



Part 1 - Improving the performance of beef production systems in northern Australia



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1. What are the strategies most likely to improve the profit and resilience of your beef production system?

2. How can you assess alternative strategies?

Estimating the change in profit is the only way of knowing whether you are improving performance

The approach

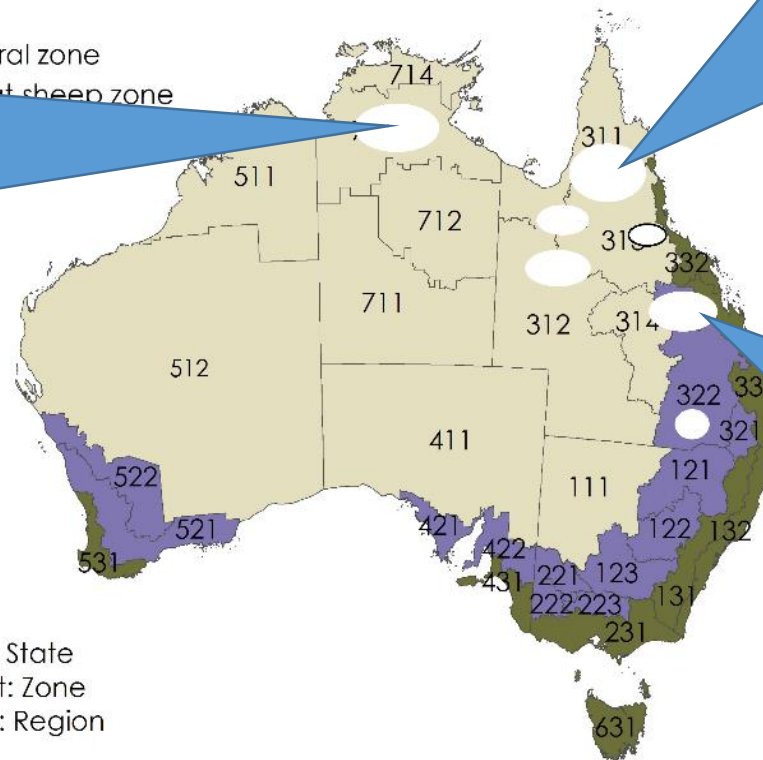
- We modelled a representative (median) beef property:
 - Incorporated survey, research and trial data
 - Applied a representative management strategy
 - Assessed the value of change by comparing alternative strategies to the current strategy over time

Regional property models

Katherine /VRD/Sturt
Plateau
147,000ha
7,400AE
Live export steers

Australian broadacre zones and regions

Pastoral zone
Wheat sheep zone



NQ Gulf
30,000ha
1,500AE
Live export steers

Fitzroy
8,700ha
1,500AE
Feed on steers

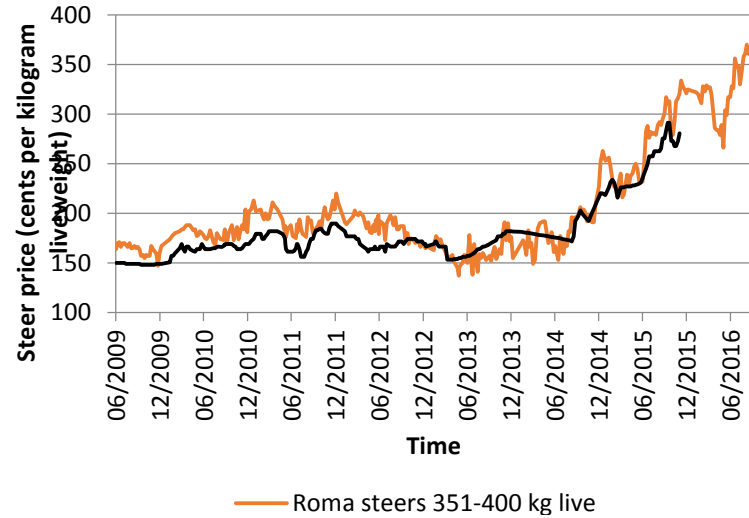
The details are in the 216 page draft report that covers these three regions

The data

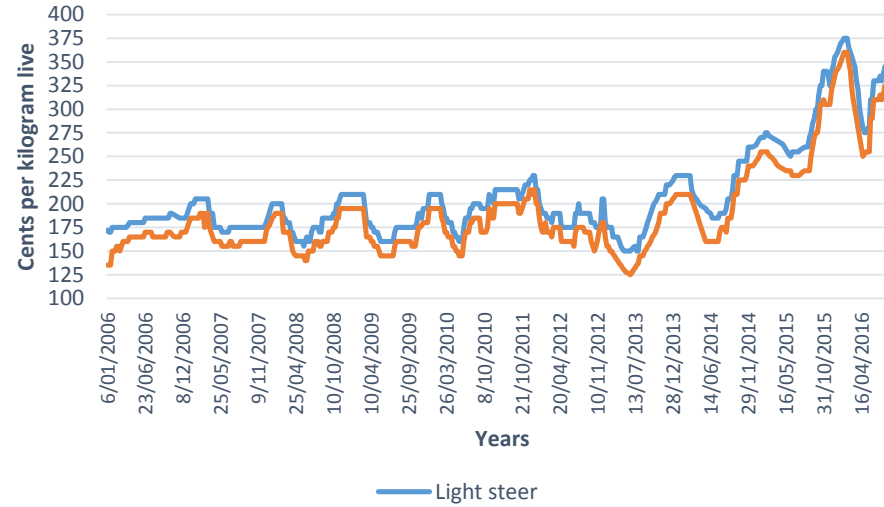
- We worked with about 30 property owners and managers across northern Australia to compile case studies looking at their options
- Key technologies were identified by industry participants and RD&E staff.
- Regional, survey and research (response) data was gathered from:
 - *Cash Cow* project
 - *Determining property-level rates of breeder cow mortality in northern Australia* project
 - *High Output Forages* project
 - *Phosphorus supplementation of Brahman heifers in Phosphorus deficient country in the NT* project
 - Numerous research and extension publications

The prices and costs

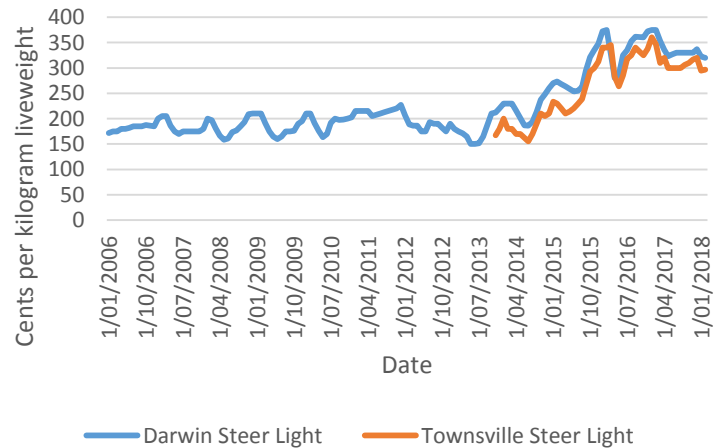
Roma and Dinmore



Darwin



Townsville



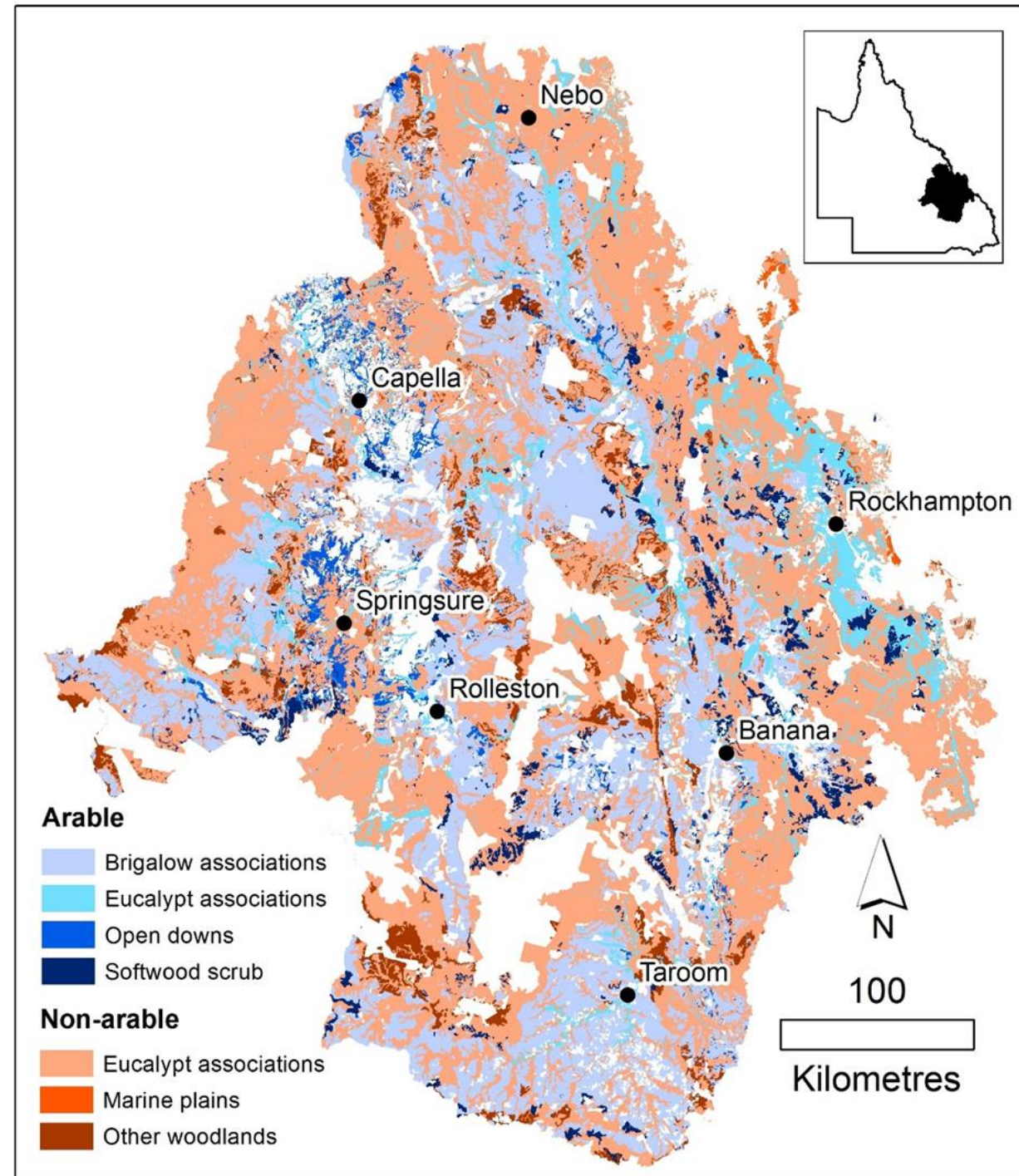
Prices and costs applied in the models reflected:

- The average of the last decade or so,
- The expected price basis for different classes of sale stock

The prices applied do not indicate any expectation for the trend of future prices

Fitzroy region

- 12.2 million ha of grazing land
- 42% of the area available for grazing has arable soils (more productive)
- Base property model
 - 8,700ha, 1,500AE
 - Feed on steers off buffel grass
 - Cash Cow project Central Forest median reproduction efficiency



Strategies to build profit and resilience

Fitzroy region

➤ Improve steer performance

- Legume-grass pastures
- Forage crops such as oats
- Custom feedlotting
- HGPs

➤ Marketing options

- Organic beef
- EU steers
- Wagyu beef

➤ Improve breeder performance

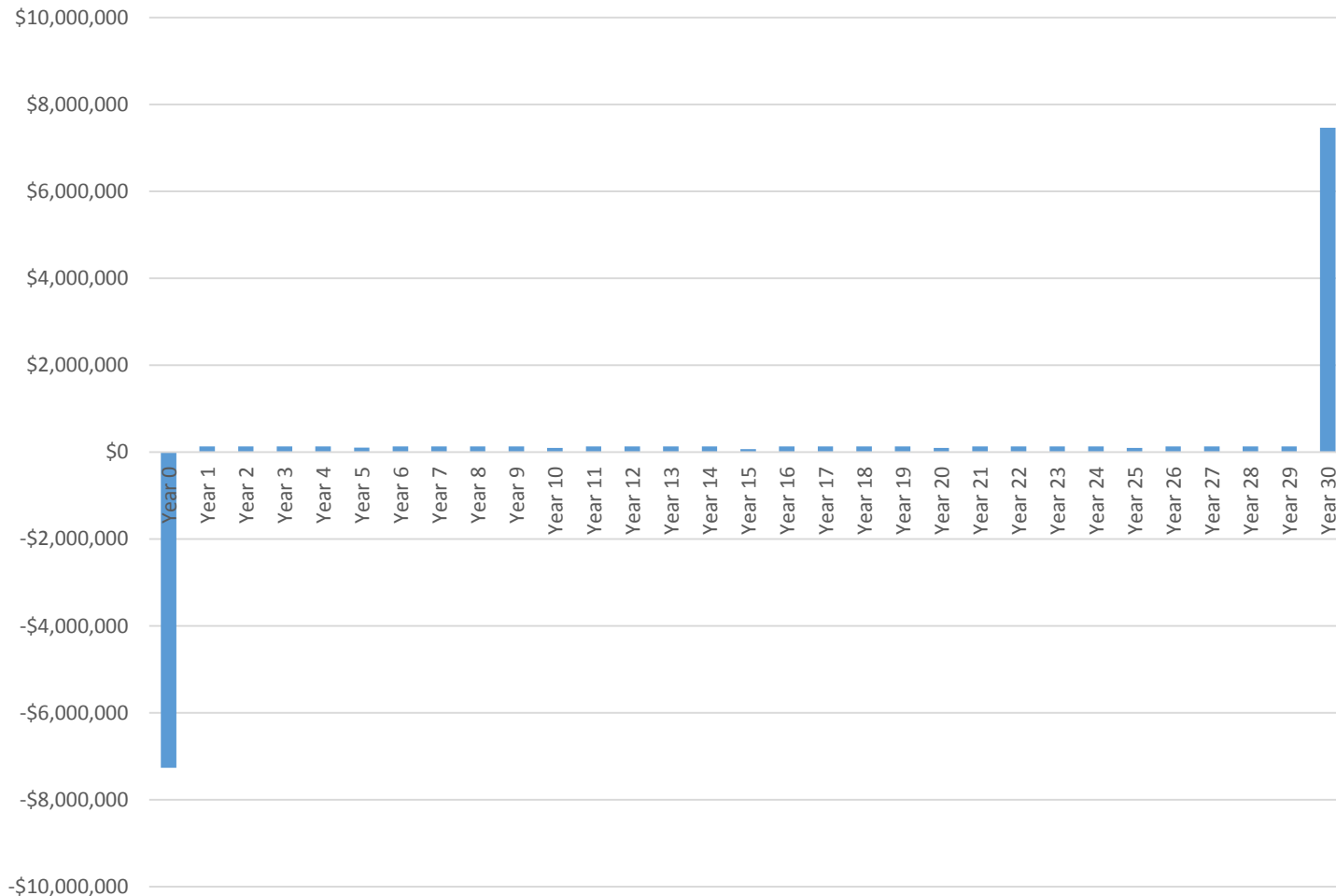
- Better genetics for fertility
- Investing to reduce foetal/calf loss
- Pestivirus management
- P supplementation
- Supplementing first calf heifers to improve re-conception rates

Improving steer performance

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Leucaena (feed-on weight)				
Leucaena + purchased breeders				
Desmanthus (feed-on weight)				
Forage oats (feed-on weight)				
Feedlotting steers (slaughter weight: 674 kg)				
HGP – same price, heavier weight (545 kg)				
HGP – lower price, heavier weight (-10c/kg)				
HGP – same price, lighter weight (495 kg)				

The process – model the property without change

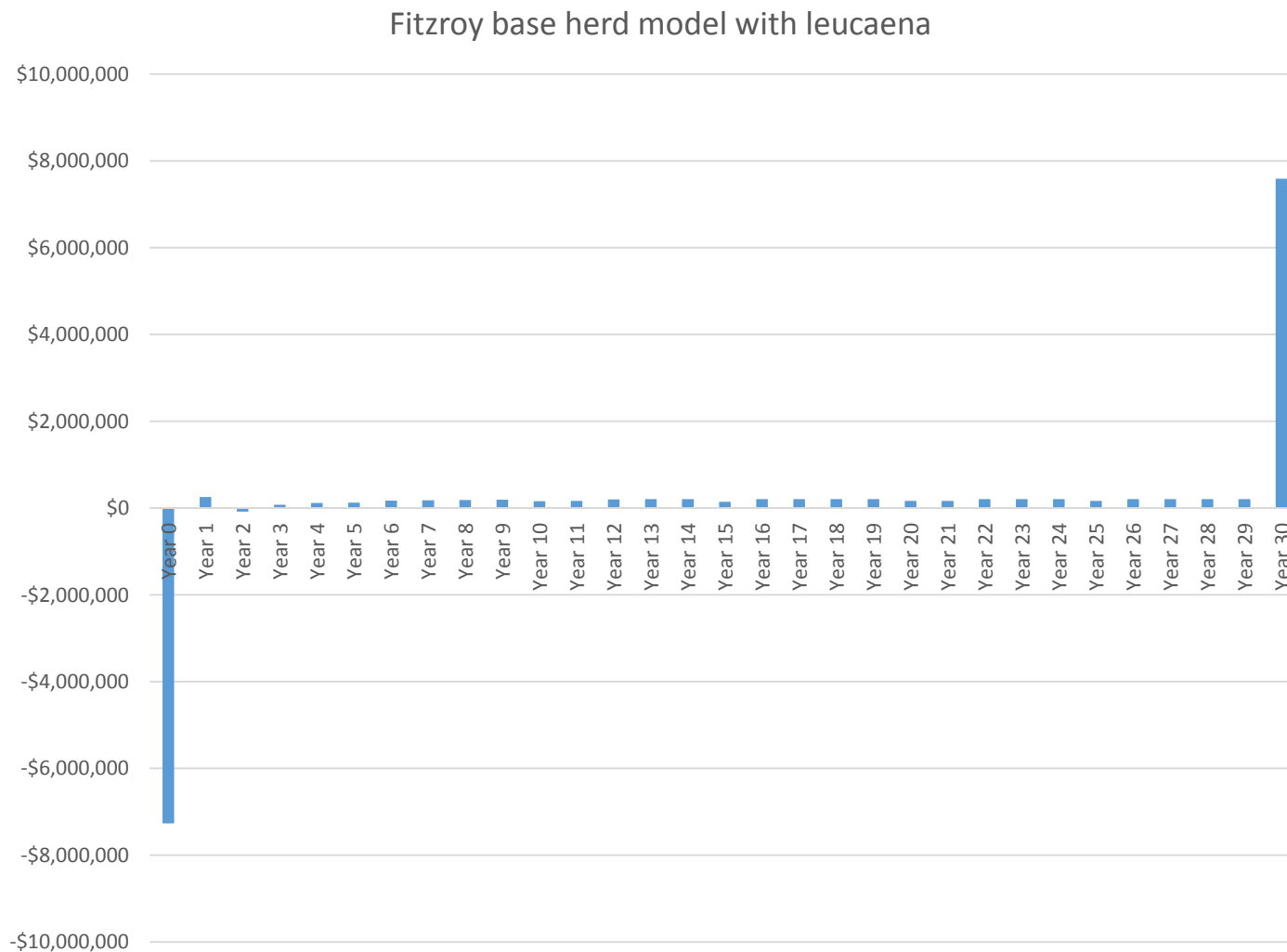
Fitzroy base herd model



Discount rate	5.00%
Net Present Value	-\$3,684,418
IRR	1.71%

- A property is an investment of resources over time to achieve the goals of the investor.
- The time value of money is represented by the discount rate.
- Looking at the return on the total investment is interesting but not that helpful.
- The goal is to see whether we can make the beef production system more efficient, not sell it.

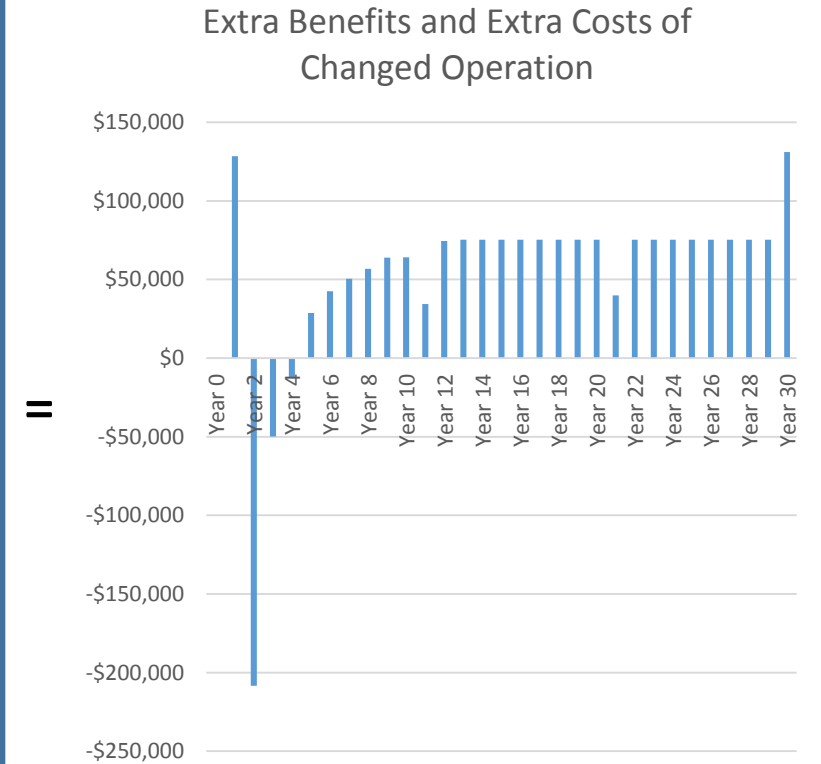
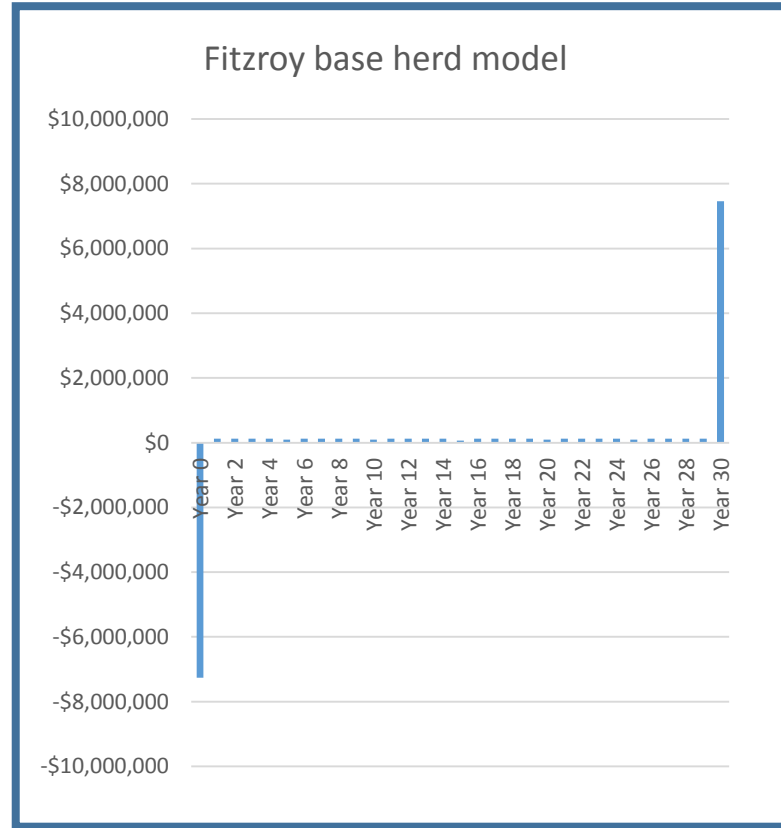
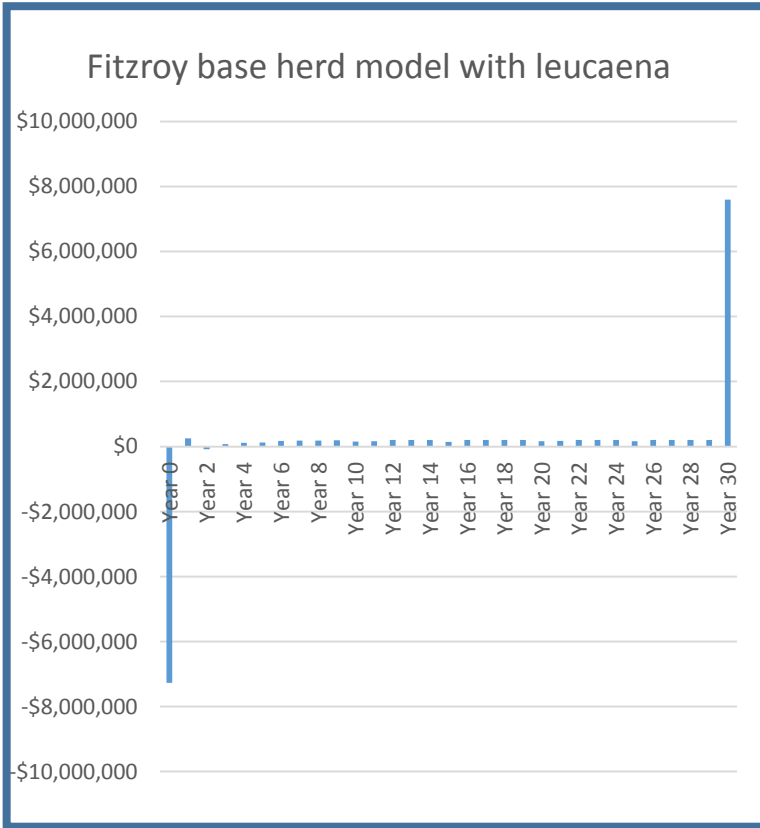
Next step – implement the change Base property with leucaena



Discount rate	5.00%
Net Present Value	-\$3,043,289
IRR	2.38%

- Looking at a changed investment strategy (leucaena) as an alternative, discrete whole farm investment does not tell you much either.
- It is necessary to look at the marginal costs and returns over time to understand the impact of the change.

Identify the difference over time – marginal analysis



One possible future – another possible future = marginal analysis

Key concepts applied – opportunity cost; time value of money; Principle of marginality

Calculate the marginal return on extra capital

Extra Benefits and Extra Costs of Changed Operation



Discount Rate

5.00% (opportunity cost)

Marginal Net Present Value


\$620,063

Marginal IRR

33.51%

Convert the marginal NPV to an annualised return

- Just a different way of communicating the marginal benefits of change
- Has an identical value to the marginal NPV

Discount Rate	5.00%	
Marginal Net Present Value	\$620,063	
Amortised value of marginal NPV	\$40,336	

Identify some of the risks: Peak deficit, year of peak deficit, payback period

Total improvement "change" vs "do nothing"	\$128,369	-\$208,344	-\$49,764	-\$12,374	\$28,761	\$42,540	\$50,575	\$56,873	\$63,876	\$64,100
Cumulative improvement (compounded)	\$128,369	-\$73,557	-\$126,998	-\$145,722	-\$124,247	-\$87,920	-\$41,741	\$13,046	\$77,574	\$145,553
Year label	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Interest rate for NPV	5.00%									
NPV of "Change" advantage	\$620,063									
Annualised return (profit/yr for analysis period)	\$40,336									
Period of analysis	30									
Peak deficit (with interest)	-\$145,722									
Year of peak deficit	2021									
Payback year	2025									
Payback period (years)	7									
IRR of "Change" advantage	33.51%									

If different ways of running a particular system are to be compared, the initial measuring stick is the expected extra return on any extra capital invested to change the system

Improving steer performance

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Leucaena (feed-on weight)	\$40,336	-\$145,722	4	7
Leucaena + purchased breeders	\$46,135	-\$190,539	4	7
Desmanthus (feed-on weight)	\$26,779	-\$103,212	4	8

Each strategy is optimised for the property to test whether the end point is worth achieving. All scenarios are tested over the same 30 year investment period

Improving steer performance

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Desmanthus (feed-on weight)	\$26,779	-\$103,212	4	8
Forage oats (feed-on weight)	-\$34,521	-\$1,544,320	never	never
Feedlotting steers (slaughter weight: 674 kg)	-\$48,841	-\$2,166,733	never	never

Improving steer performance

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Feedlotting steers (slaughter weight: 674 kg)	-\$48,841	-\$2,166,733	never	never
HGP – same price, heavier weight (545 kg)	\$10,794	-\$5,063	1	2
HGP – lower price, heavier weight (-10c/kg)	-\$806	-\$33,182	never	never
HGP – same price, lighter weight (495 kg)	-\$5,494	-\$231,803	never	never

Marketing options

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Organic beef (25% price premium, 20% less AE)	\$2,436	\$0	n/a	n/a

Marketing options

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Organic beef (25% price premium, 20% less AE)	\$2,436	\$0	n/a	n/a
EU slaughter and feed-on (same age, 15 c/kg)	\$5,494	-\$10,500	2	2
EU feed-on only (younger age, 2 cohorts)	\$5,338	-\$10,500	2	2
EU feed-on only, lower premium (-7.5 c/kg)	-\$3,845	-\$183,713	never	never

Marketing options

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EU feed-on only (younger age, 2 cohorts)	\$5,338	-\$10,500	2	2
EU feed-on only, lower premium (-7.5 c/kg)	-\$3,845	-\$183,713	never	never
Wagyu beef, price premium maintained	\$32,943	-\$269,104	4	12
Wagyu beef, premium reduces from Yr 20	\$3,218	-\$269,104	4	>30
Wagyu beef, premium reduces from Yr 10	-\$42,071	-\$1,927,459	never	never

Improving breeder performance

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Better genetics for fertility (6% > WR)	-\$3,265	-\$126,309	never	never

* Only in the first and second calving groups

Improving breeder performance

Fitzroy region	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Better genetics for fertility (6% > WR)	-\$3,265	-\$126,309	never	never
Reducing foetal/calf loss, \$5/head*	\$474	-\$1,829	5	6
Reducing foetal/calf loss, \$7.50/head*	-\$418	-\$17,502	never	never
Reducing foetal/calf loss, \$20,000 capital*	\$1,019	-\$20,000	2	12
Reducing foetal/calf loss, \$40,000 capital*	-\$220	-\$40,451	4	never

* Only in the first and second calving groups

Improving breeder performance

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Reducing foetal/calf loss, \$20,000 capital*	\$1,019	-\$20,000	2	12
Reducing foetal/calf loss, \$40,000 capital*	-\$220	-\$40,451	4	never
Pestivirus, high prevalence – vac all	\$1,025	-\$21,219	6	15
Pestivirus, high prevalence – vac heifers	\$3,683	-\$3,276	5	6
Pestivirus, naïve herd - vaccination	-\$2,436	n/a	never	never

* Only in the first and second calving groups

Improving breeder performance

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Pestivirus, high prevalence – vac heifers	\$3,683	-\$3,276	5	6
Pestivirus, naïve herd - vaccination	-\$2,436	n/a	never	never
Feeding first calf heifers (M8U, +20 kg LW)	-\$9,684	-\$2,038,342	never	never
Wet season spelling for breeders	-\$1,715	-\$56,715	never	never

* Only in the first and second calving groups

P status of the breeder herd - Fitzroy

Category	(Soil P in ppm)
Acute	2-3
Deficient	4-5
Marginal	6-8
Adequate	>8

To look at the impact of different levels of P status on breeder herd performance alone and the likely response to P supplements, we:

- Described the performance of a breeder herd running on land with each level of P status. (This is no longer the median herd)
- Described the change in performance for breeder mortality, breeder liveweight, cull cow sale weight, weaning rate, weaner weight when various P supplementation regimes were applied
- Started with the herd in the pre-supplementation state, provided the supplement in the first year and allowed the herd to adjust over time to the new level of performance. The herds with Acute, Deficient or Marginal P status do not achieve the level of performance of a herd with Adequate P status
- Identified the value of the supplementation program over a 30 year investment time frame
- Weaners were transferred to the same brigalow block at weaning and compensated for the differences in weaning weight by the time of sale; we only looked at the impact of P supplements on breeder herd performance in the Fitzroy

P status of the breeder herd

Treatment	P status of country	Supplement strategy	Supplement cost \$/breeder/annum (no feeding out cost)
1	Marginal	No supplement	
2	Marginal	Wet season P	\$1.71
3	Marginal	Dry season N +P	\$13.84
4	Marginal	Dry season (N +P), Wet season P	\$15.55
5	Deficient	No supplement	
6	Deficient	Wet season P	\$5.32
7	Deficient	Dry season N +P	\$17.97
8	Deficient	Dry season (N +P), Wet season P	\$23.29
9	Acute	No supplement	
10	Acute	Wet season P	\$8.24
11	Acute	Dry season N +P	\$18.81
12	Acute	Dry season (N +P), Wet season P	\$27.05

Impact of P status on breeder herd performance

P Status ppm	Fitzroy	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)	Marginal IRR
6-8	Marginal P herd, P wet season	\$7,918	-\$1,365	1	1	2796%
	Marginal P herd, N+P dry season	\$1,542	-\$21,252	8	14	317%
	Marginal P herd, N+P dry, P wet	\$375	-\$33,892	8	1	244%

Impact of P status on breeder herd performance

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	Marginal P herd, N+P dry season	\$1,542	-\$21,252	8	14	317%
	Marginal P herd, N+P dry, P wet	\$375	-\$33,892	8	1	244%
4-5	Deficient P herd, P wet season	\$17,767	-\$4,251	1	1	1162%
	Deficient P herd, N+P dry season	\$9,025	-\$10,692	1	1	347%
	Deficient P herd, N+P dry, P wet	\$16,206	-\$14,943	1	1	463%

Impact of P status on breeder herd performance

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	Deficient P herd, N+P dry season	\$9,025	-\$10,692	1	1	347%
	Deficient P herd, N+P dry, P wet	\$16,206	-\$14,943	1	1	463%
2-3	Acute P herd, P wet season	\$48,216	-\$7,136	1	1	1279%
	Acute P herd, N+P dry season	\$11,477	-\$13,769	1	1	521%
	Acute P herd, N+P dry, P wet	\$44,714	-\$20,839	1	1	432%

Insights for the Fitzroy

- You are not offering much!
- Median beef system performance is quite well sorted;
- This reduces the potential for improving breeder herd performance;
- Diminishing returns and/or the time cost of money lead to many of the negatives
- Perennial legumes look good (in the right place at the right time)
- Future opportunities will be where you find them;
- For example - moving to Wagyu genes 20 years ago increased the cost of production and reduced herd productivity but those who appropriately adopted the genetics have done quite well.

The Katherine region



ABS data

Region	Number of properties	Average property size (ha)	Average number of meat cattle
713	114	147,308	8,740

NT Pastoral Industry survey data

Base model

- 147,000ha property, 7,400AE
- Live export steers off native pastures
- Cash Cow project Northern Forest median reproduction efficiency
- Median rates of mortality from the “breeder cow mortality project”

Strategies to build profit and resilience

Katherine region

➤ Improve steer performance

- Stylo augmentation
- Steer mortality rates
- Feeding the steer tail concentrates
- Floodplain agistment

➤ Improve herd performance

- P supplementation
- Herd segregation
- BYO bulls

➤ Improve breeder performance

- Better genetics for fertility
- Investing to reduce foetal/calf loss
- Feeding first calf heifers to improve re-conception rates
- Female culling strategy
- Breeder mortality rates

Improving steer performance

Katherine region	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Mortality rates in steers \$5 per head	\$35,345	-\$14,710	2	2
Mortality rates in steers \$10 per head	\$20,489	-\$44,338	2	3
Mortality rates in steers \$100,000 capital	\$44,005	-\$100,000	1	3

Improving steer performance

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Mortality rates in steers \$5 per head	\$35,345	-\$14,710	2	2
Mortality rates in steers \$10 per head	\$20,489	-\$44,338	2	3
Mortality rates in steers \$100,000 capital	\$44,005	-\$100,000	1	3
Stylo augmentation (15% utilisation)	\$25,083	-\$571,271	5	16
Stylo augmentation (20% utilisation)	\$41,605	-453,604	5	13
Stylo augmentation (Miller and Stockwell – 40% utilisation)	\$82,327	-\$125,740	4	6

Improving steer performance

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Stylo augmentation (Miller and Stockwell – 40% utilisation)	\$82,327	-\$125,740	4	6
Feeding the steer tail concentrates	-\$31,168	-\$1,344,287	never	never

Improving steer performance

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Feeding the steer tail concentrates	-\$31,168	-\$1,344,287	never	never
Agisting steers on the floodplains (tail)	\$14,462	n/a	1	1
Agisting steers on the floodplains (all)	\$121,544	n/a	1	1

Improving breeder performance

Katherine region	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Better genetics for fertility (6% > WR)	\$22,464	-\$225,425	5	15

Improving breeder performance

Katherine region	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Better genetics for fertility (6% > WR)	\$22,464	-\$225,425	5	15
Reducing foetal/calf loss, \$5/head	\$32,445	-\$30,445	3	3
Reducing foetal/calf loss, \$10/head	\$2,468	-\$108,259	5	18
Reducing foetal/calf loss, \$300,000 capital	\$43,475	-\$300,000	3	7
Reducing foetal/calf loss, \$600,000 capital	\$24,889	-\$600,000	3	14

Improving breeder performance

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Reducing foetal/calf loss, \$5/head	\$32,445	-\$30,445	3	3
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Reducing foetal/calf loss, \$300,000 capital	\$43,475	-\$300,000	3	7
Reducing foetal/calf loss, \$600,000 capital	\$24,889	-\$600,000	3	14
Mortality rates in breeders \$10 per head	\$28,162	-\$83,160	1	1
Mortality rates in breeders \$750,000 capital	\$62,970	-\$750,000	1	9

Improving breeder performance

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Reducing foetal/calf loss, \$600,000 capital	\$24,889	-\$600,000	3	14
Mortality rates in breeders \$10 per head	\$28,162	-\$83,160	1	1
Mortality rates in breeders \$750,000 capital	\$62,970	-\$750,000	1	9
Feeding first calf heifers	-\$89,814	-\$3,862,000	never	never
Heifer cull strategy	\$8,677 to \$32,147	n/a	1	1

Improving herd performance

Katherine region	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Acute P herd, P dry, P wet (KSRS trial)*	\$410,084	-\$237,026	2	2
Herd segregation \$100,000 capital#	\$184,968	-\$100,000	1	1
Herd segregation \$1,000,000 capital#	\$129,209	-\$1,000,000	1	7
Herd segregation \$2,000,000 capital#	\$67,256	-\$2,000,000	1	15
Breed Your Own Bulls	\$34,443	-\$78,400	2	3

* Compared to the base herd without P, all classes of cattle are run on Acute P status country

These benefits are unlikely to be in addition to the P benefits

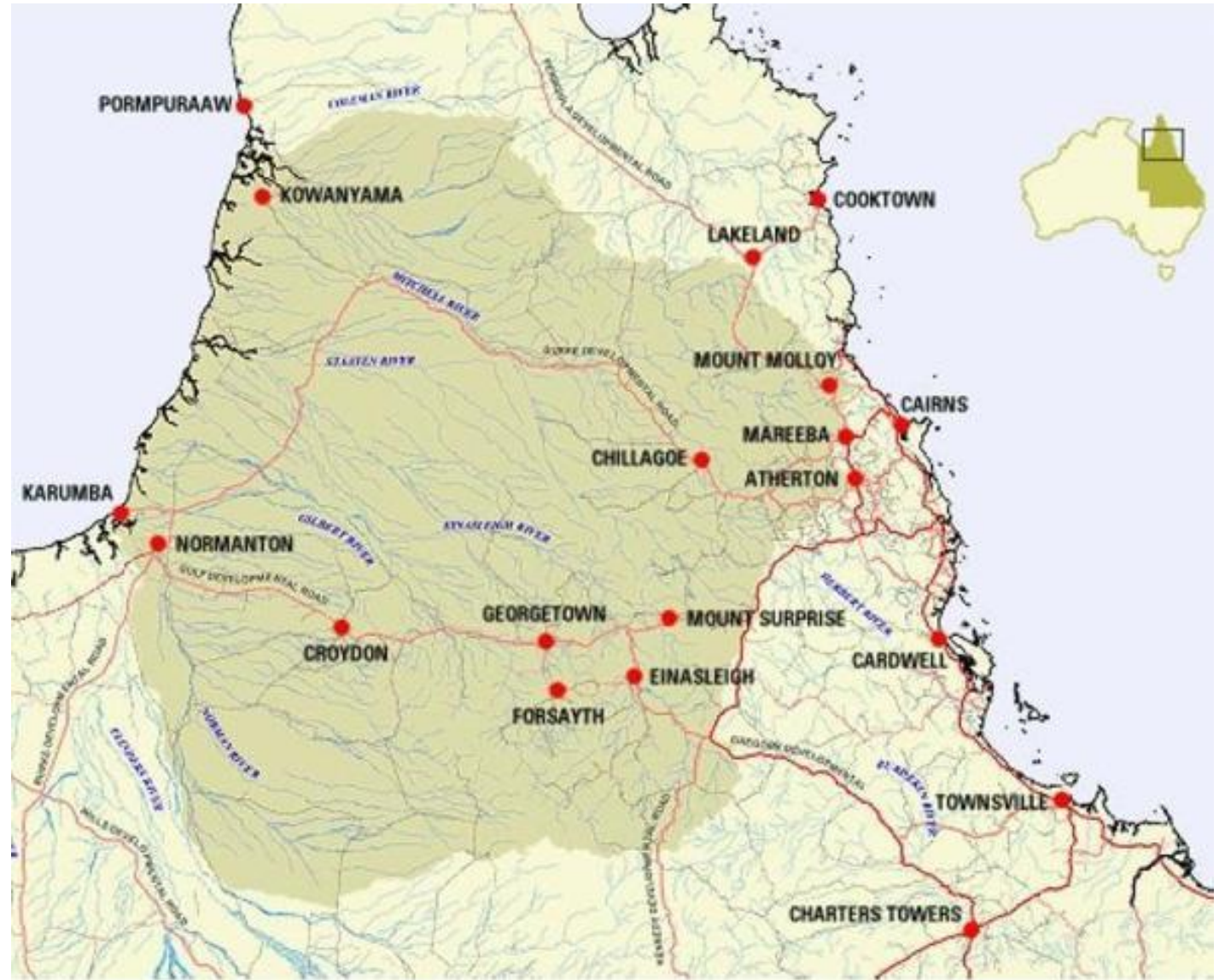
Katherine region insights

- Properties larger in size on average but generally with low output per unit area
- A long history of development being constrained by the availability of capital
- Suitable investments aimed at improving beef production systems can be shown to add significantly to profit
 - even at the long term beef prices applied in this analysis
 - the marginal return on extra capital invested is often upwards of 20% per annum before tax.
- The key strategies to consider for investment are those that efficiently reduce mortality rates (where they are high) and /or efficiently improve steer nutrition

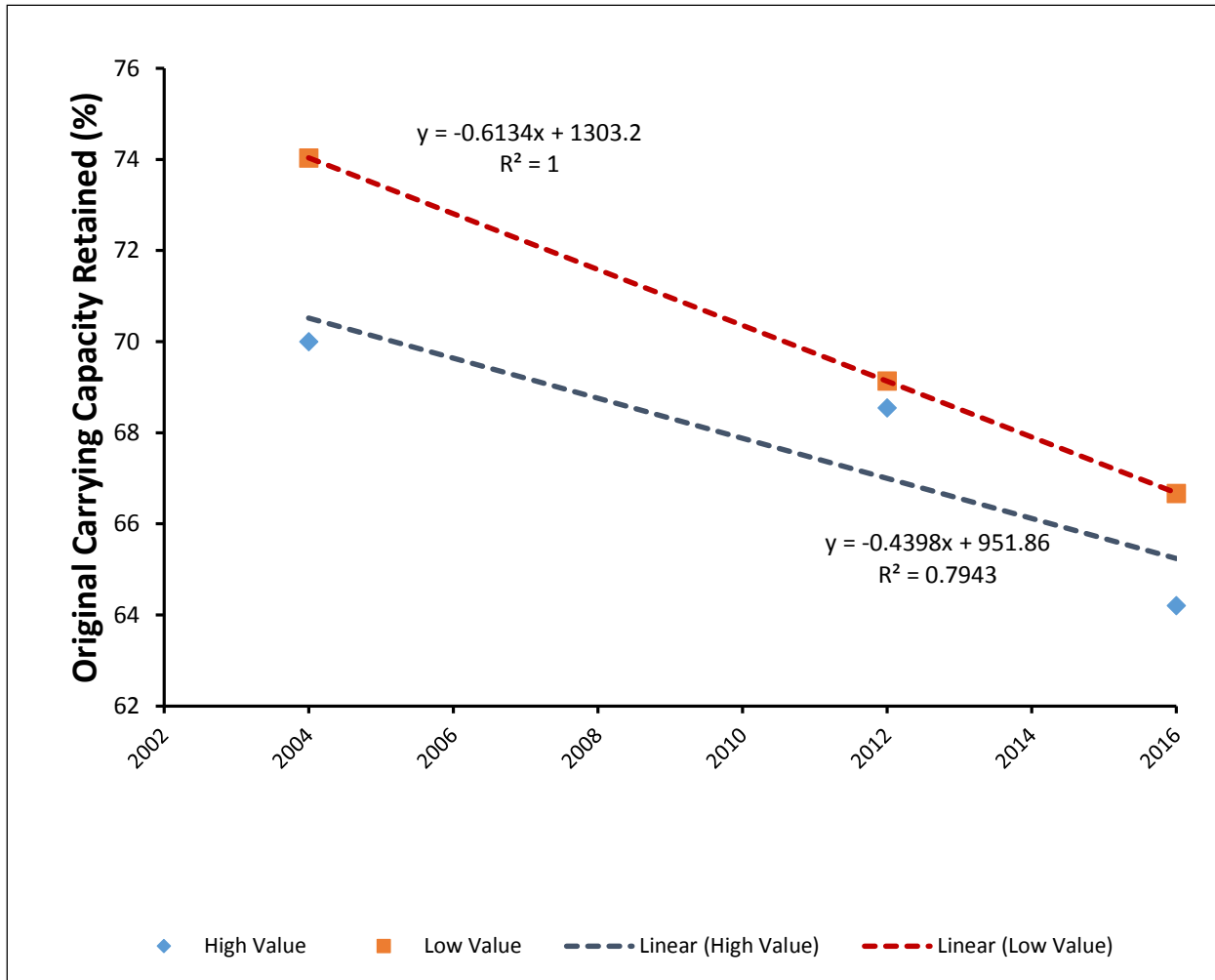
NQ Gulf

Base model

- 30,000ha property, 1,500AE
- Live export steers off native pastures
- Median Cash Cow Northern Forest reproduction efficiency



Declining land condition and inappropriate P

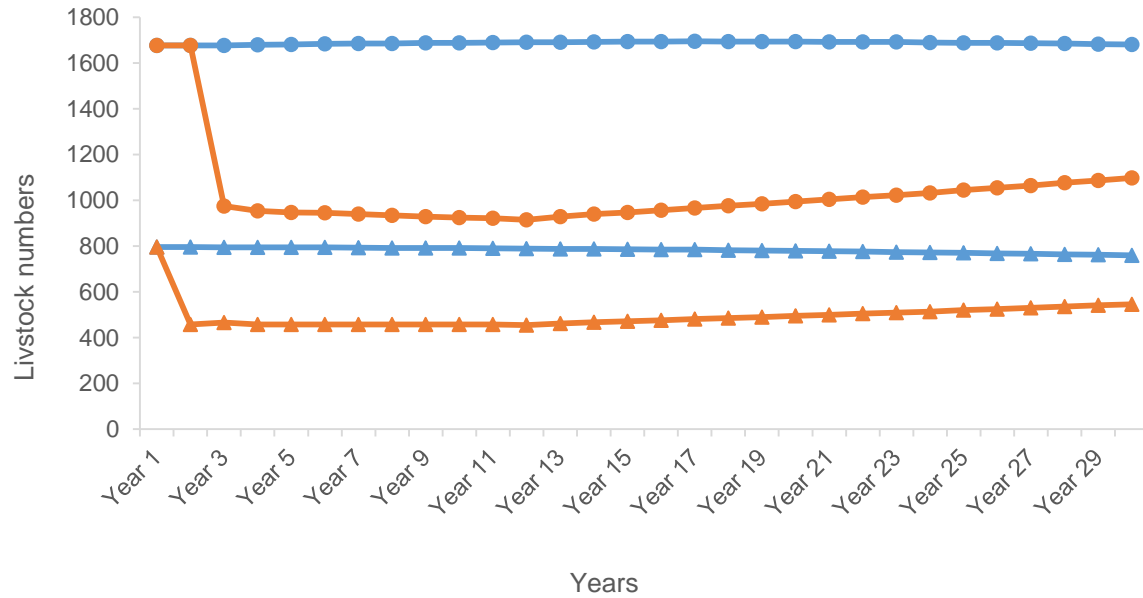


- The property currently is assessed as having 40 to 60% more cattle than its long term carrying capacity. Maintaining this stocking rate will lead to a continuing decline in carrying capacity / land condition.
- Inadequate wet season P is also being fed

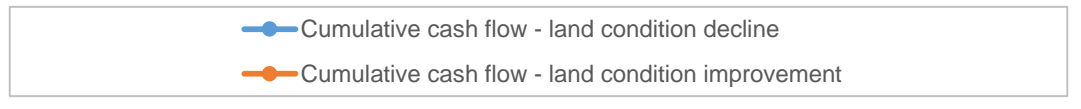
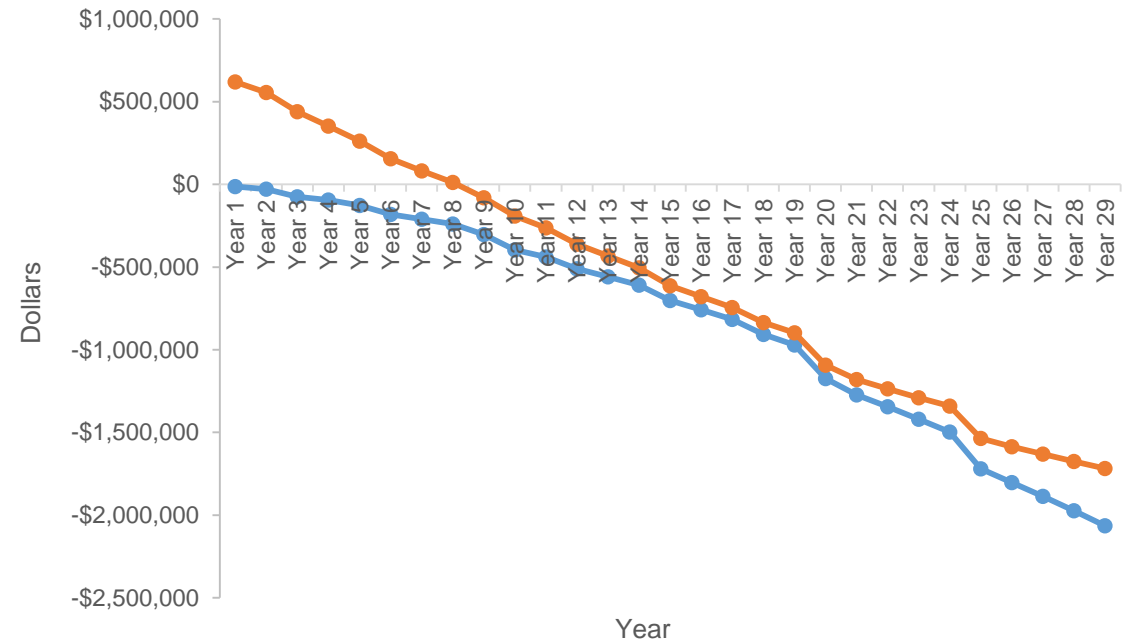
Year	% carrying capacity retained
2018	65%
2027	60%
2037	55%
2047	50%

Restoring land condition

Output – restore land condition

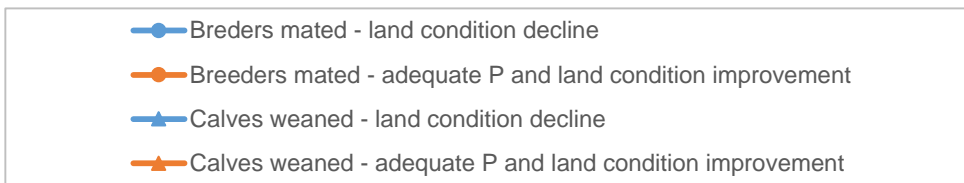
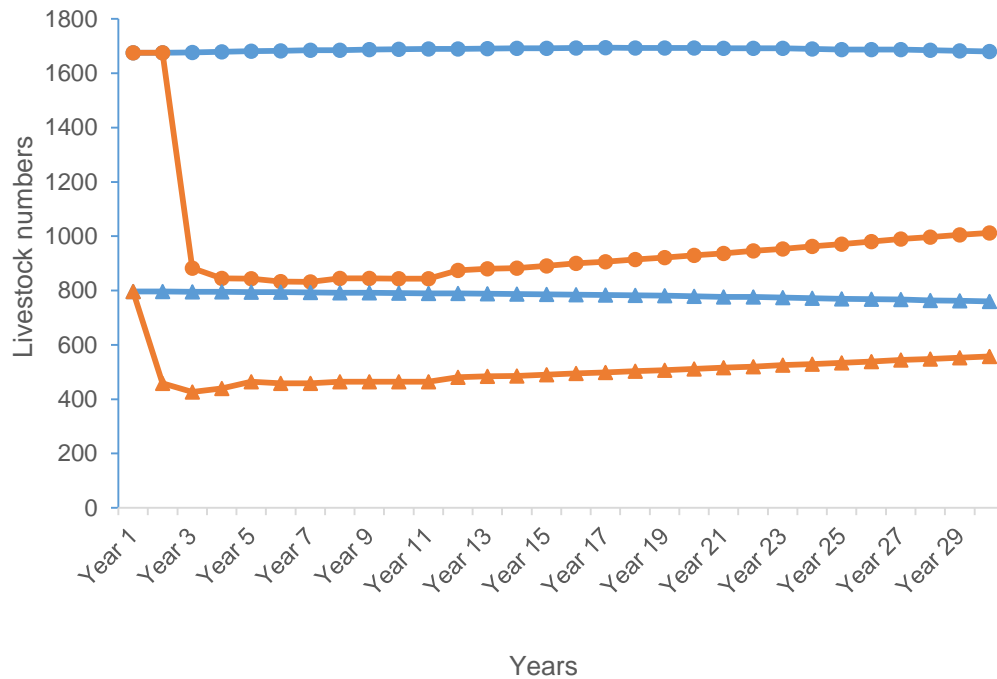


Cumulative cash flow

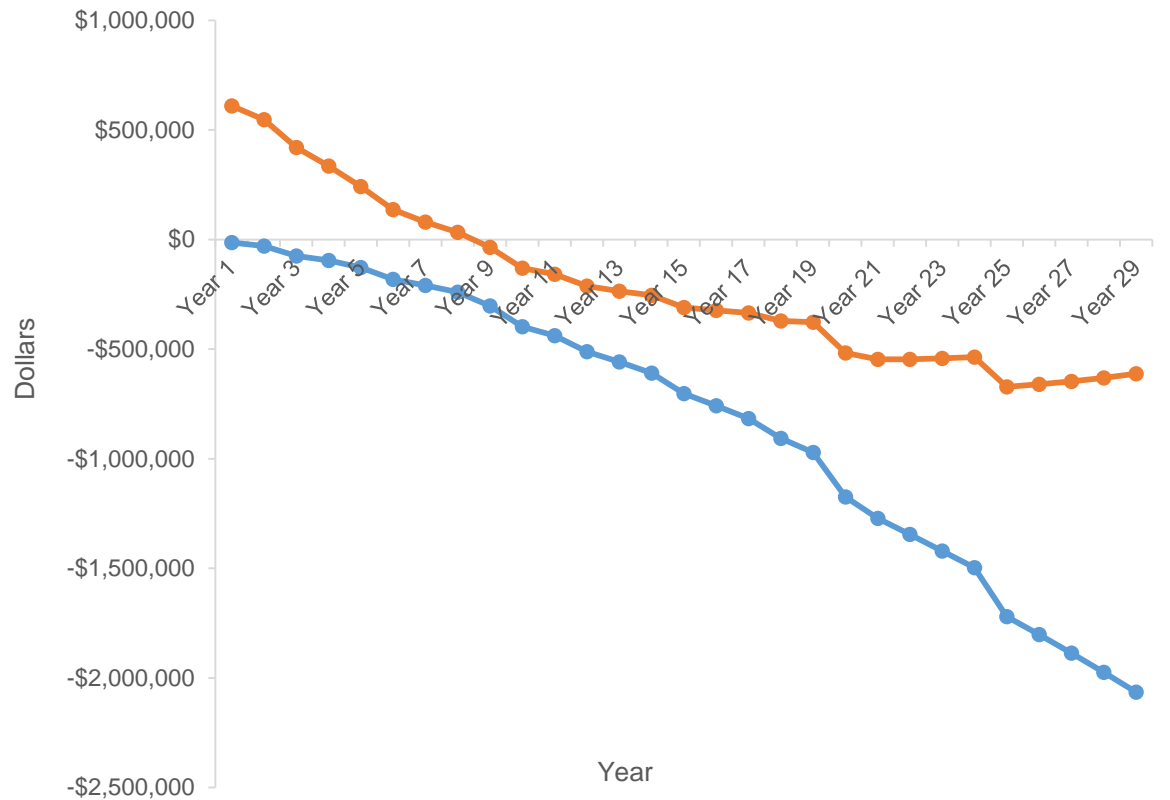


Restoring land condition and providing adequate P

Output – land condition restoration and adequate P



Cumulative cash flow



Strategies to build profit and resilience

NQ Gulf

Improve land condition and provide appropriate P supplementation	Annualised marginal NPV	Peak Deficit	Year of peak deficit	Payback period (years)
Arresting land condition decline	\$12,195	n/a	1	1
Appropriate P supplementation + land condition restoration	\$41,961	n/a	1	1

Significant improvement but the property is probably still not sufficiently resilient to survive over the longer term

Additional strategies to build profit and resilience

NQ Gulf

➤ Improve steer performance

- Production feeding molasses
- Stylo pastures
- Leucaena
- Silage
- Selling steers one year older
- Sending steers on agistment to the Downs

➤ Improve breeder performance

- Better genetics for fertility
- Investing to reduce foetal/calf loss
- Supplementing first calf heifers to improve re-conception rates

➤ Improve herd performance

- BYO bulls

All these strategies are compared to the new “base herd” that has effective wet P and land condition

Improving steer performance

NQ Gulf	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Production feeding molasses	-\$5,739	-\$247,725	never	never

Improving steer performance

NQ Gulf	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Production feeding molasses	-\$5,739	-\$247,725	never	never
Stylo pastures (low production)	\$6,633	-\$214,889	7	18
Stylo pastures (higher production)	\$9,518	-\$188,668	6	16
Leucaena on frontage	-\$277	-\$396,157	5	>30
Leucaena on red basalt	\$771	-\$302,291	6	>30

Improving steer performance

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Leucaena on red basalt	\$771	-\$302,291	6	>30
Silage	-\$10,216	-\$529,669	never	never
Steers one year older	\$17,169	-\$125,169	1	3
Agisting steers on the Downs	-\$24,555	-\$1,083,337	never	never

Investing to improving breeder performance

NQ Gulf	Annualised marginal NPV	Peak deficit	Year of peak deficit	Payback period (years)
Better genetics for fertility (6% > WR)	\$4,844	-\$108,427	7	16
Reducing foetal/calf loss, \$5/head	\$8,591	-\$815	3	4
Reducing foetal/calf loss, \$10/head	\$2,256	-\$26,676	3	10
Reducing foetal/calf loss, \$50,000 capital	\$11,528	-\$32,835	3	6
Reducing foetal/calf loss, \$75,000 capital	\$9,979	-\$61,776	3	8
Feeding first calf heifers	-\$6,072	-\$260,000	never	never

Investing to improving breeder performance

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Feeding first calf heifers	-\$6,072	-\$260,000	never	never
Improving herd performance				
Breed Your Own Bulls	\$20,742	-\$24,975	1	3

Insights from the analysis of the NQ Gulf

- Similar levels of herd performance and production to the Katherine region but suffers by having properties which are generally smaller in size
- Addressing land condition decline and P supplementation significantly improve relative profitability but appear unlikely to make the property sufficiently resilient to survive as a separate production system into the future.
- Even so, it is critical that these two issues are addressed before anything else is considered.
- The remaining question is whether additional strategies can be found to make the property more viable.

Insights for beef production systems across northern Australia

- The key insight gained from the analyses undertaken to date is that where a profitable beef production system is already in place it can be difficult to find production strategies that will dramatically improve the profit and reduce the riskiness of that system.
- This finding is independent of the current performance level of the beef production system
- In many cases, the increased risk associated with change is a more critical determinant of outcomes than increased profit.

Insights for northern Australia

First priority - strategies that target overall herd performance

- The key is P supplementation when appropriate
- Herd segregation (where there is continuous mating)
 - Underpinned by foetal ageing and the combination of relevant strategies
 - May require a significant investment of capital
- Reducing median mortality rates in steers and female stock fundamentally underpins improvement in profit and resilience
- Arresting land condition decline is a prerequisite for resilience
- BYO bulls?

Insights for northern Australia

- Second priority is improving steer nutrition with perennial legumes
 - Leucaena a clear winner in the Fitzroy (when established and managed appropriately)
 - Small seeded legumes (e.g. Caatinga stylo and Desmanthus) may have an important role in more favoured regions
 - Augmenting pastures with stylos for steers looks worthy of revisiting; there is a need to clarify pasture establishment / utilisation / nutrition
 - Lack of research data for leucaena in the far north inhibits value proposition
 - Early analysis of the Mitchell grasslands (Northern Downs) suggests purchasing a leucaena property in CQ and transferring all steers at weaning could be very attractive but risky

Insights for northern Australia

- Investing in **the breeder herd** in isolation
 - unlikely to significantly improve business profit and resilience,
 - exceptions are P supplementation and herd segregation when appropriate
- Prerequisite for breeders
 - Implement **low-cost strategies to aid resilience**:
 - ✓ body condition
 - ✓ herd structure
 - female cull age (effects herd profit and herd resilience)
 - age of steer turn-off (effects number of breeders in the herd)

PART 2

Part 2 Low cost strategies to build the resilience of beef production systems in northern Australia

- Topics

- Breeder body condition and rates of mortality
- female cull age (effects herd profit and herd resilience)
- age of steer turn-off (effects number of breeders in the herd)

- For example:

- Why did an agistment exercise for the NQ Gulf property reduce profit while an agistment exercise for the Katherine property have the opposite impact?
- Why was selling steers one year older more profitable in the NQ Gulf?

Assessing strategies

- There are numerous alternative management strategies and new technologies which arrive at an increasing rate; the challenge is to identify the ones that make your beef production system more efficient
- A clear understanding of the production system is required. We needed access to both experienced property managers and relevant R&D results.
- Applying an appropriate framework to decision making and understanding the reasoning behind the process will point roughly which direction to go, not the answer
- Partial budgets applied to estimate the expected extra return on extra capital invested is the best way to have a first look when a beef production system is already in place
- There is always a tax angle; this varies property to property and can change the result
- All the analyses were compiled in the Breedcow and Dynama suite of programs
- Available (free) at: <https://www.daf.qld.gov.au/business-priorities/animal-industries/beef/breedcow-and-dynama-software>

Improving the performance of beef production systems in northern Australia



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Questions