell, it has been shown that leucaena can produce annual liveweight gains of approximately 0.7 kg/head/day compared to grass pasture alone, which in this particular trial achieved 0.48kg/head/day and 0.58kg/head/day in two consecutive years. This can greatly reduce the time taken to finish cattle to slaughter weights, which will also have an impact on lifetime GHG emissions and emissions intensity for these animals. Table 2 shows results from modelling of GHG emissions from animals on the Springtime leucaena pasture system versus if these animals were on a grass pasture system only.

Table 2. GHG emissions comparison for grass vs leucaena grazing systems.

Greenhouse Gas Emissions	Leucaena	Grass
Livestock		
Methane (CH_4)	511.35	525.29
Nitrous oxide (N_2O)	29.70	30.06
Total livestock emissions (t CO_2e)	541.05	555.35
Total pasture emissions (t CO_2e)	63.00	0
Total emissions (t CO_2e)	604.15	555.35
Turnoff (t beef)	63.48	52.89
Emissions per hectare (t CO_2e/ha)	1.01	0.93
Emissions per tonne beef (t CO2e/t beef)	8.52	10.50
Emissions per AE (t CO2e/AE)	2.11	2.08

Image 3. Cattle grazing leuceana at property 2.

As shown in Table 2, due to the emissions coming from the legume in the pasture total emissions from the leuceana system are slightly higher than in the grass only system. This also slightly increases the total emissions per hectare in the leuceana system—as well as the fact that more animals can be carried per hectare in the leuceana system. In contrast, emissions intensity is superior in the leuceana system due to the higher weight gains achieved when grazing leuceana and the higher total kilograms of beef produced under that system. These higher weight gains are able to offset the higher emissions, resulting in less total emissions per kilogram of beef produced. The higher weight gains also mean that these cattle will reach finished weights more quickly than their grass only counterparts, attributing less overall lifetime emissions and also improving turnover of cattle in the business.

In this business improving the feedbase to improve animal performance has helped to ensure that for every unit of CO_2e being produced the property maximises the beef produced and improves efficiency. The increase in weight gains and turnover will also assist in offsetting the cost of establishing the leuceana, which will help to ensure that improving the feedbase did not come at a negative cost to the business overall.

Conclusion

Through modelling both properties have been able to assess the impacts of different management strategies on the GHG emissions of their herds. While it may not always be possible to decrease total emissions from the herd, it is often possible to improve emissions intensity. Improving this figure ensures that the greatest production is gained for each unit of CO_2e output and the business is therefore more likely to be operating at maximum potential. Many of the production improvements that help to achieve improved emissions intensity are seen as industry best practice and often also work to improve business outcomes, such as increasing profit. Therefore, focussing on implementing strategies that will improve the productivity and profitability of the beef business in the long-term is a win–win scenario.

Further information

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Or visit http://futurebeef.com.au/resources/projects/climate-clever-beef/

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