

Grazing management, herd productivity and greenhouse gas emissions— Oakleigh, Kidston



30 March 2015

Overview

Oakleigh and Fernhills cover 41,960 ha and are owned and managed by Darcy, Juliane, Kelly and Robyn Cowan. The properties were purchased in 2010 and are run in conjunction with the family property Woodbine, south of Prairie. The breeder herd includes Brahman cross cows and mostly Brangus bulls. Weaners are sent to Woodbine and sold into southern feeder markets (ideally over 400 kg liveweight) fifteen months later.



Image 1. The Cowan families—Robyn and Kelly, and Juliane and Darcy.

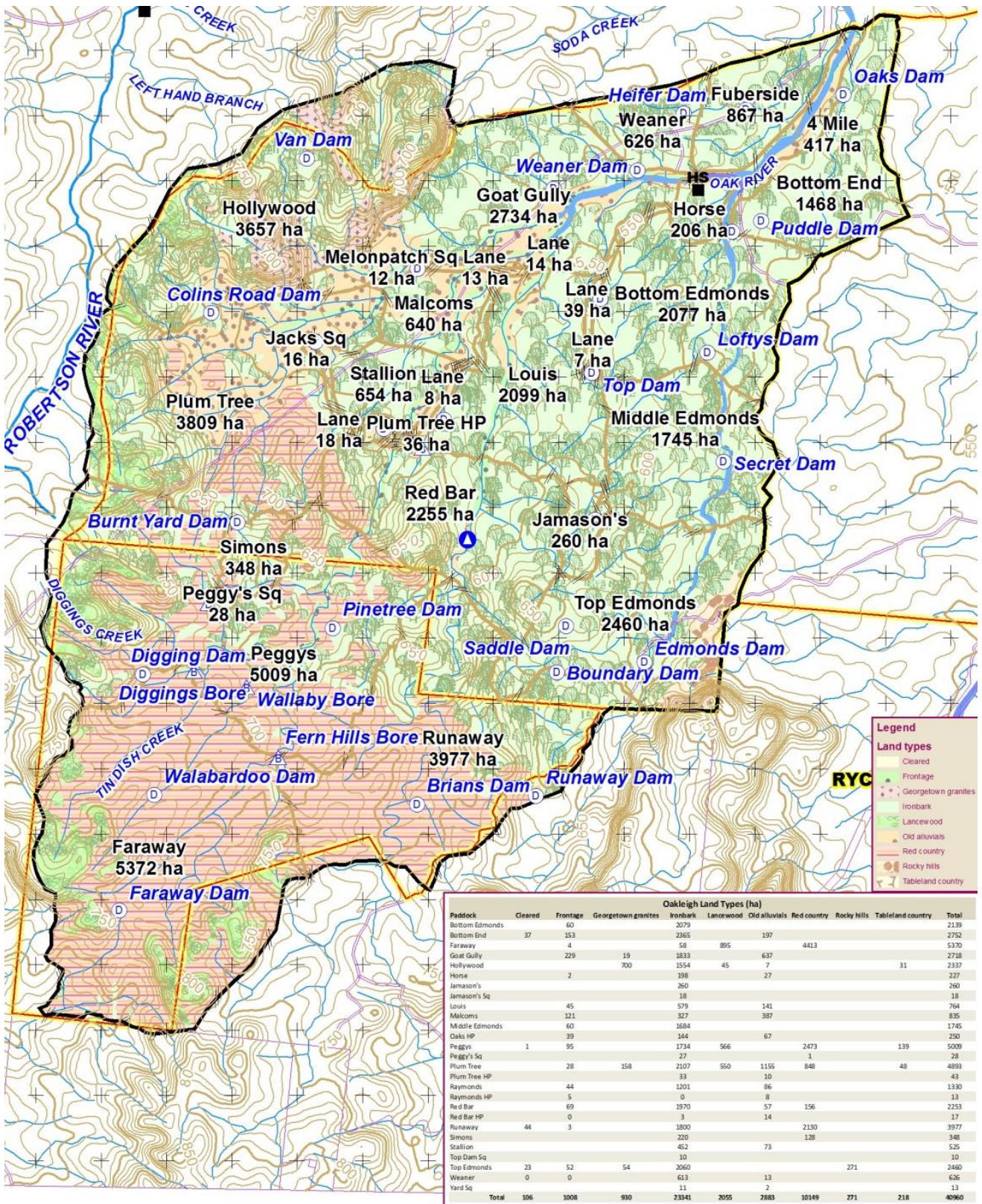


Image 2. Oakleigh and Fernhills land type and infrastructure map.

Climate Clever Beef

The Cowan beef enterprise is typical of many family breeding operations in north-west Queensland in terms of scale, the grazing resource and herd productivity. The social and financial well-being of many northern beef producers is under threat from low profitability, high debt loads and a series of poor or failed wet seasons. It is estimated the beef industry is contributing 79% of greenhouse gas (GHG) emissions produced by agricultural practices in Australia, mostly in the form of methane from livestock. The Cowan families chose to participate in the Climate Clever Beef (CCB) project to, firstly, identify feasible and profitable herd and grazing practices and, secondly, assess carbon farming options that may be available to extensive beef enterprises.

Grazing management

Infrastructure development on Oakleigh–Fernhills includes the 15 main and five smaller holding paddocks, 23 dams, four troughs and two sets of yards. Generally land condition is in A to B condition across the main paddocks, indicating a minimal reduction in productivity ($\geq 75\%$ of original carrying capacity). Pastures are generally dominated by 3P (productive, palatable and perennial) grasses with some Seca and Verano. The presence of Kangaroo, Blue grasses and Giant speargrass in most paddocks reflects a history of conservative stocking rates. Key land types include frontage soils, old alluvials, ironbark, Goldfield soils, poorer granites, lancewood and range country (Table 1).



Image 3. Spelling for five months over the 2011–2012 wet season revitalised the speargrass pastures.

Table 1. Key land types, grazing values and safe stocking rates on Oakleigh.

Country	Grazing Value (from 10 = most productive to 1 = least productive)	Safe Stocking Rates (AE = Adult Equivalent)
Goldfields (Red duplex)	10	1 AE:10 ha
Frontage	9.5	1 AE:9 ha
Old alluvial	9.5	1 AE:9 ha
Ironbark	7	1 AE:12 ha
Ranges and poorer granites	3	Hilly country, fairly unusable
Lancewood/other	2	Fairly unusable country

Soil phosphorus varies significantly across most paddocks due to a mix of land types (Table 2). Phosphorus (P) levels at 2 ppm are considered acutely deficient and all cattle require wet season phosphorus supplementation. At 4–6 ppm of soil phosphorus growing cattle requires supplementation and above 8 ppm there is no economic response to feeding phosphorus. Generally Oakleigh–Fernhills has marginal to adequate soil phosphorus levels, reinforcing that the heifer group is a priority for wet season phosphorus supplementation.

Table 2. General land types and soil fertility.

Land Type	Soil Fertility
Ranges/sandy soils	< 5 ppm phosphorus
Frontage	15 ppm phosphorus
Ironbark	6 ppm phosphorus
Goldfields (Red duplex)	11 ppm phosphorus

The Cowan families currently wet season spell at least two major paddocks annually; approximately 8,000 ha or 20% of Oakleigh–Fernhills (Image 4). Stocking rate management and wet season spelling are the key grazing management strategies used on Oakleigh–Fernhills to regenerate 3P grasses, particularly on the more fertile country where cattle tend to overgraze. On most extensive breeding properties the sweeter frontages are usually overgrazed, with land and pastures in poor condition. The frontage paddocks on Oakleigh have been conservatively stocked and wet season spelled over previous years and are in good condition. The Cowans keep a close eye on pasture quantity in all paddocks to ensure that the more fertile land types in each paddock are not overgrazed (see Table 3).



Image 4. Grazed Faraway paddock on left and spelled Peggy’s paddock on right. Peggy’s paddock had been spelled for four months over the wet.

Currant bush and Eucalypt species (Image 5) are resistant to fire, and steady thickening of these species significantly reduces annual pasture growth across many land types. With the exception of wildfire, burning is not commonly used on Oakleigh–Fernhills.



Image 5. Kiri Broad (DAF) inspecting Currant bush (foreground) and Ironbark (background) thickening in 2011 on Oakleigh. Both species are difficult to control with fire.

The last three years have highlighted the unreliability of dams and surface water. The Drought Emergency Water Assistance Scheme subsidies have been effectively used to drill bores, and to equip and install water tanks and troughs to improve stock water supplies and drought resilience.



Image 6. New bore with solar panels.



Image 7. Drought Water subsidies being put to good use.

Table 3. Paddock carrying capacities (Oakleigh–Fernhills).

Paddock	Adult Equivalents Usually Carried (AEs)	Hectares per Adult Equivalent (ha/AE)	Land Types
Bottom Edmonds	175	12.22	60 ha Frontage, 2,079 ha Ironbark
Bottom End	238	11.56	37 ha Cleared, 153 ha Frontage, 2,365 ha Ironbark, 197 ha Old alluvials
Faraway	361	14.88	4 ha Frontage, 58 ha Ironbark, 895 ha Lancewood, 4,413 ha Red country
Goat Gully	253	10.74	229 ha Frontage, 1,833 ha Ironbark, 637 ha Old alluvials
Hollywood	126	18.55	700 ha Georgetown granites, 1,554 ha Ironbark, 7 ha Old alluvials
Horse	50	4.54	2 ha Frontage, 198 ha Ironbark, 27 ha Old alluvials
Jamason's	21	12.38	260 ha Ironbark
Louis	69	11.09	45 ha Frontage, 579 ha Ironbark, 141 ha Old alluvials
Malcom's	88	9.49	121 ha Frontage, 327 ha Ironbark, 387 ha Old alluvials
Middle Edmonds	143	12.20	60 ha Frontage, 1,684 ha Ironbark
Oaks HP	24	10.42	39 ha Frontage, 144 ha Ironbark, 67 ha Old alluvials
Peggy's	351	14.27	95 ha Frontage, 1,734 ha Ironbark, 566 ha Lancewood, 2,473 ha Red duplex
Plum Tree	383	12.78	28 ha Frontage, 2,107 ha Ironbark, 1,155 ha Old alluvials, 848 ha Red country, 756 ha Other
Raymond's	113	11.78	44 ha Frontage, 1,201 ha Ironbark, 86 ha Old alluvials
Red Bar	186	12.11	69 ha Frontage, 1,970 ha Ironbark, 57 ha Old alluvials, 156 ha Red duplex
Runaway	322	12.35	47 ha Frontage/cleared, 1,800 ha Ironbark, 2,130 ha Red duplex
Simon's	37	9.41	220 ha Ironbark, 128 ha Red duplex
Stallion	45	11.67	452 ha Ironbark, 73 ha Old alluvials
Top Edmond's	175	14.06	23 ha Cleared, 52 ha Frontage, 2,060 ha Ironbark, 325 ha Other
Weaner	51	12.27	613 ha Ironbark, 13 ha Old alluvials
Total	3211		

Pasture monitoring and setting stocking rates

The Cowan family aim to spell 20% of their property each wet season. A series of photo monitoring points (Images 8 and 9) have been installed across the various land types to record progress and land condition over time through varying seasonal conditions. Their ongoing spelling program plus timely herd reductions has been a vital factor in their management of consecutive failed wet seasons followed by a third light, late wet. The Oakleigh–Fernhills management team mainly rely on past paddock stocking rate records and continuous visual wet season pasture yield evaluations to adjust cattle numbers early each year.



Image 8. Top Edmonds paddock, March 2012.



Image 9. Top Edmonds paddock, March 2015.

Herd supplementation

The Cowan's rule of thumb in relation to herd nutrition on Oakleigh–Fernhills is not to overgraze and to make sure there is sufficient grass ahead of cattle. In addition to stocking rate management and wet season spelling, the Cowan families have targeted their herd supplementation program through Near-infrared Spectroscopy (NIRS) and faecal phosphorus analysis. Generally this data (Table 4) suggests marginal phosphorus in some paddocks and identifies heifers as the key group to target with wet season phosphorus supplementation. Bulk bags with some lime for waterproofing are the preferred wet season supplement delivery method. Protection from the weather would be preferable but the cost of sufficient lick sheds across each paddock is significant. The use of bulk bags also allows the Cowans to distribute sufficient wet season supplement in the late dry season prior to wet weather access issues arising. The long-time lapse from sampling dung to receiving analysis results has been an ongoing laboratory issue. By the time the results are released the nutritional advice is many weeks old and may not be as informative.



Table 4. Faecal testing, February 2013 to July 2014.

Date	Paddock	Crude Protein (%)	Digestibility (%)	Non Grass (%)	Phosphorus (mg/kg)
20/02/2013	Fernhills Breeders	8.06	54.33	10.90	2,403
20/02/2013	Goat Gully	8.19	53.58	14.48	2,705
20/02/2013	Oakleigh Breeders	8.09	52.24	18.85	1,921
01/06/2013	Goat Gully	5.26	51.22	9.00	
01/06/2013	Oakleigh Breeders	5.98	51.23	16.03	
01/06/2013	Fernhills Breeders	6.54	52.80	13.67	
25/06/2014	Edmond's Dam	6.38	55.56	13.68	2,439
25/06/2014	Saddle Dam	6.79	55.65	21.43	4,220
25/06/2014	Jamason's Dam	6.08	52.90	30.16	1,997
25/06/2014	Jamason's Trough	6.44	51.85	14.36	6,850
25/06/2014	Raymond's Dam	6.90	51.57	26.03	1,750
25/06/2014	Yard Dam	6.84	52.15	26.79	1,857
25/06/2014	Jack's Dam	7.50	52.20	16.92	1,887
25/06/2014	Melon Patch	7.43	51.86	14.94	5,007
25/06/2014	Goat Gully	6.26	52.46	16.60	4,048

This year the weaners, no. 2 PTIC heifers and no. 3 joiner heifers have been supplemented over the dry season with a dry lick (Table 5) plus M8U (+ 1% P + Rumensin 100). M8U intakes have averaged 1.3 kg/head/day. Breeders are fed a urea based lick during the dry season. Heifers are run separately on the best alluvial country and are fed wet season phosphorus. Both soil and ongoing faecal analysis suggest reasonable background soil phosphorus levels across most paddocks.

Table 5. Dry season urea based supplement.

Ingredients	% Inclusions	Intakes
Salt	35.3	100–200 g/day depending on animal size
Urea	19	
CSM	10	
GranAm	17	
MDCP	12	
Lime	6	
Trace minerals	0.5	
Rumensin 100	0.2	
Total	100.0	



Image 10. Heifers on Oakleigh–Fernhills receive wet season phosphorus via bulk bags (10% P as fed).

Herd management

Oakleigh–Fernhills currently runs around 2,500 breeders plus 330 joiner heifers and 350 weaner heifers. The breeding herd is not segregated into different paddocks due to flood gate problems in the wet season. In the first round (April/May) heifers and dry cows are pregnancy tested and wet cows are identified through a bang tail system. The aim is to sell empty heifers before they reach 4 teeth and have cull cows dress 220–240 kg Hot Standard Carcase Weight (HSCW). Around 700 replacement heifers go back into the herd annually. Through a cross breeding program the Cowans aim to breed cattle suited to the harsh northern conditions rather than implement early weaning or expensive supplementation programs.

Oakleigh–Fernhills only uses Brangus bulls (at 2–3%) bred on Woodbine and these bulls come from cows that have a calf every year. There is significant selection pressure on replacement heifers for Oakleigh–Fernhills, with culling on “hairy” or “soft” attributes. However, it must be remembered low hump height is an important selection trait due to positive market signals received from southern buyers and backgrounders. This year the no. 2 and no. 3 heifers have been spike fed with M8U as a trial to hopefully boost conception rates. All these heifers will be pregnancy tested in May 2015 to evaluate the results.



Image 11. Cross bred weaners about to be mustered.

Weaners

There are two, or sometimes three, mustering rounds each year on Oakleigh–Fernhills. Weaners are taken off down to 140 kg, tailed out at Oakleigh and sent immediately south if grass supplies are adequate on Woodbine. If there is a lack of feed on Woodbine weaners are held over for longer on Oakleigh–Fernhills. Branding and ear tagging are done on Oakleigh–Fernhills and castration at Woodbine. An average year would deliver a 200 kg weight gain at Woodbine, particularly since the recent blade ploughing on the Buffel paddocks. Most years 1,000–1,400 weaners are sent to Woodbine from June to October.



Image 12. Brahman cross cows and cross bred weaners.

Herd Productivity and Emissions

Annual liveweight gains in growing cattle range from 100–120 kg/head and female death rates are quite low at 3% annually. Most years just under half (47%) of the turnoff from Oakleigh–Fernhills is female, which can only be achieved across a run of years if death rates are low (Table 6). Herd analysis, conducted in 2012, reveals good breeder performance with long term weaning rates around 57% and gross margins in excess of \$120/AE.

Table 6. Oakleigh herd performance 2012.

Total adult equivalents (AE)	4,000
Total cattle	3,875
Total breeders	2,878
Total calves weaned	1,643
Weaners/total cows mated	57%
Overall breeder deaths	3
Female sales/total sales (%)	47%
Total Cattle Sold	
Total cows and heifers sold	724
Total steers sold	811
Maximum steer age	1
Prices	
Average cow and heifer price	\$466
Average steer and bullock price	\$354
Summary	
Net cattle sales	\$638,597
Direct costs excluding bulls	\$138,800
Gross Margin	
Total gross margin	\$622,956
Gross margin/AE	\$121.04

The FarmGas Model (Table 7) was also used in 2012 to estimate the emission of Carbon Dioxide equivalents (CO₂e) from the herd and overall beef enterprise on Oakleigh–Fernhills. The CO₂e per tonne of liveweight sold or turned off is in excess of 13 tonnes per annum. Total annual emissions of CO₂e is around 5,400 tonne.

Table 7. Estimated greenhouse gas (GHG) emissions.

Adult equivalents (AE)	4,000
Beef liveweight sold (t)	411
Land area (ha)	40,960
Total livestock emissions (t CO₂e)	5,441
GHG emissions per hectare (t CO ₂ e/ha)	0.13
GHG emissions per AE (t CO ₂ e/AE)	1.36
GHG emissions per liveweight (t CO₂e/t LW sold)	13.24

Conclusion

Based on herd and FarmGas modelling, the GHG emissions from Oakleigh–Fernhills and other Gulf breeding enterprises ranges from 11.7 to 23 tonnes of carbon dioxide equivalents (CO₂e) to every tonne of liveweight sold off the property. Branding, growth and death rates are not only the key profit drivers of any breeding business but directly influence GHG emissions and emission intensity. Due to the extensive nature of northern breeding enterprises and the accuracy of herd recording systems, it is very difficult to, firstly, identify exact emissions each year and, secondly, to validate reduced emissions or lower emission intensity.

Claiming emission reductions and subsequent income is subject to a detailed “integrity” test and must:

- Go beyond normal practice
- Be measureable
- Be conservative
- Be based on peer review
- Be internationally consistent
- Avoid carbon leakage

The Oakleigh–Fernhills CCB case study clearly outlines how difficult it would be for extensive beef producers to participate in Carbon Farming Initiatives and Carbon Trading schemes.

Acknowledgements

We wish to thank the following persons for their help in preparing this case study:

- The Cowan families
- DAF Beef Team (Bernie English, Kiri Broad, Emma Hegarty, Joe Rolfe and Steven Bray)
- NGRMG staff (Andrew Taylor, Ricky Archer and Niilo Gobius)