Carbon and Grazing - finding the balance

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Overview

Carbon cycle

National level emissions

State level

Farm level

– Climate Clever Beef

– Herd (Blanncourt)

– Regrowth (Jimarndy)

– Soil (Nth Gulf, Wambiana, Toorak)
Carbon cycle

Interdependence

- Plants
- Animals
- Soil carbon
- Soil biology
- Atmosphere
- Water quality
- Biodiversity
- Land condition

- Fossil fuel emissions
- Livestock (extensive, intensive)
- Cropping
- Forestry
- Horticulture

- Business productivity and profit
- Communities
What is the fuss about?

Global atmospheric concentration of carbon dioxide

Source: IPCC 2001
Heading to 450 ppm
Figure 6: Queensland – Emissions by Sector, 2008

Dept of Climate Change 2010

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Greenhouse gas emissions from Australian agriculture, 2003

- Savanna burning = 11.8 Mt
- Agricultural soils = 18.7 Mt
- Stubble burning = 0.3 Mt
- Rice cultivation = 0.4 Mt
- Manure management = 3.3 Mt
- Enteric fermentation (methane from livestock) = 62.7 Mt

Mt = Million tonnes of greenhouse gas emissions

75% Cattle
20% Sheep
90% Cattle in Qld
80% of land use in Qld
Assessed carbon stocks and greenhouse emissions including:

- Livestock methane (1.5 t CO$_2$-e per AE per year)
- Property energy emissions (0.09 t CO$_2$-e per ha per year)
- Livestock biomass and turn-off
- Forage and litter biomass
- Savanna burning
- Tree biomass (clearing and growth in remnant and regrowth veg.)
- Soil carbon and land condition
Net carbon position of QLD beef industry

Total emissions 17.4 or 1.2 Mt CO2-e
Climate Clever Beef

The region, business, identification of options and analysis of options are evaluated in terms of:

- Productivity
- Profitability
- Land condition
- Greenhouse gas emissions
- Climate change risk
- Business resilience and adaptability

Climate Clever Beef website

- Part of MLA’s Northern Grazing Systems Initiative
- DAFF Australian Farming Futures funding
Gulf case study – Business situation

- Purchased property with stock 15 years ago.

- Ran ‘as-is’ for 3 years, low weaning rates and poor land condition.

- Then undertook considerable effort to improve the business including:
  - Reducing stocking rates
  - Wet season spelling
  - Pasture improvement
  - Supplementation
  - Feeding of young cattle to meet weight-for-age targets
Gulf case study – Business situation

Analysed current situation and situation 15 years ago.

– Business financial analysis
– Herd structure and productivity

Profitability

• Gross margin has increased – 165% (BreedcowDynama)
• There is room for improvement compared to regional benchmarks (ProfitProbe) primarily due to high feed costs to reach weight-for-age specifications of younger cattle and reduced time to first calving.

Productivity

• Weaning rate improved from <50% to 70%, death rates reduced significantly
• Cow numbers reduced by about one third, however same number of calves
• Weight gains improved from 50-60 kg/hd/yr to 130-150 kg/hd/yr
• Beef sold increased 180%
Gulf case study – Business situation

**Land Condition**
- 85% C-condition 15 years ago
- 85% A/B-condition currently

**Greenhouse gas emissions**
- 300 kg CO$_2$e/ha/yr 15 years ago
- 250 kg CO$_2$e/ha/yr currently
- 17% improvement

**Greenhouse gas emissions efficiency**
- 25.1 kg CO$_2$e/kg beef 15 years ago
- 11.7 kg CO$_2$e/kg beef currently
- 53% improvement

- Energy use was 2% of total emissions
- Pasture biomass increased by 85 kg CO$_2$e/ha/yr with improved land condition

- 9 businesses in CQ 17 ± 5 kg CO$_2$e/kg beef, 610 ± 280 kg CO$_2$e/ha/yr
Gulf case study – Business situation

Climate change risk
• Good. Due to good land condition and feeding regimes (can be extended in poor seasons).

Business resilience and adaptability
• Fair. Due to some profitability indicators of concern.
• Conflict between cost of feeding strategy to improve productivity and reduce greenhouse gas emissions and impact on profitability

Future actions and analysis
• Heifer management to reduce feeding costs.
• Explore less costly feeding options and target only specific mobs.
• Explore alternative marketing strategies for different mobs of cattle.
Approximately 36% of Jimarndy is regrowth

An area of 1000ha of 10 year old regrowth was used for scenario testing.

Management options considered include:

- Do nothing; allow regrowth to continue to regrow
- Chaining; chain the regrowth periodically
- Leucaena; clear regrowth and establishment leucaena
- Graslan; clear regrowth using graslan herbicide (slows subsequent regrowth)
- Fire; periodically burn regrowth
- Bladeplough; clear regrowth using bladeploughing (slows subsequent regrowth).
Jimarndy regrowth management

Regrowth basal area for regrowth management options. Used to calculate carbon in the regrowth. (Bladeplough and Graslan the same)
Jimarndy regrowth management

Livestock carrying capacity (AEs) for six regrowth management options. (Bladeplough and Graslan the same)
## Jimarndy regrowth management

### Net present value of regrowth management options

<table>
<thead>
<tr>
<th></th>
<th>Livestock income only</th>
<th>Livestock and regrowth sequestration income ($10/t)</th>
<th>Livestock and regrowth sequestration income ($10/t), minus methane emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do Nothing</td>
<td>$ 274,664</td>
<td>$ 652,015</td>
<td>$ 625,605</td>
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<tr>
<td>Chaining</td>
<td>$ 391,549</td>
<td></td>
<td></td>
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<tr>
<td>Leucaena</td>
<td>$ 383,785</td>
<td>$ 338,069</td>
<td>$ 253,717</td>
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<td>Graslan</td>
<td>$ 338,413</td>
<td>$ 12,089</td>
<td>-$ 37,418</td>
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<tr>
<td>Fire</td>
<td>$ 325,363</td>
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</tr>
<tr>
<td>Bladeplough</td>
<td>$ 338,413</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Costs $/ha

- bladeplough: 150
- Chaining: 60
- Fire: 30
- Leucaena - plant: 608
- Leucaena - maintenance: 66
- Graslan: 150
Soil Health and Management

Soil carbon with good and poor land condition

- Northern Gulf and northern Burdekin region in far north Qld
- Five paired sites

Georgetown Granite land type

- Good condition
- Poor condition
  - no perennial grasses

No significant difference across land types

Some small differences within a land type but direction not consistent
Soil type x grazing pressure interacted to influence SOC stock to 30cm depth

SOC stock lower in Vertosol & Kandosol soils under Heavy Grazing

SOC stock higher in Sodosol-Kandosol soil under Heavy Grazing

The different response to management of different land types means that caution is required with soil carbon sequestration

Toorak grazing trial

• Mitchell Grass country
• Grazing sheep
• 5 pasture utilisation treatments and exclosure
• Trial ran for 26 years 1984-2010

• Preliminary soil analysis indicates
  No significant difference

Pasture and litter yield

Soil carbon

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Carbon Farming Initiative

- Methodology and scheme development still underway
- Regrowth retention
- Land rehabilitation
- Herd efficiency
- What will it cost to participate?
- What are the risks?
- How will it compliment beef businesses???
Take home messages

- Beef industry does have significant GHG emissions
- On-farm GHG emissions can be calculated
- Soil carbon changes are slow, hard to predict and hard to measure
- There are often on-farm opportunities to reduce emissions and maintain or improve profitability
- Carbon Farming may provide some profitable opportunities, but scheme details are still being developed for extensive beef.