

# Burnett beef production systems

## Analysing management strategies to build resilience

R.L. Murphy, R.J. Sneath

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**This publication has been compiled by:**

**Ray Murphy**, Senior Agricultural Economist, Rural Economic Development, Department of Primary Industries, Queensland  
**Roger Sneath**, Principal Beef Extension Officer, Animal Science, Department of Primary Industries, Queensland

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## Summary

This report details the economic implications of alternative management strategies for a beef cattle enterprise in the Inland Burnett region of Queensland. Other reports present results for other regions across Queensland's grazing lands (FutureBeef 2024). It is intended that the results of these analyses will support the implementation of resilient grazing, herd, and business practices necessary in managing seasonal variability. The property-level, regionally specific herd, and business models which were developed can be used by consultants, advisors, and producers to assess both strategic and tactical management decisions for their own properties.

The implications that alternative management strategies have on grazing businesses in the Burnett are analysed in this report by using scenario analysis to define a base or example property and then measure the impact on this base property of the implementation of the alternative management strategies. The natural, production, financial and human characteristics of the base property were identified using published data and the expert opinion of experienced local beef cattle producers, industry specialists and Queensland Department of Primary Industries (DPI) staff.

The base property had a total area of 2,000 ha, entirely used for a beef cattle grazing enterprise utilising native and sown pastures. Land types included a mixture of blue gum on alluvial plains, ironbark and spotted gum country. The property had a carrying capacity of 465 AE.

The base management strategy was to run a self-replacing (approximately 50% *Bos indicus*) breeding herd, grazing on the native and improved pastures. Breeding cows were supplemented with a urea loose dry lick. The breeding herd was control mated with an average calving date in mid-September. Steers were sold immediately after being weaned at 7 months of age. The base property and the base strategy turn off 106 weaner steers each year, from 271 breeders mated, generating a herd gross margin after imputed interest of \$139,516.

The operating profit of this base property and base strategy was -\$39,296. This calculation includes the non-cash allowances for depreciation and a management allowance of \$50,000. This loss represents a -0.4% return on total capital. Total capital includes over \$8 million in land and improvements. In this case the owners of this business would require off farm income to operate the property and cover living expenses.

Alternative management strategies that may support enterprise profitability and resilience were investigated using the Breedcow and Dynama suite of herd budgeting software. Breedcow+ steady state models were developed for the base property, running the base strategy, as well as for fully implemented alternative management strategies. Discounted cashflow budgets over thirty years were then developed using Dynama+ and Investan spreadsheets to model the change from the base strategy to the alternative strategy.

The following alternative strategies were analysed.

- Optimising steer sale age and female culling.
- Planting legumes.
- Grazing weaner steers on forage oats.
- Buying in replacement heifers and using *Bos taurus* bulls.
- Harvesting timber.

Table 1 shows the gross margins after imputed interest, annualised Net Present Values (NPV) and peak deficits for each of the strategies.

Table 1 Summary of results for the management strategies investigated

Strategy	Gross margin after imputed interest	Change in profit (Annualised NPV)	Peak deficit
<b>Base strategy</b>			
Turning off weaner steers at 7 months	\$139,516		
<b>Optimising steer sale age</b>			
Turning off feeder steers at 19 months	\$168,753	\$28,927	-\$27,450
Turning off bullocks at 31 months	\$154,529	\$17,986	-\$64,172
<b>Optimising surplus heifer sale age</b>			
Sell surplus heifers at 19 months	\$150,034	\$7,970	-\$11,400
Sell surplus heifers at 31 months	\$146,135	\$8,211	-\$8,969
<b>Planting legumes</b>			
Leucaena and existing improved pasture within frost free blue gum country	\$189,574	\$29,925	-\$116,678
Leucaena and existing improved pasture within frost prone blue gum country	\$183,098	\$25,200	-\$126,423
Leucaena and new improved pasture within 'ironbark on good soils' country	\$194,496	\$30,384	-\$152,700
Leucaena and native grasses within ironbark on good soils country	\$186,553	\$24,242	-\$135,338
Planting other legume pastures using cultivation within 'ironbark on good soils' country	\$184,438	\$28,129	-\$76,145
Planting legume pastures using burning and aerial seeding within 'ironbark on good soils' country	\$141,035	-\$945	na
<b>Grazing weaner steers on forage oats</b>	\$135,837	-\$4,288	na
<b>Buying in replacement heifers and using <i>Bos taurus</i> bulls</b>	\$117,251	-\$8,672	na
<b>Harvesting timber</b>	No change	\$18,394	\$0

An analysis of alternative turn off ages of steers shows that profitability would increase by \$28,927 per year if steers were kept for an additional 12 months and turned off as 19-month-old feeder steers to be sold to a feedlot. This analysis assumes that steers would grow at 160 kg per year. Individual producers need to consider how much good country they have on their property that would be able to grow these steers to a suitable weight.

The option of keeping surplus heifers until they were 19 months old increased profitability by \$7,970. However, producers may feel that keeping heifers longer than required to select replacement breeders will increase the complexity of herd management, for not enough increase in profitability.

Establishing legumes to increase pasture productivity and utilisation, carrying capacity, and liveweight gain provides significant increases in profitability. This increase in productivity would also give producers more confidence that the property can consistently grow out steers to 19 months of age.

Planting leucaena within the 'blue gums on alluvial plains' country increased profitability by \$29,925 per year, if the area was frost free and steers were sold at 19 months of age. If this area was frost prone the increase in profitability would be \$25,200 per year since frosts will reduce the productivity of the leucaena. A major issue with these leucaena strategies was the large capital investment and a time lag for production to reach its potential. The peak deficits for these strategies were in excess of \$115,000, with payback periods of 7-8 years. Financial strategies will need to be implemented for the business to cope with these financial impacts.

If the 'ironbark on good soils' country within the base property has characteristics that allow for leucaena to grow, this would be a good area to plant leucaena. The lower baseline productivity of this ironbark country will provide a greater boost in carrying capacity and growth rate. Planting leucaena with new improved pastures within the 'ironbark on good soils' country increased profitability by \$30,384 but with a peak deficit of \$152,700 and a payback period of 8 years. Planting leucaena without new improved pasture increased profitability by \$24,242.

Planting other legumes such as desmanthus and stylo, after cultivation, within the 'ironbark on good soils' country increased profitability by \$28,129 per year with a peak deficit of \$76,145. The option to aerial seed these same species after burning resulted in a slight reduction in profit due to poorer legume establishment.

Grazing steers on oats decreased profitability by \$4,288 since the increase in cattle income does not cover the cost of growing the oats. This is supported by previous studies that show grazing forage oats reduced profitability (Murphy 2024). While the oats are growing, there is a large amount of feed available for three months. However, this country will not produce much feed of significance over summer, since all the pasture would be eradicated to grow a good oats crop, and hence have little grazing value. Producers need to be very clear of the benefits of the oats and the lost pasture utilisation before adopting a strategy of grazing oats.

The option to buy in replacement heifers each year and mate all cows to *Bos taurus* bulls decreases profitability by \$8,672 per year. In this strategy the cost of buying in heifers outweighs the benefits of an increased weaner price per kg and the increased weight gain.

Harvesting timber using the assumptions in this report will increase profitability by \$18,394 per year. Producers considering this need to build personal and contractual relationships with contractors, as well as having a clear understanding of the legislative requirements of vegetation management. This may prove to be a deterrent for some landholders.

There is the potential to undertake several of these strategies over a long-term planning period. If the strategy to undertake a large timber harvest in the first year was implemented, this financial windfall could be used to finance leucaena establishment within the 'blue gums on alluvial plains' country. Once that leucaena was fully productive the manager can then move on to planting legumes within the 'ironbark on good soils' country.

Whilst every effort was made to ensure the assumptions used in each scenario were accurate and validated with industry participants, relevant experts or published scientific studies, the results presented should be viewed as indicative only.

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# 1 General introduction

More than 80% of Queensland's 173 million ha are used for grazing livestock on lands extending from northern humid tropical areas to arid western rangelands and southern subtropics (QLUMP 2022). The grazing industries make an important contribution to the Queensland economy, with the beef industry in 2020-21 accounting for 41% (\$5.9 billion) of the total gross value of Queensland agricultural production (ABS 2022b).

The beef industry is not without its challenges, with variable rainfall, especially long periods of drought, being a major challenge to these multimillion-dollar businesses. The industry additionally faces variable commodity prices and there is pressure on long-term financial performance and viability due to an ongoing disconnect between asset values and returns, high debt levels and a declining trend in terms of trade (ABARES 2019). Making decisions prior to and amidst this adversity can be difficult, but it is often these decisions that play a large part in supporting the long-term profitability and resilience of beef businesses.

This report was produced as part of the project titled, 'GrazingFutures Livestock Business Resilience'. The objective of the work within this project was to improve the knowledge and skills of advisors and producers in assessing the economic implications of management decisions which aim to increase profitability and resilience. This report details the analysis of the economic implications of alternative management strategies for an example beef cattle enterprise in the Burnett region of Queensland.

## 1.1 The Burnett region of Queensland

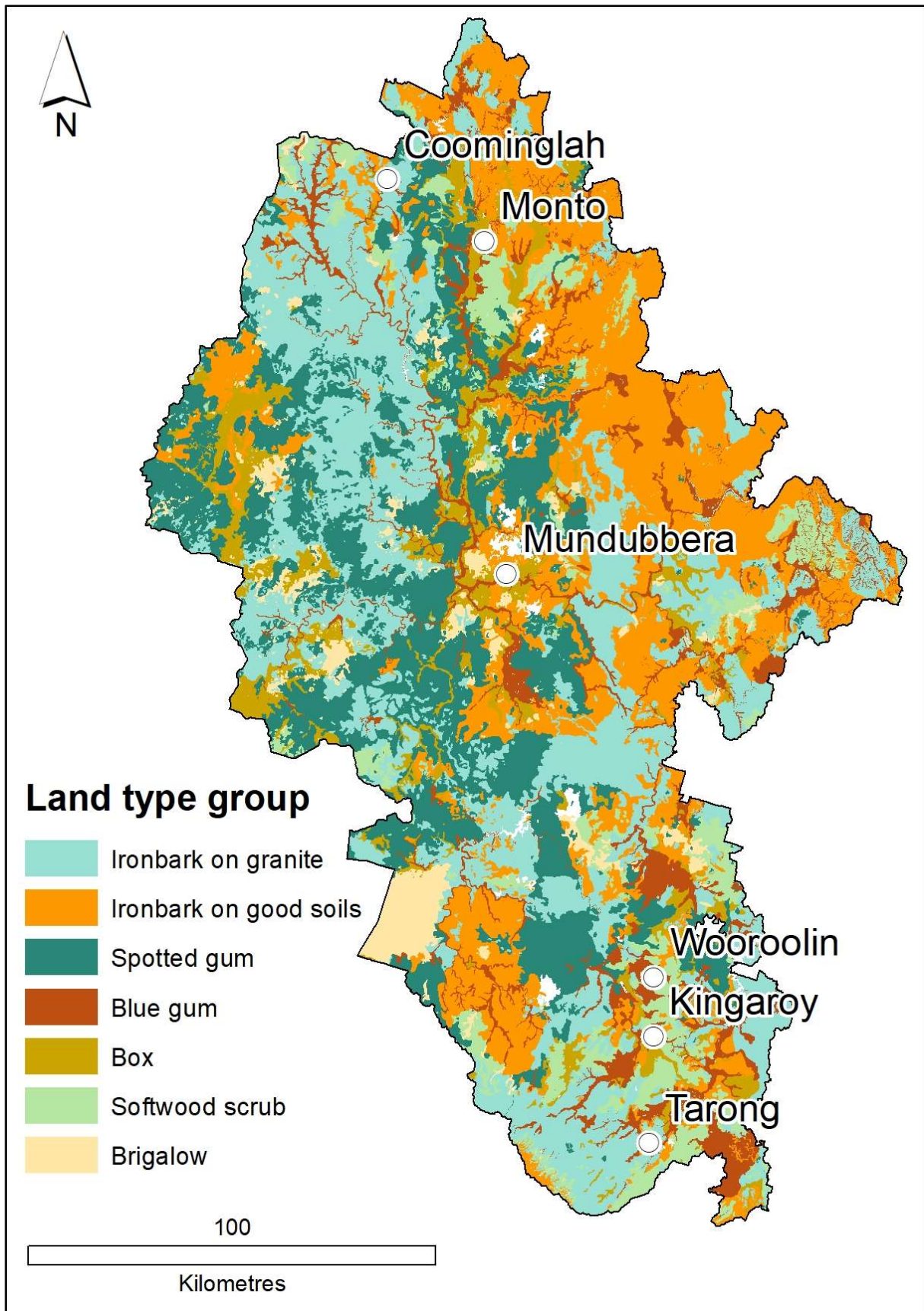
### 1.1.1 The land resource

The Burnett region for this report is defined as the North Burnett Local Government Area and the South Burnett Local Government Area of Queensland, approximately 250km northwest of Brisbane. The Burnett covers an area of 2.8 million ha and has a diverse range of soils and vegetation, with the predominant broad land types being ironbark, spotted gum, blue gum, box and brigalow. The distribution of land types across the Burnett is shown in Figure 1.

Most of the agricultural area of the Burnett is used for cattle grazing. Crops, including peanuts, navy beans, wheat, grain and sorghum, are also grown, predominately in the south of the region.

The predominant native grasses in the Burnett are black speargrass (*Heteropogon contortus*), pitted bluegrass (*Bothriochloa decipiens*) and wiregrasses (*Aristida spp.*). Native legumes found in the region include glycine pea (*Glycine tabacina*), woolly glycine (*Glycine tomentella*) and emu foot (*Psoralea tenax*). Sown pastures popular in the Burnett include Rhodes grass (*Chloris gayana*), Green Panic (*Megathyrsus maximus*), creeping bluegrass (*Bothriochloa insculpta*), Siratro (*Macroptilium atropurpureum*), Desmanthus (*Desmanthus spp.*), shrubby stylo (*Stylosanthes scabra* cvv.) and Wynn cassia (*Chamaecrista rotundifolia* cv. *Wynn*). More fertile soil types in the grazing areas grow oats (*Avena sativa*) and sorghum (*Sorghum spp.*) as forage crops.

The quality of these pastures is affected by the interaction between climate, soil type and grazing pressure (O'Sullivan 2022). 28% of the land area of the Burnett, shown in Figure 1, has been categorized as ironbark on granite, which are shallow, hard setting soils with low water availability and fertility. It requires conservative stocking practices (spelling pastures and flexible stocking rates) to maintain effective ground cover and pasture productivity (FutureBeef 2024).



**Figure 1** Land types and selected weather stations in the Burnett region

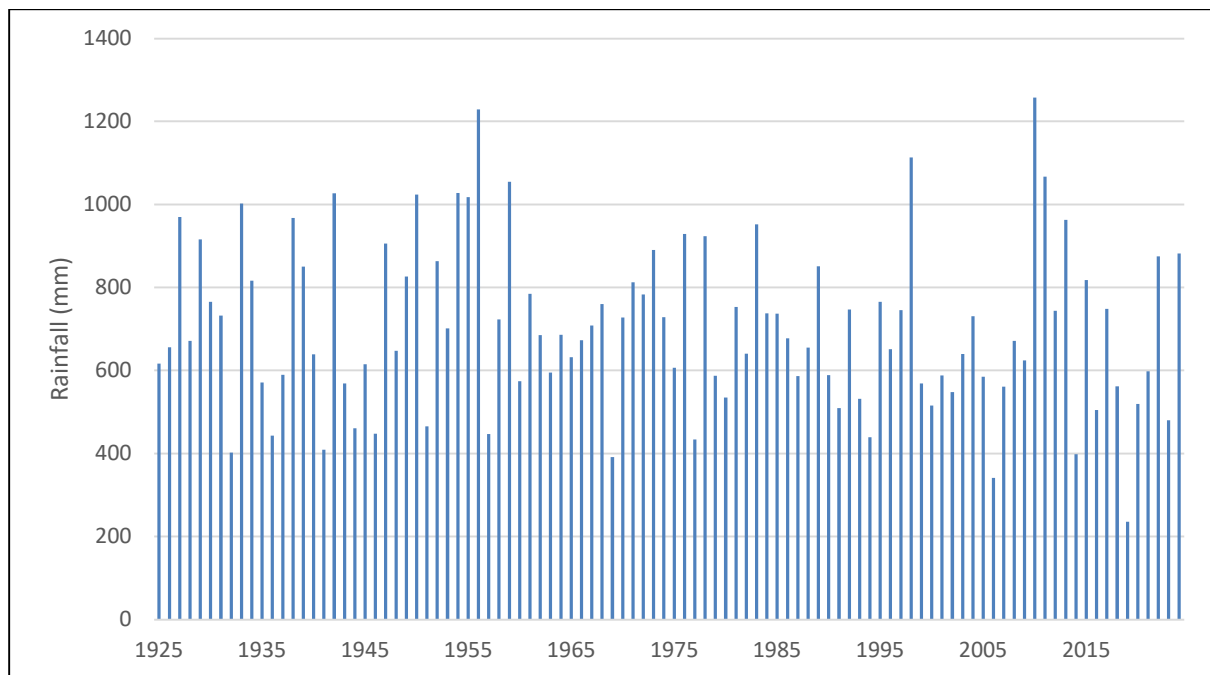
### 1.1.2 Rainfall

The Burnett region has a subtropical climate with variable annual and seasonal rainfall. Table 2 shows the median rainfall, over the last 30 years, for 4 weather stations across the Burnett, with the median rainfall for Mundubbera being 632 mm. The location of these weather stations can be found in Figure 1.

Table 2 show that 75% of Mundubbera’s annual rainfall occurs in the summer pasture growing season (October to March). Rain at other times of the year can provide an opportunity for cropping in suitable areas. Rainfall variability in the Burnett is shown in Figure 2, where the annual rainfall of Mundubbera over the past 100 years is displayed. The minimum annual rainfall over this period is 238mm and the maximum is 1,257mm.

**Table 2** Median monthly rainfall (mm) of weather stations in the Burnett, 1995-2024 (SILO 2025)

Town	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Coominglah	78	84	35	19	18	19	13	19	15	55	73	69	609
Mundubbera	52	105	42	23	29	15	23	16	22	51	58	76	632
Wooroolin	74	89	55	27	29	29	18	16	26	68	80	101	732
Tarong	78	74	50	23	28	22	20	15	20	61	59	67	652



**Figure 2** Annual rainfall at Mundubbera, 1925-2024 (SILO 2025)

### 1.1.3 Burnett grazing industries

Extensive beef cattle production is the principal land use across the Burnett region. A total of 87.6% of the area is used for grazing, supporting 1,253 grazing businesses (ABS 2022a), with beef cattle being grazed on 1,234 properties. In 2020-21 the Burnett region had a total cattle herd size of 442,069, representing 2% of Australia's and 4% of Queensland's cattle numbers and producing \$247 million, or 2% of Australia's and 4% of Queensland's gross value of cattle (ABS 2022b).

While extensive beef grazing is the predominate land use, other agricultural industries make up a large portion of the gross value of agriculture in the Burnett. This includes fruit, producing \$235 million, pigs producing \$72 million and broadacre crops producing \$32 million per year (ABS 2022b).

The large areas of 'ironbark on granite' and spotted gum land types across the Burnett are suitable to cattle breeding rather than cattle fattening. Many grazing properties sell calves as weaners (6 or 7 months of age), which are sold through local saleyards to be fattened within the Burnett and other regions. Growing out steers for an additional year to be sold at around 19 months of age direct to feedlots, both locally and in other regions, may also be a viable option for producers. Some producers also finish cattle suitable for slaughter. The growing out of cattle beyond weaners requires better country and can involve the use of forage crops. Cattle feedlotting also occurs in the region, utilising local grain and hay.

Local saleyards, of which the largest is the Burnett Livestock Exchange at Biggenden, offer producers the option to sell cattle as weaners, store cattle and cattle suitable for slaughter. Some producers will sell cattle direct to feedlots. A variety of abattoirs across southern Queensland provide producers with the opportunity to sell finished and cull cattle direct to slaughter.

The prevalence of cattle ticks has resulted in most cattle in the Burnett having a significant percentage of *Bos indicus* in their breeding. Many producers run cross breed herds. There is presently a trend to increase the percentage of *Bos taurus* cattle in the herds that create 'flat back' cattle, with no or reduced humps, for the domestic slaughter market. The number of Angus and Wagyu cattle in the Burnett is also increasing.

Ticks are a major pest affecting cattle grazing, with the Burnett falling within the cattle tick infested zone of Queensland. Other pests affecting cattle grazing include deer, pigs and wild dogs.

Weeds that have a significant impact on grazing in the Burnett include giant rat's tail grass (*Sporobolus pyramidalis*), lantana (*Lantana camara*), African lovegrass (*Eragrostis curvula*) and Indian couch grass (*Bothriochloa pertusa*). All these weeds are invasive, reduce grazing productivity and are difficult to eradicate. Pasture dieback, a condition that causes the premature death of tropical and sub-tropical grasses, is also impacting on pastures in the Burnett. It affects most high-yielding sown grass species and some native species, while legumes and other broadleaf plants are unaffected.

## 2 General methods

The implications that alternative management strategies had on grazing businesses in the Burnett were analysed in this report. Scenario analysis was used to define a base or example property and then to measure the impact of the alternative management on this base property. The natural, production, financial and human characteristics of the base property were identified using published data and the expert opinion of experienced local beef cattle producers, industry specialists and experienced DPI staff. These experts also assisted in determining the alternative strategies that were analysed and the changes to the base property that occurred due to the implementation of these alternative strategies.

The implications of alternative management strategies were investigated using the Breedcow and Dynama suite of herd budgeting software, freely available online. The first step was to build a Breedcow+ steady state model for the base property, running the base strategy. Secondly, Breedcow+ was used to investigate the optimal female and steer turn off ages for the base strategy. Thirdly, Breedcow+ models were developed for each of the alternative management strategies, modelling them when the alternative strategy had been fully implemented and all production indicators had reached a steady state. The key indicator when comparing strategies at this stage of the analysis is gross margin after imputed interest, which equals income less variable costs and interest (at 5% annually) on the capital involved in each strategy.

Finally, Dynama+ and Investan spreadsheets were used to model the change from the base strategy to each of the alternative strategies. This software calculated the following indicators that are provided in this report.

- The annual change in profitability over thirty years (NPV of the change).
- The maximum cumulative cash deficit/difference between the two strategies (peak deficit).
- The number of years before the peak deficit is achieved (years to peak deficit).
- The number years before the investment is paid back (payback period).

Dynama+ and Investan use discounted cash flow techniques to model the changes over a 30-year period with a discount rate of 5%. The models were compiled in real (constant value) terms, with all variables expressed in terms of the price level of the current year (2024), except for livestock prices. Cattle prices were based on the historic 10-year averages, outlined in Section 3.3. The resulting cattle prices were then applied to represent the expected value of real livestock prices going forward. It was assumed that future inflation would equally affect all costs and benefits. The wheat sale price used in this report was also a long-term average price.

A guiding principle of this analysis was that grazing pressure remains the same or appropriate to the available pasture in all alternative strategies. This grazing pressure was measured as Adult Equivalents (AE) over the area of the base property. This analysis uses linear weight AE, where the liveweight of cattle classes are expressed relative to a standard animal, a 455 kg liveweight steer at nutritional maintenance (maintaining weight). Other processes are available to calculate AE, including metabolic weight and metabolisable energy requirement. Linear weight (as used in Breedcow Dynama) was used in this analysis to maintain consistency with past reports from this project.

### 3 Constructed base beef cattle property

#### 3.1 Area, land types and enterprises

The details of the constructed base property, with its herd and business characteristics, were developed after consultation with local producers, industry specialists and experienced DPI staff in 2024 and 2025. The base property was viewed as representative of a number of properties in the Burnett and operated by managers with average (neither excellent nor poor) management skills.

The base property had a total area of 2,000 ha, entirely used for a beef cattle grazing enterprise utilising native and sown pastures. The details of the land types and pastures of the base property are shown in Table 3. The property had a carrying capacity of 465 AE, using a linear weight AE model, where 1 AE is equivalent to a 455kg liveweight steer maintaining its weight.

**Table 3** Land types and pastures of the base property

Land type	Pasture	Area (ha)
Blue gums on alluvial plains	Rhodes grass, panics, stylo and siratro	300
Ironbark on good soils	Spear grass and forest bluegrass, with some stylo and Wynn cassia	900
Ironbark on granite		500
Spotted gum		300
TOTAL		2,000

The base management strategy was to run a self-replacing (approximately 50% *Bos indicus*) breeding herd, grazing on the native and improved pastures detailed in Table 3. Breeding cows were supplemented with a urea loose dry lick between June and December when the quality of pasture had declined.

The breeding herd was control mated with a 3-month joining period commencing in mid-November. The average calving date was in mid-September. Steers were sold immediately after being weaned at 7 months of age (247 kg) at a local saleyard. The growth path of the weaner steers is outlined in Section 3.2 and Table 7.

The heifers selected as replacements were mated at 26 months of age. Heifers not required as replacement breeders were sold at 12 months of age. The cow cull age was 12 years of age.

The average bull percentage used was 3%, bull mortality was 4% and 20% of the bulls were replaced with purchased bulls each year.

This strategy resulted in 271 breeders mated and 106 weaner steers sold each year on this property. A calendar of herd management activities for the base strategy is shown in Table 4.

**Table 4** Breeding and growing pathway for the base strategy

<b>Month</b>	<b>Activity</b>
October	
November	
December	Mating
January	
February	
March	
April	Pregnancy testing
May	Sell cull cows
June	
July	Test bulls and sell cull bulls
August	
September	Average calving date
October	
November	
December	
January	Branding
February	
March	
April	Weaning and sell steers
May	
June	
July	
August	
September	Sell cull heifers

## 3.2 Herd structure and performance

Table 5 shows the conception rates, loss of calves between conception and weaning, the proportion of 'empties' (PTE) sold, and mortality rates used in this analysis. As a reflection on management practice seen in the region, 20% of empty first calf females have been retained. This reproduction data generates a weaning rate, from all cows mated, of 78%.

**Table 5** Reproduction parameters and mortality rates for the base strategy

<b>Initial cattle age (year)</b>	<b>Weaners</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>11</b>
<b>Final cattle age (year)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>11</b>	<b>14</b>
Expected conception rate for age group (%)	n/a	90	75	85	85	85
Expected calf loss from conception to weaning (%)	n/a	7	7	7	7	7
Proportion of empties (PTE) sold (%)	n/a	80	100	100	100	100
Female death rate (%)	2	4	2	2	2	3
Male death rate (%)	2	2	2	2	n/a	n/a

The base strategy produces 213 weaners from 271 breeders mated and sells 106 weaner steers and 98 females (surplus heifers and cull cows). Female sales make up 48% of total sales. The herd structure is shown in Table 6 and the final details of the herd outputs and gross margin are shown in Table 11.

**Table 6** Herd structure for the base strategy

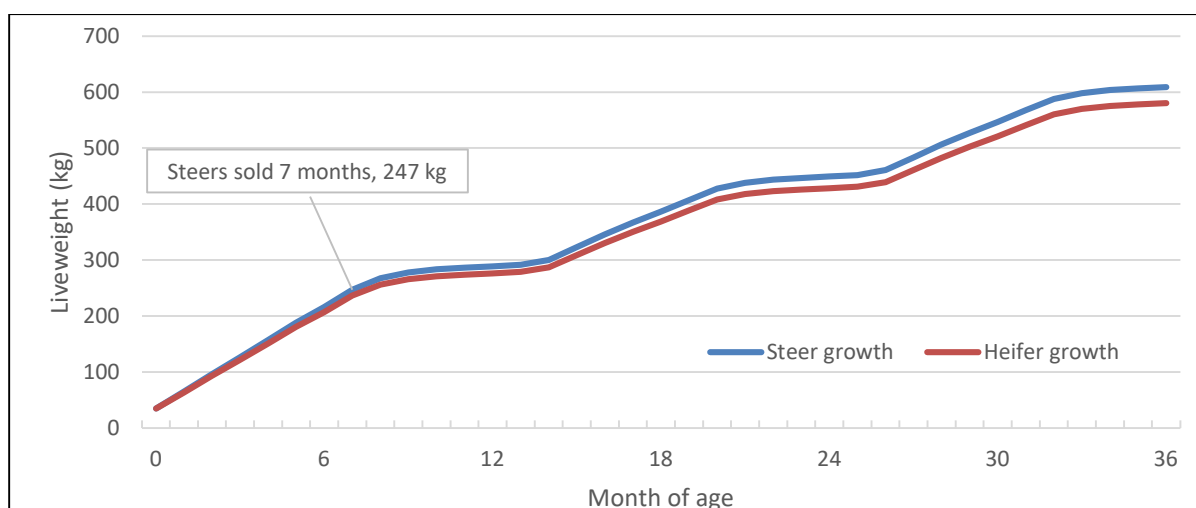
<b>Age at start of period</b>	<b>Number kept for the whole year</b>	<b>Number sold</b>	<b>Number purchased</b>	<b>Total AE</b>
Extra for cows weaning a calf	n/a	n/a		74
Weaners 5 months to 1 year	58	155		42
Heifers 1 year but less than 2	57	0		44
Heifers 2 years but less than 3	51	4		58
Cows 3 years plus	178	46		229
Bulls all ages	8	1	1	16
<b>TOTAL</b>	<b>353</b>	<b>206</b>	<b>1</b>	<b>465</b>

Table 7 and Figure 3 show the growth paths of steers and heifers for the base strategy. The annual weight gain of steers was 160 kg. Male calf daily weight gain from birth in September until weaning in March (at 7 months of age) was 1.0 kg/day. Heifers had a growth rate of 5% less than a steer throughout their life. At weaning, the average weight of steers was 247kg and heifers was 236kg. After weaning, daily growth rates are low through winter, then increases in December with summer rainfall and improved pasture quality.

The impact of frost and seasonal variability over a 30-year period have been accounted for when estimating the average steer and heifer growth paths in Table 7. There will be year to year variability which will require tactical decisions to be made in response to those current conditions.

**Table 7** Estimated average steer and heifer growth paths for the base strategy

Cumulative months from birth	Month	Steer weight gain (kg/day)	Steer weight (kg)	Heifer weight gain (kg/day)	Heifer weight (kg)
0	Sep	Birth	35	Birth	35
1	Oct	1.00	65	0.95	64
2	Nov	1.00	96	0.95	93
3	Dec	1.00	126	0.95	121
4	Jan	1.00	157	0.95	151
5	Feb	1.00	188	0.95	180
6	Mar	1.00	216	0.95	207
7	Apr	1.00	247	0.95	236
8	May	0.68	267	0.65	256
9	Jun	0.33	278	0.31	265
10	Jul	0.19	283	0.18	271
11	Aug	0.09	286	0.09	274
12	Sep	0.09	289	0.09	276
13	Oct	0.09	292	0.09	279
14	Nov	0.28	300	0.27	287
15	Dec	0.75	323	0.71	308
16	Jan	0.75	346	0.71	330
17	Feb	0.68	367	0.65	351
18	Mar	0.68	386	0.65	369
19	Apr	0.68	407	0.65	389



**Figure 3** Estimated average steer and heifer growth paths for the base strategy

Table 8 shows the husbandry treatments applied to the various classes of cattle, held for 12 months. The total husbandry costs for the base strategy were \$19,478 per year. The largest individual husbandry costs were dry lick for breeders at \$8,249 and weaner hay at \$2,551 per year. The price of replacement bulls had been set at \$8,000 each.

**Table 8** Husbandry treatments applied and cost (\$/head/year ex GST) for the base strategy

Treatments	Weaners	Females		Steers		Bulls
		1-2 years	2+ years	1-2 years	2+ years	
Management tag	\$2.23					
NLIS tags	\$3.59					
7in1 vaccine	\$4.67	\$2.34	\$2.34			\$2.34
Vibriosis vaccine						\$9.75
3-day sickness vaccine						\$12.27
Injectables for parasites	\$2.34					
Pour on for parasites		\$5.78	\$7.23	\$5.78	\$7.23	\$11.56
Buffalo fly control		\$1.93	\$2.41	\$1.93	\$2.41	\$2.41
Pain relief (steers)	\$1.15					
Pain relief (heifers)	\$0.33					
Hay for weaners 3kg x 10 days @ \$400/t	\$12.00					
Lick for breeders 150g x 180 days @\$1,066/t		\$28.78	\$28.78			
Pregnancy Testing		\$3.70	\$3.70			
Bull testing (every 2 <sup>nd</sup> year, cost averaged)						\$45.00
<b>Total</b>	<b>\$25.16*</b>	<b>\$42.53</b>	<b>\$44.45</b>	<b>\$7.71</b>	<b>\$9.64</b>	<b>\$83.33</b>

\* Total husbandry cost of weaner heifers

### 3.3 Cattle price data

Cattle price is an important factor influencing profitability in any beef business, and cattle price variability adds difficulty to any budgeting and profit analysis such as contained in this report. Figure 4 shows the variability of cattle prices at the Roma saleyards from July 2014 to June 2024. The Roma saleyards is Australia's largest cattle selling centre, is approximately 400km from the Burnett and is a good guide to cattle price trends across southern Queensland.



**Figure 4** Cattle prices at the Roma saleyards from 2014 to 2024

The cattle prices used in this analysis have been determined, utilising relevant long-term data for the Roma saleyards, personal communication with cattle agents in the Burnett to identify the relationship between prices in Roma and the Burnett saleyards, and MLA over the hook data for cattle sold direct to abattoir. Average prices over the 10-year period until June 2024 were used in this analysis to reflect a long-term cattle price.

For the base strategy, the 7-month-old steers would be sold at a local saleyard, 50 km from the property. Cull heifers were also sold at a local saleyard. Cull cows and bulls would be sold to a southern Queensland (SQ) abattoir. When considering the option to sell progeny older than weaners in Section 4.1, 19-month-old feeder steers and heifers would be sold to a feedlot 150 km from the property and 31-month-old bullocks and heifers would be sent to a SQ abattoir for slaughter.

The price data applied in the herd model to calculate the net price per head of stock sold are shown in Table 9 and Table 10.

**Table 9** Male cattle price data used in the base and alternative strategies

Parameter	Steers 7 months	Steers 19 months	Steers 31 months	Cull bulls
Market	Local saleyards	Feedlot	SQ abattoir	SQ abattoir
Paddock weight (kg)	247	428	588	800
Weight loss to sale (%)	6%	6%	8%	8%
Sale weight (kg)	232	402	541	736
Price (\$/kg liveweight)	\$3.87	\$3.63	\$3.28	\$2.41
Commission (%)	4%	0%	0%	0%
Other selling costs (\$/head)	\$18	\$5	\$5	\$5
Freight (\$/head)	\$5	\$22	\$36	\$63
Gross price (\$/head)	\$899	\$1,459	\$1,774	\$1,774
Total selling and freight costs (\$/head)	\$60	\$27	\$41	\$68
<b>Net price (\$/head)</b>	<b>\$839</b>	<b>\$1,432</b>	<b>\$1,733</b>	<b>\$1,706</b>

**Table 10** Female cattle price data used in the base and alternative strategies

Parameter	Heifers 12 months	Heifers 19 months	Heifers 31 months	Cows 3+ years
Market	Local saleyards	Feedlot	SQ abattoir	SQ abattoir
Paddock weight (kg)	274	408	560	500
Weight loss to sale (%)	6%	6%	8%	8%
Sale weight (kg)	257	384	515	460
Price (\$/kg liveweight)	\$3.16	\$3.34	\$3.21	\$2.84
Commission (%)	4%	0%	0%	0%
Other selling costs (\$/head)	\$18	\$5	\$5	\$5
Freight (\$/head)	\$5	\$21	\$34	\$31
Gross price (\$/head)	\$813	\$1,281	\$1,654	\$1,306
Total selling and freight costs (\$/head)	\$56	\$26	\$39	\$36
<b>Net price (\$/head)</b>	<b>\$757</b>	<b>\$1,255</b>	<b>\$1,615</b>	<b>\$1,270</b>

### 3.4 Herd outputs and gross margin

The sale prices, sale weights, selling costs, treatment costs and bull replacement strategy identified previously for the base management strategy were applied to the herd structure shown in Table 6 to produce the herd gross margin shown in Table 11. The herd gross margin after imputed interest of the base strategy was \$139,516.

**Table 11** Herd parameters and gross margin for the base strategy

<b>Parameter</b>	<b>Base strategy</b>
Total AE	465
Weaner heifers retained	58
Total breeders mated	271
Total breeders mated and kept	230
Total calves weaned	213
Weaners/total cows mated	78%
Female sales/total sales	48%
Total cows and heifers sold	98
Total steers and bullocks sold	106
Average female price	\$1,034
Average steer and/or bullock price	\$839
Capital value of herd	\$467,162
Imputed interest on herd value	\$23,358
Net cattle sales	\$193,095
Variable costs excluding bulls	\$19,414
Bull replacement	\$10,808
Herd gross margin	\$162,874
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>
Gross margin/AE	\$350
Gross margin/AE less interest on livestock capital	\$300

AE, adult equivalent expressed as linear weight AE.

Note: bull sales are included in net bull replacement, not net cattle sales.

### 3.5 Operating returns calculation

The additional information required to complete a profit and investment analysis includes the fixed (overhead), capital and finance expenses incurred, together with the opening and closing value of the land, plant and improvements. Table 12 gives the assumed fixed (overhead) cash costs for the property, totalling \$119,000 per year. Table 13 shows the plant inventory for the property, totalling a market value of \$177,000.

**Table 12** Annual fixed (overhead) cash costs for the base strategy

Item	Annual Cost
Admin, office, phone, accounting	\$10,000
Rates, rents	\$12,000
Electricity, power	\$7,000
Fuel and oil	\$15,000
Insurance	\$12,000
Motor vehicle expenses	\$20,000
Repairs and maintenance	\$25,000
Wages and contractors	\$10,000
Chemical regrowth control (Tordon)	\$8,000
<b>Total</b>	<b>\$119,000</b>

**Table 13** Plant inventory for the base strategy

Item	Market Value
4wd Ute	\$30,000
Tractor	\$40,000
Farm truck	\$60,000
Motor Bikes	\$10,000
Side by side	\$10,000
Slasher	\$2,000
Workshop and saddlery	\$25,000
<b>Total</b>	<b>\$177,000</b>

Non-cash items required to calculate operating profit are depreciation, which was calculated using the information in Table 13, and an allowance for the operator's labour and management which was set at \$50,000. The value of the land and fixed improvements was set at \$8,225,100, at an average of \$4,113/ha.

Results of the profit analysis for the base strategy can be seen in Table 14 with an operating profit of -\$39,296 and a return on total capital of -0.4%. No allowance for any potential capital gain in land value was included. The negative return on total capital result is evidence of a disconnect between the productive capacity of grazing land and the price of the land. Furthermore, it also reflects that many grazing families in the Burnett require off farm income to provide a reasonable cashflow.

**Table 14** Expected value of annual outcomes for base strategy

<b>Factor</b>	<b>Value</b>
Operating profit	-\$39,296
Return on total capital	-0.4%

## 4 Strategies to build profitability and resilience

The following strategies, identified by experienced industry specialists and DPI staff, are representative of practices within the region, have relevant data available for analysis and are achievable for many producers to implement should they choose.

- Optimising steer sale age and female culling.
- Planting leucaena
- Planting other legume pastures
- Grazing weaner steers on forage oats.
- Buying in replacement heifers and using *Bos taurus* bulls
- Harvesting timber

Whilst every effort was made to ensure that the assumptions used in each scenario were accurate and validated with industry participants, relevant experts or published scientific studies, the results presented should be viewed as indicative only.

### 4.1 Optimising steer sale age and female culling

#### 4.1.1 Introduction

After modelling the base property and base strategy, the next step in a Breedcow Dynama analysis is to investigate opportunities to improve profitability by changing steer and female sale ages. This was undertaken by creating new steady-state Breedcow models comparing the alternative ages of sale, whilst maintaining equivalent grazing pressure.

#### 4.1.2 Optimal steer sale age

This section compares the following steer sale age strategies.

- The base strategy of turning off steers at 7 months of age as weaners
- Turning off steers at 19 months of age as feeders
- Turning off steers at 31 months of age as bullocks

This was undertaken while maintaining grazing pressure at 465 AE and with no other change to herd management.

As the steer turn off age increases, the number of breeders mated decreases to maintain the same grazing pressure. Table 15 shows that the number of breeders mated when turning off weaners was 271, when turning off feeders was 236 and when turning off bullocks was 197.

Table 15 also shows that the herd gross margin after imputed interest was highest for the option of turning off feeder steers. The herd gross margin after imputed interest for turning off 19-month-old feeder steers was \$168,753, while for 31-month-old bullocks it was \$154,529 and for 7-month-old weaners it was \$139,516. Turning off steers older than 3 years of age is not common in the Burnett and was not considered in this analysis.

**Table 15** Herd parameters and gross margin for alternative steer turn-off ages

<b>Parameter</b>	<b>Weaner steers 247 kg (7 months) Base strategy</b>	<b>Feeder steers 428 kg (19 months)</b>	<b>Bullocks 588 kg (31 months)</b>
Total AE	465	465	465
Weaner heifers retained	58	51	42
Total breeders mated	271	236	197
Total breeders mated and kept	230	200	166
Total calves weaned	213	185	154
Weaners/total cows mated	78%	78%	78%
Female sales/total sales	48%	49%	49%
Total cows and heifers sold	98	86	71
Total steers and bullocks sold	106	91	74
Average female price	\$1,034	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,432	\$1,733
Capital value of herd	\$467,162	\$484,151	\$511,242
Imputed interest on herd value	\$23,358	\$24,208	\$25,562
Net cattle sales	\$193,095	\$220,181	\$203,469
Variable costs excluding bulls	\$19,414	\$17,816	\$15,548
Bull replacement	\$10,808	\$9,404	\$7,831
Herd gross margin	\$162,874	\$192,960	\$180,091
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$168,753</b>	<b>\$154,529</b>
Change in herd gross margin after imputed interest	\$0	\$29,237	\$15,013
Gross margin/AE	\$350	\$415	\$387
Gross margin/AE less interest on livestock capital	\$300	\$363	\$332

An investment analysis of the change from the base strategy to these alternative strategies can be found in Table 16. For turning off feeder steers, the profitability increased by \$28,927 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit was -\$27,450 and occurred in year 2 when no steers were sold, which was offset by the sale of cows that was required to maintain total AE at 465. The deficit was paid back in year 2.

For turning off bullocks, the profitability increased by \$17,986 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit was -\$64,172 and occurred in year 3 after no steers were sold for 2 years. As with the feeder steers strategy, the sale of cows that was required to maintain total AE at 465 does offset the lack of steer sales. The deficit was paid back in year 3.

**Table 16** Returns for changing from the base strategy to alternative steer turn-off ages

<b>Factor</b>	<b>Turn off feeder steers at 19 months</b>	<b>Turn off bullocks at 31 months</b>
NPV	\$444,674	\$276,496
Annualised NPV	\$28,927	\$17,986
Peak deficit (with interest)	<b>-\$27,450</b>	<b>-\$64,172</b>
Year of peak deficit	2	3
Payback period (years)	2	3
IRR	173%	na

*All terms defined in the Glossary of terms and abbreviations*

The strategy of turning off 19-month-old feeder steers was more profitable than turning off weaners or bullocks, given the assumptions made in this analysis. Turning off weaners results in running more breeders, which reduces a producer's ability to sell nonbreeding animals in dry times. Turning off bullocks provides a producer with more selling options, and the ability to sell animals earlier than planned if market prices rise sharply. Furthermore, turning off bullocks gives the producer more options to sell cattle if conditions turn dry, without selling breeders.

### 4.1.3 Optimal cow cull age

Table 17 shows the herd parameters and gross margins for cow culling ages between 10 and 13 years of age while not changing any other factor and maintaining grazing pressure at 465 AE. The herd gross margins after imputed interest for these strategies were within \$1,119 of the base strategy, indicating that for the base property where breeder fertility was high, cull cow age was not a factor that had significant influence on herd gross margin. Therefore, no investment analysis has been undertaken examining a transition from the base strategy to these strategies.

**Table 17** Herd parameters and gross margin for alternative cow cull ages

Parameter	Cull cows at 10 years	Cull cows at 11 years	Cull cows at 12 years Base strategy	Cull cows at 13 years
Total AE	465	465	465	465
Weaner heifers retained	62	60	58	57
Total breeders mated	267	269	271	273
Total breeders mated and kept	226	228	230	231
Total calves weaned	209	211	213	214
Weaners/total cows mated	78%	78%	78%	78%
Female sales/total sales	48%	48%	48%	48%
Total cows and heifers sold	96	97	98	99
Total steers and bullocks sold	104	105	106	107
Average female price	\$1,062	\$1,046	\$1,034	\$1,024
Average steer and/or bullock price	\$839	\$839	\$839	\$839
Capital value of herd	\$470,812	\$468,723	\$467,162	\$465,942
Imputed interest on herd value	\$23,541	\$23,436	\$23,358	\$23,297
Net cattle sales	\$192,187	\$192,744	\$193,095	\$193,369
Variable costs excluding bulls	\$19,368	\$19,393	\$19,414	\$19,430
Bull replacement	\$10,626	\$10,727	\$10,808	\$10,870
Herd gross margin	\$162,193	\$162,624	\$162,874	\$163,069
<b>Herd gross margin after imputed interest</b>	<b>\$138,653</b>	<b>\$139,188</b>	<b>\$139,516</b>	<b>\$139,772</b>
Change in herd gross margin after imputed interest	<b>-\$863</b>	<b>-\$328</b>	\$0	\$256
Gross margin/AE	\$349	\$350	\$350	\$351
Gross margin/AE less interest on livestock capital	\$298	\$299	\$300	\$301

#### 4.1.4 Optimal heifer cull age

Table 18 shows the herd parameters and gross margins for the following strategies for selling surplus heifers while not changing any other factor and maintaining grazing pressure at 465 AE.

- Culling heifers at 12 months (the base strategy), selling at a local saleyards
- Culling heifers at 19 months, selling direct to a feedlot
- Culling heifers at 31 months, selling to a SQ abattoir.

As the surplus heifer cull age increases, the number of breeders mated decreases to maintain the same grazing pressure. Table 18 shows that the number of breeders mated when culling surplus heifers at 12 months was 271, when culling at 19 months of age was 255 and when culling as spays at 31 months of age was 233.

**Table 18** Herd parameters and gross margin for alternative cull ages of surplus heifers

Parameter	Sell surplus heifers at 12 months Base strategy	Sell surplus heifers at 19 months	Sell surplus heifers at 31 months
Total AE	465	465	465
Weaner heifers retained	58	100	91
Total breeders mated	271	255	233
Total breeders mated and kept	230	216	197
Total calves weaned	213	200	182
Weaners/total cows mated	78%	78%	78%
Female sales/total sales	48%	48%	48%
Total cows and heifers sold	98	91	83
Total steers and bullocks sold	106	100	91
Average female price	\$1,034	\$1,278	\$1,452
Average steer and/or bullock price	\$839	\$839	\$839
Capital value of herd	\$467,162	\$472,794	\$483,156
Imputed interest on herd value	\$23,358	\$23,640	\$24,158
Net cattle sales	\$193,095	\$202,661	\$198,585
Variable costs excluding bulls	\$19,414	\$18,842	\$19,017
Bull replacement	\$10,808	\$10,145	\$9,275
Herd gross margin	\$162,874	\$173,674	\$170,293
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$150,034</b>	<b>\$146,135</b>
Change in herd gross margin after imputed interest	\$0	\$10,518	\$6,620
Gross margin/AE	\$350	\$373	\$366
Gross margin/AE less interest on livestock capital	\$300	\$323	\$314

Table 18 also shows that herd gross margin after imputed interest increased as the sale age of surplus heifers was increased to 19 months of age. The herd gross margin after imputed interest for culling surplus heifers at 12 months was \$139,516, while for 19-month-old heifers was \$150,034 and for 31-month-old heifers it was \$146,135.

An investment analysis of the change from the base strategy to both strategies can be found in Table 19. For selling surplus heifers at 19 months, the profitability increased by \$7,970 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit was -\$11,400 and occurred in year 2. The deficit was paid back in year 2.

For surplus heifers and selling them at 31 months, the profitability increased by \$8,211 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit was -\$8,969 and occurred in year 3. The deficit was paid back in year 3.

**Table 19** Returns for changing from the base strategy to alternative sale ages of surplus heifers

<b>Factor</b>	<b>Sell surplus heifers at 19 months</b>	<b>Sell surplus heifers at 31 months</b>
NPV	\$122,523	\$126,227
Annualised NPV	\$7,970	\$8,211
Peak deficit (with interest)	<b>-\$11,400</b>	<b>-\$8,969</b>
Year of peak deficit	2	3
Payback period (years)	2	3
IRR	106%	na

The options to keep heifers to 19 or 31 months does increase profitability. Furthermore, keeping heifers for an extra one or two years will reduce breeder numbers and provide a producer with more options to sell animals if conditions turn dry. However, producers may feel that keeping heifers for an extra one or two years will increase the complexity of herd management, for not enough of an increase in profitability.

It should be noted that these results show an anomaly, that selling surplus heifers at 19 months of age had a higher change in herd gross margin after imputed interest than selling surplus heifers at 31 months of age. In contrast, selling surplus heifers at 31 months of age shows a higher increase in profitability. This anomaly was caused by differences in the Breedcow+ software and Dynama software which use different rounding protocols. Breedcow+ was used to calculate gross margins and used cattle numbers with decimal places, whereas Dynama (used to calculate Annualised NPV) used whole numbers. This can create differences between the models used when examining smaller herds such as this one. For example, if Breedcow+ calculated bull purchases as 1.6, Dynama would round that up to 2.0 and change the associated cash costs.

This analysis provides a guide to producers that suggests selling surplus heifers older than the base strategy of 12 months should increase longer term profitability. Producers considering this must do their own calculations to see if this holds true for their situation and at what age the surplus heifers should be sold.

## 4.2 Planting legumes

### 4.2.1 Introduction

Introducing legumes into pastures can increase pasture productivity, utilisation, carrying capacity, and liveweight gains. Legumes such as desmanthus, stylo and siratro are often found as part of improved pastures in the Burnett. The base property in this analysis was assumed to have improved pasture within the 'blue gums on alluvial plains' country that includes stylo, siratro, as well as Rhodes grass and panics.

Another legume, leucaena, is highly significant to the Queensland beef industry with foliage of high nutritive value for ruminant production (Shelton et al. 2021). Leucaena is a deep-rooted legume that is more drought tolerant than shallow rooted grasses. It also contributes nitrogen to the soil that can be accessed by other pasture species. This promotes more productive pasture grasses and overall quantity and quality of feed available for stock. In a recent economic study of the opportunity for increased use of legumes in Queensland's brigalow belt, leucaena showed the highest increase in profitability of all the legumes investigated (Thompson et al. 2025).

Planting leucaena is a long-term strategy and producers need to be aware of all the implications. To ensure healthy plants for the long term, leucaena establishment needs to be carefully planned and implemented using information and advice from various sources including the DPI. The leucaena also needs to be managed correctly including fertilising if required and pruning. Pruning is essential to reduce the height of the plant which allows stock to utilise the leaf. Pruning also assists grazing management to reduce the chance of the plant setting seed and the risk of unmanageable plants becoming an environmental weed.

The establishment costs and the prevalence of frosts, which reduce the productivity of leucaena, has resulted in a relatively low uptake of leucaena in the Burnett. However, with careful planning and management, introducing leucaena into the base property was worthy of analysis, especially since it will increase carrying capacity and a producer's confidence to grow out steers to feeders rather than sell them as weaners.

The strategies for planting legumes that are analysed in the following sections are listed below.

- Leucaena and existing improved pasture on frost free blue gum country
- Leucaena and existing improved pasture on frost prone blue gum country
- Leucaena and new improved pasture on the 'ironbark on good soils' country
- Leucaena and native grass on the 'ironbark on good soils' country
- Planting other legume pastures using cultivation on the ironbark on good soils
- Planting legume pastures using burning and aerial seeding on the ironbark on good soils

### 4.2.2 Leucaena and existing improved pasture within frost free blue gum country

Leucaena is usually planted on the better country of a property. In this base property, that was the 'blue gums on alluvial plains', that had existing improved pasture of Rhodes grass, panics, stylo and siratro. One potential issue with blue gum country in the Burnett is that it might be frost prone. With this in mind, this section examines leucaena and existing improved pasture on frost free blue gum country. The next section examines this strategy on frost prone blue gum country.

The leucaena establishment method was to cultivate 5m strips and leave a 5m uncultivated strip between the cultivated strips. Leucaena was planted in the middle of the cultivated strips, so there

was 10m between the leucaena rows. Seeding rate was 2kg/ha and the establishment cost was \$430/ha. This land type was assumed to not be phosphorus (P) deficient, so no fertiliser was applied.

The leucaena was used for growing out steers from weaning until they were 19 months of age. To do this 92 ha of leucaena needed to be planted. The weight gain for a steer on this leucaena country was 235kg per year when established. The carrying capacity of the property increased to 492 AE, which was 27 AE more than the base property. The carrying capacity on the leucaena was zero in the year after planting, 50% in the second year and 100% in the third and subsequent years.

Table 20 shows the herd parameters and gross margins for this strategy. It shows that the herd gross margin after imputed interest was \$189,574, an increase of \$50,058 over the base strategy. The number of breeders mated decreases from 271 to 252.

**Table 20** Herd parameters and gross margin for the leucaena and existing improved pasture strategy, within frost free blue gum country and steers sold at 19 months of age

<b>Parameter</b>	<b>Base strategy</b>	<b>Leucaena &amp; existing improved pasture on frost free blue gum</b>
Total AE	465	492
Weaner heifers retained	58	54
Total breeders mated	271	252
Total breeders mated and kept	230	213
Total calves weaned	213	197
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	49%
Total cows and heifers sold	98	91
Total steers and bullocks sold	106	97
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,539
Capital value of herd	\$467,162	\$515,752
Imputed interest on herd value	\$23,358	\$25,788
Net cattle sales	\$193,095	\$244,862
Variable costs excluding bulls	\$19,414	\$19,483
Bull replacement	\$10,808	\$10,018
Herd gross margin	\$162,874	\$215,362
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$189,574</b>
Change in herd gross margin after imputed interest	\$0	\$50,058
Gross margin/AE	\$350	\$438
Gross margin/AE less interest on livestock capital	\$300	\$385

With a strategy such as this, with a major capital investment and a time lag for production to improve, it is essential to undertake an investment analysis of the change from the base strategy to this strategy. The results of this analysis can be found in Table 21.

This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total planting cost of \$39,559, a cost of replanting 10% of the area in year 3 and pruning costs of \$100/ha every 5 years.

Profitability increased by \$29,925 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit during implementation was \$116,678 which occurred in year 5, with a payback period of 7 years and an IRR of 33%.

**Table 21** Returns for changing from the base strategy to the leucaena and existing improved pasture strategy, within frost free blue gum country and steers sold at 19 months of age

<b>Factor</b>	
NPV	\$460,026
Annualised NPV	\$29,925
Peak deficit (with interest)	-\$116,678
Year of peak deficit	5
Payback period (years)	7
IRR	33%

### 4.2.3 Leucaena and existing improved pasture within frost prone blue gum country

The blue gum country of this base property could be prone to frosts in winter, which will reduce the productivity of the leucaena. Both the liveweight gain and carrying capacity were lower for this leucaena, than if it was planted on frost free country.

Table 22 shows the herd parameters and gross margins for this strategy. It shows that the herd gross margin after imputed interest was \$183,098, an increase of \$43,582 over the base strategy. The number of breeders mated decreases from 271 to 249.

**Table 22** Herd parameters and gross margin for the leucaena and existing improved pasture strategy, within frost prone blue gum country and steers sold at 19 months of age

Parameter	Base strategy	Leucaena & existing improved pasture on frost prone blue gum
Total AE	465	485
Weaner heifers retained	58	53
Total breeders mated	271	249
Total breeders mated and kept	230	211
Total calves weaned	213	195
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	49%
Total cows and heifers sold	98	90
Total steers and bullocks sold	106	95
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,493
Capital value of herd	\$467,162	\$509,915
Imputed interest on herd value	\$23,358	\$25,496
Net cattle sales	\$193,095	\$237,761
Variable costs excluding bulls	\$19,414	\$19,262
Bull replacement	\$10,808	\$9,905
Herd gross margin	\$162,874	\$208,594
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$183,098</b>
Change in herd gross margin after imputed interest	\$0	\$43,583
Gross margin/AE	\$350	\$430
Gross margin/AE less interest on livestock capital	\$300	\$377

The leucaena establishment, costs and management were the same as in the frost-free blue gum country, described in Section 4.2.2. However, the weight gain for a steer on leucaena on frost prone country was 220kg per year when established. This leucaena was used by growing out steers from weaning until they were 19 months of age. To do this 98 ha of leucaena needed to be planted. The carrying capacity of the property increased to 485 AE, 20 AE more than the base property. The carrying capacity on the leucaena was zero in the first year after planting, 50% in the second year and 100% in the third and subsequent years.

The results of an investment analysis can be found in Table 23. This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total planting cost of \$42,139, a cost of replanting 10% of the area in year 3 and pruning costs of \$100/ha every 5 years.

Profitability increased by \$25,200 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit during implementation was \$126,423 which occurred in year 5, with a payback period of 8 years and an IRR of 28%.

**Table 23** Returns for changing from the base strategy to the leucaena and existing improved pasture strategy, within frost prone blue gum country and steers sold at 19 months of age

Factor	
NPV	\$387,391
Annualised NPV	\$25,200
Peak deficit (with interest)	-\$126,423
Year of peak deficit	5
Payback period (years)	8
IRR	28%

#### 4.2.4 Leucaena and new improved pasture within the 'ironbark on good soils' country

Leucaena is usually planted on the better country, such as the blue gum country found on this base property. Leucaena could also be grown on some of the land types that make up the grouping 'ironbark on good soils' that have good soil depth. Producers considering this strategy should seek advice from the DPI to make sure their land is suitable.

Table 24 shows the herd parameters and gross margins for this strategy. It shows that the herd gross margin after imputed interest was \$194,496, an increase of \$54,980 over the base strategy. The number of breeders mated decreases from 271 to 258.

**Table 24** Herd parameters and gross margin for the leucaena and new improved pasture strategy, within the 'ironbark on good soils' country and steers sold at 19 months of age

Parameter	Base strategy	Leucaena new improved pasture on ironbark (good)
Total AE	465	505
Weaner heifers retained	58	55
Total breeders mated	271	258
Total breeders mated and kept	230	218
Total calves weaned	213	202
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	49%
Total cows and heifers sold	98	93
Total steers and bullocks sold	106	99
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,539
Capital value of herd	\$467,162	\$529,142
Imputed interest on herd value	\$23,358	\$26,457
Net cattle sales	\$193,095	\$251,219
Variable costs excluding bulls	\$19,414	\$19,988
Bull replacement	\$10,808	\$10,278
Herd gross margin	\$162,874	\$220,953
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$194,496</b>
Change in herd gross margin after imputed interest	\$0	\$54,980
Gross margin/AE	\$350	\$438
Gross margin/AE less interest on livestock capital	\$300	\$385

The establishment method was to cultivate 85% of the land area, assuming 15% of the area was trees and obstacles. Leucaena was planted in rows with a 10m gap between rows. Pasture was planted in 5m strips between the leucaena rows. Seeding rate was leucaena 2kg/ha and grasses 10kg/ha (Rhodes grass 20%, Gatton panic 40% and Bisset creeping bluegrass 40%). The establishment cost was \$631/ha. This land type was assumed to have a P level of 12 mg/kg colwell, and 120kg of DAP was applied to the leucaena strips at planting.

This leucaena was used by growing out steers from weaning until they were 19 months of age. To do this 112 ha of leucaena needed to be planted. The weight gain for a steer on this leucaena country when established was 235kg per year. The carrying capacity of the property increased to 505 AE, 40 AE more than the base property. The carrying capacity on the leucaena was zero in the first year after planting, 50% in the second year and 100% in the third and subsequent years.

The results of an investment analysis can be found in Table 25. This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total planting cost of \$70,408, a cost of replanting 10% of the area in year 3, pruning costs of \$100/ha every 5 years along with fertilising costs of \$24,015 every five years (DAP applied at 178 kg/ha).

Profitability increased by \$30,384 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit during implementation was -\$152,700 which occurred in year 5, with a payback period of 8 years and an IRR of 24%.

**Table 25** Returns for changing from the base strategy to the leucaena and new improved pasture strategy, within the 'ironbark on good soils' country and steers sold at 19 months of age

Factor	
NPV	\$467,084
Annualised NPV	\$30,384
Peak deficit (with interest)	-\$152,700
Year of peak deficit	5
Payback period (years)	8
IRR	24%

## 4.2.5 Leucaena and native grasses within the ‘ironbark on good soils’ country

This strategy is similar to the previous strategy, but without planting improved pastures and leaving native pasture between the leucaena. Producers considering this strategy should seek advice from the DPI to make sure their land is suitable for leucaena.

Table 26 shows the herd parameters and gross margins for this strategy. It shows that the herd gross margin after imputed interest was \$186,553, an increase of \$47,037 over the base strategy. The number of breeders mated decreases from 271 to 253.

**Table 26** Herd parameters and gross margin for the leucaena and native grasses strategy, within the ‘ironbark on good soils’ country and steers sold at 19 months of age

Parameter	Base strategy	Leucaena & native pasture on ironbark (good)
Total AE	465	494
Weaner heifers retained	58	54
Total breeders mated	271	253
Total breeders mated and kept	230	215
Total calves weaned	213	199
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	49%
Total cows and heifers sold	98	92
Total steers and bullocks sold	106	97
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,493
Capital value of herd	\$467,162	\$522,855
Imputed interest on herd value	\$23,358	\$25,977
Net cattle sales	\$193,095	\$242,247
Variable costs excluding bulls	\$19,414	\$19,626
Bull replacement	\$10,808	\$10,092
Herd gross margin	\$162,874	\$212,530
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$186,553</b>
Change in herd gross margin after imputed interest	\$0	\$47,037
Gross margin/AE	\$350	\$430
Gross margin/AE less interest on livestock capital	\$300	\$377

Establishment method was to cultivate 5m strips and leave a 5m uncultivated strip between the cultivated strips. Leucaena was planted in the cultivated strips, so that there was 10m between the leucaena rows. Seeding rate was 2kg/ha and the establishment cost was \$433/ha. This land type was assumed to have a P level of 12 mg/kg colwell, and 120kg of DAP was applied to the leucaena strips at planting.

This leucaena was utilised by growing out steers from weaning until they were 19 months of age. To do this 130 ha of leucaena needed to be planted. The weight gain for a steer on this leucaena country when established was 220kg per year. The carrying capacity of the property increased to 494 AE, 29 AE more than the base property. The carrying capacity on the leucaena was zero in the first year after planting, 50% in the second year and 100% in the third and subsequent years.

The results of an investment analysis can be found in Table 27. This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total planting cost of \$56,256, a cost of replanting 10% of the area in year 3, pruning costs of \$100/ha every 5 years and fertilising at \$182/ha every five years (DAP applied at 148 kg/ha).

Profitability increased by \$24,242 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit during implementation was \$135,338 which occurred in year 5, with a payback period of 8 years and an IRR of 23%.

**Table 27** Returns for changing from the base strategy to the leucaena and native grasses strategy, within the 'ironbark on good soils' country and steers sold at 19 months of age

Factor	
NPV	\$372,661
Annualised NPV	\$24,242
Peak deficit (with interest)	-\$135,338
Year of peak deficit	5
Payback period (years)	8
IRR	23%

#### 4.2.6 Planting other legume pastures using cultivation within the ‘ironbark on good soils’ country

This analysis had considered two strategies to introducing other legumes into the ironbark on good soil types of the base property (1) cultivating in strips, and (2) burn existing pasture and aerial seeding. This section analyses the cultivating in strips option, which involved cultivating 5m strips and planting desmanthus and stylo seed, which will increase the carrying capacity and growth rates of this area and give the producer greater confidence to grow out steers to 19 months of age.

Table 28 shows the herd parameters and gross margins for high-cost cultivation strategy. It shows that the herd gross margin after imputed interest was \$184,438, an increase of \$44,922 over the base strategy. The number of breeders mated decreases from 271 to 254.

**Table 28** Herd parameters and gross margin planting legume pastures using cultivation within the ‘ironbark on good soils’ country and steers sold at 19 months of age

Parameter	Base strategy	Legume pasture using cultivation on ironbark (good)
Total AE	465	494
Weaner heifers retained	58	54
Total breeders mated	271	254
Total breeders mated and kept	230	215
Total calves weaned	213	199
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	49%
Total cows and heifers sold	98	92
Total steers and bullocks sold	106	97
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,466
Capital value of herd	\$467,162	\$519,578
Imputed interest on herd value	\$23,358	\$25,979
Net cattle sales	\$193,095	\$239,629
Variable costs excluding bulls	\$19,414	\$19,120
Bull replacement	\$10,808	\$10,092
Herd gross margin	\$162,874	\$210,417
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$184,438</b>
Change in herd gross margin after imputed interest	\$0	\$44,923
Gross margin/AE	\$350	\$426
Gross margin/AE less interest on livestock capital	\$300	\$373

The pasture establishment method was to cultivate 5m strips and leave a 5m uncultivated strip between the cultivated strips. Desmanthus and stylo will then be planted in the cultivated strips at a seeding rate of 2kg/ha of uncoated seed (desmanthus 50% and caatinga stylo 50%). The establishment cost was \$266/ha. This land type was assumed to have a P level of 12 mg/kg colwell, and 45kg of DAP was applied to the legume strips.

This improved pasture was used by growing out steers from weaning until they were 19 months of age. To do this 130 ha of desmanthus and stylo needed to be planted. The weight gain for a steer on this improved country when established was 210kg per year. The carrying capacity of the property increased to 494 AE, 29 AE more than the base property. The carrying capacity on this area was zero in the first year, 50% in the second year, 75% in the third year and 100% in the fourth and subsequent years.

The results of an analysis can be found in Table 29. This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total planting cost of \$34,523, a cost of replanting 10% of the area in year 3 and fertilising at \$179/ha every five years.

Profitability increased by \$28,129 per year (measured as Annualised NPV) as a result of adopting this strategy. The peak deficit during this implementation was \$76,145 which occurred in year 4, with a payback period of 7 years and an IRR of 35%.

**Table 29** Returns for changing from the base strategy to planting legume pastures using cultivation within the 'ironbark on good soils' country and steers sold at 19 months of age

Factor	
NPV	\$432,416
Annualised NPV	\$28,129
Peak deficit (with interest)	-\$76,145
Year of peak deficit	4
Payback period (years)	7
IRR	35%

#### 4.2.7 Planting legume pastures using burning and aerial seeding within the 'ironbark on good soils' country

This section analyses the lowest-cost legume establishment option, which involved burning the native pasture and then aerial seeding of desmanthus and stylo which will result in a lower increase in the carrying capacity than the cultivating strips option. This strategy is appealing to many producers because of the lower capital cost but has a high risk of poor legume establishment.

Table 30 shows the herd parameters and gross margins for this strategy. It shows that the herd gross margin after imputed interest was \$141,035, an increase of \$1,519 over the base strategy. The number of breeders mated increased from 271 to 274.

**Table 30** Herd parameters and gross margin for planting legume pastures using burning and aerial seeding within the 'ironbark on good soils' country with steers sold as weaners

Parameter	Base strategy	Legume pasture using aerial seeding on ironbark (good)
Total AE	465	470
Weaner heifers retained	58	59
Total breeders mated	271	274
Total breeders mated and kept	230	232
Total calves weaned	213	215
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	48%
Total cows and heifers sold	98	99
Total steers and bullocks sold	106	107
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$839
Capital value of herd	\$467,162	\$472,251
Imputed interest on herd value	\$23,358	\$23,613
Net cattle sales	\$193,095	\$195,199
Variable costs excluding bulls	\$19,414	\$19,625
Bull replacement	\$10,808	\$10,925
Herd gross margin	\$162,874	\$164,648
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$141,035</b>
Change in herd gross margin after imputed interest	\$0	\$1,520
Gross margin/AE	\$350	\$350
Gross margin/AE less interest on livestock capital	\$300	\$300

The pasture establishment method was to burn the area and aerial seed 50% desmanthus and 50% stylo at 2 kg/ha. The establishment cost was \$112/ha. No fertiliser was applied.

This strategy will increase pasture quality and increase the carrying capacity of the property to 470 AE, 5 AE more than the base strategy. Given the small increase in carrying capacity, this strategy will continue to turn off weaners. The area of country aerial seeded has been nominally set at 130 ha, the same as the area seeded using cultivation. The carrying capacity on this area was zero in the first year, 50% in the second year, 75% in the third year and 100% in the fourth and subsequent years.

The results of this analysis can be found in Table 31. This investment analysis models the changing herd and sale numbers over the establishment years. It also includes the total fire and seeding cost \$14,495.

Profitability decreases by \$945 per year (measured as Annualised NPV) as a result of adopting this strategy. The benefits of the extra carrying capacity does not outweigh the cost of establishment.

**Table 31** Returns for changing from the base strategy to planting legume pastures using burning and aerial seeding within the ‘ironbark on good soils’ country with steers sold as weaners

Factor	
NPV	-\$14,532
Annualised NPV	-\$945
Peak deficit (with interest)	na
Year of peak deficit	na
Payback period (years)	na
IRR	na

#### 4.2.8 Discussion

The legume strategies that involved cultivation that have been analysed in this section increase profitability by between \$24,242 and \$30,384 per year (measured as Annualised NPV). The capital investment and a time lag for improved production create significant cashflow impacts and peak deficits of up to \$152,700.

Any leucaena strategy needs to be carefully planned and implemented and producers should seek advice from the DPI to make sure their land is suitable for leucaena. Of all the leucaena strategies, the planting leucaena and new improved pasture within the ‘ironbark on good soils’ country provides the highest herd gross margin after imputed interest but at the highest establishment cost. This results in the highest peak deficit, for which producers will need to plan and manage.

## 4.3 Grazing weaner steers on forage oats

### 4.3.1 Introduction

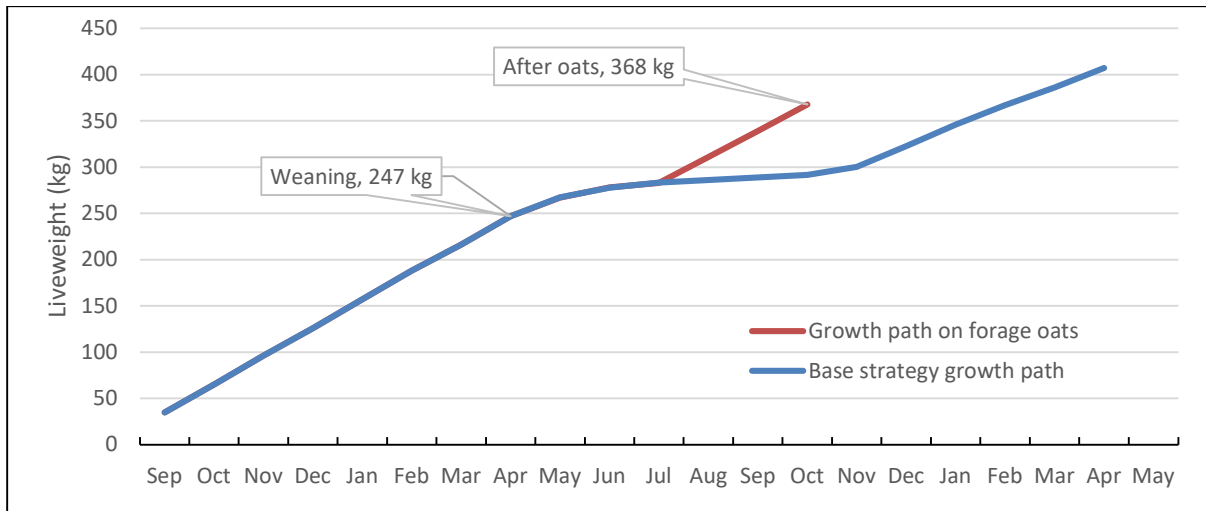
Grazing cattle on forage oats has occurred on some properties in the Burnett over past years. However, with the increase in input costs and changing winter rainfall patterns, many producers now question the economic viability of this strategy. Furthermore, similar reports for other regions in Queensland, such as the Maranoa, have found that changing to a strategy of grazing forage oats decreased profitability (Murphy *et al.* 2024).

For this strategy, weaner steers were grazed on forage oats and then sold, rather than being sold at weaning time. Forage oats were assumed to be grazed for 85 days, from July to September. The steers gained 1.0 kg/day on forage oats and were stocked at 0.6 ha per weaner steer. A contractor was used to prepare and plant the forage oats crop. The land area allocated to forage oats was assumed to be ready for cropping, therefore required no development costs and would be fallow in between crops. The costs of the forage oats crop can be found in Table 32.

**Table 32** Growing costs of forage oats

Variable Costs	QTY	RATE	COST	TOTAL (\$/ha)
<b>Fallow Management</b>				
Operation: sprayer (Contractor)	3		\$14.87 /ha	45
Herbicide: Glyphosate 450 CT	2	2.0 L/ha	\$4.80 /L	19
Herbicide: 2,4-D Amine 625	2	0.3 L/ha	\$6.50 /L	4
Herbicide: Starane Advanced	2	0.3 L/ha	\$23.50 /L	14
Herbicide: Glyphosate 450 CT	1	1.2 L/ha	\$4.80 /kg	6
Ammonia sulphate & surfactant	3		\$3.10 /ha	9
			TOTAL	97
<b>Planting</b>				
Seed		40 kg/ha	\$1.80 /kg	72
Operation: planter (Contractor)	1		\$61.11 /ha	61
			TOTAL	133
<b>Plant Nutrition</b>				
Nutrient: Urea		100 kg/ha	\$0.75 /kg	75
Nutrient: Granulock Z		40 kg/ha	\$1.30 /kg	52
Operation: Spreader (Contractor)	1		\$17.01 /ha	17
			TOTAL	144
<b>Total Variable Costs</b>				<b>\$374</b>

Grazing all weaner steers on forage oats, required 58 ha of forage oats, which reduced the capacity of the rest of the property by 26 AE to 436 AE. The weaner steers had an average weight of 283 kg before grazing forage oats and after grazing forage oats the sale weight was 368kg. The growth paths for the base strategy and the oats strategy are displayed in Figure 5.



**Figure 5** Estimated average steer growth paths for the base strategy and weaners on forage oats

Seasonal conditions do not allow for forage oats to be planted every year. After consultation with local producers and service providers, and reviewing rainfall data, it has been assumed that conditions will allow forage oats to be grown as described above in 5 out of 10 years. In 3 out of 10 years the days of grazing were reduced, steers were sold earlier at lower weights and the cost of oats remains the same. In 2 out of 10 years forage oats were not grown, steers were sold at weaning, and the fallow management costs of forage oats were still incurred. Weighted averages were calculated for the cost of forage oats, the sale weights of steers and the steer sale price, given these range of outcomes. See Table 33.

**Table 33** Weighted average of forage oats parameters

Parameter	Good forage oats yield 5 in 10 years	Reduced forage oats yield 3 in 10 years	Forage oats not planted 2 in 10 years	Weighted average
Cost of forage oats \$/ha	\$374	\$374	\$97	\$338
Grazing days	85	65	0	
Average sale weight (kg)	368	348	247	338
Steer sale price (\$/kg)	\$3.75	\$3.75	\$3.87	\$3.77

### 4.3.2 Results and discussion

Table 34 shows the herd gross margin after imputed interest of the base strategy was \$139,516, and this increased by \$14,797 to \$154,313 when the steers on forage oats strategy was implemented. Full details of the herd parameters and gross margins for the strategy can be found in Table 35.

However, Table 34 also shows that the increased herd gross margin after imputed interest was less than the cost of growing forage oats. The net result for the strategy to feed steers on forage oats was - \$3,679.

**Table 34** Herd gross margin and the cost of growing forage oats

Parameter	Base strategy	Forage oats strategy
Herd gross margin after imputed interest	\$139,516	\$154,313
Difference in herd gross margin after imputed interest		\$14,797
Area of forage oats required (ha)		58
Cost of forage oats		\$18,476
Net result		<b>-\$3,679</b>

Some producers may be able to grow forage oats at a lower cost than shown in Table 32 by owning their own equipment and using their own labour to prepare and plant the forage oats. This approach does not come without its own costs, with increased capital investment, machinery depreciation and labour costs (either paid or unpaid) that when fully considered, may generate a forage oats growing cost similar to what is described in Table 32.

**Table 35** Herd parameters and gross margin for grazing weaner steers on forage oats strategies

Parameter	Base strategy	Forage oats strategy
Total AE	465	436
Weaner heifers retained	58	53
Total breeders mated	271	247
Total breeders mated and kept	230	209
Total calves weaned	213	193
Weaners/total cows mated	78%	78%
Female sales/total sales	48%	48%
Total cows and heifers sold	98	89
Total steers and bullocks sold	106	97
Average female price	\$1,034	\$1,034
Average steer and/or bullock price	\$839	\$1,126
Capital value of herd	\$467,162	\$424,206
Imputed interest on herd value	\$23,358	\$21,210
Net cattle sales	\$193,095	\$202,966
Variable costs excluding bulls	\$19,414	\$17,629
Bull replacement	\$10,808	\$9,814
Herd gross margin	\$162,874	\$175,523
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$154,313</b>
Change in herd gross margin after imputed interest	\$0	\$14,797
Gross margin/AE	\$350	\$403
Gross margin/AE less interest on livestock capital	\$300	\$354

An investment analysis of the change from the base strategy to the strategy of growing and feeding oats to steers can be found in Table 36. The profitability decreases by \$4,288 per year (measured as Annualised NPV) as a result of adopting this strategy. Given the negative results, peak deficit, payback period and IRR calculations were not undertaken.

**Table 36** Returns for feeding oats to weaner steers

Factor	Forage oats strategy
NPV	-\$65,917
Annualised NPV	-\$4,288
Peak deficit (with interest)	na
Year of peak deficit	na
Payback period (years)	na
IRR	na

The increase in gross margin after imputed interest resulting from grazing weaner steers on forage oats does not cover the cost of growing the oats. This is supported by previous studies that show grazing forage oats reduced profitability (Murphy 2024). While the oats are growing, there is a large amount of feed available for three months. However, this country will not produce much feed of significance over summer, since all the pasture would be eradicated to grow a good oats crop, and hence have little grazing value. Producers need to be very clear of the benefits of the oats and the lost pasture utilisation before adopting a strategy of grazing oats.

## 4.4 Buying in replacement heifers and using *Bos taurus* bulls

### 4.4.1 Introduction

The prevalence of cattle ticks in the Burnett has resulted in cattle herds that include a high percentage of *Bos indicus* genetics. This comes at a cost in the marketplace, with *Bos taurus* cattle usually selling for higher prices than *Bos indicus* cattle when being sold for slaughter. There has been an increase in *Bos taurus* breeds, such as Angus, in the Burnett as producers seek strategies to increase their profits.

This option involved changing the herd from a self-replacing one, to a herd where the required replacement heifers were bought in. These bought in replacement heifers would be of similar genetic make up to the base herd, being approximately 50% *Bos indicus*.

Now that the herd no longer needs to breed and raise its own replacement heifers, *Bos taurus* bulls, for instance Charolais, Angus or Simmental, could be used in the herd to breed progeny with increased growth rates and that could achieve a higher price in the marketplace.

It was assumed that steer growth rates from birth to weaning was 1.1 kg per day, rather than the 1.0 kg per day in the base strategy. As a result, steers would be weaned and sold at 269 kg rather than 247 kg in the base strategy. Heifers would grow 5% slower than the steers and be sold at weaning at 255 kg. The sale price of weaners was assumed to be 20 c/kg higher than in the base strategy for both steers and heifers.

Two-and-a-half-year-old Pregnancy Tested In Calf (PTIC) replacement heifers were purchased each year for \$1,800 each. The purchase price of replacement bulls has been increased from \$8,000 to \$10,000. Tick treatments for these bulls have been included in herd costs of the analysis.

### 4.4.2 Results and discussion

Table 37 shows the herd parameters and gross margins for this strategy. The implementation of this strategy results in an increased number of breeders, since no replacement heifers were being raised on the property. The result was that the number of breeders mated increased from 271 in the base strategy to 366 in this strategy, while maintaining AE at 465.

The increase in breeder numbers, the sale of all weaner heifers and the extra 20 c/kg price premium for weaners results in net cattle sales increasing from \$193,095 to \$297,302. However, this comes at a cost. The cost of replacement heifers was \$118,800 per year and this results in the herd gross margin after imputed interest of this strategy being \$22,265 lower than that of the base strategy.

If the weaner price premium was increased to 30 c/kg, the herd gross margin after imputed interest of this strategy was still \$16,195 lower than that of the base strategy.

**Table 37** Herd parameters and gross margin for buying in replacement heifers and using *Bos taurus* bulls

<b>Parameter</b>	<b>Base strategy Turn off at 7 months</b>	<b>Buy in heifers, use <i>Bos taurus</i> bulls, Turn off at 7 months</b>
Total AE	465	465
Weaner heifers retained	58	0
Total breeders mated	271	366
Total breeders mated and kept	230	288
Total calves weaned	213	268
Weaners/total cows mated	78%	80%
Female sales/total sales	48%	59%
Total cows and heifers sold	98	193
Total steers and bullocks sold	106	134
Average female price	\$1,034	\$909
Average steer and/or bullock price	\$839	\$884
Capital value of herd	\$467,162	\$457,401
Imputed interest on herd value	\$23,358	\$22,870
Net cattle sales	\$193,095	\$297,302
Variable costs excluding bulls	\$19,414	\$21,488
Bull replacement	\$10,808	\$16,894
Heifer replacement	\$0	\$118,800
Herd gross margin	\$162,874	\$140,120
<b>Herd gross margin after imputed interest</b>	<b>\$139,516</b>	<b>\$117,251</b>
Change in herd gross margin after imputed interest	\$0	-\$22,265
Gross margin/AE	\$350	\$301
Gross margin/AE less interest on livestock capital	\$300	\$252

An investment analysis of the change from the base strategy to this strategy can be found in Table 38. Profitability decreases by \$8,672 per year (measured as Annualised NPV) as a result of adopting this strategy. Given the negative result, peak deficit, payback period and IRR calculations were not undertaken.

**Table 38** Returns for changing from the base strategy to buying in replacement heifers and using *Bos taurus* bulls

Factor	
NPV	-\$133,304
Annualised NPV	-\$8,672
Peak deficit (with interest)	na
Year of peak deficit	na
Payback period (years)	na
IRR	na

In this strategy, using the assumptions outlined above, the cost of buying in heifers outweighs the benefits of increased weaner sale price per kg and the increased weight gain. If a producer could source good two-and-a-half-year-old PTIC heifers for a lower price than the assumed price of \$1,800 each, this strategy might be more profitable than the base strategy. However, heifers that are offered for sale substantially cheaper than \$1,800 may well be in poor condition and not ready to provide a calf in the first year. Any extra time required for the heifer to become a productive breeder will erode any savings in buying a less expensive heifer.

## 4.5 Harvesting timber

### 4.5.1 Introduction

Figure 1, back in section 1.1, shows that 52% of the Burnett land area consists of the broad land types of 'ironbark on granite' and 'ironbark on good soils'. The timber on these and other land types in the Burnett, create the opportunity for land holders to harvest this timber in a way that will not disrupt the grazing operations of their properties.

The Burnett region has an extensive supply of native hardwood forests on private property that is available for timber production under the *Vegetation Management Act 1999*. The recent restrictions in access to native hardwood forests on public lands in Queensland has created greater interest in accessing and managing similar forests on private lands. This may prove to be a viable potential income source for graziers who have hardwood timber on their property

Managing stands of native hardwood for silvopasture, the practice of managing trees, pasture and livestock in a mutually beneficial way, can lead to an ongoing income source with the management leading to improved income from higher value trees in future harvest cycles (Shulke 2022).

A critical factor that land holders need to be aware of, is the categorisation of their land, under the *Vegetation Management Act 1999* (DNRM, 2014). The Act defines native forest in Queensland as either remnant regional ecosystems (Category B), regrowth ecosystems (Category C or R), or non-remnant forests (Category X). Category X forests are not regulated, allowing for thinning or clearing. Category X classification allows greater management flexibility and offers landholders stronger confidence in terms of the sovereign risk of having future management options impeded by changed rules in land use (Francis et al 2022).

This section has analysed a strategy to harvest timber from 900ha of the property, primarily from the ironbark land types. All operations of this strategy were undertaken by contractors and follows all legal requirements and industry best practice. It was assumed that no capital investment was required.

The net income from a timber harvest has been assumed to be \$110 per cubic metre (on farm) for native hardwood, with an estimated yield of 4 cubic meters per hectare. This would give a net income of \$440/ha for a managed timber harvest. All timber harvesting and cartage costs were covered by the timber mill. The distance from the farm to the mill will impact the timber price.

The strategy was to harvest timber in three phases, with 300ha harvested in year 1, another 300ha in year 9 and the final 300ha in year 17. This rotation will continue with the original 300ha being harvested again in year 25. It may be possible for the entire 900ha to be harvested in year 1, which could better suit the landowners cashflow needs.

Best management practice would be to thin the forested areas every 8 years. This has been included in the years that harvesting takes place (years 1, 9, 17 and 25) for the 600ha that were not being harvested. The cost for a contractor has been assumed to be \$150/hour for 30 hours at a total of \$4,500 per thinning.

With the harvesting and thinning of trees, there is the opportunity to increase pasture production and stocking rates. Landholders can take the opportunity to plant improved grasses and legumes, especially in areas where soil has been disturbed by timber harvest activities. It was assumed in this analysis that the beef cattle grazing operation of this property will neither increase nor decrease due to this strategy.

There is a risk of timber contractors leaving land in poor condition and not paying money owing to landholders. Significant effort is required by the landholder in building personal and contractual relationships with contractors and keeping up to date with legislative requirements.

## 4.5.2 Results and discussion

This strategy has been modelled to not affect the beef grazing operation and as such, the herd parameters and gross margins do not change. Table 39 outlines net income and thinning costs of the timber harvesting strategy.

**Table 39** Net income and costs for harvesting timber

Year	Net income from timber harvest	Cost of thinning
1	\$132,000	-\$4,500
9	\$132,000	-\$4,500
17	\$132,000	-\$4,500
25	\$132,000	-\$4,500

An investment analysis of the change from the base strategy to the timber harvesting strategy can be found in Table 40. Profitability increased by \$18,394 per year (measured as Annualised NPV) as a result of adopting this strategy. The timber income in year 1 from the initial harvest means that there was no peak deficit, and payback period and IRR calculations were not relevant.

**Table 40** Returns for changing from the base strategy to harvesting timber

Factor	
NPV	\$282,757
Annualised NPV	\$18,394
Peak deficit (with interest)	na
Year of peak deficit	na
Payback period (years)	na
IRR	na

While for most landholders, with a property similar to the base property, would see themselves as cattle producers, they may be missing out on an opportunity to boost cashflow by harvesting timber. The need to build personal and contractual relationships with contractors, as well as immersing themselves in the legislative requirements of vegetation management may prove to be a deterrent for some landholders. However, if this strategy was implemented well, the cashflow from the timber harvest could be of great benefit to the landholder and increase profitability by \$18,394 per year when averaged over the 30 years of this analysis.

## 5 Conclusions

This report has examined several alternative strategies that could be used by producers to build profitability and resilience. Whilst every effort was made to ensure the assumptions used in each scenario were accurate and validated with industry participants, relevant experts or published scientific studies, the results presented should be viewed as indicative only. The following are some conclusions and considerations for producers.

A 30-year analysis of the 2,000 hectare base property when running a self-replacing breeding cattle herd and turning off steers as weaners, calculated an operating profit of -\$39,296. This calculation includes the non-cash allowances for depreciation and a management allowance of \$50,000. This loss represents a -0.4% return on total capital. Total capital includes over \$8 million in land and improvements. In this case the owners of this business would require off farm income to operate the property and cover living expenses.

An analysis of alternative turn off ages of steers shows that profitability would increase by \$28,927 per year if steers were kept for an additional 12 months and turned off as 19-month-old feeder steers to be sold to a feedlot. This analysis assumes that steers would grow at 160 kg per year. Individual producers need to consider how much good country they have on their property that would be able to grow these steers to a suitable weight.

The option of keeping surplus heifers until they were 19 months old increased profitability by \$7,970 per year. However, producers may feel that keeping heifers longer than required to select replacement breeders will increase the complexity of herd management, for not enough increase in profitability.

Establishing legumes to increase pasture productivity and utilisation, carrying capacity, and liveweight gain provides the greatest increase in profitability of all the options in this analysis. This increase in productivity would also give producers more confidence that the property can grow out steers to 19 months of age.

Planting leucaena within the 'blue gums on alluvial plains' country increased profitability by \$29,295 per year, if the area was frost free. If this area was frost prone the increase in profitability would be \$25,200 per year since frosts will reduce the productivity of the leucaena. A major issue with these leucaena strategies is the large capital investment and a time lag for production to reach its potential. The peak deficits for these strategies were in excess of \$115,000, with payback periods of 7-8 years. Financial strategies will need to be implemented for the business to cope with these financial impacts.

If the 'ironbark on good soils' country within the base property has characteristics that allow for leucaena to grow, this would be a good area to plant leucaena. The lower baseline productivity of this ironbark country will provide a greater boost in carrying capacity and growth rate. Planting leucaena with new improved pastures within 'ironbark on good soils' country increased profitability by \$30,384 per year but with a peak deficit of \$152,700 and a payback period of 8 years. Planting leucaena without new improved pasture increased profitability by \$24,242 per year.

Planting other legumes such as desmanthus and stylo, after cultivation, within the 'ironbark on good soils' country increased profitability by \$28,129 per year with a peak deficit of \$76,145. The option to aerial seed these same species after burning resulted in a slight reduction in profit due to poorer legume establishment.

Grazing steers on oats decreased profitability by \$4,288 per year since the increase in cattle income does not cover the cost of growing the oats. This is supported by previous studies that show grazing forage oats reduced profitability (Murphy 2024). While the oats are growing, there is a large amount of feed available for three months. However, this country will not produce much feed of significance over summer, since all the pasture would be eradicated to grow a good oats crop, and hence have little

grazing value. Producers need to be very clear of the benefits of the oats and the lost pasture utilisation before adopting a strategy of grazing oats.

The option to buy in replacement heifers each year and mate all cows to *Bos taurus* bulls decreases profitability by \$8,672 per year. In this strategy the cost of buying in heifers outweighs the benefits of increased weaner prices per kg and the increased weight gain.

Harvesting timber using the assumptions in this report will increase profitability by \$18,394 per year. Producers considering this need to build personal and contractual relationships with contractors, as well as having a clear understanding of the legislative requirements of vegetation management. This may prove to be a deterrent for some landholders.

There is the potential to undertake several of these strategies over a long-term planning period. If the strategy to undertake a large timber harvest in the first year was implemented, this financial windfall could be used to finance leucaena establishment within the 'blue gums on alluvial plains' country. Once that leucaena was fully productive the manager can then move on to planting legumes within the 'ironbark on good soils' country.

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## 7 Glossary of terms and abbreviations

AE	Adult equivalent. An AE is a standard animal unit used to describe and quantify grazing pressure imposed on pasture by foraging ruminants. An AE rating is applied to grazing ruminants which approximates their grazing pressure relative to a standard animal.
Amortise	An amortised value is the annuity (series of equal payments) over the next $n$ years equal to the present value at the chosen relevant compound interest rate.
Cumulative cash flow	Cumulative cash flow is the predicted final bank balance of the property at the end of the investment period due to the implementation of the strategy.
DPI	Department of Primary Industries
Depreciation (as applied in estimating operating profit)	A form of fixed (overhead) cost that allows for the use (fall in value) of assets that have a life of more than one production period. It is an allowance that is deducted from gross revenue each year so that all the costs of producing an output in that year are set against all the revenues produced in that year. Depreciation of assets is estimated by valuing them at either current market value or expected replacement value, identifying their salvage value in constant dollar terms and then dividing by the number of years until replacement. The formula used in this analysis is: $\text{replacement cost} - \text{salvage value} / \text{number of years until replacement}$ .
Discount rate	The interest rate used to determine the present value of a future value by discounting. This helps determine if the future cash flows from a project or investment will be worth more than the capital outlay needed to fund the project or investment in the present.
Discounted cash flow	This technique is a way of allowing that when money is invested in one use, the chance of spending that money in another use is gone. Discounting means deducting from a project's expected earnings the amount which the investment funds could earn in its most profitable alternative use. Discounting the value of money to be received or spent in the future is a way of adjusting the future net rewards from the investment back to what they would be worth in the hand today.
Fixed (or overhead) costs	Defined as costs which are not affected by the scale of the activities in the farm business. They must be met in the operation of the farm. Examples include wages and employee on-costs, repairs, insurance, shire rates and land taxes, depreciation of plant and improvements, consultants' fees and the operators allowance for labour and management. Some fixed costs (such as depreciation or operator's allowance) are not cash costs. It is usual to count the smaller amounts of interest on a typical overdraft or short-term working capital as an operating expense (fixed cost) and deducted in the calculation of

	operating profit. The returns to lenders of fixed capital (interest, rent, lease payments) are deducted in the calculation of net profit.
Gross margin	The gross income received from an activity less the variable costs incurred. Gross margins are only the first step in determining the effect of a management decision on farm or business profitability. To determine the value of a potential strategy to the 'whole farm' or business, a more complete economic analysis is required in the form of a marginal analysis that considers the effect of alternative strategies at the property or business level.
IRR	Internal rate of return. This is the discount rate at which the present value of income from a project equals the present value of total expenditure (capital and annual costs) on the project, i.e., the break-even discount rate. This indicates the maximum interest that a project can pay for the resources used if the project is to recover its investment expenses and still just break even. <i>IRR can be expressed as either <b>the return on the total investment</b> or <b>the return on the extra capital</b>.</i>
NPV	Net present value. Refers to the net returns (income minus costs) over the life of an investment, expressed in present day terms. A discounted cash-flow allows future cash-flows (costs and income) to be discounted back to an NPV so that investments over varying time periods can be compared. The investment with the highest NPV is usually preferred. NPV was calculated at a 5% rate of return which was taken as the real opportunity cost of funds to the producer. Annualised NPV converts the Marginal NPV to an amortised, annual value. <i>The <b>annualised NPV</b> can be considered as an approximation of the <b>average annual change in profit over thirty years</b>, resulting from the management strategy.</i>
Operator's allowance	An allowance for the owners' labour and management; it can be estimated by reference to what professional farm managers/overseers are paid. Although it is often not paid in the farm accounts, it is an input required to generate the operating profit and must be deducted if a true estimate of operating profit and the return to the total capital in the business/property is to be calculated. It is generally not equal to the irregular wages paid to or drawings made by the owners. If some wages have been paid to the owners in the farm accounts and they are already included in the calculation of fixed (overhead) costs, then the only difference between the wages paid and the true opportunity cost of their labour and management will need to be allowed for when calculating operating profit.
Operating profit	The return to total capital (equivalent to total assets) invested after the variable and fixed (overhead) costs involved in earning the revenue have been deducted. Operating profit represents the reward to all the owners of the capital tied up in the enterprise. Operating profit equals gross margin (total receipts minus variable costs) minus fixed costs. When operating profit is expressed as a percentage return to total capital it

	indicates the efficiency of the use of all the capital invested in the farm enterprise. In the Dynama spreadsheet (within the Breedcow and Dynama (BCD) software package) the 'return on total non-cash assets' is equivalent to the operating profit. Both calculations are identical and are adjusted for the annual change in livestock inventory and the annual cash surplus or deficit.
Payback period	The number of years it takes for the cumulative present value to become positive. Other things being equal, the shorter the payback period, the more appealing the investment.
Peak deficit	This is an estimate of the peak deficit in cash flow caused by the implementation of the management strategy. It assumes interest is paid on the deficit and is compounded for each additional year that the deficit continues into the investment period. It is a rough estimate of the impact of the investment on the overdraft if funds for the development are not borrowed but sourced from the cash flow of the business.
Rate of return on total capital	An estimate of how profitable a business is relative to its total capital (or total assets). It is the operating profit expressed as a percentage of the average of the total capital employed for the period under review (usually a year). In the Dynama spreadsheet (within the Breedcow and Dynama (BCD) software) the 'percentage return on total non-cash assets' can be taken as equivalent to the rate of return on total capital but only for steady-state base cattle herds before implementing a change in management.
Variable costs	These costs change according to the size of an activity. The essential characteristic of a variable cost is that it changes proportionately to changes in business size (or to change in components of the business).
Year of peak deficit	The year in which the peak deficit is expected to occur.